MDAM24R01 OFFICIAL RECORD OF TRAINING - TRIM SYSTEM 05-23-75

EMPLOYEE NAME MARKS R DEPT 3041 SSN 282482721

COURSE DESCRIPTION	UIC NO	OJT HRS	GOV HRS	EMPL HRS	COMPL DATE	GRADE	GOV FAC	OTHER FAC	ATTEN SCHED
QUANTUM MECH I	091744	0	64	0	750503	SAT		X	PD
RELIABLTY MAINTNABLTY	095668	0	120	0	741220	SAT	X		FD
QA INTRO COURS	000164	0	1	0	740509	SAT	X		PD
NEW EMPLOYEE ORIENT	000164	0	3	0	740328	SAT	X		PD

EMPLOYEE'S COPY

9ND-NADC 12410/9(Rev. 2/72)

EVALUATION FOR OFF-STATION TRAINING

As required by NADCRANEINST 12410.1D of 19 Apr 1971, Enclosure (1), this form will be completed and returned to Code 063, Building 5, after completion of training or attendance at conferences. Your honest evaluation of the training/conference that you just completed is important to the Training Division.

NAME R Marks DEPT 30

1. Course Title Quantum Mechanics I

2. Training Facility and Location IU
Bloomington, IN

3. Date of training: From 14 January 1975 To 3 May 1975

4. Length of Training 4 HRS/WEEK Grade B

5. Social Security No. 282-48-2721

6. Graded GS 855 / GS-9 (Series / Level) Step 2

7. Ungraded WB (Series Level Step)

8. Supervisory ____ Non-Supervisory X

9. Is this training of immediate application to your present position?

YES. Explain why or why not THE COURSE PROVIDED THE FOUNDATION FOR UNDERSTANDING THE WORKINGS OF QUANTUM BASED INSTRUMENTS SUCH AS LED'S, LET'S, LASERS, AN TUNNELING DEVICES. EXTENSIVE USE OF PROBABILISTIC THEORY, THE FOUNDATION OF RELIABILITY, WAS EMPLOYED

10. Do other employees in your Department need this training NO.

11. In your opinion did the training justify the expenditure YES

12. Comments and recommendations concerning this training THE LEVEL OF THE COURSE WAS SUCH THAT A PREVIOUS QUANTUM MECHANICS COURSE WOULD BE A DESIRABLE PREREQUISITE. THE COURSE WAS HIGHLY THEORETICAL.

Signature

2nd Evaluation

BLDG. 120

MEMO ROUTING SLIP | NEVER USE FOR APPROVALS, DISAPPROVALS, CONCURRENCES, OR SIMILAR ACTIONS

	INITIALS	ACTION
1 TO CODE 30 R Marks	DATE	CIRCULATE / COORDINATION
2		FILE
		INFORMATION
3		NOTE AND RETURN
		PER CONVERSATION
4		SEE ME
		SIGNATURE

REMARKS

Please fill out the attached Evaluation For Off-Station Training form and return to Code 063, Building BOQ. We need this information to report you on your Official Record of Training.

FROM	DATE
063-S1 Mary	5/12
	TIME 1507

DD FORM 1 OCT 60 95 REPLACES DD FORM [illegible] WHICH WILL BE USED UNTIL EXHAUSTED

BLDG. 120

MEMO ROUTING SLIP | NEVER USE FOR APPROVALS, DISAPPROVALS, CONCURRENCES, OR SIMILAR ACTIONS

	INITIALS	ACTION
1 TO CODE 30 R. Marks	DATE	CIRCULATE / COORDINATION
2		FILE
		INFORMATION
3		NOTE AND RETURN
		PER CONVERSATION
4		SEE ME
		SIGNATURE

REMARKS

Please fill out the attached Evaluation For Off-Station Training form and return to Code 063, Building BOQ. We need this information to report you on your Official Record of Training.

FROM

063-S1 Mary

DATE 5/12

DD FORM 1 OCT 60 95 REPLACES DD FORM 1 FEB 80 WHICH WILL BE USED UNTIL EXHAUSTED

9ND-NADC 12410/9(Rev. 2/72)

EVALUATION FOR OFF-STATION TRAINING

As required by NADCRANEINST 12410.1D of 19 Apr 1971, Enclosure (1), this form will be completed and returned to Code 063, Building 5, after completion of training or attendance at conferences. Your honest evaluation of the training/conference that you just completed is important to the Training Division.

NAME R Marks DEPT 30

1. Course Title Quantum Mechanics I

2. Training Facility and Location Indiana University

Bloomington, IN

3. Date of training: From 14 January 1975 To 3 May 1975

4. Length of Training _____ Grade _____

5. Social Security No. _____

6. Graded GS _____
Series Level Step

7. Ungraded WB _____
Series Level Step

8. Supervisory _____ Non-Supervisory _____

9. Is this training of immediate application to your present position?

_____. Explain why or why not _____

10. Do other employees in your Department need this training _____.

11. In your opinion did the training justify the expenditure _____

12. Comments and recommendations concerning this training _____

_____

Signature

Waiver FPM 410.5-4b(2)(h)

TRAINING REQUEST, AUTHORIZATION, AND RECORD
NAVSO 12410/19 (REV. 7-70)
S/N 0104-942-3090

NIP
DOE: 3-25-74 CC

PART I - TRAINING REQUEST

TRAINING RESOURCE *(Name and address)*
Indiana University
Bloomington, IN

1. IDENTIFICATION OF TRAINING PROGRAM OR COURSE TITLE	2. TOTAL TRAINEES	3. STATEMENT OF CONTENTS OF COURSE OR PROGRAM
Quantum Mechanics I	1	Elementary wave mechanics, discrete and continuous eigenvalues. Probabalistic measures of spin and particle identity.

4. OBJECTIVE OF PROPOSED TRAINING *(Brief description of the specific work projects to which this training applies. Include career development aspects.)*
Course provides foundation for understanding the workings of Quantum Based Instruments. Employs extensive use of Probability Theory (foundation of Reliability) Aid in support projects.

5. TRAINING PERIOD *(Year, month, & day)*
BEGINNING DATE: 14 January 1975
ENDING DATE: 3 May 1975

COURSE HOURS

GOVERNMENT TIME	EMPLOYEE TIME
64 hrs	

6. ESTIMATED COST
A. DIRECT COSTS (TOTAL) $ 124.00
(1) TUITION AND FEES $ 124.00
(2) BOOKS AND MATERIALS $
B. INDIRECT COSTS (TOTAL) $
(1) TRAVEL $
(2) PER DIEM $
(3) TRANSPORTATION OF IMMEDIATE FAMILY, SHIPMENT OF HOUSEHOLD EFFECTS, ETC. $
C. ☐ TRAINING DOES NOT INVOLVE EXPENDITURES OF FUNDS OTHER THAN SALARY, PAY, OR COMPENSATION

7. SIGNATURE OF REQUESTING OFFICIAL
A. E. WHITNER, Director, WQEC
DATE 2/11/75

PART II - AUTHORIZATION

1. APPROVAL TO EXPEND FUNDS NOT TO EXCEED
$ 124.00

2. SIGNATURE OF APPROVING AUTHORITY *(as designated by CMMI 410)*

DATE 6 JAN 1975

Copy for: ORIGINATING OFFICE ADC 75-472

PART III - TRAINING RECORD

A	B	C	D
NAME *(Last, Initial)*	SEX	SHOP OR CODE	SOCIAL SECURITY NUMBER
16	1	4	9
MARKS R	M	0030	[redacted]

H	I		
SUPV. STATUS	OCCUPATION CODE		
	PAY PLAN	SERIES	LEVEL
1	2	5	2
2	GS	0085	09

INSTRUCTIONS

1. Originating office should complete all items on this page and route to Training Office.
2. DO NOT write below heavy lines.
3. Enter additional trainees on NAVSO 12410/19A. Complete blocks A, B, C, D, H, and I only, and attach to this request.

REQUEST FOR TRAINING

PART A TRAINING NEED Date: 11/26/74

From:

To:

Via: (1)____
(2)____
(3)____

Trainee: ROBERT J. MARKS II Pay Number: [redacted]

Position Title: ELECTRONICS ENGINEER Series No. of Position: 855

Grade Level: GS 9 Supervisory Status: Yes___ No X

Date of Employment at NAD Crane: 3/25/74 (not Comp. Date)

Social Security Number: 282-48-2721

Objective of Proposed Training: (Brief description of the specific work projects to which this training applies. Include career development aspects.)
COURSE PROVIDES FOUNDATION FOR UNDERSTANDING THE WORKINGS OF QUANTUM BASED INSTRUMENTS SUCH AS LED'S, LET'S, LASERS, AND TUNNELING DEVICES. EMPLOYS EXTENSIVE USE OF PROBABILITY THEORY, THE FOUNDATION OF RELIABILITY. COURSE WOULD AID IN SUPPORT PROJECTS (EX: PARTS STANDARDIZATION; PLANNED FLS CONSULTATION IN LASER OPTICS). APPLICABLE TO GRADUATE DEGREE.

PART B TRAINING COURSE: QUANTUM MECHANICS I

__Government X Non-Government X Professional __Management X Technical __Skills

Statement of Contents of Course or Program: QUANTUM MECHANICS I (P611): ELEMENTARY WAVE MECHANICS, DISCRETE AND CONTINUOUS EIGENVALUES, PROBABALISTIC MEASURES OF SPIN AND PARTICLE IDENTITY.

Training Facility: INDIANA UNIVERSITY Location: BLOOMINGTON, IND.

Date: 13 JAN 75 to 3 MAY 75 Time of Training: TUESDAYS AND THURSDAYS 1:30 TO 3:15 PM

Hours of Training: 64 Gov't 64 Employee 11/26/74

Employee: Robert J. Marks II

Supervisor: K. Saum

COST OF TRAINING:

Tuition	$ 124
Travel	0
Per Diem	0
Empl. Total	

TRAINING PROGRAM OUTLINE
PRODUCTION RELIABILITY SURVEILLANCE GROUP

Bob Marks

I. Orientation

A. Activity — 1 week

1. Depot

2. Department - WQEC

3. Division - Plans & Programs Division (Code 304) Aircraft Equipment Division (Code 307)

4. Branch - Various Branch - (Code 304/307)

5. Section - Various Section (Code 304/307)

B. Working Area

1. Production Reliability Surveillance

II. Basic Instructions

A. Reliability Theory — 2 weeks

1. Reading Assignments:

OD 46574 Life Cycle Product Quality Program Requirements for Naval Ordnance Material

AR-34

MIL-STD-781B

AV-2000-AV5000

MIL-D-18300

MIL-T-18303

Reference Guide for Most Commonly used system effectiveness documents

Other appropriate documents

2. Brain Storming Sessions

AR-34

MIL-STD-781B

AR-10A

AV 2000

AV 5000

Navy Contracts

MIL-T-18303

MIL-D-18300

B. Technical Indoctrinations

1. Navy Contracts

2. Equipments Specification

a. AV-2000 — 2 weeks

b. AV-5000

3. Reliability Specification

a. AV-34

b. MIL-STD-781

c. MIL-R-22973

d. MIL-HDBK-217

e. MIL-STD-785

f. MIL-STD-756

g. MIL-STD-757

4. Format and Procedures

a. MIL-T-18303

b. MIL-D-18300

c. Test Procedure

d. Check List

e. Letters

5. Explanation of Duties and Responsibilities

a. AIRTASK

b. Test Procedure Approval

c. Test Reports

d. Contract Management Cards

e. Surveillance of Manufacturer's Test Facilities

f. Special Reports

III. On the job assignments

A. Technical Projects

1. DKT-30 Transmitting Set Telemetric

2. AAU-31A Altimeter

3. AAU-32A Altimeter

4. ARR-72 Sonobuoy Receiver Set

5. ARR-75 Radio Receiving Set (Edmac)

6. ARR-75 Radio Receiving Set (AEL)

B. Data Collection

C. Data Processing

D. Reliability Analysis

E. Investigation of Programs

F. Proposed Corrective Action

IV. Forming Training

A. AMETA Course "Elements of Reliability and Maintainability.

B. ARINC application of Reliability and Maintainability Techniques.

C. Local Training - Technical Writing Course.

MDAM24R01 OFFICIAL RECORD OF TRAINING - TRIM SYSTEM 01-16-75

EMPLOYEE NAME MARKS R DEPT 3040 SSN 282482721

COURSE DESCRIPTION	UIC NO	OJT HRS	GOV HRS	EMPL HRS	COMPL DATE	GRADE	GOV FAC	OTHER FAC	ATTE SCHE
RELIABLTY MAINTNABLTY	095668	0	120	0	741220	SAT	X		FD
QA INTRO COURS	000164	0	1	0	740509	SAT	X		PD
NEW EMPLOYEE ORIENT	000164	0	3	0	740328	SAT	X		PD

EMPLOYEE'S COPY

MDAM24R01 OFFICIAL RECORD OF TRAINING - TRIM SYSTEM 01-16-75

EMPLOYEE NAME MARKS R DEPT 3040 SSN 282482721

COURSE DESCRIPTION	UIC NO	OJT HRS	GOV HRS	EMPL HRS	COMPL DATE	GRADE	GOV FAC	OTHER FAC	ATTEI SCHE
RELIABLTY MAINTNABLTY	095668	0	120	0	741220	SAT	X		FD
QA INTRO COURS	000164	0	1	0	740509	SAT	X		PD
NEW EMPLOYEE ORIENT	000164	0	3	0	740328	SAT	X		PD

EMPLOYEE'S COPY

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
304B-RJM:sh
12340/2
7 Jan 1975

MEMORANDUM

From: 304B (R. J. Marks II)
To: 304B

Subj: TDY Training Report for period 2 - 20 Dec 1974

1. Activities Visited and Persons Contacted: United States Army Management Engineering Training Center (AMETA), Rock Island, IL.

   a. Cary Chittenden
   b. George Kalemkarian

2. Purpose of visit:

   a. To attend course entitled "Elements of Reliability and Maintainability".

   b. To find out information concerning the AMETA course on probabalistic design.

3. Discussion:

   a. An outline of the material covered in the course with corresponding description follows:

      (1) Introduction

         (a) History of and need for reliability and maintainability (R&M).

         (b) Definitions of R&M.

         (c) R&M program philosophy.

      (2) Probability and Statistics

         (a) Review of basic probability definitions and laws.

         (b) Review of probabistic tools.

            1. Set theory.

            2. "Tree" solutions to problems.

         (c) Common Probability Distributions

1. Weibull
2. Exponential
3. Binomial
4. Bernoulli
5. Poissan
6. Normal
7. Lognormal
8. Gamma

(d) Probability functions used in R & M.

1. Failure density
2. Cumulative failure
3. Reliability
4. Hazard

(e) Statistics

1. Distribution measures.

a. Central tendency (ex: mean, median).

b. Dispersion measures (ex: variance, range).

(3) System and Subsystem Reliability Models

(a) Models

1. General procedure
2. Series, parallel and mixed models.
3. Partial and standby redundancies.
4. Reliability apportionment.

a. AGREE method.

b. ARINC method.

(a) MonteCarlo simulation

(4) Reliability Demonstration and Testing

(a) Parameter estimation

1. Non-parametric analysis

2. Parametric Analysis

a. Graphical procedures

b. Goodness of fit tests.

c. Normal, Exponential, and Weibull parameter estimations.

(b) Test of hypotheses (for)

1. Normal distributions

2. Weibull distributions

3. Exponential distributions

(c) Acceptance life testing

1. Exponential (MIL-HDBK-H108)

2. Weibull

a. Mean life criterion (MIL-TR3)

b. Reliable life criterion (MIL-TR6)

c. Hazard rate criterion (MIL-TR4)

3. Normal (MIL-STD-414)

4. Non-Parametric (MIL-STD-105)

(d) Accelerated life testing

(5) Stress-Strength Analysis

(a) For known distributions

1. Graphical Solutions

2. For Normal densities

3. Reliability and Safety Margin approaches.

(b) Strength distribution determination

(c) For one-shot items

(6) Maintainability Analysis

(a) Concepts of Maintainability

(b) Maintainability functions

(c) Maintainability indices

1. Time

2. Cost

3. Effectiveness

(d) Probabilistic Aspects of Maintainability.

(e) Maintainability Apportionment

(f) Maintainability Predictions (RCA method).

(7) Introduction to Systems Effectiveness

(a) The Systems Effectiveness Model (-a function of Availability, Dependability and Capability) from WSEIAC effort.

Course materials obtained are:

1. Text: "Elements of Reliability and Maintainability".

2. Book of problem solutions from text.

3. Book of common probability tables and graphs.

4. Copies of:

a. MIL-STD-470: Maintainability Program Requirements.

b. MIL-STD-471: Maintainability Demonstration.

c. MIL-STD-785A: Reliability Programs for Systems and Equipment Development and Production.

d. Air Force Systems Command Manual: R & M research and development procedures manual.

All above material is published by AMETA, Rock Island, Illinois. Also obtained were copies of probalistic paper for plotting of exponential, weibull, and normal statistics.

b. The first week course entitled "Introduction to Probabalistic Design for Reliability" will be offered by AMETA starting on 9 June 1975. The course text has not yet been printed, but a copy will be forwarded on completion by request. A bibliography of recent work in probabalistic design may be found in the most recent issue of the IEEE Transactions on Reliability. Materials obtained concerning AMETA include:

(1) AMETA Course book including course listings and abstracts.

(2) A bar graph in time of courses offered by AMETA through 1975.

4. Recommendations:

a. The course taken provides an introductive overview of the philosophy and theory of reliability, maintainability, and systems effectiveness. Although integral and differential calculus are listed as prerequisities, the mechanics of the course can be executed with a firm knowledge of algebra and graph techniques if the concept of topic can be grasped intuitively. Basic probability theory is reviewed, making an apriori knowledge unnecessary. The listed prerequisites are thus thought strong in comparison to the course demands.

b. The quality of instruction, including materials, text, and instructor, was excellent. A slide rule calculator, however, is a helpful, yet unprovided tool for problem working and tests.

c. Overall, the course met its purpose and is recommended as a theoretical introductive overview to all concerned with R & M.

R. J. MARKS II

Copy to:
G. Allen, C. Rice, R. Saum

a. MIL-STD-470: Maintainability Program Requirements.

b. MIL-STD-471: Maintainability Demonstration.

c. MIL-STD-785A: Reliability Programs for Systems and Equipment Development and Production.

d. Air Force Systems Command Manual: R & M research and development procedures manual.

All above material is published by AMETA, Rock Island, Illinois. Also obtained were copies of probalistic paper for plotting of exponential, weibull, and normal statistics.

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c. Overall, the course met its purpose and is recommended as a theoretical introductive overview to all concerned with R & M.

R. J. MARKS II

Copy to:
G. Allen, C. Rice, R. Saum

ENROLLMENT AND REGISTRATION REQUEST
FOR DoD MANAGEMENT EDUCATION AND TRAINING PROGRAM COURSES

063

1. THRU:	2. TO:	3. FROM (INSTALLATION/ACTIVITY):
	AMETA Rock Island, IL	Commanding Officer(Code 063) Naval Ammunition Depot Crane, Indiana 47522

4. COURSE TITLE AND NUMBER	5. CONDUCTED BY
Elements of Reliability & Maintenance	AMETA, Rock Island, IL 75-144

6. CLASS NUMBER	7. STARTING DATE	8. QUOTA SOURCE
	2-20 Dec 1974	

9. NOMINEE STATUS	10. AGE	11. SOCIAL SECURITY NO.	12. SECURITY CLEARANCE
Primary	24	[redacted]	Secret

13. PREVIOUS COURSES ATTENDED IN THIS SCHOOL	14. OTHER TRAINING IN COURSE AREA
None	Statistics Probability

15. NAME (Last, First, Middle initial) HOME ADDRESS (Include ZIP Code and Telephone No.) OF NOMINEE	16. IN CASE OF EMERGENCY NOTIFY:	
	A. NAME	B. RELATIONSHIP
MARKS, Robert J., II 3111 Leonard Springs Rd., Apt. 162 Bloomington, IN 47401 Send confirmation to address in Block 3.	Connie Lynn Marks	Wife
	C. STREET, CITY AND STATE	D. AREA CODE & TEL. NO.
	Same as No. 15	812-332-3892

A. ☒ MALE ☐ FEMALE

17. MILITARY ONLY →	A. RANK/GRADE	B. SERVICE	C. BRANCH	D. SOC. SEC. NO.	E. DATE OF RANK

18. RECORD OF EMPLOYMENT

JOB	PERIOD COVERED FROM	PERIOD COVERED TO	POSITION TITLE	MOS/AFSC OR NAVY DESIG/ GS GRADE & SERIES	NAME OF EMPLOYER OR ACTIVITY
1	3-25-74	Present	Electronics Engr.	GS-855-9	NAD Crane, IN
2					
3					

BRIEF RESUME OF PRESENT DUTIES

Project Engineer for Thermal Stability Program.

19. EDUCATION	YES	NO	A. HIGHEST GRADE COMPLETED	B. HIGHEST DEGREE RECEIVED	C. NAME AND LOCATION OF COLLEGE
HIGH SCHOOL GRADUATE	X			M.S.	Rose-Hulman Institute of Tech. Terre Haute, IN
COLLEGE GRADUATE	X				

20. IF BILLETING FACILITIES ARE NOT AVAILABLE, DOES NOMINEE REQUEST HOTEL RESERVATIONS?	21. NAME OF HOTEL AT WHICH NOMINEE PREFERS RESERVATION
☐ YES ☒ NO	

22. DOES NOMINEE MEET PREREQUISITES LISTED IN DOD 5010.16C?	A. SIGNATURE OF TRAINING OFFICER	B. DATE
☒ YES ☐ NO (If NO, sheet must be attached requesting waiver)	James E. Fultz	25 NOV 1974

23. NAME AND TITLE OF REQUESTING OFFICIAL	A. SIGNATURE OF REQUESTING OFFICIAL	B. DATE OF REQUEST
[illegible] F. RUIZ [illegible], Training Division	James E. Fultz by direction	25 NOV 1974

FOR SCHOOL USE ONLY

24. TO:	25. FROM (COURSE SPONSOR):

26. HOTEL RESERVATIONS CONFIRMED AT	A. HOTEL RESERVATIONS BEGIN ON EVENING OF

27. ENROLLMENT & REGISTRATION IS APPROVED	A. APPROVED/DISAPPROVED BY	B. DATE
☐ YES ☐ NO		

REMARKS	28. NOMINEE SUCCESSFULLY COMPLETED COURSE	A. GRADE
Replaces Deon D. Hersberger previously submitted.	☒ YES ☐ NO 12 Mar	A
	B. AUTHENTIFICATION (Signature and Date) A. Lynn Marks, Ph. D.	

DD FORM 1 AUG 72 1556 EDITION OF 1 OCT 67 IS OBSOLETE S/N 0102-015-7302

ELEMENTS OF RELIABILITY AND MAINTAINABILITY (JT) 5A-F2
(3 WEEKS)

Purpose: This course is designed to provide the enrollees with a working knowledge of the mathematical, engineering, and managerial aspects of reliability and maintainability, including an introduction to system effectiveness.

Scope: Among topics to be considered are the concepts of reliability (R) and maintainability (M), R&M requirements, R&M design consideration, managerial aspects of R&M programs, component and system reliability measurements, probability and statistics, data feedback and analysis, and an introduction to system effectiveness.

Prerequisites: This course is designed for engineers and scientists currently engaged in reliability and maintainability activities. Enrollees are required to have completed mathematics through differential and integral calculus.

BOSLER, Alan	[redacted]	7.43	1.69	8.80	15.91
CARLSON, Ken	[redacted]	8.70	2.70	8.80	20.20
FILLINGIM, Brian	[redacted]	7.76	2.41	8.80	18.97
HERSBERGER, Deon	[redacted]	5.85	1.81	8.80	16.46
KELSO, Dave	[redacted]	7.29	2.26	8.80	18.35
MARKS, Robert II	[redacted]	5.85	1.81	8.80	16.46
NONTE, Alan	[redacted]	2.73	.85	8.80	12.38
RICE, Claude	[redacted]	9.25	2.87	8.80	20.92
SAUM, Bob	[redacted]	10.09	3.13	8.80	22.02
SHAW, T.W.	[redacted]	6.04	1.87	8.80	16.71
SMITH, K.A.	[redacted]	6.24	1.93	8.80	16.97
WELP, Charles	[redacted]	8.70	2.70	8.80	20.20
WILLIAMS, Tim	[redacted]	3.46	1.07	8.80	13.33
ARVIN, Lawrence	[redacted]	3.87	1.20	8.80	13.87
S.S. KALBERER	[redacted]	12.59	3.90	8.80	25.29

Base Rate Overhead

Appendix B

EXTRACTS FROM THE ESPIONAGE LAWS AND FEDERAL STATUTES

United States Code, Title 18, Section 793
Gathering, Transmitting, or Losing Defense Information:

a. Whoever, for the purpose of obtaining information respecting the national defense with interest or reason to believe that the information is to be used to the injury of the United States, or to the advantage of any foreign nation, goes upon, enters, flies over, or otherwise obtains information concerning any vessel, aircraft, work or defense, navy yard, naval station, submarine base, fueling station, fort, battery, torpedo station, dockyard, canal, railroad, arsenal, camp, factory, mine, telegraph, telephone, wireless, or signal station, building, office, research laboratory, or station or other place connected with the national defense owned or constructed, or in progress of construction by the United States or under the control of the United States, or of any of its officers, departments, or agencies, or within the exclusive jurisdiction of the United States, or any place in which any vessel, aircraft, arms, munitions, or other materials or instruments for use in time of war are being made, prepared, repaired, stored, or are the subject of research or development, under any contract or agreement with the United States, or any department or agency thereof, or with any person on behalf of the United States, or any prohibited place so designated by the President by proclamation in time of war or in case of national emergency in which anything for the use of the Army, Navy, or Air Force is being prepared or constructed or stored, information as to which prohibited place the President has determined would be prejudicial to the national defense; or

b. Whoever, for the purpose aforesaid, and with like intent or reason to believe, copies, takes, makes, or obtains, or attempts to copy, take, make, or obtain and sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, document, writing, or note of anything connected with the national defense; or

c. Whoever, for the purpose aforesaid, receives or obtains or agrees or attempts to receive or obtain from any person, or from any source whatever, any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note of anything connected with the national defense, knowing or having reason to believe, at the time he receives or obtains, or agrees or attempts to receive or obtain it, that it has been or will be obtained, taken, made or disposed of by any person contrary to the provisions of this Chapter; or

d. Whoever, lawfully having possession of, access to, control over, or being entrusted with any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note relating to the national defense, or information relating to the national defense which information the possessor has reason to believe could be used to the injury of the United States or to the advantage of any foreign nation, willfully communicates, delivers, transmits, or causes to be communicated, delivered, or transmitted, or attempts to communicate, deliver, transmit or cause to be communicated, delivered or transmitted the same to any person not entitled to receive it, or willfully retains the same and fails to deliver it on demand to the officer or employee of the United States entitled to receive it; or

semination of information relative thereto, it shall be unlawful to make any photograph, sketch, picture, drawing, map, or graphical representation of such vital military and naval installations or equipment without first obtaining permission of the commanding officer of the military or naval post, camp, or station, or naval vessels, military or naval command concerned, or higher authority, and promptly submitting the product obtained to such commanding officer or higher authority for censorship or such other action as he may deem necessary.

b. Whoever, violates this section shall be fined not more than $1,000 or imprisoned not more than one year, or both. (June 25, 1948, ch. 645, 62 Stat. 737.)

United States Code, Title 18, Section 796
Use of Aircraft for Photographing Defense Installations:

Whoever uses or permits the use of an aircraft or any contrivance used, or designed for navigation or flight in the air, for the purpose of making a photograph, sketch, picture, drawing, map, or graphical representation of vital military or naval installations or equipment, in violation of Section 795 of this title, shall be fined not more than $1,000 or imprisoned not more than one year, or both. (June 25, 1948, ch. 645, 62 Stat. 738.)

United States Code, Title 18, Section 797
Publication and Sale of Photographs of Defense Installations:

On and after thirty days from the date upon which the President defines any vital military or naval installation or equipment as being within the category contemplated under Section 795 of this title, whoever reproduces, publishes, sells, or gives away any photograph, sketch, picture, drawing, map, or graphical representation of the vital military or naval installations or equipment so defined, without first obtaining permission of the commanding officer of the military or naval post, camp, or station concerned, or higher authority, unless such photograph, sketch, picture, drawing, map, or graphical representation has clearly indicated thereon that it has been censored by the proper military or naval authority, shall be fined not more than $1,000 or imprisoned not more than one year, or both. (June 25, 1948, ch. 645, 62 Stat. 738.)

United States Code, Title 18, Section 798
Disclosure of Classified Information:

a. Whoever, knowingly, and willfully communicates, furnishes, transmits, or otherwise makes available to an unauthorized person, or publishes, or uses in any manner prejudicial to the safety or interest of the United States or for the benefit of any foreign government to the detriment of the United States any classified information— (1) concerning the nature, preparation, or use of any code, cipher, or cryptographic system of the United States or any foreign government; or (2) concerning the design, construction, use, maintenance, or repair of any device, apparatus, or appliance used or prepared or planned for use by the United States or any foreign government for cryptographic or communication intelligence purposes; or (3) concerning the communication intelligence from the communications of any foreign government, knowing the same to have been obtained by such processes—Shall be fined not more than $10,000 or imprisoned not more than ten (10) years, or both. (Added Oct. 31, 1951, ch. 655, Section 24(a), 65 Stat. 719.)

United States Code, Title 18, Section 799
Violation of Regulations of National Aeronautics and Space Administration:

Whoever willfully shall violate, attempt to violate, or conspire to violate any regulation or order promulgated by the Administrator of the National Aeronautics and Space Administration for the protection or security of any laboratory, station, base or other facility, or part thereof, or any aircraft, missile, spacecraft, or similar vehicle, or part thereof, or other property or equipment in the custody of the Administration, or any real or personal property or equipment in the custody of any contractor under any contract with the Administration or any subcontractor of any such contractor, shall be fined not more than $5,000, or imprisoned not more than one year, or both. (Added Pub. L. 85-568, title III, Section 304 (c) (1), July 29, 1958, 72 Stat. 434.)

United States Code, Title 50, Section 797

120

MFAT30R02

NOTICE OF POSITION DESCRIPTION NUMBER CHANGE

FROM DATE 06/26/74 TO DATE 07/25/74 RUN DATE 08/19/74

NAME MARKS ROBERT J II SSN 282-48-2721

	DEPT	P D NUMBER	JOB TITLE	PLAN	SERIES	GR
FROM	304000	01425	ELECTRONICS ENGINEER	GS	00855	09
TO	304000	30428004	ELECTRONICS ENGINEER	GS	00855	09

POSITION DESCRIPTION NUMBER CHANGED TO ESTABLISH AUTOMATED POSITION DESCRIPTION FILE

BURSTS & DUDS

Vol. 32 No. 18 March 18, 1975 Naval Ammunition Depot, Crane, Indiana

FROM THE COMMANDING OFFICER

This issue of Bursts and Duds provides current, up-to-date information which must be followed by the Civilian Personnel Department in effecting terminations and reduction-in-force actions directed by the Commander, Naval Sea Systems Command earlier this year.

Vigorous and continuing efforts have been made by the top managers of NAD Crane to maintain stable employment levels and avoid forced reductions of permanent personnel. Until now, we have been successful in that endeavor. All appropriate actions have also been taken, independently, by the Crane Management Association and AFGE Local 1415 to eliminate or relieve the directed reduction-in-force of permanent employees.

However, I have now been ordered to reduce the NAD Crane workforce to the level of 3830 employees by 30 June 1975. In addition to absorbing all normal attrition of employees, it will be necessary to terminate the services of temporary employees and to separate 475 career and career/conditional employees by reduction-in-force procedures. These actions are necessitated by manpower ceilings imposed upon the Department of Defense, which have resulted in manpower realignments at several Naval Activities.

I deeply regret the necessity for this action. I recognize that it will cause serious hardships for many families. During my tour of duty here I have become keenly aware of the industry and dedication of Crane employees. I want to assure all of you who are adversely affected that the actions being taken do not suggest any inadequacy of performance on your part. On the contrary, you have contributed magnificently to the defense posture and security of our nation.

One step which is being taken to alleviate the reduction in personnel is to obtain authority for the "early out" retirement provisions which can be authorized by the Civil Service Commission when an activity is undergoing reduction-in-force. Request for this authority has been initiated. You will be advised of the specific provisions as soon as it is authorized.

The procedures outlined in this publication are those required by law and regualtions of the Civil Service Commission and the Navy Department. I suggest that each employee and supervisor retain this paper for future reference and to help in understanding how forced separations of employees must be effected. In addition, watch for future issues of Bursts and Duds. I will be furnishing additional information and clarification on RIF questions which come to my attention.

R. L. McArthy
Captain, USN
Commanding Officer

GENERAL INFORMATION ON REDUCTION IN PERSONNEL AT NAD CRANE

1. DEFINITIONS

a. Temporary Employee--Employee serving under a Temporary limited appointment not to exceed one year.

b. TAPER Employee--Employee serving under Temporary Authority issued by the Civil Service Commission pending the establishment of a register of eligibles.

c. Career-Conditional Employee--Employee serving under an appointment made on a permanent basis but who has less than three years' continuing service under this appointment.

d. Career Employee--Employee serving under a permanent appointment who has completed three years' or more substantially continuous service under career-conditional appointment.

e. Excepted Employee--Employee holding an appointment excepted from the Competitive Civil Service System by law, executive order or regulation. (Examples include Vietnam veterans holding Veterans' Readjustment Appointments (VRA), severely handicapped employees and undergraduate college students working under cooperative work-study agreements.)

f. Representative Rate--The step rate used in determining valid job offers in a reduction-in-force. Regulations prescribe that the step rates to be used for this purpose are the 4th step of the General Schedule (GS) for positions subject to the Classification Act, and the 2nd step for wage grade positions (supervisory and non-supervisory).

g. Competitive Level--A group of positions that are of the same grade level and are sufficiently similar as to duties and knowledge and skills needed to perform the work that interchange of employees is feasible without undue interruption of the work. Characteristics shared by all positions in a competitive level are similarity of duties, responsibilities, and pay schedules; and similarity of requirements for experience, training, skills, and aptitudes.

h. Competing Employee--Employee serving under appointment not limited to one year or less.

i. Non-Competing Employee--Employee serving under appointment with specific time limitation of one year or less. An employee with unsatisfactory performance rating regardless of type of appointment is a non-competing employee.

j. Retention Subgroups--A grouping of employees according to the type of appointment and veteran's preference. (This grouping is illustrated in paragraph 3b below).

k. Retention Register--A list of employees by competitive level in retention order.

2. NOTICE PERIODS

a. Temporary Employees.

(1) Employees serving under temporary appointments not to exceed one year will be given an advance notice of five working days. The five days will be in a work status if possible.

(2) Employees serving under TAPER and Term appointments (when present in workforce) will be given a 30-day advance notice in a work status if possible.

b. Career and Career-Conditional Employees.

(1) Employees affected by RIF action will be given an advance notice of 60 days in a duty status (if possible).

(2) The employee, upon his request, shall be carried on leave without pay or annual leave (if available) for such additional time as necessary to provide a 90-day notice period prior to separation.

3. ORDER OF SEPARATIONS

a. General. Employees serving under temporary appointments will be separated before employees in the same competitive level who hold career or career-conditional appointments.

(1) Employees in Wage Grade Positions. Temporary employees will be the first employees separated from each competitive level by retention order. That is, employees with the shortest period of creditable federal service will be released first. Consideration will also be given to veteran's preference as explained in paragraphs 3b, 4 and 8 below.

(2) Employees in Classification Act Positions. Temporary Classification Act employees will be separated in the order in which their positions are eliminated, rather than by retention order. This means that when a Classification Act position occupied by an employee on a temporary limited appointment is abolished, the employee occupying that position is terminated.

b. Except as indicated above for temporary employees in Classification Act positions, the order of release from a competitive level will be according to the following retention subgroups (unless the employee involved is entitled to another job offer, release from his competitive level will also result in his separation):

(1) OB - Non-veteran employees serving on temporary limited appointments in continuing positions.
(2) OA - Veteran employees serving on temporary limited appointments in continuing positions.
(3) 5B - Career-conditional non-veteran employees serving on temporary promotions.
(4) 5A - Career-conditional veteran employees serving on temporary promotions.
(5) 4B - Career non-veteran employees serving on temporary promotions.
(6) 4A - Career veteran employees serving on temporary promotions.
(7) 3B - Term and TAPER non-veteran employees.
(8) 3A - Term and TAPER veteran employees.
*(9) 2B - Career-conditional non-veteran employees.
*(10) 2A - Career-conditional veteran employees.
(11) 1B - Career non-veteran employees.
(12) 1A - Career veteran employees.

*Also included in these retention subgroups are career employees who are serving a probationary period and career employees who are serving in obligated positions. (Obligated positions are positions to which other employees have statutory restoration rights.)

NOTES: 1. Employees in Groups 0, 5, and 4 and employees with an unsatisfactory performance rating are called non-competing employees. All employees in these groups in the same competitive level will be removed from the competitive level before any competing employee is released.

2. Employees on temporary promotion are non-competing employees in the competitive level to which temporarily promoted. They compete for retention only in the competitive level of their regular job.

3. Release from each retention subgroup above will be by retention order. That is, employees with the shortest period of creditable federal service will be released first. Release of employees in the same subgroup with the same service date (ties) will be based on performance ratings. If performance ratings are the same then other means of breaking the tie will be used in this order: (1) length of service in present position, (2) length of service at Crane, (3) length of pertinent experience related to present position.

4. Under the Dual Compensation Act, retired members of the Armed Forces working in Civil Service positions are considered to be non-veterans and have no veterans' preference in a reduction-in-force. Exceptions to this rule are those retired veterans who have less than 20 years of full-time active service, those whose retirement was based on disability incurred in the line of duty during a period of war, or those who have been employed on a federal civilian job continuously since 30 November 1964. For reduction-in-force purposes, retired members of the Armed Forces, not covered by one of the exceptions in the preceding sentence, receive credit for only that military service performed during wartime or in a campaign or expedition for which a campaign badge has been authorized.

4. REASSIGNMENT RIGHTS (BUMP AND RETREAT)

a. Temporary Employees.

(1) Employees holding temporary limited appointments have no reassignment rights.

b. Career and Career-Conditional Employees.

(1) Career and career-conditional employees released from a competitive level are entitled to assignment to another position in one of the following ways:

(a) To a continuing position in another competitive level for which he qualifies for displacement action, but is occupied by an employee in a lower retention subgroup. In this situation, a 1A employee can displace a 1B or an employee in group 2 or 3. A 1B can displace an employee in group 2 or 3. A 2A can displace a 2B or an employee in group 3. This right to displace on the basis of subgroup superiority is known as reassignment or "bumping" rights.

(b) To a position from which he was previously promoted and which is occupied by an employee with a later service date in the same or lower retention subgroup. In this situation, a 1A with a service date of 03-17-58, can displace another 1A with a service date of 03-18-58. He can also displace an employee in subgroup 1B or in group 2 or 3. This is known as "retreat rights."

(2) A career or career-conditional employee reached for a reduction-in-force may be assigned to a vacant position for which he qualifies which is the same grade or level and/or equal representative rate to the best offer available under (1) (a) and (b) above. (This will satisfy his reduction-in-force rights.) The employee involved does not have the right to choose the position to which he will be assigned.

5. QUALIFYING FOR DISPLACEMENT (BUMP AND RETREAT)

To be eligible to bump or retreat, an employee must not only have superior retention rights to the employee in the position, but also he must be sufficiently qualified that he can assume the position without undue interruption of the work. This means that he must be fully qualified--including meeting the physical qualifications of the job for which being considered under bumping and retreat rights. If the physical requirements for the position for which being considered are greater than the one in which he is performing, a current physical examination may be necessary. As the situations are identified, the Civilian Personnel Department requests the Medical Department to schedule and conduct physical examinations as rapidly as possible. Employees should protect their rights to possible job offers under RIF by cooperating fully in the physical examining process. If they subsequently wish to decline the offer or even to appeal the decision that it represents their "best offer," they still have that right. However, if it cannot be determined that they are "fully qualified," the offer cannot be made in the first place!

6. DECLINATION OF OFFERS IN REDUCTION IN FORCE

(a) Regulations require that an employee separated from a competitive level must be given his "best" offer based on available positions and his retention standing. The "best" offer is determined on the basis of pay, using the representative rate method.

(b) An employee may decline his "best" offer if he chooses. However, such a declination will not entitle him to an offer of another position. Rather, the declination of a valid (best) offer in RIF will result in separation of the employee involved.

7. RELEASE OF EXCEPTED EMPLOYEES. Excepted employees do not compete in reduction-in-force with employees in the competitive service. They do compete with other employees in the excepted service. Excepted employees are grouped separately on retention registers by competitive levels and subgroup retention standing the same as described above. As management determines that positions occupied by excepted employees must be excessed, the employees involved compete within the excepted service for the remaining positions. Those who are not entitled to an offer of another excepted position are separated.

8. VETERANS VS. NON-VETERANS. A mistaken impression seems to persist that it is illegal or improper to separate employees with veterans' preference while non-veteran employees remain in the workforce. A look at the provisions of RIF regulations as explained in paragraphs 3 and 4 above should readily reveal the true situation. Veterans' preference applies within the retention group for RIF purposes. Since non-competing employees must be separated from a competitive level before any of the competing employees, it is required that temporary veteran employees be separated from a given competitive level ahead of non-veteran employees in retention subgroups 3b, 2b, and 1b. Similarly, a career-conditional veteran employee (2A) will be separated from a competitive level before career non-veterans in retention group 1b.

9. SEVERANCE PAY

a. Temporary Employees.

(1) Employees serving under these appointments are not eligible for severance pay.

b. Career and Career-Conditional Employees.

(1) Employees working under career-conditional appointments are entitled to severance pay if they are separated in reduction-in-force, provided they have worked without any break in service of more than three days for a minimum of 12 calendar months preceding the date of separation.

(2) A career-conditional or career employee is also entitled to severance pay, if he meets the 12 months service requirement and if he declines an offer of lower grade and rate of pay (exclusive of a retained rate) and is separated in RIF as a result of that declination. The declination of an "equivalent position" (which means one that provides a rate of pay at least equal to his current rate of pay) makes an employee ineligible for severance pay.

(3) Severance pay is computed as follows: one week of basic compensation for each year of creditable service up to 10 years; two weeks of basic compensation for each year of creditable service beyond 10 years. In addition, the basic compensation is increased by 10 per cent for each year employee's age exceeds 40. The total amount cannot exceed one year's pay at the rate of pay in effect immediately prior to separation.

(4) Employees entitled to an immediate annuity at the time of separation, or who are receiving compensation under the Federal Employee's Compensation Act are not entitled to severance pay.

10. RETENTION REGISTER

a. Official retention registers are maintained by the Civilian Personnel Department in Building 5. Employees may obtain information concerning their standing on the retention register by calling extension 1606. They may also make an appointment to see that part of the retention register in which their competitive level appears.

b. After an employee receives a RIF notice indicating a job offer or separation under RIF procedure, he is entitled to see any retention register which has a bearing on the action affecting him. Normally, this opportunity would be provided at the same time as his counseling interview as explained in paragraph 11.

11. COUNSELING

a. A member of the Civilian Personnel Department staff will be available for individual or group counseling on specific questions concerning reduction-in-force notices and to help enroll employees being separated in reemployment programs. Supervisors will arrange for counseling appointments after RIF notices are issued.

12. REEMPLOYMENT BENEFITS AND OUT-PLACEMENT SERVICE (CAREER AND CAREER-CONDITIONAL EMPLOYEES ONLY)

a. Reemployment Priority List (NAD Crane)

(1) Employees' names will be entered on this list for the positions from which they were separated and for positions f which they qualify. Names will be listed in retention subgroup order and considered in that order for reemployment, as vaca es at Crane are filled by outside hire.

(2) Separated career status employees will be carried on the Reemployment Priority List for two years and separated career-conditional employees will be carried for one year, unless their reemployment rights are satisfied earlier.

b. Department of Defense Priority Placement Program

(1) This program provides additional priority employment consideration over all types of staffing actions at federal establishments in locations where separated employees are registered for employment.

c. Civil Service Commission's Displaced Career Employee Program

(1) This program provides additional priority employment consideration over outside hires at federal establishments in locations where separated employees are willing to accept employment.

d. Details concerning the method used to apply for programs stated in b and c above, will be discussed with employees during their counseling interview.

e. In addition, every reasonable effort will be made to place employees with outside employers through an organized out-placement service.

f. Advice will also be provided on filing with the Indiana Employment Security Division for jobs which may be available in the area and for unemployment insurance benefits.

13. OUT-PLACEMENT SERVICE (TEMPORARY EMPLOYEES)

a. Assistance will be given by advising on employment opportunities which may be possible through the Civil Service Commission registers.

b. Advice will also be provided on filing with the Indiana Employment Security Division for jobs which may be available in the area and for unemployment insurance benefits.

This special RIF edition is published in lieu of the March 21 issue. The next regular issue of the Bursts and Duds will be published April 4.

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Commanding Officer - CAPT Richard L. McArthy
Executive Officer - CDR F. R. Friddle, Jr.
Editor - Dave Johnson - Depot phone 1394
Associate Editor - Anne Jones - Depot phone 1394

ELEMENTS OF RELIABILITY AND MAINTAINABILITY (JT) 5A-F2
(3 WEEKS)

Purpose: This course is designed to provide the enrollees with a working knowledge of the mathematical, engineering, and managerial aspects of reliability and maintainability, including an introduction to system effectiveness.

Scope: Among topics to be considered are the concepts of reliability (R) and maintainability (M), R&M requirements, R&M design consideration, managerial aspects of R&M programs, component and system reliability measurements, probability and statistics, data feedback and analysis, and an introduction to system effectiveness.

Prerequisites: This course is designed for engineers and scientists currently engaged in reliability and maintainability activities. Enrollees are required to have completed mathematics through differential and integral calculus.

GRADE

O	Demonstrated outstanding comprehension of course principles and techniques and a commendable facility to apply them.
S+	Demonstrated above average comprehension of course principles and techniques and a commendable facility to apply them.
S	Demonstrated average comprehension of course principles and techniques and an apparent facility to apply them.
S-	Demonstrated a limited comprehension of course principles and techniques. Opportunities for application should be carefully selected and supervision provided.
U	Demonstrated a lack of comprehension of the subject matter presented to the degree necessary for its use.
Inc.	Student was unable to complete the course due to absence from class.

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
304B-RES:las
5512
11 April 1974

MEMORANDUM

From: 304
To: 301

Subj: Secret Security Clearance for
Mr. Robert Jackson Marks II

1. It is requested that a Secret Security Clearance be obtained for Mr. Robert J. Marks II, Social Security Account Number [redacted].

2. Mr. Marks, an electronics engineer GS-855-9, is employed in the Plans and Programs Div., Quality Evaluation and Engineering Laboratory.

Copy to:
304B (Saum)
304B (Allen)
304B (Marks)

S. S. KALBERER
By direction

DEPARTMENT OF THE NAVY 0104 942 4340

POSITION OR JOB DESCRIPTION

NAVSO 12510/7 (REV. 10-67)
(See Instructions on Reverse)

[X] PD [ ] JD NO. ~~1219~~ 504000 B

POSITION OR JOB TITLE	SCHED. OR SERV.	SERIES	GRADE/ PAY LEVEL /FORMULA	CLASSIFIERS INITIALS	CLASSIFICATION OR RATING OFFICIAL (Signature, Title and Date)
1. THIRD ACTION					
2. SECOND ACTION					
3. FIRST ACTION					
4. RECOMMENDED Electronic Engineer	GS	855	11		5. NAME OF EMPLOYEE George Allen + Clark Weep

POSITION OR JOB LOCATION

6. ACTIVITY - NAME AND LOCATION
NAD Crane, Indiana

7. ORGANIZATIONAL SUBDIVISIONS *(1st)*
Quality Evaluation Department

8. *(2nd)*
Electronic Systems & Components Division

9. *(3rd)*
Avionics Equipment Branch

10. *(4th)*
Systems Effectiveness Section

11. ORGANIZATIONAL TITLE OF POSITION OR JOB *(If any)*

12. EMPLOYEES NOW PERFORMING DUTIES *(Ungraded jobs only)*

(No.:)	(Title:)	(No.:)	(Title:)

REASON FOR SUBMISSION

[X] 13 DUTIES AND RESPONSIBILITIES NOT ELSEWHERE DESCRIBED - COMPLETE DESCRIPTION ATTACHED.

	POS. OR JOB #	CLASS. OR RATING
14 ATTACHED AMENDMENT NO. ______ TO-		
15 IDENTICAL TO-		
16 ATTACHED STATEMENT OF DIFFERENCE TO-		
17 REPLACES-		

18. OTHER *(Specify)*

CERTIFICATIONS:

The description of the duties and responsibilities of this position or job is complete and accurate.

19. SIGNATURE *(Employee)* DATE

20. SIGNATURE AND TITLE *(Immediate supervisor)* DATE

R. SNIM
Mgr. Systems Effectiveness Section
(Position No., Classification or Rank)

21. SIGNATURE AND TITLE *(Person authorized to establish position or job)* DATE

V. YEAGER, Deputy Director, QE Dept.

REMARKS

The classification of this position may be appealed by the incumbent at any time. Appeals from classification actions which result in demotion or reduction in compensation must be timely in order for retroactivity to apply. Consult your classifier or appropriate activity instruction for procedures. Civil Service Commission classification standards and Department of the Navy classification guides are available for review in the Wage and Classification Office.

23. CLASSIFICATION OR RATING RECERTIFICATION:					

INSTRUCTIONS FOR COMPLETING FORM NAVSO 12510/7

FOR GRADED POSITIONS

(Note: Optional Form 8 is to be used for proposed allocations to GS-16, GS-17, or GS-18 - see NCPI 932. General instructions for preparing position descriptions are contained in NAVSO 12510/7A. Special instructions are contained in applicable Special Question Lists.)

1, 2, & 3. To be executed only by persons who have been officially authorized to take classification action. Space is provided for taking three separate actions on the same position; the second and third actions may be on maintenance review, the result of application of new standards or of review by higher authority, etc. The *position title* must be the official title authorized by CSC or Navy standards, NAVEXOS P-2440, or other appropriate instructions. The *classification official* must be a person officially authorized to classify the position.

4. Optional. A recommendation should reflect the considered judgment of the originator.

5. Enter name of employee regularly performing the work. If not regularly performed, enter "VACANT."

6. "Location" means city and state.

7 through 10. Enter as many organizational subdivisions as necessary to show the one in which the position is located.

11 Optional.

12 through 16. Self-explanatory.

17. Complete whenever the position supersedes another, out of which it has developed in whole or in part. This information is necessary for historical continuity and to provide accurate data for other personnel processes.

18 Examples of "other" reasons are "Survey," "Reorganization," and "Checklist."

19. Signature optional unless required by the activity or a higher management authority.

20 and 21. MUST be executed before forwarding to classification official.

22. For special notations by classification office e.g., brief evaluation reports, reference to Navy or CSC postaudits, competitive levels, restrictions on filling position, or requirements for reviewing position later.

This space should also be used to (a) identify any IA and "statement of difference" positions and the date each was established, and (b) the alternative series on interdisciplinary positions.

23. To be initialed and dated by the classification specialist whenever he has subsequently audited the position (e.g., on maintenance review) and found that the description is still current and accurate and that the classification assigned remains correct.

Description of duties and responsibilities.

This is normally typed on plain bond and attached to the NAVSO 12510/7. Very brief descriptions, however, such as short amendments, statements of differences, or checklist descriptions should, if space permits, be inserted in Item 22.

FOR UNGRADED POSITIONS

(Note: General instructions for preparing job descriptions are contained in NAVSO 12510/7B. Special instructions for Masters and Foremen are given in NCPI 531, Encl. 5.)

In upper right-hand corner, check the "JD" box.

1, 2, & 3. To be executed only by persons who have been officially authorized to take a rating action. Space is provided for taking three separate actions on the same job. This permits recording subsequent re-rating actions taken by the activity, as on maintenance review or application of new rating definitions, or by management bureaus or OCMM.

Job Title. Enter the official title authorized in NCPI 531, current OCMM Notices, or OCMM letters of authorization. (For a supervisory rating with a special designator, such as "Public Works," indicate the "rating concerned" in Item 22.)

Service. Enter appropriate Service, such as "W" (General Wage), "C" (Commissary), etc.

Pay Level or Formula. Enter pay level for rating, e.g., "W-11" for Plumbers; or pay formula, e.g., "WF-18" for Leadingmen Carpenter.

Rating Official. This is a person officially authorized to make rating determinations.

4 & 5. Optional.

6. "Location" means city and state.

7 through 10. Enter as many subdivisions as needed to locate the job.

11. Optional.

12. Enter the number of employees, by title, now performing work of the job, or "none," as appropriate.

13 and 14. Self-explanatory.

15 and 16. Optional. Activities may cite the appropriate P-1005 rating definition by number, in lieu of describing the job, when the P-1005 definition adequately covers most or all of the duties performed.

17. Self-explanatory.

18. For actions not covered by items 13 through 17.

19. Optional.

20 and 21. MUST be completed before forwarding to rating official.

22. To be used by rating office for purposes similar to those described in Item 22 for graded positions.

23. Optional. May be used for recording findings on maintenance review.

DEPARTMENT OF THE NAVY

POSITION OR JOB DESCRIPTION

NAVSO 12510/7 (REV. 10-67)
(See Instructions on Reverse)

304000 13

[X] PD [ ] JD NO. 1319

OFFICIAL CLASSIFICATION OR RATING ACTION

POSITION OR JOB TITLE	SCHED. OR SERV.	SERIES	GRADE/ PAY LEVEL /FORMULA	CLASSIFIERS INITIALS	CLASSIFICATION OR RATING OFFICIAL (Signature, Title and Date)
1. [illegible]					
2. SECOND REVIEW					
3. FINAL ACTION					

FOR INITIATING OFFICE ACTION

4. RECOMMENDED				5. NAME OF EMPLOYEE
Electronics Engineer	GS	855	11	George Allen + Charles Welp

POSITION OR JOB LOCATION

6. ACTIVITY - NAME AND LOCATION: NAD Crane, Indiana	9. (3rd) Avionics Equipment Branch
7. ORGANIZATIONAL SUBDIVISIONS (1st) Quality Evaluation Department	10. (4th) Systems Effectiveness Section
8. (2nd) Electronic Systems & Components Division	11. ORGANIZATIONAL TITLE OF POSITION OR JOB (If any)

12. EMPLOYEES NOW PERFORMING DUTIES (Ungraded jobs only)

(No.:)	(Title:)	(No.:)	(Title:)

REASON FOR SUBMISSION

[X] 13. DUTIES AND RESPONSIBILITIES NOT ELSEWHERE DESCRIBED - COMPLETE DESCRIPTION ATTACHED

	POS. OR JOB #	CLASS. OR RATING
14. ATTACHED AMENDMENT NO. ____ TO-		
15. IDENTICAL TO-		
16. ATTACHED STATEMENT OF DIFFERENCE TO-		
17. REPLACES-		
18. OTHER (Specify)		

CERTIFICATIONS:

The description of the duties and responsibilities of this position or job is complete and accurate.

19. SIGNATURE (Employee)	DATE
20. SIGNATURE AND TITLE (Immediate supervisor) R. [illegible] Mgr. Systems Effectiveness Section (Position No., Classification or Rank)	DATE
21. SIGNATURE AND TITLE (Person authorized to establish position or job) V. [illegible], Deputy Director, QE Dept.	DATE

22. REMARKS

The classification of this position may be appealed by the incumbent at any time. Appeals from classification actions which result in demotion or reduction in compensation must be timely in order for retroactivity to apply. Consult your classifier or appropriate activity instruction for procedures. Civil Service Commission classification standards and Department of the Navy classification guides are available for review in the Wage and Classification Office.

23. CLASSIFICATION OR RATING RECERTIFICATION:					

I. Introduction

This position is located in the Systems Effectiveness ~~Section, Avionics Equipment Branch, Electronic Systems and Components Division, N. E.~~ BRANCH, PLANS and Programs Division, Weapons Quality Engineering Center, ~~Department~~. This ~~section~~ branch is responsible for development and implementation of a program for analysis and prediction of reliability and maintainability of aircraft electronic equipment and systems. The incumbent will perform engineering studies and analysis in implementing various aspects of the program as assigned.

II. Major Duties and Responsibilities

As assigned, accomplishes project work of the following nature in connection with the full range of Avionics ~~equipments~~ systems Instruments and ~~systems~~ under ~~section~~ branch cognizance:

A. Reviews and evaluates the reliability and maintainability portions of technical development plans and proposals submitted by the ~~avionics~~ equipment manufacturers to NAVAIRSYSCOM. CUSTOMERS, including ASO, NAVAIR, NAVSEA, For projects assigned to this activity by ~~NAVAIRSYSCOM~~ the customer, NAVELEX will serve as project manager with responsibilities of keeping ~~NAVAIRSYSCOM~~ customer fully informed of progress and major obstacles requiring program changes for the R & M portions of major ~~NAVAIRSYSCOM~~ R & D or production contracts. In this capacity, the incumbent will review and provide detailed comments and/or recommendations on program plans, test procedures, math models, predictions, and testing reports as pertain to the reliability and/or maintainability of the system.

Appendix B

EXTRACTS FROM THE ESPIONAGE LAWS AND FEDERAL STATUTES

United States Code, Title 18, Section 793
Gathering, Transmitting, or Losing Defense Information:

a. Whoever, for the purpose of obtaining information respecting the national defense with interest or reason to believe that the information is to be used to the injury of the United States, or to the advantage of any foreign nation, goes upon, enters, flies over, or otherwise obtains information concerning any vessel, aircraft, work or defense, navy yard, naval station, submarine base, fueling station, fort, battery, torpedo station, dockyard, canal, railroad, arsenal, camp, factory, mine, telegraph, telephone, wireless, or signal station, building, office, research laboratory, or station or other place connected with the national defense owned or constructed, or in progress of construction by the United States or under the control of the United States, or of any of its officers, departments, or agencies, or within the exclusive jurisdiction of the United States, or any place in which any vessel, aircraft, arms, munitions, or other materials or instruments for use in time of war are being made, prepared, repaired, stored, or are the subject of research or development, under any contract or agreement with the United States, or any department or agency thereof, or with any person on behalf of the United States, or any prohibited place so designated by the President by proclamation in time of war or in case of national emergency in which anything for the use of the Army, Navy, or Air Force is being prepared or constructed or stored, information as to which prohibited place the President has determined would be prejudicial to the national defense; or

b. Whoever, for the purpose aforesaid, and with like intent or reason to believe, copies, takes, makes, or obtains, or attempts to copy, take, make, or obtain and sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, document, writing, or note of anything connected with the national defense; or

c. Whoever, for the purpose aforesaid, receives or obtains or agrees or attempts to receive or obtain from any person, or from any source whatever, any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note of anything connected with the national defense, knowing or having reason to believe, at the time he receives or obtains, or agrees or attempts to receive or obtain it, that it has been or will be obtained, taken, made or disposed of by any person contrary to the provisions of this Chapter; or

d. Whoever, lawfully having possession of, access to, control over, or being entrusted with any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note relating to the national defense, or information relating to the national defense which information the possessor has reason to believe could be used to the injury of the United States or to the advantage of any foreign nation, willfully communicates, delivers, transmits, or causes to be communicated, delivered, or transmitted, or attempts to communicate, deliver, transmit or cause to be communicated, delivered or transmitted the same to any person not entitled to receive it, or willfully retains the same and fails to deliver it on demand to the officer or employee of the United States entitled to receive it; or

e. Whoever, having unauthorized possession of, access to, or control over any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note relating to the national defense, or information relating to the national defense which information the possessor has reason to believe could be used to the injury of the United States or to the advantage of any foreign nation, willfully communicates, delivers, transmits or causes to be communicated, delivered, or transmitted, or attempts to communicate, deliver, transmit or cause to be communicated, delivered, or transmitted the same to any person not entitled to receive it, or willfully retains the same and fails to deliver it to the office or employee of the United States entitled to receive it; or

f. Whoever, being entrusted with or having lawful possession or control of any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, note, or information relating to the national defense,

(1) through gross negligence permits the same to be removed from its proper place of custody or delivered to anyone in violation of his trust, or to be lost, stolen, abstracted, or destroyed, or

(2) having knowledge that the same has been illegally removed from its proper place of custody or delivered to anyone in violation of his trust, or lost, or stolen, abstracted, or destroyed, and fails to make prompt report of such loss, theft, abstraction, or destruction to his superior officer—

Shall be fined not more than $10,000 or imprisoned not more than ten (10) years, or both.

g. If two or more persons conspire to violate any of the foregoing provisions of this section, and one or more of such persons do any act to effect the object of the conspiracy, each of the parties to such conspiracy shall be subject to the punishment provided for the offense which is the object of such conspiracy. June 25, 1948, c. 645, Section 1, 62 Stat. 736, amended Sept. 23, 1950, c. 1024, Section 18, 64 Stat. 1003.

United States Code, Title 18, Section 794
Gathering or Delivering Defense Information to Aid Foreign Government:

a. Whoever, with intent or reason to believe that it is to be used to the injury of the United States or to the advantage of a foreign nation, communicates, delivers, or transmits, or attempts to communicate, deliver, or transmit, to any foreign government, or to any faction or party or military or naval force within a foreign country, whether recognized or unrecognized by the United States, or to any representative, officer, agent, employee, subject, or citizen thereof, either directly or indirectly, any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, note, instrument, appliance, or information relating to the national defense, shall be punished by death or by imprisonment for any term of years or for life.

b. Whoever, in time of war, with intent that the same shall be communicated to the enemy, collects, records, publishes, or communicates, or attempts to elicit any information with respect to the movement, numbers, description, condition, or disposition of any of the Armed Forces, ships, aircrafts, or war materials of the United States, or with respect to the plans or conduct, or supposed plans or conduct of any naval or military operations, or with respect to any works or measures undertaken for or connected with, or intended for the fortification or defense of any place, or any other information relating to the public defense, which might be useful to the enemy, shall be punished by death or by imprisonment for any term of years or for life.

c. If two or more persons conspire to violate this section, and one or more of such persons do any act to effect the object of the conspiracy shall be subject to the punishment provided for the offense which is the object of such conspiracy. As amended Sept. 3, 1954, c. 1261, Title II, Section 201, 68 Stat. 1219.

United States Code, Title 18, Section 795
Photographing and Sketching Defense Installations:

a. Whenever, in the interest of national defense, the President defines certain vital military and naval installations or equipment as requiring protection against the general dis-

Writes, reviews, and revises

B. ~~Develops~~ specifications for reliability and maintainability testing, prediction, estimations, calculations, and design analysis for a wide range of electronic and electromechanical equipment.

C. Evaluates contractors' work on projects involving studies in various aspects of systems effectiveness including writing of handbooks on failure rates and general reliability techniques, computer techniques for reliability analysis and specification writing. Participates in and coordinates continuing survey of electronic industry to maintain up-to-date knowledge of reliability testing and assurance methods and procedures.

D. Performs or coordinates studies for the purpose of establishing optimum methods and procedures for determining reliability and operational problem areas of avionics equipments in Fleet use. This includes performing reliability and maintainability analyses on this equipment as necessary as well as intensive study of methods used in the Fleet for trouble-shooting, repairing and reporting failures and problem areas. Develops or participates in development of methods for the efficient handling and analysis of this data (including computer application) and generates reports and recommendations to ~~Naval Air Systems Command~~ customers for implementation of same. This function requires considerable liaison effort between the ~~Fleet~~ high level management personnel within governmental agencies and ~~manufacturers~~ industry, and ~~Naval Air Systems Command~~. This liaison is ~~primarily~~ accomplished by the incumbent.

E. Performs special engineering investigations on electronic systems which are performing below the specified reliability level in the Fleet. The incumbent will gather such failure data as is available, review the applicable specifications, review the design and installation of the system

and utilizing such techniques as circuit analysis, math modeling, failure rate predictions, redundancy, etc. will provide to customer such recommendations as will correct the areas of deficiency and improve the reliability of the systems. Such recommendations might include changing the inherent design, changing materials or circuitry, requiring new tests or methods of testing in the applicable specifications.

F. Performs tests on selected avionics equipment to determine the Mean-Time-Between-Failures. This includes responsibility for assuring adequacy of both the environmental and testing set-ups, for performing the tests, for evaluating the data, and for preparing the final report.

III. Controls Over the Position

This position is under the supervision of the Manager of the Systems Effectiveness Branch, Electronic Engineer. Instructions as to priorities and time limitations are normally provided with new assignments. The incumbent is responsible for determining the proper approach, planning, and carrying out the project assignments only on the more unprecedented problems encountered. Technical problems of this nature as well as those involving policy matters or of an unprecedented nature are usually discussed jointly with the Division and Branch Managers. Completed work is reviewed periodically for general adequacy in meeting program objectives and policy conformance. Written guides utilized include engineering handbooks and textbooks, military specifications, technical reports and studies, etc. A portion of the work includes consideration of areas for which little or no precedent exists.

IV. Qualification Requirements of the Work

This position requires knowledge of scientific and engineering principles and theories in the field of electronics and mechical related fields such as can be learned through completion of a full four-year curriculum in electronic engineering or physics plus appropriate experience in the particular area of application or work closely related thereto. Also Knowledge of Aeronautical AR-10, A-34, AR-104, AR-108, AR-113, MIL-STD-781B MIL-HDBK-217B, MIL-HDBK-472, MIL-STD-480 MIL-T-18303B

I. INTRODUCTION

This position is that of Manager of the Systems Effectiveness Branch, Aircraft Equipment Division, Quality Evaluation and Engineering Laboratory Department.

A. The Systems Effectiveness Branch develops and implements programs for the analysis, prediction, improvement, and assurance of reliability and maintainability of avionic electronic systems and equipment.

B. The Branch staff consists of electrical and mechanical engineers, physicists, and technicians. Three basic operating groups comprise the Branch: Reliability Standardization, Production Reliability Surveillance, and Engineering Support and Advanced Systems. Each operating group has as its leader a GS-12, Senior Program Manager. These groups have broad responsibilities in program management, system effectiveness analysis and evaluation, preparation and evaluation of specifications and standards, testing, and professional consulting.

1. Program Management

a. The Branch manages Reliability and Maintainability Demonstration Test Programs on a variety of equipments and complex systems. Such assignments are conducted for NAVAIRSYSCOM Project Engineers by providing liaison with avionics manufacturers, reviewing and approving the test procedures, monitoring the tests, analyzing test reports, and summarizing progress and results. Reliability and maintainability data obtained from these programs is used to make recommendations to NAVAIRSYSCOM for new procurements and program changes.

b. A broader Branch function is that of developing and managing Reliability Program Plans. Contracts for very large and complex systems usually require that the prime contractor develop and implement a Reliability Program Plan in accordance with MIL-STD-785 and any special provisions of the contract. This Branch is presently responsible for assuring the adequacy of the contractor's Reliability Program for the AN/USM-247 Versatile Avionics Shop Test (VAST) System and the Joint-Services-In-Flight-Data-Transmission-Systems (JIFDATS). Personnel assist the contractor in preparing the program plan, review it for approval, and maintain a surveillance over the contractor's efforts to fulfill the plan's requirements and objectives.

2. Systems Effectiveness Analysis and Evaluation

a. As a consequence of analyzing reliability and maintainability test reports, the Branch has available a data base which, when combined with information collected from the Fleet, is used to identify failure trends and improve equipment. These studies often require statistical analysis and data processing. Besides analyzing test and Fleet data, the Branch develops statistical test plans for evaluating sampling test data and making accept/reject decisions. Several of these test plans have been published in MIL-STD-781. Additionally, the Branch prepares reliability predictions and systems math models.

b. The Branch evaluates technical proposals submitted by contractors in many areas of systems effectiveness. The Branch has participated in contractor selection for: MIL-HDBK-217 "Reliability Stress and Failure Rate Data for Electronic Equipment", F14 and S3A Aircraft avionics, various

systems effectiveness studies, equipment reliability improvement programs, and automatic test equipments. Other duties include state-of-the-art studies in areas such as Built-In-Test (BIT) and defining future design requirements.

3. Preparation and Evaluation of Specifications and Standards

a. Capable of preparing documents from conception to final printing, personnel in this area review, revise, and establish the systems effectiveness requirements of detailed equipment specifications. This Branch is responsible for assuring that adequate reliability requirements exist in many flight instrument equipment specifications. Equipment specifications, MIL-Handbooks, MIL-Standards, and other procurement documents are prepared for various NAVAIRSYSCOM and other DOD Offices. They included MIL-STD-781, MIL-HDBK-217, AR-10, MIL-I-8700, AR-34, and AV-2000.

4. Testing

a. The Branch performs AGREE Reliability Tests, including temperature cycling and vibration, on fuel quantity, airspeed, and attitude indicators. Such testing can be performed once on a small number of equipments or by lots as production tests.

5. Consultation

a. The experience gained through the variety of programs conducted by this Branch is often called upon by NAVAIRSYSCOM when specific problems arise. These problems may be in avionic equipment systems effectiveness or, in many cases, far outside this realm. Representatives of this

Branch have been asked to represent NAVAIRSYSCOM in several design review, contract definition, and proposal evaluation meetings. Engineering analysis on such varied problems as waveguide corrosion, life-cycle costing, foam mount design, and TWT tube failures have been conducted.

b. Recently the Branch was requested to investigate medical instrument reliability to determine if reliability assurance requirements were being adequately specified. Now, a representative of this Branch is working with the Veterans Administration to update quality assurance provisions in their specifications and is serving as chairman of the recently organized Reliability Committee of the Association for the Advancement of Medical Instrumentation (AAMI).

II. MAJOR DUTIES AND RESPONSIBILITIES

A. Administrative Duties - The Branch Manager is responsible for the overall planning, organizing, staffing, directing, and controlling of the Branch. He coordinates the Branch effort to efficiently accomplish the objectives of assigned tasks; and, if necessary, personally accomplishes or participates in the more difficult project work.

Task assignments are usually received in the form of letters from NAVAIRSYSCOM and come via the Division Supervisor along with any special instructions from that level. Because of the broad scope of written task assignments under which the Branch works, frequently assignments are received verbally from cognizant Naval Command project engineers during liaison contacts by the incumbent.

b. Conduct such in-plant surveillance of the contractor's activities, testing , and scheduling for the reliability and maintainability effort as is necessary to determine their adequacy.

c. Review and comment on data resulting from the reliability and maintainability demonstrations, verify any calculations used, and note failure trends.

d. Report to NAVAIRSYSCOM when poor design practices are employed, and make suggestions for improvements of equipment or procedures.

7. Reliability and Maintainability of Aircraft Bomb Racks - To report to NAVAIRSYSCOM summaries of reliability and maintainability data received by this activity on aircraft bomb racks; and review and comment on the reliability and maintainability portions of armament equipment specifications.

C. Supervision Over Others - In carrying out the foregoing responsibilities, the Branch Manager exercises direct technical and administrative supervision over the work of the three Senior Program Managers, PD #1230, GS-855-12, PD #1352, GS 855-12; and PD #1252, GS-1910-12. Through them, he will exercise indirect supervision over the work of other engineering, scientific, and technical personnel in grades GS-5 through GS-11.

III. CONTROLS OVER THE POSITION

This position is under the supervision of the Manager of the Aircraft Equipment Division, PD #6100. Assignments defining program objectives are normally received by letter from Naval Commands and are usually relayed by the supervisor directly to the incumbent with instructions only as to personnel and budget limitations. Incumbent is expected to resolve problems regarding requirements of assigned projects directly with the originator. Problems of correlation

with other programs and policy questions are resolved through conferences and meetings with superiors. However, the incumbent is fully accountable for the effectiveness of Branch operations. Completed work is subjected to technical and administrative control for review of program accomplishments, economy of management, and adherence to established policies.

IV. QUALIFICATION REQUIREMENTS OF THE WORK

This position requires knowledge of scientific and engineering principles and theories in electronics and related fields such as can be acquired through completion of a full four year curriculum in a recognized college or university leading to a Bachelors Degree in Electrical Engineering or equivalent. The incumbent must also have an understanding of statistics, reliability and maintainability, and substantial experience in preparing test plans, specifications, procedures and program plans. The position also requires supervisory experience and capabilities to coordinate and guide work effort of engineers or scientist involved in the various Branch programs.

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C. Supervision Over Others - In carrying out the foregoing responsibilities, the Branch Manager exercises direct technical and administrative supervision over the work of the three Senior Program Managers, PD #1239, GS-855-12, PD #1352, GS-855-12; and PD #1252, GS-1910-12. Through them, he will exercise indirect supervision over the work of other engineering, scientific, and technical personnel in grades GS-5 through GS-11.

III. CONTROLS OVER THE POSITION

This position is under the supervision of the Manager of the Aircraft Equipment Division, ~~PD #0190~~. Assignments defining program objectives are normally received by letter from Naval Commands and are usually relayed by the supervisor directly to the incumbent with instructions only as to personnel and budget limitations. Incumbent is expected to resolve problems regarding requirements of assigned projects directly with the originator. Problems of correlation

with other programs and policy questions are resolved through conferences and meetings with superiors. However, the incumbent is fully accountable for the effectiveness of Branch operations. Completed work is subjected to technical and administrative control for review of program accomplishments, economy of management, and adherence to established policies.

IV. QUALIFICATION REQUIREMENTS OF THE WORK

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COMPREHENSIVE PLANS, continued

Enroll. Code	Type of enrollment	In 1974 enrollee paid	In 1975 enrollee pays
Kaiser Foundation Health Plan (Hawaii)			
631	Self Only—High Option	$ 3.33	$ 2.48
632	Self and Family—High Option	12.40	10.47
Kaiser Foundation Health Plan (Northern California)			
591	Self Only—High Option	$ 4.47	$ 3.34
592	Self and Family—High Option	12.16	9.41
Kaiser Foundation Health Plan (Oregon)			
571	Self Only—High Option	$ 3.14	$ 2.56
572	Self and Family—High Option	9.48	8.14
Kaiser Foundation Health Plan (Southern California)			
621	Self Only—High Option	$ 7.08	$ 6.25
622	Self and Family—High Option	18.99	17.12
Lovelace-Bataan Health Program (New Mexico)			
741	Self Only—High Option	*	$ 5.45
742	Self and Family—High Option	*	18.45
Medical Service Bureau Plan (North Idaho)			
811	Self Only—High Option	$ 6.29	$ 4.14
812	Self and Family—High Option	14.38	9.12
Metro Health Plan (Michigan)			
521	Self Only—High Option	$ 9.70	$ 8.65
522	Self and Family—High Option	23.41	20.77
Michael Reese Health Plan, Inc. (Illinois)			
751	Self Only—High Option	*	$ 5.27
752	Self and Family—High Option	*	14.33
National Hospital Association Plan (Oregon-Washington)			
841	Self Only—High Option	$ 1.72	$ 2.23
842	Self and Family—High Option	4.40	5.72
RIGHA Health Plan (Rhode Island)			
701	Self Only—High Option	$ 4.55	$ 6.57
702	Self and Family—High Option	14.01	15.48
Ross-Loos Medical Group (Los Angeles)			
611	Self Only—High Option	$ 4.85	$ 5.33
612	Self and Family—High Option	11.34	11.95
SSS Plan (Puerto Rico)			
891	Self Only—High Option	$ 1.70	$ 2.09
892	Self and Family—High Option	8.87	7.82
Union Health Service, Inc. (Illinois)			
761	Self Only—High Option	*	$ 3.44
762	Self and Family—High Option	*	13.57
University Affiliated Health Plans, Inc. (Washington, D.C.)			
771	Self Only—High Option	*	$ 4.61
772	Self and Family—High Option	*	17.82
Washington Physicians Service (Seattle)			
831	Self Only—High Option	$ 3.97	$ 4.61
832	Self and Family—High Option	14.27	15.80
Western Clinic Plan (Washington)			
561	Self Only—High Option	$ 4.42	$ 3.87
562	Self and Family—High Option	10.70	8.67

U.S. Civil Service Commission

Bureau of Retirement, Insurance, and Occupational Health

FEDERAL EMPLOYEES HEALTH BENEFITS PROGRAM
1975 BIWEEKLY HEALTH BENEFITS RATES

BIWEEKLY WITHHOLDING RATES FOR ALL PLANS AND OPTIONS FOR 1975

- These rates apply to all Federal employees on a biweekly pay schedule except Postal Service employees. Postal Service employees should contact their personnel office or head of installation for information.
- For 1975, the biweekly Government contribution is increased from $5.49 to $7.64 for a self only and from $13.67 to $18.93 for a family enrollment, but no more than 75% of the total cost of any type of enrollment.
- Your biweekly withholding from pay in 1974 and 1975 is shown below.
- To find whether your biweekly withholding increases or decreases in 1975, compare amounts shown in last two columns for your plan and type of enrollment.
- Equivalent monthly withholding and contribution rates are approximately 2⅙ times the biweekly rates.

GOVERNMENT-WIDE PLANS

Enroll. Code	Type of enrollment	In 1974 enrollee paid	In 1975 enrollee pays
Service Benefit Plan (Blue Cross-Blue Shield)			
101	Self Only—High Option	$ 6.39	$ 5.40
102	Self and Family—High Option	15.30	12.88
104	Self Only—Low Option	1.02	1.02
105	Self and Family—Low Option	2.50	2.50
Indemnity Benefit Plan (Aetna)			
201	Self Only—High Option	$ 5.03	$ 3.88
202	Self and Family—High Option	12.50	9.77
204	Self Only—Low Option	1.49	1.59
205	Self and Family—Low Option	3.69	3.9[illegible]

EMPLOYEE ORGANIZATION PLANS

Enroll. Code	Type of enrollment	In 1974 enrollee paid	In 1975 enrollee pays
Alliance Health Benefit Plan			
461	Self Only—High Option	$ 5.12	$ 2.83
462	Self and Family—High Option	12.33	6.74
464	Self Only—Low Option	.94	.75
465	Self and Family—Low Option	2.39	1.91
AFGE Health Benefit Plan			
301	Self Only—High Option	$ 6.05	$ 4.49
302	Self and Family—High Option	12.86	8.93
304	Self Only—Low Option	1.04	.94
305	Self and Family—Low Option	3.03	2.73
American Postal Workers Union Plan			
471	Self Only—High Option	$ 6.83	$ 8.71
472	Self and Family—High Option	12.94	17.47
474	Self Only—Low Option	1.45	1.45
475	Self and Family—Low Option	3.54	3.54

Enroll. code	Type of enrollment	In 1974 enrollee paid	In 1975 enrollee pays
Canal Zone Benefit Plan			
431	Self Only—High Option	$ 4.94	$ 2.79
432	Self and Family—High Option	12.25	6.99
Foreign Service Benefit Plan			
401	Self Only—High Option	$ 2.06	$ 1.96
402	Self and Family—High Option	7.43	6.73
GEBA Health Benefit Plan			
411	Self Only—High Option	$ 3.03	$ 2.33
412	Self and Family—High Option	13.94	11.64
414	Self Only—Low Option	.78	.78
415	Self and Family—Low Option	1.97	1.97
Government Employees Hospital Association Benefit Plan			
311	Self Only—High Option	$ 6.00	$ 3.85
312	Self and Family—High Option	8.98	5.66
314	Self Only—Low Option	2.14	1.91
315	Self and Family—Low Option	3.70	3.70
Mail Handlers Benefit Plan			
451	Self Only—High Option	$ 4.44	$ 3.95
452	Self and Family—High Option	13.81	12.64
454	Self Only—Low Option	1.63	1.89
455	Self and Family—Low Option	5.02	5.20
NALC Health Benefit Plan			
321	Self Only—High Option	$ 3.07	$ 2.95
322	Self and Family—High Option	10.08	9.07
324	Self Only—Low Option	.99	.99
325	Self and Family—Low Option	2.87	2.87
...tmasters Benefit Plan			
361	Self Only—High Option	$ 9.15	$ 7.00
362	Self and Family—High Option	17.74	12.48
364	Self Only—Low Option	1.35	1.35
365	Self and Family—Low Option	3.28	3.28
Rural Carrier Benefit Plan			
381	Self Only—High Option	$ 4.55	$ 3.00
382	Self and Family—High Option	10.30	6.48
SAMBA Health Benefit Plan			
441	Self Only—High Option	$ 2.74	$ 2.48
442	Self and Family—High Option	7.21	6.28

COMPREHENSIVE PLANS

Enroll. code	Type of enrollment	In 1974 enrollee paid	In 1975 enrollee pays
Arizona Health Plan (Arizona)			
721	Self Only—High Option	*	$ 3.98
722	Self and Family—High Option	*	15.97
Columbia Medical Plan (Maryland)			
671	Self Only—High Option	$ 5.00	$ 4.18
672	Self and Family—High Option	17.04	17.14
Community Health Care Center Plan (Connecticut)			
711	Self Only—High Option	$ 4.90	$ 4.06
712	Self and Family—High Option	15.66	13.64
Compcare Health Plan (Wisconsin)			
691	Self Only—High Option	$ 7.21	$ 6.88
692	Self and Family—High Option	19.34	18.49
DePaulo Health Plan, Inc. (California)			
731	Self Only—High Option	*	$ 6.03
732	Self and Family—High Option	*	19.87
Family Health Program (California)			
661	Self Only—High Option	$ 6.49	$ 4.72
662	Self and Family—High Option	19.52	15.29
Foundation for Medical Care (California)			
861	Self Only—High Option	$ 4.24	$ 3.51
862	Self and Family—High Option	10.82	9.56
Group Health Association (Washington, D.C.)			
501	Self Only—High Option	$ 6.77	$ 7.00
502	Self and Family—High Option	17.60	18.14
504	Self Only—Low Option	3.23	3.16
505	Self and Family—Low Option	8.93	8.89
Group Health Cooperative Plan (Puget Sound)			
541	Self Only—High Option	$ 3.24	$ 2.49
542	Self and Family—High Option	9.44	7.28
Group Health Incorporated Family Doctor Plan (New York-New Jersey)			
801**	Self Only—High Option	$ 2.59	$ 2.02
802**	Self and Family—High Option	10.62	6.07
804**	Self Only—Low Option	1.35	***
805**	Self and Family—Low Option	4.15	***
Group Health Plan (Minneapolis-St. Paul)			
531**	Self Only—High Option	$ 4.18	$ 3.26
532**	Self and Family—High Option	13.15	11.63
Harvard Community Health Plan (Massachusetts)			
681	Self Only—High Option	$ 6.70	$ 6.04
682	Self and Family—High Option	19.61	16.06
HMSA Plan (Hawaii)			
871	Self Only—High Option	$ 3.08	$ 2.46
872	Self and Family—High Option	10.34	8.66
Health Insurance Plan (H.I.P.) (Greater New York)			
511**	Self Only—High Option	$ 4.61	$ 3.55
512**	Self and Family—High Option	14.51	12.27
514**	Self Only—Low Option	2.76	***
515**	Self and Family—Low Option	9.55	***
Kaiser Community Health Foundation Plan (Cleveland)			
641	Self Only—High Option	$ 5.55	$ 4.51
642	Self and Family—High Option	16.64	14.40
Kaiser Foundation Health Plan (Denver)			
651	Self Only—High Option	$ 4.91	$ 4.03
652	Self and Family—High Option	14.08	12.25

*New plan effective January 1975.

*New plan effective January 1975
**These are new enrollment codes.
***Low Option discontinued.

GENERAL INFORMATION ON REDUCTION IN PERSONNEL AT NAD CRANE

1. DEFINITIONS

a. Temporary Employee - Employee serving under a Temporary limited appointment not to exceed one year.

b. Taper Employee - Employee serving under Temporary Authority issued by the Civil Service Commission pending the establishment of a register of eligibles.

c. Term Employee - Employee serving under temporary appointment with a four-year tenure or an extension beyond 4 years, but with specific limitation. All term employees at Crane were converted to these appointments 7 April 1968.

d. Career-Conditional Employee - Employee serving under an appointment made on a permanent basis but who has less than three years continuing service under this appointment.

e. Career Employee - Employee serving under a permanent appointment who has completed three years or more service under career-conditional appointment.

f. Excepted Employee - Employee holding an appointment excepted from the Competitive Civil Service System by law, executive order or regulation. (Examples include Vietnam veterans holding Veterans' Readjustment Appointments (VRA), severely handicapped employees and undergraduate college students working under cooperative work-study agreements.)

g. Representative Rate - The step rate used in determining valid job offers in a reduction-in-force. Regulations prescribe that the step rates to be used for this purpose are the 4th step of the General Schedule (GS) for positions subject to the Classification Act, the 2nd step rate for positions paid from a 3-step wage schedule, and the 3rd step rate for positions paid from a 5-step wage schedule.

h. Competitive Level - A group of positions that are of the same grade level and are sufficiently similar as to duties and knowledge and skills needed to perform the work that interchange of employees is feasible without undue interruption of the work.

i. Competing Employee - Employee serving under appointment not limited to one year or less.

j. Non-Competing Employee - Employee serving under appointment with specific time limitation of one year or less. An employee with unsatisfactory performance rating regardless of type of appointment is a non-competing employee.

k. Retention Subgroups - A grouping of employees according to the type of appointment and veteran's preference. (This grouping is illustrated in paragraph 3 b below).

l. Retention Register - A list of employees by competitive level in retention order.

2. NOTICE PERIODS

a. Temporary, Taper, and Term Employees

(1) Employees serving under temporary appointments not to exceed one year, will be given an advance notice of five working days. The five days will be in a work status if possible.

(2) Employees serving under Taper and Term appointments will be given a 30-day advance notice in a work status if possible.

b. Career and Career-Conditional Employees

(1) When a reduction in force involves 100 or more employees, an advance notice of 60 days in a duty status, (if possible) is required.

(2) When a reduction involves less than 100 employees, a 30-day advance notice in duty status, (if possible) is required.

(3) In either (1) or (2) above, the employee, upon his request, shall be carried on leave without pay or annual leave, (if available), for such additional time as necessary to provide a 90-day notice period prior to separation.

3. ORDER OF SEPARATIONS

a. General. Employees serving under Temporary appointments will be separated before employees in the same competitive level who hold Term and TAPER appointments.

(1) Employees in Wage Grade Positions. Employees within each category of Temporary, Term and TAPER will be separated from each competitive level in retention order. That is, employees with the shortest period of creditable Federal Service will be released first. Consideration will also be given to Veteran's Preference as explained in paragraphs 3b, 4 and 8 below.

(2) Employees in Classification Act Positions. Temporary Classification Act employees will be separated in the order in which their positions are eliminated, rather than by retention order. This means that when a Classification Act position occupied by an employee on a temporary limited appointment is abolished, the employee occupying that position is terminated.

b. Except as indicated above for temporary employees in Classification Act positions, the order of release from a competitive level will be according to the following retention subgroups (unless the employee involved is entitled to another job offer, release from his competitive level will also result in his separation):

(1) OB - Non-veteran employees serving on temporary limited appointments.
(2) OA - Veteran employees serving on temporary limited appointments.
(3) 6B - Term non-veteran employees serving on temporary promotions.
(4) 6A - Term veteran employees serving on temporary promotions.
(5) 5B - Career-conditional non-veteran employees serving on temporary promotions.
(6) 5A - Career-conditional veteran employees serving on temporary promotions.
(7) 4B - Career non-veteran employees serving on temporary promotions.
(8) 4A - Career veteran employees serving on temporary promotions.
(9) 3B - Term and TAPER non-veteran employees.

(10) 3A - Term and TAPER veteran employees.
*(11) 2B - Career-conditional non-veteran employees.
*(12) 2A - Career-conditional veteran employees.
(13) 1B - Career non-veteran employees.
(14) 1A - Career veteran employees.

* Also included in these retention sub-groups are career employees who are serving a probationary period and career employees who are serving in obligated positions. (Obligated positions are positions to which other employees have statutory restoration rights.)

NOTES: 1. Employees in Groups 0, 6, 5, and 4 and employees with an unsatisfactory performance rating are called non-competing employees. All employees in these groups in the same competitive level will be removed from the competitive level before any competing employee is realeased.

2. Employees on temporary promotion are non-competing employees in the competitive level to which temporarily promoted. They compete for retention only in the competitive level of their regular job.

3. Release from each retention sub-group above will be by retention order. That is, employees with the shortest period of creditable Federal Service will be released first. Employees within the same sub-group with the same service date will be released in inverse alphabetical order.

4. Under the Dual Compensation Act, retired members of the Armed Forces working in Civil Service positions are considered to be non-veterans and have no veterans' preference in a reduction-in-force. Exceptions to this rule are those retired veterans who have less than 20 years of full-time active service, those whose retirement was based on disability incurred in the line of duty during a period of war, or those who have been employed on a federal civilian job continously since 30 November 1964. For reduction-in-force purposes, retired members of the Armed Forces, not covered by one of the exceptions in the preceding sentence, receive credit for only that military service performed during wartime or in a campaign or expedition for which a campaign badge has been authorized.

4. REASSIGNMENT RIGHTS (Bump and Retreat)

a. Temporary Employees

(1) Employees holding temporary limited appointments have no reassignment rights.
(2) Employees holding TAPER appointments have no reassignment rights.
(3) Employees holding Term appointments have no reassignment rights, but may be administratively assigned to other SEA positions. Veteran's preference eligibles may displace non-veterans. It is NAD Crane policy that Term veterans will place Term non-veterans, and temporary employees in continuing SEA support positions for which they qualify. Similarly, Term non-veterans will displace temporary employees in continuing SEA support positions for which they qualify. Term employees do not have retreat rights.

b. Career and Career-Conditional Employees

(1) Career and Career-Conditional employees released from a competitive level are entitled to assignment to another position in one of the following ways:

(a) To a continuing position in another competitive level for which he qualifies, but is occupied by an employee in a lower retention sub-group. In this situation a 1A employee can displace a 1B or an employee in group 2 or 3. A 1B can displace an employee in group 2 or 3. A 2A can displace a 2B or an employee in group 3. This right to displace on the basis of sub-group superiority is known as reassignment or "bumping " rights.

(b) To a position from which he was previously promoted and which is occupied by an employee with a later service date in the same or lower retention sub-group. In this situation a 1A with a service date of 3-17-58, can diplace another 1A with a service date of 3-18-58. He can also displace an employee in sub-group 1B or in group 2 or 3. This is known as "retreat rights".

(2) A Career or Career-Conditional employee reached for a reduction-in-force may be assigned to a vacant position for which he qualifies which is the same grade or level and/or equal representative rate to the best offer available under (1) (a) and (b) above. (This will satisfy his reduction-in-force rights.) The employee involved does not have the right to choose the position to which he will be assigned.

5. QUALIFYING FOR REASSIGNMENT (Bump & Retreat)

To be eligible to bump or retreat, an employee must not only have superior retention rights to the employee in the position, but also he must be sufficiently qualified that he can assume the position without undue interruption of the work. This means that he must be fully qualified - including meeting the physical qualifications of the job for which being considered under bumping and retreat rights. If the physical requirements for the position for which being considered are greater than the one in which he is performing, a current physical examination is necessary. As the situations are identified, the Civilian Personnel Department requests the Medical Department to schedule and conduct physical exams as rapidly as possible. Employees should protect their rights to possible job offers under RIF by cooperating fully in the physical examining process. If they subsequently wish to decline the offer or even to appeal the decision that it represents their "best offer", they still have that right. However, if it cannot be determined that they are "fully qualified", the offer cannot be made in the first place!

6 DECLINATION OF OFFERS IN REDUCTION IN FORCE

a) Regulations require that an employee separated from a competitive level must be given his "best" offer based on available positions and his retention standing. The "best" offer is determined on the basis of pay, using the representative rate method.

(b) An employee may decline his "best" offer if he chooses. However, such a declination will not entitle him to an offer of another position. Rather, the declination of a valid (best) offer in RIF will result in separation of the employee involved

7. RELEASE OF EXCEPTED EMPLOYEES. Excepted employees do not compete in reduction-in-force with employees in the competitive service. They do compete with other employees in the excepted service. Excepted employees are grouped separately on retention registers by competitive levels and subgroup retention standing the same as described above. As management determines that positions occupied by excepted employees must be excessed, the employees involved compete within the excepted service for the remaining positions. Those who are not entitled to an offer of another excepted position are separated.

8. VETERANS vs NON-VETERANS. A mistaken impression seems to persist that it is illegal or improper to separate employees with veteran's preference while non-veteran employees remain in the workforce. A look at the provisions of RIF regulations as explained in paragraphs 3 and 4 above should readily reveal the true situation. Veteran's preference applies within the retention group for RIF purposes. Since non-competing employees must be separated from a competitive level before any of the competing employees, it is required that temporary veteran employees be separated from a given competitive level ahead of non-veteran employees in retention subgroups 3b, 2b, and 1b. Similarly a term veteran employee will be separated from a competitive level before career/conditional and career non-veterans in retention groups 2b and 1b, etc.

9. SEVERANCE PAY

a. Temporary, Term and TAPER Employees

(1) Employees serving under these appointments are not eligible for severance pay.

b. Career and Career-Conditional Employees

(1) Employees working under career-conditional or career appointments are entitled to severance pay if they are separated in reduction-in-force, provided they have worked without any break in service of more than 3 days for a minimum of 12 calendar months preceding the date of separation.

(2) A career-conditional or career employee is also entitled to severance pay, if he meets the 12 months service requirement and if he declines an offer of lower grade and rate of pay (exclusive of a retained rate) and is separated in RIF as a result of that declination. The declination of an "equivalent position" (which means one that provides a rate of pay at least equal to his current rate of pay) makes an employee ineligible for severance pay.

(3) Severance pay is computed as follows: 1 week of basic compensation for each year of creditable service up to 10 years; 2 weeks of basic compensation for each year of creditable service beyond 10 years. In addition, the basic compensation is increased by 10% for each year employee's age exceeds 40. The total amount cannot exceed 1 year's pay at the rate of pay in effect immediately prior to separation

(4) Employees entitled to an immediate annuity at the time of separation, or who are receiving compensation under the Federal Employee's Compensation Act are not entitled to severance pay.

10. RETENTION REGISTER

a. Official retention registers are maintained by the Civilian Personnel Department in Building 5. Employees may obtain information concerning their standing on the retention register by calling extension 1553. They may also make an appointment to see that part of the retention register in which their competitive level appears.

b. After an employee receives a RIF notice indicating a job offer or separation under RIF procedure, he is entitled to see any retention register which has a bearing on the action affecting him. Normally this opportunity would be provided at the same time as his counseling interview as explained in paragraph 11.

11. COUNSELING

a. A member of the Civilian Personnel Staff will be available for individual or group counseling on specific questions concerning reduction-in-force notices and to help enroll employees being separated in reemployment programs. Supervisors will arrange for counseling appointments.

12. REEMPLOYMENT BENEFITS AND OUT PLACEMENT SERVICE (CAREER AND CAREER-CONDITIONAL EMPLOYEES ONLY)

a. Reemployment Priority List (NAD Crane)

(1) Employees' names will be entered on this list for the positions from which they were separated and for positions for which they qualify. Names will be listed in retention subgroup order and considered in that order for reemployment.

(2) Separated career status employees will be carried on the Reemployment Priority List for 2 years and separated career-conditional employees will be carried for 1 year, unless their reemployment rights are satisfied earlier.

(3) Priority consideration of employees on the Reemployment Priority List is limited to positions of representative rate equal to or below the position from which they were separated in RIF.

b. Department of Defense Priority Placement Program

(1) This program provides additional priority employment consideration at Federal establishments in locations where separated employees are willing to accept employment.

c. Civil Service Commission's Displaced Career Employee Program

(1) This program provides additional priority employment consideration at Federal establishments in locations where separated employees are willing to accept employment.

d. Details concerning the method used to apply for programs stated in (b) and (c) above, will be discussed with employees during their counseling interview.

e. In addition, every reasonable effort will be made to place employees with outside employers.

13. OUTPLACEMENT SERVICE (TEMPORARY EMPLOYEES)

a. Assistance will be given by advising on employment opportunities which may be possible through the Civil Service Commission registers.

b. Advice will also be provided on filing with the Indiana Employment Security Division for jobs which may be available in the area and for unemployment insurance benefits.

Burst and Duds--published bi-weekly at the Naval Ammunition Depot, Crane, Indiana, from appropriated funds and printed on U.S. Government equipment, in compliance with NAVEXOS p-35. This publication receives the services of Armed Forces News Bureau. The views and opinions expressed in this publication are not necessarily those of the Department of the Navy.
Commanding Officer - CAPT John C. Donahue, USN
Executive Officer - CDR P. M. Stroux
Editor - Dave Johnson - Depot phone 1394

STANDARD FORM 50 - Rev. December 1961
U.S. Civil Service Commission
FPM Chap. 295

NOTIFICATION OF PERSONNEL ACTION
(EMPLOYEE—See General Information on Reverse)

NAVY OVERPRINT 10-72 (7C)

(FOR AGENCY USE) 184 — 03520

1. NAME (CAPS) LAST-FIRST-MIDDLE MR.-MISS-MRS.	2. (FOR AGENCY USE)	3. BIRTH DATE (Mo., Day, Year)	4. SOCIAL SECURITY NO.
MARKS ROBERT J II	00	08/25/50	0 282-48-2721

5. VETERAN PREFERENCE (1-NO 3-10 PT. DISAB 5-10 PT. OTHER 2-5 PT. 4-10 PT. COMP)	5A. (FOR AGENCY USE)	6. TENURE GROUP	7. SERVICE COMP. DATE	8. [illegible]
1	11	2	03/25/74	

9. FEGLI (1 - COVERED (Regular only—declined Optional) 2 - INELIGIBLE 3 - WAIVED 4 - COVERED (Reg.—Opt.))	10. RETIREMENT (1-CS 2-FICA 3-FS 4-NONE 5-OTHER)	11. (FOR CSC USE)
1	1	

12. CODE NATURE OF ACTION	13. EFFECTIVE DATE (Mo., Day, Year)	14. CIVIL SERVICE OR OTHER LEGAL AUTHORITY
920 REORGANIZATION CHANGE	04/01/75	

15. FROM: POSITION TITLE AND NUMBER	16. PAY PLAN AND OCCUPATION CODE	17. (a) GRADE OR LEVEL	(b) STEP OR RATE	18. SALARY
ELECTRONICS ENGINEER 304280041	GS 00855	09	02	PA $13269

19. NAME AND LOCATION OF EMPLOYING OFFICE

20. TO: POSITION TITLE AND NUMBER	21. PAY PLAN AND OCCUPATION CODE	21A. FUNCT. CLASS.	22. (a) GRADE OR LEVEL	(b) STEP OR RATE	23. SALARY
ELECTRONICS ENGINEER 304280041	GS 00855	14	09	02	PA $13269

24. NAME AND LOCATION OF EMPLOYING OFFICE
WEAPONS QUALITY ENGRG CENTER - 30 NAD CRANE, INDIANA
PLANS AND PROGRAMS DIVISION - 304
SYSTEMS EFFECTIVENESS BR - 3041

25. DUTY STATION (City—county—State)	26. LOCATION CODE
CRANE, MARTIN, INDIANA	18-1055-101

27. APPROPRIATION	28. POSITION OCCUPIED (1-COMPETITIVE SERVICE 2-EXCEPTED SERVICE)	29. APPORTIONED POSITION FROM: TO: (1 - PROVED - 1 2 - WAIVED - 2)	STATE
FAIR LABOR - EXEMPT	1		

30. REMARKS
A. SUBJECT TO COMPLETION OF 1 YEAR PROBATIONARY (OR TRIAL) PERIOD COMMENCING
B. SERVICE COUNTING TOWARD CAREER (OR PERMANENT) TENURE FROM:
C. DURING PROBATION

SEPARATIONS: SHOW REASONS BELOW, AS REQUIRED. CHECK IF APPLICABLE:
RESULT OF REORGANIZATION.

D. RETIRED UNIFORMED SERVICE:
UNIFORMED SERVICE DESIGNATION:
DATE OF RETIREMENT FROM UNIFORMED SERVICE: (Mo., Day, Year)
UNIFORMED SVC PAY GRADE:
UNIFORMED SVC COMPONENT:

E. WORK SCHEDULE: F
F. PAY RATE DETERMINANT: 1
G. SPECIAL PROGRAM ID: 00

31. DATE OF APPOINTMENT AFFIDAVIT (Accessions only)

OFFICE MAINTAINING PERSONNEL FOLDER (If different from employing office)

34. SIGNATURE (Or other authentication) AND TITLE
N. SMITH
PERSONNEL STAFFING SPECIALIST

35a. SUBMITTING OFFICE NUMBER: 2562

33. CODE: NV24 EMPLOYING DEPARTMENT OR AGENCY: DEPARTMENT OF THE NAVY

35. DATE: 05/09/75

0109 — 200 — 4271
50 — 134 — 20

I. EMPLOYEE COPY

JEWETT PUBLICATIONS
BOX 371
FARMERSBURG, IND. 47850

2087

Jan 20 1975

71-590/813

PAY TO THE ORDER OF Bob [illegible] $20.00

Twenty and 00/100 DOLLARS

JTS

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FARMERSBURG · INDIANA

Richard D. Jewett

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DELUXE CHECK PRINTERS

ROBERT J. MARKS II
2531 Jefferson
Terre Haute, Indiana 47802
(812) 234-2570

RESUME

JANUARY 1974

Education	Garfield Heights High School Garfield Heights, Ohio Rose-Hulman Institute of Technology Terre Haute, Indiana Major: Electrical Engineering Degrees: B.S. (1972), M.S. (1973)
Major Course Work	Laser Optics (Linear Systems, Communications Systems, Electromagnetic Waves, Fourier Optics, Thesis Research) Acoustics (Traveling Waves, Acoustics, Advanced Acoustics) Statistics (Probability and Statistics, Statistical Methods, Statistical Inference)
Research Papers	"Holographic Recording of Variant Systems" (Master's Thesis) "Derivations and Applications of the Modern Tempered Scale"
Scholarships and Awards	Tuition Grant for Graduate Study at Rose-Hulman (1972-3) Rose Honor Key for outstanding academic and extracurricular activities)
Extracurricular Activities	Broadcasting Club of Rose-Hulman (Member, Editorial Board Chairman, Continuity Director, Chief Announcer, General Manager) The Rose Thorn (Cartoonist) Rose-Hulman Glee Club (Member) The Rose Technic (Cartoonist)
Employment and Experience	Ford F. M. Inc. (WPFR-WKZI) West Terre Haute, Indiana Music Director, Disc Jockey Undergraduate Physics Lab Instructor FCC Liscense Class Instructor Guest Lecturer in Fourier Optics on Piecewise Isoplanicity)
Employment Objectives	Position in research, development, or teaching in the field of Laser Optics, Acoustics, or Statistics.
Personal	Single 6'1" 185 lbs. Born: 8-25-50 Draft Classification: 1-H Church: Lutheran
Hobbies and Outside Activities	Member of IEEE Music (Theory, Guitar, Bass, Composition- 58 Musical Compositions Copyrighted) Cartooning
References	See attached list.

REFERENCES

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Paul Dean Ford
President of Ford FM Inc.
Professional Engineer
R.R. 2, Box 50
West Terre Haute, Indiana (812) 533-1661

ADDITIONAL REFERENCES FURNISHED ON REQUEST

00164

120

1. ORGANIZATION	2. PAYROLL PERIOD	3. BLOCK NO.	4. SLIP NO.
304000 NAD, CRANE, INDIANA			

5. EMPLOYEE'S NAME	6. (FOR AGENCY USE)	7. SOCIAL SECURITY NO.
MARKS ROBERT J II		282-48-2721

PART A—NOTIFICATION OF BASIC PAY CHANGE

8. NATURE OF ACTION CODE	892 QUALITY INCREASE 893 WITHIN GR. INCREASE 894 PAY ADJUSTMENT	896 ADMINISTRATIVE PAY INCREASE 897 ADMINISTRATIVE PAY DECREASE OTHER *(Specify)*	9. EFFECTIVE DATE	10. DATE OF LAST EQUIV. INCREASE	11. OLD SALARY
894			10-13-74		PA $12167

12. (FOR AGENCY USE)	13. GRADE OR LEVEL	14. NEW STEP OR RATE	15. NEW SALARY
ELECTRONICS ENGINEER	GS 00855	09/01	PA $12841

	16. WORK IS OF AN ACCEPTABLE LEVEL OF COMPETENCE.	18. SIGNATURE	DATE
	17. PERFORMANCE IS SATISFACTORY OR BETTER		10/15/74

PART B—DATA ON UNPAID ABSENCE

19. PERIOD(S)	20. TOTAL EXCESS	21. IN PAY STATUS AT END OF WAITING PERIOD?	22. INITIALS
		1. YES X 2. NO	jda

PART C—PAYROLL CHANGE DATA

	BASE PAY	OVERTIME		GROSS PAY	FEDERAL TAX	FICA	STATE TAX	BOND
23. PREV. NORM.								
24. NEW NORM.								
25. THIS PRD.								
	CSR	GROUP LIFE INS.	HEALTH BENEFITS	ORGAN. DUES				NET PAY
23a. PREV. NORM.				-				
24a. NEW NORM.								
25a. THIS PRD.								

26. APPROPRIATION(S)	27. PREPARED BY	28. AUDITED BY

PART D—REMARKS

RESULT OF E. O. 11811 APPROVED 7 OCTOBER 1974.

BSP 11/6

STANDARD FORM 1126 (5-part Cont.)
February 1966
1126-127

PAYROLL CHANGE SLIP — EMPLOYEE'S COPY

U.S. CIVIL SERVICE COMMISSION
FPM SUPPLEMENT 296-31

"FAILURE DELETION CONFIDENCE UPON IMPLEMENTATION OF CORRECTIVE ACTION DURING EXPONENTIAL SEQUENTIAL TESTING"

ROBERT J. MARKS II
CODE 3041
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

ABSTRACT

Confidence levels are placed on the action of deleting failures generated by a failure mode of a system which has been subjected to corrective action during an exponential sequential test.

Physical implementation of sequential testing many times violates the underlying assumption by which the test was formulated. For example, the often contractually required sequential test methods of MIL-STD-781B (1, 2) allow for deletion of failures generated by a troublesome failure mode upon implementation of a corrective action and subsequent substantiation testing (3). Ideally, a system change during a sequential test should be cause for test abortion and reinitiation. Such a practice, however, wastes information gained during initial testing and is thus clearly not always optimally cost effective. The level of confidence at which one may delete failures of an uncorrected mode is thus addressed with attention restricted to the exponential case.

The system under inspection is viewed as a number of statistically independent exponential series failure modes. The modes of interest (those having the higher failure rates) are those expected to be exposed during test. Consider a single mode which has experienced failures up to test time T_u * at which time corrective action is implemented. The system, and thus the corrected mode, is tested an additional time T_c * during which r_c mode failures occur. In order to delete all failures occurring during T at a confidence level of $1 - \alpha$, one must establish the probability of a non-occurrence of a failure during T_u using information gained during T_c. This is equivalent to

$$P(\theta_c \geq T_u \mid T_c, r_c) = 1 - \alpha \qquad (1)$$

* u and c subscripts refer to parameters of the uncorrected and corrected mode respectively.

From elementary statistics (4)

$$P\left(\theta_c \geq \frac{2T_c}{\chi^2_{\alpha;\nu}}\right) = 1 - \alpha \tag{2}$$

where χ^2_ν is the chi-squared PDF with ν degrees of freedom. For the time terminated test, one usually lets

$$\nu_p = 2(r+1) \tag{3}$$

This assignment, however, assumes a failure immediately after test termination at time $T_c + dt$ and is employed primarily to avoid the awkward situation of $r = 0$. Thus the p (for pessimistic) subscript. A more optimistic assignment is

$$\nu_o = 2r + 1 \tag{4}$$

This condition essentially assumes the occurrence of 1/2 failure at test time $T_c + dt$ and, although more favorable to the producer, is still weighted toward the customer. One might have the tendency to further reduce the assumed failure to 1/3 or 1/4, but in the limit, the undesirable situation of $r = 0$ is again encountered. The 1/2 failure case seems to be the golden mean between fairness to the producer and mathematical nicety.

Comparing equations 1 and 2 yields the relationship by which failure reclassification confidence can be found.

$$\frac{T_c}{T_U} = \frac{1}{2}\chi^2_{\alpha;\nu} \tag{5}$$

Consider now the optimal producer's case in which $r_c = 0$. For the pessimistic case, $r_p = 2$. Since

$$\alpha = e^{-\frac{1}{2}\chi^2_{\alpha;2}} \tag{6}$$

the pessimistic reclassification confidence from equations 3 and 5 is

$$1 - \alpha_p = 1 - e^{-T_c/T_u} \tag{7}$$

Curiously, this expression is recognized as the mode unreliability at T_c assuming a mode MTBF of T_u . For the optimistic case $r_o = 1$ and $1 - \alpha_o$ is found from

$$\frac{T_c}{T_u} = \frac{1}{2}\chi^2_{\alpha_o;1} = \frac{1}{2} z_{\alpha_o/2} \tag{8}$$

where z refers to the standardized normal distribution.

For purposes of comparison, $1 - \alpha_o$ and $1 - \alpha_p$ vs. T_c/T_u is offered in Figure 1.

For the case of m modes having undergone corrective action during test, the confidence, $1 - \alpha_M$, for reclassifying all of the failures resulting from the uncorrected mode is

$$1 - \alpha_M = \prod_{n=1}^{m} (1 - \alpha_n) \tag{9}$$

where $1 - \alpha_n$ is the reclassification confidence of the n^{th} mode.

Note that no assumptions have been made concerning the underlying distribution of the uncorrected mode. Upon correction, however, a constant failure rate is assumed for the mode and thus the system.

(1) MIL-STD-781B "Reliability Tests: Exponential Distribution"

(2) B. Epstein, A. A. Patterson, C. R. Qualls "The Exact Analysis of Sequential Life Tests with Particular Application to AGREE Plans", Aerospace Reliability and Maintainability Conference 1963

(3) AR-34, "Failure Classification for Reliability Testing, General Requirements for". In-house document for Naval Air Systems Command, 1969.

(4) H. J. Larson. "Introduction to Probability Theory and Statistical Inference", New York, John Wiley and Sons, Pg 247, 1969

FIGURE CAPTIONS:

Fig. 1: Optimistic $(1-\alpha_o)$ and pessimistic $(1-\alpha_p)$ reclassification confidence vs. T_c / T_u = corrected mode test time/ uncorrected mode test time.

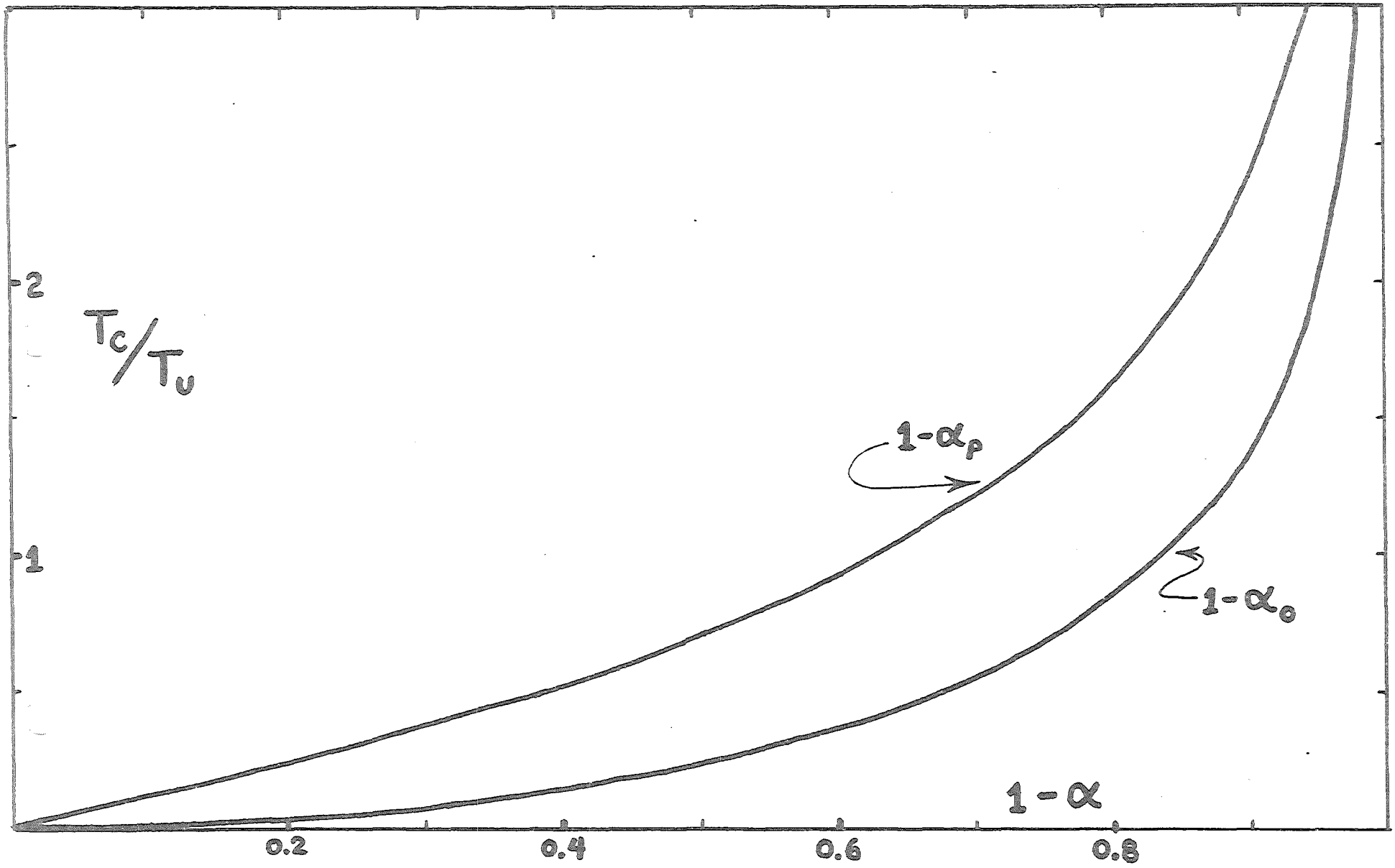


FIG. 1

OTHER REPRESENTATIONS OF $\chi^2_{\alpha;r}$; $r = 1, 2$

GENERAL:

$$f_{\chi^2_r}(x) = \frac{1}{\Gamma(r/2)\,2^{r/2}}\, x^{\frac{r}{2}-1} e^{-x/2}\, u(x)$$

$$\alpha = \int_{\chi^2_{\alpha;r}}^{\infty} f_{\chi^2_r}(x)\,dx$$

I. FOR $r = 1$:

$$f_{\chi^2_1}(x) = \frac{1}{\Gamma(1/2)\,2^{1/2}}\, x^{-\frac{1}{2}} e^{-x/2}\, u(x)$$

$$\Gamma\left(\tfrac{1}{2}\right) = \sqrt{\pi}$$

$$\Rightarrow f_{\chi^2_1}(x) = \frac{1}{\sqrt{2\pi x}}\, e^{-x/2}\, u(x)$$

$$\alpha = \int_{\chi^2_{1;\alpha}}^{\infty} \frac{1}{\sqrt{2\pi x}}\, e^{-x/2}\,dx \quad ; \quad \chi^2_{1;\alpha} \geq 0$$

LET $\quad x = z^2 \Rightarrow dx = 2z\,dz$

$$x = \chi^2_{1;\alpha} \Rightarrow z = \sqrt{\chi^2_{1;\alpha}}$$

$$\alpha = \int_{\sqrt{\chi^2_{1;\alpha}}}^{\infty} \frac{2}{\sqrt{2\pi}}\, e^{-z^2/2}\,dz$$

$$\frac{\alpha}{2} = \int_{\sqrt{\chi^2_{1;\alpha}}}^{\infty} \frac{1}{\sqrt{2\pi}}\, e^{-z^2/2}\,dz$$

WE KNOW: $\quad \frac{\alpha}{2} = \int_{z_{\alpha/2}}^{\infty} \frac{1}{\sqrt{2\pi}}\, e^{-z^2/2}\,dz$

THUS: $\quad z^2_{\alpha/2} = \chi^2_{1;\alpha}$

II. FOR $\nu = 2$

$$f_{\chi^2_\nu}(x) = \frac{1}{\Gamma(1)\,2}\, e^{-x/2}\, \mu(x)$$

$$\Gamma(1) = 0! = 1$$

$$\Rightarrow f_{\chi^2_2}(x) = \frac{1}{2} e^{-x/2} \mu(x)$$

$$\alpha = \frac{1}{2}\int_{\chi^2_{1;\alpha}}^{\infty} e^{-x/2}$$

$$= e^{-\chi^2_{\alpha;2}/2} \Rightarrow \chi^2_{\alpha;2} = 2\ln\frac{1}{\alpha}$$

APPLICATION TO RECLASSIFICATION CONFIDENCE $(1-\alpha)$

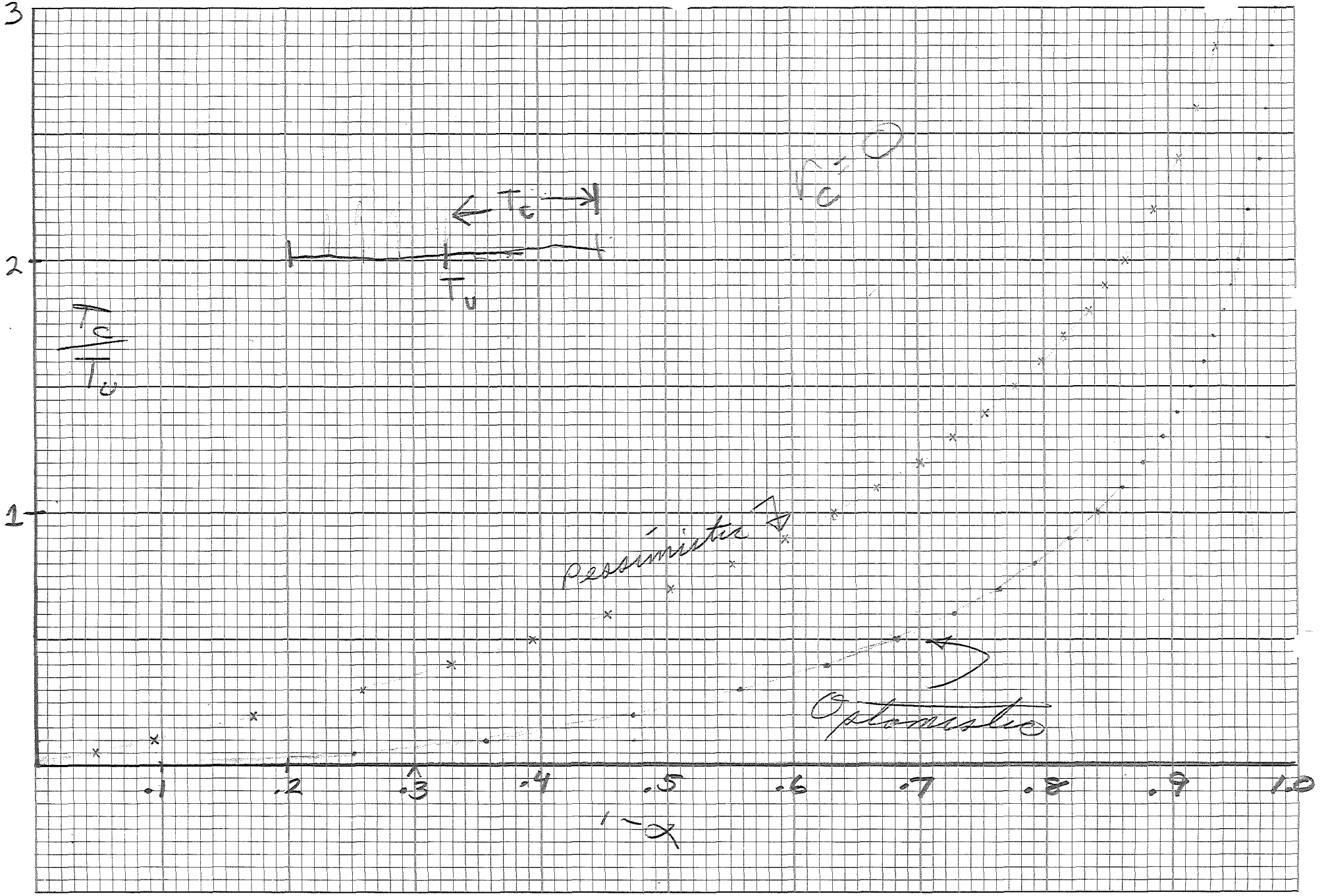
I. OPTOMISTIC: $\nu = 1$

$$\chi^2_{\alpha;1} = \frac{2T_c}{T_u} = z^2_{\alpha/2}$$

II. PESSIMISTIC: $\nu = 2$

$$\chi^2_{\alpha;2} = \frac{2T_c}{T_u} \Rightarrow \alpha = e^{-\chi^2_{\alpha;2}/2} = e^{-T_c/T_u}$$

$\frac{T_c}{T_v}$	$\sqrt{\frac{2T_c}{T_v}} = Z_{\alpha_0/2}$	$\frac{\alpha_0}{2}$	$1-\alpha_0$	$1-\alpha_p = 1-e^{-T_c/T_v}$
0.0	0.0	1	0	0
0.1	0.44721	0.326	0.348	0.095
0.2	0.632	0.264	0.472	0.181
0.3	0.77	.221	0.558	0.259
0.4	0.89	.187	0.626	0.330
0.5	1	.159	0.682	0.393
0.6	1.10	.136	0.728	0.451
0.7	1.18	.119	0.762	0.503
0.8	1.26	.104	0.792	0.551
0.9	1.34	0.0901	0.820	0.593
1.0	1.41	0.079	0.842	0.632
1.1	1.48	0.0694	0.8612	0.667
1.2	1.55	0.0606	0.879	0.699
1.3	1.61	0.0537	0.893	0.727
1.4	1.67	0.0475	0.905	0.753
1.5	1.73	0.0418	0.916	0.777
1.6	1.79	0.0367	0.927	0.798
1.7	1.84	0.0329	0.934	0.817
1.8	1.90	0.0287	0.943	0.835
1.9	1.95	0.0256	0.949	0.850
2.0	2	0.0228	0.955	0.865
2.2	2.10	0.0179	0.964	0.889
2.4	2.19	0.01426	0.971	0.909
2.6	2.28	0.01130	0.977	0.926
2.8	2.37	.00889	0.982	0.939
3.0	2.45	.00714	0.985	0.950
0.05	0.316	.3745	0.251	0.049

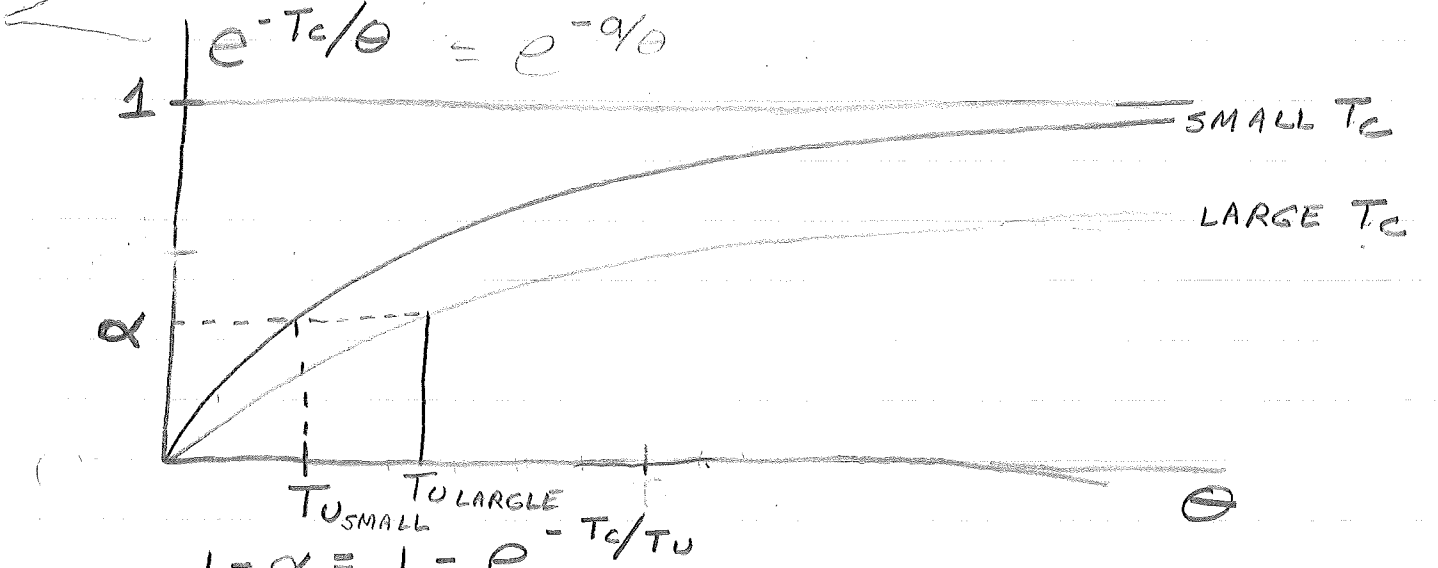


$P[\text{CORRECT RECLASSIFICATION AT } 1-\alpha \text{ CONFIDENCE} \mid \theta]$

$= P[r=0 \text{ IN TEST TIME } T_c \mid \theta]$

$= R(T_c/\theta)$

$= e^{-T_c/\theta} = \alpha e^{-T_u/\theta}$



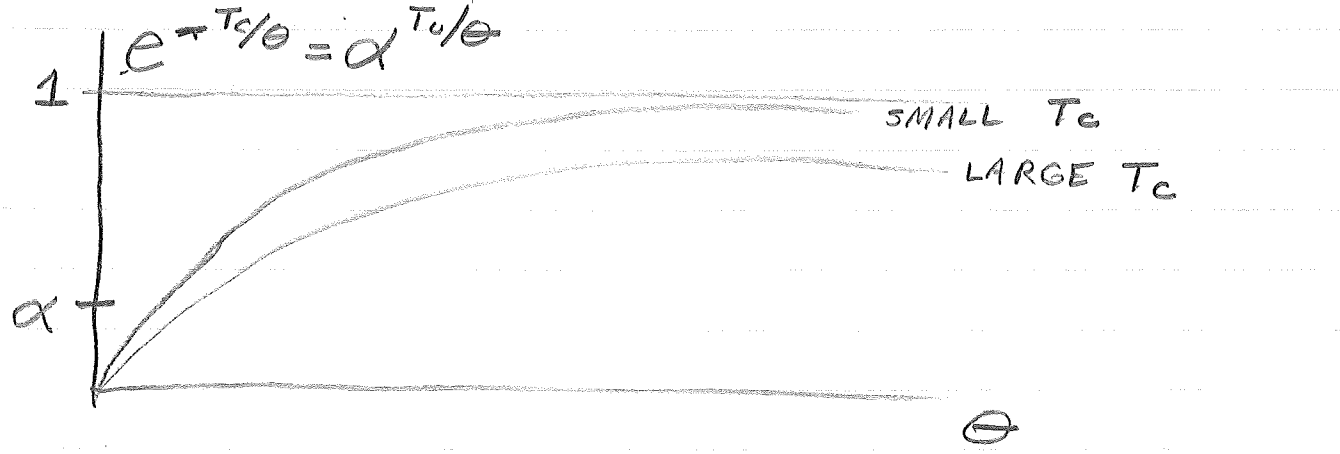
$1-\alpha = 1 - e^{-T_c/T_u}$

$\alpha = e^{-T_c/T_u}$

$-\frac{T_c}{T_u} = \ln \alpha$

$T_c = T_u \ln \frac{1}{\alpha}$

$\Rightarrow e^{-T_c/\theta} = e^{-T_u \ln \frac{1}{\alpha}/\theta} = e^{+\ln \alpha^{(T_u/\theta)}} = \alpha^{T_u/\theta}$



Censoring at some fixed time t_0

If $0 \le r < r_0$ failures occur in less than t_0 the test is stopped; if no failures occur in less than t_0 test is halted.

Since failed items are not replaced the survival or non-survival of any particular unit is a Bernoulli trial with probability of failure

$$p = 1 - e^{-t_0/\theta}.$$

Thus, the number of failures has the following function

$$f(r;\theta) = \binom{n}{r}\left(1 - e^{-t_0/\theta}\right)^r \left(e^{-t_0/\theta}\right)^{n-r}$$

$r = 0, 1, 2, \ldots r_0 - 1$

$$f(r_0;\theta) = 1 - \sum_{r=0}^{r_0-1} \binom{n}{r}\left(1 - e^{-t_0/\theta}\right)^r \left(e^{-t_0/\theta}\right)^{n-r}$$

$r = r_0$

and

$f(r;\theta) = 0$, $r = r_0+1, r_0+2, \ldots$

If $r_0 = 1$, $r = 1$

$$F(r,\theta) = 1 - \sum_{n=0}^{0} \binom{1}{0} (1 - e^{-t_0/\theta})^{0} (e^{-t_0/\theta})^{1-0}$$

$$= 1 - e^{-t_0/\theta} = P(A/\theta)$$

Let $t_0 = t_{m'}$, $\theta = t_m$

Then it

$t_{m'}/t_m$: $P(A/t_m)$ - Prob. of failure at t_0 given θ

1.6	.63
2.0	.86
3.0	.95
.7	.50
1.4	.75
2.3	.90
4.6	.99

.50
.25
.10
.01

$P[1$ FAILURE FROM $t=0$ to $t_0/\theta_0 = t_m$

~~$P[1$ FAILURE~~

$P[r<1$ FROM $t=0$ to $= 1-\alpha$

$P[\theta_0 > t / r=1] = 1-\alpha$

SOME QUICK EXAMPLES

$= 1650/1613$

$F(r,\theta) = 1 - e^{-1.99} \cong 63\%$

Prob. of a failure at $T_{m'}$ given $\theta = t_m$

For Mixture, $r_0 = 2$, $n = 2$

thus

$$f(r, \theta) = 1 - \sum_{r=0}^{1} \binom{n}{r} (1 - e^{-t_0/\theta})^{r} (e^{-t_0/\theta})^{n-r}$$

$$= 1 - \left[e^{-2t_0/\theta} + 2(1 - e^{-t_0/\theta})(e^{-t_0/\theta}) \right]$$

If $t_0 = 1650$, $\theta = 1663$, $t_0/\theta = .99$

$$= 1 - \left[e^{-1.98} + 2(1 - e^{-.99})(e^{-.99}) \right]$$

$$= 1 - [.24 + 2(.63)(.37)]$$

$$= 1 - [.24 + .46] = 1 - .70 = .30 \text{ or } 30\%$$ ~~.28~~

For alternative ~~derivation~~ derivation $t_0/\theta = 1.98$

$$f(r, \theta) = 1 - e^{-2(1650)/1663} = 1 - e^{-1.98} = .86\%$$

For mixture

See 66% 4 d.f. used.

$$f(r, \theta) = 1 - \left[e^{-3.96} + 2(1 - e^{-1.98})(e^{-1.98}) \right]$$

$$= 1 - [.02 + 2(.86)(.14)]$$

$$= 1 - [.02 + .24] = .74$$

FAILURE RECLASSIFICATION SUBSTANTIATION (FRST TIME / CONFIDENCE TABLE

TERMS:

$1-\alpha$ = RECLASSIFICATION CONFIDENCE

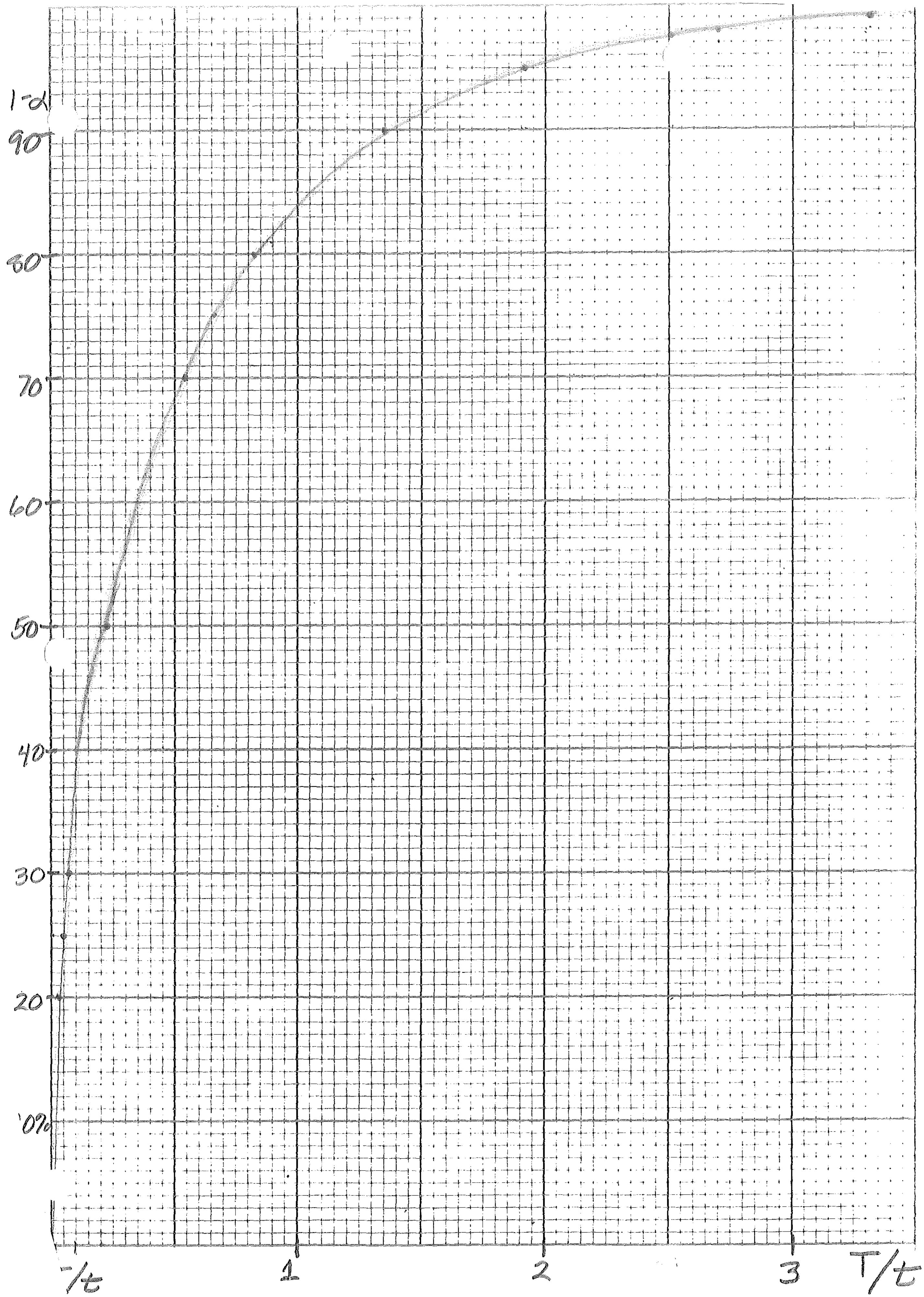
t = UNCORRECTED MODE'S TOTAL TEST TIME

T = FRST TIME

$\chi^2_{\alpha;1}$ = AREA TO THE RIGHT OF CHI-SQUARE PROBABILITY DENSITY FUNCTION' (WITH 1 DEGREE OF FREEDOM) ORDINATE

$1-\alpha$	$T/t = \frac{1}{2}\chi^2_{\alpha,1}$
0.5 %	0.0000196
1.0 %	0.000078
2.0%	0.000314
2.5%	0.000491
5%	0.00197
10%	0.0079
20%	0.0321
25%	0.051
30%	0.074
50%	0.227
70%	0.537
75%	0.662
80%	0.821
90%	1.353
95%	1.920
97.5%	2.512
98%	2.706
99%	3.318

$1-\alpha$	$T/t\ \chi^2_{\alpha,1}$
99.5%	3.938
9.9.9%	5.414



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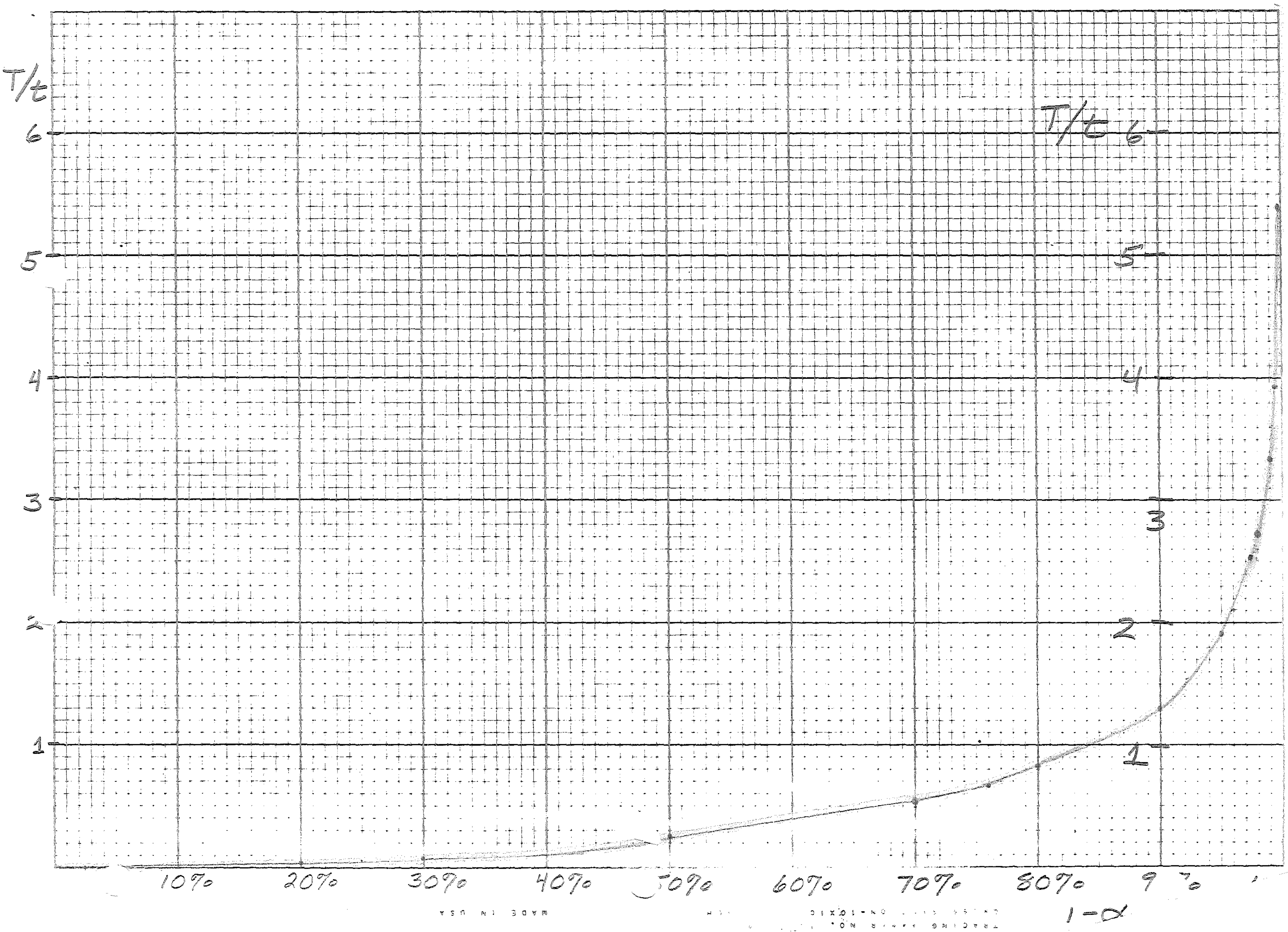

T/t
6
5
4
3
2
1
T/t 6
5
4
3
2
1
10%
20%
30%
40%
50%
60%
70%
80%
9 %
1-α

GROUP RECLASSIFICATION CONFIDENCE

GIVEN CONFIDENCES $1-\alpha_1$ AND $1-\alpha_2$ IN RECLASSIFYING FAILURE MODES 1 AND 2 RESPECTIVELY, THE CONFIDENCE FOR RECLASSIFYING BOTH MODES SIMULTANEOUSLY, $1-\alpha_{12}$, IS GIVEN BY

$$1-\alpha_{12} = (1-\alpha_1)(1-\alpha_2) \qquad (1)$$

THE RECLASSIFICATION CONFIDENCE OF m MODES, $1-\alpha_M$, THE n^{TH} OF WHICH HAS RECLASSIFICATION CONFIDENCE $1-\alpha_n$, IS

$$1-\alpha_M = \prod_{n=1}^{m} (1-\alpha_n) = (1-\alpha_1)(1-\alpha_2)\ldots(1-\alpha_m) \quad (2)$$

THESE RELATIONSHIPS ARE VALID IF THE FAILURE MODES ARE STATISTICALLY INDEPENDENT.

APRIL 2050

PROOF:

THE RECLASSIFICATION CONFIDENCE OF TWO FAILURE MODES MAY BE STATED AS

$$1-\alpha_{12} = P[\theta_1 \geq T_{U_1} \text{ AND } \theta_2 \geq T_{U_2}] \quad (3)$$

ASSUMING INDEPENDENCY.

$$1-\alpha_{12} = P[\theta_1 \geq T_{U_1}]\,P[\theta_2 \geq T_{U_2}]$$

$$= (1-\alpha_1)(1-\alpha_2) \quad (4)$$

Eq. 2 MAY EASILY BE ARIVED AT BY INDUCTION.

NOTE, FROM Eq. 4, THAT

$$\begin{aligned}\alpha_{12} &= \alpha_1 + \alpha_2 - \alpha_1\alpha_2 \\ &= \alpha_1(1-\alpha_2) + (1-\alpha_1)\alpha_2 + \alpha_1\alpha_2 \\ &= P[\theta_1 \leq T_{U_1}]\,P[\theta_2 \geq T_{U_2}] \\ &\quad + P[\theta_1 \geq T_{U_1}]\,P[\theta_2 \leq T_{U_2}] \\ &\quad + P[\theta_1 \leq T_{U_1}]\,P[\theta_2 \leq T_{U_2}] \end{aligned} \quad (5)$$

EACH TERM IN THIS EXPRESSION CONTAINS A PROBALISTIC STATEMENT WITHIN WHICH IS AN UNDESIREABLE STATEMENT. NOTE THAT THE "RISK" OF COMBINING MODES IS NOT $=\alpha_1\alpha_2$:

$$\alpha_{12} \neq \alpha_1\alpha_2 \quad (5)$$

FOR AEL ARR-75 FAILURE RECLASSIFICATION

MODE	$1-\alpha_p$	$1-\alpha_o$
RF FILTER #1	.63	~.80
#2	.63	.8
TRANSFORMER	.63	~.8
CONNECTOR	.63	~.8
MIXER	.25	~.35

GROUP RECLASSIFICATION:

PESSIMISTIC

$$1-\alpha_N = (.63)^4(.25) = 0.04$$

WITHOUT MIXERS:

$$1-\alpha_N = (.63)^4 = .16$$

OPTOMISTIC

$$1-\alpha_N = (.8)^4(.35) = 0.14$$

WITHOUT MIXERS

$$1-\alpha_N = (.8)^4 = .41$$

NOTES ON PAPER

1. ANY FAILURES OCCURING DURING FRST MUST BE SUBSTANTIATED NOT TO HAVE BEEN A RESULT OF THE CORRECTED MODE

2. EMPLOYING NON-WORST CASE DERIVATION CONSIDERATIONS INTO REQUIRED CONFIDENCE LEVEL FRST TEST TIME IN "REQUIRED FAILURE RECLASSIFICATION TEST TIME FOR A GIVEN CONFIDENCE LEVEL" IS AS FOLLOWS

$1-e^{-T/t}$	$1-\alpha$	WORST CASE $T/t = \frac{1}{2}\chi^2_{\alpha;2}$	ALTERNATE $T/t = \frac{1}{2}\chi^2_{\alpha;}$
0.50	50%	0.69	0.23
0.75	75%	1.39	0.66
0.90	90%	2.30	1.35
0.95	95%	3.00	1.92
0.99	99%	4.61	3.31

3. ASSUMPTION OF A CONSTANT FAILURE RATE FOR A COMPLEX SYSTEM, SUCH AS IS DONE IN MIL-STD-781B, IS A COMMON PRACTICE. ON THE PART LEVEL, HOWEVER, THE EXPONENTIAL ASSUMPTION IS NOT NECESSARILY THE BEST ASSUMPTION. A STUDY BY KAO (OF '71) OF CORNELL, FOR EXAMPLE, FOUND THAT ELECTRON TUBES FAIL ACCORDING TO A WEIBULL DISTRIBUTION. THUS, CONCLUSIONS DRAWN IN THE PAPERS ARE ONLY AS GOOD AS THE EXPONENTIAL ASSUMPTION'S VALIDITY.

ROUGH DRAFT
3041-RJM:sh
13070

MEMORANDUM

From: 3041 (R. J. Marks)
To: 3041 (~~C. Rice~~) (R. SAUM)
VIA: 3041 (C. RICE)
Subj: Work Statement and Present Status (Revision of AR-34)

Ref: (a) 14 Feb 1975 Meeting (R. Saum, C. Rice, and R. Marks) at NAD Crane
(b) AR-34, "Failure Classification for Reliability Testing, General Requirements for"

ENCL: a. 19 Feb 75 phone con with Wm T. Sumerlin
b. "Required Failure Reclassification Test Time for a given Confidence Level"
c. "Failure Reclassification Guidelines based on Calculated Test Times"

Discussion:

In reference (a), the need for a more specified definition of paragraph 3.3, number 2 of reference (b) was stated. That is, what constitutes "sufficient data" for substantiation of failure reclassification. Current "sufficient data" is determined solely by engineering judgement. Investigation of formulation of statistical guidelines for more precise failure reclassification will be the method of attack by this activity for drafting more precise "sufficient data" requirements.

In-house consultation possibilities included D. Kent. W. T. Sqmerlin, former member of the AGREE committe, was also suggested as a consultant in the effort. Mr. Sumerlin has been subsequently contacted and has offered his support in the effort. (see enclosure (a)).

Areas to be explored in regard to the establishment of sufficient data requirements for substantiation of failure reclassification, subject to revision, or expansion are as follows:

1. Statement in item 1 in enclosure (a).
2. Statement in item 2 in enclosure (a).

3. Reclassification requirements of corrected failure modes under test with both no and apriori assumptions.

4. Correlation of failure mode and corrective action types to apriori weighting of sufficient data requirements.

5. Employment of established and/or recent statistical works in determining sufficient test data requirements.

6. Other areas exposed by investigation of the above items.

The present work status in these investigative avenues is reflected in enclosure (2) and (3). Application of the results to the failure reclassification efforts on the ARR-75. (AEL-EMTECH) is contained in enclosure (3).

TELEPHONE CONVERSATION RECORD

This record will be used for both incoming and outgoing calls. The person originating an outgoing call or receiving an incoming call will sign the original.

DATE: 2/19/75

DURATION OF CALL: FROM 1030 TO 1048

REFERENCE (Serial, Contract, etc.):

	(Name)	(Title)	(Location)
PERSON CALLED	Bob Marks	Rel. Eng.	NAD Crane, IN
PERSON CALLING	Wm. T. Sumerlin		McDonnell Aircraft, MO

SUBJECT: Revision of AR-34 on Failure Reclassification

NAME OF CONTRACTOR: Wm. T. Sumerlin (PH: 314-232-9666)

McDonnell Aircraft

P. O. Box 181

Hazelwood, MO 63042

During introductive phase, Mr. Sumerlin recalled Carl Wiggington and Bob Saum. He stated he was reflected a great deal on AR-34 and MIL-STD-781B, and has as a result, developed definite opinions. Which were reflected during the conversation as follows:

1. No "random failure" should be reclassified since the test is to short to show the benefits of the reclassification. In case of a reject decision, due only to random failures, the system under test should be corrected (by redesign or other corrective action), and the test reinitiated. The stated philosophy behind this opinion is that forethought in design is better than corrective action under test.

2. "Pattern Failures" should be subject to a degree of reclassification, since usually sufficient test time exists for qualification. Mr. Sumerlin stated pattern failures were not characteristic of the exponential assumption*. To include the occurance of the pattern failure as a random failure, a single failure should be counted upon reclassification.

3. Upon being asked about a random failure reclassification with a "no risk" determined via test, Mr. Sumerlin said such action would be possible in certain instances, if sufficient test time, etc. exists. Sumerlin was enthusiastic in his response and welcomed future contact regarding questions and consultation in this matter.

SIGNATURE

TELEPHONE CONVERSATION RECORD

* I.e. constant failure rate?

Enclosure (1)

Required Failure Reclassification Test Time
for a Given Confidence Level

The problem under inspection:

A system failure mode, m, has experienced failure(s) in test time t at which time corrective action (denoted m') is taken. Employing the exponential assumption and no apriori judgement as to the corrective action's effectiveness, how long must one test the corrected system with no failures to establish with $1-\alpha$ confidence the non-occurance of a failure in the uncorrected system test time t.

Stated more rigourously, we must determine the required test time T to establish that

$$P[E(r) < 1] = 1 - \alpha \qquad (1)$$

where $P[r = 0] = 1 - \alpha$

P is read "the probability that"

r is the number of failures in test time T_c

E(r) is the "expected value of r"

For an exponentially modeled failure mode (ie one that fails "randomly"),

$$E(r) = \lambda_{m'} t \qquad (2)$$

where $\lambda m'$ is the constant failure rate of the corrected failure mode. Noting that $\theta_{m'}$, the corrected failure mode's MTBF, may be written

$$\theta_{m'} = 1/\lambda_{m'} \qquad (3)$$

we may rewrite Eq. 1 as follows:

$$P[\theta_{m'} > t] = 1-\alpha \qquad (4)$$

We are thus testing the corrected mode to determine if its MTBF is greater than the uncorrected system test time. This, then, is equivalent to testing for the non-occurance of a failure in test time t with $1-\alpha$ confidence.

From elementry statistics, if an exponential population is tested for time T with r failures, (1,2), is

$$P\left[\theta \geq \frac{2r\hat{\theta}}{\chi^2_{\alpha;2r}}\right] = 1-\alpha \qquad (5)$$

where

$\hat{\theta}$ is the test estimate (in this case mean MTBF) of the parameter

α is the area to the right of B in the chi-squared probability density function with $2r$ degrees of freedom.

Comparing Eqs. 4 and 5, the failure reclassification substantiation test (FRST) requires that

$$t = \frac{2r\hat{\theta}}{\chi^2_{\alpha;2r}} \qquad (6)$$

We now assume that the FRST runs for time T (yet to be determined) without failure. Our best estimate of $\hat{\theta}$ in the strict statistical sense is infinity. In order that the analysis be more realistic, we assume the worst case condition in which a failure occurs immediately after conclusion of the FRST at time T + dt. Thus,

$$r = 1$$
$$\hat{\theta} = \text{TOTAL TEST TIME}/r = T \qquad (7)$$

Substituting into Eq. 6 followed by rearrangement gives

$$T = \frac{1}{2} t \chi^2_{\alpha;2}$$

This is the final desired relationship giving the required FRST time to establish with $1-\alpha$ confidence the non-occurance of over one failure in test time t under stated worst case conditions. Note that

$$T > t \quad \text{FOR} \quad \chi^2_{\alpha;2} > 2 \qquad (9)$$

Roughly,

$$\chi^2_{\alpha;2} > 2 \quad \text{FOR} \quad 1-\alpha \leq 0.7$$

Thus, more FRST time is required that original test time when the reclassification confidence, $1-\alpha$, is greater than 70%. Some typical values of T as a function of are offered below:

t = UNCOR. TEST TIME
T = COR. " " W/O FAIL.

$1-\alpha$ (Confidence)	$T/t = \frac{1}{2}\chi^2_{\alpha;2}$	$\frac{1}{2}\chi^2_{\alpha;1}$
0.5	0.693	.227
0.75	1.386	.66
0.90	2.302	1.35
0.95	2.995	1.9
0.99	4.605	3.3

References:

(1) Harold J. Larson, Introduction to Probability Theory and Statistical Inference, John Wiley and Sous, 1969, pg 247

(2) Elements of Reliability and Maintainability, AMETA, Rock Island IL, 1973, pg IV-48

Failure Reclassification Confidence from Stated Test Times

1. Parameter definitions:

t - test time on uncorrected mode
T - test time on corrected mode
r - tallied failures during test of corrected mode
$\hat{\theta}$ - Point estimate of the corrected failure mode MTBF - T/r.
$1-\alpha$ - Confidence in reclassification
$\chi^2_{\alpha;\nu}$ Chi-squared probability density function ordinate (with ν degrees of freedom) to the right of which is area α.
θ - True MTBF of corrected failure mode.

2. Derivation (Worst case condition)

Under the exponential assumption, the MTBF confidence interval (1,2) for the failure reclassification substantiation that (FRST) (3) is

$$P\left[\theta \geq \frac{2r\hat{\theta}}{\chi^2_{\alpha;2r}}\right] = 1-\alpha \qquad (1)$$

Since $$\hat{\theta} = T/r \qquad (2)$$

we have equivalently

$$P\left[\theta \geq \frac{2T}{\chi^2_{\alpha;2r}}\right] = 1-\alpha \qquad (3)$$

To avoid the r = 0 situation, a worst case condition is assumed. This condition is the occurance of a failure at FRST time T + dt. Thus,

r = number of observed failures +1 (4)

In that we wish to test for:

$$P[\theta \geq t] = 1-\alpha \qquad (5)$$

we compare with Eq. 3 and write

$$t = 2T/\chi^2_{\alpha;2r} \qquad (6)$$

or equivalently:

$$\chi^2_{\alpha;2r} = 2T/t \qquad (7)$$

Thus, given r, T, and t as defined in Eq. 4 and section 1, the reclassification confidence, $1-\alpha$, must satisfy Eq. 7.

3. Application of Worst Case Condition Derivation to Reliability on ARR-75 Sonobuoy Receiver

In the latest (Feb 75) reliability test status report on the ARR-75 sonobuoy receiver from AEL-EMTECH, the following data was cited:

RAT: Reliability Acceptance Test (Production)

Total test time = T = 1650 hrs.

Total failures: 3

Failure modes:

a. IC: failure at 317 hrs.

b. MIXER: failure at 706 hrs.

c. TRANSISTOR: failure at 1149 hrs.

RQT: Reliability Qualification Test

Total test time = t = 1663 hrs.

Total failures: 12

Failure Modes:

a.	RF filter #1	558 hrs.
b.	RF filter	628 hrs.
c.	Transformers	1018 hrs.
		1018 hrs.
		1502 hrs
d.	Connector	1562 hrs.
e.	Mixers	1018 hrs.
		1370 hrs.

1562 hrs.

1663 hrs.

Need of the ARR-75 necessitated production and shipment of the unit prior to successful completion of the RQT. Since all RQT failures had corrective action imposed in over 90% of the RAT test, we may view the RAT as a FRST for the RQT. Examples follow:

a. In view of the cited data, what is the confidence, $1-\alpha$, in reclassifing the following RQT failures under worst case conditions:

RF filter #1

RF filter #2

Transformers

Connectors

For each of these four failure modes, a parts screening type corrective action was implemented. No further corresponding failures occured in the FRST (RAT) test. Thus, from Eq. 7,:

$$\chi^2_{\alpha;2} = \frac{2(1650)}{1663} = 1.98$$

From chi-squared tables:

$$\chi^2_{0.5,2} = 1.38 \qquad \chi^2_{0.3,2} = 2.40$$

A rough interpolation gives a reclassification confidence of

$$1-\alpha = 60\%$$

b. In view of the cited data what is the confidence of reclassifying the mixer failure under worst case conditions. Since there occured one failure in the FRST we have from Eq. 7:

$$\chi^2_{\alpha;4} = 1.98$$

Fram chi-squared tables:

$$\chi^2_{0.75;4} = 1.92 \qquad \chi^2_{0.10;4} = 2.19$$

The failure reclassification confidence for this case is thus about

$$1 - \alpha = 25\%$$

4. Alternate derivation:

Assuming worst case conditions for FRST failure determination places the most stringent of test requirements on the contractor. A less stringent requirement is the assumption that if K failures are observed in FRST time T, then 2K + 1 failures will occur in FRST time 2T. In lieu of Eq. 4, we thus have

r = number of observed failures +1/2 (8)

This assumption, although still weighted toward the customer, requires less of the contractor in test time for a given confidence level.

5. Application of Alternate Derivation to Reliability Testing on the ARR-75

We shall now employ the less stringent failure reclassification test in the above section to the ARR-75 data.

a. With reference to section 3, the failure reclassification confidence for the RF filters, connector and transformers under the alternate derivation, is found from:

$$\chi^2_{\alpha;1} = 1.98$$

From chi-squared tables:

$$\chi^2_{0.2;1} = 1.64 \qquad \chi^2_{0.1;1} = 2.71$$

The reclassification ~~risk~~ CONFIDENCE is thus about:

$$1 - \alpha = 80\%$$

b. With reference to section 3, the failure reclassification confidence for the mixers under the alternate derivation is:

$$\chi^2_{\alpha;3} = 1.98$$

From chi-squared tables:

$$\chi^2_{0.7,3} = 1.42 \qquad \chi^2_{0.5,3} = 2.37$$

Roughly, the reclassification confidence is then:

$$1 - \alpha = 35\%$$

Note that, in both of the above cases the reclassification ~~risk~~ CONFIDENCE, as predicted, is greater than the corresponding worst case condition calculations in section 3. The first by 20% and the second by 10%.

6. Discussion:

The failure reclassification risks discussed herein assume nothing about the effectiveness of the corrective action. That is, the corrected failure mode is not considered better or worse than the original failure mode. This allows no employment of engineering judgement, a feature which seemingly would be of significant value in the area of failure reclassification.

The two failure reclassification risks derived herein differ only in the method of FRST failure tallying assumptions. The lack of information on the occurance of no failures in the FRST necessitates these assumptions. Patterns set up by sections 2 and 4 may be extended by assuming nk + 1 failures in test time nT given that k failures occured in FRST time T.

← However, in the limit, one is again confronted with the original problem on the occurance of no FRST failures. The alternate derivation of section 4 is thought to be the golden mean with respect to contractor and customer fairness and mathematical nicity, even though the worst case assumption of section 1 is primarily employed in reliability practice.

7. References

(1) Harold J. Larson, Introduction to Probability Inference, John Wiley and Sons, 1969, pg 247.

(2) Elements of Reliability and Maintainability, AMETA, Rock Island, IL, 1973, pg IV-48

(3) Required Failure Reclassification Test Time for a Given Confidence Level - R. J. Marks II

FOR A SINGLE FAILURE MODE

ZERO-FAILURE TEST TIME REQUIRED FOR CORRECTIVE ACTION SUBSTANTIATION

Q: A SYSTEM FAILURE MODE m, HAVING EXPERIENCED SOME FAILURES IN TIME t_c, IS CORRECTED. THE NEW "FAILURE MODE" IS DENOTED BY m'. HOW LONG MUST ONE TEST TO GIVE A $1-\alpha$ CONFIDENCE THAT, UNDER THE EXPONENTIAL ASSUMPTION, $\theta_{m'} > t_c$?

A: THE QUESTION ABOVE MAY BE RESTATED AS: AT WHAT TIME T CAN A FAILURE OCCUR SUCH THAT WE ARE $1-\alpha$ SURE $\theta_{m'} > t_c$? THIS WILL GIVE THE REQUIRED TEST TIME. IF WE TERMINATE THE TEST AT TIME T AT THE OCCURANCE OF THE FIRST FAILURE, THEN

$$\hat{\theta} = T$$

THE GENERAL $1-\alpha$ CONFIDENCE INTERVAL FOR $\theta_{m'}$ IS

$$P\left[\theta_{m'} \geq \frac{2r\hat{\theta}}{\chi^2_{\alpha;2r}}\right] = 1-\alpha$$

WHERE $r = 1$ IS THE NUMBER OF FAILURES. THUS:

$$P\left[\theta_{m'} \geq \frac{2T}{\chi^2_{\alpha;2}} = t_c\right] = 1-\alpha$$

$\therefore$ REQUIRED TEST TIME $T = \frac{1}{2} t_c \chi^2_{\alpha;2}$

EXAMPLE: FOR $t_c = 2000$ HRS

$1-\alpha$	T
0.50	1390 HRS
0.75	2770 HRS
0.90	4610 HRS
0.95	5990 HRS

FOR $1-\alpha \geq 0.75$ $T > t_c$

NOTE: THIS INTERVAL MAY POSSIBLY BE TIGHTENED BY TAKING INTO ACCOUNT THE POSITION IN TIME OF THE FAILURE.

COMMENT:

HAVING ESTABLISHED THAT

$$P[\theta_{m'} \geq t_c] = 1-\alpha$$

WE HAVE

$$P[\lambda_{m'} = \frac{1}{\theta_{m'}} \leq \frac{1}{t_c}] = 1-\alpha$$

$$= P[\lambda_{m'} t_c \leq 1]$$

NOW, THE EXPECTED NUMBER OF FAILURES IN TIME t_c IS

$$E(r) = \lambda_{m'} \cdot t_c$$

THUS

$$P[E(r) \leq 1] = 1-\alpha$$

THE PHONY FAILURE USED TO ESTABLISH TEST TIME T IS HERE REFLECTED SO THAT ACTUALLY:

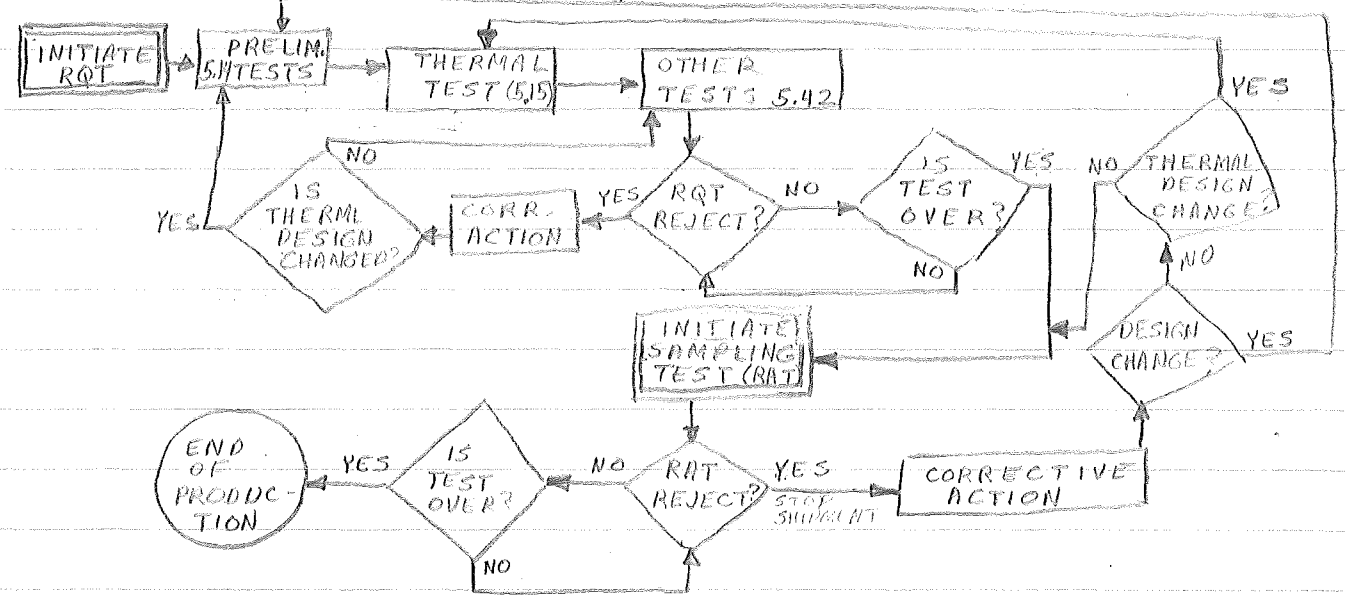
$$P[E(r) = 0] = 1-\alpha$$

THUS, BY ESTABLISHING THAT $\theta_{m'} > t_c$ AT A $1-\alpha$ CONFIDENCE, WE ARE ALSO ESTABLISHING THAT NO FAILURES WOULD OCCUR IN TIME t_c AT A $1-\alpha$ DEGREE OF CONFIDENCE.

NOTE: IN THIS ANALYSIS WE HAVE ASSUMED A WORST CASE CONDITION OF SORTS IN THAT A FAILURE IS ESSENTIALLY ASSUMED AT TIME $T+dt$

MIL-STD-781B REJECT DECISION ACTION

- DURING RELIABILITY QUALIFICATION (5.4.8.4)
  - PERFORM CORRECTIVE ACTION
    DOES IT EFFECT THE THERMAL DESIGN?
    1. NO: REDO QUAL. TEST FROM 5.4.2
    2. YES: REDO QUAL. TEST FROM 5.1.4
- DURING SAMPLING TEST → STOP SHIPMENT
  - PERFORM CORRECTIVE ACTION
    1. FOR A DESIGN CHANGE;
       REDO QUAL TEST FROM PAR. 5.14
    2. FOR A NOT A DESIGN CHANGE:
       IS THERMAL DESIGN CHANGED?
       a. NO: REINITIATE SAMPLING PHASE @ 5.15
       b. YES: REDO QUAL. TEST FROM 5.4.2.



NO TEST TIGHTENING OR LOOSENING INCLUDED HERE, NOR ANY AR34 DOCUMENTATION REQUIRED

NOTES ON 2/14/75 MEETING
BOB SAUM, CLAUDE RICE, BOB MARKS

MIL-STD-781B IS DUE FOR REWRITING. INCLUSION OF AR-34 IS DESIRED, BUT AR-34 AS IT STANDS, IS IN PARTS INADEQUATE. SPECIFICALLY, PARAGRAPH 3.3, #2. THAT IS, WHAT CONSTITUTES "SUFFICIENT DATA"? IT WAS DECIDED THAT A SEARCH FOR A MORE QUANTIFIED DEFINITION OF "SUFFICIENT DATA"

B.S. STATED THAT WM. T. SUMMERLIN, WHO SERVED ON THE AGREE COMMITTEE SHOULD BE CONTACTED:

WM. T. SUMERLIN
MC DONNELL AIRCRAFT
314-232-9666
P.O. BOX 181
HAZELWOOD, MO. 63042.

AT A NOV. '74 WAVELEX / JOINT COMMAND RELIABILITY WORK SHOP ON REL. TESTING, B.S. RECOLECTED SUMER IN SUGGESTING ON RECLASSIFICATION OF PATTERN FAILURES, AT LEAST ONE FAILURE SHOULD BE KEPT. R.M. WAS TO CHECK ON THIS AND

OTHER IDEAS SUMERLIN MIGHT HAVE CONCERNING FAILURE RECLASSIFICATION.

GENERAL FEELING WAS THAT ORIGINAL TEST SPECS ($\theta_1, \theta_0, \alpha, \beta$) SHOULD BE INCORPERATED SOMEWAY IN THE FAILURE RECLASSIFICATION SCHEME. A "RISK" OF SORTS SHOULD ALSO BE STATED.

Bob Marks

CODE IDENT
30003

AR-34
26 MARCH 1969

NAVAL AIR SYSTEMS COMMAND
DEPARTMENT OF THE NAVY

FAILURE CLASSIFICATION FOR RELIABILITY TESTING, GENERAL REQUIREMENTS FOR

APPROVED

NAVAL AIR SYSTEMS COMMAND
DEPARTMENT OF THE NAVY

FAILURE CLASSIFICATION FOR RELIABILITY TESTING, GENERAL REQUIREMENTS FOR

This specification has been approved by the
Naval Air Systems Command, Department of the Navy

1. SCOPE

1.1 PURPOSE. This specification establishes criteria for classification of failures occurring during reliability tests.

1.2 APPLICABILITY. This specification, when made a part of the procurement document or the equipment specification, applies to any reliability test, including, but not limited to, tests performed in accordance with MIL-R-22973, MIL-R-23094, and MIL-STD-781.

2. APPLICABLE DOCUMENTS

2.1 GENERAL. The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein:

SPECIFICATIONS

Military

MIL-R-22973	Reliability Index Determination for Avionic Equipment Models, General Specification For
MIL-R-23094	Reliability Assurance For Production Acceptance of Avionic Equipment, General Specification For NOTE: MIL-R-23094 has been superseded by MIL-STD-781 for all new procurements.

STANDARDS

Military

MIL-STD-721	Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors and Safety
MIL-STD-781	Reliability Tests: Exponential Distribution

2.2 AVAILABILITY OF DOCUMENTS. When requesting specifications, standards, drawings, and publications refer to both title and number. Copies of applicable specifications required by contractors in connection with specific procurement functions may be obtained upon application to the Commanding Officer, Naval Publications and Forms Center, (Code 105) 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

3. REQUIREMENTS

3.1 FAILURES. In addition to the definition of failure as given in MIL-STD-721, and any definition given in the applicable reliability test specification or standard, the following criteria for the determination of a failure shall apply:

Whenever any of the performance characteristics are outside of the requirements of the specification at any specified environmental conditions, at least one failure has occurred.

3.2 FAILURE CLASSIFICATION. All failures occurring during reliability tests, including failures occurring during equipment burn-in under the environmental conditions specified for the reliability test, shall be classified and reported as either relevant or nonrelevant. Only those failures classified relevant shall be used in computing equipment MTBF, or for making an accept/reject decision.

3.2.1 RELEVANT FAILURES. All failures are relevant unless determined by the procuring activity (or an authorized representative thereof) to be caused by a condition external to the equipment under test which is not a test requirement. Relevant failures include:

(1) Design/Workmanship Failures: Failures due to design deficiencies or poor workmanship of either the equipment or component parts shall be classified relevant.

(2) Component Part Failures: Failures due to defective component parts shall be classified as relevant failures. In the event that several component parts of the same type fail during the test, each one shall be considered a separate relevant failure, unless it can be shown that one failure caused one or more of the others (see MIL-STD-781, Dependent Failures).

(3) Wearout Parts: Certain parts of known limited life, such as batteries, may have a life stipulated prior to the initiation of testing as approved by the procuring activity. Failures of these parts occurring prior to the end of the stipulated period are relevant. Failures of these parts occurring after the stipulated period are nonrelevant, but any dependent failures caused thereby are relevant.

(4) Multiple Failures: In the event simultaneous part failures occur, each failed part which would independently prevent satisfactory equipment performance shall be counted as a relevant failure except as follows: If the contractor and the procuring activity agree that the failure of one part was entirely responsible for the failure of any other parts, then each such dependent part failure shall not be counted as a relevant failure. At least one equipment relevant failure shall be counted when a dependent failure is claimed.

(5) Intermittent Failures: The first occurrence of an intermittent failure on any one equipment shall be counted as a relevant failure, although subsequent occurrences of the same intermittency on that same unit will be considered nonrelevant. However, no equipment shall be shipped for which an intermittent failure remains unresolved, without specified approval of the government inspector.

(6) Adjustments:

(a) Accessible Controls - Each adjustment of a control which is accessible to the operator during normal use is a relevant failure if the information necessary to restore equipment operation is not available from indicators which are an integral part of the equipment under test.

(b) Inaccessible Controls - Each adjustment of a control which is inaccessible to the operator during normal use is a relevant failure, unless a period of operating (not standby) time has elapsed, since the last adjustment of any inaccessbile control on that equipment, which is equal to or greater than the period specified for the equipment "operational stability."

(7) Failures of Built-in Test: Any malfunction (including a false alarm) of the Built-in Test features of the equipment shall be classified as a relevant failure.

3.2.2 NONRELEVANT FAILURES. Although nonrelevant failures are not used for MTBF calculations, all failures shall be recorded and reported. Only those failures listed below may be counted as nonrelevant.

(1) Failures directly attributable to improper installation in the test chamber.

(2) Failures of test instrumentation or monitoring equipment (other than the Built-in Test function).

(3) Failures resulting from test operator error in setting up, or in testing the equipment.

(4) Dependent failures, unless caused by degradation of items of known limited life. (At least one relevant failure shall be counted when a dependent failure is claimed).

(5) Failures attributable to an error in the test procedures.

(6) The second (and any subsequent) occurrences of the same intermittent failure on the same unit.

(7) Failures occurring during burn-in, trouble-shooting, repair verification, or set-up time.

(8) Malfunctions of the Time Totalizing Meters or certain lighting circuit failures, when the approved test procedures specifically designate them as nonrelevant.

(9) Failures clearly attributable to an overstress condition in excess of the design requirements.

(10) Adjustments:

(a) Accessible Controls - Adjustments of controls which are accessible to the operator during normal use shall be counted as nonrelevant failures provided the adjustment is accomplished without reference to test equipment, meters, indicators, etc., which are not a functional part of the equipment under test.

(b) Inaccessible Controls - Adjustments of controls which are not accessible to the operator during normal use are nonrelevant failures provided no such adjustment has been made to the unit under test for a period of operating time at least equal to that specified for the system "operational stability".

(11) Other, as explicitly defined in the approved test procedures.

3.3 RECLASSIFICATION. A failure, classified as relevant, may be reclassified to nonrelevant provided that all of the following conditions are met:

(1) Corrective action (an equipment design, part, or production process change) has been made in accordance with the applicable reliability test specification or standard on all equipment of the lot from which the reliability test sample was drawn, and;

(2) Sufficient test data has been accumulated to indicate the corrective action is effective in eliminating the failure mode, ~~and;~~ as outlined in para. 3.3.1, and;

(3) Approval of the procuring activity (or authorized representative) is obtained for reclassification of the failure.

3.4 FAILURE ANALYSIS. An analysis of the cause of each failure shall be made in accordance with the applicable reliability test specification or standard. "PRODUCTION PROCESS CHANGES" INCLUDES CHANGES SUCH AS A HIGHER LEVEL OF COMPONENT SCREENING

3.5 FAILURE REPORTS. Any and all failures (both relevant and nonrelevant) which occur during equipment burn-in and the reliability tests shall be recorded and reported in accordance with the contract and the applicable reliability test specification. The reports shall include the results of the failure analyses.

4. QUALITY ASSURANCE PROVISIONS: Not applicable.

5. PREPARATION FOR DELIVERY: Not applicable.

6. NOTES:

6.1 DEFINITIONS. All definitions are in accordance with MIL-STD-721, and the applicable reliability test specification or standard.

6.2 PRECEDENCE OF DOCUMENTS. When the requirements of the contract, this specification or applicable subsidiary specification, are in conflict the following precedence shall apply:

(1) Contract: The contract shall have precedence over any specification.

(2) The Equipment Detail Specification: The equipment detail specification shall have precedence over all applicable subsidiary specifications.

(3) This Specification: This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications, where applicable, shall be specifically approved in writing by the Naval Air Systems Command.

(4) Reference Specifications: Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

CLAUDE:

I AM VERY CONCERNED ABOUT THIS BUSINESS OF OF FAILURES. WE SHOULD HAVE SOME DOCUMENTED FOR MAKING THESE TYPES OF DECISIONS. SUCH GU. MIGHT FIND THERE WAY INTO AR-34 AND BELIEVE THAT SUCH DECISIONS CAN IN SOME BE STATED IN TERMS OF A RISK; AND, THAT BE AWARE OF OUR RISKS. I HAVE BEEN IN SE MEETINGS WHERE THIS ASPECT OF AR-34 HAS CRITICIZED; AND, I HAVE FOUND IT DIFFICULT WHENEVER ASKED NOW WE KNOW WE MADE THE DECISION. WILLIAM T. SUMMERLIN HAS EVEN SUGG THAT AT LEAST ONE OF THE RECLASSIFIED FAILURES COUNTED.

AS YOU KNOW, I HAVE BEEN CONCERNED (ABOUT WITH PROBLEM FOR SOME TIME NOW. I THINK IT'S T DO SOMETHING ABOUT IT.

B MARKS MIGHT BE A GOOD MAN TO THIS; AND, WE COULD GET HELP FROM D. KE.

LETS DISCUSS IT ON MONDAY

Bob.

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
304B-TS:sh
13070

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana
To: Bendix Electrodynamics Division, 11600 Sherman Way, North Hollywood, CA 91304
Via: Chief, Defense Contract Administrative Services Offices, 8900 DeSoto Avenue, Canoga Park, CA 91304

Subj: Contract N00019-73-C-0183 for Sonar Detecting Range Set, AN/AQS13B, Work Unit Assignment C112.139, Reliability Demonstration Test, Failure Reclassification Requests

Ref: (a) Bendix ltr E5787-064 of 13 Dec 1974 to NAVAIRSYSCOM
(b) Failure Report ACA 088, Sonar Receiver Serial Number EXX0023, System Group Number 23
(c) Bendix ltr E5787-065 of 20 Dec 1974 to NAVAIRSYSCOM
(d) Failure Report ACA 070, Indicator 3183200
(e) Failure Analysis Report 74-081
(f) ECP-1309, Change Number 8

1. As directed by Naval Air Systems Command, the Naval Ammunition Depot (Code 304B) has been given the responsibility for action upon references (a) and (c).

2. Reference (a) requests authorization to reclassify a catastrophic failure of a NAFI-4 Doppler Processor Number 2 during the MTI Doppler Lockout test. Channel 6 failed to display the CW spoke within the ATP specified 400 to 3000 yard range of channel sweep.

3. Failure Analysis Report, reference (b), substantiates the action requested by reference (a).

4. Reference (c) requests authorization to reclassify a catastrophic failure of transistor Q1, JANTX 2N2484 on the Test Generator P.C. Assembly, part number 3185465, installed in the 3183200 Azimuth Range Indicator (serial number EXX-0018), at high temperature.

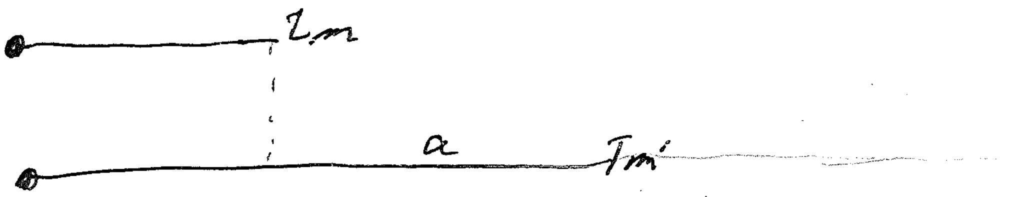
5. Failure Analysis Report, references (d), (e) and (f) substantiate the action requested by reference (c).

6. Having reviewed the corrective action and accumulated test hours since occurrence of these relevant failures, this activity concurs with the requests of references (a) and (c), and hereby reclassifies these relevant failures to nonrelevant.

7. The comments contained herein do not authorize or imply any changes in the requirements or conditions of the contract or applicable specification.

8. If further information or clarification is required concerning this letter, it should be directed to Commanding Officer, Naval Ammunition Depot (Code 304B), Crane, Indiana, or by telephoning Mr. Claude Rice at 812-854-1299.

S. S. KALBERER
By direction



$$\text{Prob}(0 \text{ failures in } T_m') = e^{-\lambda T_m'}$$
$$= e^{-\lambda(t_m + a)}$$
$$= e^{-\lambda t_m} \cdot e^{-\lambda a}$$

if λ is same for both periods however if it is not we have

$$\text{Pr}(0 \text{ failures in } T_m') = e^{-\lambda_N t_m} \cdot e^{-\lambda_R a}$$

Pr (0 failures in T_m) = Prob of 0 failures in T_m Pr of the 0 failures in a

Prob of (0 failures in t_m) = Prob of 0 failures in T_m / Prob of 0 failures [illegible]

$$e^{-\lambda t_m} = \frac{e^{-\lambda T_m}}{e^{-\lambda a}}$$

$$-\ln \lambda t_m = -\ln \lambda t_m + \ln \lambda a$$

Prob (0 failures in t_m / failure rate of λ_R)

$$e^{-\lambda_R t_m} = e^{-\frac{t_m}{\theta_K}} = e^{-t_m/a}$$

$r = 0, \ \theta_K = a$

which depends on λ_R and t_m. If t_m is fixed, then λ_R is what you want to vary

$$1 - e^{-a/t_m} \neq e^{-t_m/a}$$

Problem: An item is tested for t_1 hours without failures in mode m but is reworked for failures in mode(s) other than m. (1) How long should the reworked item be tested to assure MTBF of reworked item for mode m is equivalent to the MTBF of the original item with respect to mode m. (2) How long should we test the reworked equipment, say t_2, to establish with 1-α confidence the non-occurrence of a failure in time, t_1.

If test is truncated by time

$$Pr\left(2T/\chi^2_{\alpha,2r+2} \le \theta \le 2T/\chi^2_{\alpha,2r+1}\right) = 1-2\alpha$$

Therefore ~~as a result of~~ with a test for t_1 hours without failure

$$Pr\left(2t_1/\chi^2_{\alpha,2}[redacted] \le \theta_N\right) = 1-\alpha,$$

or

$$Pr\left(\theta_N \ge 2t_1/\chi^2_{\alpha,2}[redacted]\right) = 1-\alpha \qquad (2)$$

where θ_N ~~stands~~ the MTBF of the non-reworked item. If the reworked item is tested for t_2 hours,

$P_r(\theta_R \geq 2t_2/\chi^2_{\alpha_2, 2[\blacksquare]}) = 1-\alpha_2$ (3)

where θ_R denotes the MTBF of the renewal item, if

$$2t_1/\chi^2_{\alpha_1, 2[\blacksquare]} = 2t_2/\chi^2_{\alpha_2, 2[\blacksquare]}, \quad (4)$$

it can be stated that θ_R is at least as good as θ_N with $(1-\alpha_1)(1-\alpha_2)$ confidence. The equality of equation (4) is maintained if

$$t_1/\chi^2_{\alpha_1, 2[\blacksquare]} = t_2/\chi^2_{\alpha_2, 2[\blacksquare]}. \quad (5)$$

If $t_2 = t_1$, α_1 must equal α_2 to maintain this equality and a confidence of $(1-\alpha)^2$ is obtained. However, if $t_2 = 2t_1$, the $\chi^2_{\alpha_2, 2[\blacksquare]}$ must equal $2\chi^2_{\alpha_1, 2[\blacksquare]}$ to maintain the equality and the confidence level is $(1-\alpha_1)(1-\alpha_2)$. Similarly if

$t_2 = 3t_1$, $\chi^2_{\alpha_2, 2}$ [redacted] must equal $3\chi^2_{\alpha_1, 2}$ [redacted].

Table 1 gives some values for which the above equalities would hold. ~~for 0 failures (2 degrees of freedom)~~. For example, for $\alpha_1 = .01$, $\chi^2_{.01, 2} = 9.21034$ and if $t_2 = 2t_1$ then α_2 must equal .0001 as $\chi^2_{.0001, 2} = 18.4207$ ~~which~~ is $2\chi^2_{.01, 2}$. ~~Similarly~~, if $\alpha_1 = .10$, $\chi_{.10, 2} = 4.60547$ and if $t_2 = 3t_1$, then α_2 must equal ~~.005~~ [.001] as $\chi^2_{.001, 2} = 13.8155$ which is $3\chi^2_{.10, 2}$.

Table 2 gives the resultant confidence level as a result of both tests for the values given in Table 1. Using the ~~above~~ examples

in the above paragraphs, the resultant confidence for when $t_2 = 2t_1$ is $(1-.01)(1-.001)$ or $(.99)(.999)$ which equals .9899 and for $t_2 = 3t_1$ it is $(1-.10)(1-.001)$ or $(.90)(.999)$ which equals .8991.

It is interesting to note there is another method to obtain the same resultant confidence. This is for t_2 to be a fraction ($1/k$) of t_1. Using this fact and equation (5),

$$t_1 / \chi^2_{\alpha_1, 2n+2} \text{ must } = t_2 / k \chi^2_{\alpha_2, 2n+2}$$

~~who k is for~~

Therefore, $\chi^2_{\alpha_1, 2n+2}$ must equal $k \chi^2_{\alpha_2, 2n+2}$ or $\chi^2_{\alpha_2, 2n+2}$ must equal $\chi^2_{\alpha_1, 2n+2} / k$.

~~Using the two examples given above and Table I and~~

If $t_2 = t_1/2$, then $\chi^2_{\alpha_2, 2n_2}$ must equal $\chi^2_{\alpha_1, 2n_2}/2$. Using Table 1, we see that $\chi^2_{.01,2} = 1/2\ \chi^2_{.0001,2}$ which gives $\alpha_1 = .0001$ and $\alpha_2 = .01$ and a resultant confidence of $(.9999)(.99) = .9899$, the same as if $t_2 = 2t_1$. Similarly for $t_3 = t_1/3$, $\chi^2_{.001,2} = \chi^2_{.001,2}/3$ giving with $\alpha_1 = .001$ and $\alpha_2 = .10$ and a resultant confidence of $(.999)(.90) = .8991$, the same as if $t_2 = 3t_1$. The reason for this is that α_1 and α_2 are just switched when going from a multiple of t_1 to a fraction of $1/t_2$. However, the original value of θ estimated, θ_N, will be much less with $t_2 =$ fraction of t_1 than with $t_2 =$ multiple of t_1.

Table 2. Multiples of $\chi^2_{\alpha,2}$ for α and $1-\alpha$ values.

α	$1-\alpha$	$\chi^2_{\alpha,2}$	$2\chi^2_{\alpha,2}$	$3\chi^2_{\alpha,2}$		
.00510	.99490	18.4267	18.4267			
.00016	.99984			17.97438		
.00050	.99950	15.7018				
.00066	.99934		14.75562			
.00100	.99900	13.8155		13.8155		
.00338	.99662		11.98293			
.00500	.99500	10.5966				
.00839	.99161			9.65164		
.0100	.9900	9.21034	9.21034			
.0250	.9750	7.37776				
.0278	.9722			7.22385		
.0420	.9580		6.43776			
.0419	.958					
.0500	.9500	5.99146				
.0678	.9322			5.49794		
.0934	.9176		4.8159			
.1000	.9000	4.60517		4.15651		
.1328	.8672		3.66516			
.1678	.8322					
.2000	.8000	3.21888				
.2554	.7446		2.77258			
.3000	.7000	2.40795				
.4000	.6004	1.83258				
.5000	.5000	1.38629				

Table 2

Conf. Level for First Test $(1-d_1)$	Possible Conf. Levels for Second Test $(1-d_2)$ and the Resultant Conf. $(1-d_1)(1-d_2)$ if t_2 equals					
	t_1		$2t_1$		$3t_1$	
	Second Test	Resultant	Second Test	Resultant	Second Test	Resultant
.99990	.99990	.99980				
(.99984)	(.99984)	.99968				
.99950	.99950	.99900				
(.99934)	(.99934)	.99868				
.99900	.99900	.99800				
(.99672)	(.99672)	.99345				
.99500	.99500	.99002				
(.99161)	(.99161)	.98329				
.99000	.99000	.98010	.99990	.98990		
.9750	.9750	.9506	.99934	.9744		
.9722)	(.9722)	.9452				
(.9580)	(.9580)	.9178				
.9500	.9500	.9025	.99672	.9469	.99984	.9498
(.9322)	(.9322)	.8690				
(.9176)	(.9176)	.8420				
.9000	.9000	.8100	.9990	.8910	.99900	.8991
(.8678)	(.8678)	.7531				
(.8322)	(.8322)	.6926				
.8000	.8000	.6400	.9580	.7664	.99161	.7932
.7450)	(.9450)	.5550				
.7000	.7000	.4900	.9176	.6429	.9722	.6805
.6000	.6000	.3600	.8322	.4993	.9322	.5593
.5000	.5000	.2500	.7450	.3725	.9161	.4580

) - Found by interpolation.

FAILURE RECLASSIFICATION

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
3041-CFR:sh
13070
2 Apr 1975

MEMORANDUM

From: 3041 (C. Rice)
To: 3041 (R. Saum)

Subj: Plan activities for Apr 1975

1. Ken Smith

a. AN/DRQ-4(ANC) - Find out when testing is scheduled to resume. When received review the monthly report and the failure diagnosis and corrective action.

b. AN/DRQ-4 (Reaction) - Keep in close contact with contractor to monitor progress of Reliability testing.

c. AN/DSU-4/A - Reliability testing is scheduled to commence early in April. If testing is initiated, make a visit to the contractor's facilities to witness testing.

2. Deon Hersberger

a. ARC-159 - Expect a monthly report.

b. ARC-159(V) - Expect monthly report. Review reclassification requests for two failures.

c. A24G-39 - Contact the contractor for Reliability reports for months of January, February and March 1975 testing.

3. Tom Shaw

a. ARN-84 - Review reliability report and visit contractor's facility.

b. ALQ-126 - Review reliability report.

c. AQS-13B - Review reliability report and visit contractor to witness RAT on final system.

d. ASW-27B - Review final report and visit plant to attend FRB since they are in reject.

e. BIT - Finish quarterly report, ARN-84 report and initiate AR-10 investigation.

4. Bob Marks

a. ARR-75-(AEL) - Continue monitoring the contractor's Reliability Test Program.

b. DKT-30 - Check with the contractor regarding status of Reliability Testing and reports.

c. AAU-31/A and AAU32/A - Check with DCAS-QAR regarding status of testing -- when reports can be expected.

d. ARR-72 Edmac - Continue monitoring program status.

e. ARR-75 Edmac - Continue monitoring program status.

5. Claude Rice

a. ASW-25 - Contractor is deliquent in submitting Reliability Re[illegible]

b. APN-202-/R1623 - Check with contractor regarding status of Reliability program status and test reports.

c. ID 1481 - No action required.

C. F. RICE

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
06-DWM:enh
12721/1

MINUTES OF AFGE MEETING
30 January 1975

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1. Employment Limitations. The Commanding Officer referred to the article published in the Daily Bulletin on 29 January 1975 and stated there was nothing new since that date. He stated that NAVSEASYSCOM has imposed a civilian personnel ceiling of 3824 for 30 June 1975. There has been no decision made to conduct a reduction-in-force. NAVSEASYSCOM has requested authority for Crane to conduct a RIF of permanent employees and to release temporary employees if it becomes an absolute necessity. The Commanding Officer stated that he had indicated in a letter to NAVSEA that if no RIF is imposed that our projected ceiling is 4350 for 30 June 1975. However, he further stated that we have sufficient workload to not only support an allocation of 4450 for FY 1975 but also through 1976. If a RIF is necessary, notices will have to be issued no later than 1 May. Firm guidance should be received by 1 March. Later in the meeting Mr. Combs stated the Union is preparing information to submit to Congressmen in an effort to curtail the proposed RIF action.

2. Hiring Freeze. The Commanding Officer stated there was no blanket hiring freeze at this time. However, hiring is being restricted to those billets that are deemed absolutely necessary.

3. Reorganization of the Ordnance Department. While the Commanding Officer was in Washington, D. C. recently, he briefed Headquarters regarding the reorganization of the Ordnance Department. Additional information will be submitted regarding the reorganization. The Commanding Officer indicated that negotiations are still being conducted.

4. Junking of Materials. It was pointed out that materials that have not been issued within a year are being sent to the batcher for junking. It was felt that this was a great waste. The Commanding Officer stated that hard goods should not be junked and that he will look into this matter.

5. Change of Name for Depot. When asked concerning the status of the name change for the Depot, the Commanding Officer stated that Weapons Materials Center has been proposed, but no decision has been made at this time.

David Combs

DAVID COMBS
President, AFGE Lodge No. 1415

Distribution:
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06 (5 copies)
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DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
06-DWM:enh
12721/1

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CHECKLIST

Reliability Test Procedures (For use with MIL-R-23094A and MIL-STD-781A)

General

1. Are separate test procedures provided for the Qualification (Pre-delivery) and Sampling (during delivery) tests?

2. Has a careful review been made of the applicable documents, including:

   a. the contract, modifications and changes

   b. the equipment specification

   c. the system specification

   d. the reliability specification

   e. the specification for format

Format

3. Is the specification properly titled?

4. Does the title page include:

   a. the title of the test

   b. equipment name and nomenclature

   c. contract number and date

   d. manufacturer's name

   e. the date of the test procedures

   f. any appropiate revision information

5. Is an equipment list provided?

6. Are diagrams of the test setup furnished?

7. Have schematics of any special test equipment been included?

8. Are the figures and tables numbered in sequence and referred to in the text?

9. Are the test procedures complete and self sufficient?

10. Have samples of the data sheets, test logs, failure analysis reports etc. been included?

Introduction

11. Does the first portion of the procedure list:

a. the specified MTBF

b. the documents which describe the test requirements, including, as applicable:

(1) the contract, and pertinent changes or ammendments or waivers

(2) the equipment specification and ammendments thereto

(3) the system specification

(4) the reliability test specification, with mention of:

(a) the Test Level

(b) the Test Plan (or Figure)

(c) the Procedure (for MIL-R-23094 only)

Initiation of test

12. Does the procedure state what tests must be completed prior to initiation of the reliability test?

13. Does the procedure either provide for a thermal survey or state that one has been conducted? If previously done, has the data been submitted for approval?

14. Does the procedure allow for an initial period of "burn in" or "de-bugging"?

15. Is the test equipment known to be capable of performing its intended function? (This includes temperature chamber, vibration equipment, vibration/ Scorsby equipment, recording apparatus, any special test equipment.)

Definition of Failure

16. Does the procedure fully define what constitutes a failure? [Should include definitions of system/equipment failure, part failure, primary and secondary failures, pattern failures, and "minor" failures; and should define relevant vs nonrelevant failures.]

17. Does the procedure state that no repair action is to be taken unless a failure can be demonstrated to exist? Is provision made for the verification of a suspected failure?

18. Is any provision made for the verification of the completness of a repair?

19. Is it stated that all failed parts will receive a complete analysis?

20. Is it clearly stated that ALL failures will be recorded and reported?

Test Samples

21. Does the procedure describe how the test samples will be selected?

22. How many equipments will be used on the test? Is there a range of sample sizes which is permissible?

Test Level and Duty Cycle

23. Have the periods of heating and cooling been fully detailed?

24. Has the vibration level, duration, and periodicy been fully described?

25. Have the "on" and "off" periods been defined?

26. Are any variations in the supply voltage required?

Performance/Operational Tests/Checks

27. Has the procedure provided for operational checks and performance tests as required? Are these to be made during stabilization at high temperature?

28. Are the performance tests sufficient to demonstrate satistactory performance?

29. Are the tolerances clearly indicated? Are they in accordance with the equipment specification? Is any degration allowed?

Length of Test

30. Does the procedure clearly state how the determination will be made to terminate the test? Does it state that only equipment "on" time will be counted toward the calculation of equipment MTBF?

31. Is there a description of the action to be taken when an accept decision is reached? a reject decision?

Accept/Reject Criteria

32. Does the procedure state the Test Plan (or Figure) from which the accept/reject criteria is drawn?

33. Is there a table delineating the accept/reject criteria? Is it given in hours, rather than multiples of MTBF? (A chart may be included if desired, but is neither sufficient nor necessary.)

Preventive Maintenance

34. Does the procedure delineate all necessary scheduled maintenance?

35. Does the procedure prohibit unscheduled maintenance?

Logs

36. Are the test logs generally in accordance with the specified requirements?

Reports

37. Does the procedure mention the reporting requirements?

38. Will the initial report include a failure rate prediction and description of the contractors organization?

39. Will the monthly reports be summaries - - not merely point reports, and include a log of all adjustments as well as a report and failure analysis of ALL failures?

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
304B-CFR:sh
13070

MEMORANDUM

From: 304B (C. Rice)
To: 304B (R. Saum)

Subj: Planned Activities for Jan 1975

1. Ken Smith

a. DRQ-4 (American Nucleonies) - Production Reliability Testing is scheduled to begin January 20. A visit to contractor's facilities is planned in order to witness the testing.

b. DSU-4A/A - Testing was initiated and then suspended due to failures. It is planned to review the corrective action to see if it remedies the situation. Plan to witness restart of R testing.

c. DKT-30 - Plan to continue to monitor the progress of the reliability test schedule.

d. ARR-75-(AEL) - Plan to follow-up on failures that have occurred during Production Reliability Testing. A plant visit may be necessary to resolve these failures.

e. DRQ-4 - (Reaction Instrument) - Plan to keep in close touch with the contractor to monitor progress on the contract.

f. ARR-75 (Edmac) - Plan to monitor progress on the reliability test schedule.

2. Tom Shaw

a. ALQ-126 - Review and comment on 29 failure reclassification requests.

b. AQS-13B - Visit contractor's facility to review corrective actions on previous failures and discuss recent reclassification request.

c. ASW-27B - Attend FRB at contractor's facility to review final report.

d. ARN-84 - Visit contractor's facility to receive update on production contract and review last 3 montsh reliability reports.

e. BIT - Review available system specs and initiate quarterly report. Initiate study on specification verification method.

f. AAU 32/AAU/31 - Review failure and reliability data.

3. Deon Hersberger

a. A24G-39 - Expect monthly report.

b. AAU-24/A - Follow-up on corrective action implementation for pattern failure problems.

c. AQA-7(V) - Prepare comments on contractor's M & SE report #3. Discuss with contractor techniques used in preparation of the final Reliability Prediction Analysis Report. Expect Reliability Acceptance Test and TAAF Test Procedures. Attend contractor's monthly program review.

d. ARC-159 - Expect month test report.

e. ARC-159(V) - Expect reclassification requests for 2 RST failures and one R demo test failure.

f. ASA-76 - Expect monthly report.

g. DLQ-3 - Expect Reliability and Life Test Report.

h. ARC-175(V) - Evaluate Reliability Potential and Report to JASC.

4. Claude Rice

a. ASW-25 - Contact contractor regarding status of monthly reliability reports.

b. APN202/R1623 - Keep in touch with contractor and JCASC as to the progress of testing on these equipments.

c. ID 1431/A - No action required.

C. F. RICE

NAVAIRSYSCOM PROJECTS

WU Number	Equipment	Contract N00019-	Contractor
C112.40	QPL Audio Components	Various	Various
83	BIT Indicator Spec.		
89	ASA 76	71-C-0507	Magnavox
99	DRQ 4	72-C-634	ANC
109	ALQ 126	72-C-0046	Sanders
109	ALQ 126	72-C-0566	Sanders
118 146	AAU/24/A	72-C-0456 72-C-0066	Leigh
122	ARN 84	74-C-0191	Hoffman
124	DLQ 3	73-C-0067	Rodele
132	A/A24G39	73-C-0309	GE
133	R-1623	73-C-0411	Motorola
134	Spec. Review & Preparation		
139	AQS 13B	73-C-0380	Bendix
140	DKT 30	74-C-0106	Microcom
144	SQR Iamps Processor	73-C-0488	DRSI
150	DSU 4A/A	73-C-0475	Sperry
151	APN 202	73-C-0526	Motorola
153	PGSE-ASW27B	71-C-0371	Harris
158	ARR 75	74-C-0135	AEL
159	Counting Group Accelerometer	74-C-0389	Systron Donner
160	DRQ 4	74-C-0193	Reaction
161	ID 1791A	74-C-0253	Jet
162	ASW 25	73-C-0194	Harris
166	ID 1481A/A	73-C-0554	Jet

NAVAIRSYSCOM PROJECTS (Cont'd.)

WU Number	Equipment	Contract N00019-	Contractor
168	ARC 159	74-C-0407	Collins
169	ASW 27	73-C-0386	Litton
171	AQA 171	74-C-0380	Magnavox
172	AAU-32A	74-CC-0541	Kollsman
173	A/A24G 39	74-C-0417	GE
174	ARR 72	74-C-0538	Edmac
175	ARR 75	74-C-0539	Edmac
179	AAU 31A	74-C-0212	Kollsman
181	ASW 27	75-C-0103	Harris

PRODUCTION RELIABILITY SURVEILLANCE PLANT INSPECTION GUIDE

I. Pre-Inspection:

A. Prepare the travel requests at least 10 days in advance of scheduled departure.

B. Be certain to co-ordinate the trip with the local DCAS Representative and the Contractor.

C. Review the test procedure and make notes of any pecularities.

D. Review the project folder and any other literature which might provide insight to the contractor or this particular contract.

II. Plant Inspection:

A. Review with DCAS Representative the purpose of your visit, of the Production Reliability Surveillance AIRTASK, and the Test Procedures. Offer your assistance in supervising the tests, and interpreting the Reliability Test Procedures and test data.

1. What type of monitoring does DCAS perform?

2. Do they witness failure analysis and observe the implementation of corrective action?

3. Do they check for non-standard parts approval?

4. How often is the test equipment calibrated? Is the calibration program traceable to the National Bureau of Standards?

5. Are the record keeping methods adequate?

6. Are test procedures strictly adhered to?

7. Does the DCAS office approach there work objectively and in an impartial manner or do they seem to be influenced by the company?

B. Generally, review the Reliability Test Procedures with DCAS and the contractor's representatives. The Reliability Procedures check-list should be used as a guide during this discussion.

C. Inspect the contractor's test set-up and operation:

1. Temperature chamber. (High and Low Temperature limiting devices).

2. Method of temperature cycling.

3. Vibration equipment. (Monitoring and overtravel control).

4. Vibration cycle.

5. Method of operating the equipment during duty cycle. (Transient control).

6. Method of performing operational checks.

a. Compare this with the schematic or block diagram in the test procedures.

b. Check it for technical accuracy.

7. Make sure that the contractor is properly measuring those performance characteristics required in the test procedures.

8. Check the method of failure documentation and the failure data they intend to put into the reports.

D. Inspect the contractor's documentation.

1. Review the laboratory notebook.

2. Review the method and procedure of preparing and circulating failure reports.

3. Review failure reports that have already been prepared to be assured that they are prepared correctly and processed properly.

4. Discuss the problems the contractor and the DCAS Representative might have in classifying failures.

E. Obtain names and telephone numbers of persons visited.

III. Post Inspection:

A. After returning from the trip prepare a trip report. Be sure that all of the items discussed in the meetings with DCAS and contractor personnel are included in the trip report.

B. Be sure to follow-up on any verbal agreements or other commitments made during your trip. Follow-up is important: Be sure that you re-establish contact with the DCAS Representative and the company representatives, especially if there were reports or other information that were to be supplied to you after the trip. Make plans also for a revisit if necessary.

CHECKLIST

Reliability Test Procedures (For use with MIL-R-23094A and MIL-STD-781)

General

	23094	781B	MIL-	18303
1. Are separate test procedures provided for the Qualification (Pre-delivery) and Sampling (during delivery) tests?	--	--		3.11
2. Has a careful review been made of the applicable documents, including:	N/A	N/A		N/A
a. the contract, modifications and changes				
b. the equipment specification				
c. the system specification				
d. the reliability specification				
e. the specification for format of test procedures				

Format

3. Is the specification properly titled?	--	--		3.2.1
4. Does the title page include:	--	--		3.3
a. the title of the test				
b. equipment name and nomenclature				
c. contract number and date				

	23094	781B	18303
d. manufacturer's name			
e. the date of the test procedures			
f. any appropriate revision information			
5. Is a test equipment list provided?	4.3	5.1.3	3.11
6. Are diagrams of the test setup furnished?	--	--	3.11
7. Have schematics of any special test equipment been included?	--	--	3.11
8. Are the figures and tables numbered in sequence and referred to in the text?	--	--	--
9. Have samples of the data sheets, test logs, failure analysis reports etc. been included?	4.3	5.1.3	3.11
10. Are the test procedures complete and self sufficient?	--	--	3.1
Introduction			
11. Does the first portion of the procedure list:	--	--	3.11
a. the specified MTBF Θ_o			
b. the documents which describe the test requirements, including, as applicable:			
(1) the contract, and pertinent changes or amendments or waivers			
(2) the equipment specification and ammendments thereto			
(3) the system specification			
(4) the reliability test specification, with mention of:			
(a) the Test Level			
(b) the Test Plan (or Figure)			

(c) the Procedure (for MIL-R-23094 only)	23094	781B	18 3
c. a description of the equipment and list of all components (R/T unit, control unit, etc.) to be tested			
Initiation of test			
12. Does the procedure state what tests must be completed prior to initiation of the reliability test?	3.2.2	5.1.2	--
13. Does the procedure either provide for a thermal survey or state that one has been conducted? If previously done, has the data been included with the test procedures or submitted for approval?	3.5	5.1.5	3.11
14. Does the procedure allow for an initial period of "burn-in" or "de-bugging"?	3.4	5.1.7	3.11
15. Is the test equipment known to be capable of performing its intended function? (This includes temperature chamber, vibration equipment, vibration/Scorsby equipment, recording apparatus, any special test equipment.)	3.1.1	5.3	3.11
Definition of Failure			
16. Does the procedure fully define what consitutes a failure? Should include definitions of system/ equipment failure, part failure, primary and secondary failures, pattern failures, and "minor" failures; and should define relevant vs nonrelevant failures.	3.12-3.14	5.5.1	3.11
17. Does the procedure state that no repair action is to be taken unless a failure can be demonstrated to exist? Is provision made for the verification of a suspected failure?	3.13	5.5.2-3	3.11
18. Is any provision made for the verification of the completeness of a repair?	3.16.3	5.6	3.11
19. Is it stated that all failed parts will receive a complete analysis?	3.15	5.6	3.11

	23094	781B	18 3
20. Is it clearly stated that ALL failures will be recorded and reported?	3.12	5.11.2.1	3.11
Test Samples			
21. Does the procedure describe how the test samples will be selected?	3.2.2	5.4.1	3.11
22. How many equipments will be used on the test? Is there a range of sample sizes which is permissible?	3.2.3	5.4.1 & 4.2.3.1	3.11
Test Level and Duty Cycle			
23. Have the periods of heating and cooling been fully detailed?	3.6	5.2.3	3.11
24. Has the vibration level, duration, and periodicy been fully described?	Table I	5.3.2	3.11
25. Have the "on" and "off" periods been defined?	3.7	5.2.1	3.11
26. Are any variations in the supply voltagle required?	Table I	5.2.4	3.11
Performance/Operational Tests/Checks			
27. Has the procedure provided for operational checks and performance tests as required? Are these to be made during stabilization at high temperature?	4.3.6	5.4.6	3.11
28. Are the performance tests sufficient to demonstrate satisfactory performance?	3.8	4.2.2.2	3.11
29. Are the tolerances clearly indicated? Are they in accordance with the equipment specification? Is any degradation allowed?	4.3	5.1.3	3.11
Length of Test			
30. Does the procedure clearly state how the determination will be made to terminate the test? Does it state that only equipment "on" time will be counted toward the calculation of equipment MTBF?	3.3	4.2.2.4	3.11

	23094	781B	18 3
31. Is there a description of the action to be taken when an accept decision is reached? a reject decision?	3.19	5.4.8	3.11
Accept/Reject Criteria			
32. Does the procedure state the Test Plan (or Figure) from which the accept/reject criteria is drawn?	4.2.2.1	3.19	3.11
33. Is there a table delineating the accept/reject criteria? Is it given in hours, rather than multiples of MTBF? (A chart may be included if desired, but is neither sufficient nor necessary.)	--	--	3.11
Preventive Maintenance			
34. Does the procedure delineate all necessary scheduled maintenance?	3.9	5.8	3.11
35. Does the procedure prohibit unscheduled maintenance?	3.9	5.8	3.11
Logs			
36. Are the test logs generally in accordance with the specified requirements?	4.3	5.1.3	3.11
Reports			
37. Does the procedure mention the reporting requirements?	3.17	5.11	3.11
38. Will the initial report include a failure rate prediction and description of the contractors organization?	3.17.1	5.11.1	3.11
39. Will the monthly reports be summaries - - not merely point reports, and include a log of all adjustments as well as a report and failure analysis of ALL failures?	3.17.1	5.11.1	3.11

I. ELECTRONIC PARTS

A. Resistors
- *1. Fixed
  - a. Film
    - Carbon
    - Ceramic
    - Carbon Ceramic
    - Coaxial
    - Metal
    - Metal Oxide
  - b. Conductive Plastic
  - c. Fluidic
  - d. Ribbon
  - e. Wirewound
- *2. Thermistors
- *3. Varistors

B. Capacitors
- *1. Fixed
  - a. Gas and Air Dielectric
  - b. Ceramic
  - c. Fluidic
  - d. Glass Dielectric
  - e. Lacquer Dielectric
  - f. Semiconductor
  - g. Mica Dielectric
  - h. Mica-Paper Dielectric
  - i. Paper Dielectric
  - j. Paper-Plastic Dielectric
  - k. Plastic Dielectric
  - l. Quartz Dielectric
  - m. Tanalum
    - Fluid Electrolyte
    - Foil
    - Solid Electrolyte
- *2. Variable

C. Inductors
- *1. Fixed
  - a. AF, IF, and RF
  - b. Filters
  - c. Other
- *2. Variable
- *3. Transformers
  - a. Impedance Matching
  - b. Power Distribution
  - c. Isolation
  - d. Pulse
  - e. Variable

*D. Filters
1. Bandpass
2. Broadband
3. Highpass
4. Lowpass
5. Noise and Interference

E. Diodes
- *1. LVA Type
- *2. Zener
- *3. Voltage Reference
- *4. Varactor Type
- *5. Rectifier, Small Signal, Switching
- *6. Tunnel

F. Transistors
1. Unijunction
2. FET
3. Small Signal Chopper
4. High Power

G. I. C's.
- *1. Linear
  - a. OP Amps
  - b. Voltage Followers
  - c. Voltage Regulators
  - d. Voltage Comparitars
  - e. Receivers
  - f. Drivers
- *2. Digital
  - a. Gates
  - b. Flip Flops
  - c. Memories
  - d. Latches
  - e. Adders
  - f. Shift Registers
  - g. Decoders/Drivers
  - h. Counters
- *3. Converters

*H. Piezoelectric Crystals
1. Frequency Determining
2. Filters

I. Electronic Tubes
- *1. Receiving
- *2. Transmitting
- *3. Tuning Indicators
- *4. Rectifiers
- *5. Thyratrons
- *6. Regulator and Control

*J. Connectors and Adaptors
1. Coaxial Connectors
   - a. Flexible
     - BN Series
     - BNC Series
     - C Series
     - HN Series
     - LC Series
     - LN Series
     - LT Series
     - MHV Series
     - N Series
     - SC Series
     - SM Series
     - TNC Series
     - TPS Series
     - UHF Series
     - Multiple
     - Triaxial
     - Twinaxial
   - b. Rigid/Semi-Rigid
2. AC Power
   - a. Pin and Socket
   - b. Switch Interlocked
   - c. Spring Contact

* Separate Data Sheet

3. Audio
    a. Jacks
    b. Plugs
    c. Pin and Socket
4. Printed Circuit
5. Misc. Connectors
    a. Banana Plugs
    b. Alligator Clips
6. Adaptors
    a. Alligator Clip/Banana Plug
    b. Binding Post/Coaxial
    c. Banana Plug/Binding Post
    d. Waveguide/Coaxial
    e. Connector/Test Clips
    f. Tube Socket Conversion
    g. Other

II. ELECTROTHERMAL AND ELECTROCHEMICAL DEVICES

- *A. Fuses
- *B. Thermocouple
- *C. Batteries
  1. Dry Cell
     a. Carbon-Zinc
     b. Manganese-Zinc
     c. Mercury-Zinc
     d. Silver Chloride
  2. Cadmium-Mercury Oxide
  3. Lead
     a. Acid
     b. Lead Dioxide
  4. Water Activated
     a. Cuprous Chloride-Magnesium
     b. Magnesium-Magnesium Perchlorate
     c. Silver Chloride-Magnesium
  5. Mercury-Cadmium
  6. Nickel
     a. Iron
     b. Zinc
     c. Cadmium
  7. Nuclear
  8. Silver-Zinc
  9. Solar
  10. Zinc-Copper Oxide

* Separate Data Sheet

III. ELECTROMAGNETIC AND ELECTRONUCLEAR DEVICES

- A. Microwave Devices
  - 1. Diodes
  - 2. Klystron
    - a. Amplifier
    - b. Reflex Oscillator
  - 3. Magnetron
  - 4. Traveling Wave Tubes
  - 5. Backward Wave Oscillator
  - 6. Switches
- B. Electromagnetic Devices
  - 1. Receiving and Transmitting Tubes
  - 2. Antennas
- C. Electronuclear Devices
  - 1. Alpha Counters
  - 2. Beta Counters

IV. ELECTRO-OPTIC AND DISPLAY DEVICES

- A. Photo Sensitive Devices
  - 1. Photodiodes
    - a. Tubes
    - b. Semiconductors
  - 2. Photocells
  - 3. Phototransistors
  - 4. T. V. Pick-up Tubes
- B. Light-Emitting Devices
  - 1. Monochromatic
    - a. L.E.D.'s
    - b. L.E.T.'s
    - c. Laser Tubes
  - 2. Flash Tubes
  - 3. Black Light
  - 4. Incandescent
  - 5. Fluorescent
- C. Display Devices
  - 1. C.R.T.'s
  - 2. Liquid Crystal
  - 3. Nixie Tubes
- D. Hybrid
  - 1. Photo-Isolation Devices

V. ELECTROMECHANICAL DEVICES

GENERAL

DISTRIBUTION OF $\frac{1}{X}$

THEOROM: IF STATISTIC X HAS PROBABILITY DENSITY FUNCTION $f_X(x)$, THEN $\frac{1}{X}$ HAS A P.D.F OF $\frac{1}{Y^2} f_X(\frac{1}{Y})$ IF $X > 0$.

PROOF: GIVEN $X \geq 0 \sim f_X(x)$

$$P[x_e \leq X \leq x_u] = \int_{x_e}^{x_u} f_X(x)\,dx \quad ; x_e, x_u > 0$$

$$= P\left[\frac{1}{x_u} \leq \frac{1}{X} \leq \frac{1}{x_e}\right]$$

LET $x = \frac{1}{Y} \Rightarrow dx = -\frac{1}{Y^2}\,dY$

$$P\left[\frac{1}{x_u} \leq \frac{1}{X} \leq \frac{1}{x_e}\right] = -\int_{\frac{1}{x_e}}^{\frac{1}{x_u}} \frac{f_X(\frac{1}{Y})}{Y^2}\,dY$$

LET $Y_u = \frac{1}{x_e}$; $Y_e = \frac{1}{x_u}$

$$\Rightarrow P\left[Y_e \leq \frac{1}{X} \leq Y_u\right] = \int_{Y_e}^{Y_u} \frac{f_X(\frac{1}{Y})}{Y^2}\,dY$$

$$\therefore f_{\frac{1}{X}}(Y) = \frac{1}{Y^2} f_X(\tfrac{1}{Y}) \quad ; X, Y > 0$$

QED

REMARK: $f_{\frac{1}{X}}(Y)$ IS A GOOD P.D.F. :

$$\int_0^\infty f_{\frac{1}{X}}(Y)\,dY = 1$$

PROOF:

LET $X = \frac{1}{Y} \Rightarrow dY = -\frac{1}{X^2}$

$X = 0 \Rightarrow Y = \infty$, $X = \infty \Rightarrow Y = 0$

$$\int_0^\infty f_{\frac{1}{X}}(Y)\,dY = \int_0^\infty \frac{1}{Y^2} f_X\left(\frac{1}{Y}\right) dY$$

$$= +\int_\infty^0 X^2 f_X(x) \left(\frac{-dx}{x^2}\right)$$

$$= \int_0^\infty f_X(x)\,dx$$

$$= 1$$

EX: UNIFORM DISTRIBUTION:

$$f_X(x) = \frac{1}{a}\mu(x)\mu(a-x)$$

WHERE

$$\mu(x) = \begin{cases} 1; & x \geq 0 \\ 0; & x \leq 0 \end{cases}$$

THEN

$$f_X\left(\frac{1}{Y}\right) = \frac{1}{a}\mu\left(\frac{1}{Y}\right)\mu\left(a - \frac{1}{Y}\right)$$

BUT

$$\mu\left(\frac{1}{Y}\right) = \mu(Y)$$

$$\mu\left(a - \frac{1}{Y}\right) = \mu(-Y)\,\mu\left(Y - \frac{1}{a}\right)$$

THUS

$$f_X\left(\frac{1}{Y}\right) = \frac{1}{a}\mu\left(Y - \frac{1}{a}\right)$$

AND

$$f_{\frac{1}{X}}(Y) = \frac{1}{a}Y^2\,\mu\left(Y - \frac{1}{a}\right)$$

NOTE:

$$\int_{-\infty}^{\infty} f_{\frac{1}{X}}(Y)\,dY = \int_{\frac{1}{a}}^{\infty} \frac{dY}{aY^2} = 1$$

COMPUTING $\chi^2_{\alpha;\nu}$ FOR LARGE $\nu \geq 31$

FROM THE CENTAL LIMIT THEOROM, A χ^2_ν RANDOM VARIABLE APPROACHES A NORMAL DISTRIBUTION AS $\nu \to \infty$ [1]. χ^2_ν PROBABILITY DENSITY FUNCTION (PDF) PARAMETERS ARE

$$\sigma^2 = 2\nu \qquad (1)$$
$$\mu = \nu$$

THE P.D.F. FOR A NORMAL RANDOM VARIABLE IS

$$f_z(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \qquad (2)$$

THUS, THE PDF FOR χ^2_ν FOR LARGE ν IS

$$f_{\chi^2_\nu}(x) \simeq \frac{1}{\sqrt{4\pi\nu}} e^{-\frac{(x-\nu)^2}{4\nu}} \qquad (3)$$

[1] LARSON, "INTRO TO PROB. AND STATISTICAL INFERENCE", JOHN WILEY & SONS INC. NEW YORK, 1969, Pg 213.

BY DEFINITION:

$$\alpha = \int_{\chi^2_{\alpha;\nu}}^{\infty} f_{\chi^2}(x)\,dx \qquad (4)$$

THUS, FOR LARGE ν

$$\alpha \simeq \int_{\chi^2_{\nu,\alpha}}^{\infty} \frac{1}{\sqrt{4\pi\nu}}\, e^{-\frac{(x-\nu)^2}{4\nu}}\, dx \qquad (5)$$

MAKING THE VARIABLE SUBSTITUTION

$$z = \frac{(x-\nu)}{\sqrt{2\nu}}$$

GIVES

$$\alpha = \int_{\frac{\chi^2_{\nu;\alpha}-\nu}{\sqrt{2\nu}}}^{\infty} \frac{1}{\sqrt{2\pi}}\, e^{-\frac{z^2}{2}}\, dz \qquad (6)$$

WE KNOW THAT

$$\alpha = \int_{z_\alpha}^{\infty} \frac{1}{\sqrt{2\pi}}\, e^{-z^2/2}\, dz \qquad (7)$$

COMPARING Eqs. 6 & 7 GIVES

$$Z_\alpha = \frac{\chi^2_{\nu;\alpha} - \nu}{\sqrt{2\nu}} \qquad (8)$$

OR EQUIVALENTLY

$$\chi^2_{\nu;\alpha} = \sqrt{2\nu}\, Z_\alpha + \nu \qquad (9)$$

Eq. 9 CAN BE CONSIDERED AS THE VALUE OF $\chi^2_{\nu;\alpha}$ FOR LARGE VALUES OF ν ($\nu > 30$).

CONFIDENCE FOR $r \geq 14$

A TOTAL OF r FAILURES OCCURED IN A TIME TERMINATED TEST OF DURATION T. THE MTBF POINT ESTIMATE IS

$$\hat{\theta} = T/r \tag{1}$$

FROM STATISTICS,

$$P\left[\theta \geq \frac{2r\hat{\theta}}{\chi^2_{\alpha;2r+2}}\right] = 1-\alpha \tag{2}$$

OR EQVIVALENTLY,

$$P\left[\theta \geq \frac{2T}{\chi^2_{\alpha;2r+2}}\right] = 1-\alpha \tag{3}$$

THE LOWER POINT OF CONFIDENCE, θ_ℓ, IS THUS

$$\theta_\ell = \frac{2T}{\chi^2_{\alpha;2r+2}} \tag{4}$$

FOR LARGE VALUES OF r (>30)

$$\chi^2_{r;\alpha} = \sqrt{2r}\, z_\alpha + r \qquad (5)$$

SINCE

$$\nu = 2r + 2 \qquad (6)$$

EQ 4 BECOMES

$$\theta_\ell = \frac{T}{\sqrt{r+1}\, z_\alpha + (r+1)} \qquad (7)$$

THUS, FOR LARGE VALUES OF r (>15), ONE IS $1-\alpha$ CONFIDENT THAT THE TRUE MTBF IS GREATER THAN θ_ℓ. THAT IS

$$P\left[\theta \geq \theta_\ell = \frac{T}{\sqrt{r+1}\, z_\alpha + r + 1}\right] = 1-\alpha \qquad (8)$$

θ CONFIDENCE STATEMENTS

1. CONFIDENCE INTERVAL

$$P\left[\theta_L = \frac{2r\hat{\theta}}{\chi^2_{\frac{\alpha}{2};\nu}} \leq \theta \leq \frac{2r\hat{\theta}}{\chi^2_{1-\frac{\alpha}{2};\nu}} = \theta_U\right] = 1-\alpha$$

2. LOWER BOUND

$$P\left[\theta \geq \frac{2r\hat{\theta}}{\chi^2_{\alpha;\nu}} = \theta_L\right] = 1-\alpha$$

3. UPPER BOUND

$$P\left[\theta \leq \frac{2r\hat{\theta}}{\chi^2_{1-\alpha;\nu}} = \theta_U\right] = 1-\alpha$$

FOR TIME-TERMINATED TEST $\nu = 2r+2$

FOR FAILURE-TERMINATED TEST $\nu = 2r$

$$\hat{\theta} = \frac{\text{TOTAL TEST TIME}}{\text{TOTAL FAILURES}} = \frac{T}{r}$$

PROPOSED INVESTIGATIVE AVENUES FOR IMPROVEMENT AND EVALUATION OF AVIONICS BUILT-IN TEST SYSTEM EFFECTIVENESS

A sole effort has been extended toward quantifying avionic effectiveness with the inclusion of BIT. Although incomplete the ARINC report offers a sound basis for such a measure based on previous models. This paper briefly reviews the ARINC report and suggests some possible areas of evaluation and refinement in need of examination.

I. THE ARINC MODEL

ARINC Research Corporation (1) has provided a foundation for evaluating system effectiveness for avionics embellished with built-in test. Their model is an expanded version of that proposed by the WSEIAC effort (2) and (3), which defined system effectiveness as the "measure of the extent to which a system may be expected to achieve a set of specific mission requirements".

The elements of system effectiveness are:

1. Availability: A measure of the system at the start of a mission
2. Dependability: A measure of the system condition during the mission
3. Capability: A measure of the system's ability to achieve mission objectives given the system condition at time of mission execution.

A basic overview of these elements are offered in Fig. 1:

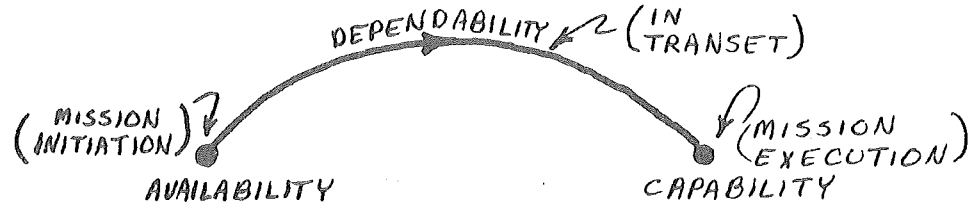


Fig. 1: Overview of the Elements of System Effectiveness

In order to quantify the effectiveness measure, availability, dependability, capability and system effectiveness are expressed probabilistically. If there are n possible mutually exclusive states of the system in question and there are m objectives, the system effectiveness relationship is

$$[E] = [A][D][C] \tag{1}$$

where

$$[E] = [E_1, \ldots, E_j, \ldots, E_m] \tag{2}$$

Ej = System Effectiveness for j^{TH} Objective (Probability of Mission Success)

and

$$[A] = [A_1 \cdots A_i \cdots A_n] \tag{3}$$

Ai = Probability the system is in state i at the start of the mission

and

$$[D] = \begin{bmatrix} D_{11} \cdots D_{1k} \cdots D_{nk} \\ \vdots \\ D_{i1} \cdots D_{ik} \cdots D_{in} \\ \vdots \\ D_{n1} \cdots D_{nk} \cdots D_{nn} \end{bmatrix} \tag{4}$$

D_{ik} = Probability the system will change from state i to state k during the mission.

and

$$[C] = \begin{bmatrix} C_{11} \cdots C_{1p} \cdots C_{1m} \\ \vdots \\ C_{K1} \cdots C_{Kp} \cdots C_{Km} \\ \vdots \\ C_{n1} \cdots C_{np} \cdots C_{nm} \end{bmatrix} \qquad (5)$$

C_{kp} = Probability of achieving objective p given the system is in state k.

The above relationship views system effectiveness as the probability of meeting mission objectives. Factors include how the equipment functions at the time of mission initiation (availability), how the equipment operates in transient to the mission sight (dependability), and how the equipment will operate in various states at the time of mission execution (capability).

Addition of Built-in-Test (BIT) equipment to the avionics effects system effectiveness in three basic ways:

1. BIT will indicate (to a degree) the system state
2. The operator will be forced to make a decision as to the validity of the BIT indication.
3. The types and number of states will be changed.

These changes effect the availability and dependability measures of the avionics (and also the capability in the sense the number and types of states are changed). ARINC (1) incorporates these concerns by expanding the effectiveness equation by expanding the three element matrices of the system effectiveness measure.

The i^{TH} element in the "new" availability matrix, $\hat{A}_i$, is given by

$$\hat{A}_i = A_i \sum_{j=1}^{n} I_{ji} L_{ji} \qquad (6)$$

where

Ai is defined in Eq. 3

Iji is the probability BIT indicates the system is in state j when actually it is in state i.

Lji is the probability of initiating the mission when BIT shows the system is in state j when actually the system is in state i.

We may write Eq. 6 in matrix form as

$$[\hat{A}] = [A][1][IL]^T \tag{7}$$

where

(A) is defined in Eq. 3

(1) is an NXN matrix of "1's"

$(IL)^T$ is the transpose of the NXN matrix (IL), the ji^{TH} element of which is $I_{ji}\, L_{ji}$.

Note that I and L respectively represent the monitoring and decision making BIT characteristics which effect system availability.

As with availability, the dependability matrix must be altered with the inclusion of BIT. The ik^{TH} element of the "new" dependability matrix, $\hat{D}_{ik}$, is written:

$$\hat{D}_{ik} = D_{ik} \sum_{q=1}^{n} J_{qk}\, G_{qk} \tag{8}$$

where

D_{ik} is defined in Eq. 4

J_{qk} is the probability that BIT indicates state q during the mission when the true state is k

G_{qk} is the probability of a mission completion decision when BIT indicates the system is in state q when actually the system is in state k.

In matrix form Eq. 8 becomes

$$[\hat{D}] = [O]\left[[[1]_R[J\,G]]^T[1]_c\right]^T \tag{9}$$

where

(D) is defined in Eq. 4

(JG) is an NXN matrix the qk^{TH} element of which is $J_{qk}G_{qk}$

$(1)_R$ is an n element row vector of "1's"

$(1)_C$ is an n element column vector of "1's"

Again the monitoring characteristics of BIT are reflected in J and the decision characteristics in G.

As previously mentioned, inclusion of BIT into avionics does not effect the form or definition of the capability matrix as given in Eq. 5. The meaning of the matrix however, is changed in that BIT will alter the number and type of system states. This change also effects the meaning of the previously defined availability and dependability matrices in the same manner.

With inclusion of BIT the system effectiveness equation becomes

$$[E] = [\hat{A}][\hat{D}][\hat{C}] \tag{10}$$

This is the basic model proposed by ARINC for measuring the system effectiveness of avionics with built-in-test equipment.

II. POSSIBLE AREAS OF REFINEMENT AND EXPANSION OF THE ARINC MODEL

The ARINC BIT system effectiveness scheme provides an intuitively sound model for measuring system effectiveness. As with any model, the dexterity and exactness of the ARINC method can only be validified by statistical verification. To follow are suggested areas in which the BIT system effectiveness model might possibly be matured.

A. Confidence in Effectiveness

Any computed measure is only as good as its component elements. Many of the elements comprising the BIT system effectiveness relationship are difficult to quantize. System reliability, inherent in the availability and dependability elements of system effectiveness, is perhaps the most sophisticated measure in the effectiveness equation. Maintainability, inherent also in availability and dependability follows. The capability concept, however, has not been developed to the extent that it can be quantified by standard techniques*. Likewise, the human factor of decision introduced by the inclusion of BIT is also difficult to quantize. With such low confidence in these measures, how good can the resulting point estimate of system effectiveness be considered? One possible answer lies in the employment of confidence intervals (4) (5).

Consider again the system effectiveness equation given in Eq. 10 and their corresponding relationships in Eqs. 7, 9 and 5. We assume each of these elements can be assigned an arbitrary confidence interval. Specifically, if b is a statistical matrix element, and $1-\alpha$ is the degree of confidence, we write

$$P[x_\ell < b < x_u] = 1-\alpha \qquad (11)$$

*ARINC REPORT (1), Pg. 4

where X_ℓ and X_u are respectively the lower and upper points of the confidence interval and P() is read,"The probability that . . ." . In other words, Eq. 11 says that we are 100 $(1-\alpha)$% certain that the true value of b lies between X_ℓ and X_u.

Examining the mechanics of the matrix multiplication needed to compute system effectiveness, we find we are solely concerned with addition and multiplication of statistical elements. To assign a confidence interval to the resulting system effectiveness, we must determine how confidence intervals interrelate upon multiplication and addition of statistics.

As an example of such a combination, consider the addition of two statistics X_1 and X_2 sampled respectively from two independent distributions $f_{X1}(x)$ and $f_{X2}(x)$. The distribution of $X_1 + X_2$ is then the convolution of the two density functions. Specifically:

$$f_{X_1+X_2}(x) = f_{X_1}(x) * f_{X_2}(x) = \int_{-\infty}^{\infty} f_{X_1}(Y)\, f_{X_2}(x-Y)\, dY \tag{12}$$

For an example of how such notions might be applied towards confidence interval combination, consider the case where $f_{X1}(x)$ is normally distributed with mean μ_1 and variance σ_1^2 and $f_{X2}(x)$ is normally distributed with mean μ_2 and variance σ_2^2. That is

$$f_{X_1}(x) = N(\mu_1, \sigma_1)$$
$$f_{X_2}(x) = N(\mu_2, \sigma_2) \tag{13}$$

where

$$N(\mu, \sigma) = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} \tag{14}$$

It can be shown *via Eq. 12 that

$$f_{X_1+X_2}(x) = N\left(\mu_1+\mu_2, \sqrt{\sigma_1^2+\sigma_2^2}\right) \tag{15}$$

If both σ_1 and σ_2 are known, a $1 - \alpha$ confidence intervals for μ_1 and μ_2, (the best estimates of the statistics)** are

$$P[X_1 - \sigma_1 z_{\alpha/2} < \mu_1 < X_1 + \sigma_1 z_{\alpha/2}] = 1-\alpha$$
$$P[X_2 - \sigma_2 z_{\alpha/2} < \mu_2 < X_2 + \sigma_2 z_{\alpha/2}] = 1-\alpha \tag{16}$$

where

$$z_\beta = \int_\beta^\infty N(0,1)\,dx$$
$$= \frac{1}{\sqrt{2\pi}} \int_\beta^\infty e^{-\frac{1}{2}x^2}\,dx \tag{17}$$

Similarly a $1 - \alpha$ confidence interval for $\mu_1 + \mu_2$ is

$$P\left[(X_1+X_2) - \sqrt{\sigma_1^2+\sigma_2^2}\, z_{\alpha/2} \le \mu_1+\mu_2 \le (X_1+X_2) + \sqrt{\sigma_1^2+\sigma_2^2}\, z_{\alpha/2}\right] = 1-\alpha \tag{18}$$

* Miller Freund (4) p. [illegible]

The lengths of the confidence intervals given by Eqs. 16 and 18 are then

$$CI_{X_1} = 2\sigma_1 Z_{\alpha/2}$$
$$CI_{X_2} = 2\sigma_2 Z_{\alpha/2} \qquad (19)$$
$$CI_{X_1+X_2} = 2\sqrt{\sigma_1^2 + \sigma_2^2}\, Z_{\alpha/2}$$

The confidence interval for the mean of the sum of the two random variables is thus larger than for the mean of either of its components (See Fig. 2). Thus, for the same degree of confidence, we are less certain about the location of $\mu_1 + \mu_2$ than we are about the location of either μ_1 or μ_2. We have added two somewhat uncertain numbers and have arrived at a more uncertain number. This, unfortunately, is the tradeoff required in the condensation of a number of statistics into a single measure. We lose information. We look at one number instead of at each of many individual numbers, but the single number is more comprehensible.

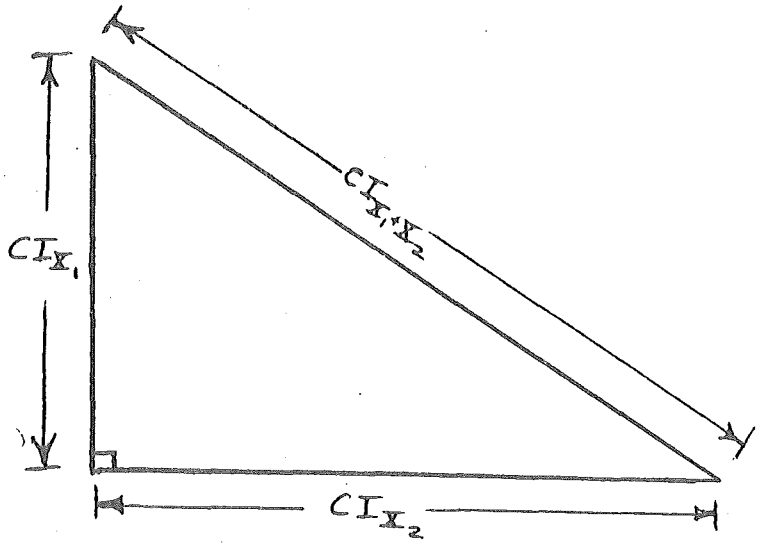


Fig. 2: $1 - \alpha$ confidence intervals, CI, for μ_1, μ_2 as determined respectively by X_1, X_2, and $X_1 + X_2$ sampled from normal populations of known variance, σ_1^2, σ_2^2, and $\sigma_1^2 + \sigma_2^2$.

Such notions can be extended to the non-parametric case. Again consider statistics X_1 and X_2 with estimated even two-sided $(1-\alpha)$ confidence intervals ΔX_1 and ΔX_2. That is:

$$P[\bar{X}_1 - \Delta X_1 \leq \mu_1 \leq \bar{X}_1 + \Delta X_1] = 1-\alpha$$
$$P[\bar{X}_2 - \Delta X_2 \leq \mu_2 \leq \bar{X}_2 + \Delta X_2] = 1-\alpha \qquad (20)$$

To determine $(1-\alpha)$ confidence intervals for operations concerning these statistics we need consider only worst case conditions. Thus, for addition and subtraction:

$$P[(\bar{X}_1 \pm \bar{X}_2) - (\Delta X_1 + \Delta X_2) \leq \mu_1 \pm \mu_2 \leq (\bar{X}_1 \pm \bar{X}_2) + (\Delta X_1 + \Delta X_2)] = 1-\alpha \qquad (21)$$

For division, the worst case conditions for the non-parametric case dictate:

$$P\left[\frac{\bar{X}_1 - \Delta X_1}{\bar{X}_2 + \Delta X_2} \leq \frac{\mu_1}{\mu_2} \leq \frac{\bar{X}_1 + \Delta X_1}{\bar{X}_2 - \Delta X_2}\right] = 1-\alpha \qquad (22)$$

Similarly, for multiplication:

$$P[(\bar{X}_1 - \Delta X_1)(\bar{X}_2 - \Delta X_2) \leq \mu_1 \mu_2 \leq (\bar{X}_1 + \Delta X_1)(\bar{X}_2 + \Delta X_2)] = 1-\alpha \qquad (23)$$

Note that the confidence interval for the addition of statistics in Eq. 21 is

$$CI_{X_1+X_2} = 2(\Delta X_1 + \Delta X_2) \tag{24}$$

For the previous normal test, the confidence intervals added as in the right triangle in Fig. 2. For the non-parametric case, the resulting confidence interval is the sum of the legs, rather than the hypotenuse, and is thus longer. Thus knowledge of the underlying distribution tightens the confidence in the sum in that more information about the statistics are available.

How, then, does all of this apply to system effectiveness? Simply, if it is possible to extend the preceding notions to multiplication and addition of statistics sampled from various populations, a confidence interval may be placed on the computed system effectiveness. Thus, the rather shaky measures of system capabilities and human factors inherent in the BIT effectiveness equation would have their uncertainty reflected in the final effectiveness measure. This is opposed to the point estimate of system effectiveness which reflects none of these uncertainties.

B. On The Measure Of Capability

As previously mentioned, system capability to date has defied effective quantization. A rough proposal follows for capability methodology.

The definition of capability previously presented can be expressed as:

$$C_{KP} = P[O_P / S_K] \tag{25}$$

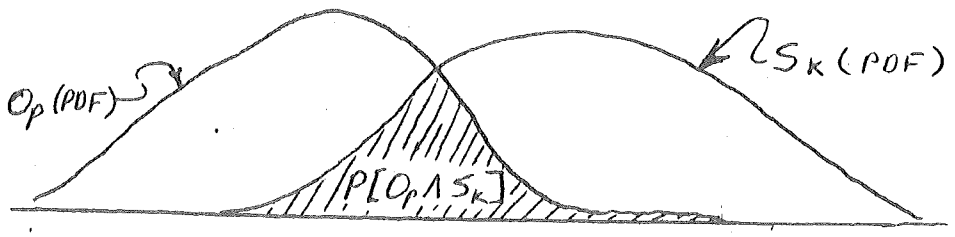
where

C_{kp} is defined in Equation 5
O_p is objective P success
S_k is system state K
"/" is read "given that"

We may view O_p as a distribution. That is, objective p demands a certain strain on the executing system. Likewise, the system has a certain strength distribution in state K. If such strength-strain relationships can be determined for a system, the capability could be determined via established methods (6). We may rewrite Eq. 25 as

$$C_{KP} = \frac{P[O_p \wedge S_K]}{P[S_K]} \tag{26}$$

Where $\wedge$ denotes "and" or intersection. Examination of Fig. 3 exposes $P(O_p \wedge S_k)$ as the intersection of the O_p and S_k distributions:



The quantity $P(S_k)$ is merely the probability that the system will be in state S_k at mission execution time.

Although determining the distribution for O_p and S_k might presently envolve rather subjective measures, the result is better than pure bull-dozer reasoning.

C. Model Verification

As previously mentioned a model can only be validified by statistical verification. As such, a system for reporting effectiveness elements generated in the field is direly needed. Careful attention to the form and recording of such data would be necessary.

D. Conclusions

The body of this paper lists only a few of the areas in which the BIT effectiveness measure is in need of examination and expansion.

A closer examination of the ARINC report coupled with familiarization with the WSEIAC and SEM (System Effectiveness Methodology) efforts would reveal other areas.

Proposed are the effectiveness confidence and capability measure. Development of these ideas would necessitate study of the literature and consultation.

A method for collection of BIT avionics data pertinent to the avionics system effectiveness is the only method by which the ARINC model can be verified. No such data collection system has even been initiated even though the need for one is obvious.

1. Aeronautical Radio Inc. (ARINC) Research Corporation, Final Report, "A Technique for Evaluating Avionics Built-In Test," Publication 974-02-1-1132, September 1971.

2. Weapons System Effectiveness, Industry Advisory Committee (WSEIAC), Final Report of Task Group II, Air Force Systems Command Publication #AFSC-TR-62-2, January 1965.

3. United States Army Management Engineering Training Agency (AMETA), "Elements of Reliability and Maintainability", Rock Island Arsenal, Rock Island, Ill., October 1973, Section VII.

4. Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Prentice Hall, Englewood Cliffs, N. J., 1965 Chapter 7.

5. IBID. 3 Section IV

6. IBID. 3 Section V and Bibliography

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
102 (01)	723	LINEAR	PERCISION VOLTAGE REGULATOR		14 PINS: 1/4"x1/4" FP, 1/4"x1/8" FP, 1/4"x3/8" DIP, 1/4"x3/8" FP; 10 PINS: 1/4"x1/4" FP, 1/4"x1/8" FP	-
107 (01)	LM109		VOLTAGE REGULATOR, (5 VOLT)		3 PINS TO3 TO5	-
103 (01)	710		SINGLE DIFFERENTIAL VOLTAGE COMPARATOR		14 PINS: 1/4"x1/4" FP, 1/4"x3/4" DIP; 10 PINS: 1/4"x1/4" FP; CANS 8 PIN 10 PIN	-
(02)	711		DUAL CHANNEL DIFFERENTIAL VOLTAGE COMPARATOR			-
(03)	LM106		SINGLE VOLTAGE COMPARATOR/ BUFFER			-
(04)	LM111		PRECISION VOLTAGE COMPARATOR/BUFFER			-
104 (01)	55107		DUAL LINE RECEIVER		14 PINS: 1/4"x1/4" FP, 1/4"x1/8" FP, 1/4"x3/4" DIP, 1/4"x3/8" FP; 16 PINS: 1/4"x7/8" DIP, 1/4"x3/8" FP	-
(02)	55108		DUAL LINE RECEIVER (OPEN COLLECTOR OUTPUT)			-
(03)	9614		DUAL DIFFERENTIAL LINE DRIVER (2 STATE OUTPUT)			-
(04)	9615		DUAL DIFFERENTIAL LINE RECEIVER			-
(05)	55113		DUAL DIFFERENTIAL LINE DRIVER (3 STATE OUTPUT WITH HIGH-IMPEDANCE OFF-STATE)			-

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
57 (01)	4006A	CMOS	DUAL 4-STAGE/DUAL 5-STAGE STATIC SHIFT REGISTER			200 mW/IC
(02)	4014A		8-STAGE SYNCHONOUS PARALLEL OR SERIAL INPUT/SERIAL OUTPUT STATIC SHIFT REGISTER			
(03)	4015A		DUAL 4-STAGE SERIAL INPUT/ PARALLEL OUTPUT STATIC SHIFT REGISTER			
(04)	4021A		8 STAGE ASYNCHRONOUS PARALLEL INPUT/SERIAL OUTPUT OR SYNCHRONOUS SERIAL INPUT/SERIAL OUTPUT STATIC SHIFT REGISTER			
(05)	4031A		64-STAGE STATIC SHIFT REGISTER			
201 (01)	MCM 5303	LINEAR	64 WORDS/8 BITS PER WORD PROM WITH OPEN COLLECTOR		24 PINS- 1/2" x 1 1/4" DIP 5/8" x 1/2" FP 1/4" x 3/4" FP	575 mW
(02)	MCM 5304		64 WORDS/8 BITS PER WORD PROM WITH INTERNAL PULLUP RESISTOR			
101 (01)	741		SINGLE OPERATIONAL AMPLIFIER- INTERNALLY COMPENSATED		14 PINS- 1/4" x 1/4" FP 1/4" x 5/8" FP 1/4" x 3/4" DIP 1/4" x 3/4" FP 10 PINS- 1/4" x 1/4" FP CANS- 8 PIN 10 PIN	—
(02)	747		DUAL OPERATIONAL AMPLIFIER- INTERNALLY COMPENSATED			—
(03)	LM101A		SINGLE OPERATIONAL AMPLIFIER- EXTERNALLY COMPENSATED			—
(04)	LM108A		SINGLE OPERATIONAL AMPLIFIER- EXTERNALLY COMPENSATED			—
106 (01)	LM102		VOLTAGE FOLLOWER		14 PINS- 1/4" x 3/4" DIP 10 PINS- 1/4" x 1/4" FP CANS- 8 PIN	—
(02)	LM110		VOLTAGE FOLLOWER (HIGH SPEED)			—

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
53 (01)	4007A	CMOS	DUAL COMPLEMENTARY PAIR PLUS INVERTER		14 PINS: 1/4"x1/4" FP, 1/4"x 3/4" DIP, 1/4"x 3/8" FP; 16 PINS: 1/4"x 7/8" DIP, 1/4" x 3/8" FP	200mWdc
" (02)	4019A		QUAD AND-OR-SELECT GATE			
54 (01)	4008A		FOUR-BIT FULL ADDER		16 PINS: 1/4"x 7/8" DIP, 1/4"x 3/8" FP	
55 (01)	4009A		INVERTING HEX BUFFER			
(02)	4010A		NONINVERTING HEX BUFFER			
(03)	4049A		INVERTING HEX BUFFER			
(04)	4050A		NONINVERTING HEX BUFFER			
56 (01)	4017A		DECADE COUNTER/DIVIDER		14 PINS: 1/4"x 3/4" DIP, 1/4"x 3/8" FP; 16 PINS: 1/4"x 7/8" DIP, 1/4"x 3/8" FP	
(02)	4018A		PRESETTABLE DIVIDE BY "N" COUNTER			
(03)	4020A		14-STAGE RIPPLE-CARRY BINARY COUNTER/DIVIDER			
(04)	4022A		DIVIDE-BY-8 COUNTER/DIVIDER			
(05)	4024A		7-STAGE BINARY COUNTER			

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
(04)	9314	TTL	4-BIT LATCH, MASTER RESET		↓	325 mW
„16 (01)	5408	↓	QUADRUPLE, 2-INPUT POSITIVE AND GATE		14 PINS: $\frac{1}{4}$"x$\frac{1}{4}$" FP $\frac{1}{8}$"x$\frac{1}{4}$" FP $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	50 mWdc PER GATE
(02)	5409		QUADRUPLE, 2-INPUT POSITIVE AND GATE (OPEN COLLECTOR OUTPUT)		↓	↓
50 (01)	4011A	CMOS	QUADRUPLE, 2-INPUT NAND GATE		14 PINS. 1/4"x1/4" FP 1/4"x3/4" DIP 1/4"x3/8" FP	200 mWdc
(02)	4012A	↓	DUAL, 4-INPUT NAND GATE		↓	↓
(03)	4023A		TRIPLE, 3-INPUT NAND GATE		↓	↓
51 (01)	4013A		DUAL D-TYPE EDGE TRIGGERED FLIP-FLOP		14 PINS: $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	↓
(02)	4027A	↓	DUAL J K MASTER-SLAVE FLIP FLOP		16 PINS: $\frac{1}{4}$"x$\frac{7}{8}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	↓
52 (01)	4000A	↓	DUAL 3-INPUT NOR GATE (PLUS INVERTER)		14 PINS: 1/4"x1/4" FP 1/4"x3/4" DIP 1/4"x3/8" FP	↓
(02)	4001A	↓	QUAD 2-INPUT NOR GATE		↓	↓
(03)	4002A	↓	DUAL 4-INPUT NOR GATE		↓	↓
(04)	4025A	↓	TRIPLE 3-INPUT NOR GATE		↓	↓

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
(05)	54162	TTL	SYNCHRONOUS 4-BIT DECADE COUNTER (SYNCHRONOUS CLEAR)			
(04)	54161		SYNCHRONOUS 4-BIT BINARY COUNTER (ASYNCHRONOUS CLEAR)			
(07)	5490		HIGH SPEED DECADE COUNTER			265 mW dc
(08)	54192		SYNCHRONOUS 4-BIT UP/DOWN DECADE COUNTER			490 mW dc
(09)	54193		SYNCHRONOUS 4-BIT UP/DOWN BINARY COUNTER			
14 (01)	54150		SIXTEEN INPUT DATA SELECTOR/ MULTIPLEXER, WITH ENABLE		16 PINS: $\frac{1}{4}$" x $\frac{7}{8}$" DIP; $\frac{1}{4}$" x $\frac{3}{8}$" FP; 24 PINS: $\frac{1}{2}$" x $1\frac{1}{4}$" DIP; $\frac{3}{8}$" x $\frac{1}{2}$" FP	375 mW dc
(02)	9312		EIGHT-INPUT DATA SELECTOR/ MULTIPLEXER, WITH ENABLE			245 mW dc
(03)	54153		DUAL, FOUR-INPUT DATA SELECTOR/ MULTIPLEXER, WITH ENABLE			286 mW dc
(04)	9309		DUAL, FOUR-INPUT DATA SELECTOR/ MULTIPLEXER, WITHOUT ENABLE			245 mW dc
(05)	9322		QUAD, TWO INPUT DATA SELECTOR/ MULTIPLEXER, WITH ENABLE			275 mW dc
15 (01)	5475		4 BIT LATCH COMPLEMENTARY OUTPUTS		14 PINS: 1/4" x 1/4" FP; 1/4" x 1/8" FP; 1/4" x 3/4" DIL; 1/4 x 3/8" FP; 16 PINS: 1/4" x 7/8" DIP; 1/4" x 3/8" FP; 24 PINS: 1/2" x 1/4" DIP; 3/8" x 1/2" FP; 3/8" x 1/2" FP; 1/4" x 3/8" FP	280 mW dc
(02)	5416		4 BIT LATCH			
(03)	9308		DUAL, 4 BIT LATCH			630 mW dc

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
29 (01)	54L42	TTL	BCD TO-DECIBAL-DECODER		16 PINS $\frac{1}{4}$" x $\frac{7}{8}$" D.I.P $\frac{1}{4}$" x $\frac{3}{5}$" F.P	121 mWdc
(02)	54L43		EXCESS-3 TO DECIMAL DECODER			
(05)	54L44		EXCESS-3-GRAY-TO DECIMAL DECODER			
(04)	54L46		BCD-TO-SEVEN-SEGMENT DECODER/DRIVER (30 VOLT OPEN COLLECTOR OUTPUT)			237 mWdc
(05)	54L47		BCD TO SEVEN SEGMENT DECODER/DRIVER (15 VOLT, OPEN COLLECTOR OUTPUT)			
11 (01)	54181		ARITHMETIC LOGIC UNIT/ FUNCTION GENERATOR		24 PINS 1/2" x 1 1/4" DIP 3/8" x 1/2" FP 1/4" x 1/2" FP	795 mWdc
12 (01)	54121		SINGLE MONOSTABLE VIBRATOR		14 PINS $\frac{1}{4}$" x $\frac{7}{8}$" FP $\frac{1}{4}$" x $\frac{3}{5}$" FP $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{5}$" FP 16 PINS: $\frac{1}{4}$" x $\frac{7}{8}$" DIP $\frac{1}{4}$" x $\frac{1}{4}$" FP	220 mWdc
	54122		SINGLE RETRIGGERABLE MONOSTABLE VIBRATOR WITH CLEAR			170 mWdc
	54123		DUAL RETRIGGERABLE MONOSTABLE VIBRATOR WITH CLEAR			190 mWdc
13 (01)	5492		DIVIDE BY-12 COUNTER			268 mWdc
(02)	5493		4-BIT BINARY COUNTER			
(03)	54160		SYNCHRONOUS 4-BIT DECADE COUNTER (ASYNCHRONOUS CLEAR)			500 mWdc
(04)	54163		SYNCHRONOUS 4-BIT BINARY COUNTER (SYNCHRONOUS CLEAR)			

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
(02)	54L164	TTL	8-BIT PARALLEL-OUT SERIAL SHIFT REGISTER			120 mWdc PER REGISTER
(03)	54L28		DUAL, 8-BIT SHIFT REGISTER			134 mWdc PER REGISTER
(04)	54L00		4-BIT SHIFT REGISTER			124 mWdc PER REGISTER
(05)	54L70		8-BIT PARALLEL-OUT SERIAL SHIFT REGISTER			52 mWdC PER REGISTER
10 (01)	5442		BCD TO DECIMAL DECODER			226 mWdC
(02)	5443		EXCESS 3 TO DECIMAL DECODER			
(03)	5444		EXCESS 3 GRAY TO DECIMAL DECODER			
(04)	5445		BCD TO DECIMAL-DECODER/DRIVER (30-VOLT, OPEN COLLECTOR OUTPUT)			341 mWdC
(05)	C4145		BCD TO DECIMAL-DECODER/DRIVER (15-VOLT, OPEN COLLECTOR OUTPUT)			
(06)	5446		BCD TO SEVEN-SEGMENT DECODER/DRIVER (30 VOLT, OPEN COLLECTOR OUTPUT)			467 mWdC
(07)	5447		BCD TO SEVEN-SEGMENT DECODER/DRIVER (15-VOLT, OPEN COLLECTOR OUTPUT)			
(08)	5448		BCD TO SEVEN-SEGMENT DECODER/DRIVER			
(09)	5449		BCD-TO-SEVEN-SEGMENT DECODER/ DRIVER (5.5 VOLT, OPEN COLLECTOR OUTPUT)			

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
7 (01)	5486	TTL	QUADRUPLE 2 INPUT EXCLUSIVE OR GATE		14 PINS: $\frac{1}{4}$"x$\frac{1}{4}$" FP $\frac{1}{4}$"x$\frac{1}{8}$" FP $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	64 mWdc PER GATE
26 (01)	54286		QUADRUPLE, 2-INPUT EXCLUSIVE OR GATE			9 mWdc PER GATE
8 (01)	5406		HEX INVERTER BUFFER/DRIVER, 30 VOLT OUTPUT			54 mWdc PER BUFFER
(02)	5407		HEX INVERTER BUFFER/DRIVER, 15 VOLT OUTPUT			
(03)	5416		HEX BUFFER/DRIVER, 30 VOLT OUTPUT			
(04)	5417		HEX BUFFER/DRIVER 15-VOLT OUTPUT			
9 (01)	5495		4-BIT RIGHT-SHIFT, LEFT SHIFT REGISTER		14 PINS $\frac{1}{4}$"x$\frac{1}{4}$" FP $\frac{1}{8}$"x$\frac{1}{4}$" FP $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP 16 PINS: $\frac{1}{4}$"x$\frac{3}{8}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	422 mWdc PER REGISTER
(02)	5496		5-BIT SHIFT REGISTER			400 mWdc PER REGISTER
(03)	54164		8-BIT PARALLEL-OUT SERIAL SHIFT REGISTER			322 mWdc PER REGISTER
(04)	54165		8-BIT PARALLEL-LOAD SHIFT REGISTER			372 mWdc PER REGISTER
(05)	54194		4-BIT BIDIRECTIONAL SHIFT REGISTER			360 mWdc PER REGISTER
(06)	54195		4-BIT PARALLEL-ACCESS SHIFT REGISTER			372 mWdc PER REGISTER
28 (01)	54L95		4-BIT RIGHT-SHIFT, LEFT-SHIFT REGISTER			20 mWdc PER REGISTER

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
5 (01)	5450	TTL	EXPANDABLE DUAL 2-WIDE 2-INPUT AND-OR-INVERT GATE			51 mWdc PER GATE
(02)	5451		DUAL 2-WIDE, 2-INPUT AND-OR-INVERT GATE			
(03)	5453		EXPANDABLE 4-WIDE 2-INPUT AND-OR-INVERT GATE			68 mWdc PER GATE
(04)	5454		4-WIDE, 2 INPUT AND-OR-INVERT GATE			
40 (01)	54H50		EXPANDABLE DUAL 2-WIDE, 2-INPUT AND-OR-INVERT GATE			140 mWdc PER DEVICE
(03)	54H53		EXPANDABLE 2-2-2-3 INPUT AND-OR-INVERT GATE			
(05)	54H55		EXPANDABLE 2-WIDE, 4-INPUT AND OR-INVERT GATE			75 mWdc PER DEVICE
41 (03)	54L55		2-WIDE, 4 INPUT AND OR-INVERT GATE			4.5 mWdc PER DEVICE
74 (02)	5464		4-2-3-2 INPUT AND-OR-INVERT GATE			88 mWdc PER DEVICE
(03)	54LS5		4-2-3-2 INPUT AND OR-INVERT GATE (OPEN COLLECTOR)			
6 (01)	5482		2-BIT FULL ADDER		14 PINS: $\frac{1}{4}$"x$\frac{1}{4}$" FP; $\frac{1}{4}$"x$\frac{1}{5}$" FP; $\frac{1}{4}$"x$\frac{3}{4}$" DIP; $\frac{1}{4}$"x$\frac{3}{5}$" FP; 16 PINS: $\frac{1}{4}$"x$\frac{4}{5}$" DIP; $\frac{1}{4}$"x$\frac{3}{5}$" FP	300 mWdc
(02)	5483		4-BIT FULL ADDER			600 mWdc
(03)	9304		DUAL FULL ADDER			300 mWdc

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
(05)	54H101	TTL	SINGLE J-K EDGE TRIGGERED FLIP FLOP		↓	210 mW dc PER FLIP-FLOP
71 (01)	54S74					
(03)	54S112					
10	54S113					
	54S114					
	54S174					
↓	54S175					
4 (01)	5402		QUADRUPLE 2-INPUT POSITIVE NOR GATE		14 PINS: $\frac{1}{4}$"x$\frac{1}{4}$" FP $\frac{1}{4}$"x$\frac{1}{8}$" FP $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	60 mW dc PER GATE
(02)	5423		DUAL 4-INPUT POSITIVE NOR GATE WITH STROBE AND EXPANDABLE INPUT		16 PINS $\frac{1}{4}$"x$\frac{7}{8}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	↓
(03)	5425		DUAL 4-INPUT POSITIVE NOR GATE WITH STROBE		↓	↓
↓ (04)	5427		TRIPLE 3 INPUT POSITIVE NOR GATE		14 PINS $\frac{1}{4}$"x$\frac{1}{4}$" FP $\frac{1}{4}$"x$\frac{1}{8}$" FP $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	4.2 m W dc PER GATE
27 (01)	54L02		QUADRUPLE 2-INPUT POSITIVE NOR GATE			
73 (01)	54S02	↓	QUADRUPLE 2-INPUT POSITIVE NOR GATE			6.2 m W dc PER GATE

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
(06)	5470	TTL	SINGLE EDGE TRIGGERED FLIP FLOP			
(07)	5479		DUAL D TYPE EDGE TRIGGERED FLIP-FLOPS, BUFFERED OUTPUT			
17 (01)	54174		HEX D TYPE, POSITIVE EDGE TRIGGERED FLIP-FLOPS, WITH CLEAR AND SINGLE OUTPUTS		16 PINS $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP	73 mWdc PER FLIP-FLOP
(02)	54175		QUAD, D TYPE, POSITIVE EDGE TRIGGERED FLIP FLOPS, WITH CLEAR AND COMPLEMENTARY OUTPUTS			65 mWdc PER FLIP FLOP
21 (01)	54L71		R-S MASTER-SLAVE FLIP FLOP		14 PINS: $\frac{1}{4}$" x $\frac{1}{4}$" FP $\frac{1}{8}$" x $\frac{1}{4}$" FP $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP	11 mWdc PER FLIP FLOP
(02)	54L72		J-K-MASTER-SLAVE FLIP FLOP			
(03)	54L73		DUAL J K MASTER SLAVE FLIP-FLOP			
(04)	54L78		DUAL J-K MASTER-SLAVE FLIP-FLOP			
(05)	54L74		DUAL D TYPE EDGE TRIGGERED FLIP-FLOP			
22 (01)	54H72		SINGLE, J-K MASTER-SLAVE FLIP FLOP		14 PINS: $\frac{1}{4}$" x $\frac{1}{4}$" FP $\frac{1}{4}$" x $\frac{3}{8}$" FP $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP 16 PINS: $\frac{1}{4}$" x $\frac{7}{8}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP	137 mWdc PER FLIP FLOP
(02)	54H7		DUAL J K MASTER-SLAVE FLIP-FLOP			148 mWdc PER FLIP FLOP
(03)	54H74		DUAL D TYPE EDGE TRIGGERED FLIP FLOP			125 mWdc PER FLIP FLOP
(04)	54H76		DUAL J-K MASTER-SLAVE FLIP FLOP			148 mWdc PER FLIP FLOP

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
(06)	5470	TTL	SINGLE EDGE TRIGGERED FLIP-FLOP			
(07)	5479		DUAL D TYPE EDGE TRIGGERED FLIP-FLOP, BUFFERED OUTPUT			
17 (01)	54174		HEX, D TYPE, POSITIVE EDGE TRIGGERED FLIP-FLOPS, WITH CLEAR AND SINGLE OUTPUTS		16 PINS $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP	73 mWdc PER FLIP FLOP
(02)	54175		QUAD, D TYPE, POSITIVE EDGE TRIGGERED FLIP-FLOPS, WITH CLEAR AND COMPLEMENTARY OUTPUTS			65 mWdc PER FLIP FLOP
21 (01)	54L71		R-S MASTER-SLAVE FLIP-FLOP		14 PINS $\frac{1}{4}$" x $\frac{1}{4}$" FP $\frac{1}{8}$" x $\frac{1}{4}$" FP $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP	11 mWdc PER FLIP FLOP
(02)	54L72		J-K-MASTER-SLAVE FLIP-FLOP			
(03)	54L73		DUAL J-K MASTER SLAVE FLIP-FLOP			
(04)	54L78		DUAL J-K MASTER-SLAVE FLIP-FLOP			
(05)	54L74		DUAL D TYPE EDGE TRIGGERED FLIP FLOP			
22 (01)	54H72		SINGLE, J-K MASTER SLAVE FLIP FLOP		14 PINS $\frac{1}{4}$" x $\frac{1}{4}$" FP $\frac{1}{4}$" x $\frac{3}{8}$" FP $\frac{1}{4}$" x $\frac{3}{4}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP 16 PINS $\frac{1}{4}$" x $\frac{7}{8}$" DIP $\frac{1}{4}$" x $\frac{3}{8}$" FP	137 mWdc PER FLIP FLOP
(02)	54H7		DUAL J-K MASTER-SLAVE FLIP-FLOP			148 mWdc PER FLIP FLOP
(03)	54H74		DUAL D-TYPE EDGE TRIGGERED FLIP FLOP			125 mWdc PER FLIP FLOP
(04)	54H76		DUAL J-K MASTER-SLAVE FLIP FLOP			140

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
72 (01)	54540	TTL	DUAL, 4-INPUT POSITIVE NAND BUFFER		ALL 14 PINS 1/4"x1/4" FP 1/4" x 11/8" FP 1/4" x 3/4" DIP 1/4" x 3/8" FP	121 mWdc PER BUFFER
70 (01)	54500		QUADRUPLE, 2-INPUT POSITIVE NAND GATE		14 PINS: 1/4" x 1/4" FP 1/8" x 1/4" FP 1/4 x 3/4" DIP 1/4 x 3/8" FP 16 PINS: 1/4" x 3/4" DIP 1/4" x 3/8" FP	49.5 mWdC PER GATE
(02)	54503		QUADRUPLE, 2-INPUT POSITIVE NAND GATE (OPEN COLLECTOR OUTPUT)			
(03)	54504		HEX, 1 INPUT INVERTER GATE			
(04)	54505		HEX, 1-INPUT INVERTER GATE (OPEN COLLECTOR OUTPUT)			
(05)	54510		TRIPLE, 3-INPUT POSITIVE NAND GATE			
(06)	54520		DUAL, 4-INPUT POSITIVE NAND GATE			↓
(08) ↓	54530		SINGLE, 8 INPUT POSITIVE NAND GATE			55 mWdc PER GATE
2 (01)	5472		SINGLE J-K MASTER-SLAVE FLIP FLOP			110 mWdc PER FLIP FLOP
(02)	5473		DUAL J-K MASTER-SLAVE FLIP FLOP NO PRESET			
(03)	54 07		DUAL J-K-MASTER-SLAVE FLIP FLOP NO PRESET			
(04)	5476		DUAL J-K MASTER-SLAVE FLIP FLOP			
(05	5474	↓	DUAL D TYPE EDGE TRIGGERED FLIP-FLOP			

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
1 (01)	5430	TTL	SINGLE, 8-INPUT POSITIVE NAND GATE		14 PINS: $\frac{1}{4}" \times \frac{1}{4}"$ FP $\frac{1}{8}" \times \frac{1}{4}"$ FP $\frac{1}{4}" \times \frac{3}{4}"$ DIP $\frac{1}{4}" \times \frac{3}{8}"$ FP	40 mWdc PER GATE
(02)	5420		DUAL, 4-INPUT POSITIVE NAND GATE			
(03)	5410		TRIPLE, 3-INPUT POSITIVE NAND GATE			
(04)	5400		QUADRUPLE, 2-INPUT POSITIVE NAND GATE			
(05)	5404		HEX, 1-INPUT INVERTER GATE			
(06)	5412		TRIPLE, 3-INPUT POSITIVE NAND GATE (OPEN COLLECTOR OUTPUT)			
(07)	5401		QUADRUPLE, 2-INPUT POSITIVE NAND GATE (OPEN COLLECTOR OUTPUT)			
(08)	5405		HEX, 1-INPUT INVERTER GATE (OPEN COLLECTOR OUTPUT)			
(09)	5403		SAME A COMMERCIAL DESIGNATION 5401 (07) WITH DIFFERENT PIN CONFIGURATION			
3 (01)	5440		DUAL, 4-INPUT POSITIVE NAND BUFFER			100 mWdc PER BUFFER
(02)	5437		QUADRUPLE, 2-INPUT POSITIVE NAND BUFFER			
(03)	5438		QUADRUPE, 2-INPUT POSITIVE NAND BUFFER (OPEN COLLECTOR OUTPUT)			
24 (01)	54H40		DUAL, 4 INPUT, POSITIVE NAND BUFFER (HIGH SPEED)			134 mWdc PER BUFFER

INTEGRATED CIRCUITS

MIL. SPEC. 38510/	COMMERCIAL DESIGNATION	PART TYPE	FUNCTIONAL DESCRIPTION	RECOMMENDED MANUFACTURER	AVAILABLE PACKS	MAXIMUM DISSIPATION
20 (01)	54L30	TTL	SINGLE, 8-INPUT POSITIVE NAND GATE		14 PINS: $\frac{1}{4}$"x$\frac{1}{4}$" FP $\frac{1}{8}$"x$\frac{1}{4}$" FP $\frac{1}{4}$"x$\frac{3}{4}$" DIP $\frac{1}{4}$"x$\frac{3}{8}$" FP	4 mWdc PER GATE
(02)	54L20		DUAL, 4-INPUT POSITIVE NAND GATE			
(03)	54L10		TRIPLE, 3-INPUT POSITIVE NAND GATE			
(04)	54L00		QUADRUPLE, 2-INPUT POSITIVE NAND GATES			
(05)	54L04		HEX, 1-INPUT INVERTER GATES			
(06)	54L01		QUADRUPLE, 2-INPUT POSITIVE NAND GATES (OPEN COLLECTOR OUTPUT)			
23 (01)	54H30		SINGLE, 8-INPUT POSITIVE NAND GATE			198 mWdc PER GATE
(02)	54H20		DUAL, 4-INPUT POSITIVE NAND GATE			
(03)	54H10		TRIPLE, 3-INPUT POSITIVE NAND GATE			
(04)	54H00		QUADRUPLE, 2-INPUT POSITIVE NAND GATE			
(05)	54H04		HEX, 1-INPUT INVERTER GATE			
(06)	54H01		QUADRUPLE, 2-INPUT POSITIVE NAND GATE (OPEN COLLECTOR OUTPUT)			
(07)	54H22		DUAL, 4-INPUT POSITIVE NAND GATE (OPEN COLLECTOR OUTPUT)			

Report

POINT STATISTICS

$\hat{r}$ = TOTAL NUMBER OF FAILURES = 89
$\hat{b}$ = TOTAL BIT FAILURES ($\in r$) = 10
$\hat{n}$ = FAILURES NOT DETECTED = 4
$\hat{T}$ = TOTAL TEST TIME = 19,500 HRS

RATIOS

DEPENDIBILITY = $d = \frac{r - n}{r} = 1 - \frac{n}{r}$
FAILURES NOT DETECTED = $f = \frac{n}{r}$
% BIT FAILURES = $p = b/r$

ASSUME
T/n IS EXPONENTIAL
T/r IS EXPONENTIAL

ONLY DEPEND. IS EXAMINED.

$$\hat{d} = 1 - \frac{\hat{n}}{\hat{r}} \qquad (1)$$

FIND $\hat{d}_e$ SUCH THAT

$$P[d > d_e] = 1 - \alpha \qquad (2)$$

A NON-PARAMETRIC APPROACH IS

$$\bar{d}_{e_i} = 1 - \frac{n_u}{r_e} \qquad (3)$$

WHERE $\bar{d}_e$ IS THE NONPARAMETRIC MEASUR AND

$$P[n < n_u] = 1 - \alpha \qquad (4)$$

$$P[r_i > r_e] = 1 - \alpha \qquad (5)$$

THIS WILL YIELD A VALUE OF $1-\alpha$ FOR $\bar{d}_e$ SUCH THAT

$$\bar{d}_e < d_e \qquad (6)$$

THIS IS TRUE SINCE THE RESULT OF COMBINING THE STATISTICAL ESTIMATES OF n & r IS NOT KNOWN. IF IT WAS, WE COULD GET $1-\alpha$ FOR d IN A PARAMETIC ANALYSIS,

NOW

$$P\left[\frac{T}{F} = \theta_p < \frac{2n\hat{\theta}_p}{\chi^2_{1-\alpha;\,2r+2}}\right] = 1-\alpha \qquad (7)$$

OR EQUIVALENTLY

$$P\left[p/T = \frac{1}{\theta_n} > \frac{\chi^2_{1-\alpha;\,2p+2}}{2n\hat{\theta}_n}\right] = 1-\alpha$$

$$\Rightarrow P\left[p > \frac{T\chi^2_{1-\alpha;\,2p+2}}{2n\hat{\theta}_n}\right] = 1-\alpha$$

SINCE

$$\hat{\theta}_n = \frac{T}{F} \qquad (8)$$

WE HAVE

$$P\left[p > \frac{1}{2}\chi^2_{1-\alpha;\,2p+2}\right] = 1-\alpha \qquad (9)$$

THUS, COMPARING WITH Eq. #5

$$r_e = \frac{1}{2}\chi^2_{1-\alpha;\,2p+2} \qquad (10)$$

WE KNOW ALSO THAT

$$P\left[\frac{I}{n} = \theta_n > \frac{2n\hat{\theta}}{\chi^2_{\alpha;2n+2}}\right] = 1-\alpha \quad (13)$$

REARRANGING

$$P\left[\frac{n}{T} < \frac{\chi^2_{\alpha;2n+2}}{2r\hat{\theta}}\right] = 1-\alpha$$

$$= P\left[n < \frac{T\chi^2_{\alpha;2n+2}}{2r\hat{\theta}}\right]$$

$$= P\left[n < \frac{1}{2}\chi^2_{\alpha;2n+2}\right] \quad (14)$$

COMPARING WITH Eq. 4

$$n_U = \frac{1}{2}\chi^2_{\alpha;2n+2} \quad (15)$$

FOR LARGE VALUES OF ν ($\nu > 30$)

$$\chi^2_{\nu;\alpha} = \sqrt{2\nu}\, z_\alpha + \nu \quad (16)$$

$$\chi^2_{2r+2;\alpha} = \sqrt{2(r+1)}\, z_\alpha + 2(r+1)$$

THUS

$$n_U =$$

$r > 30$

r IS SO LARGE WE MUST EMPLOY THE FACT THAT FOR LARGE ν

$$\chi^2_{r;\alpha} = \sqrt{2\nu}\, z_\alpha + \nu \qquad (16)$$

THUS, FROM Eq. 10

$$r_e = \frac{1}{2}\chi^2_{1-\alpha;\,2r+2}$$

$$= \frac{1}{2}\left[2\sqrt{r+1}\, z_{1-\alpha} + 2(r+1)\right]$$

$$= \sqrt{r+1}\, z_{1-\alpha} + (r+1) \qquad (17)$$

NOW THE NUMBERS ON Pg 1 :-

(1) $1-\alpha = 90\%$

FROM 17:

$$r_e = \sqrt{90}\, z_{0.9} + (90)$$

$$= \sqrt{90}\, z_{0.1} + 90$$

$$= \sqrt{90}\,(1.28) + 90$$

$$= -0.28\sqrt{90} + 90$$

$$= 87.34$$

FROM 15

$$n_0 = \frac{1}{2}\chi^2_{\alpha;2n+2}$$

$$= \frac{1}{2}\chi^2_{0.1;10}$$

$$= \frac{1}{2}(15.987)$$

$$= 7.99$$

FROM 3

$$\bar{d}_e = 1 - \frac{n_u}{r_e}$$

$$= 1 - \frac{7.99}{87.34}$$

$$= 1 - 0.0915$$

$$= 91\%$$

$1 - \alpha = 90\%$

THUS, WE 90% CONFIDENT (NON-PARAMETRICALLY) THAT

$$d > 91\%$$

(2) $1 - \alpha = 95\%$

FROM 17

$$r_e = \sqrt{90}\, Z_{0.95} + 90$$

$$= -\sqrt{90}\, Z_{0.05} + 90$$

$$= -\sqrt{90}\,(1.65) + 90$$

$$= 74.35$$

FROM 15

$$n_v = \frac{1}{2} \chi^2_{\alpha;\, 2n+2}$$

$$= \frac{1}{2} \chi^2_{0.05;\, 10}$$

$$= \frac{1}{2}(18.307)$$

$$= 9.153$$

FROM 3

$$\overline{d_e} = 1 - \frac{n_u}{r_e}$$

$$= 1 - \frac{9.153}{74.35}$$

$$= 1 - 0.123$$

$$= 87.7\%$$

THUS, WE ARE 95% CONFIDENT (NON PARAMETRICALLY) THAT

$$d > 88\%$$

ROUGH DRAFT
3041-RJM:sh
13070

MEMORANDUM

From: 3041 (R. J. Marks)
To: 3041 (~~C. Rice~~) (R. SAUM) Copy to Dr Kent
VIA: 3041 (C. RICE)
Subj: Work Statement and Present Status (Revision of AR-34)

Ref: (a) 14 Feb 1975 Meeting (R. Saum, C. Rice, and B. Marks) at NAD Crane
(b) AR-34, "Failure Classification for Reliability Testing, General Requirements for"

ENCL: a. 19 Feb 75 phone con. with Wm. T. Sumerlin
b. "Required Failure Reclassification Test Time for a given Confidence Level"
c. "Failure Reclassification Confidence from Stated Test Time"

Discussion:

In reference (a), the need for a more specified definition of paragraph 3.3, number 2 of reference (b) was stated. That is, what constitutes "sufficient data" for substantiation of failure reclassification. Currently, "sufficient data" is determined solely by engineering judgement. Investigation of formulation of statistical guidelines for more precise failure reclassification will be the method of attack by this activity for drafting more precise "sufficient data" requirements.

In-house consultation possibilities include D. Kent, W. T. Sqmerlin, former member of the AGREE committee, was also suggested as a consultant in the effort. Mr. Sumerlin has been subsequently contacted and has offered his support in the effort. (see enclosure (a)).

Areas to be explored in regard to the establishment of sufficient data requirements for substantiation of failure reclassification, subject to revision or expansion, are as follows:

1. Statement in item 1 in enclosure (a).
2. Statement in item 2 in enclosure (a).

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3. Reclassification requirements of corrected failure modes under test with both no and apriori assumptions.

4. Correlation of failure mode and corrective action types to apriori weighting of sufficient data requirements.

5. Employment of established and/or recent statistical works in determining sufficient test data requirements.

6. Other areas exposed by investigation of the above items.

The present work status in these investigative avenues is reflected in enclosure (b) and (c). Application of the results to the failure reclassification efforts on the ARR-75. (AEL-EMTECH) is contained in enclosure (3).

NSN 0107-990-6000

The person originating an outgoing call or receiving an incoming call will sign the original.

2/19/75

AUTHORIZATION NO.	DURATION OF CALL FROM 1030 TO 1048	REFERENCE (Serial, Contract, etc.)

ORIGINATOR (Name)	(Title)	(Location)
Bob Marks	Rel. Eng.	NAD Crane, IN
PERSON CALLED (Name)	**(Title)**	**(Location)**
Wm. T. Sumerlin		McDonnell Aircraft, MO

SUBJECT

Revision of AR-34 on Failure Reclassification

GIST OF CONVERSATION

Wm. T. Sumerlin (PH: 314-232-9666)

McDonnell Aircraft

P. O. Box 181

Hazelwood, MO 63042

During introductive phase, Mr. Sumerlin recalled Carl Wiggington and Bob Saum. He stated he has reflected a great deal on AR-34 and MIL-STD-781B, and has as a result, developed definite opinions. Which were reflected during the conversation as follows:

1. No "random failure" should be reclassified since the test is to short to show the benefits of the reclassification. In case of a reject decision, due only to random failures, the system under test should be corrected (by redesign or other corrective action), and the test reinitiated. The stated philosophy behind this opinion is that forethought in design is better than corrective action under test.

2. "Pattern Failures" should be subject to a degree of reclassification, since usually sufficient test time exists for qualification. Mr. Sumerlin stated pattern failures were not characteristic of the exponential assumption*. To include the occurance of the pattern failure as a random failure, a single failure should be counted upon reclassification.

3. Upon being asked about a random failure reclassification with a "no risk" determined via test, Mr. Sumerlin said such action would be possible in certain instances, if sufficient test time, etc. exists. Sumerlin was enthusiastic in his response and welcomed future contact regarding questions and consultation in this matter.

SIGNATURE Robert J. Marks

TELEPHONE CONVERSATION RECORD

24

* Is this true?

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Enclosure (1)

Required Failure Reclassification Test Time for a Given Confidence Level

The problem under inspection:

A system failure mode, m, has experienced failure(s) in test time t at which time corrective action (denoted $\lambda_{m'}$) is taken. Employing the exponential assumption and no apriori judgement as to the corrective action's effectiveness, how long must one test the corrected system with no failures to establish with $1-\alpha$ confidence the non-occurance of a failure in the uncorrected system test time t.

Stated more rigourously, we must determine the required test time T to establish that

$$P[E(r) < 1] = 1 - \alpha \qquad (1)$$

where $\alpha = P[r > 1]$

P is read "the probability that"

r is the number of failures in test time T_c

E(r) is the "expected value of r"

For an exponentially modeled failure mode (ie one that fails "randomly"),

$$E(r_{m'}) = \lambda_{m'} t \qquad (2)$$

where $\lambda_{m'}$ is the constant failure rate of the corrected failure mode. Noting that $\theta_{m'}$, the corrected failure mode's MTBF, may be written

$$\theta_{m'} = 1/\lambda_{m'} \qquad (3)$$

We may rewrite Eq. 1 as follows:

$$P[\theta_{m'_c} > t_{m'_c}] = 1-\alpha \qquad (4)$$

We are thus testing the corrected mode to determine if its MTBF is greater than the uncorrected system test time. This, then, is equivalent to testing for the non-occurance of a failure in test time t with $1-\alpha$ confidence.

From elementry statistics, if an exponential population is tested for time T with r failures, the one-sided lower $1-\alpha$ confidence interval for θ is (1,2),

$$P\left[\theta_{m'} \geq \frac{2r\hat{\theta}_{m'}}{\chi^2_{\alpha;2r}}\right] = 1-\alpha \qquad (5)$$

where

$$\hat{\theta}_{m'} = T_{m'}/r_{m'} = t_{m'}$$

$\hat{\theta}$ is the test estimate (in this case mean MTBF) of the parameter

α is the area to the right of B in the chi-squared probability density function with 2r degrees of freedom.

$\chi^2_{\alpha;\nu}$ is the chi-squared probability density function ordinate (with ν degrees of freedom) to the right of which is area α.

Comparing Eqs. 4 and 5, the failure reclassification substantiation test (FRST) requires that

$$t_{m'} = \frac{2r\hat{\theta}_{m'}}{\chi^2_{\alpha;2r}} = \frac{2r\,t/r}{\chi^2_{\alpha,2r}} = \frac{2t_{m'}}{\chi^2_{\alpha,2r}} \qquad (6)$$

We now assume that the FRST runs for time T (yet to be determined) without failure. Our best estimate of $\hat{\theta}$ in the strict statistical sense is infinity. In order that the analysis be more realistic, we assume the worst case condition in which a failure occurs immediately after conclusion of the FRST at time $T + dt$. Thus,

$$r = 1$$

$$\hat{\theta}_{m'} = \text{TOTAL TEST TIME}/r = T_{m'} \qquad (7)$$

Substituting into Eq. 6 followed by rearrangement gives

$$T_{m'_c} = \frac{1}{2} t_{m'_c} \chi^2_{\alpha;2}$$

This is the final desired relationship giving the required FRST time to establish with $1-\alpha$ confidence the non-occurance of over one failure in test time t under stated worst case conditions. Note that

$$T_m > t_m \text{ FOR } \chi^2_{\alpha;2} > 2 \qquad (9)$$

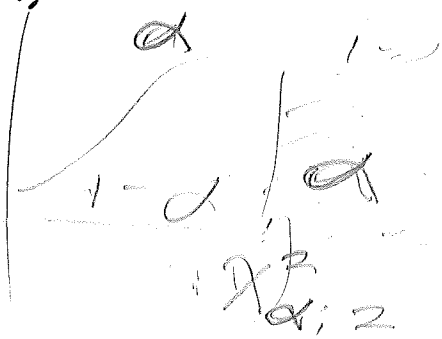
Roughly,

$$\chi^2_{\alpha;2} > 2 \quad \text{FOR} \quad 1-\alpha \leq 0.7$$

Thus, more FRST time is required that original test time when the reclassification confidence, $1-\alpha$, is greater than 70%. Some typical values of T as a function of are offered below:

$T/t = T/\hat{\theta}$

$1-\alpha$ (Confidence)	$T/t = \frac{1}{2}\chi^2_{\alpha;2}$
0.5	0.693
0.75	1.386
0.90	2.302
0.95	2.995
0.99	4.605



References:

(1) Harold J. Larson, Introduction to Probability Theory and Statistical Inference, John Wiley and Sons, 1969, pg 247

(2) Elements of Reliability and Maintainability, AMETA, Rock Island IL, 1973, pg IV-48

$\alpha = .10 = P[K \geq 1]$

Failure Reclassification Confidence from Stated Test Times

1. Parameter definitions:

t - test time on uncorrected mode
T - test time on corrected mode
r - tallied failures during test of corrected mode
$\hat{\theta}$ - Point estimate of the corrected failure mode MTBF - T/r.
$1-\alpha$ - Confidence in reclassification
$\chi^2_{\alpha;V}$ - Chi-squared probability density function ordinate (with V degrees of freedom) to the right of which is area α.
θ - True MTBF of corrected failure mode.

2. Derivation (Worst case condition)

Under the exponential assumption, the MTBF confidence interval (1,2) for the failure reclassification substantiation that (FRST) (3) is

$$P\left[\theta \geq \frac{2r\hat{\theta}}{\chi^2_{\alpha;2r}}\right] = 1-\alpha \qquad (1)$$

Since $$\hat{\theta} = T/r \qquad (2)$$

we have equivalently

$$P\left[\theta \geq \frac{2T}{\chi^2_{\alpha;2r}}\right] = 1-\alpha \qquad (3)$$

To avoid the r = 0 situation, a worst case condition is assumed. This condition is the occurance of a failure at FRST time T + dt. Thus,

r = number of observed failures +1 (4)

In that we wish to test for:

$$P[\theta \geq t] = 1-\alpha \qquad (5)$$

we compare with Eq. 3 and write

$$t = {}^{2T}/_{\chi^2_{\alpha;2r}} \qquad (6)$$

or equivalently:

$$\chi^2_{\alpha;2r} = 2T/t \qquad (7)$$

Thus, given r, T, and t as defined in Eq. 4 and section 1, the reclassification confidence, $1-\alpha$, must satisfy Eq. 7.

3. Application of Worst Case Condition Derivation to Reliability on ARR-75 Sonobuoy Receiver

In the latest (Feb 75) reliability test status report on the ARR-75 sonobuoy receiver from AEL-EMTECH, the following data was cited:

RAT: Reliability Acceptance Test (Production)

Total test time = T = 1650 hrs.

Total failures: 3

Failure modes:

a. IC: failure at 317 hrs.

b. MIXER: failure at 706 hrs.

c. TRANSISTOR: failure at 1149 hrs.

RQT: Reliability Qualification Test

Total test time = t = 1663 hrs.

Total failures: 12

Failure Modes:

a.	RF filter #1	558 hrs.
b.	RF filter	628 hrs.
c.	Transformers	1018 hrs.
		1018 hrs.
		1502 hrs
d.	Connector	1562 hrs.
e.	Mixers	1018 hrs.
		1370 hrs.

1562 hrs.

1663 hrs.

Need of the ARR-75 necessitated production and shipment of the unit prior to successful completion of the RQT. Since all RQT failures had corrective action imposed in over 90% of the RAT test, we may view the RAT as a FRST for the RQT. Examples follow:

a. In view of the cited data, what is the confidence, $1-\alpha$, in reclassifing the following RQT failures under worst case conditions:

RF filter #1

RF filter #2

Transformers

Connectors

For each of these four failure modes, a parts screening type corrective action was implemented. No further corresponding failures occured in the FRST (RAT) test. Thus, from Eq. 7,:

$$\chi^2_{\alpha;2} = \frac{2(1650)}{1663} = 1.98$$

From chi-squared tables:

$$\chi^2_{0.5,2} = 1.38 \qquad \chi^2_{0.3,2} = 2.40$$

A rough interpolation gives a reclassification confidence of

$$1-\alpha = 60\%$$

b. In view of the cited data what is the confidence of reclassifying the mixer failure under worst case conditions. Since there occured one failure in the FRST we have from Eq. 7:

$$\chi^2_{\alpha;4} = 1.98$$

Fram chi-squared tables:

$$\chi^2_{0.75;4} = 1.92 \qquad \chi^2_{0.70;4} = 2.19$$

The failure reclassification confidence for this case is thus about

$$1 - \alpha = 25\%$$

4. Alternate derivation:

Assuming worst case conditions for FRST failure determination places the most stringent of test requirements on the contractor. A less stringent requirement is the assumption that if K failures are observed in FRST time T, then 2K + 1 failures will occur in FRST time 2T. In lieu of Eq. 4, we thus have

r = number of observed failures +1/2 (8)

This assumption, although still weighted toward the customer, requires less of the contractor in test time for a given confidence level.

5. Application of Alternate Derivation to Reliability Testing on the ARR-75

We shall now employ the less stringent failure reclassification test in the above section to the ARR-75 data.

a. With reference to section 3, the failure reclassification confidence for the RF filters, connector and transformers under the alternate derivation, is found from:

$$\chi^2_{\alpha;1} = 1.98$$

From chi-squared tables:

$$\chi^2_{0.2;1} = 1.64 \qquad \chi^2_{0.1;1} = 2.71$$

The reclassification ~~risk~~ CONFIDENCE is thus about:

$$1-\alpha = 80\%$$

b. With reference to section 3, the failure reclassification confidence for the mixers under the alternate derivation is:

$$\chi^2_{\alpha;3} = 1.98$$

From chi-squared tables:

$$\chi^2_{0.7,3} = 1.42 \qquad \chi^2_{0.5,3} = 2.37$$

Roughly, the reclassification confidence is then:

$$1-\alpha = 35\%$$

Note that, in both of the above cases the reclassification ~~risk~~ CONFIDENCE, as predicted, is greater than the corresponding worst case condition calculations in section 3. The first by 20% and the second by 10%.

6. Discussion:

The failure reclassification risks discussed herein assume nothing about the effectiveness of the corrective action. That is, the corrected failure mode is not considered better or worse than the original failure mode. This allows no employment of engineering judgement, a feature which seemingly would be of significant value in the area of failure reclassification.

The two failure reclassification risks derived herein differ only in the method of FRST failure tallying assumptions. The lack of information on the occurance of no failures in the FRST necessitates these assumptions. Patterns set up by sections 2 and 4 may be extended by assuming nk + 1 failures in test time nT given that k failures occured in FRST time T.

← However, in the limit, one is again confronted with the original problem on the occurance of no FRST failures. The alternate derivation of section 4 is thought to be the golden mean with respect to contractor and customer fairness and mathematical nicety, even though the worst case assumption of section 1 is primarily employed in reliability practice.

7. References

(1) Harold J. Larson, Introduction to Probability Inference, John Wiley and Sons, 1969, pg 247.

(2) Elements of Reliability and Maintainability, AMETA, Rock Island, IL, 1973, pg IV-48

(3) Required Failure Reclassification Test Time for a Given Confidence Level - R. J. Marks II

4 R TEST REQUIREMENTS

.1 R TEST CATEGORIES
- .1 QUALIFICATION (4.2.3)
  - .1 SAMPLE SIZE (4.2.3.1)
  - .2 EVALUATION CRITERIA (4.2.3.1)
- .2 ACCEPTANCE (SAMPLING) (4.2.4)
  - .1 SAMPLE SIZE (4.2.4.1)
    - .1 MAXIMUM (4.2.4.1.1)
    - .2 MINIMUM (4.2.4.1.2)
  - .2 EVALUATION CRITERIA (4.2.4.2)
- .3 LONGEVITY (5.4.8.6) (4.2.7)
  - .1 GENERAL (4.2.7.1)
  - .2 SAMPLE SIZE (.2)
  - .3 EVALUATION (.3)
  - .4 REQUIREMENTS (5.4.8.6)

NOTE: IF TEST PLAN ~~XXVII~~ (FIXED LENGTH PROD. VERIF. TEST) AND TEST PLAN ~~XXVI~~ (FIXED LENGTH DEMONSTRATION TEST) ARE TO BE INCLUDED, STICK 'EM HERE

.2 PRE-TEST REQUIREMENTS (5.1)
- .1 FAILURE PREDICTION (5.1.1)
- .2 DETAIL R TEST PROCEDURES (5.1.3)
- .3 TEST FACILITIES REQUIREMENTS (5.3)
  - .1 TEST CHAMBERS (5.3.1)
  - .2 VIBRATION REQ (5.3.2)
  - .3 EQUIP. COOLING (5.3.3)
    - .1 EXTERNAL (5.3.3.1)
    - .2 INTERNAL (5.3.3.2)
  - .4 INSPECTION (5.1.4)
- .4 PRE R TESTS
  - .1 SELECTION OF EQUIP (5.4.1)
  - .2 DESIGN AND PERFORMANCE TESTS (5.1.2)
  - .3 SURVEYS
    - .1 THERMAL (5.1.5)
    - .2 VIBRATION (5.1.6)
  - ~~.3 BURN-IN~~ (5.1.7)
  - .4 PRECEEDING R TEST
    - .1 EQUIP. INSTALLATION (5.4.2)
    - .2 TESTING THE SET UP (5.4.2)
    - .3 BURN-IN) (5.1.7)
    - .4 INITIATING THE TEST (5.4.3)

.3 R TESTING REQUIREMENTS

.1 TEST LEVELS

.1 BASIS FOR TEST LEVEL (6.2)

.2 GENERAL REQUIREMENTS (4.1)
(TEST LEVELS A - J)

.3 SPECIFIC REQ.

.1 EQUIP. CYCLING (5.4.4, 5.4.5, 5.4.6) (5.2)

.2 PREVENTIVE MAINT. (5.8)

.2 TEST PLANS (4.2)

.1 GENERAL (4.2.1)

.1 DISCUSSION (4.2.1.1)

.1 SELECTION OF A TEST PLAN (6.3.7)
.1 RECOMMENDATIONS & CONSIDERATIONS (6.3.7.1)

.2 USE OF TEST PLANS (4.2.1.2)

.2 REQUIREMENTS (4.2.2)

.2 TERMONOLOGY AND INTERPRETATION

.1 BASIS OF TEST PLANS (6.3.2)

.2 SAMPLING RISKS (6.3.3)

.3 DECISION RISKS (6.3.4)

.4 DISCRIMINATION RATIO (6.3.5) (4.2.1.3)

.5 O.C. AND EXPECTED TEST TIME (6.3.6)

.6 SPECIFIED MTBF (6.5.1.1)

.4 SPECIFIC TEST PLANS

.1 SUMMARY (6.3.1)

.2 SPECIFIC (TEST PLANS)

.3 DETERMINATION OF COMPLIANCE (5.4.8)

.1 GENERAL (5.4.8.1)

.2 ACCEPT (5.4.8.5)

.3 CONTINUE TEST (5.4.8.3)

.4 REJECT DECISION

.1 RQT (5.4.8.4)

.2 RAT (5.4.8.5)

.4 ON THE OCCURANCE OF A FAILURE

- .1 FAILURE ACTIONS (5.5)
  - .1 FAILURE CLASSIFICATIONS (5.5.1)
  - .2 FAILURE ANALYSIS (5.5.2)
  - .3 FAILURE CONFORMATION (5.5.3)
- .2 VERIFYING REPAIR (5.6)
- .3 CORRECTIVE ACTION (5.7)
- .4 PREVENTIVE MAINTAINANCE (5.8)
- .5 RESTORATION OF FAILED EQUIP (5.9)

.5 REQUIRED DOCUMENTATION

- .1 TEST RECORDS (5.10)
  - .1 TEST LOG AND DATA RECORD (5.10.1)
  - .2 EQUIPMENT FAILURE RECORD (5.10.2)
  - .3 FAILURE SUMMARY RECORD (5.10.3)
  - .4 FAILURE TAG (5.10.4)
  - .5 FAILURE I.D. REPORT (5.10.5)
- .2 TEST REPORTS (5.11)
  - .1 MONTHLY SUMMARY (5.11.1)
  - .2 FINAL REPORT (5.11.2)
    - .1 FAILURE SUMMARY & ANALYSIS (5.11.3)
    - .2 RELIABILITY DESIGN DATA (5.11.23)
    - .3 CORRELATION OF TEST RESULTS (5.11.24)

.6 MISC.

.1 AIR FORCE REQUIRE.

.1 GROUND SYSTEMS (6.5)

.2 PROCEDURES (6.6)

.2 CONSIDERATION OF APPLICATION (64

Form 8
May 1960
Dep[illegible]t of Labor
Re[illegible]n 609.2

NOTICE TO FEDERAL EMPLOYEE ABOUT UNEMPLOYMENT COMPENSATION

This form has been given to you because (1) you have been separated from your job, or (2) you are expected to be in nonpay status for 7 calendar days or more, or (3) you have been transferred to another payroll office.

Federal workers have unemployment compensation rights similar to those of workers in private industry. If you become unemployed or are in nonpay status for 7 consecutive calendar days or more and you want to FILE A CLAIM, go to the nearest PUBLIC EMPLOYMENT OFFICE.

TAKE WITH YOU—

1. Your SOCIAL SECURITY ACCOUNT NUMBER CARD. (If you do not have a Social Security card, apply for one, but you do not need to delay filing your claim pending its receipt.)
2. The OFFICIAL NOTICE of your most recent SEPARATION or of your present NONPAY status (Standard Form 50, Payroll Change Slip SF–1126 or similar document), if you have received it.
3. THIS FORM, and all similar forms which you have received. The office where you file your claim will obtain information needed for your claim from

COMMANDING OFFICER
NAVAL AMMU[illegible]ION DEPOT (CODE 02)
CRANE, INDIANA 47522

(Federal agency will insert in the box above name and address of office where your payroll records are maintained.)

KEEP THIS FORM with your Standard Form 50 and other personnel records. It is important to have it if you file a claim for unemployment compensation.

8–103

Resulting Distributions from Elementary Statistical Combination

R. L. Marks II
Code 3041
Naval Ammunition Depot
Crane Ind.

Concern has been expressed at this activity regarding the statistical distribution resulting from elementary combination of parametric statistics [1, 2]. To follow are methods of determining the resulting distribution upon addition, subtraction, division, and multiplication of two independent statistics with known distributions. Statistics X and Y will be combined to give a statistic Z. The respective probability density functions (PDF) will be denoted by $f_X(x)$, $f_Y(x)$, and $f_Z(x)$. The cumulative distribution function (CDF) for X is defined as

$$F_X(x) = \int_{-\infty}^{x} f_X(x)\,dx \qquad (1)$$

The definition of Reliability follows:

$$R_X(x) = 1 - F_X(x) \qquad (2)$$

Distributions representations for X and Z are analogous.

~~A. Statistics~~

A. Addition

The ~~Data~~ PDF of the statistic

$$Z = X + Y \qquad (3)$$

is found through the convolution of the PDF's of X and Y:

$$f_Z(x) = f_X(x) * f_Z(x)$$

$$= \int_{-\infty}^{\infty} f_X(\xi)\, f_Z(x-\xi)\,d\xi$$

$$= \int_{-\infty}^{\infty} f_X(x-\xi)\, f_Z(\xi)\,d\xi \qquad (4)$$

For example, consider the two exponential distributions

$$f_X(t) = \lambda_1 e^{-\lambda_1 t}\,\mu(t)$$

$$f_Y(t) = \lambda_2 e^{-\lambda_2 t}\,\mu(t) \qquad (5)$$

where $\mu(t)$ is the unit step function defined as

$$\mu(t) = \begin{cases} 1 & ; \ x \geq 0 \\ 0 & ; \ x < 0 \end{cases} \qquad (6)$$

Substituting into eqn. 4 gives

$$f_Z(t) = \int_{-\infty}^{\infty} [\lambda_1 e^{-\lambda_1 \xi}\,\mu(\xi)]\,[\lambda_2 e^{-\lambda_2 (t-\xi)}\,\mu(t-\xi)]\,d\xi$$

$$= \lambda_1 \lambda_2 e^{-\lambda_2 t} \int_0^t e^{-(\lambda_1 - \lambda_2)\xi}\,d\xi$$

Evaluation gives the final answer

$$f_Z(t) = \frac{\lambda_1 \lambda_2}{\lambda_1 - \lambda_2}\left[e^{-\lambda_2 t} - e^{-\lambda_1 t}\right] \qquad (7)$$

Combination of PDF's in this manner, of course, need not be limited to PDF's of the same type

B. Subtraction

To determine the resulting ~~relationship~~ distribution of Z

$$Z = X - Y \qquad (9)$$

where $f_X(x)$ and $f_Y(y)$ are known, one merely has to employ the relationship

$$f_{(-Y)}(x) = f_Y(-x) \qquad (10)$$

Equation 9 may be then rewritten as

$$Z = X + (-Y) \qquad (11)$$

and the method [illegible] of statistical [illegible] upon addition can be [illegible] to find the distribution of Z.

Consider, for example, eqs. 5 as applied to the subtraction operation of eq. 9. From eq. 10, we write

$$f_{-Y}(t) = \lambda_2 e^{\lambda_2 t} \mu(-t) \qquad (12)$$

The PDF's of $f_X(t)$ and $f_{-Y}(t)$ need now be convolved as defined in eq. 04 to find $f_Z(t)$

$$f_Z(t) = f_X(t) * f_{-Y}(t)$$

$$= \int_{-\infty}^{\infty} [\lambda_1 e^{-\lambda_1 \xi} \mu(\xi)][\lambda_2 e^{\lambda_2 (t-\xi)} \mu(\xi - t)] d\xi$$

$$= \lambda_1 \lambda_2 e^{\lambda_2 t} \left[\int_0^{\infty} e^{-(\lambda_1 - \lambda_2)\xi} d\xi \, \mu(-t) \right.$$

$$\left. \int_t^{\infty} e^{-(\lambda_1 - \lambda_2)\xi} d\xi \, \mu(t) \right]$$

Evaluation gives the PDF of Z as

$$f_Z(t) = \frac{\lambda_1 \lambda_2}{\lambda_1 - \lambda_2} e^{\lambda_2 t} \left[\mu(-t) \right.$$

$$\left. + e^{-(\lambda_1 - \lambda_2) t} \mu(t) \right] \quad (13)$$

c. Division

The CDF of Z where

$$Z = X/Y \tag{14}$$

may be determined from the following relationship [3,4]:

$$F_Z(x) = \int_{-\infty}^{\infty} F_X(\xi x)\, dF_Y(\xi) \tag{15}$$

Employing the same running example, eqn. 5 becomes via eqn. 1:

$$F_X(t) = [1 - e^{-\lambda_1 t}]\mu(t) \tag{16}$$

$$F_Y(t) = [1 - e^{-\lambda_2 t}]\mu(t) \tag{17}$$

Thus

$$dF_Y(t) = \lambda_2 e^{-\lambda_2 t}\mu(t)\, dt$$

Substituting into eqn. 15 gives

$$F_Z(t) = \int_{-\infty}^{\infty} [1 - e^{-\lambda_1 t\xi}]\mu(t\xi) \times \lambda_2 e^{-\lambda_2 \xi}\mu(\xi)\, d\xi$$

$$= \lambda_2 \int_0^{\infty} [1 - e^{-\lambda_1 t\xi}] e^{-\lambda_2 \xi}\, d\xi\, \mu(t) \tag{18}$$

Evaluation gives the CDF of Z as

$$F_Z(t) = \left[1 - \frac{\lambda_2}{\lambda_1 t + \lambda_2}\right] \mu(t) \tag{19}$$

$$= \frac{\lambda_1 t}{\lambda_1 t + \lambda_2} \mu(t)$$

Since

$$\frac{d}{dt} F_Z(t) = f_Z(t) \tag{20}$$

we have the final desired PDF of Z:

$$f_Z(z) = \frac{\lambda_1 \lambda_2}{(\lambda_1 t + \lambda_2)^2} \mu(t) \tag{22}$$

On general:

$$dF_{\frac{1}{I}}(t) = f_{\frac{1}{I}}(t)\,dt \qquad (26)$$

Thus, from eq. 25

$$dF_{\frac{1}{Z}}(t) = \frac{1}{t^2} f_{\frac{1}{Y}}\left(\frac{1}{t}\right) dt \qquad (27)$$

Substituting appropriately into eq. 15 (with $dF_{\frac{1}{X}}(\xi)$ substituted for $dF_X(\xi)$) gives

$$F_Z(t) = \int_{-\infty}^{\infty} F_X(\xi x)\left[\frac{1}{\xi^2} f_Y\left(\frac{1}{\xi}\right)\right] d\xi \qquad (28)$$

Consider, as an example, the following uniform PDF's

$$f_X(t) = \frac{1}{b}\mu(t)\mu(b-t) \quad ; b>1$$

$$f_Y(t) = \frac{1}{a}\mu(t)\mu(a-t) \quad ; a>1 \tag{29}$$

From eq. 1

$$F_X(t) = \frac{t}{b}\mu(t)\mu(b-t) + \mu(t-b) \tag{30}$$

Substituting into eq. 28 gives

$$F_Z(t) = \int_{-\infty}^{\infty} \left[\frac{\xi t}{b}\mu(t\xi)\mu(b-\xi t) + \mu(\xi t - b)\right] \times \frac{1}{a\xi^2}\mu\left(\frac{1}{\xi}\right)\mu\left(a-\frac{1}{\xi}\right)\Big] d\xi \tag{31}$$

Since

$$\mu\left(\frac{1}{\xi}\right) = \mu(\xi) \tag{32}$$

and

$$\mu\left(a-\frac{1}{\xi}\right) = \mu\left(\xi - \frac{1}{b}\right) \quad ; \quad b, \xi > 0 \tag{33}$$

eq. 31 simplifies to

$$F_Z(t) = \int_{1/b}^{\infty} \left[\frac{t}{ab\xi}\mu(t\xi)\mu(b-\xi t) + \frac{1}{a\xi^2}\mu(\xi t - b)\right] d\xi \tag{33}$$

D. Multiplication

The remaining elementary arithmetic operation is ~~the parametric~~ statistical parameter multiplication

$$Z = XY \tag{23}$$

One may employ the division method for analyzing multiplication if the PDF or CDF of the inverse of either X or Y can be generated. That is, we look at eq. 23 as

$$Z = \frac{X}{\frac{1}{Y}} \tag{24}$$

Under certain regularity conditions, the PDF of a statistic's inverse may be written as [see Appendix]

$$f_{\frac{1}{X}}(t) = \frac{1}{t^2} f_X\left(\frac{1}{t}\right) \tag{25}$$

Thus, for the exponential distribution of eq. 1

$$F_{\frac{1}{X}}(t) = \int_{-\infty}^{t} \frac{1}{x^2} f_X\left(\frac{1}{x}\right) dx \tag{23}$$

THERMAL STABILITY PROGRAM PROGRESS REPORT
(22 Nov 74)

1. Test Instrument Status:
The Thermal Stability Program has been reactivated. All needed test equipment has been sent to calibration for reactivation. Sufficient instruments have been returned to execute periodic and functional testing except for the capacitance bridge. A bridge was borrowed, but does not measure capacitance to a sufficient range.

2. Thermal Chamber Status:
All but one thermal chamber (Standard #2413) is incapable of testing. The constant temperature (Associated) chamber needs the strip chart recorder which is presently in electromechanical calibration on priority. Standard Chambers #2427 and #2413 have faulty mechanical refrigeration. Standard Chamber #2426 does not cycle properly. Steps toward repair of these three chambers through their warranty have been taken. Peters, of Contract Administration, is handling manufacturer contact.

3. Testing Status:
In reference to the attached topological overview of the testing plan:

a. Darkened in cells correspond to completed testing prior to cancellation of funds (1 Oct 74).

b. Additional testing executed in the only operational chamber (Standard #2413) is

(1) Completion of 10^0 to 20^0 at 3 hours, rep. 1 to 750 hours

(2) Initiation of 15^0 to 55^0 at 3 hours, rep. 2. This test is scheduled for completion to 250 hours on 2 Dec 74.

c. Previous program philosophy calls for executing each run in the same environmental chamber. Identical runs from different repetitions are to be run in different chambers. (Chambers in which runs were executed are listed in the 0 hour blocks of the attached test plan topological overview.) The present program aim is test completion in repetitions 1 and 2 to 1000 hours as chamber capability, program philosophy, and time permit.

4. Test Instrument Procurement Status:
The following test instruments are in the process of being requested from DIPEC:

a. Frequency Counters (1)

b. Precision Noise Generators (1)

c. Automatic Capacitance Bridges (2)

d. Percision Digital Voltmeters (2)

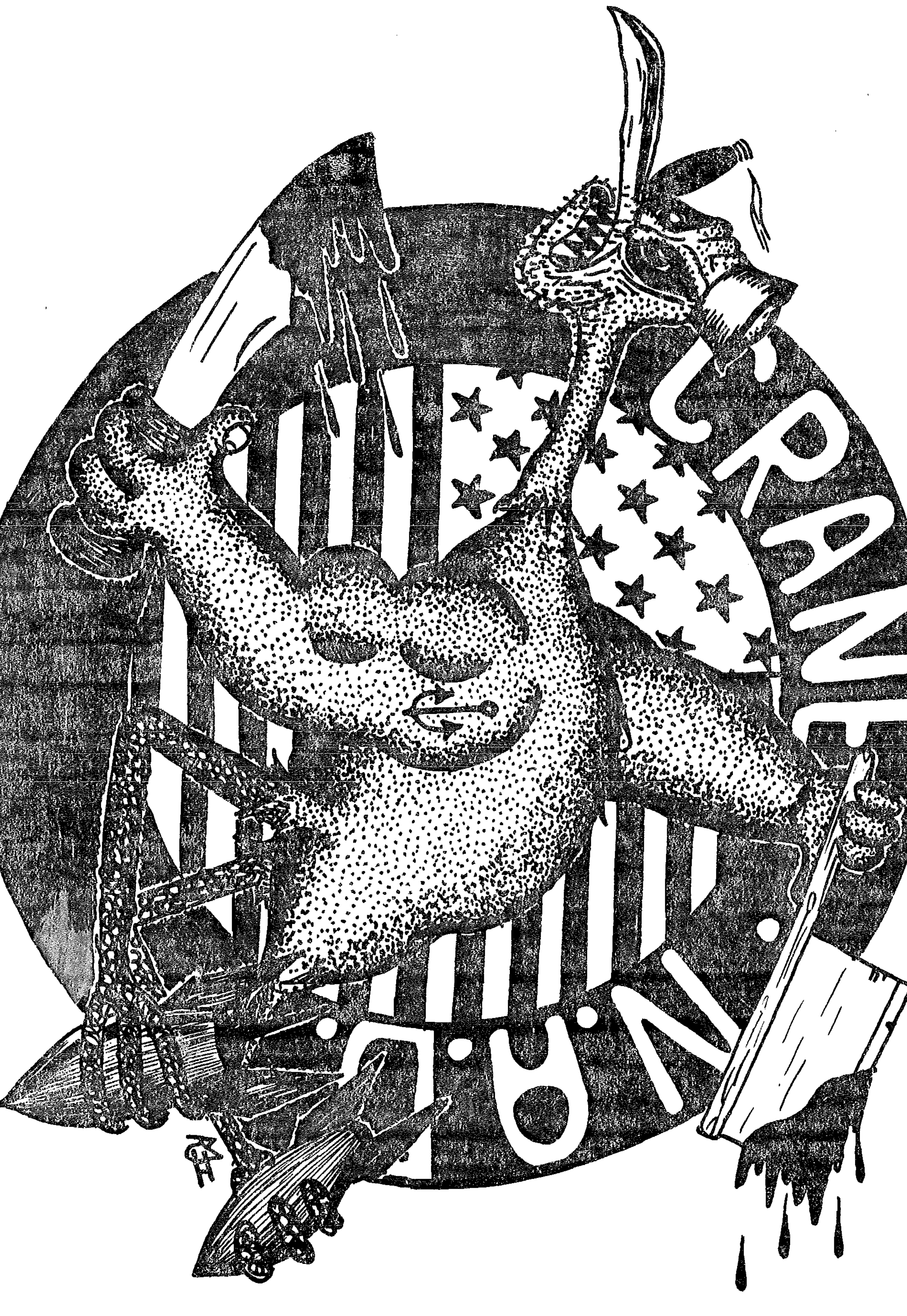
e. General Purpose Curve Tracer (1)

5. Lab Security Status:
Jimmy Stevens of the Lock Shop has inspected the lockers in the lab, and is presently procuring necessary items for their additional security.

6. Report Status:
The Test Procedure for the Thermal Stability Program has been completed and is awaiting high level approval.

The quarterly report for the first quarter of FY 75 has been completed and is awaiting high level approval.


GRANF
U.S.A.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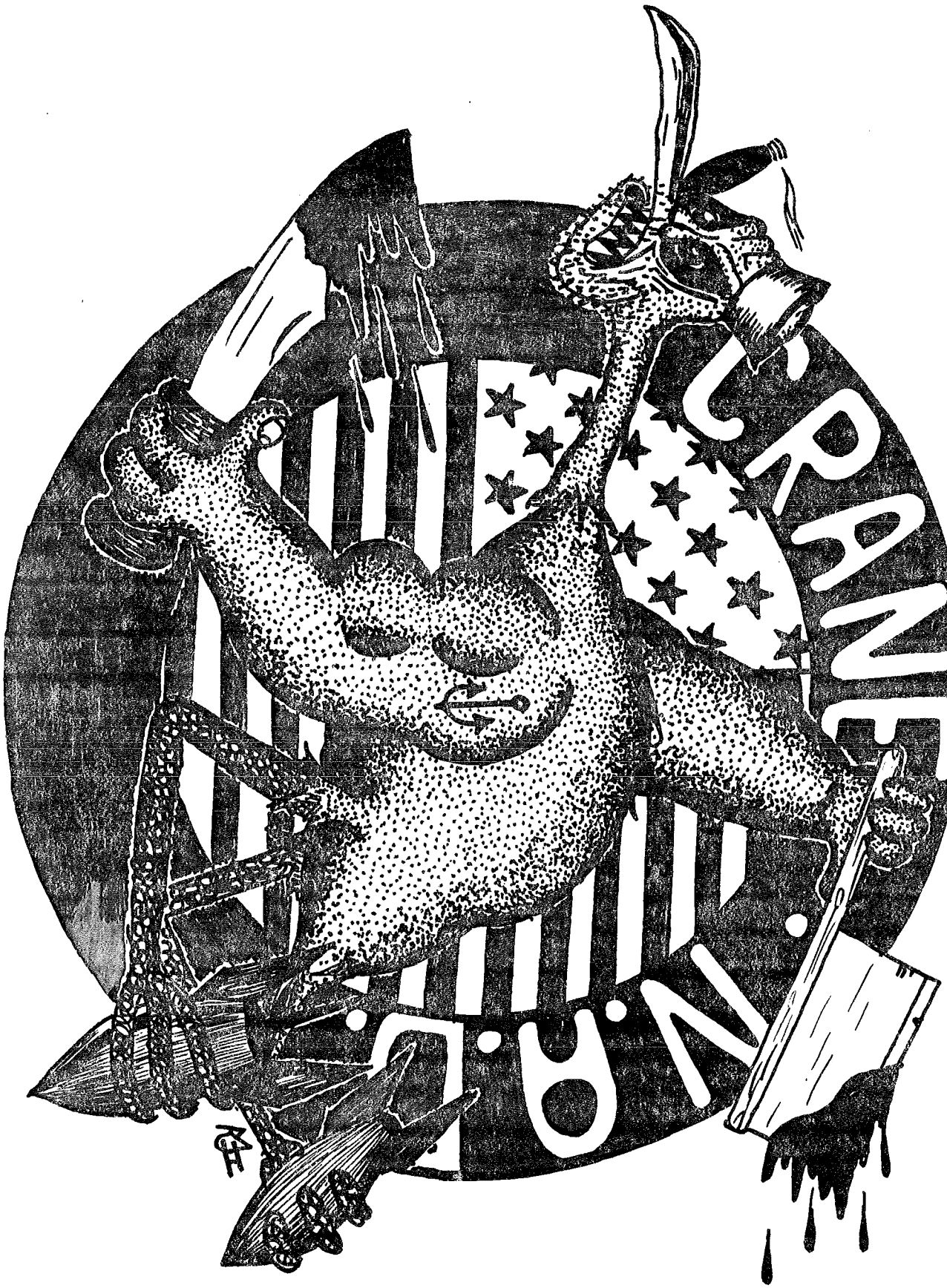
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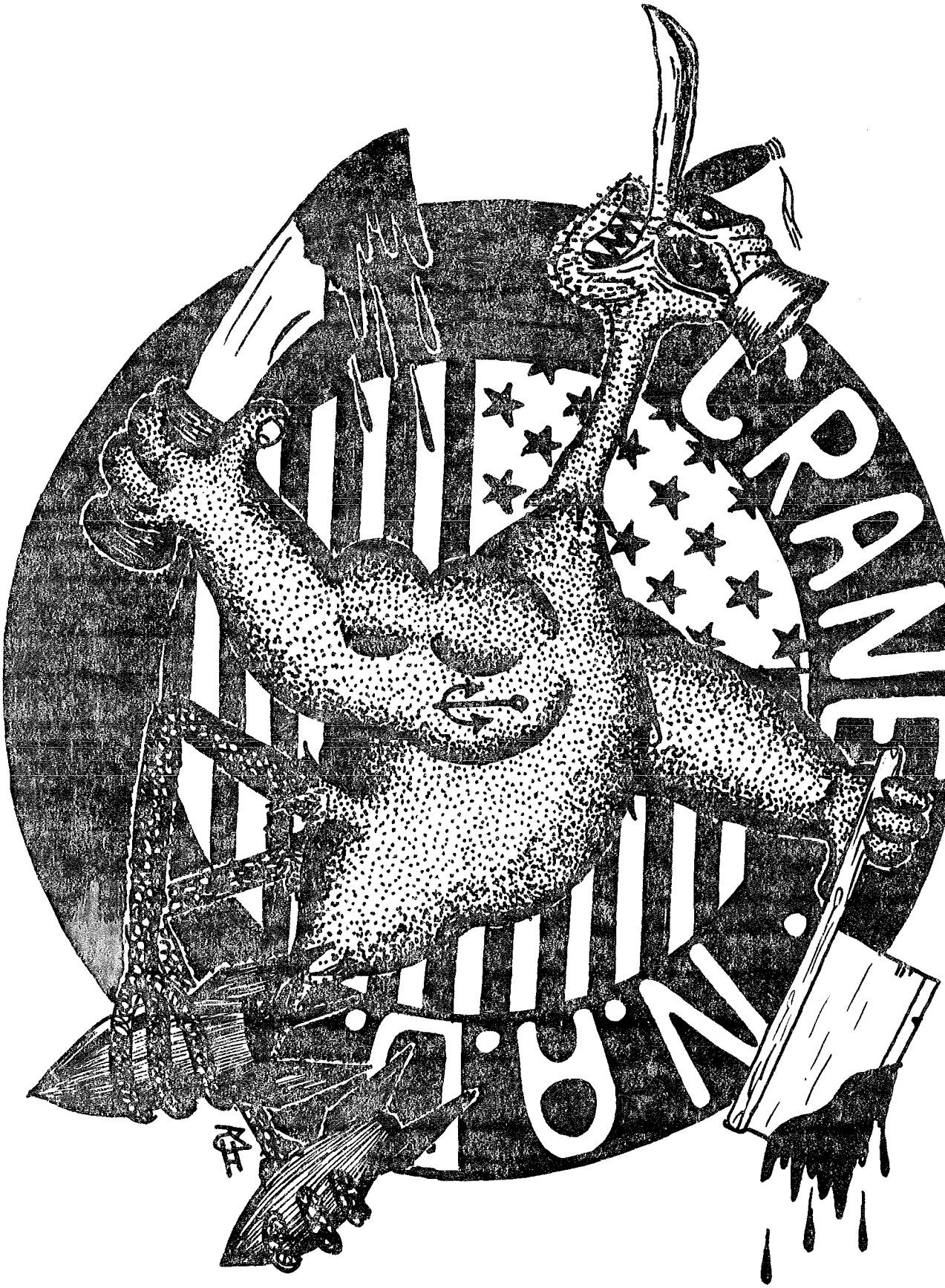
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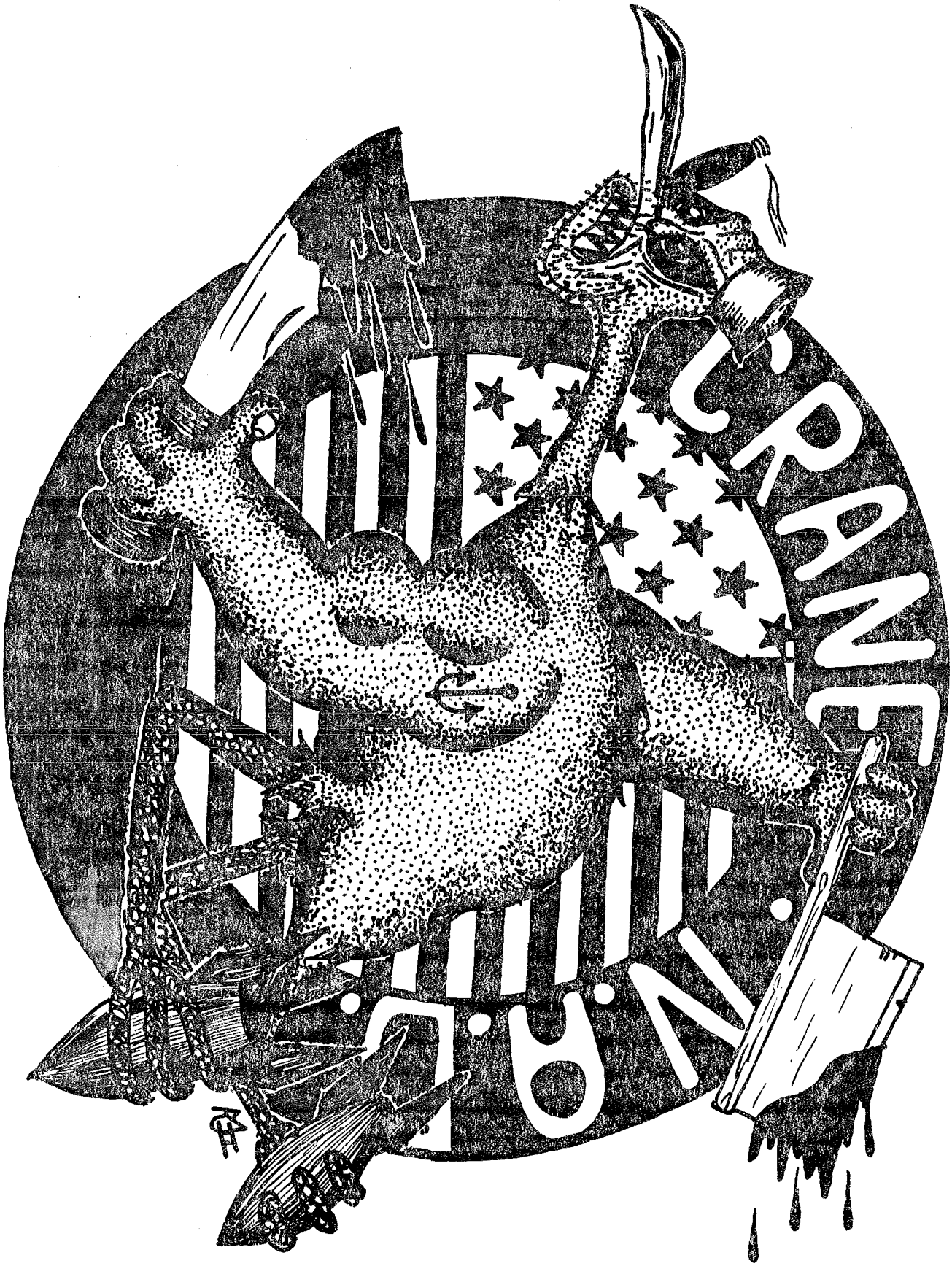
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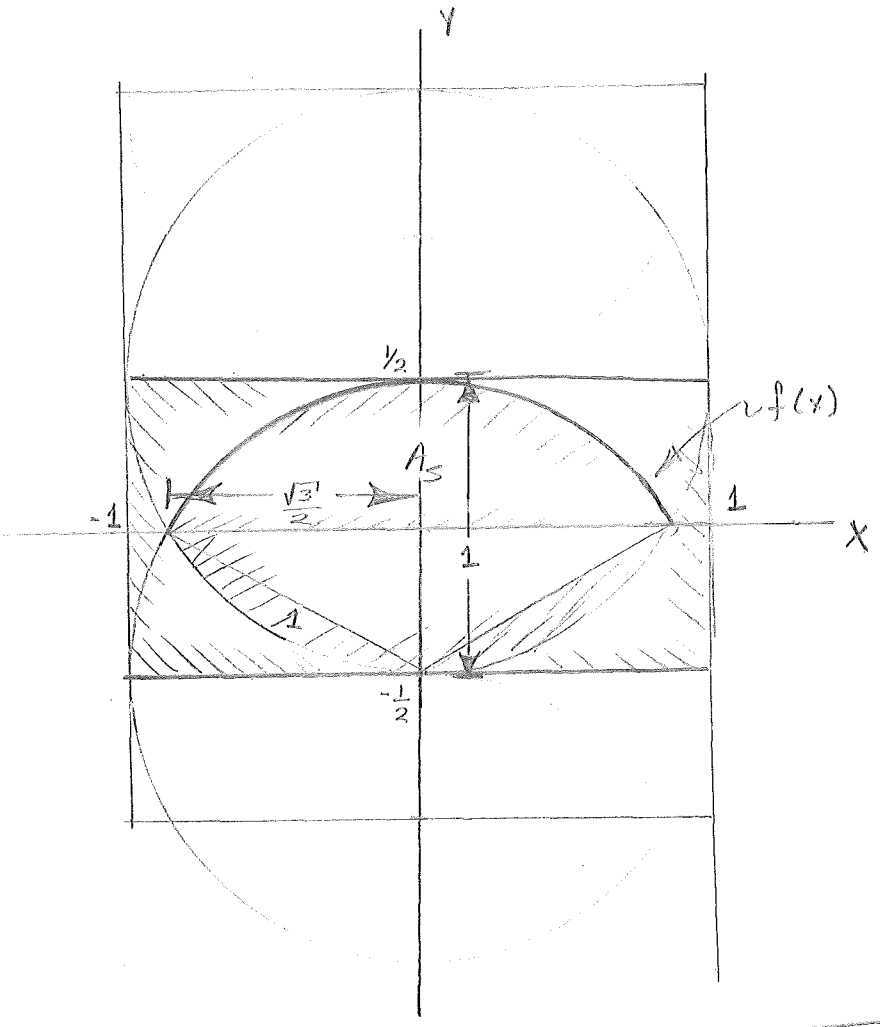
$$P[\text{suc}] = \frac{3\sqrt{3}}{4} + \frac{\pi}{6}$$



$f(x)$: $x^2 + (y - \frac{1}{2})^2 = 1 \Rightarrow f(x) = \sqrt{1 - x^2} + \frac{1}{2}$

$$A = 2\int_0^{\sqrt{3}/2} \left[\sqrt{1 - x^2} + \frac{1}{2}\right] dx$$

$x = \sin\phi \Rightarrow dx = \cos\phi\, d\phi$

$x = 0 \Rightarrow \phi = 0$

$x = \frac{\sqrt{3}}{2} \Rightarrow \phi = \frac{\pi}{3}$

$$\therefore A = 2\int_0^{\pi/3} \left[\cos\phi + \frac{1}{2}\right]\cos\phi\, d\phi$$

$$= 2\int_0^{\pi/3} \left[\cos^2\phi + \frac{1}{2}\cos\phi\right] d\phi$$

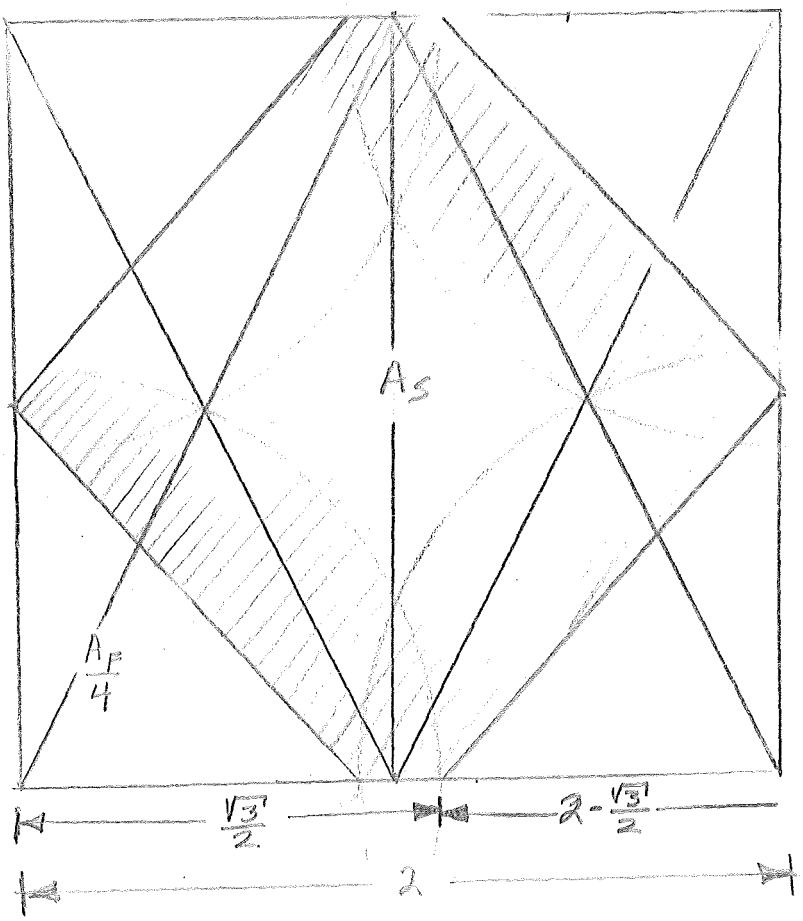
$$= \left[\sin\phi\cos\phi + \phi\right]_0^{\pi/3} + \sin\phi\Big|_0^{\pi/3}$$

$$= \left[\frac{\sqrt{3}}{2} \times \frac{1}{2}\right] + \frac{\pi}{3} + \frac{\sqrt{3}}{2}$$

$$= \frac{3\sqrt{3}}{2} + \frac{\pi}{3}$$

$A_T = 2$

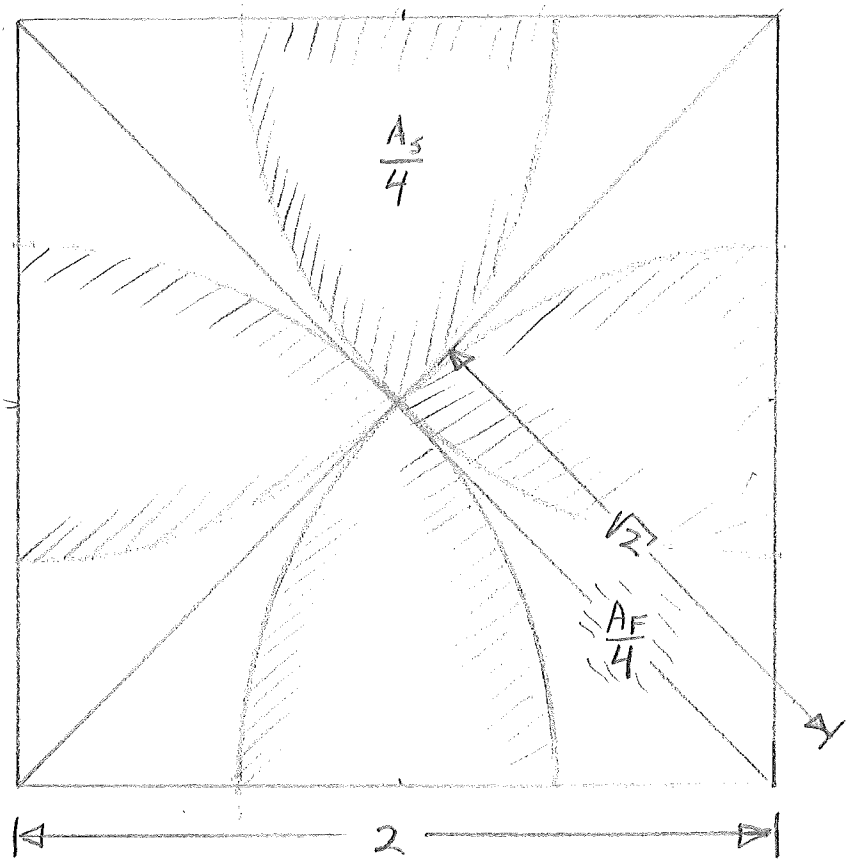
$P[suc] = \frac{1}{2} + \frac{\sqrt{3}}{8}$



$A_F = 2 - \frac{\sqrt{3}}{2}$; $A_T = 4$

$A_S = A_T - A_F = 2 + \frac{\sqrt{3}}{2}$

$P[\text{SUCCESS}] = \frac{A_S}{A_T} = \frac{1}{2} + \frac{\sqrt{3}}{8}$



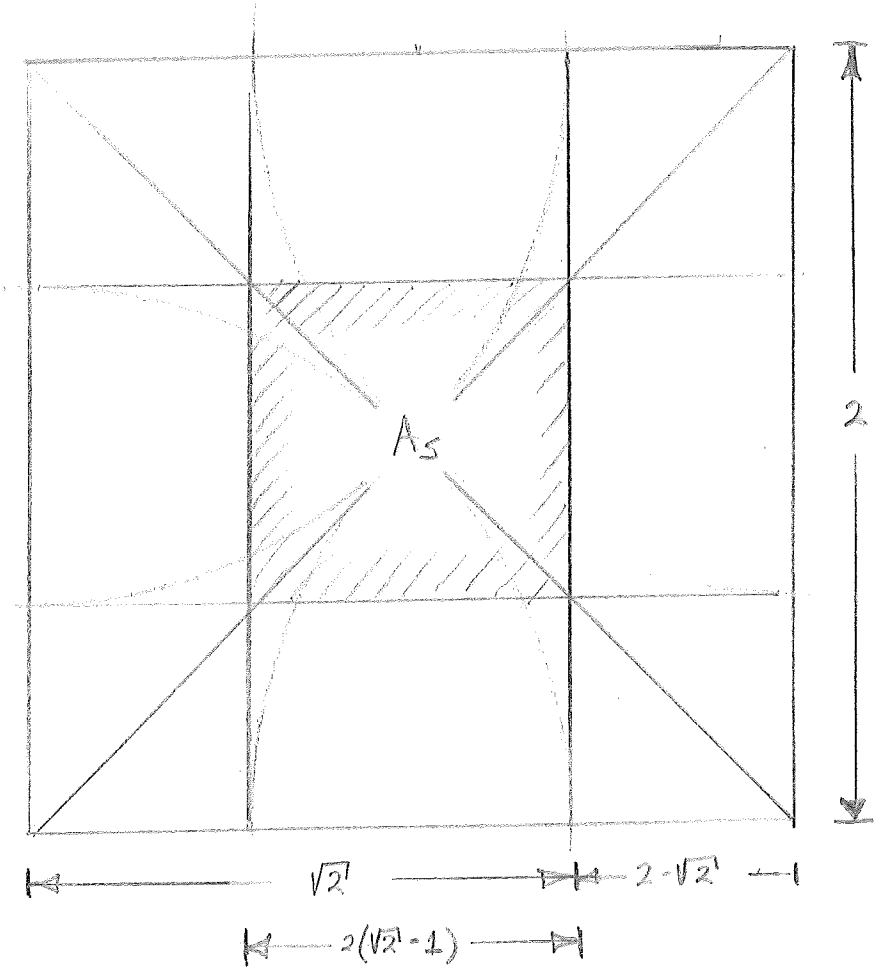
$P[\text{SUCCESS}] = \frac{\pi}{2} - 1$

$$2\left(\frac{A_S}{4}\right) + \frac{A_F}{4} = \frac{1}{4}(2\pi) \Rightarrow 2A_S + A_F = 2\pi$$

$$A_T = A_S + A_F = 4$$

$$\therefore A_S = 2\pi - 4$$

$$P[\text{suc}] = \frac{A_S}{A_T} = \frac{\pi}{2} - 1$$



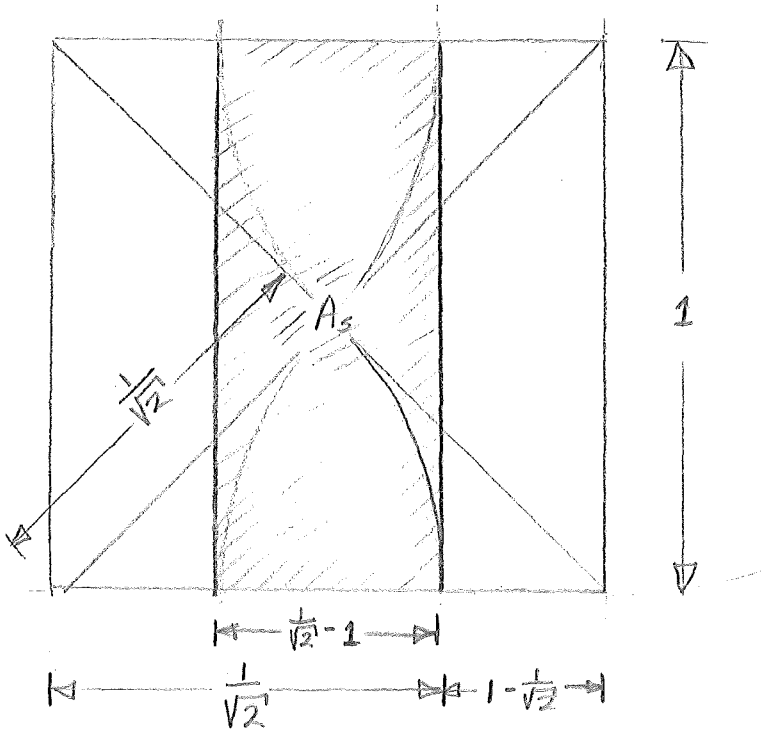
$P[suc] = 3 - 2\sqrt{2}$

$A_S = [2(\sqrt{2}-1)]^2$

$= 4(2+1-2\sqrt{2})$

$= 4(3-2\sqrt{2})$

$A_T = 4$

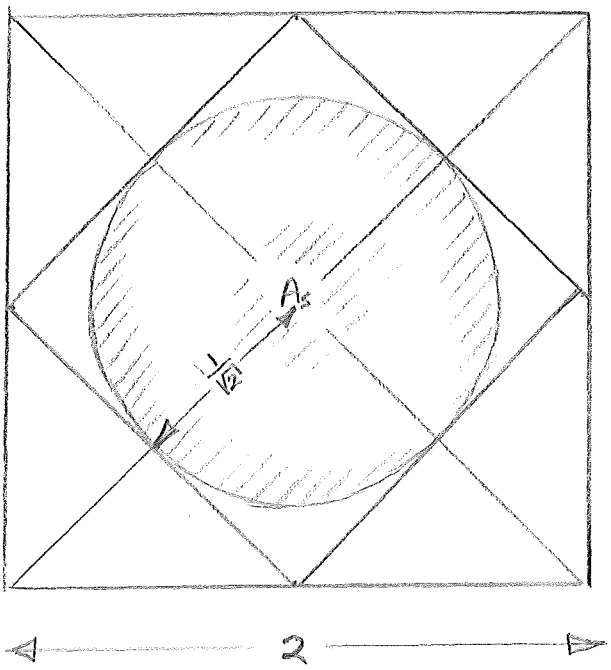


$P[\text{SUCCESS}] = \frac{1}{\sqrt{2}} - 1$

FROM FIGURE'S GEOMETRY:

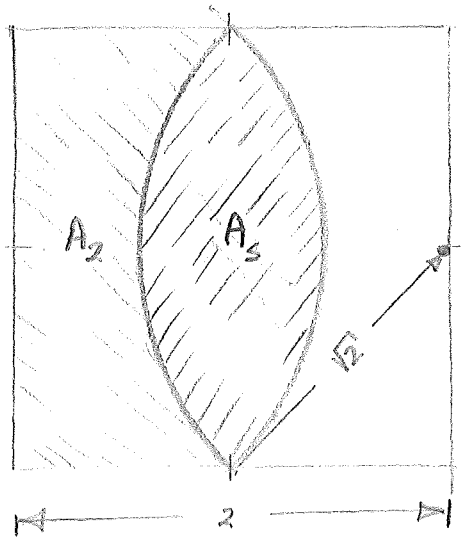
$$A_S = \frac{1}{\sqrt{2}} - 1$$

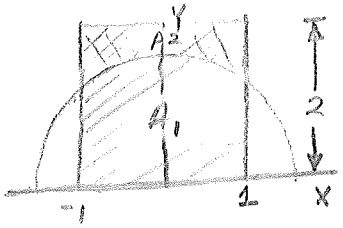
$$\Rightarrow P[\text{SUCCESS}] = \frac{A_S}{A_T} = \frac{1}{\sqrt{2}} - 1$$



$$P[\text{success}] = \frac{\pi}{8}$$

$$P[\text{SUCCESS}] = \frac{\pi}{4} - \frac{1}{2}$$





$\Rightarrow x^2 + y^2 = 2$

$A_1 = 2\int_0^1 \sqrt{2 - x^2}\, dx$

$x = \sqrt{2}\sin\phi \Rightarrow dx = \sqrt{2}\cos\phi\, d\phi$

$x = 0 \Rightarrow \phi = 0$

$x = 1 \Rightarrow \phi = \frac{\pi}{4}$

$\Rightarrow A_1 = 2\int_0^{\pi/4} \sqrt{2 - 2\sin^2\phi} \times \sqrt{2}\cos\phi\, d\phi$

$= 4\int_0^{\pi/4} \cos^2\phi\, d\phi$

$= 2\left[\sin\phi\cos\phi + \phi\right]_0^{\pi/4}$

$= 2\left[\frac{1}{2} + \frac{\pi}{4}\right] = 1 + \frac{\pi}{2}$

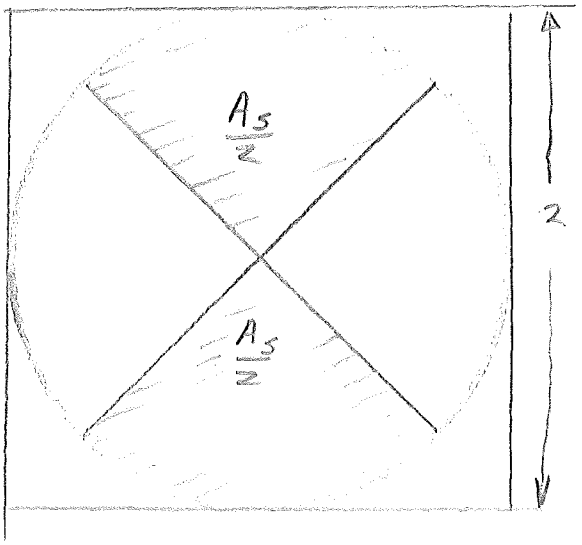
$\therefore A_2 = 4 - A_1$

$= 4 - \left(1 + \frac{\pi}{2}\right)$

$= 3 - \frac{\pi}{2} \Rightarrow A_s = 4 - 2A_2 = 4 - 6 + \pi$

$= \pi - 2$

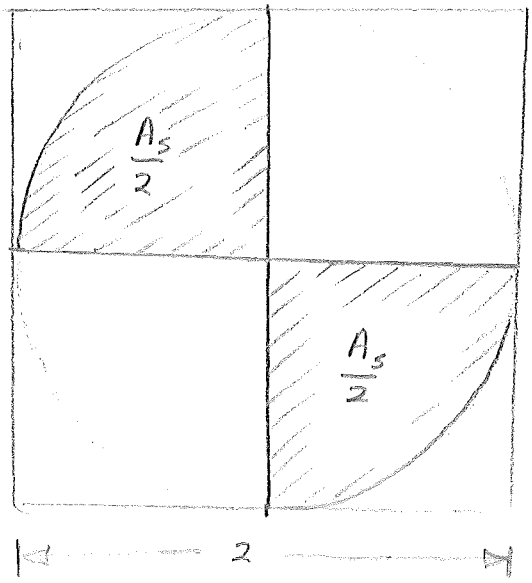
$$P[\text{SUCCESS}] = \frac{A_s}{\text{AREA OF SQUARE}} = \frac{\pi}{4} - \frac{1}{2}$$



AS WITH #2:

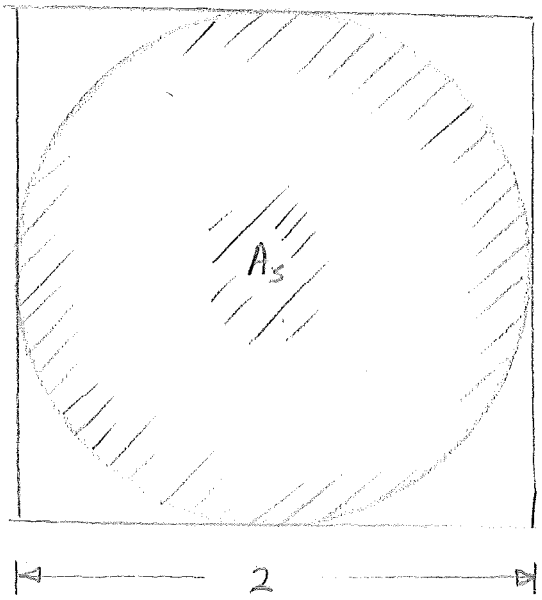
$P[\text{SUCCESS}] = \frac{\pi}{8}$

$P[\text{success}] = \frac{\pi}{8}$



$A_s = \frac{\pi}{2}$

$P[\text{success}] = \frac{A_s}{A_T} = \frac{\pi}{8}$



$P[\text{SUCCESS}] = \frac{\pi}{4}$

$A_s = \pi$

$$P[\text{SUCCESS}] = \frac{A_s}{\text{SQUARE AREA}} = \frac{\pi}{4}$$

"THERMAL CYCLING REVIEW MEETING"

PRESENTED AT

NAD CRANE

WQEC

by GEORGE ALLEN
BOB MARKS
TIM WILLIAMS

7/16/74

PRESENTATION OUTLINE

I. INTRODUCTION

II. THERMAL SURVEYS

III. DATA FILE PRESENTATION

IV. TEMPERATURE CYCLING RESULTS

V. TEST UNITS AND PROCEDURE

VI. PROM PROGRAMMING DATA

VII. LAB TOUR AND DEMONSTRATION

VIII. SUMMARY, CONCLUSIONS, DISCUSSI

FIGURE 4

F-4 AIRCRAFT ENVIRONMENTAL CONTROL SYSTEM PERFORMANCE

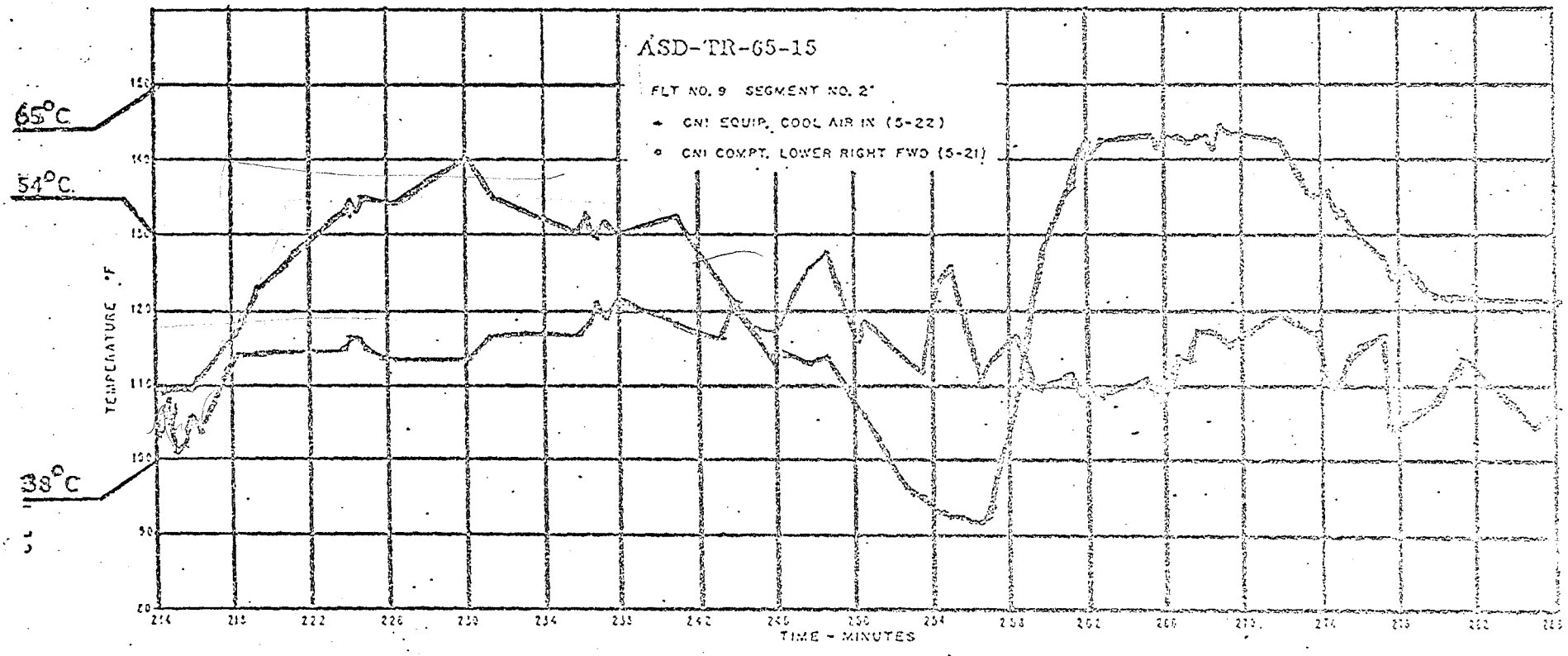
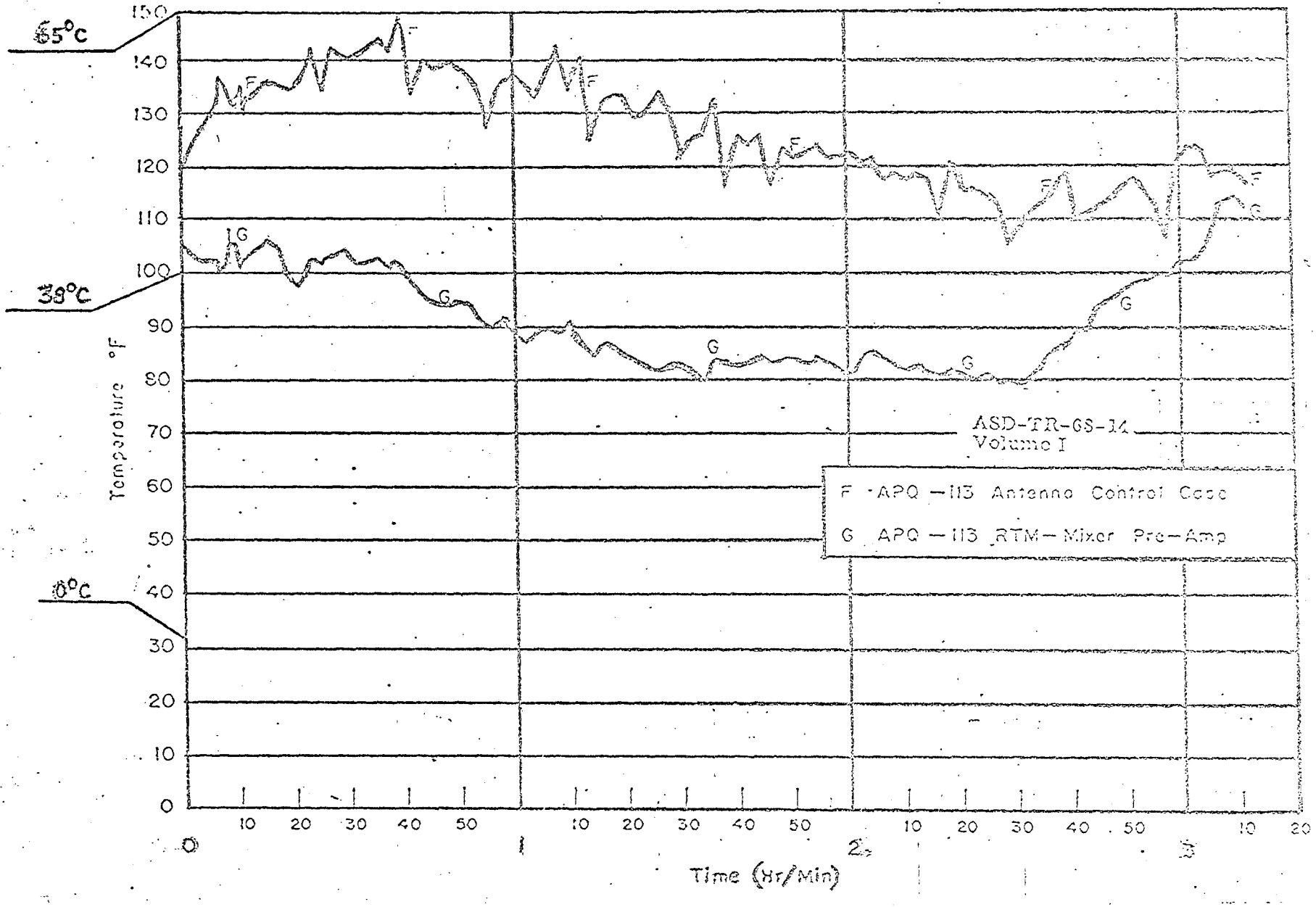


FIGURE 3

F-111 AIRCRAFT ENVIRONMENTAL CONTROL SYSTEM PERFORMANCE



OBJECTIVES

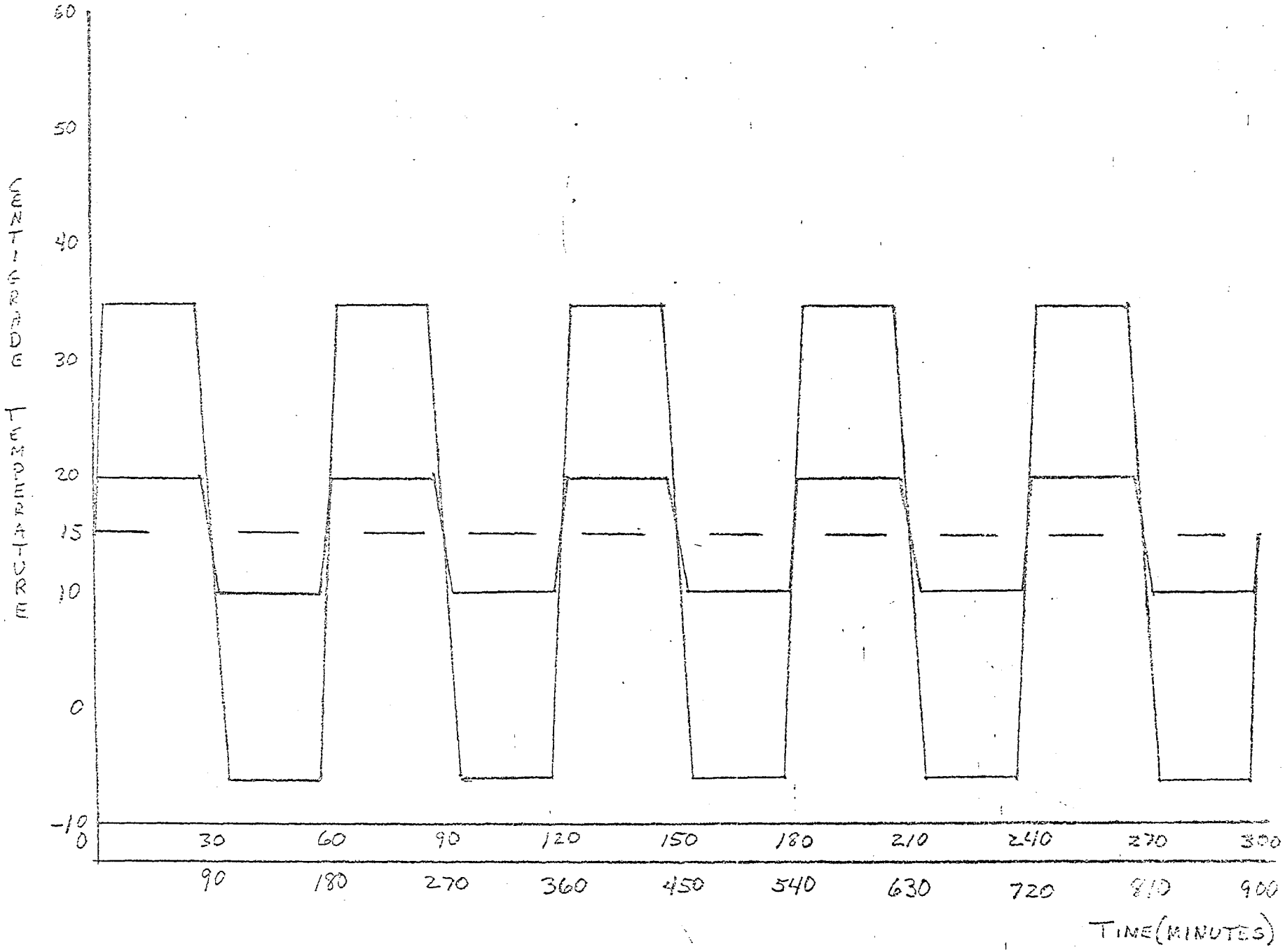
- DETERMINE WHEN THERMAL CYCLING DEGRADES RELIABILITY
- IDENTIFY LIMITS OF DEGRADATION EFFECT
  - CYCLE PERIOD
  - TEMPERATURE RANGE
  - MEAN TEMPERATURE
- IDENTIFY SPECIFICATION PARAMETERS TO CONTROL FUTURE DEGRADATION

APPROACH

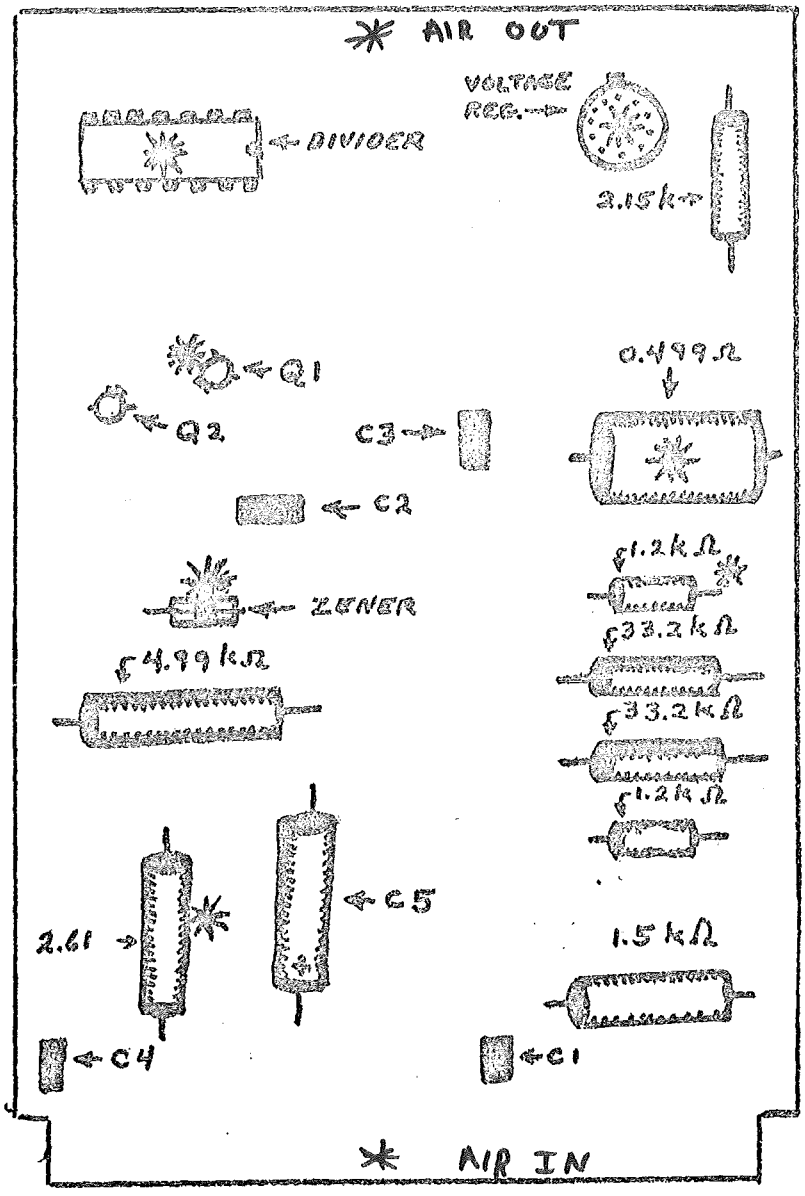
- PROCURE TEST SAMPLES
- IDENTIFY ENVIRONMENTS
- OBTAIN TEST EQUIPMENT
- IDENTIFY TEST PARAMETERS
- INITIATE TESTING
- MONITOR TESTING
- IDENTIFY FAILURES
- ANALYSE RESULTS
- REPORT ANALYSES

SIDE STUDY (PROMS)

- NICHROME RESISTOR "LINK" FUSING ANALYSIS
- NICHROME PROGRAMMING HISTORY
- VENDER PRODUCT EVALUATION
- FMEA ON NICHROME PROMS

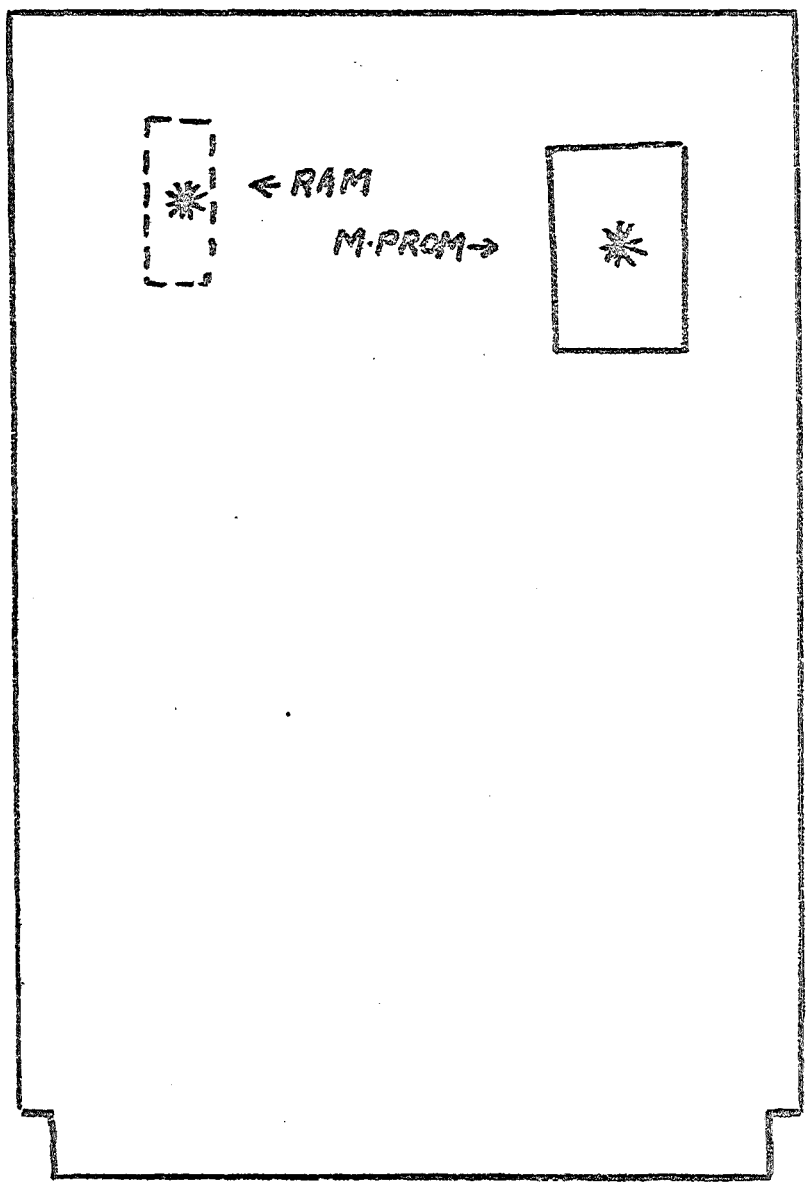

60
50
40
30
20
15
10
0
-10
CENTIGRADE TEMPERATURE
0
30
60
90
120
150
180
210
240
270
300
90
180
270
360
450
540
630
720
810
900
TIME(MINUTES)

CARD # 1

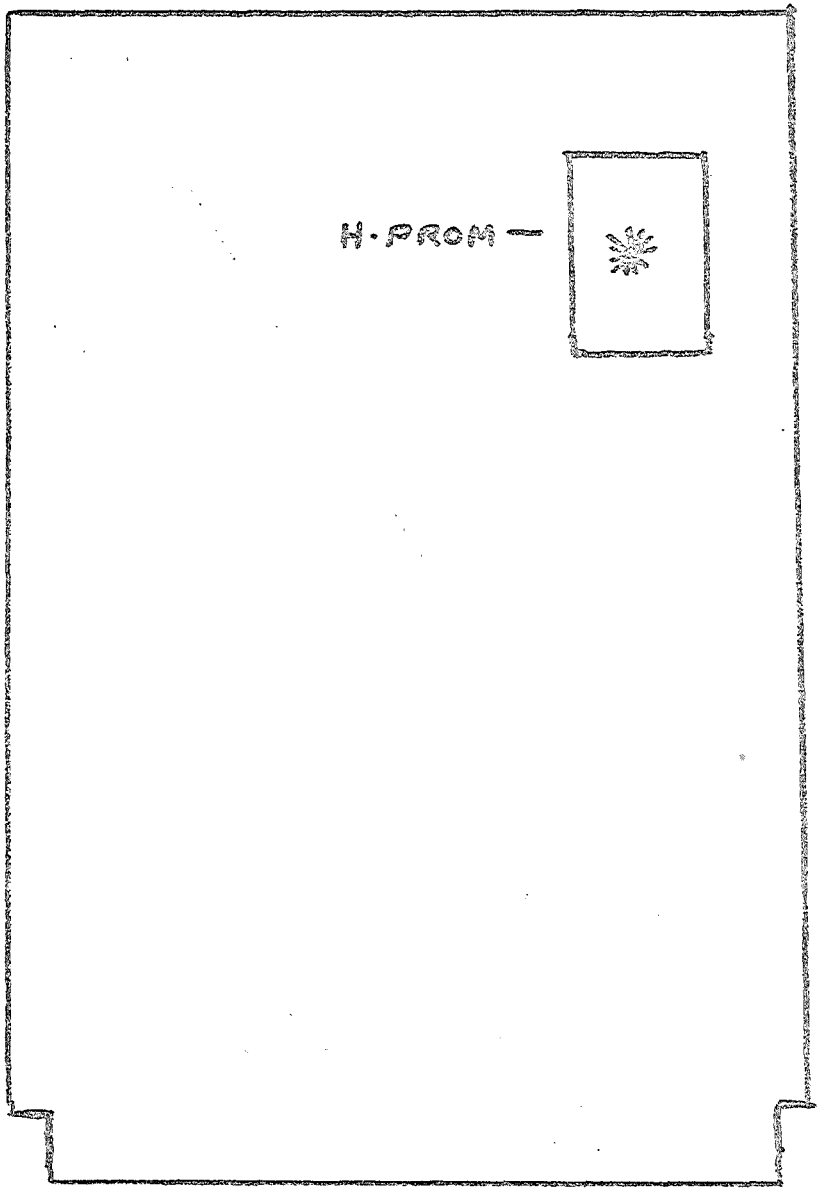


* MONITORED COMPONENTS

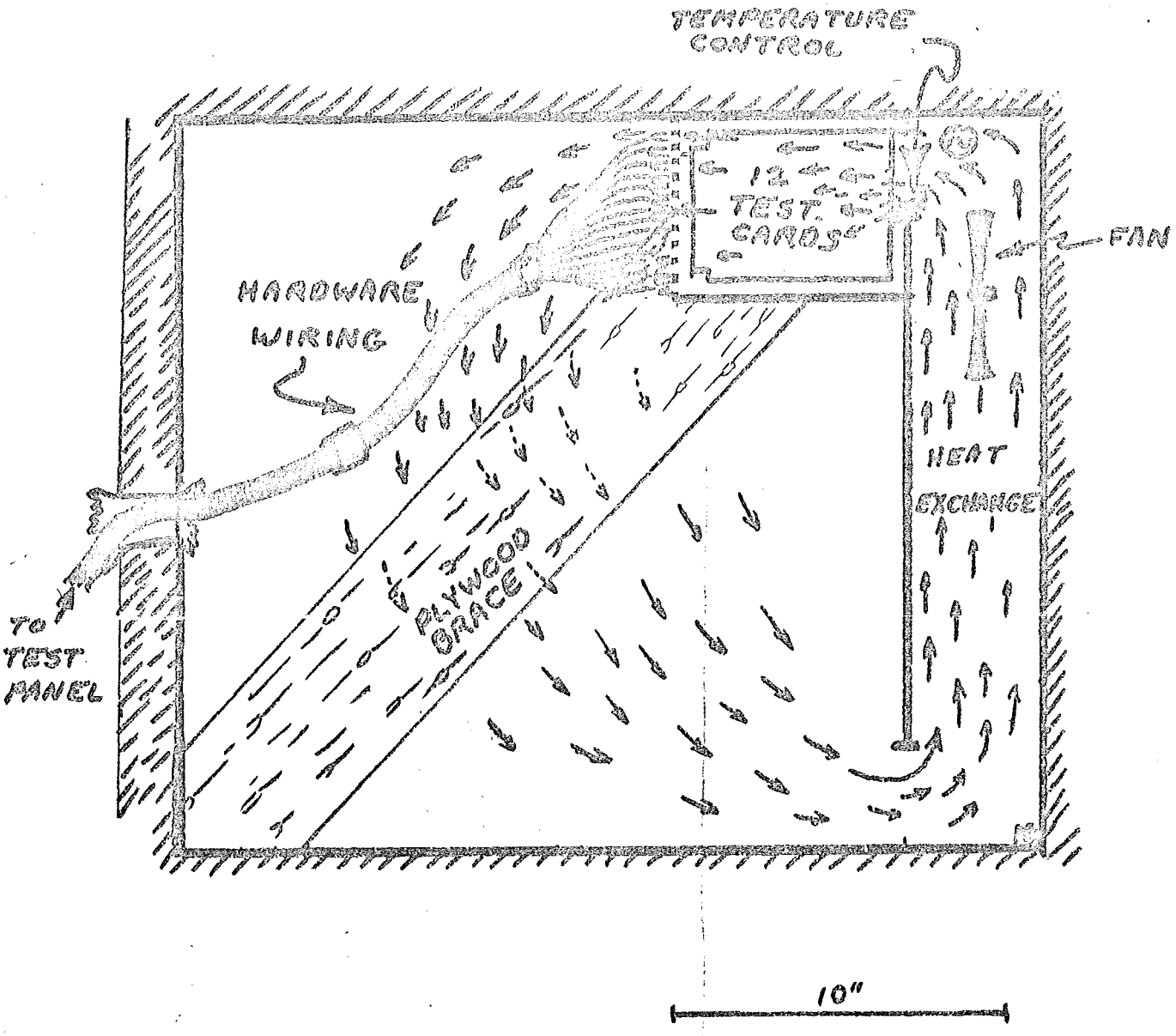
CARD #2

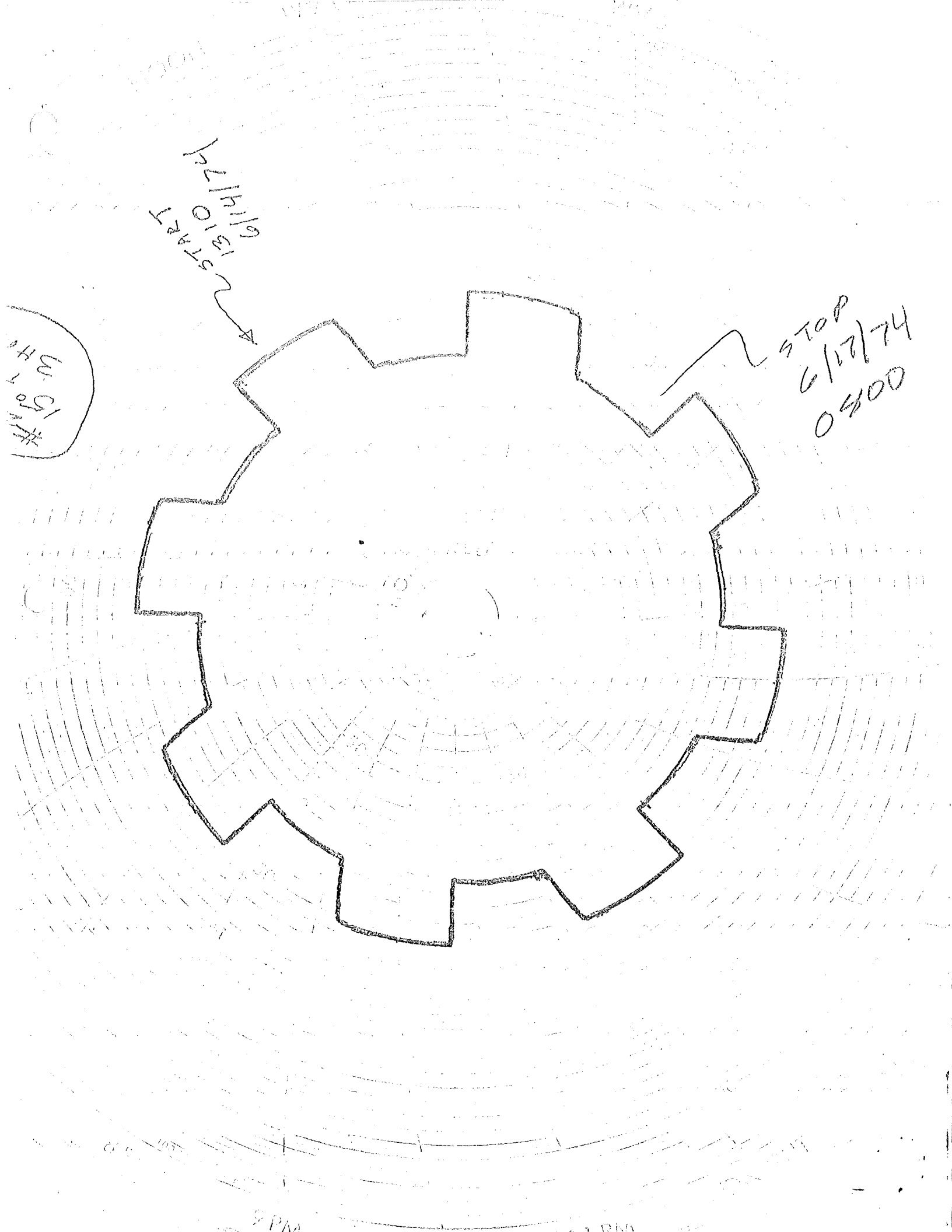


CARD #3



FLOW DIAGRAM




6/17/74
0400

0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
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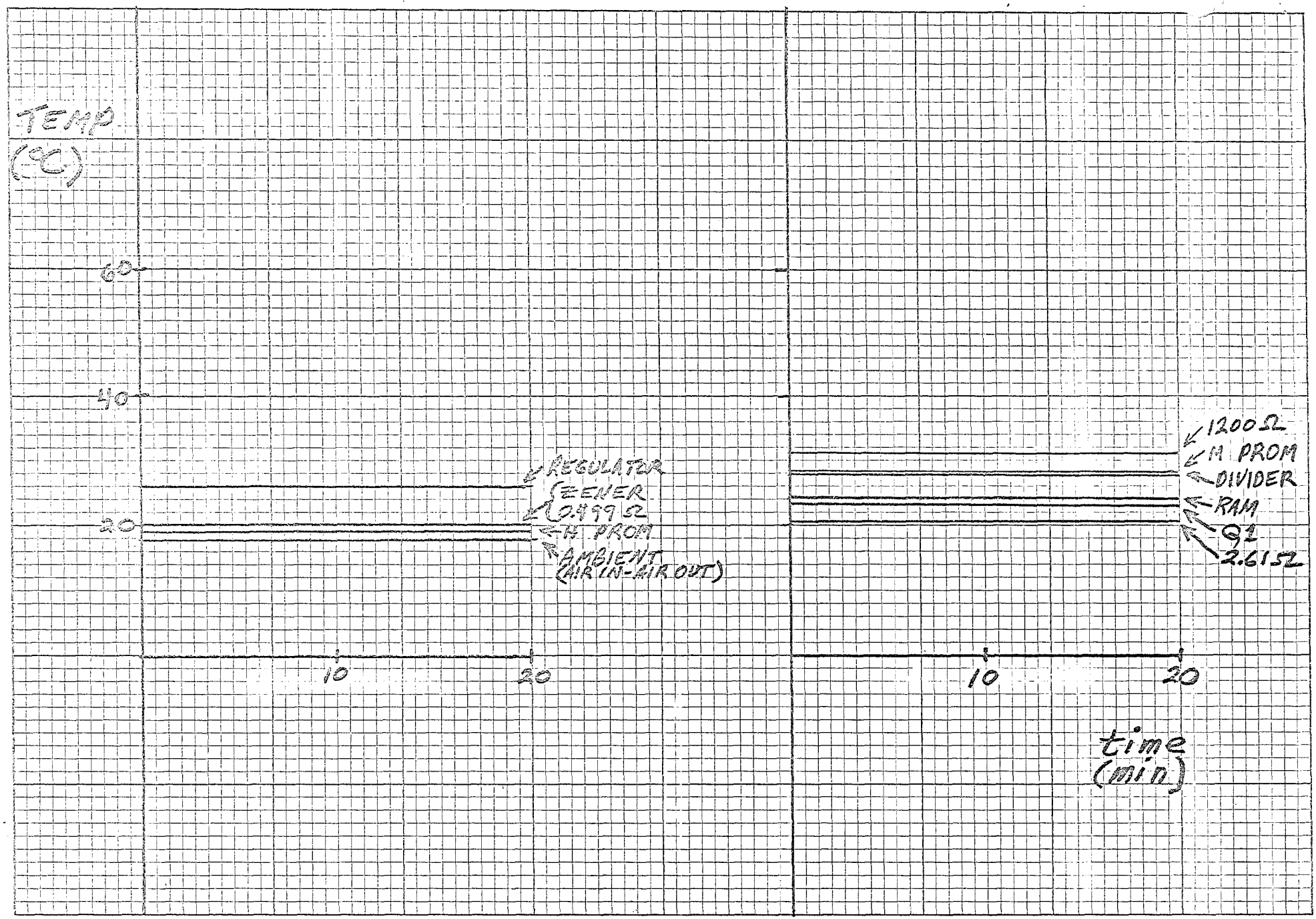
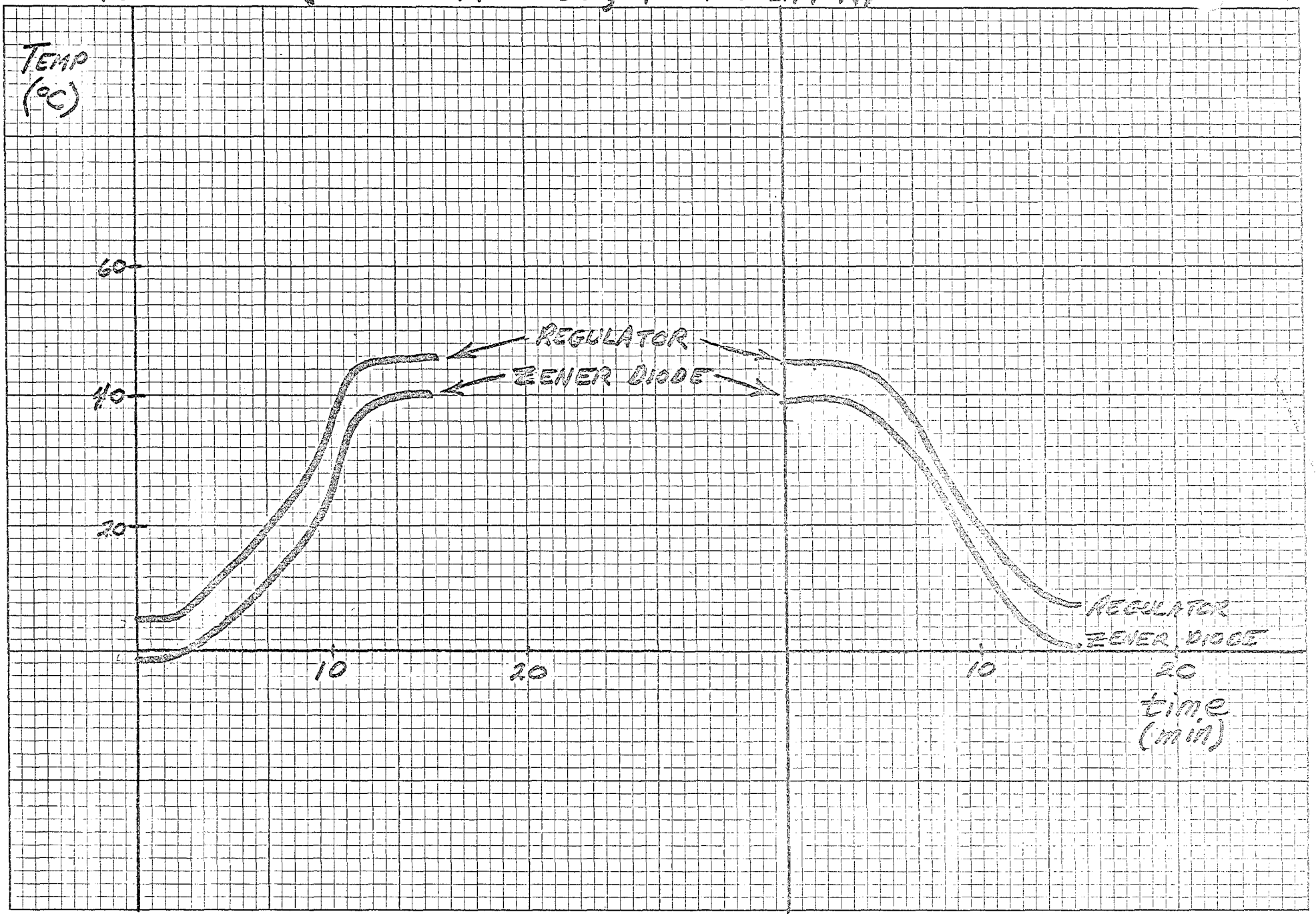


-50 to 35°C (AMBIENT)

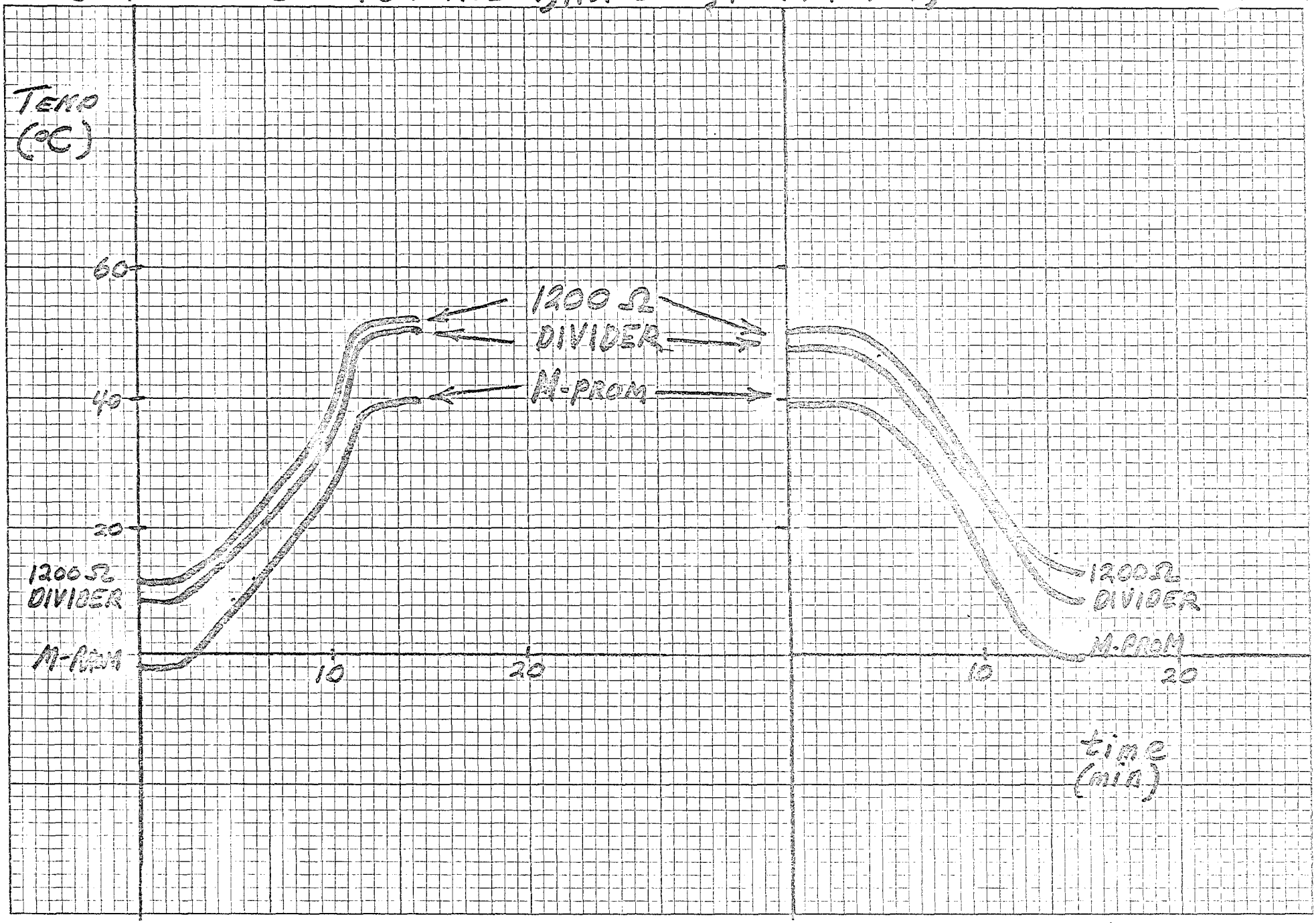
-5°C to 35°C (1-0.499Ω, 2-H-PROM)

5° to 35°C (3-ZENER DIODE, 4 REGULATOR)



-5°C to 35°C (5-2.61Ω, 6-Q1·2N22[illegible], 7-RAM)

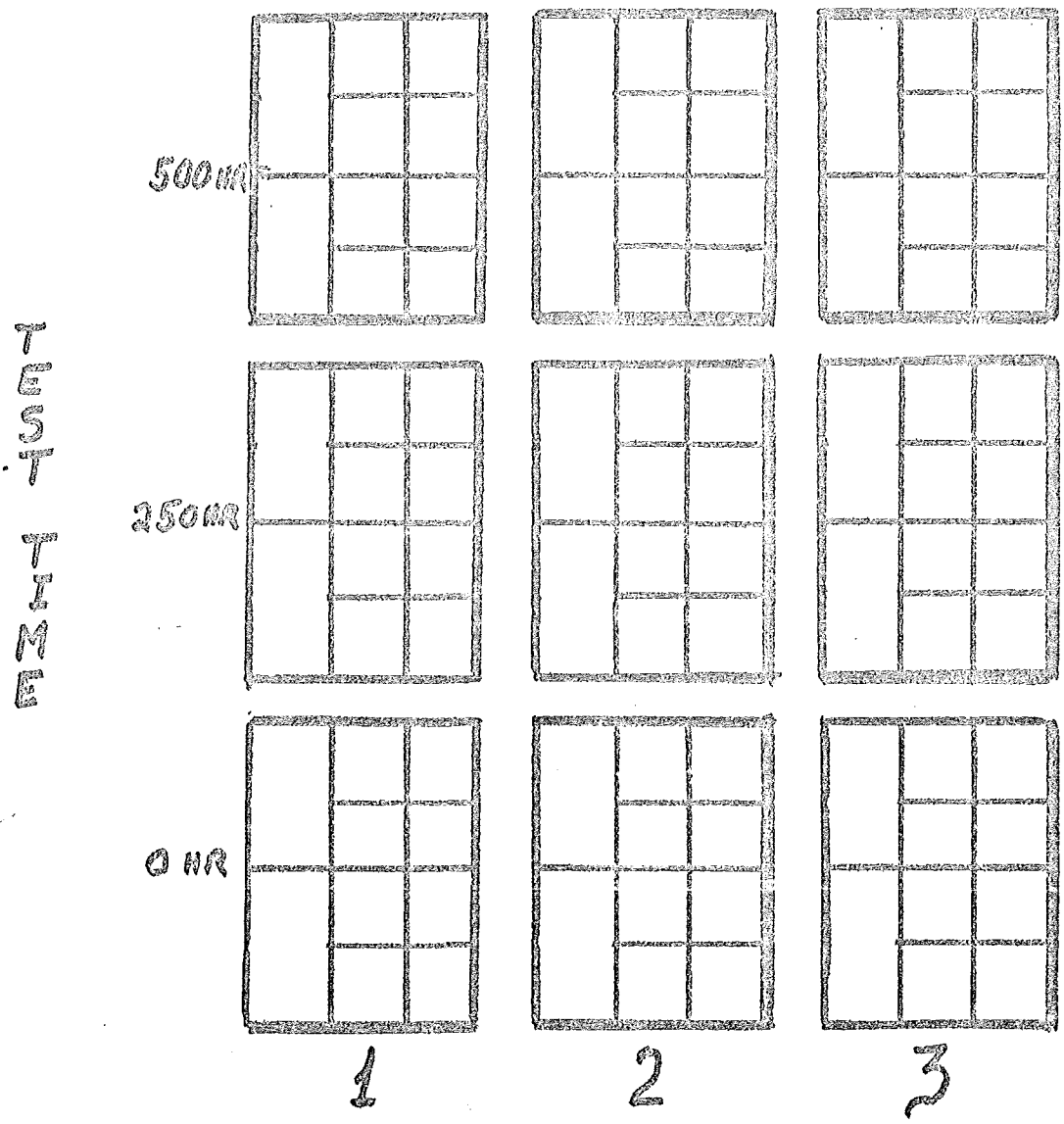
-5° to 35°C (8-DIVIDER, 9-1200-Ω, 10-M-PROM)



CYCLE PERIOD

MEAN TEMPERATURE	TEMPERATURE RANGE	∞	1½ HR	3 HR
15.5°C	±5.0°C	A,B,C,D	A,B,C,D	A,B,C,D
	±20.0°C		A,B,C,D	A,B,C,D
65.0°C	±5.0°C	A,B,C,D	A,B,C,D	A,B,C,D
	±20.0°C		A,B,C,D	A,B,C,D

DATA REPRESENTATION OF A SINGLE TEST AT A GIVEN TEST TIME



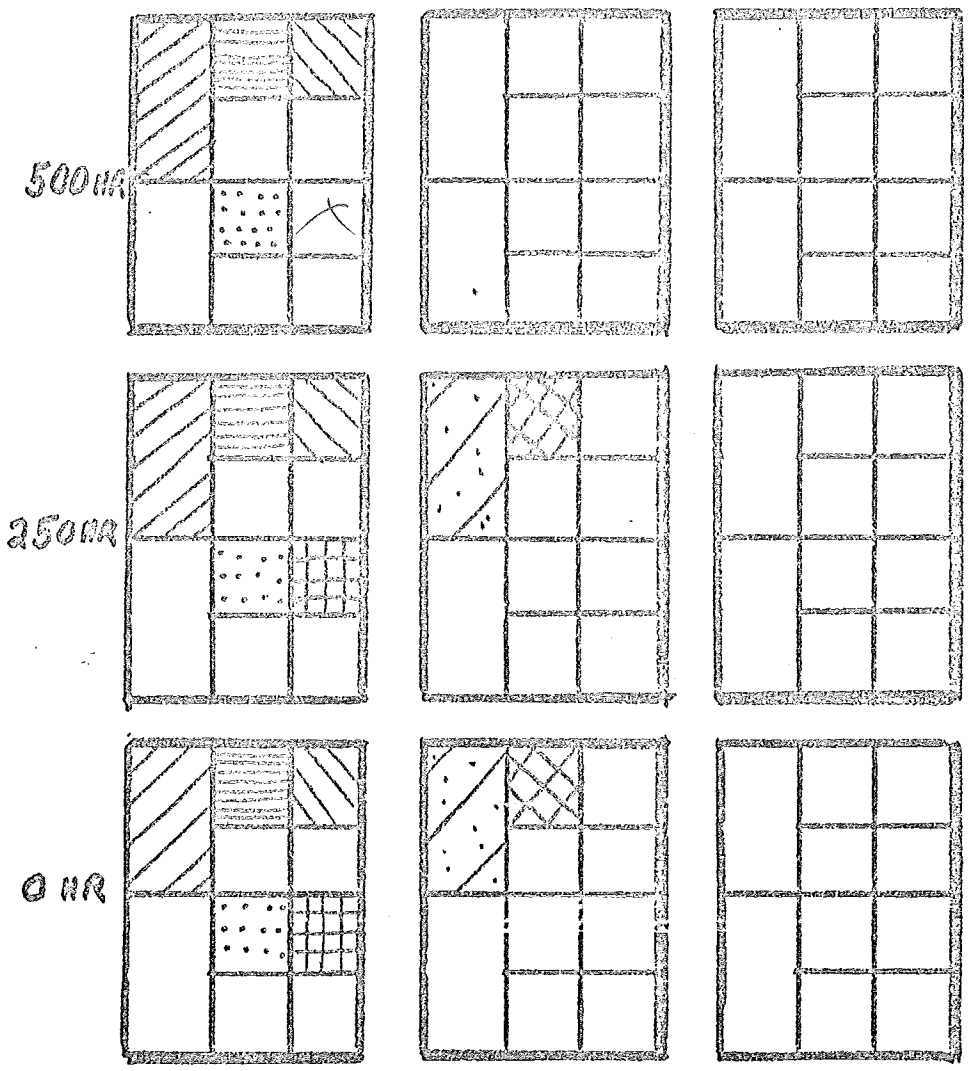
DATA ORGANIZATION FOR ENTIRE TEST

DATA CODE

MEAN TEMP.	AMP.	PERIOD	TEST TIME	CRKT.	REP.	CHAMB #
1 15°C	1 0	0 ∞	1 0	1 A	1 1	1 2426
2 35°C	2 ±20	1 1.5	2 250	2 B	2 2	2 2427
	3 ±5	2 3	3 500	3 C	3 3	3 2413
				4 D		4 2414
						5 ASSOC.

Data Analyses Applications

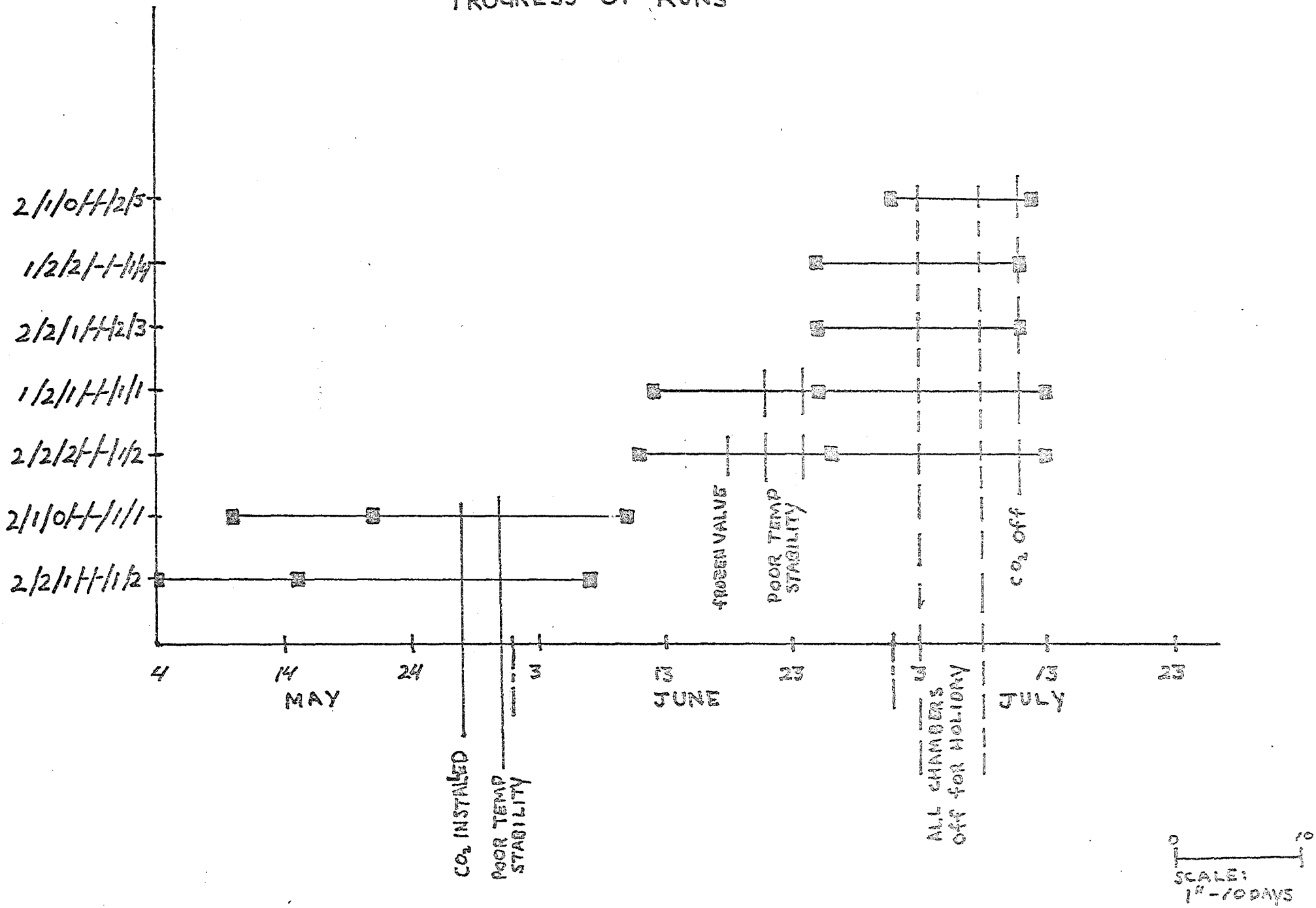
- Comparison of One Part Class Against Another for "Weak Links"
- Vender Comparisons
- Reliability Evaluation of State-of-Art Devices
- Reliability Modeling of Cycling Parameters - Prediction Improvement
- Failure Prediction Correlation
- Identification of Inter-Acting Effects of Thermal Cycling Parameters



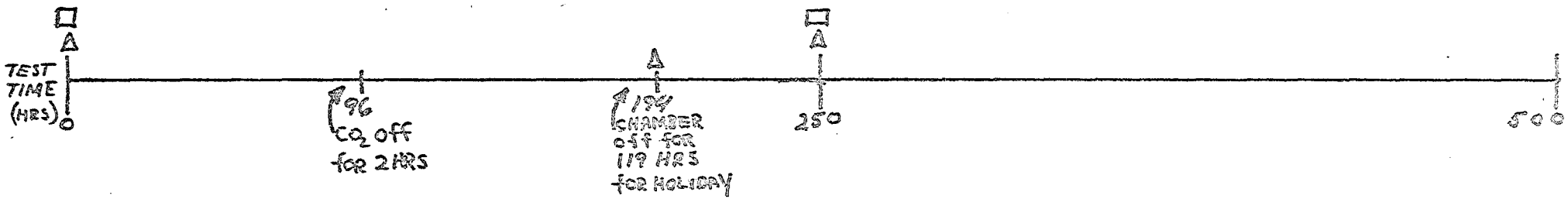
TESTING STATUS

20% COMPLETE

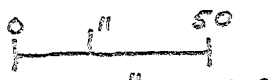
PROGRESS of RUNS



HISTOGRAM of +5 TO 55°C CYCLING 1.5 HRS

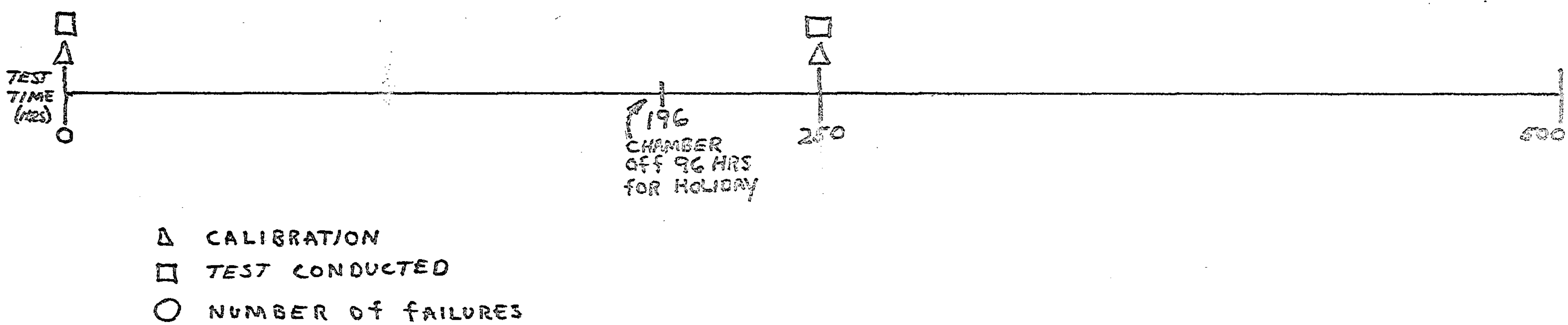


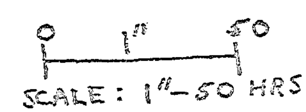
△ CALIBRATION
□ TEST CONDUCTED
○ NUMBER of FAILURES



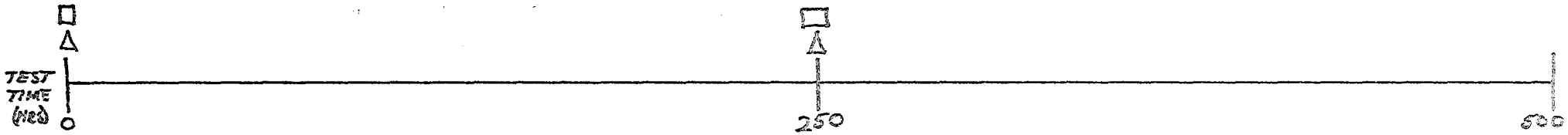
2/2/1 1 1/2 1/3 1/4 2/3

HISTOGRAM of -5 TO 35 °C CYCLING 3 HRS





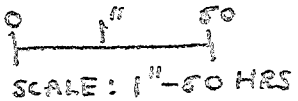
HISTOGRAM of 35°C CYCLING



△ CALIBRATION

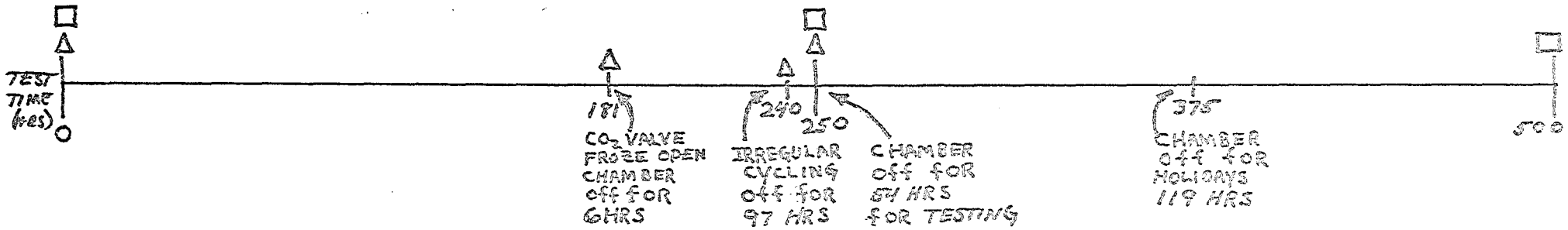
□ TEST CONDUCTED

○ NUMBER of FAILURES



2/1/0/1/2/1/2/5

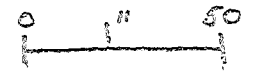
HISTOGRAM of 15-55°C CYCLING 3 HR.



△ CALIBRATION

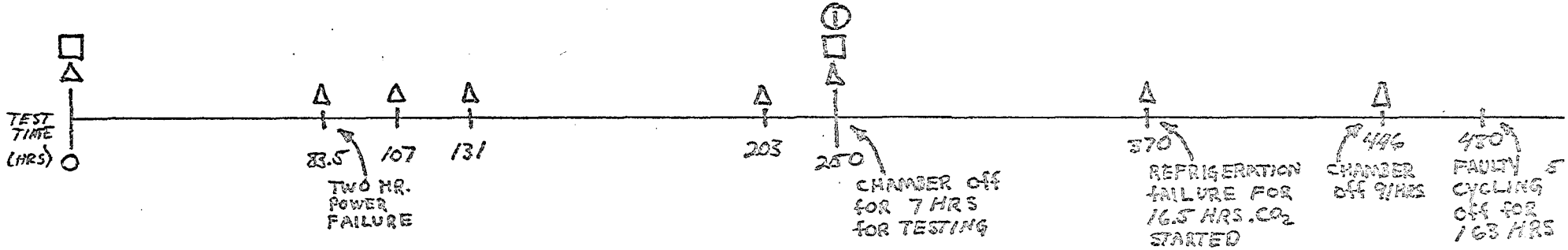
□ TEST CONDUCTED

○ NUMBER of FAILURES



2/2/2/$\frac{1}{2}$/$\frac{3}{4}$/1/2

HISTOGRAM of 15-55°C CYCLING 1.5 HR



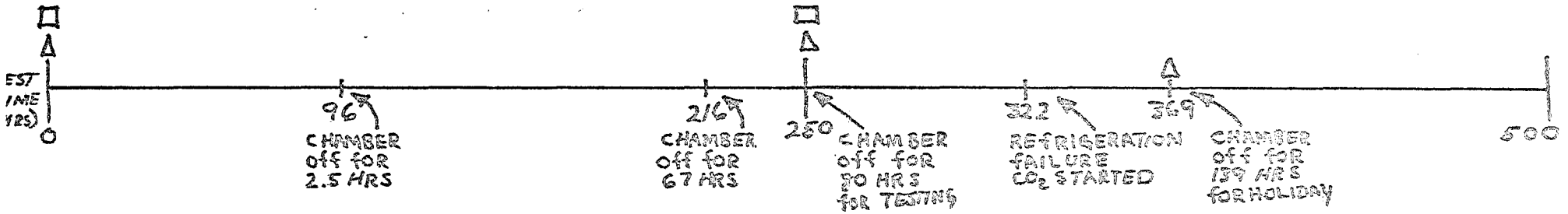
△ CALIBRATION
□ TEST CONDUCTED
② NUMBER of FAILURES

0 1" 50

SCALE: 1" = 50 HRS

2/2/1 1 2/3 1 3/4 / 1 / 2

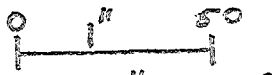
HISTOGRAM of -5 TO 35°C CYCLING 1.5 HRS



△ CALIBRATION

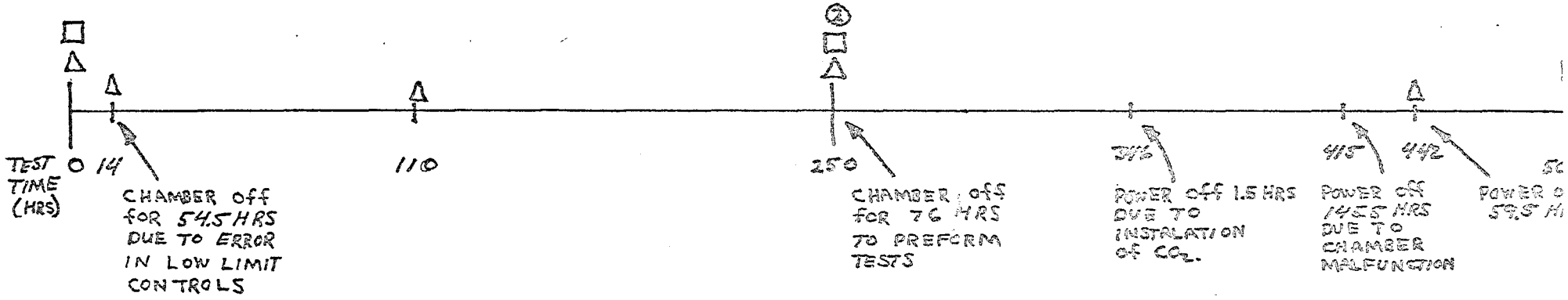
□ TEST CONDUCTED

○ NUMBER of FAILURES



1 / 2 / 1 / 3 / 3 / 1 / 1

HISTOGRAM 35° CYCLING



△ CALIBRATION

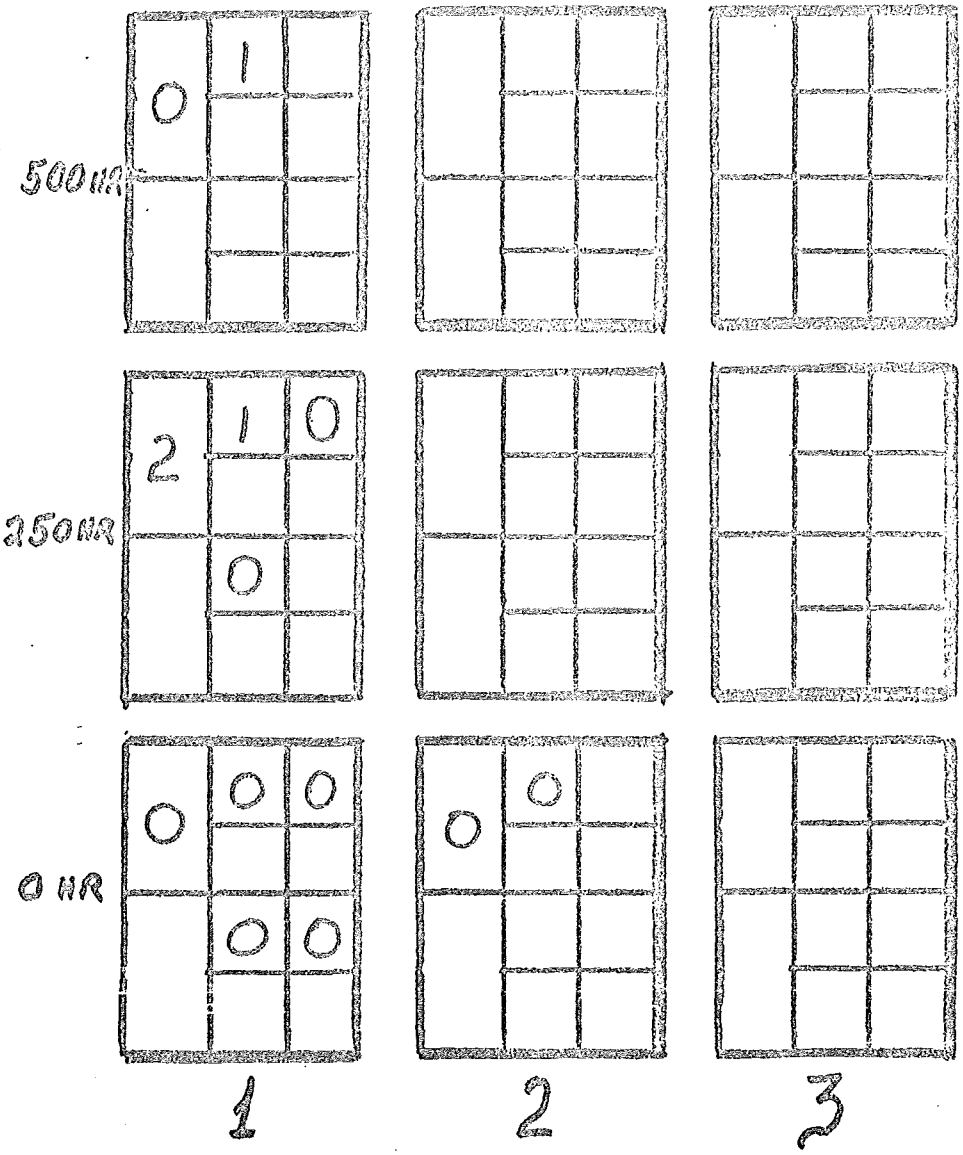
□ TEST CONDUCTED

② NUMBER OF FAILURES

0 1" 50

SCALE: 1"-50 HRS

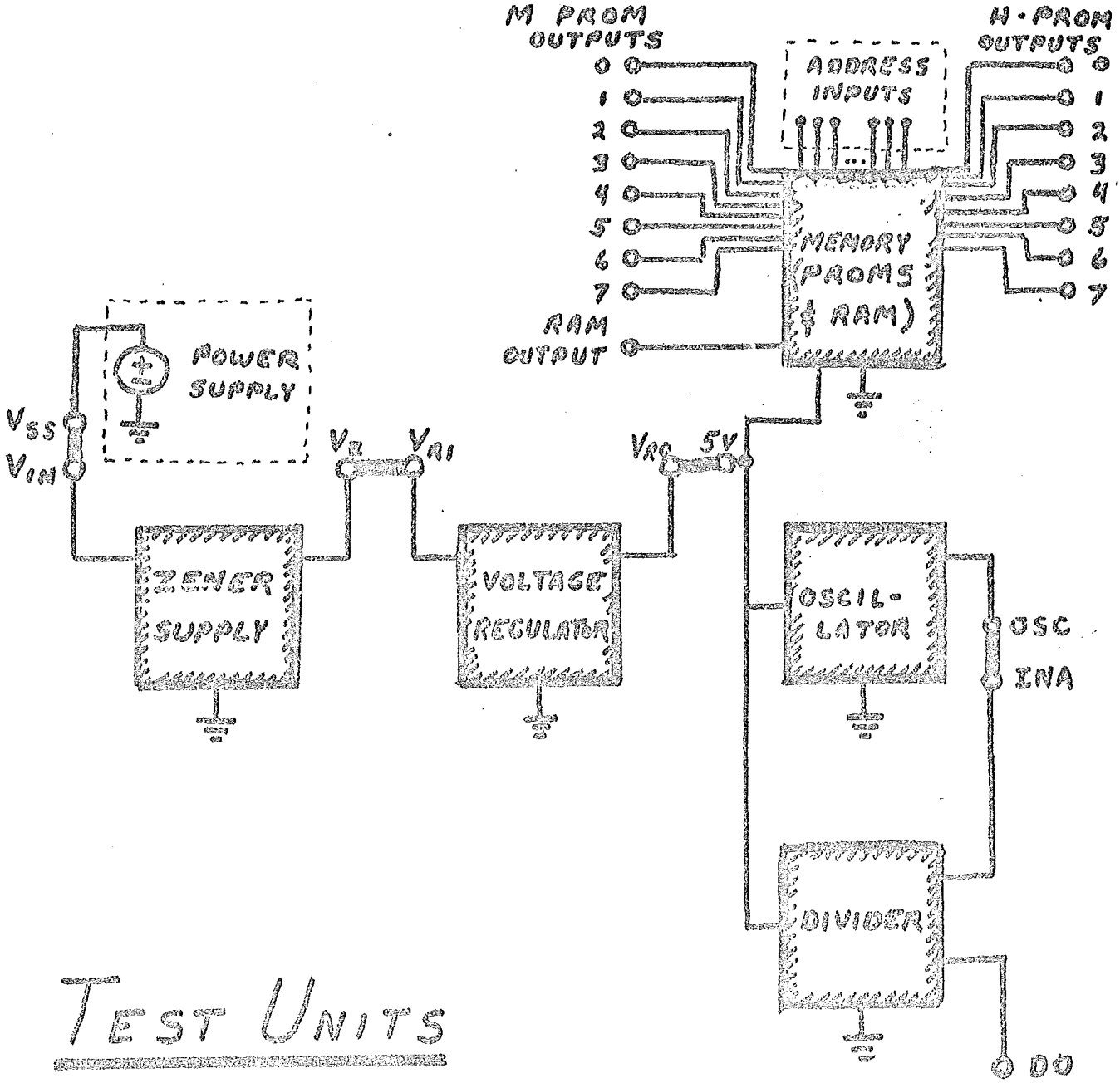
2/1/0/$\frac{2}{3}$/$\frac{2}{4}$/1/1



TESTING FAILURE SUMMARY

Functional Test Parameters

- Supply Voltage
- Zener Voltage
- Zener Current
- Regulator Voltage
- Oscillator Frequency
- PROM Programming
- RAM Programmability
- Divider Operation



TEST UNITS

○ ⟶ MONITORING POINT

⟶ TEST PANEL CONNECTION

⟶ EXTERNAL CONNECTION

FIGURE 2-A

POWER REGULATOR SCHEMATIC

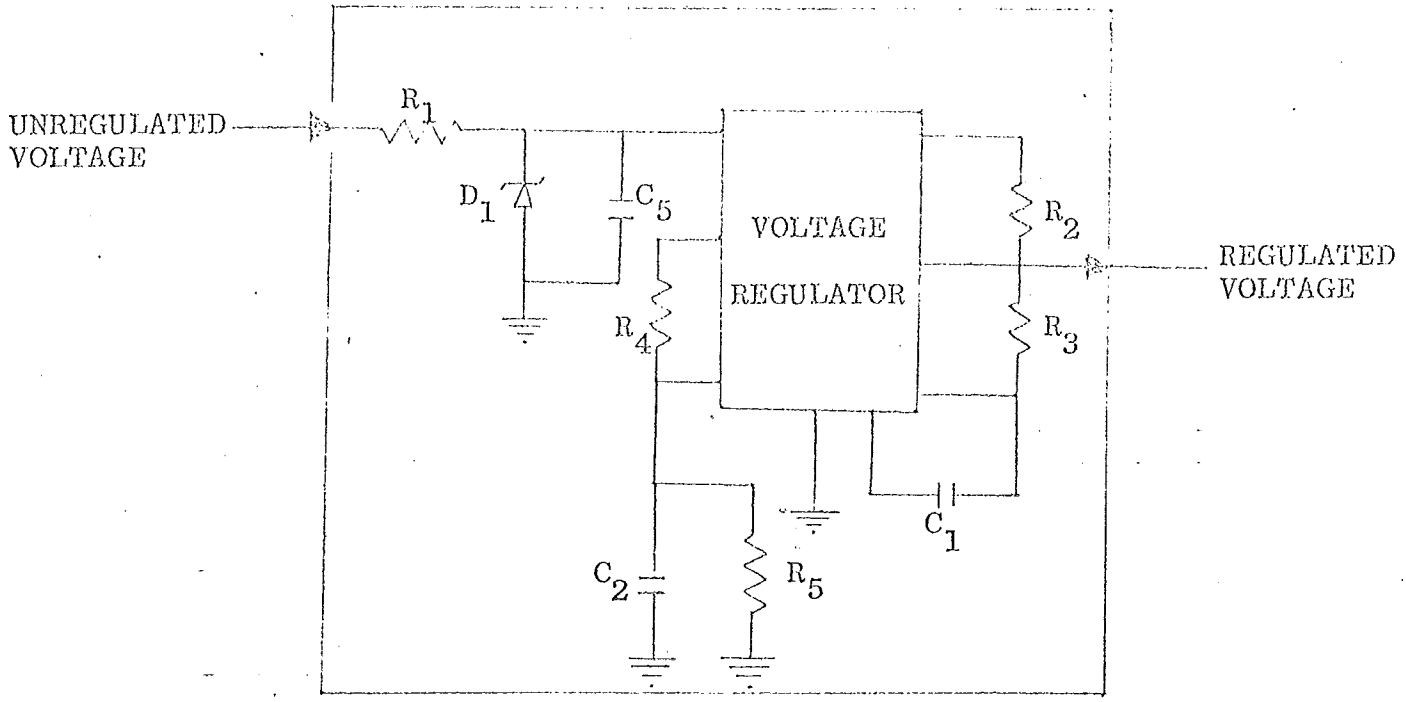


FIGURE 2-B

OSCILLATOR SCHEMATIC

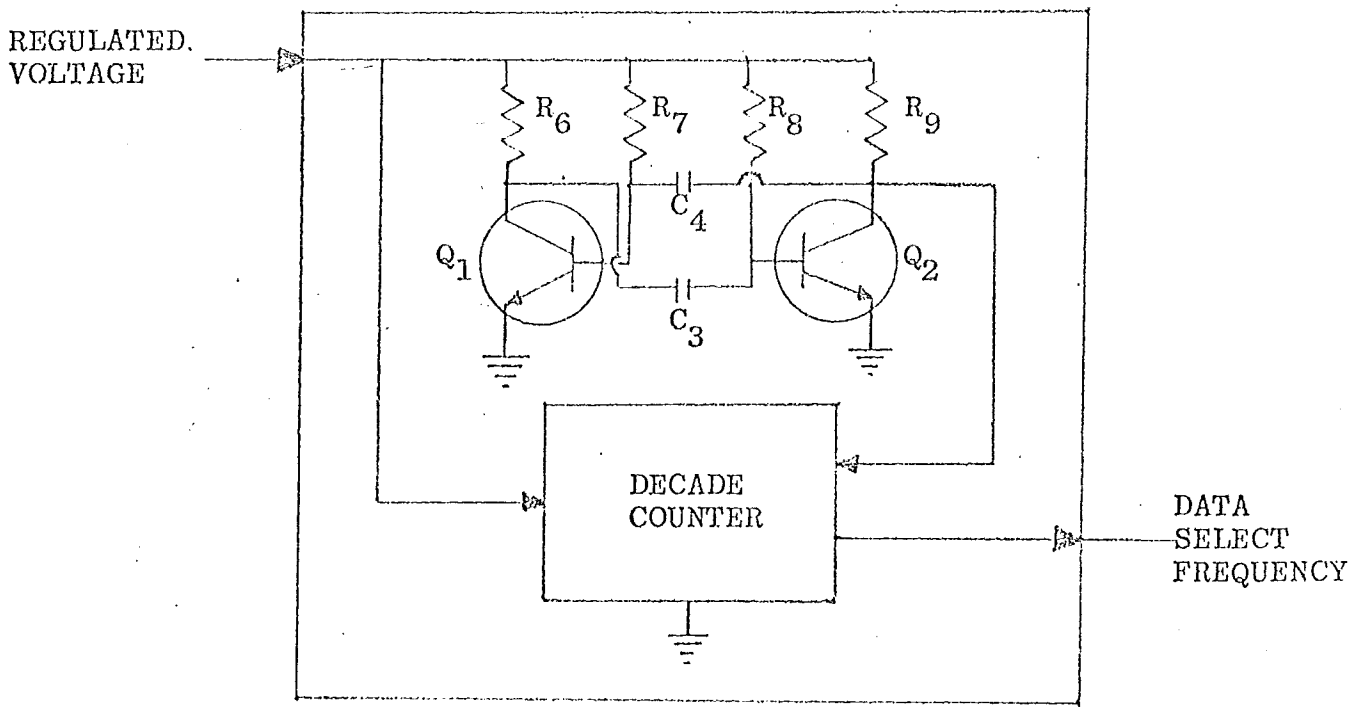
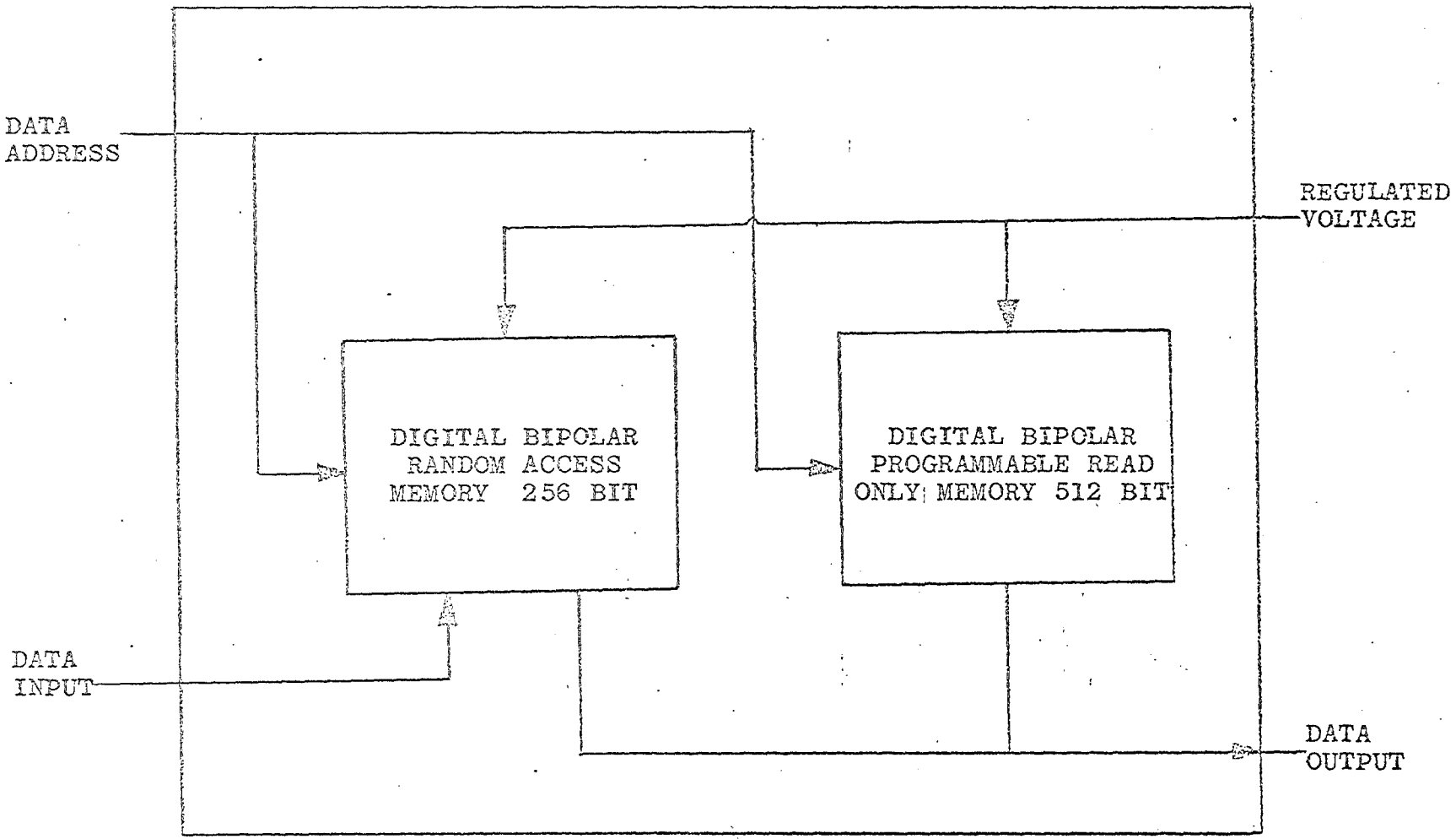
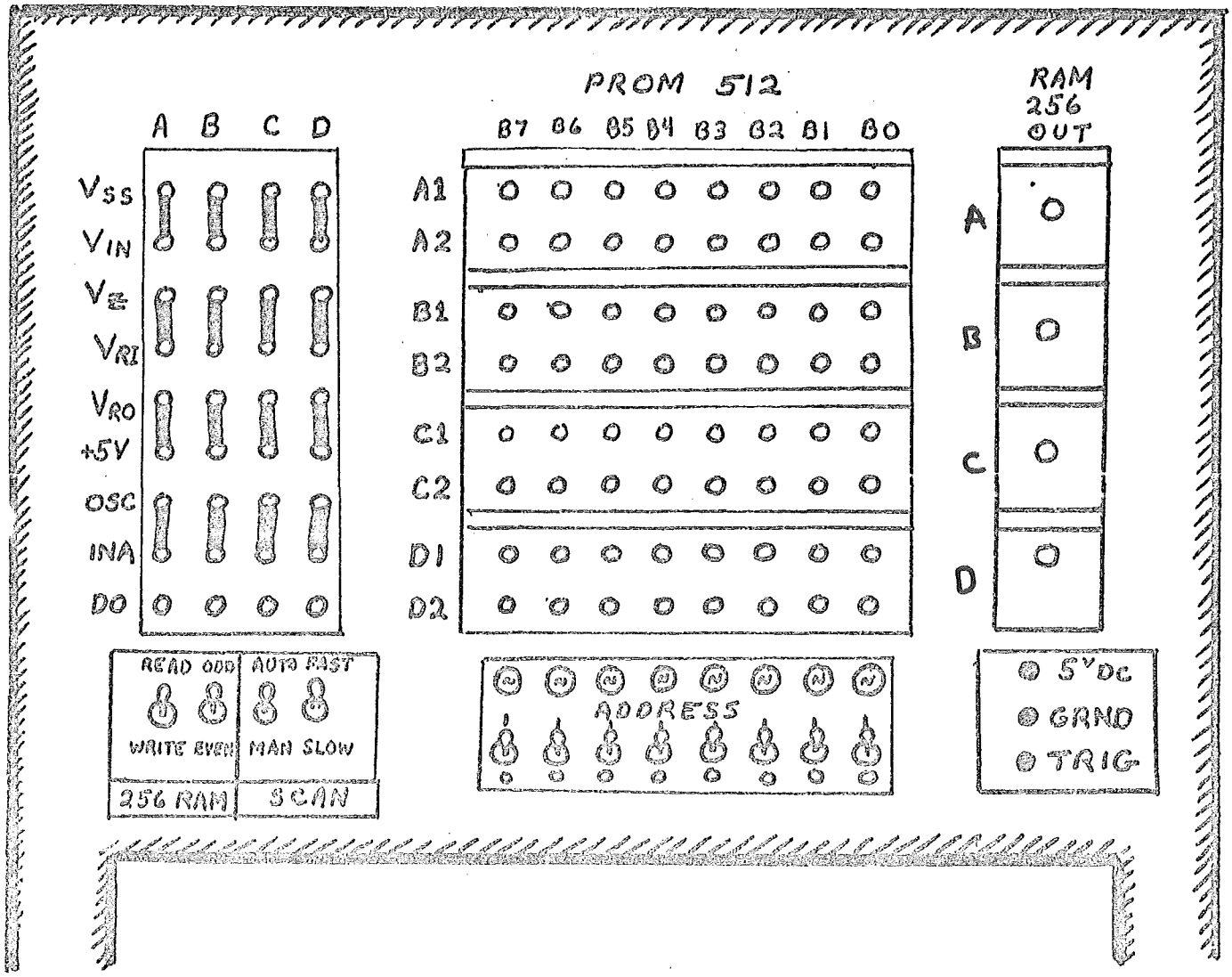


FIGURE 2-C

MEMORY SCHEMATIC





FUNCTIONAL TEST PANEL

Test Classes and Parameters

4 - Microcircuits (TTL/ Linear)

- Supply Current
- Logic Level Voltages
- Input Currents
- Voltage Regulation
- Leakage Current

1 - Transistor (Silicon npn)

- Saturation Voltage
- DC Gain
- Leakage Current

1 - Zener Diode (Power)

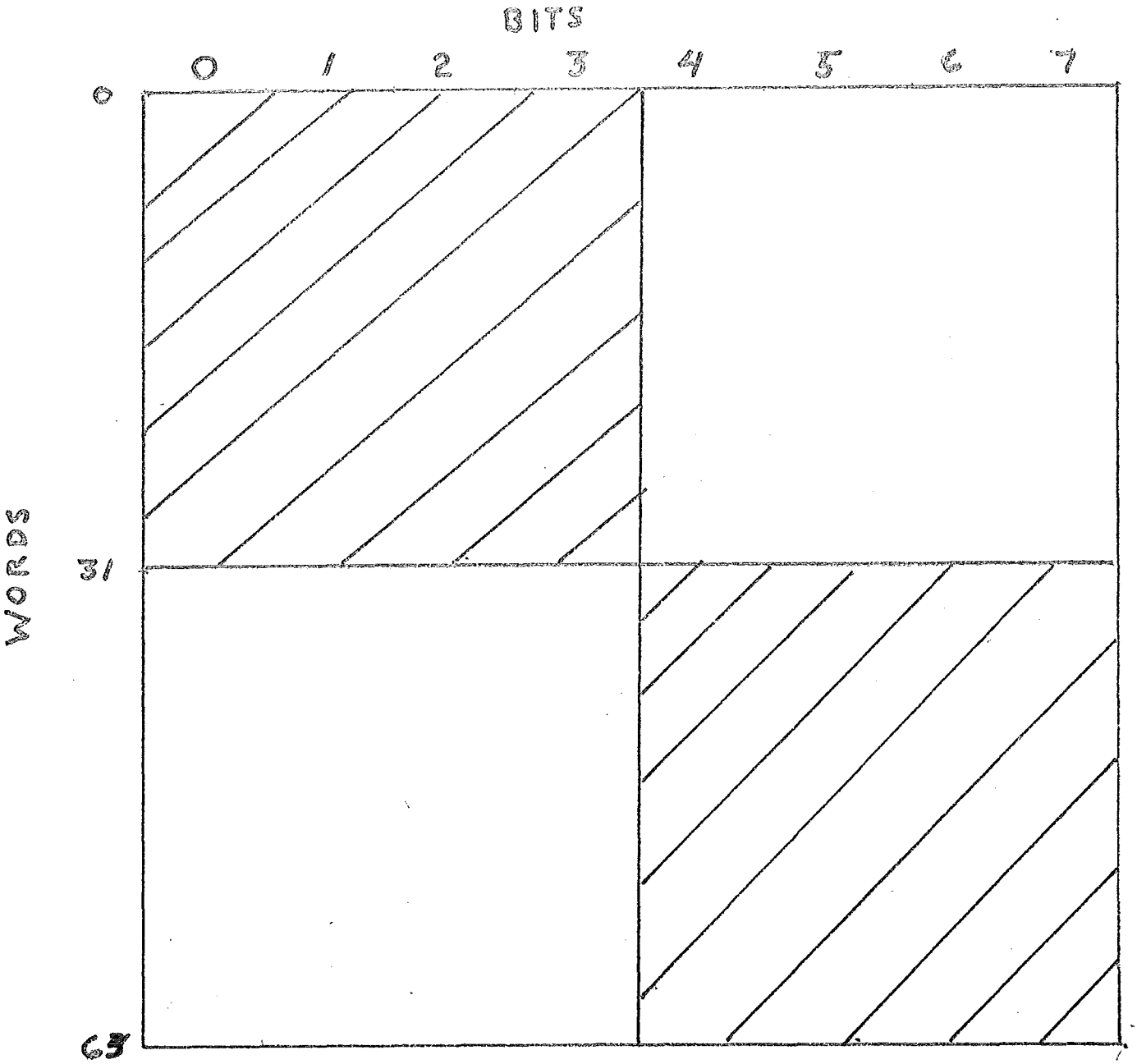
- Reverse Leakage Current
- Breakdown Voltage

5 - Capacitors (Mica/ Tantalum)

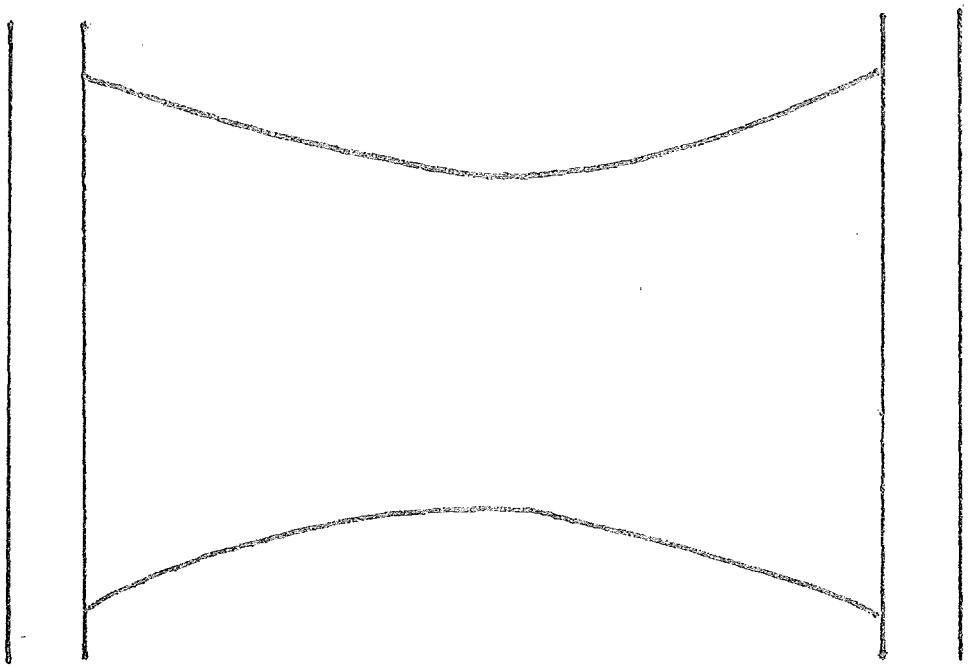
- Capacitance
- Dissipation

9 - Resistors (Film/ Wire Wound)

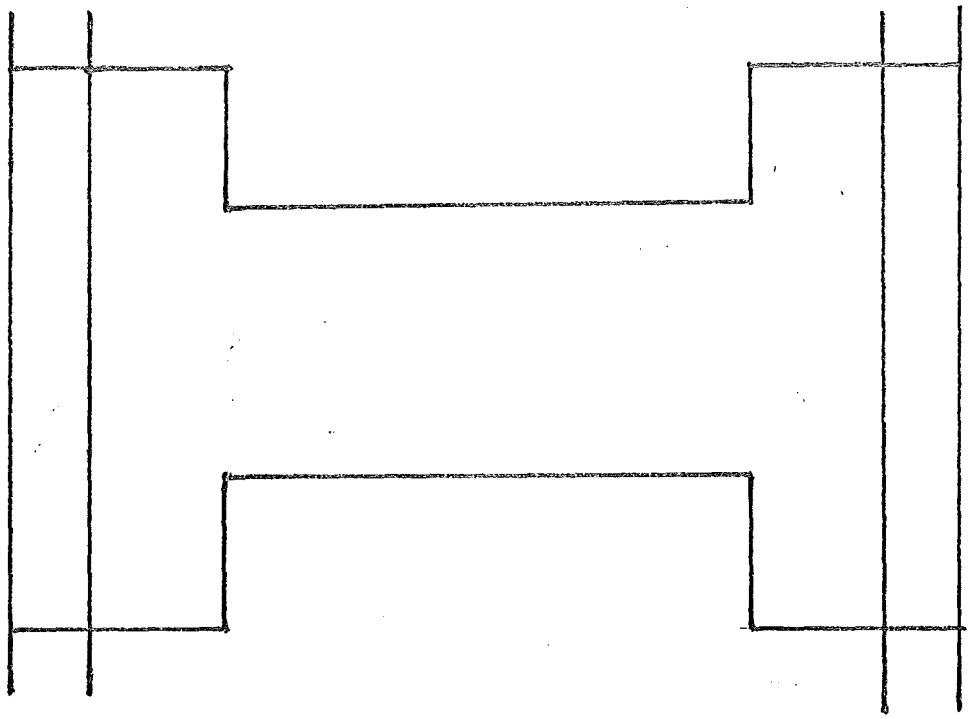
- Resistance



LINK MATRIX

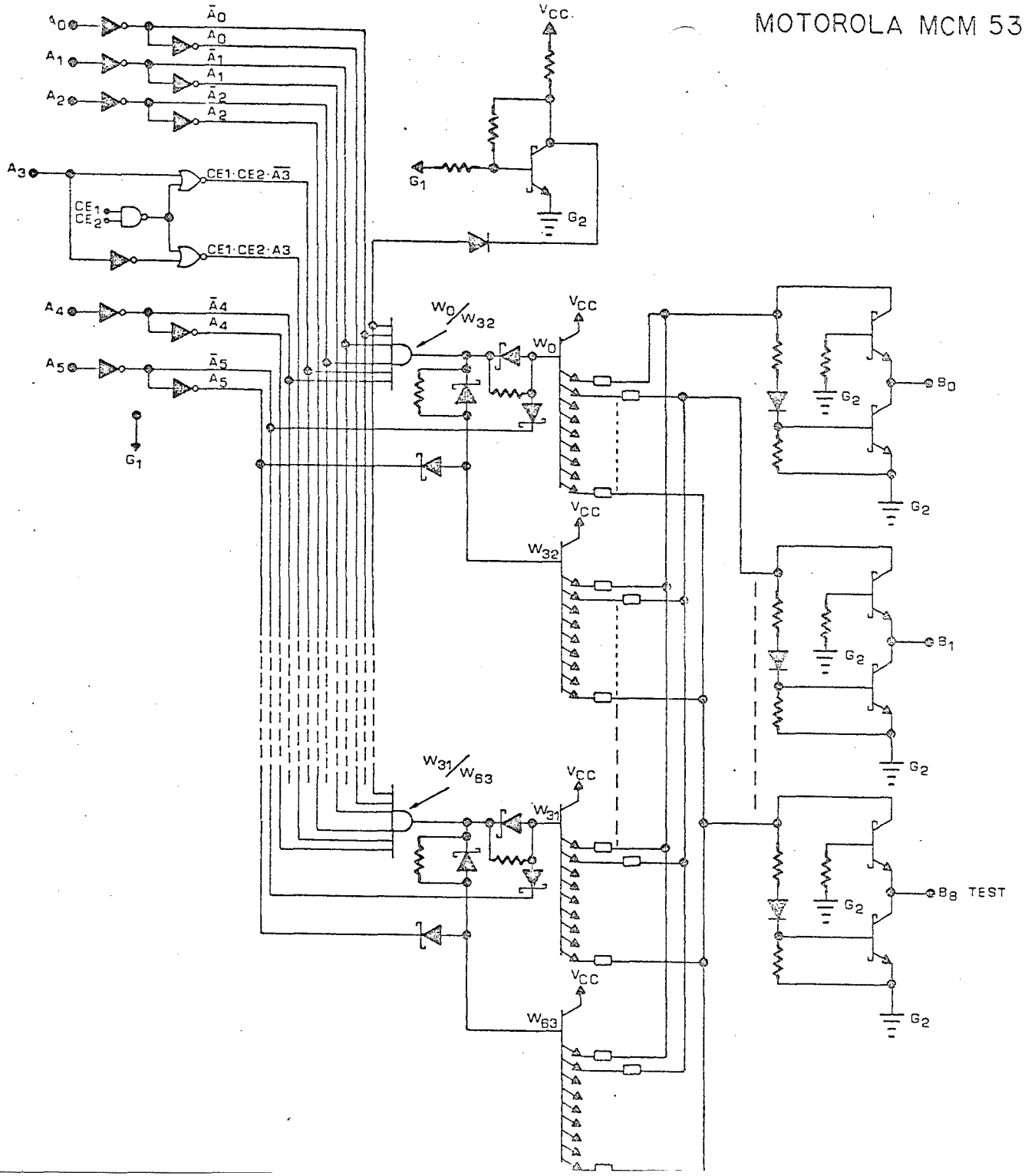


MOTOROLA

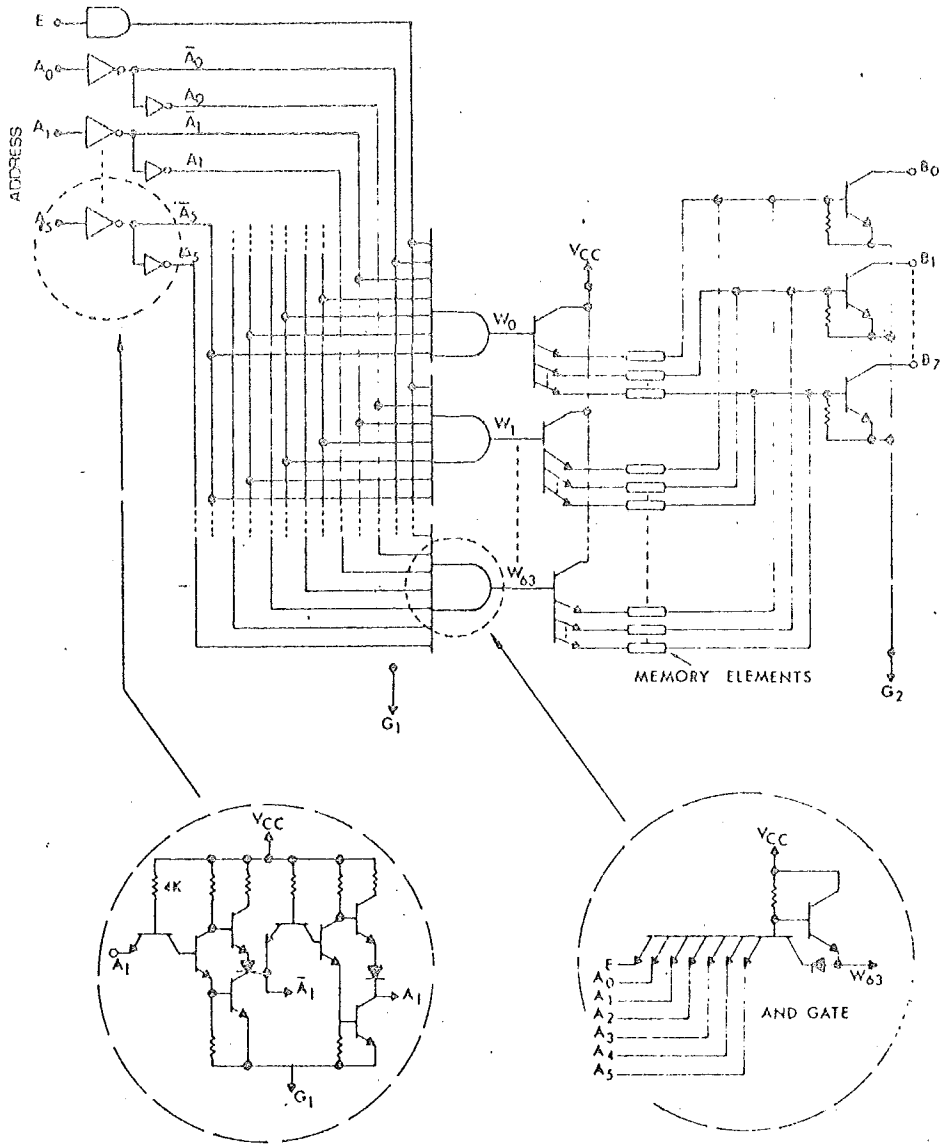


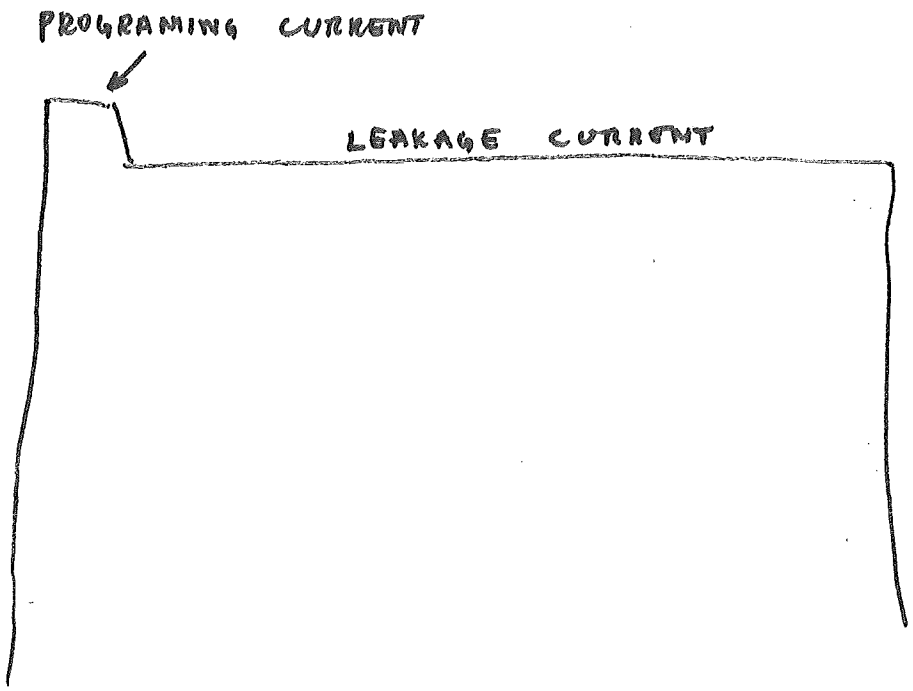
HARRIS

MOTOROLA MCM 5303 PROM

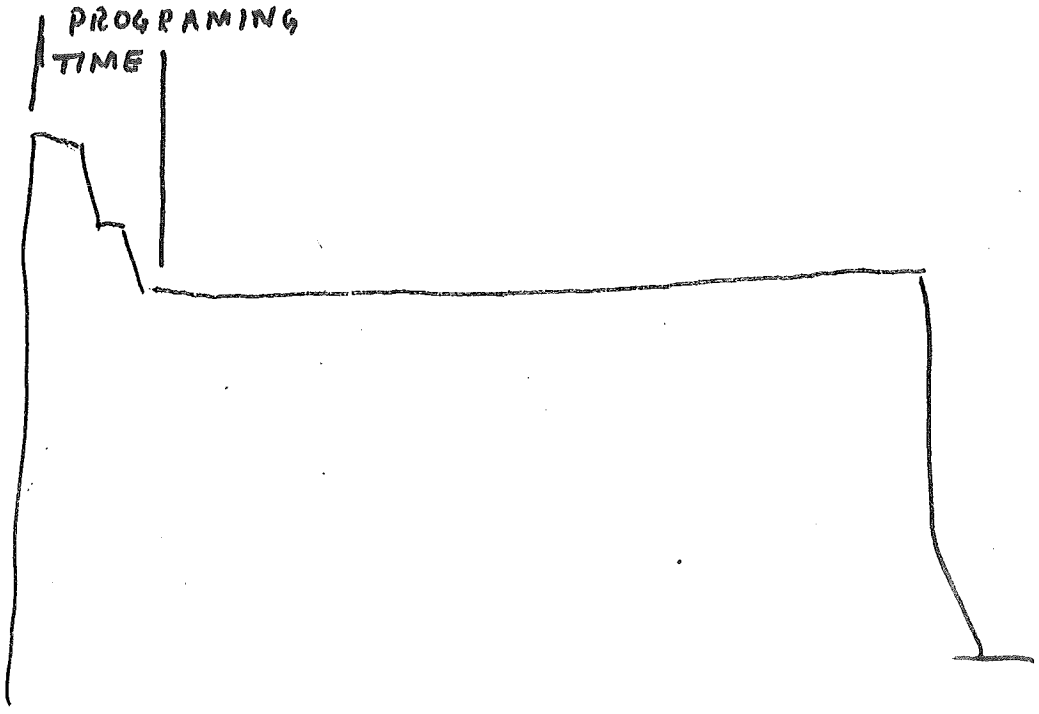


HARRIS—0512 PROM



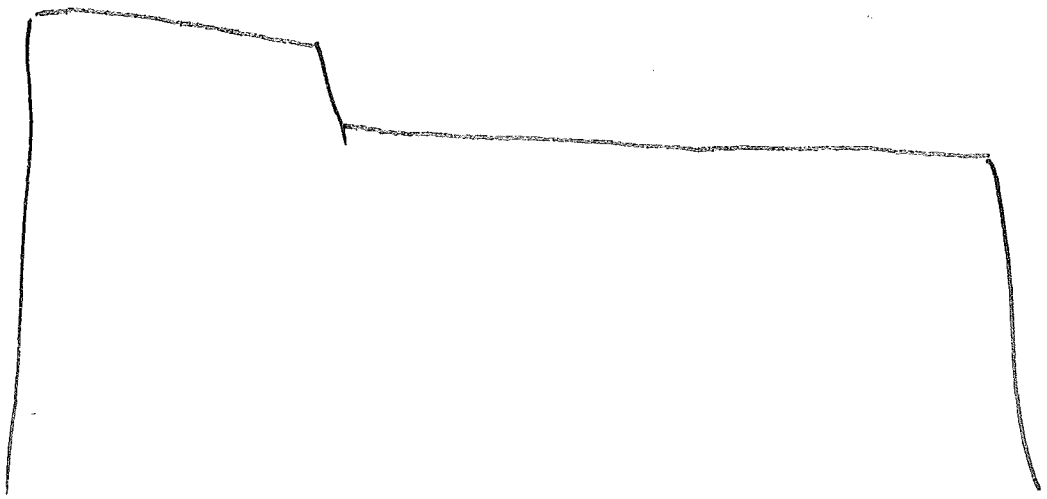


COMMON BLOW

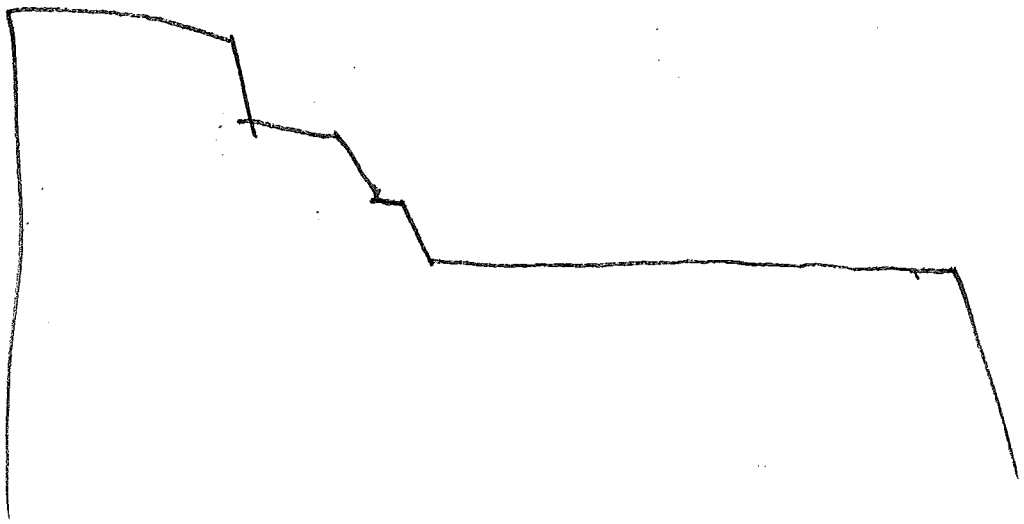


STAIRCASE BLOW

HARRIS 0512 PROM



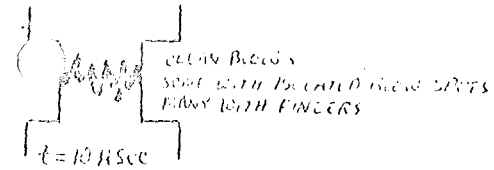
COMMON BLOW



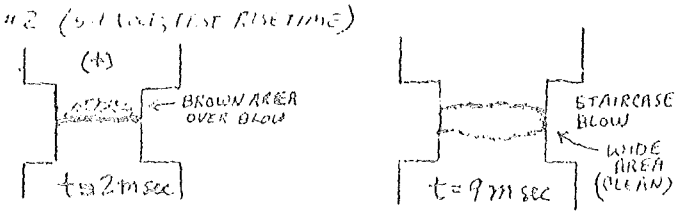
STAIRCASE BLOW

HARRIS 0512 PROM (OPTICAL) — D/C 7243

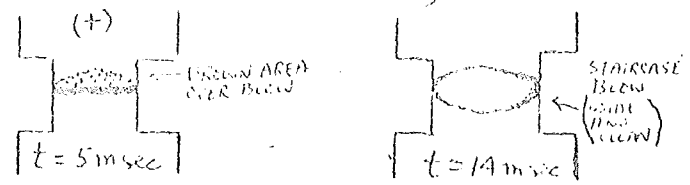
#1 (6.2 VOLT ; FAST RISETIME)



#2 (5.1 VOLT; FAST RISETIME)



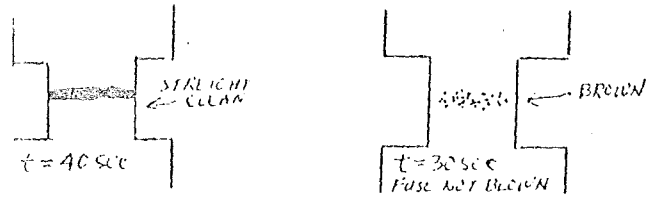
#3 (4.3 VOLT ; FAST RISETIME)



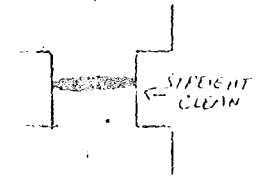
#4 (3.3 VOLT ; FAST RISETIME)

(WOULD NOT PROGRAM WITH A SINGLE 500 msec pulse)

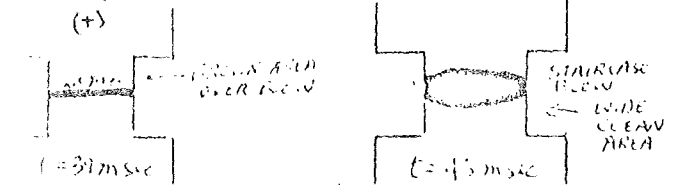
#5 (CONST. V, CONST. I) – NEAR THRESHOLD



#6 (6 SEC ; 1 V/SEC RAMP)



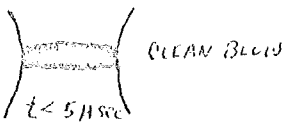
#7 (1 AMP/SEC RAMP)



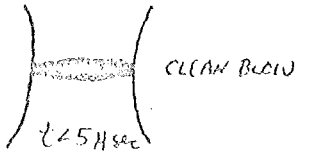
(2.6 AMP/SEC RAMP)

MOTOROLA 5003 PROM (OPTICAL) — D/C 7242

TEST #1 (6.2 VOLT; FAST RISETIME)



TEST #2 (5.1 VOLT ; FAST RISETIME)



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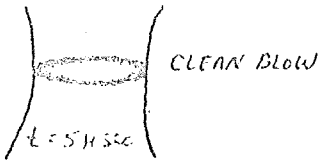
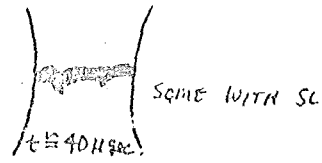
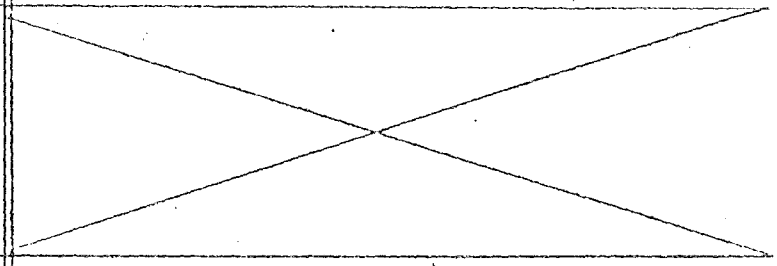
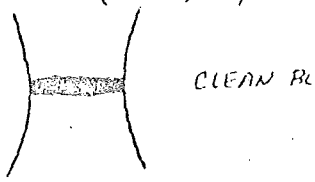


TEST #4 (3.3 VOLT ; FAST RISETIME)

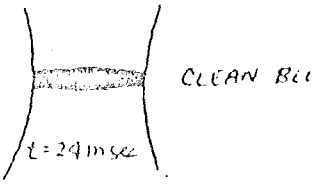




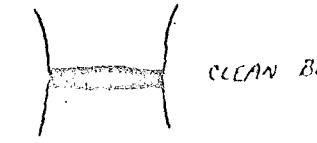
TEST #6 (6 SEC; 1 V/SEC RAMP)

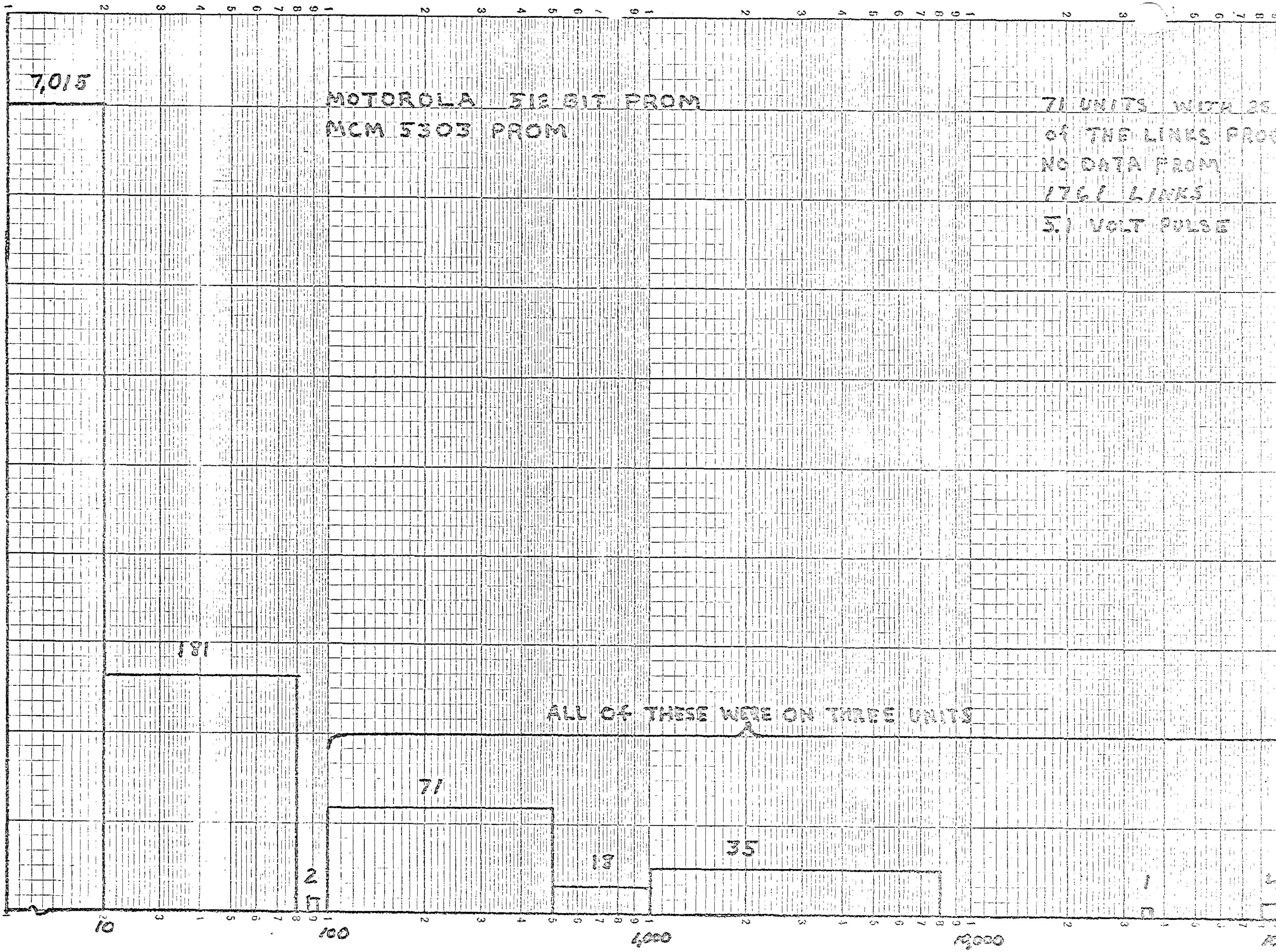


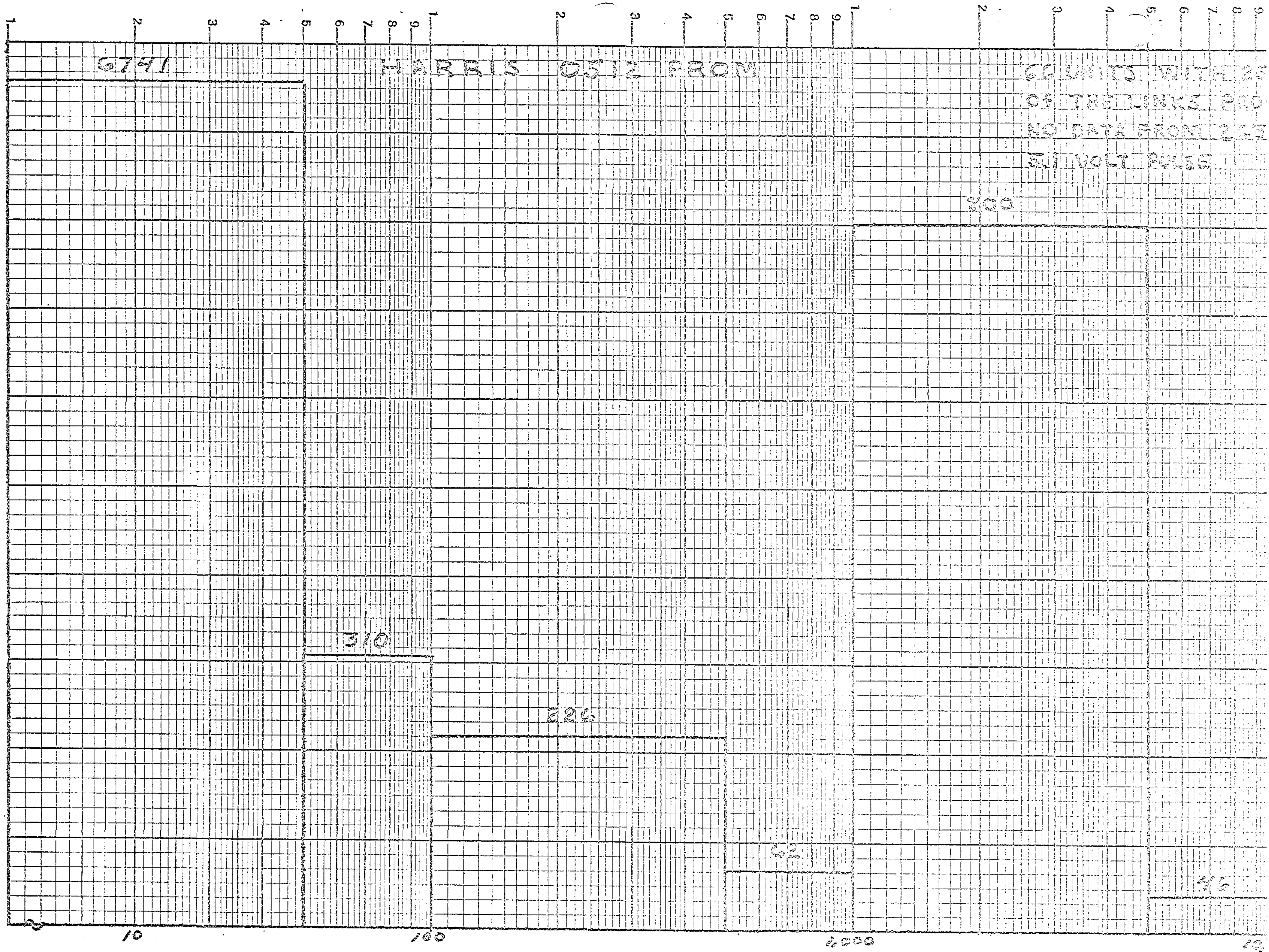
TEST #7 (1 AMP/SEC RAMP)

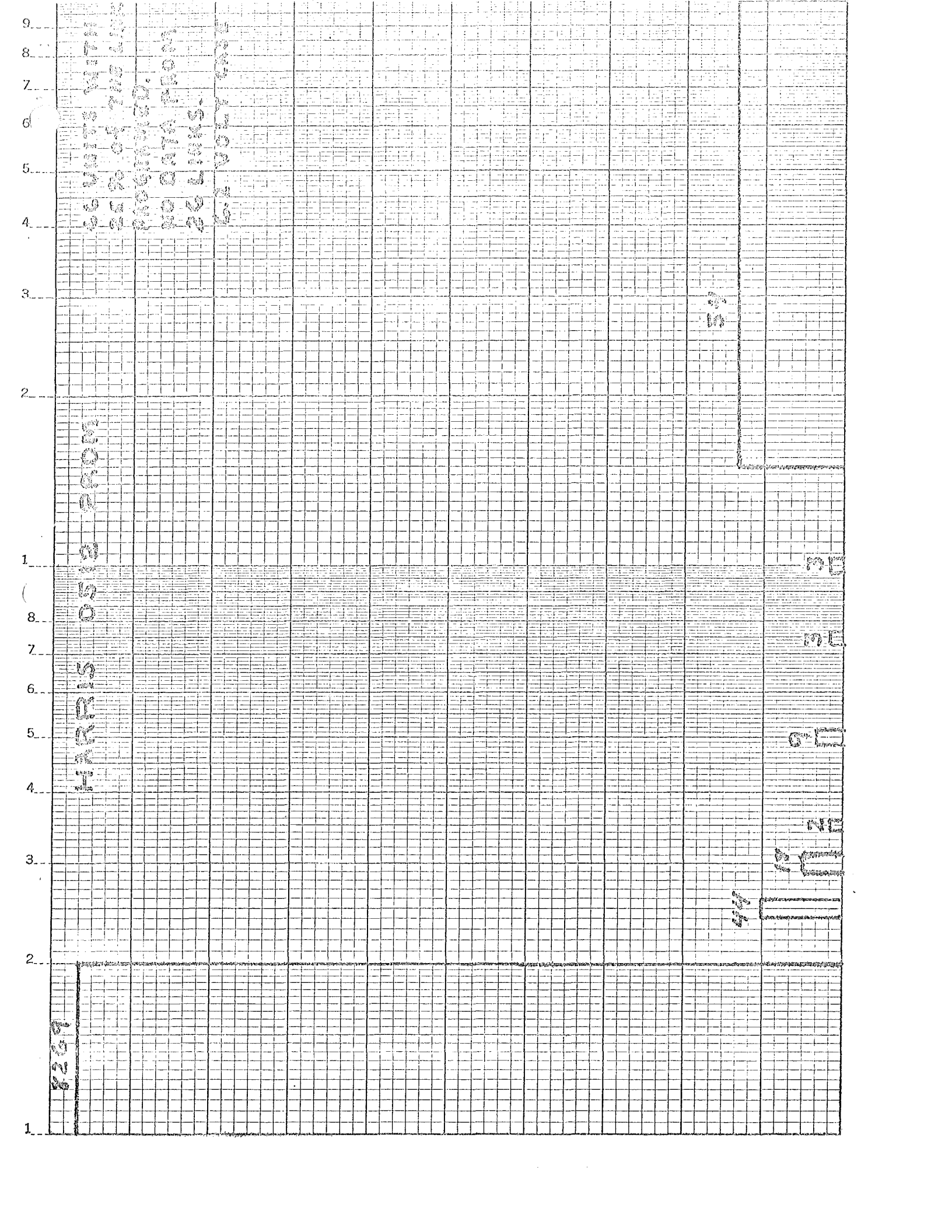


TEST #8 (2.6 AMP/SEC RAMP)




7,015
MOTOROLA 512 BIT PROM
MCM 5303 PROM
71 UNITS WITH 25
of THE LINES PRO
NO DATA FROM
1766 LINKS
5.1 VOLT PULSE
181
ALL OF THESE WERE ON THREE UNITS
71
2
18
35
1
10
100
1,000
10,000


6741
HARRIS C512 FROM
COUNTS WITH 25
OF THE LINKS PRO
NO DATA FROM 266
5.7 VOLT PULSE
900
310
226
62
46
10
100
1000



EMPLOYEE SERVICE STATEMENT

(See information on reverse)

1. NAME (CAPS) LAST-FIRST-MIDDLE	MR.-MISS-MRS.	2. BIRTH DATE (Mo.,Day,Yr.)	3. SOCIAL SECURITY NO.	4. STATEMENT NO.
MARKS, ROBERT JACKSON II		08-25-50	[redacted]	1

5. SERVICE SUMMARY	FROM MO.	FROM DAY	FROM YR.	TO MO.	TO DAY	TO YR.	SERVICE YRS.	SERVICE MOS.	SERVICE DAYS	CIVIL SERVICE RETIREMENT DEDUCTIONS YES	CIVIL SERVICE RETIREMENT DEDUCTIONS NO	IF "NO" NAME OTHER RETIREMENT SYSTEM
A. PREVIOUS CIVILIAN SERVICE							00	00	00			
B. SERVICE PERFORMED IN THIS AGENCY	03	25	74	08	15	75	01	04	20	X		
C. MILITARY SERVICE	00	00	00	00	00	00	00	00	00			
D. ACCUMULATE ALL SERVICE AND ENTER TOTAL SERVICE HERE ➡							01	04	20			

6. COMPLETE THIS ITEM ONLY FOR EMPLOYEES SEPARATING FROM POSITIONS SUBJECT TO THE CIVIL SERVICE RETIREMENT SYSTEM – YOUR RETIREMENT BENEFIT, BASED ON THE ABOVE SEPARATION, IS INDICATED BELOW:

- ☐ NONE – TRANSFER TO ANOTHER POSITION SUBJECT TO CSC RETIREMENT
- ☐ DEFERRED ANNUITY AT AGE 62 OR LUMP SUM REFUND
- ☒ LUMP SUM REFUND ONLY
- ☐ IMMEDIATE ANNUITY

REMARKS CONCERNING SERVICE ENTRIES ABOVE:

8. SIGNATURE OF EMPLOYEE	DATE	11. AGENCY NAME, INCLUDING BUREAU AND DIVISION, AND ADDRESS
[signature]	08-08-75	NAVSEASYSCOM Naval Weapons Support Center Crane, Indiana 47522
9. SIGNATURE OF AGENCY OFFICIAL [signature]	DATE 08-08-75	
10. TITLE OF AGENCY OFFICIAL Staffing Clerk		

2815-101

STANDARD FORM 2815
MARCH 1974
FPM SUPPLEMENT
831-1

1. Employee Copy – See information on reverse.

3041-GEA:sh
3010/3
9 JUL 1975

From: Commanding Officer, Naval Weapons Support Center, Crane, Indiana
To: Commander, Naval Electronic Systems Command (ELEX-470), Washington, DC 20360

Subj: Monthly Status Report for Jun 1975

Ref: (a) NAVELEXSYSCOM ltr 470-CEN:dm 3920 Ser 73-470 of 23 Apr 1975

Encl: (1) Verdin TSA Monthly Status Report - Jun 1975

1. This report is submitted to describe those tasks performed during the subject reporting period as required by reference (a).

2. Milestone status - the status for FRAP milestones is shown in Figure 1.

3. LFA Progress Summary:

a. February 1975 - Received task assignment, reference (a). NWSC Crane designated LFA, NELC, NWSC Crane, and NESTED designated as TSA's. TSA responsibilities: NWSC Crane - Verdin system, NESTED - AN/URC-85, NELC - AN/SRR-1 and AN/WSC-3.

b. March 1975 - Reviewed Verdin ILS plan. Identified discrepancies in ILS plan. Identified other documents needed. Verbal coordination with NESTED and NELC to prepare program plans. Reviewed MDCS for compatibility with FRAP objectives and data requirements. Attended MDCS review meeting between NESTED (027), NWSC Crane (3041), NAVELEX (470), and NAVSECNORDIV (6640). Attended coordination meeting between NAVELEX (470) and NWSC Crane (304) discussing need for new tasking letter.

c. April 1975 - New tasking letter, reference (a), was received. Corrected March 1975 monthly status report. Showed sample size dependence on confidence intervals and duty cycle. NWSC Crane (304) hosted coordination meeting between NESTED (027), NAVELEX (470), and NESEC (TOM-2). NESEC was given NELC TSA responsibilities due to NELC travel restrictions. Meeting minutes distributed.

d. May 1975 - Prepared and submitted LFA Implementation Plan. This plan explained how the program objectives would be met, defined detailed LFA responsibilities, and TSA responsibilities, and defined the program milestones and schedule.

4. Progress during reporting period 1 June through 30 June 1975 is as follows:

a. During week of 2 June 1975, visited NESEC Vallejo to discuss submission of AN/SRR-1 and AN/USC-3 implementation plans. Data collection method could not be specified. NESEC Vallejo decided to wait until the meeting with fleet representatives to define the data collection method. Also discussed was the kind of information desired to be submitted in fulfilling other TSA responsibilities.

b. During the week of 16 June, a visit was made to NAVELEX and NESTED. At NAVELEX, met with the Verdin project engineer to discuss data requirement needs of FRAP. Specific Verdin documents were requested. Informal comments were given on Collins monthly depot repair status reports to Verdin project engineer. Obtained several AN/UYK-20 CDRL items from ELEX-470. At NESTED, discussed the AN/URC-25 Implementation Plan and NESTED indicated that the submittal date for the AN/URC-85 Implementation Plan would be slipped about two or three weeks. Submittal of this plan will be made subsequent to changes desired by NESTED.

c. During the week of 23 June, met with representatives of the Pacific Fleet and FRAP activities at NESEC San Diego to brief details of FRAP to Fleet and obtain Fleet comments/concurrence prior to implementation. Outcome of meeting was fleet data collection by 2K and 2L forms, 2L form to be formated for information required but not found on 2K form (time meter readings, etc.). Further, the 2L and 2K form would be sent to one addressee shortly after preparation. Follow-up is necessary to document these requirements to 3M coordinating committee by submission of addressee, format for 2L form, request for subaission of forms at time of completion, and samples size required.

d. The following steps toward documenting the fleet data requirements have been initiated:

(1) specified MTBF's for each equipment are being verified with the help of each TSA.

(2) Sample sizes based upon the specified MTBF will be determined for each equipment considering total population size, confidence levels required during procurement where applicable.

(3) Determining 2L format.

(4) Submittal of documentation by 10 July 1975.

5. Plans for next month include:

a. Trips to NESTED and NESEC Vallejo to obtain results of characterization of equipment necessary to complete the reliability math models and sampling plans by 1 August 1975. These characterization which are due by 10 July will be submitted in the TSA monthly status reports for July.

b. Prepare and submit documentation necessary to define data collection requirements from fleet personnel using NDCS as outlined in paragraphs 4c and 4d of this submittal.

c. Prepare and submit reliability math models and sampling plan to TSA's and ELEX-470.

6. Progress made in support of Verdin TSA responsibilities is discussed in enclosure (1)

7. Funding status at end of this reporting period is shown in Figure 2.

8. Any questions regarding this submittal should be directed to Commanding Officer, Naval Weapons Support Center (Code 3041), Crane, Indiana or to Mr. George Allen at autovon 482-1285.

S. S. KALBERER
By direction

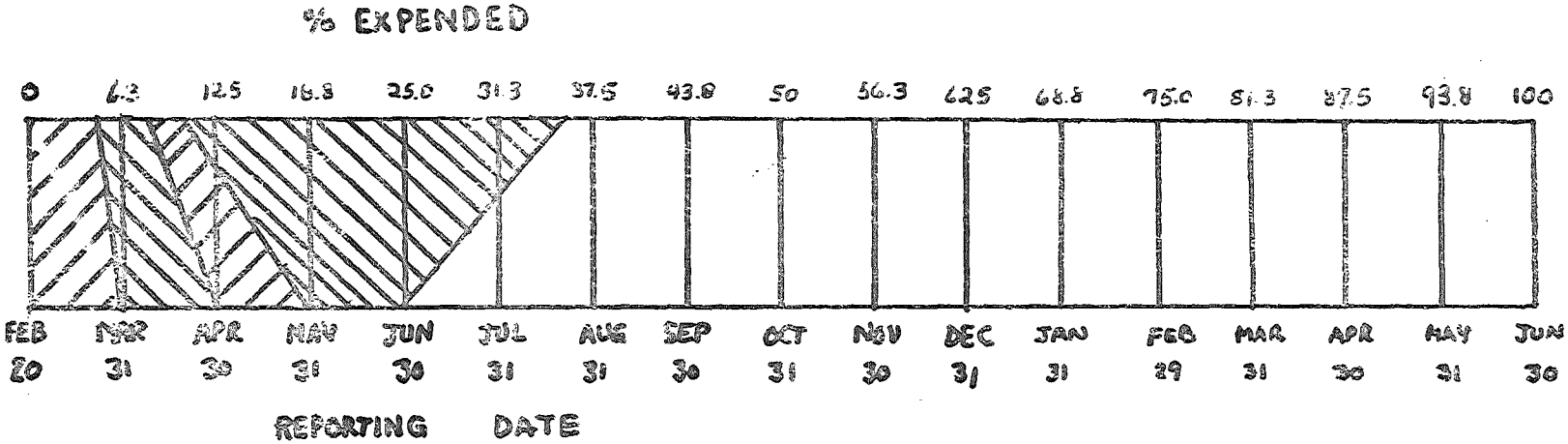
Bl. 1 copies:
3041 (Allen)

FIGURE 1

MILESTONE STATUS

	Milestone	Activity	Expected Completion Date	Date
1.	Prepare general management plan	ELEX	21 Apr 1975	23 Apr 1975
2.	Prepare LFA implementation plan	LFA	9 May 1975	16 May 1975
3.	Review and approve LFA implementation plan	ELEX	16 May 1975	in progress
4.	TSA System implementation plan			
	AN/URC-85	TSA	9 Jun 1975	in progress
	AN/SRR-1	TSA	9 Jun 1975	in progress
	AN/WSC-3	TSA	9 Jun 1975	in progress
	AN/URC-62 (Verdin)	TSA	9 Jun 1975	in progress
5.	Review and approve TSA system implementation plan	TSA	18 Jun 1975	N/S
6.	Characterize operation system	TSA	10 Jul 1975	in progress
7.	System reliability model and data collection requirements	LFA	1 Aug 1975	N/S
8.	Prepare sampling plan	LFA	15 Aug 1975	N/S
9.	Prepare data collection plan	TSA	25 Aug 1975	N/S
10.	Data collection	TSA	31 May 1975	N/S
11.	Failure analysis procedure	LFA	1 Jul 1976	N/S
12.	Fault isolation and failure analysis	LFA	15 Jul 1976	N/S
13.	Recommend corrective action	TSA	1 Jul 1976	N/S
14.	Evaluate corrective action	LFA	15 Jul 1976	N/S
15.	Propose ECP's and submit final engineering report	LFA	1 Aug 1976	N/S
16.	Configuration control sub-board action of ECP's	ELEX-470	1 Aug 1976	N/S

FIGURE 2
LFA PROGRAM STATUS



Verdin TSA Monthly Status Report
June 1975

Ref: (a) NAVELEXSYSCOM ltr 470 CEM:dm 3920 Ser 73-470 of 23 Apr 1975
(b) Fleet Reliability Assessment Program Implementation Plan Report WQEC/C 75-193 of 3 Jun 1975

1. This report is submitted to describe those tasks performed during the subject reporting period as required by references (a) and (b).

2. Verdin TSA Progress Summary:

a. Feb 1975 - Received task assignment, NWSC Crane designated URC-62 (Verdin) TSA.

b. Mar 1975 - Reviewed Verdin ILS Plan. Identified discrepancies in ILS plan. Identified other documents needed.

c. Apr 1975 - New tasking letter received. Participated in NWSC Crane sponsored TSA meeting.

d. May 1975 - LFA direction received delineating TSA responsibilities, reference (b).

3. Progress during reporting period 1 June 1975 through 30 June 1975 is as follows:

a. NELC (1300) was visited by this activity to obtain information on Verdin system, obtain baseline reliability parameters, and assess installation status. Documents reviewed are listed in Appendix A, paragraph B. Pertinent information was extracted from these documents toward accomplishing the Verdin TSA responsibility of system characterization. Verdin equipment installation schedules were also obtained at NELC.

b. An informal interface has been made with Collins Radio, the prime Verdin contractor. NWSC (3041) has been placed on the mailing list for the monthly Verdin field failure reports generated by Collins Radio which documents Collins' effort as the depot level maintenance activity for Verdin.

c. Drafting of the Verdin TSA Implementation Plan has been initiated and is scheduled for completion on 18 July 1975.

d. Verdin related documents received and reviewed toward meeting FRAP TSA system characterization efforts are listed in Appendix A, paragraph C.

4. Plans for next month include:

a. Completion and submittal of the Verdin TSA Implementation Plan by 18 July 1975.

b. Characterize the Verdin system by 30 July 1975 to include:

(1) Functional Flow Diagram and description.

(2) Identification of System Operating Modes and Duty Cycle.

(3) Reliability Baselines.

(4) System Operational Status.

(5) Gross Installation Environment Characteristics.

(6) Maintenance Planning Description.

c. Trip to Verdin contractor (Collins Radio) to discuss depot maintenance data, collection of failed parts, and failure tracking.

d. Obtaining other necessary Verdin documents as listed in Figure A.

Appendix A: Documents necessary for the Verdin TSA Effort

A. Obtained by NWSC Crane prior to 30 May 1975:

1. Integrated Logistic Support Plan: Verdin, NESC Special Communications Project Office, PME-117 of 9 Aug 1974 with appendices.

a. AN/ART-50 Operational Logistic Support Plan.

b. Applicable Documents

c. Abbreviations and Acornyms.

d. Depot Repairable Repair Parts and Part Number to FSN Cross Reference Listing

2. Verdin Reliability Program Plan, Revision II Collins Radio Company, Newport Beach Region, California of 30 Jul 1970.

3. VLF/LF Verdin Fixed Plant Transmit Terminal Purchase Description, ELEX T-67 of 6 Jul 1970.

4. Final reliability Demonstration Test Report for Verdin Transmit System AN/ART-50 Data item A001AW, contract N00039-70-C-1507, Collins Radio Company of 26 Mar 1973.

5. Final Reliability Demonstration Test Report for Verdin Receive System AN/WRR-7 Data item B001BA contract N00039-70-C-1507, Collins Radio Company of 26 Mar 1973.

6. Verdin Shipboard Mean-Time-to-repair Prediction contract N00039-70-C-1507 Collins Radio Company of 10 Feb 1971.

B. Reviewed during June 1975 visit to NELC:

1. NELC Contract Specification VLF/LF Radio Receiving Set Digital Data (U) ELEX R119B (24 Sep 1973) AN/WRR-7.

2. Naval Air Systems Command: Specification for Radio Group AN/ARA-(#)(U) AS-1238B (AV) (24 Sep 1973).

3. NELC: Contract Specification Fixed Plant Digital Data Transmitting Set AN/URT 30 (U) ELEX-T84B (24 Sep 1973).

4. Verdin Shore Installation Planning NESC PME 117 of 31 Dec 1973.

5. Collins Radio Group: Verdin Field Failure Report of 1 May 1975.

6. Collins Radio Group: Verdin first aeticle test reports and documents.

7. Preliminary Operational Instructions for Receiving Set Digital Data (U) AN/WRR-7 NAVELEX 0976-462-3031.

8. Special Operational Instructions for Transmitting Set AN/ART-50, NAVELEX 0967-462-5010, NAVAIR 16 - 30 ART 50-2.

C. Received or Procured during reporting period 1 June 1975 through 30 June 1975:

1. Document #1

2. Document #2

3. Monthly Report (#) for Verdin Field Failure Monitoring Program Line Item 38, Task 13, Contract N00039-70-C-1507, Collins Radio Company These reports will be received by NWSC Crane (3041) on a monthly basis. The first report was generated 1 April 1975.

4. Reliability Summary and Test Report for Verdin System AN/ART-50 Data Item A001AW, contract N00039-70-C-1507, Collins Radio Company, August, September, and December 1972 reports.

D. To be obtained:

1. Verdin Reliability Demonstration Electrical Test Methods and Procedure, Transmitting Set AN/ART-50 Collins Radio, submitted 12 April 1972, Data Item A001AG contract N00039-70-C-1507

2. Verdin Reliability Demonstration Electrical Test Methods and Procedure for Receiving Set AN/WRR-7 Collins Radio, submitted 21 March 1972 Data Item B001BM, contract N00039-70-C-1507.

3. Contract Specification Fixed Plant Digital Data Transmitting Set AN/URT-30 (U) Naval Electronic Systems Command ELEX-T84B of 24 September 1973.

4. TDP X32-54 of April 1967 Technical Development Plan Verdin (U)

5. N00039-70-C-1507: Contract for Verdin (with modifications) December 1973.

6. SOR S32-54 Specific Operational Requirements, Verdin (U).

7. Contractor's (Collins) Verdin Reliability and Maintainability Predictions.

8. Clarinet Verdin Classification Guide OPNAVINST 00510.112.

9. AN/ARC Transmitting Set Digital Data AS-1237.

10. ELEX R-27A/ELEX R-119 AN/WRR-7 Receiver

11. NAVMATINST 4200.31A Advance Procurement Planning.

3041-GEA:sh
3010/3
3 JUN 1975

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana
To: Commander, Naval Electronic Systems Command (ELEX-470), Washington, DC 20360

Subj: Monthly Status Report for May 1975

Ref: (a) NAVELEXSYSCOM ltr 470 CEM:dm 3920 Ser 73-470 of 23 Apr 1975
(b) NAVELEXSYSCOM ltr 47024:JF:jc 9670 Ser 41-4702 of 14 Feb 1975
(c) NAD Crane ltr 3041-GEA:rjr 3010/3 of 16 May 1975

1. This report is submitted to describe those tasks performed during the subject reporting period as required by reference (a).

2. Milestone status - The status for milestones is shown in Figure 1.

3. LFA Progress Summary:

a. February 1975 - Received task assignment, reference (b). NAD Crane designated LFA, NELC, NAD Crane, and NESTED designated as TSA's. TSA responsibilities: NAD Crane - Verdin system, NESTED - AN/URC-85, NELC - AN/SRR-1 and AN/WSC-3.

b. March 1975 - Reviewed Verdin ILS plan. Identified discrepancies in ILS plan. Identified other documents needed. Verbal coordination with NESTED and NELC to prepare program plans. Reviewed NDCS for compatibility with FRAP objectives and data requirements. Attended NDCS review meeting between NESTED (027), NAD Crane (3041), NAVELEX (470), and NAVSECNORDIV (6640). Attended coordination meeting between NAVELEX (470) and NAD Crane (304) discussing need for new tasking letter.

c. April 1975 - New tasking letter, reference (a), was received. Corrected March 1975 monthly status report. Showed sample size dependence on confidence intervals and duty cycle. NAD Crane (304) hosted coordination meeting between NESTED (027), NAVELEX (470), and NESEC (TOM-2). NESEC was given NELC TSA responsibilities due to NELC travel restrictions. Meeeting minuts distributed.

4. Progress during reporting period 1 May through 31 May 1975 is as follows:

a. The Lead Field Activity Implementation plan was completed and submitted for review and approval, reference (c). This plan will be appended by each TSA (equipment) Implementation plan as it is prepared. The LFA Implementation contains an identification of the following:

(1) Background

(2) Objectives

(3) Equipment scope

(4) Approach

(5) Definitions

(6) Program organization

(7) LFA organization

(8) Program interface

(9) LFA milestone and schedule

(10) TSA milestone and schedule

(11) Characterizing operational system

(12) Reliability model and data collection requirements

(13) Sampling plan

(14) Data collection plan

(15) Data collection

(16) Fault isolation and failure analysis

(17) Data analysis

(18) Recommend corrective action

(19) Reports

(20) LFA functions

(21) TSA functions

b. Preliminary work has been done to define the procedure for completing the reliability math model and the sampling plan. This includes identification of statistical programs, techniques, and data required for the model and sampling plan.

5. Plans for next month include:

a. Trip to NELC (1300) to obtain information on Verdin system, review system documents, resolve discrepancies discovered in ILS plan, obtain baseline reliability parameters and identify any system problems/corrective action taken.

b. Trip to NESEF (TOM-2), Vallejo to coordinate and help NESEC prepare the TSA AN/SSR-1 Implementation plan and the TSA AN/WSC-3 Implementation plan.

c. Trip to NESTED and NAVELEX to coordinate FRAP implementation plans Tycom interfaces, data collection requirements, and to discuss Verdin support requirements.

d. Approval of TSA (equipment) implementation plans.

e. Trip to Verdin Contractor to discuss depot maintenance data, collection of failed parts, and failure tracking.

6. Fudning status at the end of this reporting period is shown in Figure 2.

7. Any questions regarding this submittal should be directed to Commanding Officer, Naval Ammunition Depot (Code 3041), Crane, Indiana or to Mr. George Allen at autovon 482-1285.

S. S. KALBERER
By direction

Copy to:
NESTED (027)
NESEC (TOM-2)

ENCLOSURE

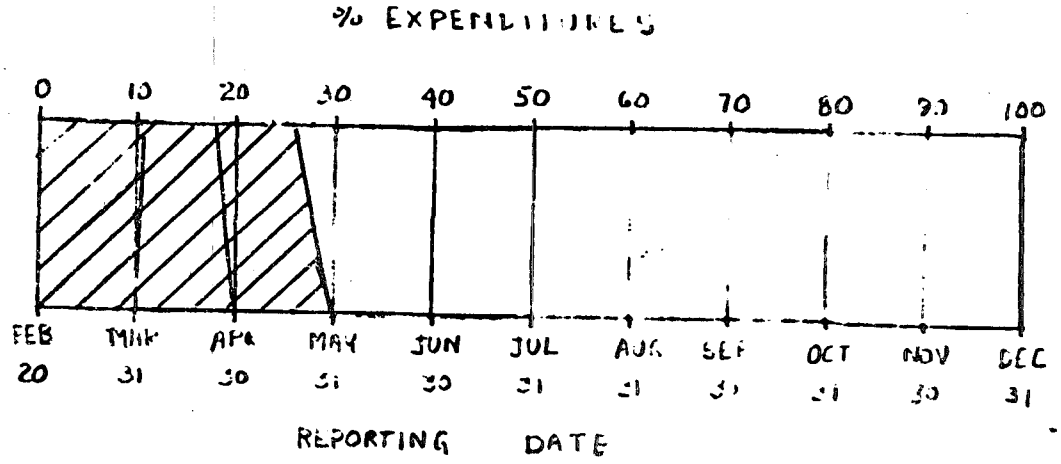
Milestone Status

Milestone		Activity	Expected Completion Date	Date Date
1.	Prepare general management plan	ELEX	21 Apr 1975	23 Apr 1975
2.	Prepare LFA implementation plan	LFA	9 May 1975	16 May 1975
3.	Review and approve LFA implementation plan	ELEX	16 May 1975	in progress
4.	TSA system implementation plan	TSA	9 Jun 1975	in progress
5.	Review and approve TSA system implementation plan	LFA	18 Jun 1975	N/S
6.	Characterize operational system	TSA	10 Jul 1975	N/S
7.	System reliability model and data collection requirements	LFA	1 Aug 1975	N/S
8.	Prepare sampling plan	LFA	15 Aug 1975	N/S
9.	Prepare data collection plan	TSA	25 Aug 1975	N/S
10.	Data collection	TSA	31 May 1975	N/S
11.	Failure analysis procedure	LFA	31 Aug 1975	N/S
12.	Fault isolation and failure analysis	LFA	15 Jun 1976	N/S
13.	Recommend corrective action	TSA	1 Jul 1976	N/S
14.	Evaluate corrective action		15 Jul 1976	N/S
15.	Propose ECP's and submit final engineering report	LFA	1 Aug 1976	N/S
16.	Configuration control sub-board action of ECP's	ELEX-470	1 Aug 1976	N/S

FIGURE 1

ENCLOSURE

FIGURE 2
LFA PROGRAM STATUS



-FUNDING STATUS-

3041-GEA:rjr
13070
5 MAY 1975

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana
To: Commander, Naval Electronics Systems Command (ELEX 470), Washington, D. C. 20360

Subj: Monthly status report for Apr 1975

Ref: (a) NAVELEXSYSCOM ltr 470:CEM:dm 3920 Ser 73-470 of 23 Apr 1975
(b) NAD Crane ltr 3041:GEA 13070 of 29 Apr 1975
(c) NELC San Diego ltr R142 ENG:drw SER 4100-11 of 14 Apr 1975

1. Reference (a) requires monthly status reports for all the tasks performed by the Lead Field Activity (LFA) and all tasks performed by the Technical Support Activities (TSA's). This report covers those tasks performed during the subject reporting period.

2. The following changes to the March 1975 monthly status report are hereby promulgated for clarification:

a. Paragraph 2.a.(3) last sentence is corrected to read, "MTBF's of the following Verdin equipments have not been identified:

(1) Shore based processor/control unit and modulator
(2) Airborne processor/demodulator, processor/control unit and modulator
(3) Shipboard processor/demodulator"

b. Paragraph 2.a.(7) is amended to include the following item:

(1) "The discrepancy in the identification of Verdin components versus necessary auxillary equipments as indicated by Figures 1-1, 1-2, 1-3, 1-4, and the text of the Integrated Logistic Support Plan for Verdin of 9 August 1974."

c. Paragraph 2.c. last sentence is corrected to read, "This meeting explored the features of the MDCS (Maintenance Data Collection System) and determined that it could meet the requirements of the FRAP (Fleet Reliability Assessment Program) only by modifying the present reporting system by CNM (Chief of Naval Material) approval".

3. Those LFA tasks performed during the subject reporting period are:

a. Further progress was made toward completing the sampling plan for the Verdin system as follows:

(1) Initial contact has been made with Naval Electronics Laboratory Center (NELC) Code 1300. A trip will be scheduled during the next reporting period to review and/or obtain those data sources identified in paragraph 2.a.(6) and to resolve those items identified in paragraph 2.a(7) as amended by this correspondence.

(2) Preliminary analysis has determined that the equipment duty cycle and the width of the 90% confidence interval are critical parameters determining the equipment sample size. Under the assumptions of a fixed length test of six months, zero repair time and an exponential distribution, sample sizes were from three systems to 42 systems for the AN/ART-50. These results are shown in Figures 1 and 2 for the AN/ART-50 specified MTBF of 750 hours.

(3) The reliability demonstration test report for the AN/ART-50 was reviewed and showed that the true MTBF of the AN/ART-50 system is below 750 hours. The point estimate for the MTBF is 3653 hours divided by seven failures, which is 522 hours MTBF. Further investigation is necessary to identify corrective action performed or required as a result of the reliability demonstration test.

(a) From the analysis demonstrated in Figures 1 and 2 and results of demonstration tests previously mentioned, it is evident that prior to sample size determination details of the duty cycle, usage rate, repair rate, down time, mission profile, other test results must be thoroughly investigated. Too large a sample size will result in excessive data acquisition costs.

(b) LFA hosted a coordinated meeting for all FRAP participants on 17 and 18 April 1975. NELC could not attend because of travel restrictions. Naval Electronics Systems Engineering Center (NESEC), Vallejo was given the TSA responsibilities for the AN/WSC-3 and AN/SSR-1 in place of NELC when it was determined that these travel restrictions would continue into the indefinite future. The results of this meeting have been distributed to all participants by means of reference (b).

(c) As required by reference (a) this activity is preparing the LFA Implementation Plan. This plan will be submitted during the next reporting period.

(4) This activity has not received a monthly status report for April from Naval Electronics Systems Test and Evaluation Detachment (NESTED) but Mr. John White and Mr. Marty Leopold of NESTED attended the coordination meeting at NAD Crane on 17 and 18 April 1975.

(5) NELC performed those activities listed in reference (c) for the period 15 May through 15 April 1975.

(6) Reference (a) directs this activity to issue a work request to NESEC Vallejo to support FRAP as a TSA. This will be accomplished during the next reporting period as soon as the LFA Implementation Plan has been completed.

7. Figure 3 shows expenditures for FRAP below planned levels. This is due to the curtailment of activities while preparing for and participating in the coordination meeting of 17 and 18 April 1975.

8. Questions regarding this submittal should be directed to the Commanding Officer, Naval Ammunition Depot (Code 3041), Crane, Indiana or to Mr. George Allen at autovon 482-1285 or 1370.

S. S. KALBERER
By direction

3041-GEP:rir
13970
22 APR 1975

From: Commanding Officer, Naval Ammunition Depot, Crane, IN
To: Commander, Naval Electronic Systems Command (Code 470),
Naval Electronic Systems Headquarters, Washington, DC 20360

Subj: Monthly Status Report for Mar 1975

Ref: (a) NAVELEX ltr 47024:JF:jc 9670 Ser 41-4702 of 14 Feb 1975
(b) NELC ltr 5142 DMG:drw Ser 4130-10 of 13 Mar 1975

1. Reference (a) requires monthly status reports for the tasks performed by the Lead Field Activity (LFA) and all tasks performed by the Technical Support Activities (TSA's). This report covers those tasks performed during the subject reporting period.

2. The following LFA tasks were performed during the subject reporting period:

a. The Integrated Logistic Support Plan for the Verdin system was reviewed for determination of a suitable sampling plan. The following summary details the progress toward completing this sampling plan.

(1) Verdin is a one, two, or four channel broadcast system capable of transmitting encrypted information by means of minimum shift keying (MSK) techniques at VLF frequencies. The Verdin system designated the AN/URC-62 consists of transmitting site equipment located at a shore installation, relay equipment in an airborne installation aboard TACAMO aircraft, and receiver configured equipment found in ship installations. The Verdin components are those processor-control units, modulators and cesium frequency standards required for the transmit functions and the receivers, processor-demodulator units and cesium frequency standards used for the receiver functions.

(2) The AN/ART-50, AN/URT-30 associated antennas and certain other periphery equipment, though not specifically Verdin system equipment, must be considered in any reliability block diagram of the Verdin operational system because of their series connection with the Verdin equipments.

(3) Shore based portions of the Verdin system are designated to operate continuously. The AN/URT-30 is the associated transmitter for shore installations having a specified MTBF of 1000 hours. Airborne portions of the Verdin system are specified to operate continuously for at least seven days and a maximum of twelve days. The AN/ART-50 transmitter alone and AN/ARR-77 receiver with frequency standard has a specified MTBF of 750 hours while the frequency standard has a specified MTBF of 2500 hours.

Shipboard installations are designated to operate continuously. The AN/WRR-7 receiver has a specified MTBF of 1000 hours. MTTR's have not been identified for any Verdin equipments or serially connected associated equipments. MTBF's of Verdin equipments have not been identified.

(4) Verdin equipment contains diagnostic circuitry to aid fault isolation to a replaceable circuit card which can be replaced at the organizational level. The depot level repair activity is the contractor.

(5) Shipboard installation are fully operational in submarine tenders AS-19, 31, 32, 33, 34, and all FBM submarines (SSBN's) except the 600, 602, and 608. Reports are being received on these installations already. Eighteen aircraft installations have already been completed while no shore stations are operational except training sites.

(6) Following documents have been identified as data sources for Verdin system equipments:

(a) NAVELEX 0967-462-2010, "Theory and Functional Description, Communication System, Digital Data AN/URC-62(S)".

(b) OPNAVINST 05510.112, "Clarinet Verdin Classification Guide".

(c) SOR 532-54, "Specific Operational Requirement Verdin (U)."

(d) Maintenance Requirement Cards.

(7) Items to be resolved before sampling plan can be completed are:

(a) The actual numbers of equipment installed, where located, and deployment schedule of ships or aircraft involved.

(b) The mission times for installations and preventive maintenance schedules.

(c) The specified MTTR's for each equipment and MTBF's presently unknown and other R&M indices determined at specified life cycle assessment points.

b. Preliminary program plans were received from the TSA's and verbal comments were passed to each TSA. NESTED has resubmitted a second draft corrected in accordance with verbal directions. Formal guidelines are being prepared to assist the TSA's in meeting the guidelines established in the 20 March 1975 meeting between the LFA and NAVELEX (470). This will be completed during the next reporting period.

c. The Maintenance Data Collection Subsystem (MDCS) for ships has been reviewed for compatibility with the data requirements of the Fleet

Reliability Assessment Program (FRAP). The results of this analysis were presented at a meeting on 26 March 1975 at NAVELEXSYSCOM. The analysis is summarized below:

(1) MDCS meets the data requirements of the FRAP program designated equipments of AN/WSC-3, AN/SRC-1 and Verdin with the following exceptions:

(a) Operational time is not explicitly available, i.e., daily, weekly, or monthly cumulative operating hours are not reported, nor is cumulative hours by mode of operation available.

(b) Traceability of the depot repairs of a maintenance action initiated at organizational level is not provided explicity. There is some question whether the records can be traced by means of special printouts. The key to answering this is in how the job control number is generated for each maintenance action. Satisfactory resolution of this could also be used to maintain histories on spares.

(c) Time lag for data processing by 3M Center.

(d) Shallow detail of data reported.

(2) MDCS exceptions to FRAP data requirements require CNO direction to the Fleet TYCOM's or their alternatives. Means to overcome these will be researched during the next reporting period.

(3) MDCS evaluation of individual TSA data requirements has been completed item by item. This analysis has been submitted to the appropriate TSA under separate correspondence.

d. Attended a coordination meeting between NAVELEX (470) and NAD Crane (Code 304) on 20 March 1975. This meeting established the need for a NAVELEX (470) management plan and a LFA management plan to clearly define responsibilities and program milestones.

e. Attended a MDCS meeting with NESTED (Code 027), NAVSECNORDIV (Code 6640) and NAVELEX (470), at NAVELEXSYSCOM on 26 March 1975. This meeting explored the features of the MDCS and determined that all MDCS information would be useful but it could meet all data requirements of the FRAP program only with slight modifications in the reporting system.

f. This activity is preparing the LFA management plan for submittal during the next reporting period. This will contain a Pert chart showing all activities necessary to complete the FRAP tasks and their time relationships. In addition it will identify personnel available for participation in FRAP, the approach to be followed in management of FRAP, specify activities participating and the approach to be followed in implementing FRAP.

3. NESTED has performed the following during the period 20 February to 15 March 1975:

a. Obtained the following AN/URC-85 background information:

(1) Equipment specification.

(2) Contract.

(3) Maintainability program plan.

(4) Maintainability test report.

b. Established liaison with the FMA.

c. Identified additional data requirements consisting of:

(1) Reliability test reports.

(2) Reliability program plan.

(3) Failure reports.

(4) System mission requirements.

d. Identified specified MTBF of 500 hours and MTTR's of 10 minutes and 30 minutes for O-level and I-level maintenance respectively.

e. Submitted a program plan per paragraph 7g of reference (a).

f. Identified data requirements and arranged to collect this data from the FMA.

g. Identified the need to collect data from the depot repair activity and is planning to initiate contact with the depot activity to arrange the collection of this data.

h. Recognized the need for a reliability model and is pursuing baseline data to define the model.

4. NELC has performed those activities listed in reference (b) for the FRAP program for the period 20 February through 15 March 1975.

5. Figure 1 shows expenditures slightly beyond planned levels, but this is due simply to initial planning activity and is expected to be at planned levels at the end of the next reporting period. Milestone completion status is behind schedule due primarily to redirection of 20 March meeting and is expected to catch up over the next reporting period.

6. Questions regarding this submittal should be directed to the Commanding Officer, Naval Ammunition Depot (Code 3041), Crane, Indiana or to Mr. George Allen at autovon 482-1285 or 1370.

S. S. KALBERER
By direction

Copy to:
NELC (Code 410)
NESTED (Code 027)

NAVAL ELECTRONICS LABORATORY CENTER
271 CATALINA BOULEVARD
SAN DIEGO, CALIFORNIA 92152
714-225-6011
AUTOVON 952-1011

IN REPLY REFER TO:
NELC R142
EWG:drw
Ser 4100-11

14 APR 1975

FROM: Commander, Naval Electronics Laboratory Center
TO: Commander, Naval Ammunition Depot, Crane (304B)

SUBJ: Submission of FRAP Monthly Status Report (April 1975)

REF: (a) NAVELEX ltr. Ser. 41-4702 of 14 February 1975
(b) TELCON, NAVELEX 470 and Mr. E. Glunt, NELC 21 March 1975
(c) TELCON, G. Allen (NAD) and G. Pillion (NELC) 2 April 1975
(d) Memorandum Ser. 80-4702, J. Fong to G. Allen, 11 March 1975
(e) NAVELEX TWX (S.E.L. INFORMATION) 4 March 1975

ENCL: (1) April 1975 FRAP Progress/Status Report
(2) VERDIN Equipment Breakdown

1. In accordance with paragraph 8.b of reference (a), the progress of this Center's effort in support of the Fleet Reliability Assessment Program (FRAP), covering the last two weeks of March 1975 and the first two weeks of April 1975, is hereby submitted as Enclosure (1) for your review.

2. Reference (b) verbally informed Code 4100 that a change of assigned equipments to NELC had been made by NAVELEX 470. NELC is now responsible for assessing the operational reliability of the AN/WSC-3 and VERDIN systems.

3. Reference (c) verbally confirmed the change in program assignments and indicated NELC will be receiving a new tasking statement from NAVELEX 470 along with an approved Management Plan and Milestone Charts on or about 15 April 1975.

4. To facilitate the assessment of the VERDIN equipments, NELC hereby requests the documentation supplied to NAD by NAVELEX as indicated in reference (d).

5. Reference (e) supplies a list of FRAP designated equipments that were requested by COMNAVELECSYSCOM for inclusion on the Maintenance Data Collection System (MDCS) Selected Equipment List (SEL). An assumption was made that all equipments including the VERDIN RCVR(AN/WRR-7) will be included in the SEL. NELC hereby requests confirmation of this action so as to include MDCS as a major source of operational reliability data.

Reference (c)

NELC R142
EWG:drw
Ser 4100-11

6. Although official confirmation of the change in NELC assignment has not been received as of this date, NELC will proceed on the assumption that the verbal changes as stated in references (b) and (c) will be forthcoming in the very near future.

7. Enclosure (2) VERDIN EQUIPMENT BREAKDOWN, is included for information only and lists the equipments of the VERDIN surface, air, and land sites that will be included as part of the reliability assessment program.

E. W. GLUNT
By direction

Copy to:
6460 (4) w/o encls.
4000 (1) w/encls.
4100 (5) w/encls.
NAVELEX 470 (Cdr. Mandel) (1 copy w/encls.)
NAVELEX 470 (J. Fong) (1 copy w/encls.)

ECT PROGRESS REPORT
Commander, Naval Electronics Laboratory Center
Commander, Naval Ammunition Depot, Crane

OBLEM NO.	PROGRAM/PROJECT	REPORTING PERIOD	DATE
-142	FRAP	MAR/APR 1975	12 Apr. 1975

JECT	TASK NO.	SPONSOR
		NAVELEX 470

NCIPAL INVESTIGATOR	CODE	TELEPHONE	ASSOCIATE INVESTIGATOR	CODE	TELEPHONE
. F. PILLION	4100	X6386			

ACTIVITY STATUS

DUE THIS REPORTING PERIOD

) March 1975, NELC final Program Plan Submission - Not now required due to change
assignment and direction of program that includes development of an overall FRAP
nagement Plan generated by NAVELEX 470 and the Lead Field Activity, NAD, Crane.
is Management Plan to include revised Milestones and due dates as described to
LC per reference (c).

DUE NEXT REPORTING PERIOD

sks as assigned by the LFA and, upon receipt of the new FRAP Management Plan, any
lestone requirements spelled out therein.

ACTIVITIES IN PROCESS AT END OF REPORTING PERIOD

- Acquisition of data on AN/WSC-3 and VERDIN System. (Historic)
- Refining Specific data requirements.
- Reviewing accumulated data on assigned equipments.
- Support to Lead Field Activity as requested and required.

MILESTONE STATUS						
NO.	MILESTONE IDENTIFICATION	MILESTONE DATE			CHECK ONE	
		SCHED	REVISED	ACTUAL	MADE	MISSED
				TOTALS		

DISCUSS MILESTONES MISSED *(Include reasons, effect on problem/project, remedial action taken, and when)*

Awaiting revised FRAP Milestone Chart.

FUNDING STATUS

As of 11 April 1975 Code 4100 has charged 380 hours of direct labor to FRAP and has expended $8,388.00. This amount covers a seven (7) week time frame.

URRENT CRITICAL PROBLEMS *(State: Nature of problem, impact on project, action to be taken or recommended, and when for each problem)*

NONE.

NTICIPATED CRITICAL PROBLEMS *(State: Nature of problem, impact on project, action to be taken or recommended, and when for each problem)*

NONE AS OF THIS DATE.

CONTRACTS/PURCHASE ORDER STATUS

CONTRACTOR	AMOUNT	ITEM	DUE DATE	STATUS
N/A				

TRAVEL

TRAVEL PERFORMED	PLANNED TRAVEL
NONE.	Possible visit to NAD, Crane during month of May 1975 on Invitational Type Travel Order submitted to NELC by the Lead Field Activity.

VISITORS/BRIEFINGS

NELC expects the Lead Field Activity, NAD, Crane to visit Code 4100 sometime during the latter part of April 1975. This visit is to discuss a wide range of FRAP related subjects and specifically to address the "Implementation Plan" that will be the means for the acquisition of operational reliability data direct from the fleet.

VERDIN

EQUIPMENT

BREAKDOWN

ENCLOSURE (2)

AN/WRR-7 VLF/LF Receiver

Comprised of:

- Receiver R-1738/WR
- Processor CP/1071/WR
- Demodulator/Power Supply MD-855/WRR-7
- Frequency Standard O-1695/URC

AN/URT-30 Transmitter

- Processor CP/1071/WR
- Control Unit/Power Supply C-8979/URT-30
- Modulator MD-856/ART-50
- Frequency Standard 01695/URC

AN/ART Airborne Transmitter

- Processor CP-1072/AR
- Control Unit C-8784/ART-50
- Power Supply PP 6628/AR
- Modulator MD-856/ART-50
- Freqency Standard O-1612/URC

NAVAL ELECTRONICS LABORATORY CENTER
271 CATALINA BOULEVARD
SAN DIEGO, CALIFORNIA 92152
714-225-6011
AUTOVON 952-1011

IN REPLY REFER TO:
NELC R142
EWG:drw
Ser 4100-10

13 MAR 19..

From: Commander, Naval Electronics Laboratory Center
To: Commander, Naval Ammunition Depot, Crane (304B)

Subj: Submission of FRAP Monthly Status Report (March 1975)

Ref: (a) NAVELEX ltr. ser. 41-4702 of 19 February 1975

Encl: (1) March 1975 FRAP Progress/Status Report
(2) AN/WSC-3 and AN/SSR-1 Equipment Breakdown

1. In accordance with paragraph 8.b of reference (a), the progress of this Center's effort in support of the Fleet Reliability Assessment Program (FRAP), covering the latter part of February to the second week of March 1975, is hereby submitted as Enclosure (1) for your review.

2. Enclosure (2) contains selected pages from OPNAVINST 1543.4 of September 1974, addressing the AN/WSC-3 and AN/SSR-1. This enclosure is sent for information only.

3. It is the intention of NELC to include the Antenna Groups utilized with the AN/WSC-3 (OE-82B/WSC-1(V)) for shipboard installations, and, (OE-158/BRQ, OE-176/BRQ or AN/BRA-34) for submarine installations as part of the AN/WSC-3 reliability assessment unless otherwise directed.

4. Due to the delay in the transfer of FRAP funds from NESTED to NELC, the Funding Status Chart is not included in this status report. It will be updated and included in the next (April) status report.

E. W. GLUNT
By direction

TO: Commander, Naval Electronics Laboratory Center
Commander, Naval Ammunition Depot, Crane

NELC PROBLEM NO.	PROGRAM/PROJECT	REPORTING PERIOD	DATE
R-142	FRAP	FEB/MAR 1975	14 MAR 1975

SUB-PROJECT	TASK NO.	SPONSOR
		NAVELEX 470

NELC PRINCIPAL INVESTIGATOR	CODE	TELEPHONE	ASSOCIATE INVESTIGATOR	CODE	TELEPHONE
G. F. PILLION	4100	X6386			

ACTIVITY STATUS

DUE THIS REPORTING PERIOD

1. FRAP Task Acceptance. In response to instructions contained in NAVELEX ltr. Ser. 41-4702 of 19 February 1975, NELC mailed acceptance ltr. Ser. 4100-8 on 20 February 1975. NESTED transferred $50K and it was received by NELC 10 March 1975.

2. NELC FRAP Program Plan. A draft of NELC's Program Plan for the prosecution of FRAP tasks related to the west coast candidate systems (WSC-3 and SSR-1) was submitted to NAD, Crane 5 March 1975. This draft is for review and comment and is in response to item #4 of the FRAP Milestone Chart. The final version will require approval of the Lead Field Activity (LFA) NAD Crane, 304B.

DUE NEXT REPORTING PERIOD

1. Submit final NELC FRAP Program Plan to LFA and NAVELEX 470 (31 MARCH 1975).
2. Tasks as assigned by LFA and FRAP milestone requirements. (NELC REQUESTS TASK ASSIGNMENTS FROM LFA TO BE SUBMITTED IN MEMORANDUM FORM TO ENSURE ACCURACY OF ASSIGNMENT).

ACTIVITIES IN PROCESS AT END OF REPORTING PERIOD

1. Continued review of acquired documentation (Specifications, Technical Manuals)
2. Continuing exploration for possible west coast sources of AN/WSC-3 and AN/SSR-1 reliability data.
3. Support to the Lead Field Activity as requested and required.
4. Refinement of NELC Frap Program Plan.

ENCLOSURE (1)
To NELC ltr Ser 4100-10

MILESTONE STATUS

NO.	MILESTONE IDENTIFICATION	MILESTONE DATE			CHECK ONE	
		SCHED	REVISED	ACTUAL	MADE	MISSED
1.	Submit NELC FRAP Program Plan to NAD	3/7/75		3/5/75	X	
	SUPPORT NAD IN THE FOLLOWING:					
2.	Develop overall FRAP Program Plan	3/31/75				
3.	Indoctrinate FRAP Implementation Teams	4/29/75				
4.	Begin Indoctrinating Fleet personnel	5/1/75				
5.	Begin Data Collection	5/1/75		3/1/75	X	
6.	Begin Data and Failure Analysis	7/1/75				
7.	Monthly Analysis Reports to NAVELEX	8/1/75				
8.	Begin Corrective Action Implementation	9/1/75				
9.	Final Engineering Report Submittal	11/29/75				
				TOTALS		

DISCUSS MILESTONES MISSED *(Include reasons, effect on problem/project, remedial action taken, and when)*

CURRENT CRITICAL PROBLEMS *(State: Nature of problem, impact on project, action to be taken or recommended, and when for each problem)*

ANTICIPATED CRITICAL PROBLEMS *(State: Nature of problem, impact on project, action to be taken or recommended, and when for each problem)*

1. The success of this pilot program will be dependent on the acquisition, review and analysis of many and varied types of data and relevant program information. The Reliability data (Historic and Current) must become available as soon as possible to achieve the desired results. It is recommended that a major effort of the Lead Field Activity should be directed towards the acquisition of the data requirements stated in the NELC FRAP Program Plan (Figure 5-1) submitted to NAD, Crane 5 MAR 1975.

2. The system performance and failure report forms that will be the official selection by the LFA must require equipment serial numbers for definite identification of equipments. This requirement is essential because of the proposed cascading of three (3) or more AN/WSC-3s on some ship installations.

CONTRACTS/PURCHASE ORDER STATUS

CONTRACTOR	AMOUNT	ITEM	DUE DATE	STATUS
N/A				

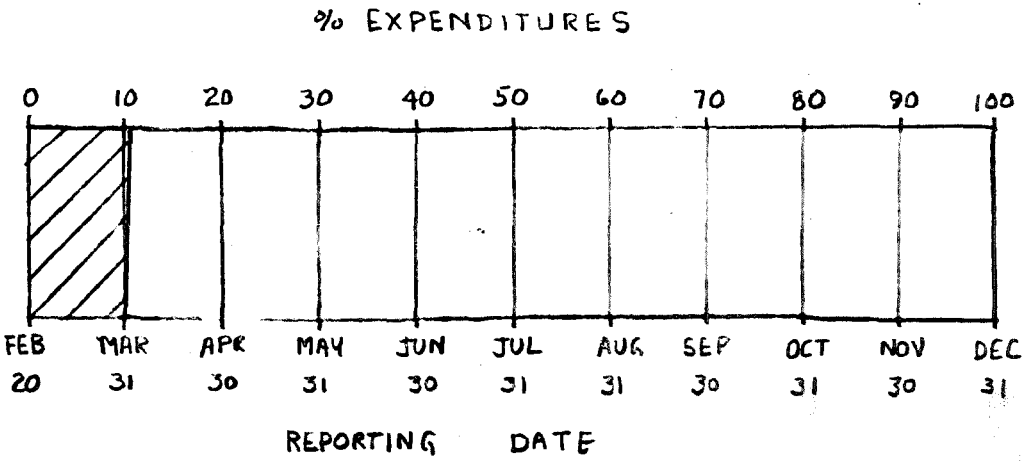
TRAVEL PERFORMED	PLANNED TRAVEL
None	None

VISITORS/BRIEFINGS

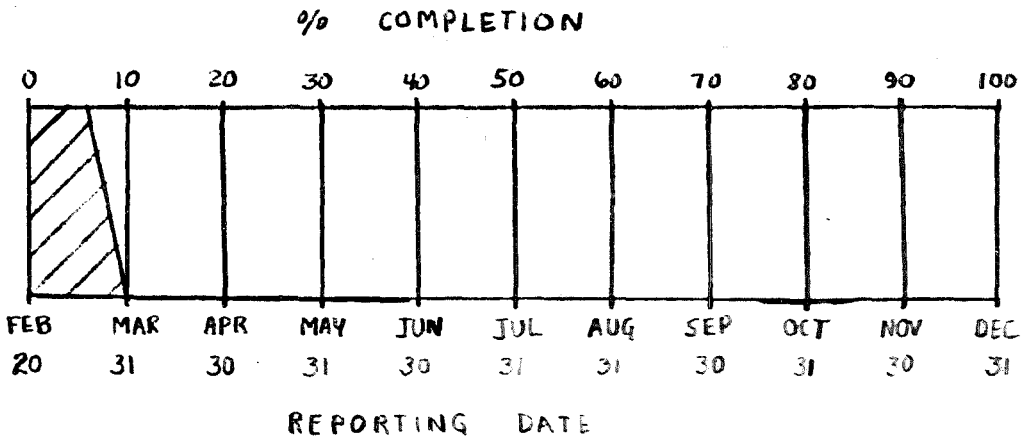
LTJG Monte Green, OPTEVFORPAC (on FRAP Task ltr. dist.) visited NELC to discuss a mutual transfer of information on AN/SSR-1. Lt. Green will be conducting the OPEVAL on the AN/SSR-1 beginning approximately 1 May 1975. This appears to be one source of data that may prove useful if the results of the OPEVAL are obtained in time to factor them into our overall analysis.

Code 4100 formally requests the LFA to make this source of data available to NELC via an official action. Code 4100 also reiterates its formal request for Fleet data on the AN/WSC-3 and AN/SSR-1 now available at the Fleet Maintenance Support Office (FMSO), Division of Ships Parts Control Center (SPCC) Mechanicsburg Pennsylvania.

FIGURE 1
LFA PROGRAM STATUS



- FUNDING STATUS -



- MILESTONE STATUS -

TSA

MONTHLY REPORTS

ANDARD FORM 50—Rev. December 1961
U.S. Civil Service Commission
FPM Chap. 295

NOTIFICATION OF PERSONNEL ACTION

(EMPLOYEE—See General Information on Reverse)

EH

NAVY OVERPRINT 10-72
(7-PT)

(FOR AGENCY USE)

00164 CN/40 WC/190 CC/39 30-2712

1. NAME (CAPS) LAST-FIRST-MIDDLE MR.-MISS-MRS.	2. (FOR AGENCY USE)	3. BIRTH DATE (Mo., Day, Year)	4. SOCIAL SECURITY NO.
MARKS, ROBERT J. II, Mr. Van Buren Apts #162, Bloomington, IN 47401	CL-00	08-25-50	0 [redacted]

5. VETERAN PREFERENCE	5A. FOR AGENCY USE	6. TENURE GROUP	7. SERVICE COMP. DATE	
1 (1-NO, 2-5 PT., 3-10 PT. DISAB, 4-10 PT. COMP, 5-10 PT OTHER)	11	2	03-25-74	[redacted] 00

9. FEGLI	10. RETIREMENT	11. (FOR CSC USE)
1 (1-COVERED (Regular only — declined Optional), 2-INELIGIBLE, 3-WAIVED, 4-COVERED (Reg. + Opt.))	1 (1-CS, 2-FICA, 3-FS, 4-NONE, 5-OTHER)	

12. CODE NATURE OF ACTION	13. EFFECTIVE DATE (Mo., Day, Year)	14. CIVIL SERVICE OR OTHER LEGAL AUTHORITY
101 Career-Cond Appt	03-25-74	Dayton Area Office Cert CO-4866 of 03-08-74

15. FROM: POSITION TITLE AND NUMBER	16. PAY PLAN AND OCCUPATION CODE	17. (a) GRADE OR LEVEL (b) STEP OR RATE	18. SALARY

19. NAME AND LOCATION OF EMPLOYING OFFICE

20. TO: POSITION TITLE AND NUMBER	21. PAY PLAN AND OCCUPATION CODE	21(a) FUNCT. CLASS.	22. (a) GRADE OR LEVEL	(b) STEP OR RATE	23. SALARY
Electronics Engineer PD #1425.1	GS 0855	99	09	01	PA $12167

24. NAME AND LOCATION OF EMPLOYING OFFICE

Quality Evaluation & Engineering Laboratory Department
[illegible]craft Equipment Division 3073
[illegible]stems Effectiveness Branch NAD, CRANE, INDIANA

25. DUTY STATION (City - county - State)	26. LOCATION CODE
Crane, Martin, Indiana	18-1055-101

27. APPROPRIATION	28. POSITION OCCUPIED (1-COMPETITIVE SERVICE, 2-EXCEPTED SERVICE)	29. APPORTIONED POSITION FROM: (1-PROVED-1, 2-WAIVED-2) TO: STATE
	1	

30. REMARKS:
X A. SUBJECT TO COMPLETION OF 1 YEAR PROBATIONARY (OR TRIAL) PERIOD COMMENCING: 03-25-74
X B. SERVICE COUNTING TOWARD CAREER (OR PERMANENT) TENURE FROM: 03-25-74 to 03-25-77

SEPARATIONS: SHOW REASONS BELOW, AS REQUIRED, CHECK IF APPLICABLE [ ] C. DURING PROBATION

ED: 04(1968)
17(1973 - Rose-Hulman Inst of Tech., Terre Haute, IN)

D. RETIRED UNIFORMED SERVICE:
UNIFORMED SERVICE DESIGNATION: [ ]
DATE OF RETIREMENT FROM UNIFORMED SERVICE: (MO - DAY - YEAR) [ ][ ][ ][ ][ ][ ]
UNIFORMED SVC PAY GRADE: [ ][ ]
UNIFORMED SVC COMPONENT: [ ]

E. WORK SCHEDULE [F]
F. PAY RATE DETERMINANT: [0]
G. SPECIAL PROGRAM ID: [0][0]

31. DATE OF APPOINTMENT AFFIDAVIT (Accessions only)
03-25-74

32. OFFICE MAINTAINING PERSONNEL FOLDER (If different from employing office)

34. SIGNATURE (Or other Authentication) AND TITLE
M. SMITH, Personnel Staffing Specialist

33. CODE NV17 EMPLOYING DEPARTMENT OR AGENCY DEPARTMENT OF THE NAVY

35. DATE 03-25-74 js

35.a. SUBMITTING OFFICE NUMBER 2562

0109 — 200 — 4241
0 — 134 — 15 1. EMPLOYEE COPY

EMPLOYEE'S COPY

DEPARTMENT OF THE NAVY

POSITION OR JOB DESCRIPTION

NAVSO 12510/7 (REV. 10-67)
(See Instructions on Reverse)

[X] PD [ ] JD NO. 1425.1

OFFICIAL CLASSIFICATION OR RATING ACTION

	POSITION OR JOB TITLE	SCHED. OR SERV.	SERIES	GRADE/ PAY LEVEL /FORMULA	CLASSI-FIERS INITIALS	CLASSIFICATION OR RATING OFFICIAL *(Signature, Title and Date)*
THIRD ACTION						
2. SECOND ACTION						
3. FIRST ACTION	Electronics Engineer	GS	855	9	RB	ROBERT G. BARNWELL Pos. Class. Spec. 20 FEB 1974
4. RECOMMENDED	Electronics Engineer	GS	855	9		5. NAME OF EMPLOYEE

POSITION OR JOB LOCATION

FOR INITIATING OFFICE ACTION

6. ACTIVITY - NAME AND LOCATION: NAD Crane, IN	9. *(3rd)*: Systems Effectiveness Branch
7. ORGANIZATIONAL SUBDIVISIONS *(1st)*: QEEL Dept.	10. *(4th)*:
8. *(2nd)*: Aircraft Equipment Division / Plans & Programs Div.	11. ORGANIZATIONAL TITLE OF POSITION OR JOB *(If any)*:

12. EMPLOYEES NOW PERFORMING DUTIES *(Ungraded jobs only)*

(No.:)	*(Title:)*	*(No.:)*	*(Title:)*

REASON FOR SUBMISSION

[ ] 13. DUTIES AND RESPONSIBILITIES NOT ELSEWHERE DESCRIBED - COMPLETE DESCRIPTION ATTACHED.

	POS. OR JOB #	CLASS. OR RATING
14. ATTACHED AMENDMENT NO. _____ TO-		
15. IDENTICAL TO-	1425	GS-855-9
16. ATTACHED STATEMENT OF DIFFERENCE TO-		
17. REPLACES-		
18. OTHER *(Specify)*		

CERTIFICATIONS:

The description of the duties and responsibilities of this position or job is complete and accurate.

	DATE
19. SIGNATURE *(Employee)*	
20. SIGNATURE AND TITLE *(Immediate supervisor)*: S. S. KALBERER / Mgr., Plans & Programs Div. *(Position No., Classification or Rank)*	
21. SIGNATURE AND TITLE *(Person authorized to establish position or job)*: A. E. WHITNER / Director, QEEL Dept.	

22. REMARKS

The classification of this position may be appealed by the incumbent at any time. Appeals from classification actions which result in demotion or reduction in compensation must be timely in order for retroactivity to apply. Consult your classifier or appropriate activity instruction for procedures. Civil Service Commission classification standards and Department of the Navy classification guides are available for review in the Wage and Classification Office.

23. CLASSIFICATION OR RATING RECERTIFICATION:					

I. INTRODUCTION

A. This position is located in the Systems Effectiveness ~~Section~~ Branch, Aircraft Equipment ~~Branch, Weapons Evaluation~~ Division, Quality Evaluation Laboratory Department. The section develops and implements systems effectiveness programs for the analysis, prediction, improvement, and assurance of reliability and maintainability of aircraft and ground support electronic systems and equipment. The position is that of a junior project engineer. The incumbent will typically be assigned cognizance of projects under the Engineering Support and Advanced Systems Program and will be under the direct supervision of the Program Manager.

II. MAJOR DUTIES AND RESPONSIBILITIES

A. Specifications and contracts for Navy Avionics Equipment require the use of Built-In Test (BIT) provisions for equipment checkout, and require tests to demonstrate the effectiveness of the BIT. This testing is performed at the contractor's facility; however, prior to the testing, the contractor is required to prepare and submit for approval or comment to NAD Crane, detailed test procedures outlining the proposed method, procedure and equipment to be utilized in conducting the test program. The incumbent is responsible for accomplishing the services required in administering this program.

B. In fulfillment of these responsibilities, the incumbent will take action as follows inasmuch as it is applicable for each project assignment.

1. Advise the contractor of appropriate action in order to facilitate the testing and acceptance of equipment.

EMPLOYEE'S COPY

DEPARTMENT OF THE NAVY

POSITION OR JOB DESCRIPTION

NAVSO 12510/7 (REV. 10-67)
(See Instructions on Reverse)

[X] PD [ ] JD NO. 1425.1

OFFICIAL CLASSIFICATION OR RATING ACTION

	POSITION OR JOB TITLE	SCHED. OR SERV.	SERIES	GRADE/ PAY LEVEL /FORMULA	CLASSI-FIERS INITIALS	CLASSIFICATION OR RATING OFFICIAL *(Signature, Title and Date)*
THIRD ACTION						
2. SECOND ACTION						
3. FIRST ACTION	Electronics Engineer	GS	855	9	RB	~~ROBERT C. BARNWELL~~ Pos. Class. Spec. 20 FEB 1974
4. RECOMMENDED	Electronics Engineer	GS	855	9		5. NAME OF EMPLOYEE

FOR INITIATING OFFICE ACTION

POSITION OR JOB LOCATION

6. ACTIVITY - NAME AND LOCATION: NAD Crane, IN

7. ORGANIZATIONAL SUBDIVISIONS *(1st)*: QEEL Dept.

8. (2nd) AIRCRAFT EQUIPMENT DIVISION Plans & Programs Div.

9. *(3rd)* SYSTEMS EFFECTIVENESS BRANCH

10. *(4th)*

11. ORGANIZATIONAL TITLE OF POSITION OR JOB *(If any)*

12. EMPLOYEES NOW PERFORMING DUTIES *(Ungraded jobs only)*

(No.:)	*(Title:)*	*(No.:)*	*(Title:)*

REASON FOR SUBMISSION

[ ] 13. DUTIES AND RESPONSIBILITIES NOT ELSEWHERE DESCRIBED - COMPLETE DESCRIPTION ATTACHED.

	POS. OR JOB #	CLASS. OR RATING
14. ATTACHED AMENDMENT NO. _____ TO-		
15. IDENTICAL TO-	1425	GS-855-9
16. ATTACHED STATEMENT OF DIFFERENCE TO-		
17. REPLACES-		
18. OTHER *(Specify)*		

CERTIFICATIONS:

The description of the duties and responsibilities of this position or job is complete and accurate.

19. SIGNATURE *(Employee)* — DATE

20. SIGNATURE AND TITLE *(Immediate supervisor)*: S. S. KALBERER
Mgr., Plans & Programs Div.
(Position No., Classification or Rank) — DATE

21. SIGNATURE AND TITLE *(Person authorized to establish position or job)*: A. E. WHITNER
Director, QEEL Dept. — DATE

22. REMARKS

The classification of this position may be appealed by the incumbent at any time. Appeals from classification actions which result in demotion or reduction in compensation must be timely in order for retroactivity to apply. Consult your classifier or appropriate activity instruction for procedures. Civil Service Commission classification standards and Department of the Navy classification guides are available for review in the Wage and Classification Office.

23. CLASSIFICATION OR RATING RECERTIFICATION:					

INSTRUCTIONS FOR COMPLETING FORM NAVSO 12510/7

FOR GRADED POSITIONS

(Note: Optional Form 8 is to be used for proposed allocations to GS-16, GS-17, or GS-18 - see NCPI 932. General instructions for preparing position descriptions are contained in NAVSO 12510/7A. Special instructions are contained in applicable Special Question Lists.)

1, 2, & 3. To be executed only by persons who have been officially authorized to take classification action. Space is provided for taking three separate actions on the same position; the second and third actions may be on maintenance review, the result of application of new standards or of review by higher authority, etc. The *position title* must be the official title authorized by CSC or Navy standards, NAVEXOS P-2440, or other appropriate instructions. The *classification official* must be a person officially authorized to classify the position.

4. Optional. A recommendation should reflect the considered judgment of the originator.

5. Enter name of employee regularly performing the work. If not regularly performed, enter "VACANT."

6. "Location" means city and state.

7 through 10. Enter as many organizational subdivisions as necessary to show the one in which the position is located.

11. Optional.

12 through 16. Self-explanatory.

17. Complete whenever the position supersedes another, out of which it has developed in whole or in part. This information is necessary for historical continuity and to provide accurate data for other personnel processes.

18. Examples of "other" reasons are "Survey," "Reorganization," and "Checklist."

19. Signature optional unless required by the activity or a higher management authority.

20 and 21. MUST be executed before forwarding to classification official.

22. For special notations by classification office - e.g., brief evaluation reports, reference to Navy or CSC postaudits, competitive levels, restrictions on filling position, or requirements for reviewing position later.

This space should also be used to (a) identify any IA and "statement of difference" positions and the date each was established, and (b) the alternative series on interdisciplinary positions.

23. To be initialed and dated by the classification specialist whenever he has subsequently audited the position (e.g., on maintenance review) and found that the description is still current and accurate and that the classification assigned remains correct.

Description of duties and responsibilities.

This is normally typed on plain bond and attached to the NAVSO 12510/7. Very brief descriptions, however, such as short amendments, statements of differences, or checklist descriptions should, if space permits, be inserted in Item 22.

FOR UNGRADED POSITIONS

(Note: General instructions for preparing job descriptions are contained in NAVSO 12510/7B. Special instructions for Masters and Foremen are given in NCPI 531, Encl. 5.)

In upper right-hand corner, check the "JD" box.

1, 2, & 3. To be executed only by persons who have been officially authorized to take a rating action. Space is provided for taking three separate actions on the same job. This permits recording subsequent re-rating actions taken by the activity, as on maintenance review or application of new rating definitions, or by management bureaus or OCMM.

Job Title. Enter the official title authorized in NCPI 531, current OCMM Notices, or OCMM letters of authorization. (For a supervisory rating with a special designator, such as "Public Works," indicate the "rating concerned" in Item 22.)

Service. Enter appropriate Service, such as "W" (General Wage), "C" (Commissary), etc.

Pay Level or Formula. Enter pay level for rating, e.g., "W-11" for Plumbers; or pay formula, e.g., "WF-18" for Leadingmen Carpenter.

Rating Official. This is a person officially authorized to make rating determinations.

4 & 5. Optional.

6. "Location" means city and state.

7 through 10. Enter as many subdivisions as needed to locate the job.

11. Optional.

12. Enter the number of employees, by title, now performing work of the job, or "none," as appropriate.

13 and 14. Self-explanatory.

15 and 16. Optional. Activities may cite the appropriate P-1005 rating definition by number, in lieu of describing the job, when the P-1005 definition adequately covers most or all of the duties performed.

17. Self-explanatory.

18. For actions not covered by items 13 through 17.

19. Optional.

20 and 21. MUST be completed before forwarding to rating official.

22. To be used by rating office for purposes similar to those described in Item 22 for graded positions.

23. Optional. May be used for recording findings on maintenance review.

2. Become thoroughly familiar with the design and performance requirements of the equipment by review of applicable specifications and documents, and through contracts with cognizant personnel at NAVAIR and the contractor's plant.

3. Attend and participate in conferences as necessary and as requested by NAVAIR in support of this assignment.

4. Review contractor's test procedures and approve them if acceptable. Advise contractor of changes or conditions necessary for approval and maintain adequate files on all contractor's and equipment for use in reprocurement or revision of procedures.

5. Conduct in-plant surveillance of the contractor's facilities, testing, and scheduling for the test program and determine if they are adequate.

6. Establish liaison with the resident Inspector in order to give assistance in supervising tests and/or interpreting test procedures.

7. Report to NAVAIR when poor design or production practices are employed, and make suggestions for improvements of equipment or procedures. NAVAIR shall be notified of major equipment failures.

8. Obtain and review the built-in test and maintainability reports for verification of calculations and conclusions.

9. Prepare quarterly reports on this program to be reviewed by the Program Manager.

10. Develop expertise in the area of Built-In Test in order to advise NAVAIRSYSCOM of new BIT developments and to assist NAVAIRSYSCOM in preparing BIT procurement specifications.

C. The incumbent shall make Electronic Equipment Reliability Predictions under the guidance of the Program Manager. This shall include reliability modeling, circuit stress analysis, and failure rate data analysis.

D. The incumbent performs, as assigned, other special projects requiring application of engineering principles, methods, and techniques. These special assignments are designed to advance the incumbent's competence and experience, and will be under the technical direction of a higher grade engineer.

III. CONTROLS OVER THE POSITION

The incumbent is supervised by the Program Manager responsible for all assigned projects of the section in the area of Engineering Support and Advanced Systems Programs. Instructions as to priorities, time limitations, general sources of information, and general approach to be followed are normally provided with new assignments. The incumbent is expected to plan and accomplish assignments with technical advise and guidance from the supervisor only on problems where standard engineering techniques and practices cannot be applied. Work is reviewed for technical accuracy, adequacy and soundness of engineering judgment.

IV. QUALIFICATION REQUIREMENTS OF THE WORK

This position requires knowledge and application of scientific and engineering principles and theories in the field of electronics such as can be acquired through experience and the completion of a full four year curriculum at a recognized college or university leading to a degree in Electronic Engineering.

TRAVEL VOUCHER OR SUBVOUCHER

(Complete with ink, ball-point pen or typewriter. DO NOT use lead pencil.)

BUREAU VOU NO. | SUBVOUCHER NO. 0084 | DO VOUCHER NO. 35 NIF 8439

PAYMENT FOR: [ ] TDY/TAD PER DIEM [ ] TDY/TAD TRAVEL [X] PCS TRAVEL

PAYMENT DESIRED: [X] CHECK [ ] CASH

PAID BY

T . ORDERS (*Paragraph, S. O. No., Issuing Hq. Date. Include amending orders.*)
S#26-74 3/21/74 NAD, CRANE, INDIANA

PAID
SYMBOL 32
NAD, CRANE, IND.

PRIOR TRAVEL PAYMENTS OR ADVANCES UNDER THESE ORDERS (*Amount, DO Vou No., date received, place paid, or DO Station No. If none, so state.*)
NONE

LAST NAME - FIRST NAME - MIDDLE INITIAL (*Soundex Code*) (*Print/Type*)	GRADE/RANK	SERVICE NO.
MARKS, ROBERT J. II	GS-9	282-48-2721

APR 22 '74

CHECK MAILING ADDRESS	DUTY PHONE NO.
NAD, CRANE, INDIANA	X1299 CRANE, 232

ORGANIZATION AND STATION
QE Bldg 120

I. ITINERARY (*See Reverse for Definition*)

DATE 19 74		LOCAL STANDARD TIME (*24 Hour Clock*)	PLACE (*Base, Activity, City and State; City and Country, Etc.*)	MODE OF TRAVEL	REASON FOR STOP	GOVT QTS USED	GOVT QTS NOT USED	NON-GOVT QTS USED	NUMBER MEALS USED: GOVT	NUMBER MEALS USED: NON-GOVT	NUMBER MEALS USED: OFFICERS OPEN MESS	SPEEDOMETER READING OR MILEAGE
3/21	DEP	2300	Terre Haute, In	PA								PER DIEM: @25= 6.25
3/22	ARR	0030	Bloomington, In		MIC							
	DEP											
	ARR											MILEAGE: 829.06-4.92
	DEP											
	ARR											
	DEP											
	ARR											
	DEP											
	ARR											
	DEP											
	ARR											

II. FOR DO USE ONLY

1. COMPUTATIONS

III. REIMBURSABLE EXPENSES

DATE	NATURE AND EXPLANATION	AMOUNT CLAIMED	ALLOWED
	HHE: 1063 CuFt @7# = 7441# - NTE 5000# 58 Miles @8.58 =		429.00

BAS/COLA ADJ ON MP R
BAS/COLA ADJ NOT REQUIRED
BAS/COLA RATE

IV. TRANSPORTATION REQUESTS/MEAL TICKETS USED

NUMBER	FROM	TO

DD 753 | HI WY
OTD | CC

V. CHARGES - BOQ OR NON-GOVT MEALS AND QTS

FROM (*Date*)	TO (*Date*)	TYPE	RATE	TOTAL PAID

VI. LEAVE STATEMENT

I was authorized _____ days leave. _____ days were taken between _____ and _____ inclusive.

I hereby claim any amount due me. The statements on face, reverse, and attached are true and complete. Payment or credit has not been received.

SIGNATURE OF CLAIMANT AND DATE

2. SUMMARY OF PAYMENT

PER DIEM (*Net Payable*)	6.25
MILEAGE OR TRANSPORTATION ALLOWANCES	4.92
REIMBURSABLE EXPENSES	429.00
TOTAL AMOUNT DUE	440.17
LESS PREVIOUS PAYMENTS (*Droppage*)	
AMOUNT CHARGED TO ACCOUNT-G CLASS	440.17
LESS VOUCHER DEDUCTIONS	

APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NO.	AUTH. ACCT'G ACTIVITY	TYPE	PER DIEM	COST CODE	AMOUNT
17X4912.1763	-	77777	00164	2E			440.17

COLLECTION DATA:

COMPUTED BY	AUDITED BY	TVL RCRD POSTED BY	RECEIVED (*Payee signature & date, or check no.*)	AMOUNT PAID
			70.110.810	440.17

DD FORM 1 JUL 65 1351-2 S/N 0102-013-2800

FORM APPROVED BY COMPTROLLER GENERAL. U. S. 2 JUNE 1965

REQUEST AND AUTHORIZATION FOR DOD CIVILIAN PERMANENT DUTY TRAVEL

(Reference: Joint Travel Regulations)

TRAVEL AUTHORIZED HEREIN AS NECESSARY IN THE PUBLIC SERVICE

1. DATE REQUESTED: 03-21-74

REQUEST FOR OFFICIAL TRAVEL

2. NAME *(Last, First, Middle Initial)*: MARKS, Robert J. II SSN: 282-48-2721

3. NEW POSITION TITLE AND GRADE OR RATING: Electronics Engineer, GS-9

4. RELEASING OFFICIAL STATION AND LOCATION, OR ACTUAL PLACE OF RESIDENCE: 2531 Jefferson, Terre Haute, Indiana 47802

5. NEW OFFICIAL STATION AND LOCATION, ACTUAL PLACE OF RESIDENCE, OR ALTERNATE DESTINATION: Naval Ammunition Depot, Crane, Indiana

DUTY REPORTING DATE AT NEW STATION: 03-25-74

6. PURPOSE OF TRAVEL: ☐ TRAVEL BETWEEN OFFICIAL STATIONS ☐ RENEWAL AGREEMENT TRAVEL ☒ OTHER *(Specify)* First Duty Station ☐ RETURN FROM OVERSEAS FOR SEPARATION

7. MODE OF TRANSPORTATION: ☐ GOVERNMENT ☒ COMMERCIAL ☐ RAIL ☐ AIR ☐ BUS ☒ OTHER *(Specify)* POV ☐ TO BE DETERMINED BY TRANSPORTATION OFFICER

PRIVATELY OWNED CONVEYANCE: ☒ ADVANTAGEOUS ☐ NOT ADVANTAGEOUS ☒ AUTOMOBILE ☐ OTHER *(Specify)* RATE PER MILE $ .06

8. PER DIEM FOR EMPLOYEE AND DEPENDENTS *(if applicable)* AUTHORIZED PER JTR.

9. ROUND TRIP TRAVEL, NOT TO EXCEED CALENDAR DAYS INCLUDING TRAVEL TIME ☐ IS ☒ IS NOT AUTHORIZED TO SEEK PERMANENT RESIDENCE

10. TEMPORARY QUARTERS SUBSISTENCE EXPENSE ☐ IS ☒ IS NOT AUTHORIZED FOR DAYS

11. ☐ MISCELLANEOUS EXPENSES ☐ REAL ESTATE EXPENSES ☐ UNEXPIRED LEASE EXPENSES not AUTHORIZED PER JTR

12. DEPENDENT OVERSEA TRAVEL ☐ CONCURRENT ☐ DELAYED ☐ EARLY RETURN ☒ NOT AUTHORIZED

13. TRANSPORTATION OF DEPENDENTS AUTHORIZED

FROM	TO
Terre Haute, Indiana	Crane, Indiana

NAMES OF DEPENDENTS	RELATIONSHIP	DATE OF BIRTH *(Children)*

14. ☒ SHIPMENT OF HOUSEHOLD GOODS AUTHORIZED NOT IN EXCESS OF 5000 *(Net Weight in Pounds)*

FROM	TO
Terre Haute, Indiana	Crane, Indiana

NONTEMPORARY STORAGE OF HOUSEHOLD GOODS AUTHORIZED ☐ YES ☒ NO

15. OVERSEA SHIPMENT OF PRIVATELY OWNED MOTOR VEHICLE AUTHORIZED ☐ YES ☒ NO

16. ADVANCE AUTHORIZED $ NONE

17. REMARKS OR OTHER AUTHORIZATION *(Use this space for special requirements, leave, excess baggage, etc. or other authorizations)*

18. ESTIMATED COST	PER DIEM	TRAVEL	OTHER	TOTAL	19. TRANSPORTATION AGREEMENT SIGNED
	$ 6.25	$ 3.48	$ 91.31	$ 101.04	☒ YES ☐ NO

20. REQUESTING OFFICIAL *(Title and Signature)*: M. SMITH, Personnel Staffing Specialist

21. APPROVING OFFICIAL *(Title and Signature)*: R. QUEEN, Acting Manager, Employment Div.

AUTHORIZATION

22. ACCOUNTING CITATION: 17 X 4912.1753 0 77777 0 00164 2E 000A0301(00-a)

23. ORDER AUTHORIZING OFFICIAL *(Title and Signature)* OR AUTHENTICATION: L. H. CONDAN, Acting Director, Civilian Personnel Department

24. DATE ISSUED: 03-21-74

25. TRAVEL ORDER NUMBER: ARCC 26-74

DD FORM 1 JUL 67 1614

TRANSPORTATION AGREEMENT OF CIVILIANS APPOINTED TO MANPOWER SHORTAGE POSITIONS

NAME *(Last, First, Middle Initial)*	PLACE OF ACTUAL RESIDENCE AT TIME OF APPOINTMENT *(To be determined at time of initial assignment)*
MARKS, ROBERT J. II	

1. 5 U.S.C. 5723, provides, under certain conditions, for travel and transportation expenses of persons appointed, student trainees, and their immediate families, movement and storage of household goods and personal effects, incident to appointment or assignment to a position within the 50 States and the District of Columbia, for which there is determined by the Civil Service Commission to be a manpower shortage. Under the law, the allowances contained therein shall not be authorized unless the appointee or student trainee agrees in writing to remain in the service of the DOD component concerned for 12 months. Accordingly, to establish eligibility for the authorized allowances, the following agreement must be executed.

2. I understand and agree that:

a. I will remain in the employ of the *(Department or Agency)* U.S. GOVT. for at least 12 months beginning with the effective date of my appointment or assignment to a position within

☐ Hawaii, ☐ Alaska, ☒ Continental United States, for which there is determined by the Civil Service Commission to be a manpower shortage, unless separated for reasons beyond my control and acceptable to the employing activity.

b. If, before the expiration of the period of time shown in paragraph 2a above, I fail to fulfill the terms of this agreement by resigning, vacating the position without authority, or if I am removed for cause, I will, upon demand, repay to the Government a sum of money equivalent to that expended by the Government for transportation and subsistence of myself, transportation of dependents, and cost of shipment or storage of my household goods and personal effects, if involved, incident to my transfer, from beginning point of travel to duty station, and I authorize the employing Department or Agency to withhold any final pay due to me to apply against or liquidate any indebtedness arising from a violation of this agreement.

3. I understand that the period of service specified above is for the purpose of establishing my eligibility for the travel and transportation allowances which may be authorized.

4. I fully understand that upon completion of the 12-month period of service specified in this agreement, I will not be eligible for return transportation at Government expense for myself, my dependents and household goods to my place of actual residence at time of my appointment. I further understand that completion of the above period of service does not terminate my employment and I may continue to serve in the same position or any other position to which I am assigned for a longer period in accordance with the employing Department or Agency regulations. This agreement neither limits nor guarantees the duration of my employment.

DATE SIGNED	SIGNATURE OF EMPLOYEE
3/21/74	

DD FORM 1 JUL 67 1615 S/N-0102-016-9700 PLATE NO. 16739

Electronics Engineer, GS-9

FOR AGENCY USE ONLY

Part A. TO BE COMPLETED BY APPLICANT OR EMPLOYEE *(typewrite or print in ink)*

1. NAME *(last, first, middle)*	2. SOCIAL SECURITY ACCOUNT NO.	3. SEX	4. DATE OF BIRTH
Marks, Robert Jackson II	[redacted]	[X] MALE [ ] FEMALE	08-25-50

5. DO YOU HAVE ANY MEDICAL DISORDER OR PHYSICAL IMPAIRMENT WHICH WOULD INTERFERE IN ANY WAY WITH THE FULL PERFORMANCE OF THE DUTIES SHOWN BELOW?	6. I CERTIFY THAT ALL THE INFORMATION GIVEN BY ME IN CONNECTION WITH THIS EXAMINATION IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF
[ ] YES [X] NO *(If your answer is "YES" explain fully to the physician performing the examination)*	Robert J. Marks II *(signature of applicant)*

Part D. TO BE COMPLETED BY AGENCY MEDICAL OFFICER *(if one is available)*

NOTE: Review the attached certificate of medical examination and make your recommendations in item 1 below. If the medical examination was done for pre-appointment purposes, circle the appropriate handicap code in part F.

1. RECOMMENDATION:

[✓] HIRE OR RETAIN. DESCRIBE LIMITATIONS, IF ANY, HERE.

[ ] TAKE ACTION TO SEPARATE OR DO NOT HIRE. EXPLAIN WHY.

2. AGENCY MEDICAL OFFICER'S NAME *(type or print)*	3. LOCATION *(city, State, ZIP Code)*	4. DATE
DR. W. C. COLEMAN	MEDICAL DEPARTMENT NAD Crane, Indiana	MAR 25 1974

Part E. TO BE COMPLETED BY AGENCY PERSONNEL OFFICER

NOTE: Enter the action taken below. If this form is used for pre-appointment purposes, be sure the appropriate handicap code in part F is circled. *IMPORTANT: See FPM Chapter 293, Subchapter 3; FPM Chapter 339; and FPM Supplement 339-31 for disposition and/or filing of both parts of this form, either separately or together.*

1. ACTION TAKEN:

[ ] HIRED OR RETAINED. [ ] NON-SELECTED FOR APPOINTMENT, OR ELIGIBILITY OBJECTED TO.

[ ] ACTION TAKEN TO SEPARATE.

2. AGENCY PERSONNEL OFFICER'S NAME *(type or print)*	3. SIGNATURE	4. DATE

Part F. HANDICAP CODE *(to be completed only in pre-appointment cases)*

If the person examined has or had a handicap listed below, circle the code number which pertains to that handicap. If more than one handicap applies, circle the one considered most limiting. If none of the handicap codes apply, circle code "00".

00 No handicap of the type listed
10 Amputation—one major extremity
11 Amputation—two or more major extremities
20 Deformity or impaired function—upper extremity
21 Deformity or impaired function—lower extremity or back
30 Vision—one eye only
31 No usable vision
40 Hearing aid required
41 No usable hearing
42 No usable hearing, with speech malfunction
43 Normal hearing, with speech malfunction
50 Tuberculosis—inactive pulmonary
51 Organic heart disease *(compensated)*—valvular, arrhythmia, arteriosclerosis, healed coronary lesions
52 Diabetes—controlled
53 Epilepsy—adequately controlled
54 History of emotional behavioral problems requiring special placement effort
55 Mentally retarded
56 Mentally restored

1. EXAMINING PHYSICIAN'S NAME *(type or print)*	3. SIGNATURE OF EXAMINING PHYSICIAN
DR. W. C. COLEMAN	W. C. Coleman MAR 25 1974 *(signature)* *(date)*
ADDRESS *(including ZIP Code)* MEDICAL DEPARTMENT NAD Crane, Indiana	IMPORTANT: After signing, return *the entire form intact* in the pre-addressed "Confidential-Medical" envelope which the person you examined gave you:

☆ U.S. GOVERNMENT PRINTING OFFICE 1972—487-737

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
0622-C-KT:cl
12330
1 8 MAR 1974

Mr. Robert J. Marks II
2531 Jefferson
Terre Haute, Indiana 47802

Dear Mr. Marks:

This is to confirm our offer of career-conditional appointment to the position of Electronics Engineer, GS-9, $12,167 per year in the Quality Evaluation and Engineering Laboratory Department.

This position offer is contingent upon your satisfactorily completing a medical examination which will be administered on 25 March when you report for your first day of duty. The employment processing will be accomplished at Bldg. 5, this Station. You should plan to report there at approximately 7:30 a.m. If you will bring this letter with you, it will expedite your entry through the security gate.

You will be authorized reimbursement to the maximum extent allowed under Department of Defense travel regulations for the expenses associated with your move from Terre Haute to the Crane area.

If you have any questions regarding this job offer, please telephone Mr. Kenneth Thompson, collect, at area code 812 854-1835.

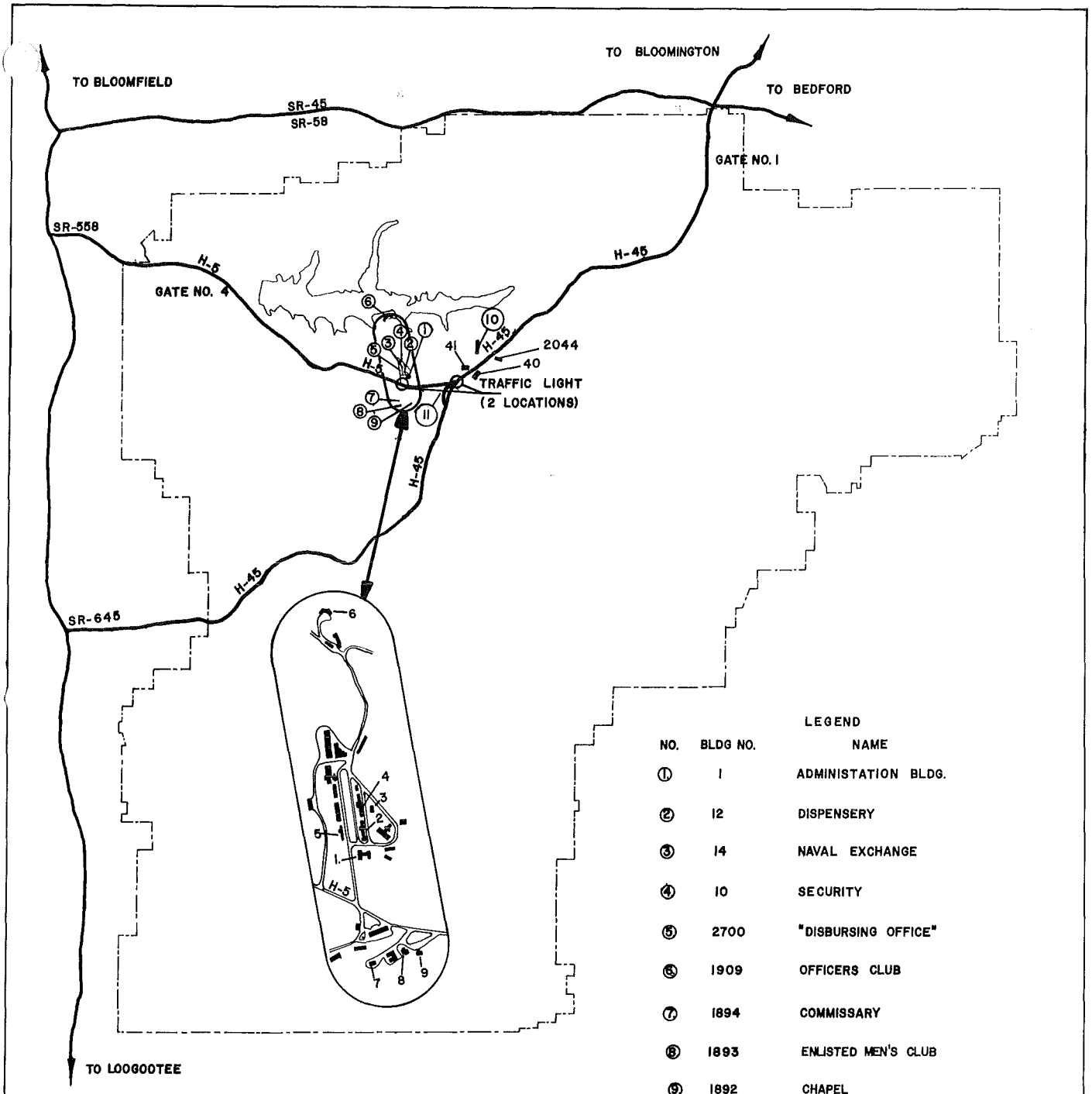
We look forward to seeing you on 25 March.

Sincerely yours,

L. H. Conrad

L. H. CONRAD
Manager, Employment Division
Civilian Personnel Department
By direction of the
Commanding Officer

Copy to:
William Sisson, Rose-Hulman Inst. of Technology



LEGEND

NO.	BLDG NO.	NAME
①	1	ADMINISTATION BLDG.
②	12	DISPENSERY
③	14	NAVAL EXCHANGE
④	10	SECURITY
⑤	2700	"DISBURSING OFFICE"
⑥	1909	OFFICERS CLUB
⑦	1894	COMMISSARY
⑧	1893	ENLISTED MEN'S CLUB
⑨	1892	CHAPEL
⑩	64	"SUPPLY OFFICE BLDG." (PERSONAL PROPERTY OFFICE)
⑪	121	CAFETERIA

ORIENTATION MAP

NAVAL AMMUNITION DEPOT

CRANE, INDIANA

N

U. S. NAVAL AMMUNITION DEPOT
Crane, Indiana

To: Each New Employee of U. S. NAD Crane

WELCOME! You are now a Member of the Team - dedicated to upholding the policies and interests of the United States of America.

Our success depends on the individual performance of each of us in our combined efforts.

Of course, you can contribute most when you have an understanding and appreciation of the Depot's Purpose and Organization. Following are a few interpretations of our rules, regulations, and conditions of work that will affect you:

1. No Smoking in vehicles at any time on the Depot; no cameras permitted; no firearms; employees are not permitted to bring intoxicating beverages on the Depot.

2. If you are unable to report for work because of illness (sick leave), you will be expected to notify your supervisor as soon as possible on the first day you are sick. In emergencies, unscheduled annual leave may be granted if you contact your supervisor.

3. Personal mail of an employee should be directed to his home address.

4. The regular tour of duty for almost all Depot employees is from 0730 until 1600, Monday through Friday, with 30 minutes for lunch.

5. Employees are warned against participation in partisan political activities. You should read the Warning Posters found in all departments on the Depot.

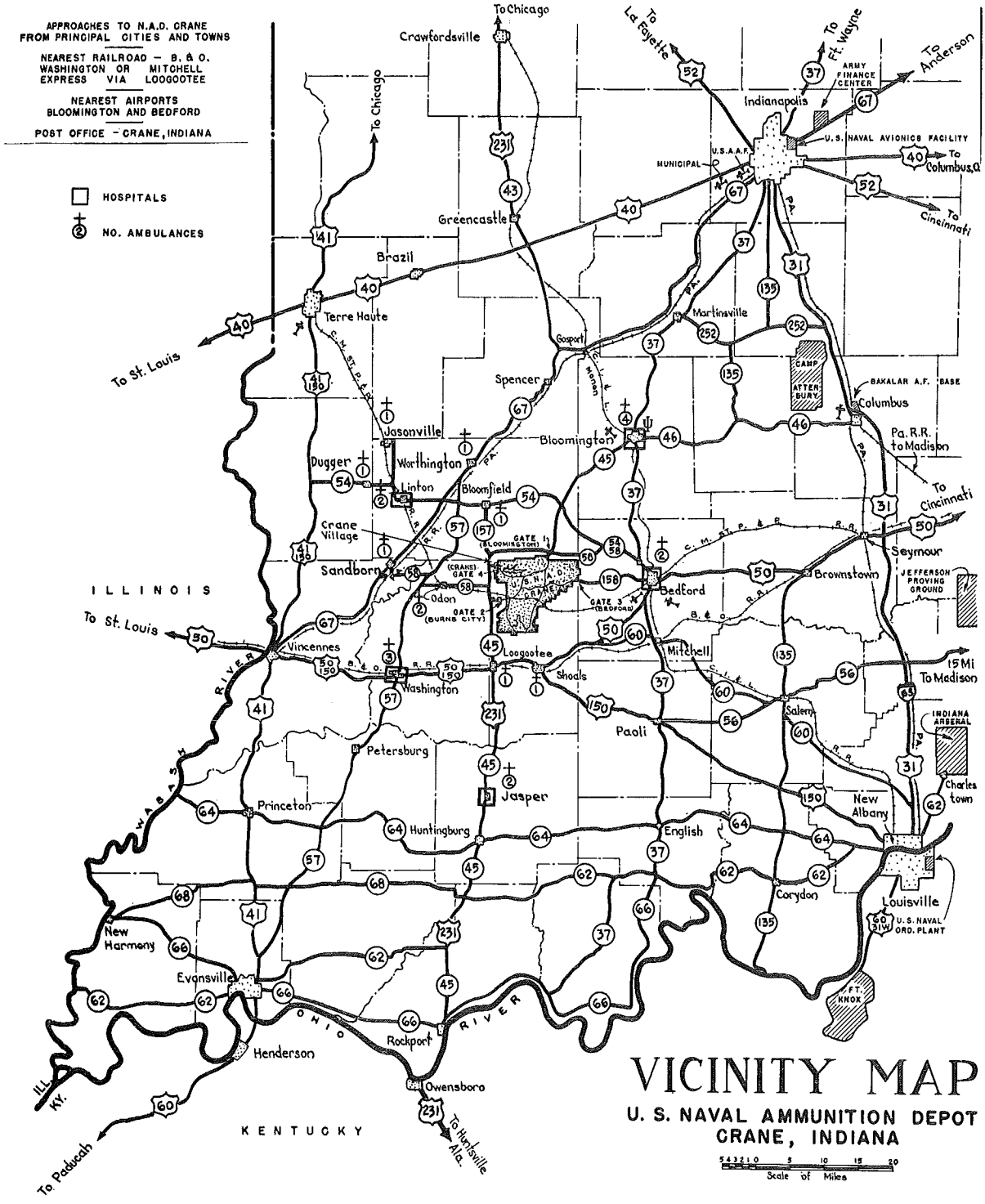
6. It is your responsibility to keep the Industrial Relations Department advised of your current address, next of kin, who to notify in case of emergency, etc.

7. If you are injured in line of duty, report the accident <u>immediately</u> to your supervisor. Report all accidents however minor.

Your attention is especially invited to the material enclosed in this folder concerning employee health benefits. If you want to take advantage of the opportunity to enroll in a health benefit plan, you have 31 days from the date of your appointment. Arrange with your supervisor to come to Building 5, Employee Services Division, to complete your enrollment.

Arrangements will be made for you to attend an indoctrination class within the next 30 days.

B. E. GALLAGHER



VICINITY MAP

U. S. NAVAL AMMUNITION DEPOT
CRANE, INDIANA

Scale of Miles

CODE OF ETHICS
FOR GOVERNMENT SERVICE

Any Person In Government Service Should:

Put loyalty to the highest moral principles and to country above loyalty to persons, party, or Government department.

UPHOLD the Constitution, laws, and legal regulations of the United States and all governments therein and never be a party to their evasion.

GIVE a full day's labor for a full day's pay; giving to the performance of his duties his earnest effort and best thought.

SEEK to find and employ more efficient and economical ways of getting tasks accomplished.

NEVER discriminate unfairly by the dispensing of special favors or privileges to anyone, whether for remuneration or not; and never accept, for himself or his family, favors or benefits under circumstances which might be construed by reasonable persons as influencing the performance of his governmental duties.

MAKE no private promises of any kind binding upon the duties of office, since a Government employee has no private word which can be binding on public duty.

ENGAGE in no business with the Government, either directly or indirectly, which is inconsistent with the conscientious performance of his governmental duties.

NEVER use any information coming to him confidentially in the performance of governmental duties as a means for making private profit.

EXPOSE corruption wherever discovered.

UPHOLD these principles, ever conscious that public office is a public trust.

(This Code of Ethics was agreed to by the House of Representatives and the Senate as House Concurrent Resolution 175 in the Second Session of the 85th Congress. The Code applies to all Government Employees and Office Holders.)

EQUAL EMPLOYMENT OPPORTUNITY

1. IT IS THE POLICY OF NAD CRANE TO PROVIDE EQUAL OPPORTUNITY FOR ALL PERSONS, TO PROHIBIT DISCRIMINATION IN EMPLOYMENT BECAUSE OF RACE, COLOR, RELIGION, SEX, OR NATIONAL ORIGIN, AND TO PROMOTE THE FULL REALIZATION OF EQUAL EMPLOYMENT OPPORTUNITY THROUGH A CONTINUING AFFIRMATIVE EEO PROGRAM IN EACH DEPARTMENT.

2. THE PRESIDENT OF THE UNITED STATES, BY HIS EXECUTIVE ORDERS, HAS SET FORTH HIS POLICY AND GUIDELINES FOR PROMULGATING THE POLICY OF EQUAL EMPLOYMENT OPPORTUNITY TO PERSONS LOOKING FOR EMPLOYMENT OR ALREADY EMPLOYED BY THE GOVERNMENT. EQUAL EMPLOYMENT OPPORTUNITY MEANS EQUAL RIGHTS IN ALL ACTIONS WHICH ARE PERSONAL TO A PARTICULAR EMPLOYEE. THIS POLICY WILL APPLY TO APPOINTMENTS, PROMOTIONS, REASSIGNMENTS, TRAINING, EMPLOYEE DEVELOPMENT, AND APPEALS OF ANY NATURE. THERE WILL BE ABSOLUTE FREEDOM FROM RESTRAINT, AND AN ABSOLUTE RIGHT FOR EQUAL EMPLOYMENT OPPORTUNITY IN ALL MATTERS.

3. SPECIAL EFFORTS WILL BE MADE TO ASSURE THAT JOB OPPORTUNITIES IN ALL DEPARTMENTS ARE MADE KNOWN TO MEN AND WOMEN OF ALL RACES, RELIGION, AND ETHNIC BACKGROUNDS, FOR IT IS THE INTENTION OF THIS COMMAND TO ELIMINATE ANY AND ALL REASONS WHICH WOULD EVEN ALLOW AN EMPLOYEE TO THINK THAT DISCRIMINATION PREVAILS IN ANY AREA.

4. IT IS EXPECTED THAT ALL MANAGEMENT PERSONNEL, SUPERVISORS, AND EMPLOYEES PUT FORTH A SPECIAL EFFORT TO ADHERE STRICTLY TO THE PRINCIPLES OF FULL AND FAIR OPPORTUNITY IN ALL PERSONNEL AND PERSONAL ACTIONS ON OR OFF THE DEPOT. THERE IS NO PLACE ON THIS DEPOT FOR ANY PERSON WHO DOES NOT WHOLE-HEARTEDLY SUPPORT THIS PROGRAM.

5. TO ACCOMPLISH THE ABOVE REQUIRES THAT EACH OF US UNDERSTAND AND ACCEPT THEIR RESPONSIBILITY TO THE EQUAL EMPLOYMENT OPPORTUNITY PROGRAM. THE IMPLEMENTATION OF THIS POLICY CAN BE ACCOMPLISHED ONLY IF EACH OF US RESOLVES TO MEET THE PERSONAL CHALLENGE TO PROVIDE EQUAL OPPORTUNITY TO ALL WHO PARTICIPATE IN NAD CRANE'S PROGRAMS AND ACTIVITIES.

6. I ASK YOUR SINCERE SUPPORT IN CARRYING OUT BOTH THE SPIRIT AND THE LETTER OF THE EQUAL EMPLOYMENT POLICIES.

R. L. McARTHY
Captain, USN
Commanding Officer

MATERNITY POLICY

1. Report of Pregnancy. Employees will:

a. Report to the Medical Officer, via their immediate supervisors, as soon as they are reasonably sure they are pregnant, so that steps can be taken to protect their health.

b. Report to Medical Department as requested for regular interviews.

c. Provide a doctor's statement including information on the expected date of confinement and any conditions which might affect their work.

d. Advise Medical Department immediately of any conditions or complications arising after original doctor's statement is provided.

2. Maternity Leave

a. Duration

(1) Normally, a woman should cease work six weeks before the expected confinement date and will return to work no later than eight weeks after delivery.

(2) Requests for leave for longer periods must be supported by a doctor's certificate.

b. Requests for Leave. Employees will submit a memorandum request for maternity leave thru their supervisors to Industrial Relations together with a physician's certificate indicating the expected date of delivery and any complications which might be aggravated by continued employment.

c. Granting Leave

(1) Career and career-conditional employees will be granted maternity leave for all reasonable periods of absence because of pregnancy or complications of pregnancy which are substantiated by a doctor's statement.

(2) Temporary employees will be granted maternity leave only to the extent that production requirements are not jeopardized. The decision in each case will be reached after consideration of workload, effect on production requirements, date of expiration of appointment, etc.

Policy State striction on Employment of Relatives

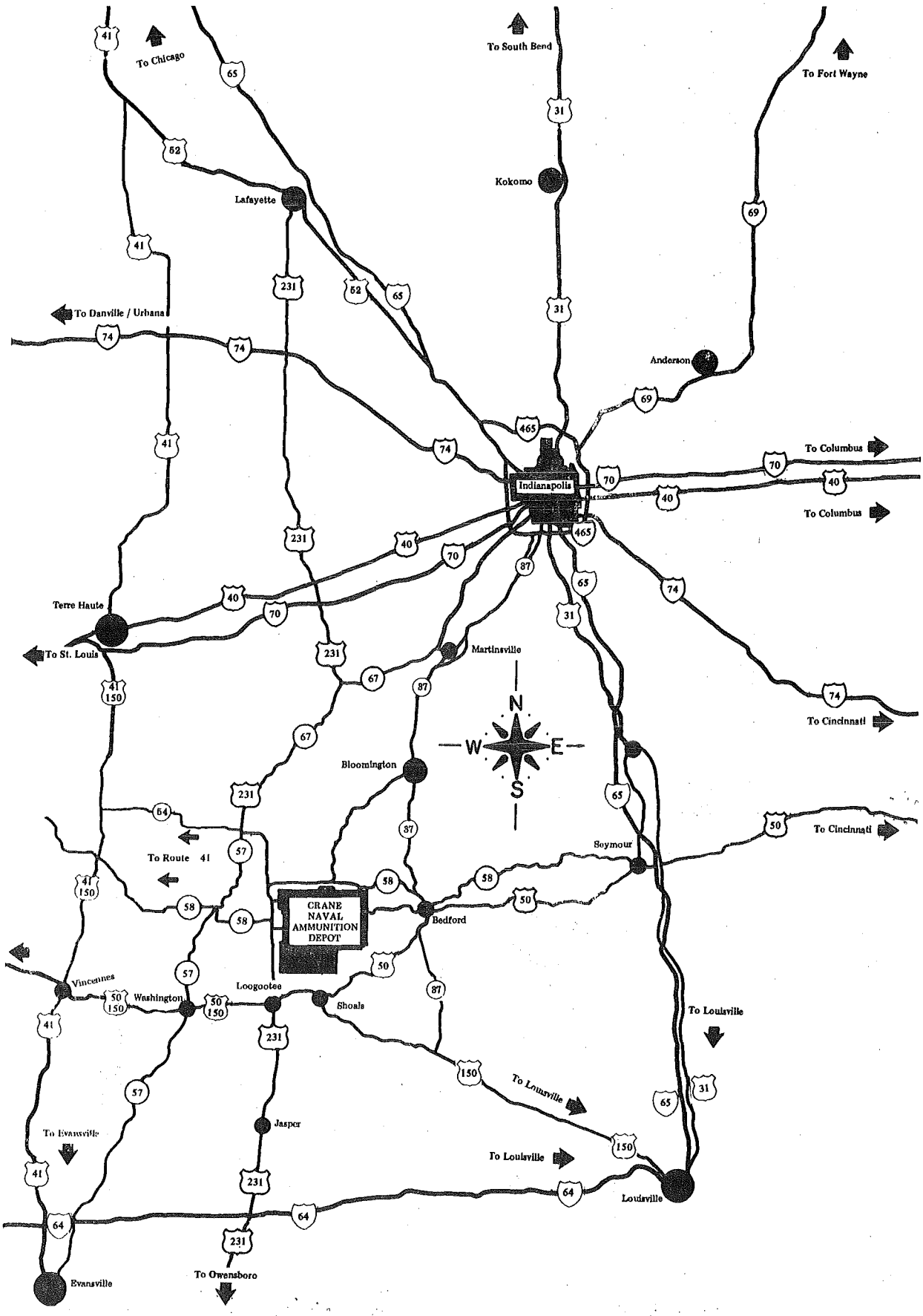
1. The following ion is extracted from Sub Part A of Part 310 of the Commissions ions concerning the employment of relatives. This information ded to indicate generally how the new restrictions are being a A station instruction on this subject will be issued soon.

"Section 221 of t ral Salary Act of 1967 incorporates into title 5 of the U. S. Code S. C. 3110) sweeping restrictions on the employment of relatives gency officials. These restrictions apply throughout all three bra of the Federal Government and the government of the District of ia."

"Under the law, lic official may not appoint, employ, promote or advance one of h elatives to a position in his agency, nor may he advocate a relat for appointment, employment, promotion, or advancement in the agen Likewise, an individual may not be appointed, employed, promot or advanced if the action was "advocated by a public official servin or exercising jurisdiction or control over the agency who is a lative of the individual."

. The following definitions apply in implementing the new law:

(a) Relative means father, mother, son, daughter, brother, sister, ncle, aunt, first cousin, nephew, niece, husband, wife, father-in-law, ther-in-law, son-in-law, daughter-in-law, brother-in-law, sister--law, stepfather, stepmother, stepson, stepdaughter, stepbrother, epsister, half brother, or half sister.


To Chicago
To South Bend
To Fort Wayne
Kokomo
Lafayette
To Danville / Urbana
Anderson
Indianapolis
To Columbus
To Columbus
Terre Haute
To St. Louis
Martinsville
To Cincinnati
N
W
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S
Bloomington
To Route 41
CRANE NAVAL AMMUNITION DEPOT
Bedford
Seymour
To Cincinnati
Vincennes
Washington
Loogootee
Shoals
To Louisville
To Louisville
To Evansville
Jasper
To Louisville
Louisville
Evansville
To Owensboro

NAVAL AMMUNITION DEPOT
Crane, Indiana

NADCRANEINST 12410.15
06C-RCG:rb
28 MAR 1973

NADCRANE INSTRUCTION 12410.15

From: Commanding Officer
To: Directors of all Departments

Subj: NAD Crane Upward Mobility Program

Ref: (a) OCMMINST 12410.1, Subj: Upward Mobility
(b) NADCRANEINST 12340.2B, Subj: Merit Promotion and Internal Placement Program

Encl: (1) Basic Position Coverage
(2) Putting It All Together

1. Purpose. To facilitate Department of the Navy Training Agreement for Upward Mobility of lower-graded general schedule and wage grade employees at NAD Crane.

2. Background. As part of NAD Crane's maximum utilization of all skills, there is a need for more flexibility in the assignment of personnel than is possible under current regulations. As a first step, NAD Crane will activate a planned program of upward mobility with self-established departmental goals.

3. Discussion. As an integral part of Personnel Management, upward mobility provides lower level employees intensive, accelerated development in order to equip each employee with the skills and specific knowledges necessary to perform successfully in a target position. These target positions provide a career opportunity for individuals presently occupying either "dead-end" positions or positions with limited career possibilities. Selection criteria under the agreement is based on the job element approach by matching people to jobs according to their potential for being successful in performing the duties of the target position. Employees may be moved out of dead-end jobs into a new career field with advancement opportunity within the general schedule series, between the craft/trade and labor occupations, and between the general schedule and craft/trade and labor occupations.

4. Policy. It is the policy of NAD Crane that all management levels encourage and support the upward mobility opportunities and assist employees in identifying these opportunities. It is recognized that current personnel retrenchments and reduction of average grade levels

d. Position Management Committee will when conducting annual surveys, identify and encourage the use of Upward Mobility Program.

R L McArthy

R. L. McARTHY

Copy to:
A3 (Division Managers)
A4 (Managers of Major Branches)
A5 (Other Supervisors)
AFGE 1415
FOP 158
01 Files

BASIC POSITION COVERAGE

1. Trainee positions. The trainees will be selected from on-board employees in the grades GS-2 through GS-9, or their wage grade equivalents, who demonstrate skills or potential for development to enter a technical, administrative, professional, or craft/trade career. The trainee position will initially be established at the current grade or wage level of the trainee. The trainee may either be detailed or reassigned to the trainee position.

2. Target positions. A training agreement, reference (a), provides either for reassignment or promotion to a different occupational series upon the satisfactory completion of training. The target position, therefore, may be at the same grade level as the trainee position or at the next higher grade level in the occupational series for which being trained. For example, a Management Technician, GS-344-6, might be trained for position as Management Analyst, GS-343-7, or a Motor Vehicle Operator, WG-5703-6 for a position as Management Technician, GS-344-5. Trainees who enter a series where positions are properly classified at two grade intervals and whose agreement calls for a two grade promotion to the target position will be eligible for such promotion upon successful completion of the training program. The variety of training assignments anticipated under this agreement precludes preparing a single position description which would cover all the occupations.

Additional development of candidates beyond the target position will follow normal Merit Promotion Program and/or Career Management Program procedures. The target positions apply to positions properly classified at one or two grade intervals within the occupational groups listed on the following page and craft/trade and labor occupations properly grouped as semi-skilled or skilled:

Note: Candidates must meet the minimum educational requirement where such is specified in the qualification standard for the target position for which selected.

PUTTING IT ALL TOGETHER

1. Establishment of Positions

a. It is in the interests of both management and employees to review the mix of levels of positions making up the workforce and the types of qualifications required. It is the responsibility of the first line supervisor and higher level managers to determine whether positions in the GS-2 to GS-9 grades or WG equivalents, would assist persons in senior positions to operate more effectively with no increase in total staffing, before submitting requests to either establish or fill positions at higher grade levels. All actions establishing or filling positions at all grade levels will be reviewed from the standpoint of the most effective utilization of command manpower and average grade controls. In determining opportunities for Upward Mobility, Departments will coordinate request with Code 06. The Equal Employment Opportunity Coordinator will assess on a continuing basis the progress toward attainment of desired goals.

b. This policy is not appropriate for the initial intake of veterans appointed under the Veterans Readjustment Appointment.

2. Advertisement

a. NAD Crane Upward Mobility openings will be well-publicized in vehicles like the Bursts and Duds, Daily Bulletin, and Bulletin Board notices. The publicity will not oversell the opportunities available, but will emphasize actual job vacancies, specific training plans, and other means of implementing the program.

b Specific positions will be advertised under the NAD Crane Merit Promotion Program, and will be labeled "Upward Mobility Position" on both the vacancy announcement and in publicity about the positions to identify these opportunities to eligible employees. Some announcements may have very basic prerequisites. The advertisements will state a training plan will be accepted in lieu of established CSC qualification requirements.

3. Selection of Trainees

a. Qualifying Standard. Trainees will be selected under the Navy Merit Promotion Plan from those applicants who are currently in positions rated GS-2 through GS-9 or their craft/trade and labor equivalents, who have competitive Civil Service status, and who can reasonably be expected to perform the duties of the target position within two years. The

b. The length of training may range from six months to two years depending upon the time required to equip the employee with the skills and specific knowledges necessary in the target job and his ability to perform required elements of the position satisfactorily. Ordinarily the target position will be one or two grades higher than the trainee's present grade or wage grade equivalent depending upon whether the target job is normally classified at one or two grade intervals. In cases where the trainee already possesses some of the qualifying skill or knowledge elements, the period of training may be established at a minimum of six months. In all cases where the trainee possesses only potential for advancement, a minimum of twelve months of training will be required to achieve eligibility for promotion.

c. To achieve eligibility for reassignment in another series at GS-7 and below, a minimum of six months will be required to qualify in the target series and 12 months additional experience is required to qualify for promotion, making a total of 18 months from entrance to eligibility for promotion. The trainee will receive career counseling before he enters the development assignment program, and at appropriately spaced intervals after he enters the program. In no case does this agreement authorize exception to the time-in-grade restrictions. Trainees who fail to meet the performance requirements of the development program may be returned to their former positions or those of similar duties and grades depending on whether original action was detail or reassignment. The development plan will be designed to have generally the same pattern for the career field to assure that the trainee acquires the necessary knowledges and skills for the career field at the appropriate level of the target position but will provide for the individual aptitudes, interests, and background of the trainee.

d. Within 30 days after reassignment to the trainee position, individual plans will be mapped out by Code 063 and receiving department, and may include any part of the following:

(1) Formal Instruction. Specially planned education courses which contribute to the career field may be taken during or after regular work hours at government expense and after consultation with the supervisor. This may include courses offered at local schools and colleges, Department of Defense Schools, or through Civilian Personnel.

(2) On-The-Job Training. All duty assignments will be meaningful and productive and provide for supervised development in the target position. Special familiarization assignments may be made to other program areas that interface with the career field; i.e., an assignment in ADP for budget or personnel. Occasionally the trainee may attend special staff meetings and conferences as orientation to special policy considerations for the activity and the career field.

5. Evaluation of Trainee's Progress. Within 30 days after assignment to a trainee position, a preliminary evaluation will be made to assess development needs of the employee in terms of meeting the job element requirements and to plan a development schedule to meet them. Subsequently, written supervisory reports on the employee's application of training received and overall development on the job will be made at regular intervals of 30 days during the first six months and 90 days thereafter as appropriate. Upon completion of the training program, supervisors will make a final summary evaluation of the achievement and performance of the trainee. Trainees, likewise, will be expected to make written evaluations of any formal training provided at government expense and to make a self-assessment of their development. The trainee will be considered to have met the qualification requirements established for the target position upon successful performance of the job element criteria identified for the position. He is then eligible for reassignment or promotion to the target position.

6. Flexibility Provisions. To avoid frequent minor amendments to the agreement caused by variation in mission of the organizational element changes in concepts of methodology in subject fields, or trainee needs, it is permissible to:

a. Tailor within the total scope and overall objectives of the development program, the length and intensity of the subject matter to meet the individual needs of trainees.

b. Adjust elapsed training time as appropriate in individual cases to cover contingencies such as excessive leave, or trainee's inability to grasp a portion of the development assignment.

c. Alter sequence of training to allow for learning experience to be responsive to actual work situations as they arise during the development period when conditions or experience indicate the desirability of such changes.

d. Add or modify subject matter material depending on technological changes, the needs of the Department, and the trainees, and evaluation experience of the development program.

... of reduction-in-force situation, and my position will be filled from within the agency and ... to exist without any change in duties. For ... reasons I cannot move from my present ...ting area. If I am separated, will I be entitled ...rance pay?

A separation for refusal to accept assignment ...e in connection with a transfer of function or ...on-in-force to entitle you to severance pay.

...ve received my draft notice. Will I be entitled to ...ce pay?

Separation to enter the military service does ...itle an employee to severance pay.

... I accept other employment and still receive ...erance pay?

..., unless (1) your new employment is in the ... Service or the District of Columbia govern... (2) your activity is transferred to a non... organization, and you accept employment ...e successor organization within 90 days of the ... the transfer.

...u accept a temporary appointment with the ... Government or District of Columbia Govern...our severance pay will be suspended during ...mporary employment and then resumed upon ...ation of the appointment. If you accept an ...tment without time limitation with the Federal ...ment or District of Columbia Government, ...ess of whether the tour of duty is full-time, ...ne, or intermittent, you lose your right to ...ce pay, and further entitlement to severance ...ll depend upon the nature of a subsequent ...ion.

...ntitlement to unemployment compensation a ...severance pay?

... I entitled to severance pay if I am receiving em...' compensation for a job-related injury?

... my severance pay, and the period covered by ...erance pay, be creditable for retirement or leave purposes?

... because when a person receives severance pay ... longer a Federal employee.

... die during the period before my severance pay ... exhausted, what happens to the balance?

...ments will continue to be made at the same ...d interval to your survivors or beneficiaries ...ur fund is exhausted. This money *will not* be ... your estate in a lump sum.

tation. Therefore, if you are in a position to receive severance pay a second time, your severance pay cannot continue after the sum of the two periods reaches 52 weeks.

Suppose, as in Question No. 6, the total severance pay to which you are entitled is $4,500. Because your at the time of separation is $100 it will take 45 weeks to pay you your entire severance pay. After receiving severance pay for 20 weeks, you are reemployed in the Federal Government under an appointment without time limitation, and the severance pay is terminated. You work for three full years and are again separated under circumstances entitling you to severance pay. You are now 48 years of age and have 23 years of creditable service. At the time of your second separation your basic weekly pay is $125. Your severance pay fund is computed as follows:

Basic allowance:

$125 (weekly salary) × 10 (first 10 years)	= $1,250
$125 (weekly salary) × 2 × 13 (years in excess of 10)	= $3,250
	$4,500

Age adjustment allowance:

$4,500 (basic allowance) × 8 (years over 40) × 10%	= $3,600

Severance pay fund:

$4,500 (basic allowance) + $3,600 (age adjustment allowance)	Total	= $8,100

The severance pay fund equals $8,100. It will take 64 and 8/10 weeks ($8,100 divided by $125) to pay you your entire severance pay. However, since total severance pay may not exceed 52 weeks, and since you have already received 20 weeks of severance pay, you are entitled to only 32 weeks of severance pay at $125 a week.

20. Q. What is the authority for paying severance pay?

A. The severance pay statute is section 5595 of title 5, United States Code; the severance pay regulations issued by the United States Civil Service Commission are in subpart G of part 550 of title 5, Code of Federal Regulations.

21. Q. Where can I get additional information about severance pay?

A. The personnel office of your agency, or the United States Civil Service Commission, will answer any other questions you have about severance pay.

For sale by the Superintendent of Documents,
U.S. Government Printing Office
Washington, D.C. 20402 - Price 10 cents

☆U.S. GOVERNMENT PRINTING OFFICE: 1970—O-382-931

severance pay

what it is

UNITED STATES CIVIL SERVICE COMMISSION
Bureau of Policies and Standards
Personnel Management Series No. 23

May 1970

Severance Pay—What It Is

A law passed in 1965 authorized, for the first time, severance pay for Federal employees who are involuntarily separated from the service. How much money an employee gets is computed on the basis of his basic pay at time of separation, his years of Federal service, and age, if he is over 40. He gets it at the same rate, and at the same intervals, as he was paid his salary.

There are some limitations on eligibility for severance pay. For example, if, when separated, an employee is receiving payments from the Labor Department's Bureau of Employees' Compensation for a job-related injury he is not entitled to severance pay. Neither is an employee who is entitled to an immediate annuity which includes a reduced annuity, a disability annuity or annuity earned as a member of the uniformed services.

The following material answers the most frequently asked questions about severance pay.

1. Q. How do I know if I am eligible for severance pay?

A. To be eligible for severance pay, you must be serving under one of the following types of appointments at the time of your separation:

(1) A career or career-conditional appointment in the competitive service, or their equivalent in the excepted service;

(2) An indefinite-appointment system that preceded the career-conditional appointment system;

(3) An indefinite appointment without time limitation in the excepted service, *except* a Presidential appointment, an appointment filled by a noncareer executive assignment, or an appointment to a Schedule C position;

(4) An overseas limited appointment without time limitation;

(5) An appointment held as a status quo employee including an appointment by which you became an indefinite employee upon promotion, demotion, or reassignment;

(6) A time-limited appointment in the Foreign Service to which you were assigned under a statutory authority that entitled you to reemployment in your former agency, but your right to reemployment had expired.

In addition, you must have been currently employed for a continuous period of at least 12 months. If you were either a part-time or a full-time employee and you meet these requirements you are eligible for severance pay.

reemployment. The offer of equivalent employment at a later time, or entitlement to an annuity beginning at a later time, has no effect on your entitlement to severance pay.

3. Q. What if I start drawing severance pay but later become entitled to a disability annuity?

A. Since the disability annuity will be retroactive to the date of your separation from the service, you will have to return all severance pay that you received.

4. Q. Who determines whether I am entitled to severance pay?

A. The separating agency makes this determination. If you are eligible, your agency advises you of the maximum amount of severance pay you may receive (referred to as the severance pay fund), the date payment will begin, and the number of weeks required to exhaust the severance pay fund.

5. Q. What should I do if my agency determines that I am not entitled to severance pay, and I believe that I am?

A. You should file a claim for pay with the Claims Division, General Accounting Office, Washington, D.C. 20548.

6. Q. How is the amount of my severance pay determined?

A. Your severance pay fund (that is, the maximum amount of severance pay you may receive) is determined on the basis of your basic rate of pay at the time of separation and years of creditable service (basic allowance). If you are over 40 years of age, an age adjustment allowance is also a part of the formula.

Your basic allowance is computed on the basis of one week's basic salary for each year of creditable service for the first 10 years, and two weeks' basic salary for each year of service thereafter. Your age adjustment allowance is computed on the basis of 10 percent of the basic allowance for each year your age exceeds 40 years of age.

For example, if you are 45 years old with 20 years of creditable service, and your basic weekly salary is $100, your severance pay fund would be computed as follows:

Basic allowance:

$100 (weekly salary) × 10 (first 10 years)	= $1,000
$100 (weekly salary) × 2 × 10 (years in excess of 10)	= $2,000
	$3,000

Age adjustment allowance:

$3,000 (basic allowance) × 5 (years

same amount as you received from you the same intervals as before until you are ployed or your severance pay fund is exh

8. Q. What is creditable service? Does it inc service?

A. Creditable service for severance pay any service which is creditable for leave poses, including military service, provided service *interrupts* otherwise creditable civ Military service which precedes civilian s creditable for severance pay purposes.

9. Q. If I resign will I be entitled to severance pa

A. Generally speaking, a resignation is separation and would not entitle you t pay. However, there are three circumst which your resignation is considered inv purposes of severance pay, provided yo declined the offer of an equivalent posit agency before separation and that you receipt of:

(1) A specific notice in writing by your you are to be involuntarily separat separation is not because of miscon quency, or inefficiency;

(2) A general notice of reduction-in-fo agency which announces that all your competitive area will be abolish ferred to another commuting area ar resignation is effective on a date more than one year before the aboliti fer; or

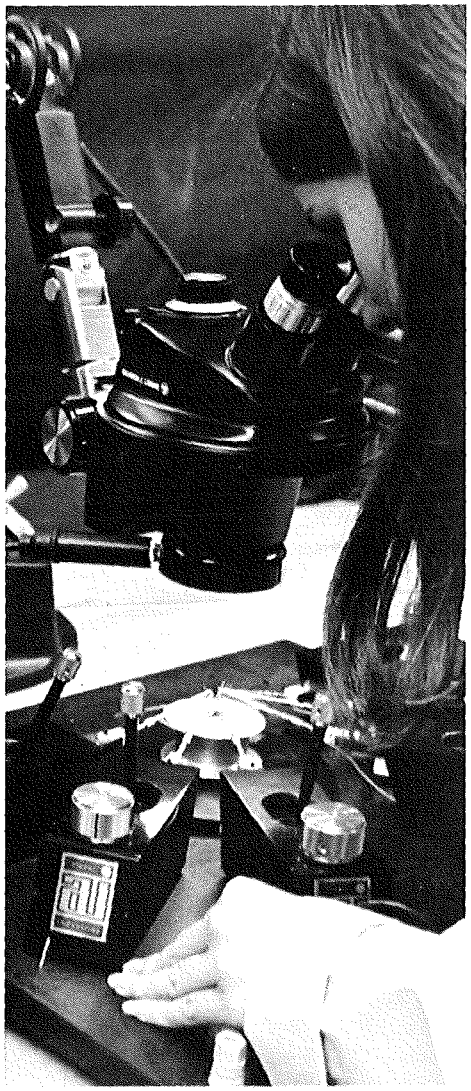
(3) A notice by your agency proposing you for declining to accompany y when it is to be moved to another area because of a transfer of functio all positions in your competitive are abolished or transferred to another area within a period of no more tha

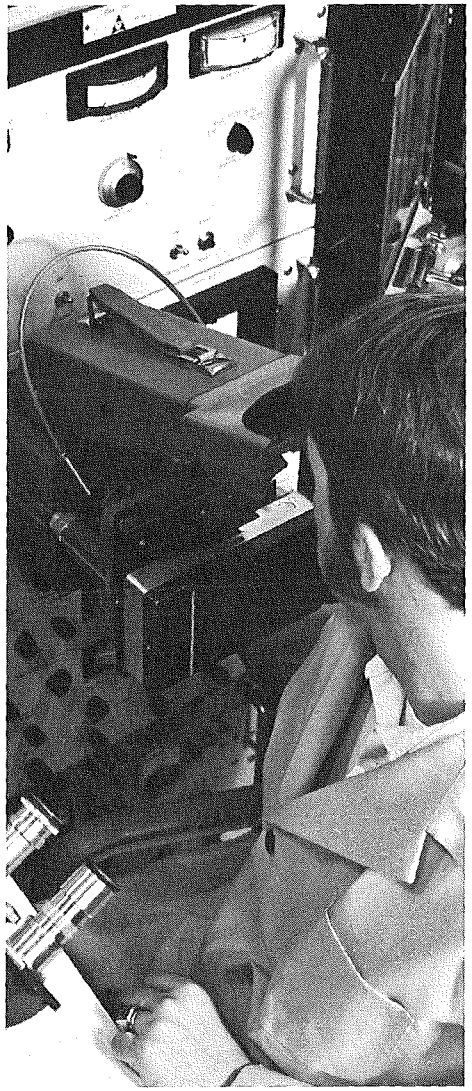
10. Q. What is an "equivalent position"?

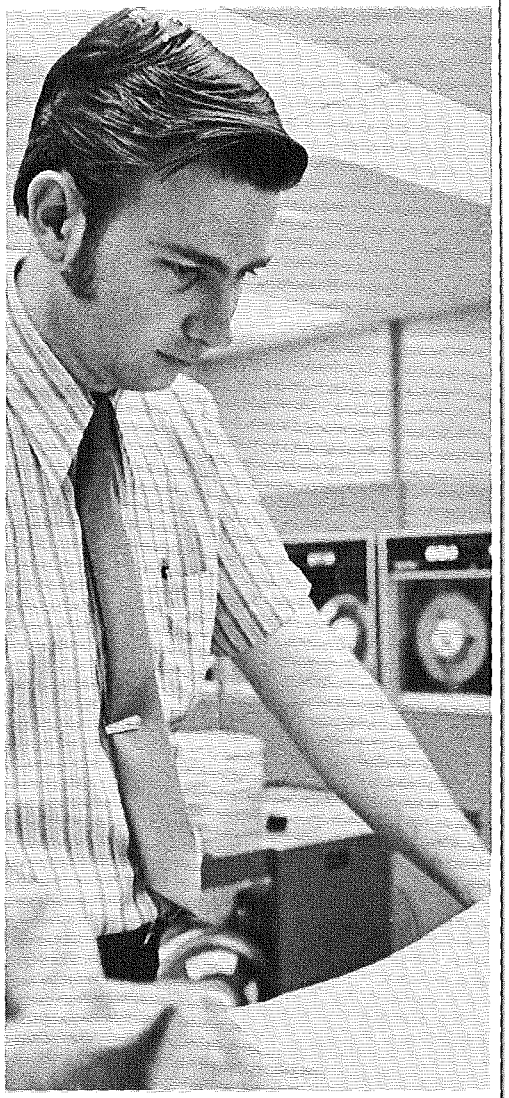
A. For purposes of entitlement to severa equivalent position is one of like seniori has meaning only for employees in the service), tenure, and pay (other than a r of pay) located within the employee's area.

11. Q. My agency is transferring the function position is a part to an installation locat 500 miles away. If I do not move with I will be separated. The agency has offere

NAD crane







Essentially the civilian employees at Crane do the same type things as personnel in any business enterprise. We supply products and services. This brochure is intended to provide specific information relating to our involvement today, especially in those areas having engineering and scientific orientations and personnel requirements.

A broad variety and scope of activities permit Crane to offer the professional a choice—in terms of his current interests and also, most probably, with respect to his future interests.

Our environment includes facilities and laboratories which allow you to develop in your field: holography, solid-state electronics, rotating components, chemical research, environmental testing, underwater acoustics, and more.

May we invite your attention to:

NAD CRANE IS AN EQUAL OPPORTUNITY EMPLOYER.

CRANE

Career Opportunities Information

Approved

(date) 5/30/72

J. C. DONAHUE
Commanding Officer
Naval Ammunition Depot
Crane, Indiana

The Environment

Larger than the District of Columbia, encompassing over 62,000 acres with modern, permanently constructed buildings, roads, and railroads—Crane is a city away from city congestion. Nearby interstates bring us closer to Indianapolis, Indiana and Louisville, Kentucky.

Unspoiled terrain is the setting for scientific and industrial activities. Man hasn't spoiled Nature at Crane. Numerous wildlife, trees, plants, and flowers live and grow in protection and freedom.

s delicate as a Japanese silk screen print, ooded Lake Greenwood covers 800 of Crane's cres. A beutiful means for natural con- ervation.

Physics

Think of the different fields of physics—spectroscopy, holography and laser optics, thermodynamics, mechanics, acoustics, ultrasonics—and Crane is involved in conceptual research or applied studies.

Applied

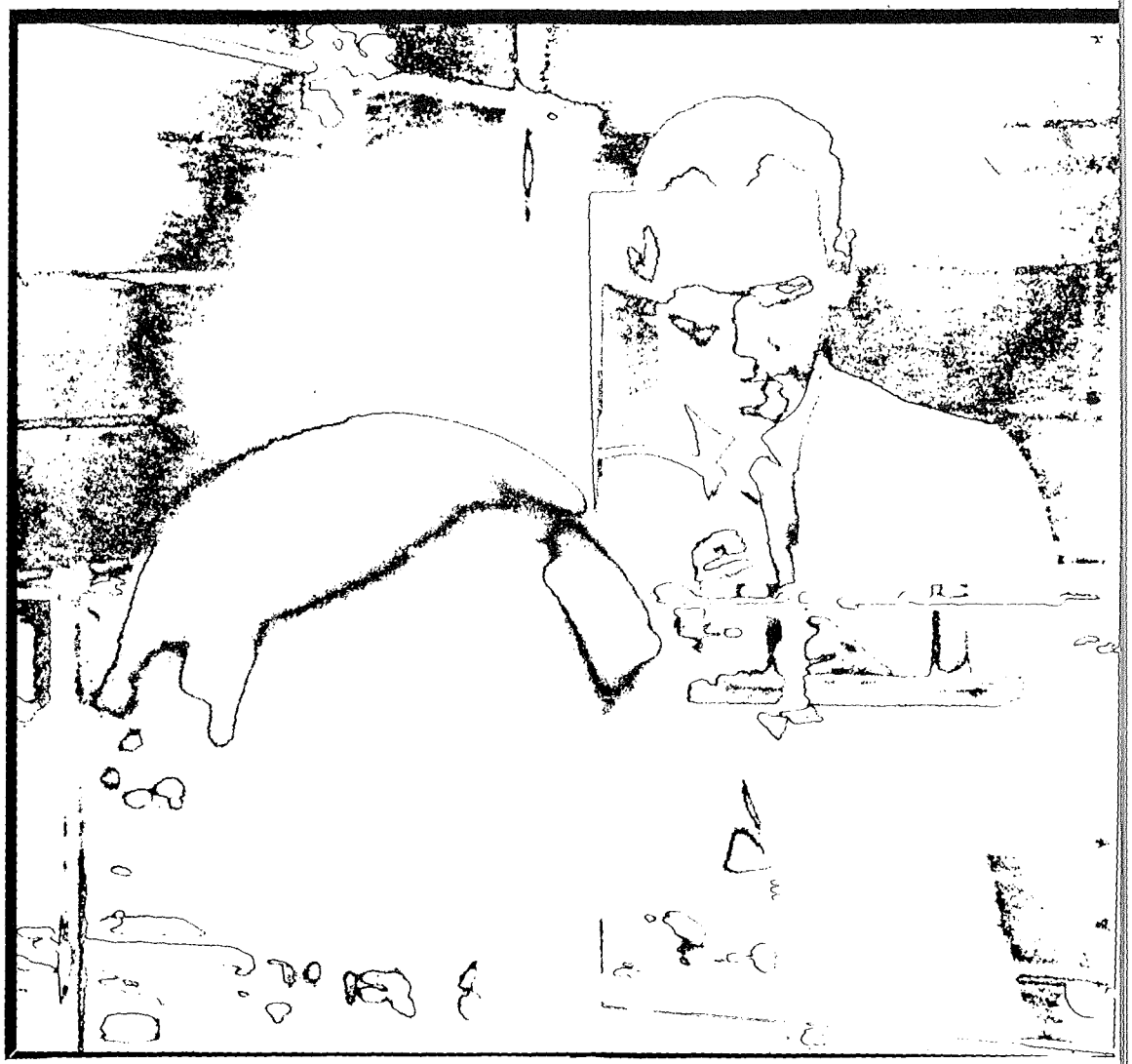
Methods of detecting persons who generate unusual amounts of static electricity is an applied research study.

Research

Spectral distribution of radiation and flame kinetics are two disciplines in the electro-magnetic spectrum we're researching. Laser radiation is another research area.

Physics Majors

Electricity and magnetism, quantum mechanics, and atmospheric physics major areas of concentration are needed for today's and tomorrow's programs.



Van de Graaf generator simulates maximum electrical charge of human body for testing electrostatic sensitivity.

Environmental Testing

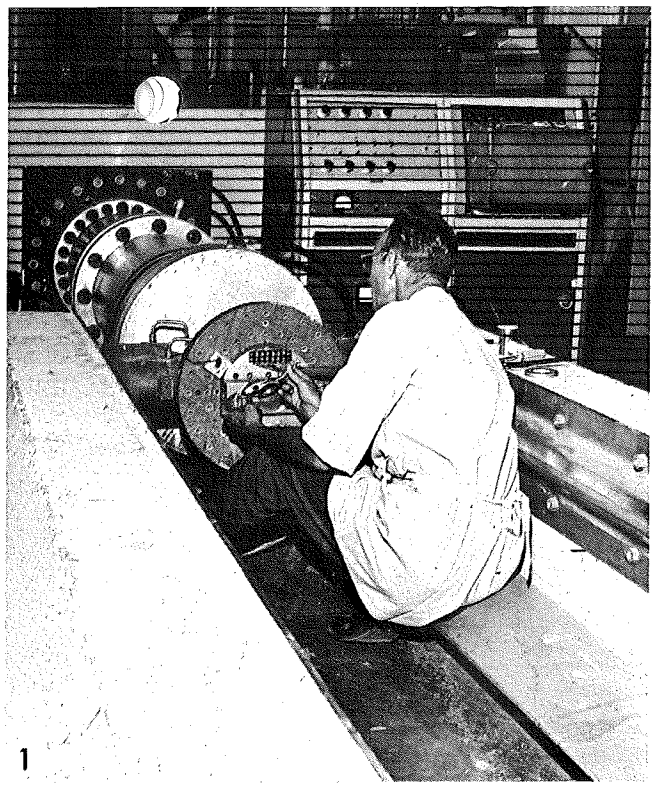
The worst environments that nature and man conceive are reproduced in our laboratory to test tiny microcircuits and two-thousand pound gun turrets.

Producing a multitude of environments, either sequentially or simultaneously, we can simulate the real environment of nearly any device. Engineers devise test regimes for a gamut of operational environments and climates.

Over 8 Million $ Laboratory

From a humble beginning—a single homemade saltspray tank—our laboratory has grown in the past 20 years to include seven buildings housing equipment worth over eight million dollars. This equipment simulates harsh corrosive action of salt water spray and various climates, insidious vibration, damaging impact of mechanical shock, and sudden acceleration.

Explosive hardware from detonators to one-ton cast loaded items are tested in instrumented steel and concrete cells. Equipment for automatically controlled tests and data acquisition is among the best in the country.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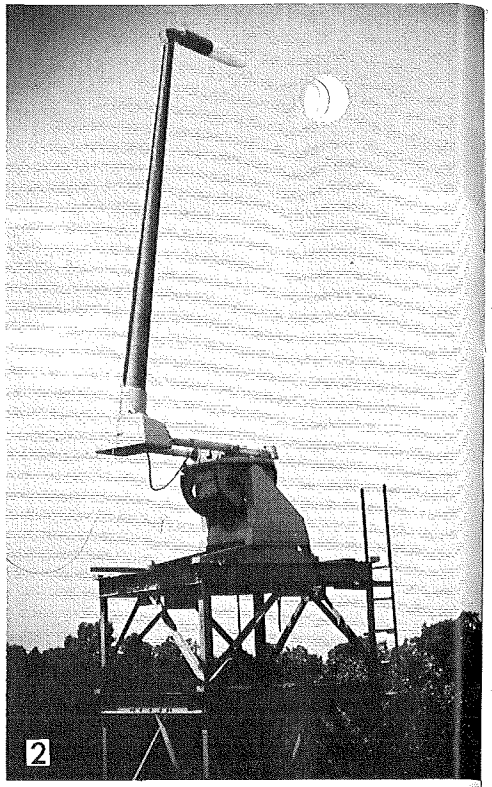
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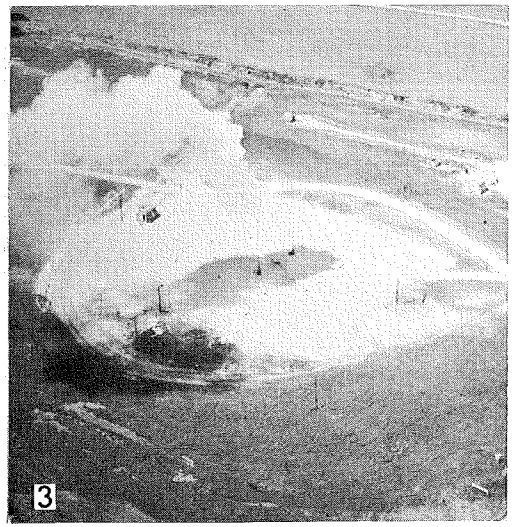
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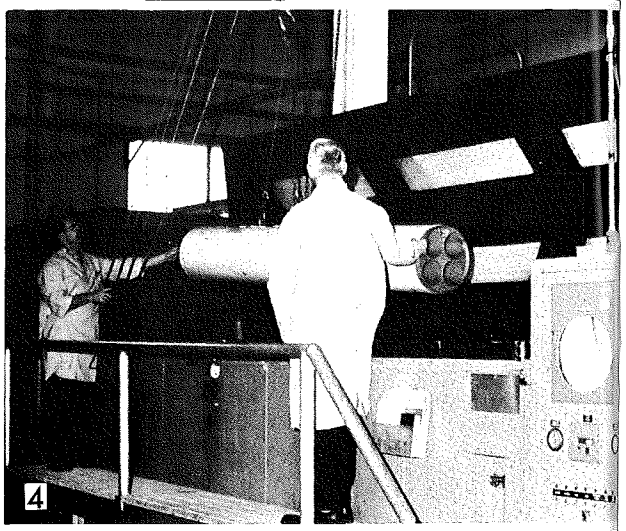
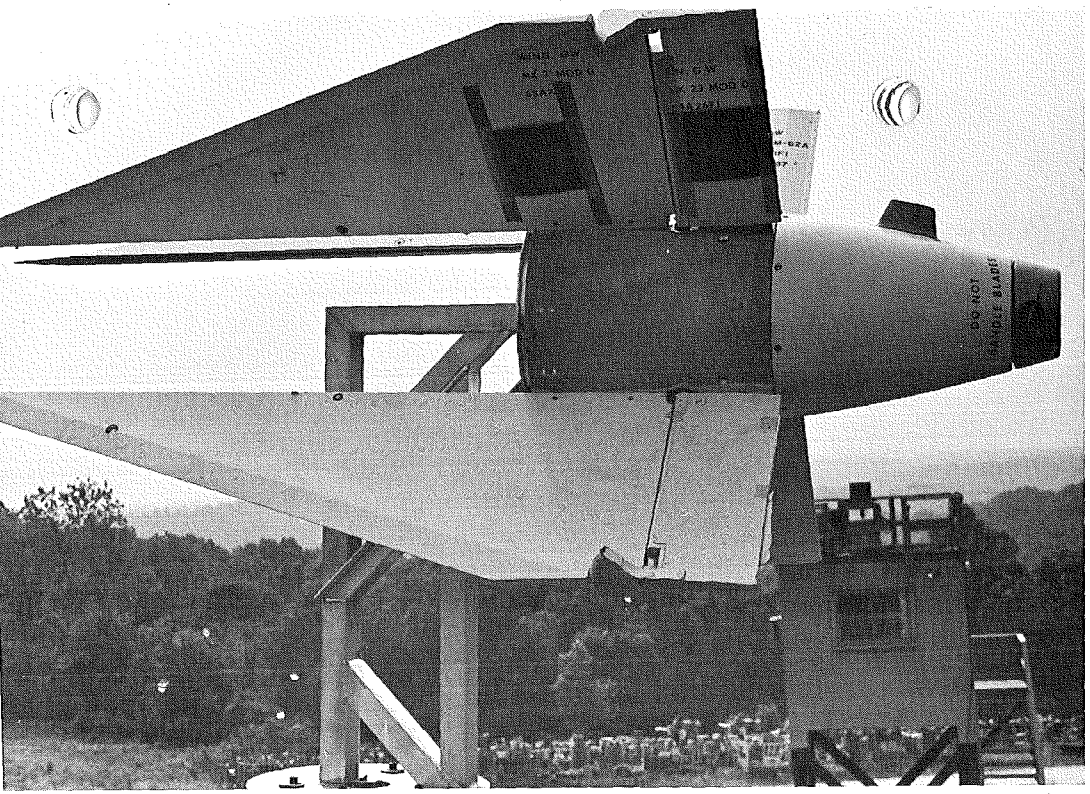

4

1 Shock machine produces up to 400,000 lbs. thrust.

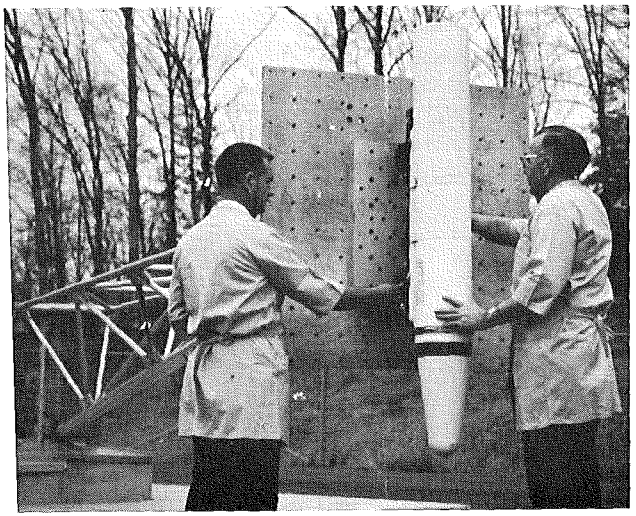
2 Model tower for testing SHRIKE antenna is located in an isolated place.

3 MAPI tower 100 feet high measures pyrotechnic items.

4 Salt spray chamber tests items as large as rocket launchers.



Elevated microwave antenna range tests guidance system in guided missile.



Centrifuge mainly tests pyrotechnic items functioning while undergoing great speed and pressure.

Crane's large and secluded land area is ideal for constructing facilities to test practically any pollutant, explosive, or noxious element without endangering wildlife or surrounding population.

Specialized Outdoor Test Facilities

Multi-Aspect Assessment of Pyrotechnic Illumination (MAPI) Range Two instrumented 300 and 100 foot towers evaluate flare candlepower from several directions, including the ground.

Centrifuge 22 foot radius centrifuge tests large packages and explosive items.

Elevated Microwave Antenna Range Nearly every type of microwave antenna for fuzes, aircraft, or shipboard can be tested.

Fast Cook-Off Facility Resistance to fire or burning time of material containing up to 1000 pounds of TNT is measured.

Drop Towers Several towers up to 100 feet high equipped with hoisting and releasing mechanism for drop testing.

Demolition Ground Remote 160 acres for detonation and destruction of up to 850 pounds of explosives.

Cloud Chamber Controls moisture content at different temperatures (-35°C to + 20°C) and produces rain in the same way that cold clouds do

Sonobuoy Water Plane Antenna Range Tests radio frequency over simulated ocean environment

Mobile & Hand Launched Rocket Test Site For firing tests.

Rocket Motor Test Stand Up to 10,000 pounds of thrust available, in instrumented facility.

Electronics

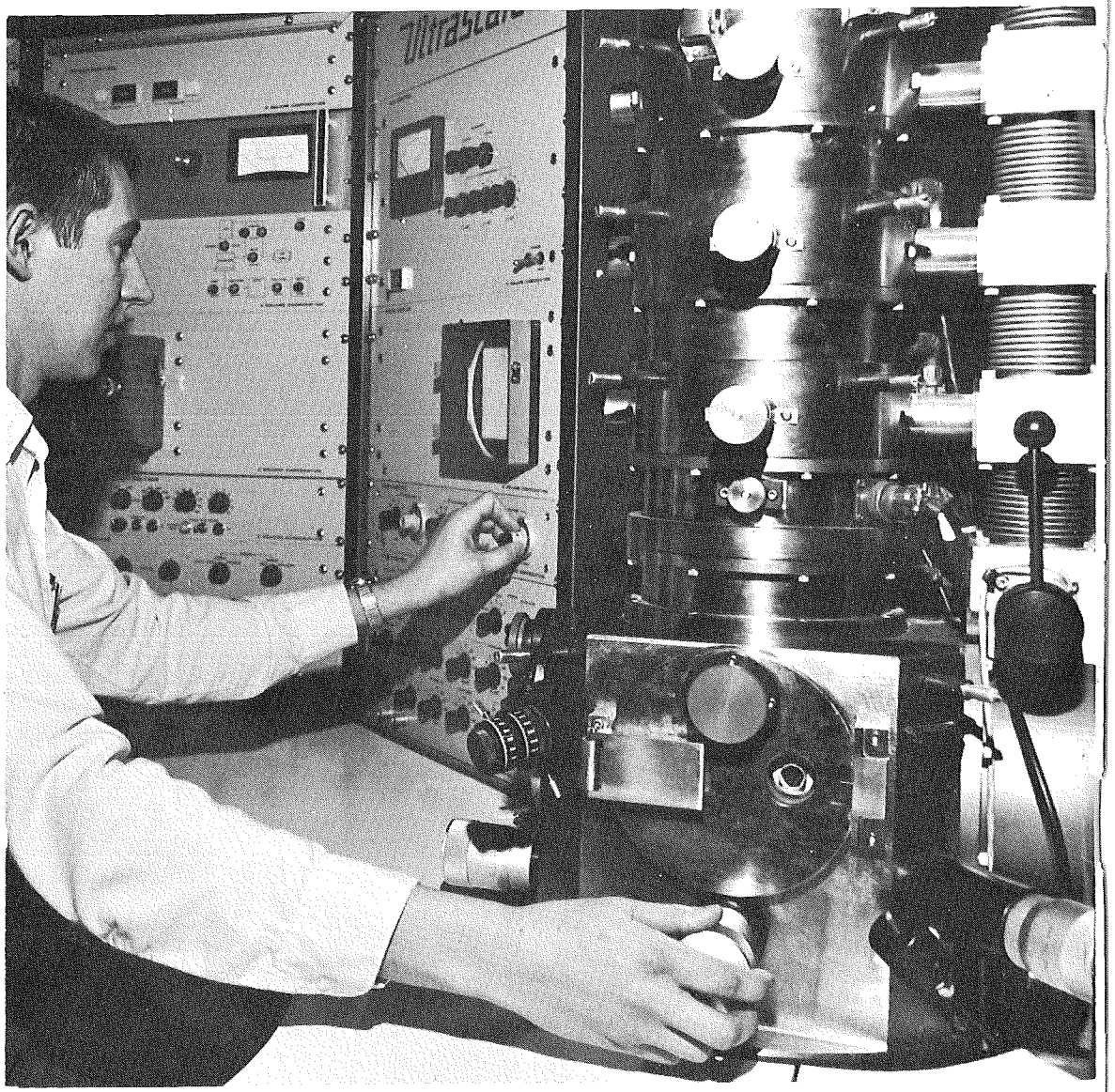
Ecology and missile systems are tied together by one thing—Crane's electronics competence.

Our competency derived from missile system work, transmitter fabrication helped the Forestry Service locate natural predators of gypsy moths.

Diverse programs require skills in solid state electronics.

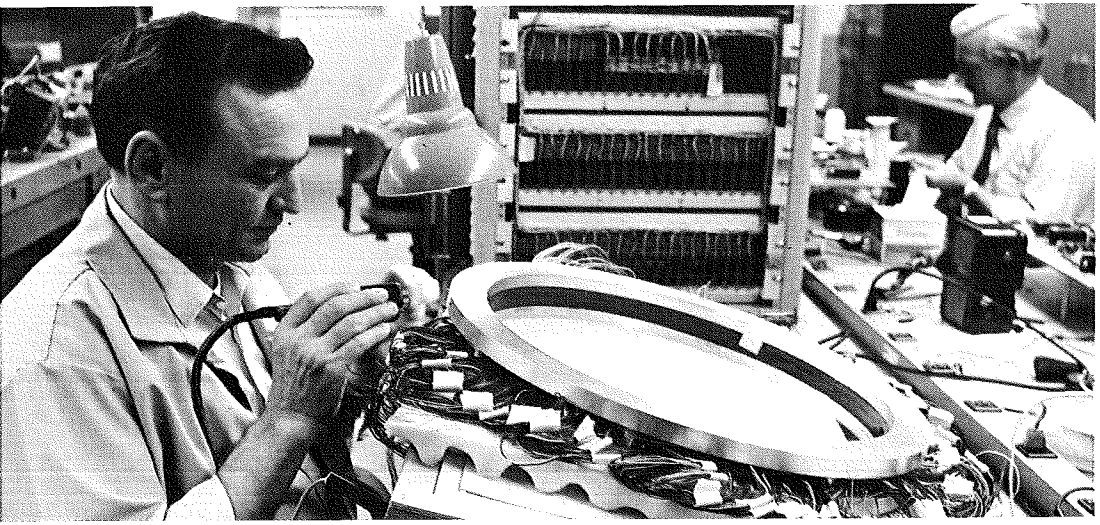
Plain & Fancy

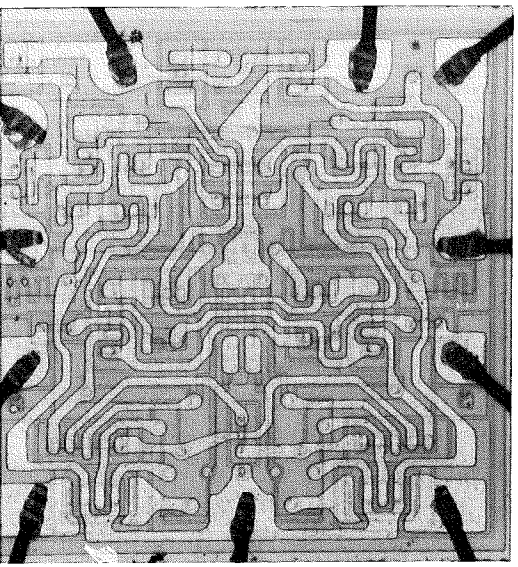
Fifteen different laboratories contain a myriad of equipment—both analog and digital. Fancy facilities include a scanning electron microscope for three dimensional analysis and a television monitored X-ray. Radio frequency free test, radiation, holographic and human visual systems performance laboratories are representative of unusual facilities.



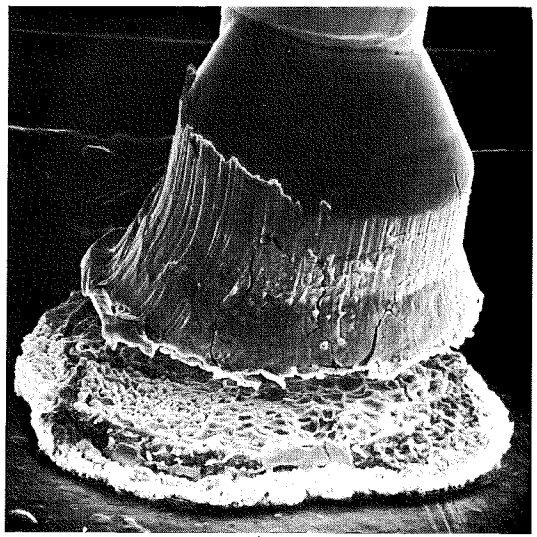
Scanning electron microscope for 50,000 to 60,000 X resolution produces a television-like image and has 150 angstrom

A Crane design by electronic engineers leads to custom fabrication of specialized electronic equipment.





Complete fabrication and failure analysis of printed circuit boards is done at Crane.



Bonding break in a printed circuit board doesn't show up with a visual examination. Under the scanning electron microscope, the failure is dramatic.

Fifteen Different Electronic Laboratories Involved In:

Systems Design - *Mathematical models employing computer analysis eliminate guesswork in design decisions for printed circuitry, test equipment, and analog or digital systems.*

Applied Research - *State-of-the-art research for semiconductor reliability tests, and acoustical delay lines involves engineers.*

Testing - *Leading in devising electrical, chemical, mechanical/environmental tests for solid state components and monolithic, hybrid, MSI, and LSI microcircuits, our testing facilities cover all kinds of electronic devices and components. Controlling production of integrated circuits and transistor devices at manufacturer's plants is part of our total test program.*

Instrumentation - *Instrumenting a variety of tests, measuring, and controlling mechanical, electrical or chemical parameters requires adept personnel.*

Failure Analysis - *Distinguishing Crane from other activities, this engineering function isolates failure mechanisms or potential failures in a variety of electronic devices and parent systems. Improvements ensuring longer life and increasing operation reliabilities are direct benefits.*

Product Development - *Modules, electro-optical, and SONAR Systems are some of our product developments.*

Aircraft Instruments And Equipment

Aircraft instrument performance greatly concerns our biggest customer—the Navy. That is why Crane has separate facilities for evaluating flight and engine instruments, navigation systems, avionics, and the associated ground support equipment. Preproduction and production sample testing, reliability and failure analysis are included in programs for Navy aircraft.

Test & Evaluation

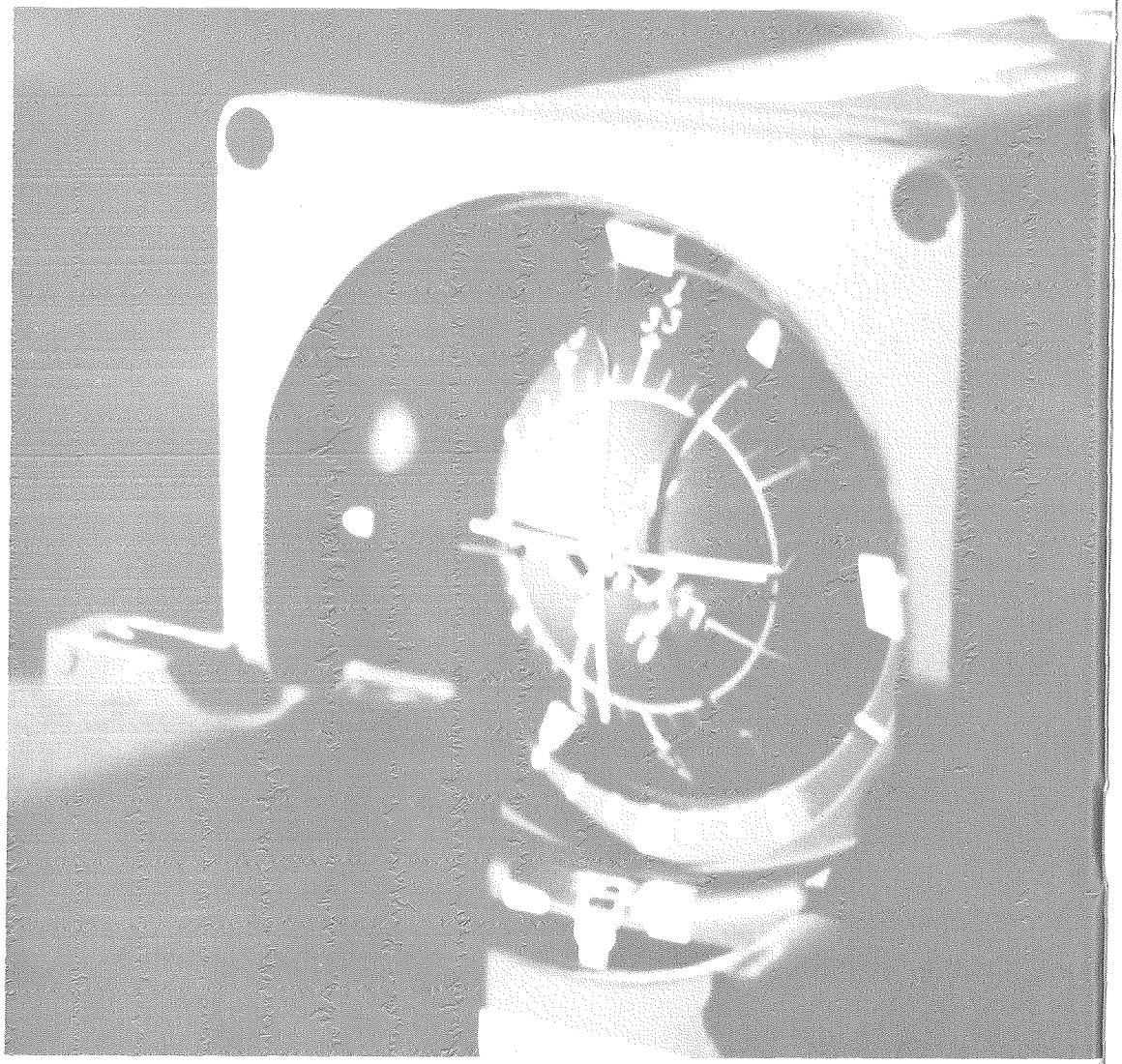
Specialized facilities evaluate instrument lighting, fuel flow performance, and electromagnetic interference. Our laboratories include equipment for simulating aircraft environment, radio navigation aids (TACAN Beacon Simulator), pressure sensing systems, and precision altitude controls.

Predictable Performance

This adds up to safety assessment, reliability, and predictable performance of aircraft equipment under actual use.

Medical & Audio

Electronic medical instruments, audio equipment, and aircraft armament are evaluated in our facilities.



Aircraft attitude indicator undergoing lighting evaluation.

Rotating Components

Directional ability of Navy aircraft, ships, and missiles is crucial.

Unerring Accuracy

Comprehensive automated failure analysis at Crane leads to rework and redesign of servo mechanisms, motor tacs, gyroscopes, synchros, and resolvers for unerring directional accuracy.

Gyroscope Specialists

State-of-the-art research and development of gas bearing gyroscopes, infinite variable testing, and rework makes us gyroscope specialists. Program-controlled digital equipment tests gyroscopes and inertial equipment for exact directional ability.

Rate Tables

An ultra-precision air bearing rate table, part of inertial digital test system, is one of a few in the country. Precision rate tables capable of polar axis alignment are here, too.

Extending our horizons with rotating component failure analysis and redesign is another reason for Crane's success.

Computerized test system and precision rate tables give widest test and evaluation range, and greatest accuracy within the state-of-the-art.

Behavioral Sciences

Man's behavior in an environment, particularly an industrial environment, is observed in the Behavioral Sciences Laboratory. Major emphasis of the laboratory is precisely measuring human behavior patterns discovered through various psychological methodology.

Primate Laboratory

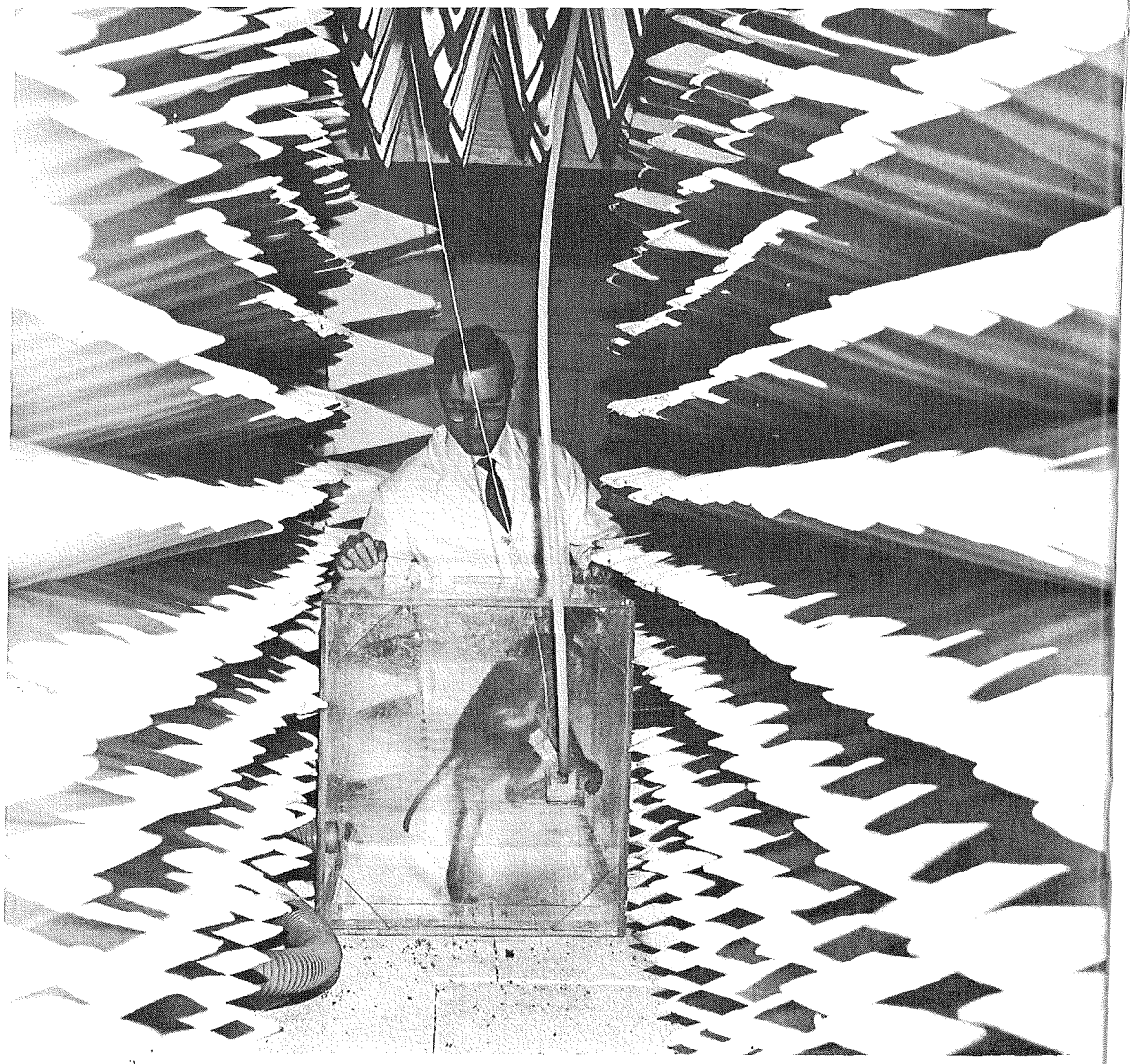
The instrumented laboratory has rodents, primates, or other animal subjects learning operant conditioning schedules in controlled experiments.

Multi Disciplined

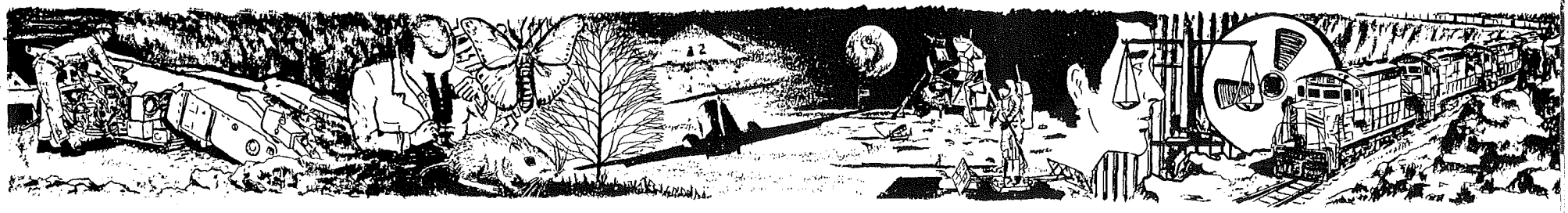
The team approach, psychologists teamed with electronic, human factors, and mechanical engineers and other specialists, allows multi-discipline experiments and comprehensive analysis.

Stimulating

Physiological-psychological effects of drugs, alcohol, chemicals and pollutants; energy source effects and visual task efficiency can be studied in the laboratory.



Primate learns variable interval reinforcement schedule in anechoic chamber for microwave study.



Technology Transfer

Crane's capabilities involve the Navy, other Department of Defense, government and non-government agencies.

The illustrations at the top of this page visually represent a few Crane programs.

Bureau Of Mines

Human factors research in underground bituminous mining for the Department of Interior involved psychologists, electronic and mechanical engineers.

Public Health Service

Chemists analyzed drugs to determine deterioration in storage. Department of Health, Education and Welfare requested this study for civil defense information.

Forestry Service

Electronic engineers and technicians devised and produced transmitters for the Department of Interior.

Federal Aviation Administration

Computer simulation of a pilot's visibility range and runway detection abilities for the Department of Transportation ultimately ensures greater aircraft safety.

NASA

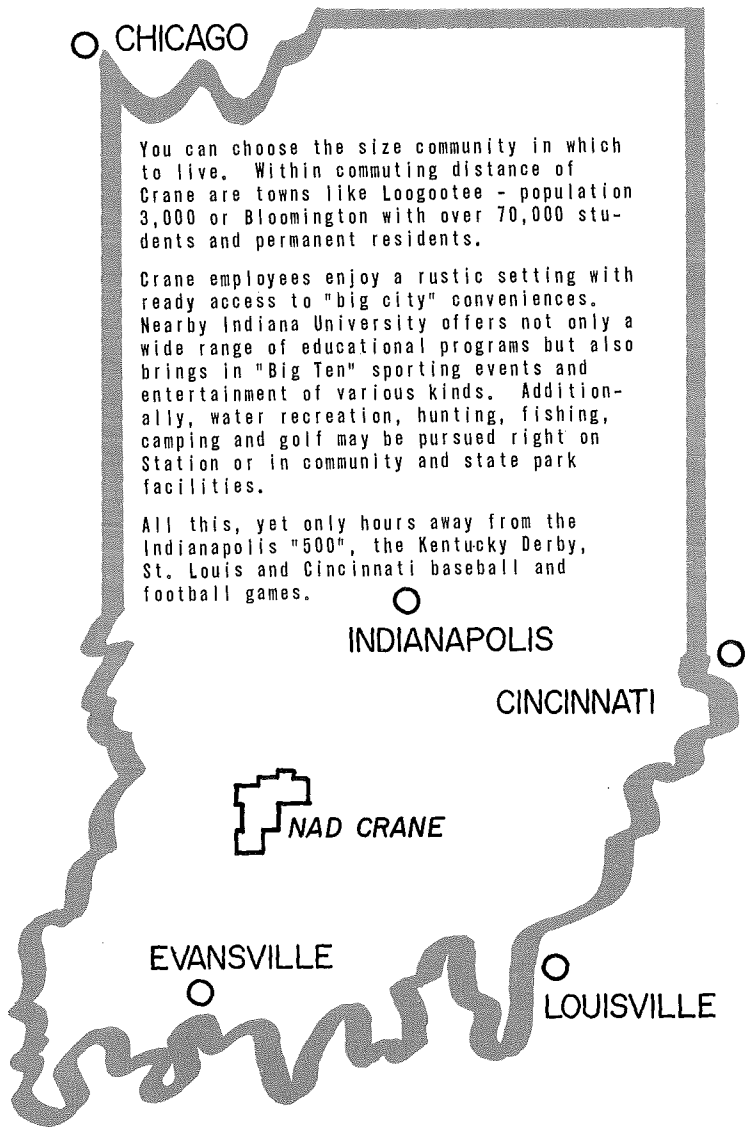
NASA spacecraft batteries undergo various test regimes with our computer controlled system. Spacecraft initiators undergo comprehensive testing in our modern explosive components test facility.

Indiana Department Of Correction

Mathematicians and operations researchers devised a computerized system of correctional information for the Department of Justice.

Federal Railroad Administration

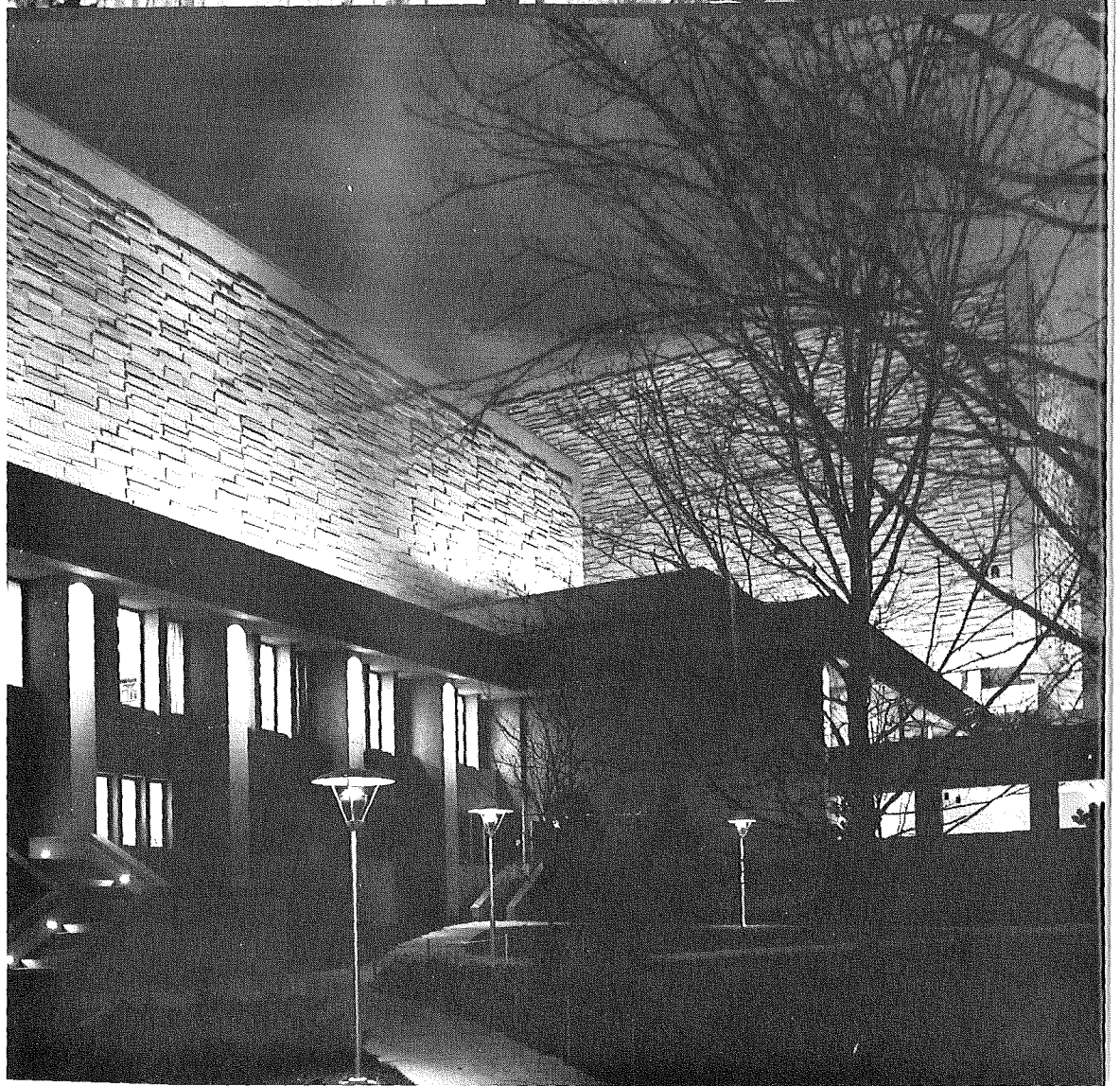
Projects for the Department of Transportation concern human factors in railroad cab design and in railroad car vandalism.

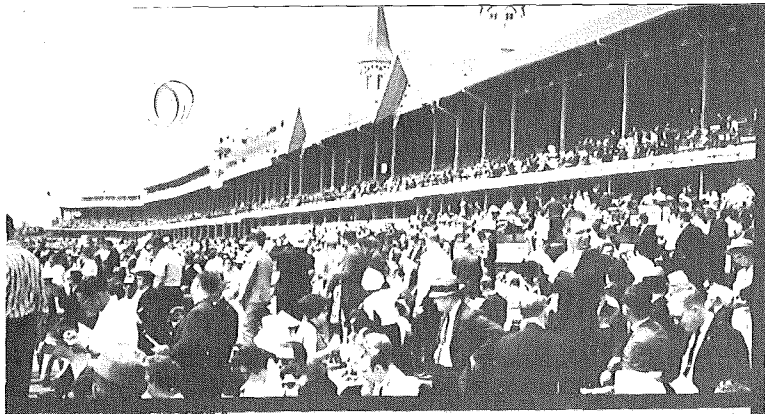


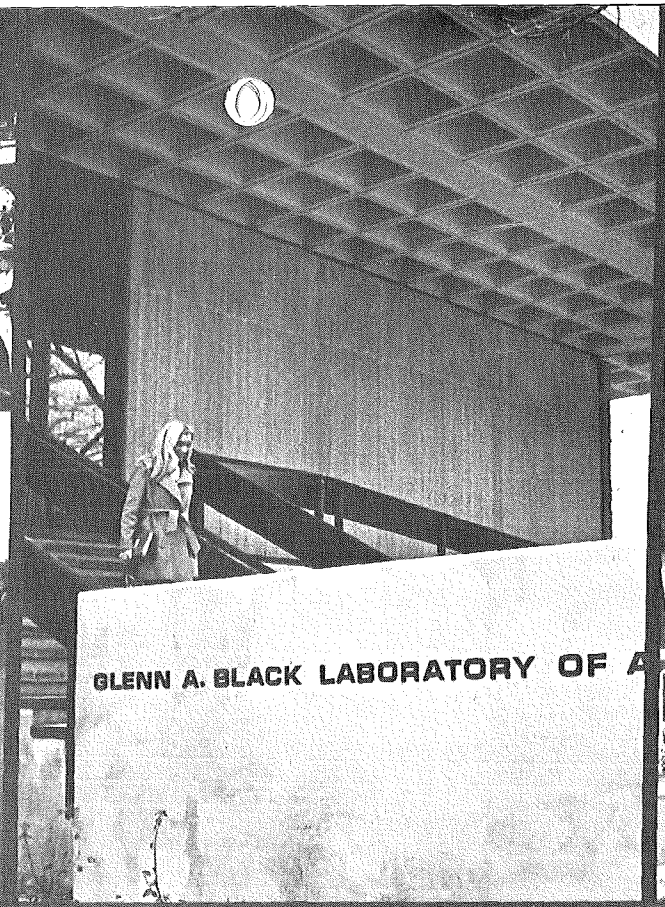
You can choose the size community in which to live. Within commuting distance of Crane are towns like Loogootee - population 3,000 or Bloomington with over 70,000 students and permanent residents.

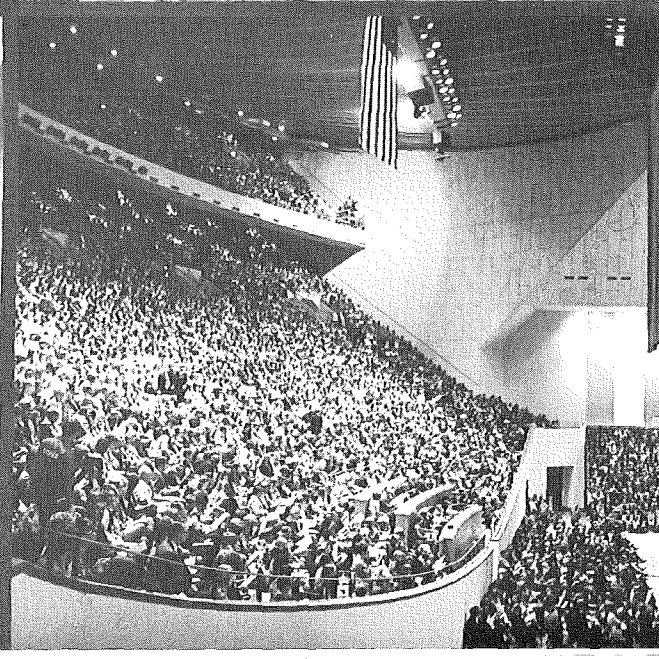
Crane employees enjoy a rustic setting with ready access to "big city" conveniences. Nearby Indiana University offers not only a wide range of educational programs but also brings in "Big Ten" sporting events and entertainment of various kinds. Additionally, water recreation, hunting, fishing, camping and golf may be pursued right on Station or in community and state park facilities.

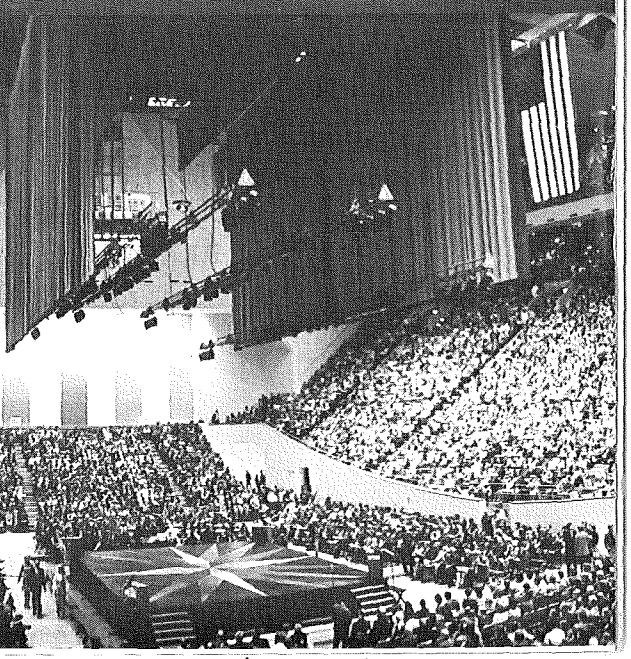
All this, yet only hours away from the Indianapolis "500", the Kentucky Derby, St. Louis and Cincinnati baseball and football games.






GLENN A. BLACK LABORATORY OF A





Flipping through our brochure, you've discovered that we're more than an ammunition depot.

Special facilities make us highly diversified—covering a spectrum of modern technology.

There's a lot going on at Crane and you can be part of it.

FOR MORE INFORMATION ABOUT YOUR INVOLVEMENT talk to our interviewer when he visits your campus or write to:

Commanding Officer
Naval Ammunition Depot (Code 06)
Crane, Indiana 47522

NAD CRANE IS AN EQUAL OPPORTUNITY EMPLOYER.

CHIEFS TOWING SERVICE INC.

13008 Oakview Blvd. Garfield Hts. Ohio 44125

April 4, 1972

SUBJECT-----Apointment of officers for the board of directors, due to the resignation of Vice-President and the Secretary-Treasurer.

As President I appoint as Vice-President ROBERT J. MARKS 2nd and as Secretary-Treasurer JOHN D. McKEON.

ROBERT J. MARKS

Robert J. Marks

PRESIDENT

ARTICLE I

CODE OF REGULATIONS

1. Stockholders' meetings shall be held at the principal office or place of business of this Company in the State of Ohio.

2. The annual meeting of the stockholders of this Company shall be held at three o'clock in the afternoon on the first Monday in April of each year, beginning with the year 1971, at which time there shall be elected by the stockholders of the Company, by ballot, a board of three (3) directors for the ensuing year, and the stockholders shall transact such other business as shall properly come before them.

3. A notice setting out the time and place of such annual meeting shall be mailed postage prepaid, to each stockholder of record, at his address as the same appears on the stock book of the Company, or if no such address appears, at his last known place of address, at least thirty (30) days prior to the annual meeting.

4. If a quorum be not present at the annual meeting, the stockholders present in person or by proxy may adjourn to such future time as shall be agreed upon by them, and notice of such adjournment shall be mailed postage prepaid, to each stockholder at least thirty (30) days before such adjourned meeting; but if a quorum be present, they may adjourn from day to day as they see fit, and no notice of such adjournment need be given.

5. A majority of the stock issued and outstanding, either in person or by proxy, shall constitute a quorum for the transaction of business at any meeting of the stockholders.

6. Each stockholder shall be entitled to one (1) vote for each share of stock standing in his own name on the books of the Company, whether represented in person or by proxy.

7. All proxies shall be in writing and properly signed.

8. The following order of business shall be observed at all annual and special meetings of the stockholders so far as practicable, viz:

1. Calling the roll.
2. Reading, correction and approval of minutes of previous meeting.
3. Reports of officers.

4. Reports of committees.
5. Election of directors.
6. Unfinished business.
7. New business.

ARTICLE II

STOCK

1. Certificates of stock shall be in a form adopted by the board of directors and shall be signed by the president or vice-president and the treasurer, and be attested by the corporate seal.

2. All certificates shall be consecutively numbered. The name of the person owning the shares represented thereby, with the number of such shares and the date of issue, shall be entered on the Company's books.

3. All certificates of stock transferred by endorsement thereon shall be surrendered for cancellation and new certificates issued to the purchaser or assignee.

4. Shares of stock shall be transferred only on the books of the Company by the holder thereof in person or by his attorney.

ARTICLE III

DIRECTORS

1. A board of three (3) directors shall be chosen annually by the stockholders at their annual meeting, to manage the affairs of the Company. Their term of office shall be one (1) year.

2. Vacancies in the board of directors by reason of death, resignation or other causes shall be filled by the remaining directors choosing from among the stockholders a director to fill the unexpired term.

3. Regular meetings of the board of directors shall be held on the first Friday of each month, at the office of the Company in Ohio, or at such other time as the board of directors shall by resolution appoint. Special meetings may be called by the president, or any two directors by giving thirty (30) days' notice to each director.

4. The directors shall have the general management and control of the business and affairs of the Company and shall exercise all the powers that may

be exercised or performed by the corporation, under the statutes, the certificate of incorporation and the by-laws.

5. Each director shall receive one (1) dollar for attendance at any meeting of the board, and shall receive no other salary or compensation for his services as a director of the Company.

6. The board of directors of the corporation has the sole power to amend by unanimous consent the original articles of incorporation.

ARTICLE IV

OFFICERS

1. The officers of this Company shall consist of a president, ROBERT J. MARKS, of 13008 Oakview Garfield Heights, Ohio; a vice-president, KEVIN G. MATSAKO, of 12901 York Boulevard Garfield Heights, Ohio; and a secretary and treasurer, WILLIAM A. PELZ, of 24440 Miles Avenue Bedford Heights, Ohio.

2. The president shall preside at all meetings of the directors and stockholders and shall have general charge of and control over the affairs of the corporation subject to the board of directors.

3. The vice president shall perform such duties as may be assigned to him by the board of directors. In case of the death, disability or absence of the president, he shall perform and be vested with all of the duties and powers of the president.

4. The secretary shall countersign all certificates of stock of the Company. He shall keep a record of the minutes of the proceedings of meetings of stoc kholders and directors, and shall give notice as required in these by-laws of all such meetings. He shall have custody of all books, records, and papers of the Company, except such as shall be in the charge of the treasurer, or of some other person authorized to have custody and possession thereof by a resolution of the board of directors.

5. The treasurer shall keep accounts of all moneys of the Company received or disbursed, and shall deposit all moneys and valuables in the name and the credit of the Company in such banks and depositaries as the board of directors shall designate. All checks for the payment of money shall be counter-

signed by the treasurer, and one other officer. ANY TWO Officers -

6. The salaries of all officers shall be fixed by the board of directors, and may be changed from time to time by a majority vote of the board.

7. Each of such officers shall serve for the term of one (1) year or until the next annual election.

ARTICLE V

SEAL

1. The corporate seal of this Company shall be a circular seal with the name of the corporation around the border and the year of incorporation in the center.

ARTICLE VI

AMENDMENTS

1. Any of these by-laws may be amended by majority vote of the stockholders at any annual meeting, or at any special meeting called for the purpose.

2. Holders of the common stock reserve the sole right to control the management of the corporation and all voting rights as specified in the by-laws of the corporation, and said right as to control of such corporation shall not be abridged by any subsequently enacted by-law.

NAVAL AMMUNITION DEPOT, CRANE, INDIANA

Effective: 14 October 1973
E. O. 11739, Approved 10-03-73

SALARY CHART

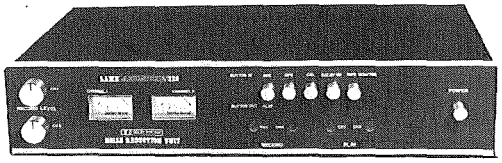
ADMINISTRATIVE, TECHNICAL, NON PROFESSIONAL AND PROFESSIONAL

RATES WITHIN GRADE & WAITING PERIOD FOR STEP INCREASES ARE:

	ENTRANCE	52 Weeks			104 Weeks			156 Weeks		
GRADE	1	2	3	4	5	6	7	8	9	10
GS-1	$5,017	$5,184	$5,351	$5,518	$5,685	$5,852	$6,019	$6,186	$6,353	$6,520
GS-2	5,682	5,871	6,060	6,249	6,438	6,627	6,816	7,005	7,194	7,383
GS-3	6,408	6,622	6,836	7,050	7,264	7,478	7,692	7,906	8,120	8,334
GS-4	7,198	7,438	7,678	7,918	8,158	8,398	8,638	8,878	9,118	9,358
GS-5	8,055	8,323	8,591	8,859	9,127	9,395	9,663	9,931	10,199	10,467
GS-6	8,977	9,276	9,575	9,874	10,173	10,472	10,771	11,070	11,369	11,668
GS-7	9,969	10,301	10,633	10,965	11,297	11,629	11,961	12,293	12,625	12,957
GS-8	11,029	11,397	11,765	12,133	12,501	12,869	13,237	13,605	13,973	14,341
GS-9	12,167	12,573	12,979	13,385	13,791	14,197	14,603	15,009	15,415	15,821
GS-10	13,379	13,825	14,271	14,717	15,163	15,609	16,055	16,501	16,947	17,393
GS-11	14,671	15,160	15,649	16,138	16,627	17,116	17,605	18,094	18,583	19,072
GS-12	17,497	18,080	18,663	19,246	19,829	20,412	20,995	21,578	22,161	22,744
GS-13	20,677	21,366	22,055	22,744	23,433	24,122	24,811	25,500	26,189	26,878
GS-14	24,247	25,055	25,863	26,671	27,479	28,287	29,095	29,903	30,711	31,519
GS-15	28,263	29,205	30,147	31,089	32,031	32,973	33,915	34,857	35,799	36,741
GS-16	32,806	33,899	34,992	36,085	37,178	38,271	39,364	40,457	41,550	----
GS-17	37,976	39,242	40,508	41,774	43,040	----	----	----	----	----
GS-18	43,926	----	----	----	----	----	----	----	----	----

LAMB LABORATORIES

DOLBY B NOISE REDUCTION UNIT



LDB 220: The LDB 220 Dolby B noise reduction unit may be used with any reel-to-reel or cassette tape recorder, and will produce up to 10dB reduction in high frequency noise and hiss. It may also be used with an FM tuner to deprocess Dolby B encoded broadcasts, and will give up to 10dB reduction in transmission hiss and high frequency interference.

Recordings may also be made of Dolby B encoded broadcasts **without deprocessing,** and the LDB 220 may then be used to deprocess the signal on playback to give a reduction in both the transmission noise and the tape hiss in one deprocessing operation.

The LDB 220 has two Dolby processors, switchable between record and playback functions, line inputs, record and playback calibration controls, Dolby calibration oscillator, multiplex filter (for use when deprocessing stereo FM), Dolby level meters, record level controls and a switchable 10dB attenuator to match the outputs of the LDB 220 to the amplifier being used It is complete with interconnecting cables and calibration tape.

LDB 240: The LDB 240 is a four processor version of the LDB 220, and has independent record and playback processors. This enables recordings to be Dolby encoded and on a three-head recorder simultaneously decoded for monitoring purposes, so that the signal is monitored at all times in its non-processed form.

SPECIFICATIONS:

Output: RECORD; 580mV from 50 ohms source; minimum load 5 Kilohms. PLAYBACK; 580mV from 5 Kilohms source; minimum load 50 Kilohms. Overload capacity record and replay +10dB.

Input: RECORD; 25mV for 580mV output. Input impedance 20 Kilohms. PLAYBACK; 25mV for 580mV output. Input impedance 30 Kilohms.

Frequency Response: MPX filter "OUT", 20Hz to 15kHz±1dB; 15kHz to 20kHz±2dB. MPX filter "IN", 20Hz to 15kHz ±1dB; 19kHz-36dB. A low pass filter is permanently connected in both the "RECORD" and "PLAYBACK" modes operating at frequencies above 20kHz. It reduces considerably interference from switching frequency (38kHz) on stereo decoders and bias frequency (55 to 105kHz) from tape recorders in the "RECORD" mode. Insertion loss 38kHz-24dB increasing to -50dB at 105kHz and above.

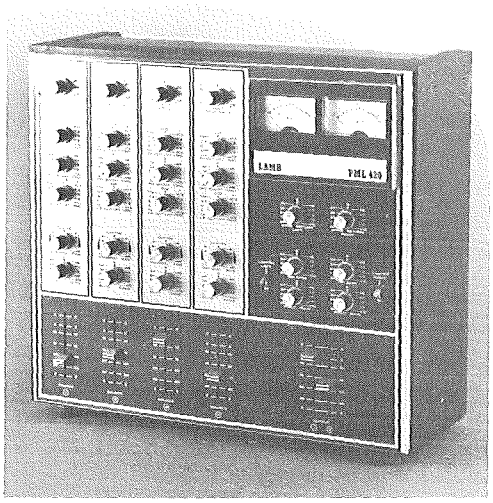
Channel Separation: Better than 50dB at 1kHz.

Signal/Noise Ratio: (Including hum) Better than 70dB reference 580mV unweighted.

MINI STUDIO

The Lamb Laboratories mini studio consists of all the essentials to create top quality, professional stereo recordings. The complete outfit, which condenses down into three portable cases, contains the widely acclaimed Lamb/ Revox high speed, two track tape recorder with built in monitor amplifiers, speakers, sel-sync, variable pitch control and separate remote control all designed to give studio performance with ease of operation. The mini studio, in addition, includes the Lamb Laboratories PML 420 four channel, two group mixer which incorporates separate input sensitivity, separate low, medium and high equalization, pan pots, echo send and return and limiters; features usually only found in a multi-thousand dollar studio console. Four Beyer microphones are also included to meet all recording needs. To complete the package are all the necessary jacked cable runs, plus a pair of Beyer DT100 studio monitor headphones, four collapsible microphone stands, two boom arms and absolutely everything else needed to handle any kind of recording session.

PML 420 MIXER



The PML 420 is a four input, two output mixing unit designed to operate in conjunction with transportable stereo tape recorders such as the Revox A77. All input and output levels are controlled through slide faders, the output pair being positioned for independent or simultaneous operation.

The PML 420 contains all the essentials of a modern studio control desk. Each input channel incorporates input sensitivity preselection, separate low, mid and high frequency equalizers, panoramic potentiometers and echo send controls. Limiters may be switched into each output group and adjusted to the desired threshold and release time, either for special effects or to prevent overmodulation.

Other features include separate left and right echo return controls and illuminated VU meters registering the output level from each group. The PML 420 is designed for maximum ergonomic efficiency. The matt black fader panel will accept chinagraph labelling and may be used for extended durations without fatiguing hands or vision.

The unit accepts signals from low or high impedance microphones and from tuner or auxiliary tape sources at studio line level. Lamb Laboratories are able to advise customers regarding suitable microphones for particular applications.

SPECIFICATIONS:

Case Size: 16½ x 14½ x 8½

Channels: Four, each incorporating mic sensitivity, high, medium and low frequency equalization, echo send, pan pot and channel fader controls; inputs on Cannon XLR 3 plugs.

Groups: Two, each with echo return, group fader, limiter in/out adjustable threshold and release. Outputs via standard jack sockets.

Monitoring: Two VU meters.

Faders: Six calibrated linear faders fitted as standard.

Performance: INPUTS; Unbalanced, switchable to line or variable from 50 K ohm to 1 K ohm: 500 microvolt to 1.2 volts sensitivity. OUTPUTS; +10 dB into 600 ohm. GAIN; 70 dB. REFERRED INPUT NOISE; 120 dBm (200 ohm source). DISTORTION; Less than 0.1% at normal levels. LIMITER RATIO; Approximately 12 to 1. LIMITER RISE TIME; 1 millisecond. LIMITER RELEASE TIME; Adjustable from 0.25 to 3 seconds. EQUALIZER; High:12 dB lift and cut at 10 kHz. Medium: 12 dB lift at 3.5 kHz. Low:12 dB lift and cut at 60 Hz.

Power Requirements: EXTERNAL SUPPLY; 200mA at 24V, ripple less than 0.5mV. Available from LPS10 Power Supply.

Accessories: LPS10 Power Supply will provide 24V at less than 0.5mV ripple from 110V 60Hz supply.

Finish: External case natural teak or matt black. Panel work in etched anodized aluminum, silver and black.

Uses: Designed for location stereophonic recordings in conjunction with Revox A77 or similar type machine; can be used for reduction, over-dubbing with the use of the limiters, or 2 channel mono recording.

SEL-SYNC (MODIFICATION FOR REVOX A77)

The Sel-Sync modification enables track one of a previously recorded tape to be heard through the top section of the record head, thereby permitting a synchronized recording to be made on the lower section (track two). This system permits two consecutive tracks to be recorded, in full synchronization, without the extra noise inherent in track-to-track (second generation) recording.

VARIABLE PITCH (MODIFICATION FOR REVOX A77)

The Variable Pitch modification is a continuous rotary control which enables any speed to be selected and held within a range of -10% to +15% of the chosen speed. Also permits a continuous slow sweep of speed within the same parameters. Uses include: correction to speed of tapes previously recorded off-speed, demonstration of the effects of pitch-change in music studies, controlled sweeping pitch-changes in electronic music, composing, etc. Removal of plug-in variable pitch control box restores the Revox A77 to normal operation.

LAMB LABORATORIES 155 Michael Drive, Syosset, New York 11791 – Telephone (516) 364-1900

LAMB LABORATORIES

PROFESSIONAL NET PRICE LIST

SPECIAL ORDER UNITS

Modifications available for Revox A77 and A77 Dolby B tape recorders. Please use Revox Form RV51B price list. Choose desired unit and add to price...

SEL-SYNC	$125.00
SEL-SYNC FOR DOLBY B	150.00
VARIABLE PITCH	75.00

The **Sel-Sync** modification enables track one of a previously recorded tape to be heard through the top section of the record head, thereby permitting a synchronized recording to be made on the lower section (track two). This system permits two consecutive tracks to be recorded, in full synchronization, without the extra noise inherent in track-to-track (second generation) recording.

The **Variable Pitch** modification is a continuous rotary control which enables any speed to be selected and held within a range of -10% to +15% of the chosen speed. Also permits a continuous slow sweep of speed within the same parameters. Uses include: correction to speed of tapes previously recorded off-speed, demonstration of the effects of pitch-change in music studies, controlled sweeping pitch-changes in electronic music, composing, etc. Removal of plug-in variable pitch control box restores the Revox A77 to normal operation.

PML-420 MIXER	$ 549.00
LPS-10 MIXER POWER SUPPLY	49.00
LDB-220 TWO PROCESSOR DOLBY B NOISE REDUCTION UNIT	169.00
LDB-240 FOUR PROCESSOR DOLBY B NOISE REDUCTION UNIT	235.00
MINI STUDIO	2610.00

April 10, 1973

Prices are subject to change without notice, especially on imported items where duties and currencies may fluctuate due to conditions beyond our control.

Our prices of all goods offered are those prevalent at time of delivery.

This listing supercedes all previous prices.

155 Michael Drive, Syosset, New York 11791 (516) 364-1900
3637 Cahuenga Blvd. West, Hollywood, California 90068 (213) 876-1200

HERE IT IS! The new salary schedule for graded employees was effective Oct. 13. The paychecks on the Nov. 1 payday will reflect the increase. Hourly rates for each step are shown in parentheses.

GENERAL SCHEDULE PROVIDING COMPARABILITY WITH 1974 PRIVATE ENTERPRISE PAY

	1	2	3	4	5	6	7	8	9	10
GS 1	$5,294(255)	$5,470(263)	$5,646(271)	$5,822(280)	$5,998(288)	$6,174(297)	$6,350(305)	$6,526(314)	$6,702(322)	$6,878(331)
2	5,996(288)	6,196(298)	6,396(308)	6,596(317)	6,796(327)	6,996(336)	7,196(346)	7,396(356)	7,596(365)	7,796(375)
3	6,764(325)	6,989(336)	7,214(347)	7,439(358)	7,664(368)	7,889(379)	8,114(390)	8,339(401)	8,564(412)	8,789(423)
4	7,596(365)	7,849(377)	8,102(390)	8,355(402)	8,608(414)	8,861(426)	9,114(438)	9,367(450)	9,620(463)	9,873(475)
5	8,500(409)	8,783(422)	9,066(436)	9,349(449)	9,632(463)	9,915(477)	10,198(490)	10,481(504)	10,764(518)	11,047(531)
6	9,473(455)	9,789(471)	10,105(486)	10,421(501)	10,737(516)	11,053(531)	11,369(547)	11,685(562)	12,001(577)	12,317(592)
7	10,520(506)	10,871(523)	11,222(540)	11,573(556)	11,924(573)	12,275(590)	12,626(607)	12,977(624)	13,328(641)	13,679(658)
8	11,640(560)	12,028(578)	12,416(597)	12,804(616)	13,192(634)	13,580(653)	13,968(672)	14,356(690)	14,744(709)	15,132(728)
9	12,841(617)	13,269(638)	13,697(659)	14,125(679)	14,553(700)	14,981(720)	15,409(741)	15,837(761)	16,265(782)	16,693(803)
10	14,117(679)	14,588(701)	15,059(724)	15,530(747)	16,001(769)	16,472(792)	16,943(815)	17,414(837)	17,885(860)	18,356(883)
11	15,481(744)	15,997(769)	16,513(794)	17,029(819)	17,545(844)	18,061(868)	18,577(893)	19,093(918)	19,609(943)	20,125(968)
12	18,463(888)	19,078(917)	19,693(947)	20,308(976)	20,923(1006)	21,538(1035)	22,153(1065)	22,768(1096)	23,383(1124)	23,998(1154)
13	21,816(1049)	22,543(1084)	23,270(1119)	23,997(1154)	24,724(1189)	25,451(1224)	26,178(1259)	26,905(1294)	27,632(1328)	28,359(1363)
14	25,581(1230)	26,434(1271)	27,287(1312)	28,140(1353)	28,993(1394)	29,846(1435)	30,699(1476)	31,552(1517)	32,405(1558)	33,258(1599)
15	29,818(1434)	30,812(1481)	31,806(1529)	32,800(1577)	33,794(1625)	34,788(1673)	35,782(1720)	36,776*1768)	37,770*1816)	38,764*1864)
16	34,607(1664)	35,761(1719)	36,915*1775)	38,069*1830)	39,223*1886)	40,377*1941)	41,531*1997)	42,685*2052)	43,839*2108)	
17	40,062*1926)	41,397*1990)	42,732*2054)	44,067*2119)	45,402* 2183)					
18	46,336*2228)									

**The rate of basic pay for employees at these rates is limited by section 5308 of title 5 of the United States Code to the rate for level V of the Executive Schedule (currently $36,000).*

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
3041-RJM:sh
12340/2
11 Jun 1975

MEMORANDUM

From: 3041 (R. J. Marks)
To: 3041 (G. Allen)

Subj: Trip Report for the period of 2 Jun 1975 to 6 Jun 1975

Encl: (1) Verdin location and installation schedule

1. Activities Visited and persons contacted:

a. Naval Electronics Laboratory Center (NELC), San Diego, CA

b.

Roger Dishong	Project Engineer
Herb Greenstein	Reliability Engineer
George Pillion	Reliability Engineer
Al Villerreal	Installations
G. Hudnall	Verdin Shore Installation
J. Richter	Program Manager

2. Purpose of visit:

a. Review documents on the Verdin system for familiarization with operation and determination of past system effectiveness measures.

b. Determine location of Verdin equipment in the fleet including installation schedules.

c. Determine the extent of involvement of NELC in the Verdin effort and NELC's overall temperment in possible future consultation and support.

3. Discussion:

a. Verdin related documents which were reviewed during the NELC visit along with relevant content are:

(1) Preliminary Operational Instructions for Receiving Set Digital Data (U) AN/WRR7, NAVELEX 0976-462-3031.

(2) Special Operational Instructions for Transmitting Set AN/ART50, NAVELEX 0967-462-5010, NAVAIR 16-30 ART 50-2.

(3) NELC Contract Specification VLF/LF Radio Receiving Set Digital Data (U) ELEX R119B (24 Sep 1973) AN/WRR-7.

(a) Specified MTBF: θ_0 = 1000 hrs.

(b) Reliability via MIL-STD-785.

(c) Reliability prediction required via MIL-HNBK-217 at 65° at Class IV environment.

(d) Maintainability program required via MIL-STD-470.

(e) Maintainability prediction required via MIL-HNBK-472.

(f) Reliability qualification: test plan V, level A of MIL-STD-781

(g) Maintainability demonstration required: method III of MIL-STD-471.

(h) Operating life = 10 years.

(i) Operational stability: must operate continuously for a period of 24 hours without adjustment.

(4) Naval Air Systems Command: Specification for Radio Group AN/ARA-(#)(U) AS-1238B (AV) (24 Sep 1973).

(a) ". . . (a) VLF/LF digital data communication system consisting of the transmitting set, digital data AN/ART-50 and a radio receiving set AN/ARR# . . . " for aircraft.

(b) Operating life = 50,000 hours.

(c) Specified MTBF including BIT electronics = 750 hours.

(d) BIT via AR 10.

(e) All equipment screening required via test plan II (reject line) test level E (cycle limits of -10° to 50°C) of MIL-STD-781.

(f) Operational stability: must operate continuously for 1500 hours without adjustment.

(5) NELC: Contract Specification Fixed Plant Digital Data Transmitting Set AN/URT 30 (U) ELEX-T84B (24 Sep 1973).

(a) Maintainability program from MIL-STD-470.

(b) Maintainability prediction from procedure II of MIL-HDBK 472.

(c) Total operating life = 10 years.

(d) Operational stability: Must operate 24 hours continuously without adjustment.

(e) Specified MTBF: θ_0 = 1000 hours.

(f) Reliability prediction required via MIL-HDBK 217.

(g) Reliability Qualification via test level A, test plan V of MIL-STD-781.

(h) Reliability Sampling via test level A, test plan V of MIL-STD-781.

(i) Operational stability: Must operate continuously for 24 hours without control adjustment.

(6) Collins Radio Group: Verdin Field Failure (1 May 1975)

(a) This report, issued first in April 1975 and generated monthly, lists all Verdin equipment returned to Collins for repair.

(b) Also listed are failure trends and suggested corrective action.

(7) Collins Radio Group: Verdin first article tests and documents

(a) Introduction and Summary

(b) Environmental Test Report AN/WRR-7 Vols I and II.

(c) Environmental Test Report AN/ART-50 Vols I and II

(d) Performance Test Report AN/VRC-62 Vols I, II, III, and IV.

(e) Tempest Test Report AN/WRR-7

(f) Tempest Test Report AN/ART-50

All first article testing has been completed successfully.

(8) NELC: Shore Installation Planning Guide

(a) This document contains the best overview of Verdin vet

b. The Verdin system consists of a shore transmitter, an aircraft relay, and a ship receiver. For the most part, Verdin has been installed on all the SSBN (ballistic) submarines. Installation on shore and in Tacamo aircraft is scheduled for initiation in June of this year. A more detailed schedule is included in enclosure (1).

c. The reception of this activity by NELC by those involved directly with Verdin was for the most part formal. The reliability group at NELC, which was initially assigned TSA responsibility in the FRAP effort prior to travel restrictions, was most helpful to this activity during visitation. Ideas and thoughts concerning implementation of FRAP were shared freely and are discussed in section 4.

(1) NELC is extensively involved in the Verdin effort including participation in the following:

(a) Awarding and performance surveillance on the Trident radio room contract. At the time of visit the awarding of the contract to either ITT or RCA (to which the Collins Radio Group is subcontracted) was being determined.

(b) Verdin shore installation.

(c) Logistic support

(d) Design and production of Verdin software (Collins was unable to successfully fulfill this contractual area).

(e) Verdin first article test surveillance.

(f) NELC was also extensively involved in the early development of Verdin.

(2) NELC was initially assigned TSA responsibilities in the FRAP effort. Lack of travel however, prohibited their participation. This activity was informed that travel was again allowed at NELC almost immediately after cancellation of their TSA status, is still allowed, and is not expected to be restricted in the future.

4. Recommendations:

a. During the visitation, FRAP philosophy and ideas were discussed by Herb Greenstein and this activity. Mr. Greenstein has been involved in the area of reliability since its birth over twenty years ago and seems to mix well the statistical and physics aspects of reliability in his

engineering philosophy. He said he would have been involved extensively in the FRAP effort had NELC retained its TSA status.

b. Upon being told that FRAP might be collecting its own data from the fleet, Mr. Greenstein replied that this would largely be a duplication of effort with some of the many already existing governmental data collection effort. When told that the MDCS system had been determined inadequate as is for FRAP, he stated that most people, being only exposed to the MDCS data itself, did not appreciate the total capability of the MDCS data when coupled with the other available information. He suggested contacting Mr. J. Bell at Naval Ship Engineering Center at Norfolk for further information concerning MDCS capabilities.

c. Mr. Greenstein also offered other advice on execution of FRAP. Do not be overly concerned with exact data such as operating time per month or down times. Estimates suffice. Look, rather, for failure trends and other problems. The purpose of FRAP, he stated, is finding new system problems in the fleet in a timely manner, determining the physics of the failure or problem mode, and recommending timely corrective action. The purpose is not to measure exact MTBF's and generate lengthy reports.

R. J. MARKS II

COMMSTA/BCA VERDIN INSTALLATIONS

VERDIN SHORE SITES	FISCAL YEAR 76											EQUIPMENT			
	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	WRR-7	SBP	SPLIT	SSIXS
COMMSTA															
① CUTLER ○	◇	▬	▬	▬	▬	▬	▬					2	2	NO	
② ANNAPOLIS ○				◇	▬	▬	▬					2	2	NO	
③ HOLT ○								◇	▬	▬	▬	2	2	YES	
④ LUALUALEI ○				◇	▬	▬						2 HON	2 HON	YES	
⑤ JIM CREEK △						◇	▬	▬	▬			2 SFR	2 SFR	YES	
⑥ THURSO △							◇	▬	▬	▬		2	2	NO	
⑦ YOKOSUKA							◇		▬	▬	▬	2	0	YES	
⑦ YOSAMI △							◇		▬	▬	▬	0	0		
⑧ GREECE △							◇		▬	▬	▬	2 ITL	0	NO	
BCA															
COMSUBPAC				◇	▬	▬	▬	▬		▬	▬	(1)			✓
COMSUBLANT	◇	▬	▬	▬	▬	▬	▬			▬		(1)			✓
COMSUBGRU 7						◇			▬	▬	▬	0			✓
COMSUBGRU 8	◇		▬	▬	▬	▬	▬				▬	0			✓

NTC YES

LEGEND

◇ BROADCAST EQUIP AVAILABILITY
△ 2 CHANNEL
○ 4 CHANNEL
▬ INSTL PERIOD
▬ SYSTEM CHECKOUT

25 APRIL 1975

NOTE

COMSUBLANT, COMSUBPAC AND USCOMEASTLANT EACH GET 1 WRR-7 AND 1 FTS IN FFB 76 FOR NON VERDIN BROADCAST

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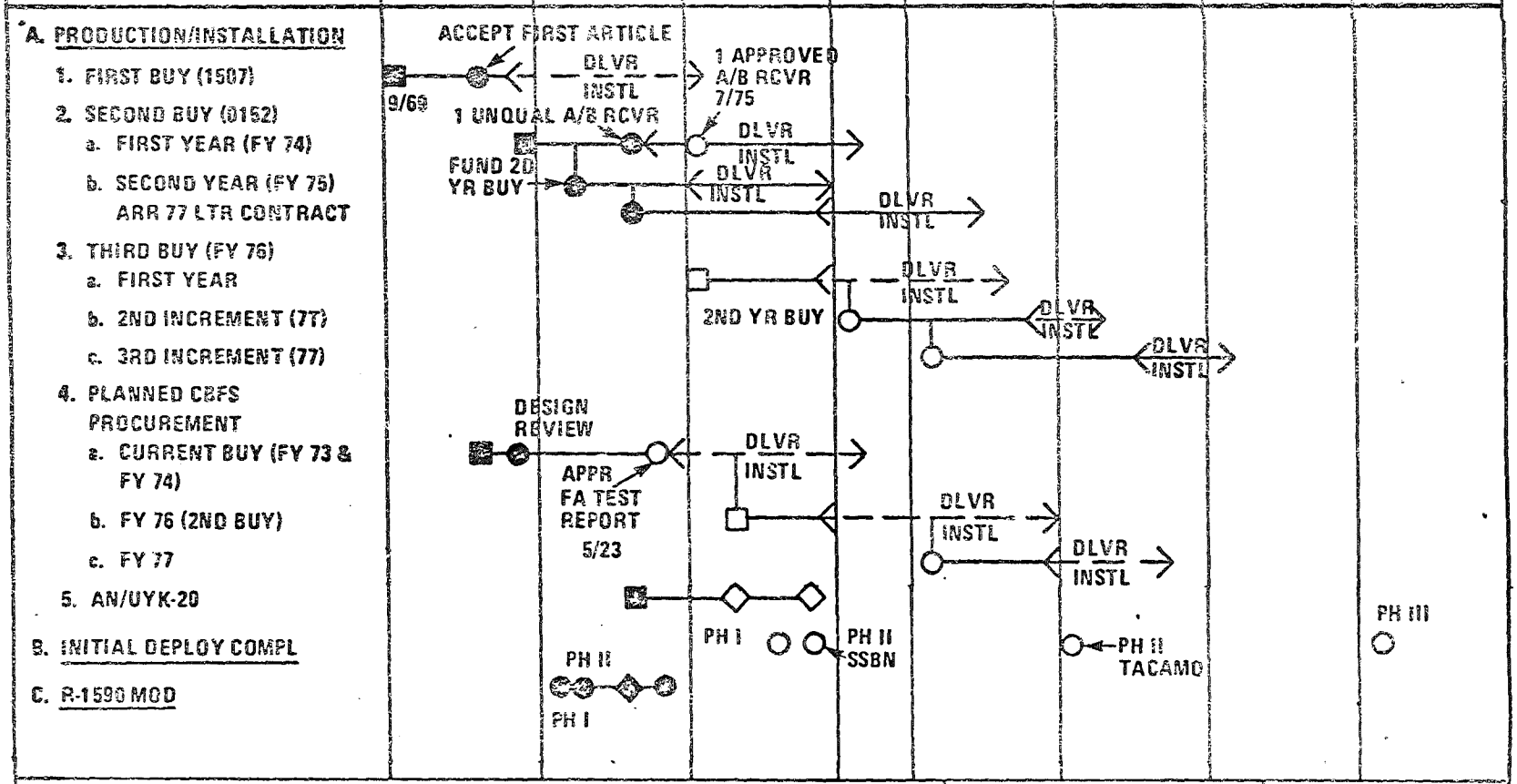
PROJECT: VERDIN

FUNDING (MILLIONS)	FY 74-PRIOR	FY 75	FY 76	TT	FY 77	FY 78	FY 79	FY 80
OPN-2 (RDT&E)	25.027 (15.642)	8.200	8.900	1.600	12.1/12.0	1.3/6.9	.9/6.3	0.0/4.9
O&MN	2.460	1.934	2.600	.608	3.0/ 3.9	3.6/ 3.6	2.8/3.6	2.4/3.5
SCN	5.157	.437	.266	–	–/ .80	–/ 1.1	–/ .68	–/ .47



STATUS
1. FUNDS
2. SCHEDULE
3. TECHNICAL
4. SUPPORT

KG 38 28V DC POWER SUPPLY; PROVISIONING/SYSTEMS STOCK
KG 38s; SHIP/SHORE INSTL; 3RD BUY.
FTS RELIABILITY
SUPPLY SUPPORT

FUNDING
FY 74 PRIOR – PROC SUM
FY 75/76 – SPENDING PLAN
FY 7T – FYDP
FY 77 → FYDP/POM 77

SYMBOLS
CONTRACT
DLVRY/INSTALL
CRITICAL EVENT

DATE OF REPORT: 25 APRIL 1975

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF: LF/MF COMMUNICATIONS

REV No.:

TYPE OF ALTERATION: [ ] TECH [X] MIL

EIC NO.: 0 3 0 7 0 0 0

CIP - OPNAV INST 4720.xx: 2 6 D

SIG. NO.:

CAT FUNCT:

CIP DATE: 6 F E B 7 1

SHIP ALTERATION
TYPE: CVA / CVAN / CVS
CLASS:
NUMBER: 4355 / 4356 / 4357 / 4358 / 4361 / 4362 / 801 / 802 / 803

PRIORITY: [ ] SHIP SAFETY [ ] PERSONNEL SAFETY [X] MISSION RELIABILITY [ ] MAINTENANCE

ASSOCIATED WITH: [ ] ORDALT [ ] MIPALT [ ] FIELD CHANGE

SCOPE DWG #:

BY:

DATE:

APPROVAL
SIGNATURE: L R Jones
TITLE: Mgr, Aircraft Carrier Ship Ice Di...
DATE (Mo., Da., Yr.): 10/16/72

PURPOSE

Provide flexibility and increased capability needed for communication on the VLF/LF bands.

References:
See Page 3

APPLICABLE SHIPS		TITLE CATEGORY
HANCOCK CVA	19	K 2265
ORISKANY	34	K 1394
MIDWAY	41	K 1173
F D ROOSEVELT	42	K 1296
CORAL SEA	43	K 1269
FORRESTAL	59	K 944
SARATOGA	60	K 659
RANGER	61	K 925
INDEPENDENCE	62	K 721
KITTY HAWK	63	K 612
CONSTELLATION	64	K 583
AMERICA	66	K 347
J F KENNEDY	67	K 489
ENTERPRISE CVAN	65	K 518
INTREPID CVS	11	K 1425
TICONDEROGA	14	K 1475

DESCRIPTION PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and equipment involved. Refer to supporting documents as necessary.)

THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH THE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D. C. 20360.

1. This alteration has been developed to define the LF/MF portion of the radio communications system installation required to support assigned missions of the CVA/CVS ship types. Other closely associated radio communications systems functional capabilities are defined in the following Ship Alterations:

SINGLE SIDEBAND COMMUNICATIONS - CVA-4355/CVS-801/CVAN-4356
UHF COMMUNICATIONS-CVA-4357/CVS-802/CVAN-4358
VHF COMMUNICATIONS - CVA-4361/CVS-804/CVAN-4362

THIS ALTERATION HAS BEEN ENTERED IN THE CSMP-DO NOT RESUBMIT

SHIP ALTERATION RECORD NAVSHIPS 4720/4 (REV. 1-69) (Formerly NAVSHIPS 99)

UNCLASSIFIED

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF

INSTALL VLF/LF/MF RECEIVE CAPABILITY

SHIP ALTERATION

TYPE	CLASS	NUMBER
CLG		380

TYPE OF ALTERATION: [ ] TECH [X] MIL

SIG. NO.	CAT./FUNCT	CIP - OPNAV INST 4720.xx	CIP DATE	EIC NO.
0132a	13000	077	9JAN69	FF00000

PRIORITY: [ ] SHIP SAFETY [ ] PERSONNEL SAFETY [ ] MISSION RELIABILITY [ ] MAINTENANCE

ASSOCIATED WITH: [ ] ORDALT [X] MIPALT [ ] FIELD CHANGE

APPROVAL

SIGNATURE Gustav F. Swanson
GUSTAV F. SWANSON

SCOPE DWG #	BY	DATE	TITLE	DATE (MO, D
N/A	N/A	N/A	CAPT USN AAW SHIPS MAINT MGR	8/7/6

PURPOSE Provide VLF/LF/MF Radio Reciver Capability

APPLICABLE SHIPS		TITLE CATEGO
GALVESTON	CLG 3	K
LITTLE ROCK	4	
OKLAHOMA CITY	5	
PROVIDENCE	6	
SPRINGFIELD	7	
TOPEKA	8	

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

Install in appropriate spaces the equipment listed in Section II Paragraph I to achieve Radio Receiving capabilities in the VLF/LF/MF frequencies. Install additional air conditioning and ventilation as necessary.

UNCLASSIFIED

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF: INSTALL AN/WRR-7 (VERDIN) RECEIVE SYS

REV NO.:

SHIP ALTERATION — TYPE: SSN | CLASS: 594 | NUMBER: 1491

TYPE OF ALTERATION: [ ] TECH [X] MIL

SIG. NO.	CAT./FUNCT	CIP - OPNAV INST 4720.xx	CIP DATE	EIC NO.
3860Q	1300	33E	180769	QB1L000

PRIORITY: [ ] SHIP SAFETY [ ] PERSONNEL SAFETY [X] MISSION RELIABILITY [ ] MAINTENANCE

ASSOCIATED WITH: [ ] ORDALT [ ] MIPALT [ ] FIELD CHANGE

APPROVAL

SIGNATURE: /s/ P. R. Sacilotto

SCOPE DWG #	BY	DATE	TITLE	DATE (Mo, Da, Yr)
0441-065-015	NAVSHIPYD CHASN	11-5-72	DEP. LOG. MGR. SHIPS 425	7-19-72

PURPOSE

To install an on-line multichannel VLF/LF communications system (Type "Q").

This alteration developed from Provisional Alteration A1491

This alteration should be accomplished concurrently with SHIPALT SSN-1363, or subsequent there-to.

APPLICABLE SHIPS	TITLE CATEGORY
SSN 594	K
SSN 595	K
SSN 596	K
SSN 603	K
SSN 604	K
SSN 605	K
SSN 606	K
SSN 607	K
SSN 612	K
SSN 613	K
SSN 614	K
SSN 615	K
SSN 621	K

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DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

EACH TRANSMITTAL OF THIS DOCUMENT OUTSIDE THE AGENCIES OF THE U.S. GOVERNMENT MUST HAVE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D.C. 20360

1. The following items are to be installed in the Radio Room under this ShipAlt:

a. R-1738/URR Receiver (replaces AN/BRR-3 receiver)

b. O-1612/URC Frequency and Time Standard (replaces AN/URQ-9 or AN/URQ-10)

CONT'D ON PAGE 1 A

THIS ALTERATION HAS BEEN ENTERED IN THE CSMP---DO NOT RESUBMIT CODE C

K-5

UNCLASSIFIED

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF: INSTALL VERDIN (AN/WRR-7) RCVR SYS

REV NO.:

SHIP ALTERATION — TYPE: SSN | CLASS: | NUMBER: 1546

TYPE OF ALTERATION: ☐ TECH ☒ MIL

SIG. NO.	CAT./FUNCT	CIP - OPNAV INST 4720.xx	CIP DATE	EIC NO.
386Q		33E	180769	QB1L000

PRIORITY: ☐ SHIP SAFETY ☐ PERSONNEL SAFETY ☒ MISSION RELIABILITY ☐ MAINTENANCE

ASSOCIATED WITH: ☐ ORDALT ☐ MIPALT ☐ FIELD CHANGE

APPROVAL — SIGNATURE

SCOPE DWG #	BY	DATE	TITLE	DATE (Mo, Da,
See Ref 16	CHASN N.S.Y.	1/13/72	DEP LOG. MGR. SHIPS 425	10/13/72

PURPOSE

To install Verdin Receiver System (AN/WRR-7)

This ShipAlt developed from Provisional ShipAlt A1491.

APPLICABLE SHIPS	TITLE CATEGOR
SSN 571	K
SSN 575	K
SSN 578	K
SSN 579	K
SSN 583	K
SSN 584	K
SSN 585	K
SSN 587	K
SSN 588	K
SSN 590	K
SSN 591	K
SSN 592	K
SSN 597	K

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

EACH TRANSMITTAL OF THIS DOCUMENT OUTSIDE THE AGENCIES OF THE U.S. GOVERNMENT MUST HAVE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D.C, 20360

1. The VERDIN (AN/WRR-7) Receiver System is to be installed in the Radio Room on applicable submarines. VERDIN equipment consists of one R-1738/URR VLF/LF Receiver; one O-1612/URC Frequency and Time Standard; one CP-1071/WR Processor and one MD-855/WRR-7 Demodulator-Power Supply in a CY-7113/WR Enclosure; two TSEC/KG-38 Key Generators; one 310275 Teletypewriter Power Supply; and one RA-8 Relay Panel with four R-91 Relays. (CONT'D ON PAGE 1A)

THIS ALTERATION HAS BEEN ENTERED IN THE CSMP---DO NOT RESUBMIT CODE C

UNCLASSIFIED

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF: INSTL VERDIN (AN/WRR-7) REC SYS

REV NO.:

SHIP ALTERATION — TYPE: SSN | CLASS: 637 671 | NUMBER: 1547

TYPE OF ALTERATION: [ ] TECH [X] M/L

CIP - OPNAV INST 4720.XX: 33E

SIG. NO.: 386Q

CAT./FUNCT: 1300

CIP DATE: 180769

EIC NO.: QB1L000

PRIORITY: [ ] SHIP SAFETY [ ] PERSONNEL SAFETY [X] MISSION RELIABILITY [ ] MAINTENANCE

ASSOCIATED WITH: [ ] ORDALT [ ] MIPALT [ ] FIELD CHANGE

APPROVAL

SIGNATURE: /s/ P. R. SACILOTTO

SCOPE DWG #	BY	DATE	TITLE	DATE (Mo, Da, Yr)
	NSY CHASN	4/17/72	DEP. LOG. MGR. SHIPS 425	10/12/72

PURPOSE

To install VERDIN System (AN/WRR-7)

This alteration developed from Provisonal Alteration A1491.

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

EACH TRANSMITTAL OF THIS DOCUMENT OUTSIDE THE AGENCIES OF THE U.S. GOVERNMENT MUST HAVE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D.C. 20360

(1) Install one VERDIN Receive System (AN/WRR-7) in the radio room as outlined below.

SSN637 Class Short Hull (Refer to Ref 13)
(SSN 637-639), SSN 646-653, SSN660-670, SSN672-677)

A. Install (1 each) O-1612 frequency and time standard and (1 each) CY 7113 Cabinet (containing the

CONT'D ON PAGE 1A)

THIS ALTERATION HAS BEEN EXTENDED IN THE CSMP---DO NOT RESUBMIT CODE C

K-15

APPLICABLE SHIPS	TITLE CATEGORY
SSN 637	K
SSN 638	K
SSN 639	K
SSN 646	K
SSN 647	K
SSN 648	K
SSN 649	K
SSN 650	K
SSN 651	K
SSN 652	K
SSN 653	K
SSN 660	K
SSN 661	K
SSN 662	K
SSN 663	K
SSN 664	K
SSN 665	K
SSN 666	K
SSN 667	K
SSN 668	K
SSN 669	K
SSN 670	K
SSN 671	K
SSN 672	K
SSN 673	K
SSN 674	K
SSN 675	K
SSN 676	K
SSN 677	K

SHORE STATIONS

VERDIN SCHEDULE
AN/URT-30

3 GFE		Oct 1974 Nov 1974 Dec 1974
1 NORVA (Training)		Jan 1975
1 Spare		Jan 1975
1 Spare/Support		Feb 1975
2 Cutler	Key/XMT	Del Jul 1975 Inst Sep 1975
2 Holt	Key/XMT	Del Oct 1975 Inst Nov 1975
2 Lualualei	Key/XMT	Del Nov 1975 Inst Dec 1975
2 Annapolis	Key/XMT	Del Nov 1975 Inst Dec 1975
2 Jim Creek	Key/XMT	Del Dec 1975 Inst Jan 1976
2 Thurso	Key/XMT	Del Jan 1976 Inst Feb 1976
2 Greece	Key/XMT	Del Feb 1976 Inst Mar 1976
2 Yosami	XMT	Del Feb 1976 Inst Mar 1976
2 Yokosuka	Key	Del Feb 1976 Inst Mar 1976
4 COMSUBLANT) WRR-7		Inst Feb 1976
3 COMSUBPAC)		Inst Feb 1976
2 USCOMEASTLANT		Inst Jun 1976
2 COMSUBGRU 7		Inst Jul 1976
2 COMSUBGRU 8		Inst Aug 1976

Pgs 9, 10, 11, 12 of THIS ENCLOSURE NOT INCLUDED IN THIS EDITION

Bob Marks
7/1/75

TELEPHONE CONVERSATION RECORD
9ND-GEN-2100/1 (2-61)
1L-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 7/2/75

AUTHORIZATION NO.

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR (Name) (Title) (Location)
NWSC, CRANE IND.

PERSON CALLED (Name) (Title) (Location)
DAVE ELY, R ENGINEER, COLLINS RADIO, CA.

SUBJECT
VERDIN RELIABILITY

GIST OF CONVERSATION

MR. ELY WAS CONTACTED TO FURTHER SHED LIGHT ON QUESTIONS 2 AND 3 OF THE MARKS/SHAPLEIGH PHONE CON OF 7/1/75. IN RESPONSE TO QUESTION 2, MR. ELY CONCURRED WITH THE SPEC, THAT IS, THE FREQUENCY STANDARD IS NOT ARR-77 RECEIVER EQUIPMENT. AND IS THUS NOT EMPLOYED IN COMPUTING THE ARR-77 RELIABILITY. FREQUENCY STANDARDS ARE DESIGNATED AS PART OF THE URT-30, WRR-7, AND ART-50. (THE ARR-77 NECESSITATES THE USE OF A FREQUENCY STANDARD, HOWEVER, BUT EMPLOYS THE ART-50's STANDARD).

CONCERNING QUESTION 3 OF THE REFERENCED PHONE CON, THE ART-50 MODULATOR WRA, IS IN FACT CONSIDERED URT-30 EQUIPMENT WHEN USED ON THE SHORE AND IS IDENTICAL TO THAT USED IN THE AIRCRAFT. THUS, MTBF

SIGNATURE

Pg 1 CONT →

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TELEPHONE CONVERSATION RECORD
9ND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 7/2/75

AUTHORIZED BY

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR Manley (Title) (Location)

PERSON CALLED (Name) (Title) (Location)
ELY

SUBJECT

GIST OF CONVERSATION

COMPUTATIONS CONCERNING THE URT-30 NEED INCLUDE THE MTBF OF THE ART-50 (AND THE CORRESPONDING MODULATOR SHELF ETC)

TO MR. ELY'S KNOWLEDGE, NO RELIABILITY REQUIREMENTS WERE EVER SPECIFIED FOR VERDIN SUBSYSTEMS AT THE WRA LEVEL. A RELIABILITY PREDICTION, HOWEVER, WAS GENERATED QUITE SOME TIME BACK BY COLLINS VIA MIL-HDBK-217A. AN AMBIENT TEMP OF 50°C WAS USED WITH A 15°C INTERNAL RISE (GIVING TOTAL OF 65°C). SOME DEVIATION FROM 217A WAS NECESSITATED. FOR EXAMPLE, COLLINS USES ~~NON~~ SOME NON-STANDARD CONNECTORS IN VERDIN WHIC HAVE BEEN NAVY APPROVED. MIL-C-26482 WAS ALSO USED. THE FOLLOWING PREDICTIONS WERE ARRIVED AT

SIGNATURE

Pg 2 CONT →

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
SND-GEN-2100/1 (2-61)
1L-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 7/2/75

AUTHORI[illegible] Marks

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIG[illegible]OR [illegible] (Title) (Location)

PERSON CALLED (Name) (Title) (Location)

ELY

SUBJECT

GIST OF CONVERSATION

SUBSYSTEM	DESCRIPTION	MTBF PREDICTED <- HRS ->	MTBF SPECIFIED
ARR-77	AIRBORNE RECEIVER	216	750
WRR-7	SHIPBOARD RECEIVER	345	1000
ART-50	AIRBORNE TRANSMITTER	164	750
URT-30	SHORE TRANSMITTER	514	1000
URC-62 VERDIN SYSTEM		64.2	214.3

THE FOLLOWING ARE PREDICTED FAILURE RATES (EXPRESSED IN PER CENT / 1000 HRS) FROM WHICH THE ABOVE TABLE WAS DETERMINED.

EQUIPMENT	AIRBORNE	SHIP	SHORE
RECEIVER		34.95	
DEMODULATOR	107.08		
PROCESSOR	262.97	126.53	96.51
*MTU	19.85	14.39	2.71
CONTROL UNIT			22.30
MODULATOR	104.76		
FREQ. STANDARD	91.20	36.44	27.31
MODULATOR SHELF	2.55		0.76**
PROCESSOR/ CONTROL UNIT/ POWER SUPPLY ENCLOSURE			9.25

**DOES NOT INCLUDE CAPACITOR, FAN, ETC.
*MAGNETIC TAPE UNIT

SIGNATURE

Pg 3 CONT →

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

Pg 4

TELEPHONE CONVERSATION RECORD
DND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 7/2/75

AUTHORIZA[illegible] Marks

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINA[illegible] (Name) (Title) (Location)

PERSON CALLED (Name) (Title) (Location)
ELY

SUBJECT

GIST OF CONVERSATION

EQUIPMENT	AIRBORNE	SHIP	SHORE
PROCESSOR/DEMODULATOR POWER SUPPLY SHELF		→ 9.49	
DEMODULATOR DRAWER		48.56	
DEMODULATOR/PWR. SUPPLY DRAWER*		→ 81.82	
MODULATOR/PWR. SUPPLY DRAWER (ATR)	→ 104.76		
PWR. SUPPLY (ATR)	24.48		48.71
~~MODULATOR — St~~			
CONTROL UNIT ATR	60.67		
PROC/PWR SUPPLY/ CONTROL EQUIP. SHELF	43.65		

DIODES AND TRANSISTORS SCREENED WITH 5/1 APPROVEMENT FACTOR (NAVY APPROVED)

* INCLUDES DEMODULATOR DRAWER FAILURE RATE

AIRBORNE I.C.'s 0.1% FAILURE / 1000 HRS

SHIP " 0.5% " "

SIGNATURE

Pg 4 CONT →

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
BND-GEN-2100/1 (2-61)
IL-0187-000-8000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

Pg 5

DATE 7/2/75

AUTHORIZATION

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR Marks (Name) (Title) (Location)

PERSON CALLED ELY (Name) (Title) (Location)

SUBJECT

GIST OF CONVERSATION

DUE TO THE NATURE OF THE METHOD IN WHICH THE SUBSYSTEM FAILURE RATES WERE OBTAINED (ie OVER THE PHONE), THEY SHOULD NOT BE TAKEN FOR GOSPEL TRUTH. THEY ARE ALL CONTAINED IN COLLIN'S RELIABILITY PREDICTION REPORTS WHICH WILL SOON BE OBTAINED BY THIS ACTIVITY.

ON PRESENT VERDIN STATUS, MR ELY SAID ~~MANY~~ ALL MTU ON THE 0152 CONTRACT ARE NOW BEING SUBJECT TO AN APPROVED ECP. ~~THEY~~ (ONE FAILED A 1/100 SAMPLE HUMIDITY TEST). RETURNED MTU'S FROM THE 1507 CONTRACT ARE BEING CHECKED ALSO. THIS WILL BE DOCUMENTED IN THE MONTHLY FAILURE REPORT. ELY RECONFIRMED NWSC'S ADDITION TO THE MAILING LIST FOR THIS REPORT.

SIGNATURE Robert J. Marks II

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
BND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE: 7/1/75

AUTHORIZATION NO.

DURATION OF CALL — FROM TO

REFERENCE (Serial, Contract, etc.): ERAP

ORIGINATOR (Name) (Title) (Location): BOB MARKS NWSC, CRANE IND

PERSON CALLED (Name) (Title) (Location): LARRY SHAPLEIGH, ELEX-4702, WASH.

SUBJECT: VERDIN CHARACTERIZATION

GIST OF CONVERSATION

MR. SHAPLEIGH ((731)-202-OX2-7526) IS LISTED IN THE VERDIN ILSP AS THE RELIABILITY ENGINEER ILSMT MEMBER FOR VERDIN. AS SUCH, SOME OF THE PRESENT PROBLEMS IN CATEGORIZATION AND RELIABILITY ASSESSMENT CONCERNING THE VERDIN ERAP EFFORT WERE POSED. QUESTION ASKED ~~AND~~ AND CORRESPONDING RESPONSES ARE AS FOLLOWS:

QUESTIONS:

1. HOW AND WHEN WILL THE CESIUM FREQUENCY STANDARDS REPLACE THE RUBIDIUM STANDARD? ARE THE RELIABILITY REQUIREMENTS FOR BOTH CESIUM AND RUBIDIUM STANDARDS EQUIVALENT?
2. ACCORDING TO THE DICK KENT/R. SAVERESE PHONE CON OF 3/12/75, ~~THE ARR77~~ θ_o (ARR77) ≃ 1000 HRS AND θ_o (FREQUENCY STANDARD) = 2500 HRS COMBINING THESE GIVES θ_o (ARR-77, FR. STANDARD) = 750 HRS

SIGNATURE

CONT → Pg-1

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
DND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 7/1/75

AUTHORIZATION NO.

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR (Name) MARKS (Title) (Location)

PERSON CALLED (Name) (Title) (Location)
SHAPLEIGH

SUBJECT

GIST OF CONVERSATION

THIS IS DIRECT CONFLICT WITH THE ARR-77 SPEC (#AS-1238B, 24 SEPT 73), WHICH STATES THAT Θ_0 FOR THE ARR-77 ("... THE UNDESIGNATED AIR-BORNE RECEIVER .... AN/ARR-# ... RECEIVE TERMINAL") IS 750 HRS, YET THE FREQUENCY STANDARD IS NOT LISTED AS PART OF THE ARR-77 EQUIPMENT (IT IS LISTED AS PART OF THE ART-50 VERDIN SUBSYSTEM). CAN YOU RESOLVE THIS DISCREPANCY?

3. ACCORDING TO THE ILS, THE ART-50 MODULATOR WRA IS USED IN THE SHORE SIGHT. THE COMPLETE ART-50 SYSTEM IS CONTAINED IN THE AIRCRAFT. WHAT THEN, IS THE MTBF OF THE ART-50 MODULATOR WRA? ARE THE MTBF'S OF THE ART-50 WRA'S SPECIFIED, OR RATHER HAVE THEY BEEN ALLOCATED BY COLLINS?

SIGNATURE

CONT → PG 2

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
BND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 7/1/75

AUTHORIZATION NO.

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR Marilyn (Name) (Title) (Location)

PERSON CALLED SHAPLEIGH (Name) (Title) (Location)

SUBJECT

GIST OF CONVERSATION

RESPONSES TO THESE QUESTIONS FROM SHAPLEIGH ARE AS FOLLOWS:

1. THE CESIUM FREQUENCY STANDARD WILL EVENTUALLY REPLACE ALL OF THE RUBIDIUM STANDARDS. WHEN, MR. SHAPLEIGH, DID NOT KNOW. THE R REQUIREMENTS ON THE CESIUM STANDARD, HE ALSO DID NOT KNOW.

2, 3. MR. SHAPLEIGH DID NOT KNOW THE ANSWERS TO THESE QUESTIONS, YET SAID HE WOULD GET WITH BILL WALLACE AND TRY TO RESOLVE THEM (AS WELL AS THE REMAINING FREQ. STANDARD QUESTIONS).

SIGNATURE

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
SND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls, the person originating an outgoing call or receiving an incoming call will sign the original.

DATE 7/1/75

AUTHORIZATION NO.

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR (Name) (Title) (Location)
JB MARKS NWSC, CRANE, IN

PERSON CALLED (Name) (Title) (Location)
AL VILLERREAL NELC, SAN DIEGO

SUBJECT
VERDIN INSTALLATION STATUS

GIST OF CONVERSATION

MR. VILLERREAL (VAL) AT 714-225-7351 IS ASSOCIATED WITH LOGISTIC SUPPORT OF THE VERDIN SYSTEM AND IS THUS KNOWLEDGEABLE IN VERDIN EQUIPMENT LOCATION AND INSTALLATION SCHEDULES. THE FOLLOWING TO DATE INFORMATION WAS VOLUNTEERED BY MR. VILLERREAL:

1. ALL SSBN's NOW ARE INSTALLED OR BEING INSTALLED WITH WRR-7's. WITH REFERENCE TO THE KENT/PETRECCA PHONE CON OF 3/13/75, THE 600 HAS HAD VERDIN INSTALLED AND THE 602 AND 608 ARE IN THE PROCESS OF HAVING VERDIN INSTALLED.
2. ALL TACAMO AIRCRAFT HAVE THE ART-50 INSTALLED. THE ARR-77 RECEIVER WON'T BE INSTALLED FOR QUITE SOME TIME.
3. THE URT-30 TRANSMITTER INSTALLATION SCHEDULE IN 6/11/75 TRIP REPORT ENCLOSURE (MARKS TO NELC, 3041-RJM-sh 12340/2) HAS BEEN SUPERCEDED. THE SCHEDULE HAS BEEN MOVED BACK, EXACTLY HOW MUCH, VAL DION'T KNOW.

SIGNATURE

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1072-754-098/69

TELEPHONE CONVERSATION RECORD
DHD-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE: 6/26/75

AUTHORIZATION NO.

DURATION OF CALL: FROM 1015 TO 1045

REFERENCE (Serial, Contract, etc.): VERDIN TSA

ORIGINATOR (Name) (Title) (Location): BOB MARKS TSA ENG. NAD CRANE

PERSON CALLED (Name) (Title) (Location): DAVE ELY (EE LEE), R PROJECT ENGINEER, COLLINS RADIO, NEWPORT BEACH CA.

SUBJECT: VERDIN SYSTEM CHARACTERIZATION AND FRAP

GIST OF CONVERSATION

DAVID W. ELY, (761) - 714 - 833 - 4899

MR. ELY IS THE R ENGINEER RESPONSIBLE FOR PREPARING MONTHLY REPORTS ON VERDIN FAILURES AND ANALYSIS. COLLINS IS THE DEPOT MAINTAINANCE ACTIVITY. MR. ELY WAS TOLD OF THE FRAP PROGRAM, OF WHICH HE WAS PREVIOUSLY UNAWARE, AND OF NAD CRANE'S ROLE AS LFA AND VERDIN TSA. HE EXPRESSED EXTREME INTEREST, AND OFFERED TO HELP THE VERDIN TSA EFFORT IN ANY REASONABLE MANNER. THE AS OF YET UNOFFICIALLY PLANNED VISIT TO COLLINS BY THIS ACTIVITY WAS EXPRESSED. MR. ELY SAID HE WOULD PREPARE AND PRESENT ANY WANTED VERDIN DOCUMENTATION DESIRED AND WOULD WANT TO FURTHER DISCUSS FRAP'S OBJECTIVES AND RELATIONSHIP WITH VERDIN. THIS ACTIVITY WILL BE SENT THE MONTHLY REPORTS MR. ELY PREPARES ALONG WITH A DOCUMENTARY/PICTURE DESCRIPTION OF VERDIN.

THE PRIMARY PURPOSE OF CONTACTING MR. EALY WAS TO USE HIS VERDIN EXPERTISE TO RESOLVE VERDIN SYSTEM CHARACTERIZATION

SIGNATURE

CONT ——→ Pg 1

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
SND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 6/26/75

AUTHORIZATION NO.

DURATION OF CALL FROM TO

REFERENCE (Serial, Contract, etc.)

ORIGINATOR (Name) (Title) (Location)

PERSON CALLED (Name) (Title) (Location)

SUBJECT

GIST OF CONVERSATION

PROBLEMS ENCOUNTERED BY THIS ACTIVITY IN WRITING THE VERDIN TSA IMPLIMENTATION PLAN. THE PROBLEM TURNED OUT TO BE THIS ACTIVITY'S CONFUSION BETWEEN VERDIN SUBSYSTEMS AND LOCATION SITES. WITH REFERENCE TO FIGS. 1-2, 1-3, AND 1-4 OF THE VERDIN ILSP, EQUIPMENT DESIGNATED VERDIN IS AS FOLLOWS

A. WRR-7 RECEIVER EQUIPMENT
   1. VLF/LF RECEIVER R-1738/WR
   2. PROCESSOR CP-1071/WR
   3. DEMODULATOR/POWER SUPPLY MD-855/WRR-7

B. ARR-77 AIRBORNE RECEIVER (UNDESIGNATED IN ILS)
   1. VLF RECEIVER & NOTCH FILTER
   2. PROCESSOR CP-1072/AR
   3. DEMODULATOR/POWER SUPPLY - MD- /AR, PP6628/AR

C. ART-50 RELAY
   1. PROCESSOR CP-1072/AR MT-4368/AR
   2. CONTROL UNIT POWER SUPPLY C-8784/ART-50 PP-6628/WR
   3. MODULATOR MD-856/ART-50, MT-4369/AR

SIGNATURE

CONT → Pg 2

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
NND-GEN-2100/1 (2-61)
IL-0187-000-8000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE 6/26/75

AUTHORIZATION NO. | DURATION OF CALL FROM TO | REFERENCE (Serial, Contract, etc.)

ORIGINATOR (Name) (Title) (Location)

PERSON CALLED (Name) (Title) (Location)

SUBJECT

GIST OF CONVERSATION

Re URT-30

1. VERDIN PROCESSOR (CP-1071/WR)
2. CONTROL UNIT/POWER SUPPLY C-8979/URT-30

THE WRR-7 RECEIVER IN FIG 1-4, WILL NOT USUALLY BE USED AT SHORE SITES, SAID MR. ELY. THE VERDIN IS ONLY A SHORE TO SHIP LINK, NOT VISA VERSA (i.e. VERDIN IS NOT A TWO WAY COMMUNICATION SYSTEM)

THE FREQUENCY STANDARD, INCLUDED AS VERDIN EQUIPMENT IN EACH SUBSYSTEM, (O-1620 SHIP, O-1622 AIR) ~~ARE~~ ARE RUBIDIUM VAPOR INSTEAD OF CESIUM AS PREVIOUSLY REPORTED IN THE VERDIN TSA MONTHLY REPORT.

IN SUMMARY THEN, THE FOUR SUBSYSTEMS OF VERDIN (WRR-1, ARR-17, ART-50 AND URT-30) ARE ESSENTIALLY SPREAD THROUGHOUT THE THREE SITE STATIONS (SHORE, AIR, SHIP) WITH SOME WRA DUPLICATION.

SIGNATURE

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

TELEPHONE CONVERSATION RECORD
SND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming outgoing calls,... The person originating on outgoing call or receiving an incoming call will sign the original.

DATE: 3/13/75

AUTHORIZATION NO.	DURATION OF CALL FROM TO	REFERENCE (Serial, Contract, etc.)

	(Name)	(Title)	(Location)
ORIGINATOR	James R. Kent	304B	NAD Crane, IN
PERSON CALLED	Mr. Joseph Petrecca, PME117-1012		NAVELEX Washington, DC

SUBJECT: Status of SHIPALTS given in ILS Plan for VERDIN

GIST OF CONVERSATION

Mr. Petrecca said going by SHIPALTS would be very difficult. However, he said he could give me the ships which had the WRR/7 Receiver installed. These are as follows:

a. Submarine Tenders AS-19, 31, 32, 33, 34.

b. All FBM submarines (SSBN's) except the 600, 602, 608 and these should have them by the end of this Fiscal Year.

I asked Mr. Petrecca if the ones installed was in a fully operational mode and being used as intended for the VERDIN System. He said he thought they were and reports were being received on them. He said he did not think they had the blessing of CINCLANT yet as they weremore or less "shaking down" the receivers presently.

I also asked Mr. Petrecca if he had available the schedule for overhaul. He said yes but would hate to give specifics for more than one or two over the telephone. He suggested Mr. Fong set up a contact in NAVSEA for us to obtain this type of information as NAVSEA periodically publishes these and they are constantly changing. He said he thought this information was unclassified. He said he thought the reset schedule was classified. Reset pertaining to those worked on by tenders.

Mr. Petrecca asked how we got the ILS plan. I told him through NAVELEX 470.

SIGNATURE: James R. Kent
JAMES R. KENT

☆ U. S. GOVERNMENT PRINTING OFFICE: O-1972-754-098/69

NAVAL AMMUNITION DEPOT
Crane, Indiana

NADCRANEINST 11240.20A CH-2
PWS-BTR:nr
5 FEB 1970

NADCRANE INSTRUCTION 11240.20A CHANGE TRANSMITTAL 2

From: Commanding Officer
To: Directors of all Departments

Subj: CH-2 to NADCRANEINST 11240.20A, Subj: Transportation Equipment Manual, 1968 Edition

1. Purpose. To establish and clarify who has right-of-way at railroad crossings concerning railroad motor cars.

2. Action. Make the following pen and ink changes:

Chapter 5, paragraph 5.c., change the last sentence to read, "Railroad equipment has the right-of-way, except that railroad motor-cars and attached track-cars shall yield right-of-way to highway traffic at crossing not protected by flasher signals. At crossings protected by flasher signals railroad motor-cars will have preference, provided the flasher signals are working."

3. Cancellation. This Change Transmittal is cancelled after the above change has been made.

J. C. DONAHUE

Copy to:
A2 (Military Officers)
A3 (Division Managers)
AD Files
PWT (2000 copies)
AFGE-1415
AFGE-3072

CHAPTER IV
PRIVATELY OWNED VEHICLES

1. Identification

a. Privately owned vehicles entering the Depot shall display proper Depot vehicle identification in accordance with the requirements of current Depot Security Regulations.

b. Security Department will issue and affix Depot motor vehicle identification on presentation of proof of:

(1) Employment by or attachment to the Depot.

(2) Proper vehicle registration.

(3) Adequate insurance coverage. ($5,000 Property Damage and $10,000/$20,000 Bodily Injury).

(4) Vehicle is in sound mechanical condition.

c. Information must be updated annually on receipt of new license, change or renewal of insurance, or change of vehicle. Form 9ND-NADC 5510/1 applies.

d. Depot motor vehicle identification decals will be removed and turned in to Security Department on sale of automobile or severance by NAD Crane.

2. Equipment

a. Vehicles shall have:

(1) A jack and lug wrench.

(2) A spare tire containing enough air to take the vehicle off the Depot.

(3) Enough fuel to assure departure from the Depot.

b. Oil flares and fusees are not permitted within the Depot.

c. No tools other than those listed above, or other articles or equipment, shall be carried in the vehicle unless they can readily be identified as not belonging to the Government, or are authorized by a Property Pass (NAVSANDA Form 155).

d. In emergencies gas may be purchased from Security Department, Building 10. If the vehicle is out of gas, service may be obtained by calling phone 551. Purchases will be limited to $1.00.

3. Accidents

a. General Procedures. When an accident occurs, the operator shall:

(1) Help the injured secure prompt medical care.

(2) Prevent additional accidents by placing flags and/or electric lanterns; by stationing traffic directors; by cleaning roadway, etc.

(3) Not smoke near the vehicles involved and warn others against smoking or other sources of ignition of gasoline which may be spilled. This is not only dangerous but is also a violation of Depot regulations.

b. Reporting

b. School Bus. When meeting or overtaking a school bus which has stopped to load or unload school children, stop before you reach the bus. Do not proceed until the bus resumes its motion or until signaled ahead by the driver. Obey local laws on meeting and overtaking school buses.

c. Railroad Crossings. Do not pass within 100 feet of any railroad crossing. Do not pass vehicles stopped at crossings, including multiple-lane highways. Railroad equipment has the right-of-way.

6. Parking. Parking is allowed in authorized parking areas only.

7. Trailers and Wagons.

a. No more than two conveyances shall be drawn behind a motor vehicle.

b. When pulling two trailers, speed should be reduced by one-half to allow ample braking power and control.

8. Sentry Gates. When approaching a sentry gate, display personnel identification in plain view. Come to a complete stop and do not proceed until instructed to do so.

9. Securing Vehicles. Unattended Government motor vehicles shall be secured by:

a. Setting the hand brake.

b. Stopping the motor.

c. Turning off all electrical circuits.

d. Removing ignition keys and returning them to their authorized location. Ignition keys shall be left in vehicles temporarily parked within the Depot during normal working hours. Keys shall be

left in Government vehicles at all times when secured within locked buildings.

e. Placing vehicles equipped with two-speed axles in low range.

f. Placing manual transmission in lowest gear or placing selector lever of vehicles equipped with automatic transmission in "Park" position.

g. Blocking wheels where necessary for positive assurance against accidental movement of vehicles.

10. Traffic Violations.

a. Security guards will issue Armed Forces Traffic Ticket, DD Form 1408, in triplicate for motor vehicle violations. The pink copy will be handed to the driver or put under the windshield wiper of an unattended vehicle. The original and duplicate copies will be forwarded to Security.

b. Security will forward the original of DD Form 1408, with recommendation for disciplinary action, to department directors.

c. Department Directors will review the circumstances and if in agreement with recommendations, complete "Report of Action Taken on Violations" space on DD Form 1408 and return to Security. If Department Director disagrees with recommendations the DD Form 1408, with his comments, will be forwarded to the Executive Officer for decision.

d. Security, on receipt of the report of action taken, will enter the violation and point assessment on operator's record and advise Public Works by memorandum of violations involving Government vehicles.

e. Civilian Personnel will send a copy of disciplinary actions to Public Works Licensing

(3) Operators shall promptly report accident to the Security Department, Extension 551.

(2) Accidents involving off-duty military personnel shall be reported in accordance with 9NDINST 5101.3A, Subj: Navy Traffic Safety Program for Off-Duty Military Personnel.

c. Security Department will investigate motor vehicle accidents. Investigators will prepare Standard Form 91A. If damage to Government property or personal injury is involved, Security Department will prepare a report for the Commanding Officer. A copy of Standard Form 91A will be sent to the Safety Department.

4. Wrecker Service. In case of an accident, Navy wreckers may be used to clear the highway so that traffic can continue. Private vehicles will be moved to the nearest convenient point which will not disturb traffic flow. Tow or wrecker service requiring less than one hour's work may be provided at the direction of the Transportation Division Manager. Service of more than one hour's work will be provided only by direction of the Public Works Officer, subject to collection of payment for services. In all cases, NADC 983, Claim Waiver Form shall be filled out by the owner and PW representative before towing service is performed.

CHAPTER V
TRAFFIC REGULATIONS

1. Regulations. Operators of motor vehicles on Depot highways shall comply with applicable Indiana Motor Vehicle Laws and additional regulations as established by NAD Crane.

2. Enforcement. The Security Department shall be responsible for the enforcement of Traffic Regulations on the Depot.

3. Speed Limit. Except where otherwise posted, speed limit on the Depot is 35 mph.

4. Emergency Vehicles. Emergency vehicles while sounding sirens and/or operating flashing red lights shall have the right-of-way. Do not pass them unless you are an official responding to an alarm. If you are meeting or are in front of them, pull to the right side of the road, stop, and wait for them to pass. Make sure there are no other fire trucks or emergency vehicles approaching before you pull back into the traffic lane. Do not follow emergency vehicles closer than 500 feet or park closer than 500 feet to fire equipment which has stopped in answer to a fire alarm.

5. Meeting and Passing.

a. Ammunition or Explosive Loaded Vehicles. When meeting explosive loaded trucks DO NOT STOP, but operate at a safe speed. Keep to the right of the center of the highway and proceed with caution in a direction parallel to the vehicle.

DO NOT OVERTAKE AND PASS until there is ample safe operating space. Give an audible signal that can be heard by the driver before attempting to pass. DO NOT PASS on an icy, snow-covered, or otherwise hazardous road.

Examiner for recording on Government Operator's Identification Card and in the driver's record.

11. Motor Vehicle Violation Point System. The point system is applicable to drivers of all vehicles on the Depot, and to operators of Government vehicles off the depot.

Offense	Points Assessed
Driving under the influence of intoxicating liquor.	12
Owner knowingly and willfully permitting another person under the influence of intoxicating liquor to operate his vehicle.	12
Manslaughter, negligent homicide, or assault by an automobile.	12
Intentionally leaving the scene of an accident involving death or personal injury without rendering aid or information.	12
Using automobile to commit a felony.	12
Operating a vehicle after suspension or revocation of the operator's permit or installation driving privilege.	12
Reckless Driving. Moving violations other than those listed in which the driver is heedless of probable injury to the safety, the property or the rights of others. Two convictions in any 12-month period results in automatic suspension of installation driving privilege for 6 months.	5

Intentionally leaving the scene of an accident involving damage to property of another, without making identity known.	6
Speeding:	
Up to 10 MPH over speed limit	2
11 - 15 MPH over speed limit	4
16 or more MPH over speed limit	6
Failure to obey traffic signs or signals, or instructions of traffic officer.	3
Knowingly operating an unsafe vehicle.	3
Other violations.	2
Failure to comply with installation registration requirements.	1

If the point assessment or accumulation is a total of 12 or more points, the operator's driving privilege on this Depot will be suspended for a fixed period of time not to exceed one year. Points assessed against an individual will remain in effect for a 24-month period. Expiration of a suspension period will, of itself, serve to cause removal of the record of all points assessed.

TELEPHONE CONVERSATION RECORD
9ND-GEN-2100/1 (2-61)
IL-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE: 3/12/75

AUTHORIZATION NO.

DURATION OF CALL — FROM TO

REFERENCE *(Serial, Contract, etc.)*

ORIGINATOR *(Name)* James R. Kent *(Title)* 304B *(Location)* NAD Crane, IN

PERSON CALLED *(Name)* Mr. Rudolph Savarese, PME 117-222 *(Title)* (VERDIN Project Engineer) *(Location)* NELC Washington, D. C.

SUBJECT
Information on VERDIN System Required for Preparation of FRAP Program Plan

GIST OF CONVERSATION

Mr. Savarese confirmed the following: AN/WRR 7 shipboard receiver specified MTBF = 1000 hrs., AN/URT-30 Shore Transmitter specified MTBF = 1000 hrs., specified MTBF for Airborne Transmitter AN/ART-50 = 750 hrs., specified MTBR for Airborne equipment = .36 hrs., and specified MTTR for ship and shore based equipment = .62 hrs.

Mr. Savarese also stated that the undesignated airborne receiver has been now specified and is the AN/ARR-77 which has a specificed MTBF by itself of approximately 1000 hrs. and the accompanying time and frequency standard has a specified MTBF = 500 hrs, (which gives a MTBF = 750 hrs. for the receiver and standard combined).

He also stated that the longest mission time for the aircraft would be 12 days, for the submarines the mission time would be 60 days, and the shore stations would have a continuous mission. He could not say what a typical mission time would be.

Mr. Savarese said that there were very few, if any of the shipboard receivers in the fully operational mode and doubted very much if any valid reliability assessment data could be obtained.

He said that there were 30 usable receivers on nuclear submarines, 4 on tenders and 4 at training sites. (The integrated logistic support (ILS) plan for VERDIN of 9 Aug 1974 indicates 57 to have been allocated to nuclear submarines, 6 to tenders, and 5 to training sites in March 1975 but all may not have been installed). However, he stressed these are not presently being used as intended.

Mr. Savarese said there were no AN/URT-30 Transmitter in fleet use but there were four at training sites, 3 at submarine training sites and 1 at Pax River (The ILS Plan indicates there are 2 scheduled for shore stations in Sept 1975).

He also stated that 18 of the AN/ART-50 Airborne Transmitter were on board aircraft

SIGNATURE

TE HONE CONVERSATION RECORD
9ND-GEN-2100/1 (2-61)
1L-0187-000-6000

This record will be used for both incoming and outgoing calls. The person originating on outgoing call or receiving an incoming call will sign the original.

DATE

AUTHORIZATION NO.

DURATION OF CALL
FROM TO

REFERENCE *(Serial, Contract, etc.)*

ORIGINATOR *(Name)* James R. Kent *(Title)* 3048 *(Location)* NAD Crane, IN

PERSON CALLED *(Name)* Mr. Radolph Savarese, PME 117-222 *(Title)* (VERDIN Project Engineer) *(Location)* NELC Washington, D. C.

SUBJECT
Information on VERDIN System Required for Preparation of FRAP Program Plan

GIST OF CONVERSATION
and one at Pax River for training. (The ILS plan indicates only 10 scheduled for aircraft up through Sept 1975). He thought we should concentrate our FRAP efforts on the receiver as it is fully operational.

Mr. Savarese said it would be another year until the airborne receiver, the AN/ARR-77, would be out.

SIGNATURE James R. Kent
JAMES R. KENT

TRIP REPORTS

VERIZON PHONE CONS
TRIP REPORTS

TRAVEL VOUCHER OR SUBVOUCHER

...e with ink, ball-point pen or typewr DO NOT use lead pencil.)

BUREAU VOU NO. | SUBVOUCHER NO. | DO. VOUCHER NO. NIP#8577

PAYMENT FOR | PAYMENT DESIRED | PAID BY

TDY/TAD PER DIEM | TDY/TAD TRAVEL | PCS TRAVEL | CHECK | CASH

ORDERS *(Paragraph, S. O. No., Issuing Ha, Date. Include amending orders.)*
1647510-03600 5/22/75 NAD Crane, IN

TRAVEL PAYMENTS OR ADVANCES UNDER THESE ORDERS *(Amount, DO Vou No., date received, place paid, Station No., If none, so state.)*
0.00 NIF# 8264 5/29/75 NAD Crane, IN

NAME - FIRST NAME - MIDDLE INITIAL *(Soundex Code) (Print/Type)*	GRADE/RANK	SSN
KS, ROBERT J. II	GS-9	282-48-2721

MAILING ADDRESS	DUTY PHONE NO.
Crane, IN	1370

IZATION AND STATION
C NAD Crane, IN

ITINERARY *(See Reverse for Definition)*

E 5		LOCAL STANDARD TIME (24 Hour Clock)	PLACE (Base, Activity, City and State; City and Country, Etc.)	MODE OF TRAVEL	REASON FOR STOP	GOVT QTS USED	GOVT QTS NOT USED	NON-GOVT QTS USED	NUMBER MEALS USED GOVT	NON-GOVT	OFFICERS OPEN MESS	SPEEDOMETER READING OR MILEAGE	II. FOR DO USE ONLY 1. COMPUTATIONS
2	DEP	0730	Bloomington, IN	PA								6/2 3/4629.	21.75
2	ARR	0935			CH							6/3-5 3	87.00
2	DEP	1029	Indianapolis, IN	CP								6/6 3/4	21.75
2	ARR	1410			TDY								
/6	DEP	0730	San Diego, CA	CP									
/6	ARR	1456			TDY								
6/6	DEP	1600	Indianapolis, IN	PA									
6/6	ARR	1805			TMC								
	DEP		Bloomington, IN									108	
	ARR		(Total Actual Cost of										
	DEP		lodging was $59.36)										
	ARR											TRANS 108mi	16.20

I REIMBURSABLE EXPENSES

DATE	NATURE AND EXPLANATION	AMOUNT CLAIMED	ALLOWED	BAS/COLA ADJ ON MP R
6/2	Phone call to rental car	.10	.10	
6-9	Rental Car	62.24	62.24	BAS/COLA ADJ NOT REQUIRED
6/9	Airport Parking	9.50	9.50	
				BAS/COLA RATE

IV. TRANSPORTATION REQUESTS/MEAL TICKETS USED

NUMBER	FROM	TO
#1-0994233	Indianapolis, IN (and return)	San Diego, CA

DD 753 | HI WY | OTD | CC

V. CHARGES - BOQ OR NON-GOVT MEALS AND QTS

FROM (Date)	TO (Date)	TYPE	RATE	TOTAL PAID

VI. LEAVE STATEMENT

I was authorized _____ days leave. _____ days were taken between _____ and _____ inclusive.

I hereby claim any amount due me. The statements on face, reverse, and attached are true and complete. Payment or credit has not been received.

SIGNATURE OF CLAIMANT AND DATE
Robert J. Marks II
ROBERT J. MARKS, II

2. SUMMARY OF PAYMENT

PER DIEM (Net Payable)	130.50
MILEAGE OR TRANSPORTATION ALLOWANCES	16.20
REIMBURSABLE EXPENSES	71.84
TOTAL AMOUNT DUE	218.54
LESS PREVIOUS PAYMENTS (Droppage)	
AMOUNT CHARGED TO ACCOUNT'G CLASS.	218.54
LESS VOUCHER DEDUCTIONS	170.00

APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUR. CONT. NO./SUB ALLOT. NO.	AUTH. ACCT'G ACTIVITY	TYPE	TRAVEL ORD. NO. / AUX. COST CODE	COST CODE	AMOUNT
17X4912.2463	900	77777	000164	2E	T0-03600	0001901105 35	218.54
Stub # 11-0142-19433							

CORRECTION DATA:

COMPUTED BY	AUDITED BY	TVL RCRD POSTED BY	RECEIVED *(Payee signature & date, or check no.)*	AMOUNT PAID
			70 124 628	48.54

CLAIMANT'S STATEMENTS

I have included herein all travel and transportation used on leave, delay en route or travel to home or permanent station for personal reasons. If travel by POV was authorized as more advantageous to the Government I, as owner or operator of the vehicle, was primarily responsible for payment of its operating expenses.

I have not included travel, transportation and/or TDY for which I have received pay or credit from any other agency of the U. S., foreign government, or the United Nations, except as jointly authorized by the secretaries concerned.

I actually performed the travel herein. Government quarters and Government mess were not utilized except as indicated.

PENALTY

The penalty for willfully making a false claim is: A maximum fine of $10,000 or maximum imprisonment of 5 years, or both. *(U. S., Code, Title 18, section 287, formerly section 80.)*

REQUIRED ATTACHMENTS

1. Original and/or copies of travel orders and amendments as instructed.
2. Traveler's copy of each transportation request *(SF 1169B)* used.
3. All receipts from transportation officer for unused transportation requests, carriers' tickets, and meal tickets.
4. Receipts from carriers if cost of transportation is claimed.
5. Charge letters for transportation requests received en route.
6. Statements of nonavailability *(quarters, mess and directed mode of transportation).*

SYMBOLS

MEANS *(Mode)* OF TRAVEL

FIRST LETTER		SECOND LETTER	
1. TRNSPN REQ	T	5. AUTO	A
2. GOVT TRNSPN	G	6. BUS	B
3. COML TRNSPN *(own expense)*	C	7. PLANE	P
4. PRIVATE VEHICLE	P	8. RAIL	R
		9. VESSEL	V

REASONS FOR STOPS

10. AWAITING TRNSPN	AT	16. MISSION COMPLETE	MMC
11. CHANGE MODE OF TRNSPN	CM	17. MECHANICAL DIFFICULTY	MEC
12. CREW REST	CR	18. PICKUP CARGO *(passengers)*	PC
13. DISCH CARGO *(passengers)*	DC	19. REMAIN OVERNIGHT	
14. LEAVE/DELAY EN ROUTE	LV	20. TEMPORARY DUTY	
15. MAINTENANCE *(refuel)*	MA	21. WEATHER ADVERSE	WX

TYPE OF CHARGES

22. BACHELOR OFFICER'S QTS ..... BOQ
23. NON-GOV'T MEALS ..... NGM
24. NON-GOVERNMENT QTS ..... NGQ

DEFINITION *(This definition pertains to military personnel only)*

NON-GOVERNMENT QUARTERS AND MEALS

Meals and quarters furnished *(with or without charge)* incident to temporary duty by: (1) Local or State governments; (2) Foreign governments; (3) Other U. S. Government agencies, (4) U. S. Government contractors; or (5) Private organizations such as the National Red Cross during disasters.

REMARKS

VII. APPROVED FOR PAYMENT *(When required by individual service regulations)*

DATE	SIGNATURE OF AUTHORIZED APPROVING/CERTIFYING OFFICER

☆U.S. GOVERNMENT PRINTING OFFICE: 1973 — 525 - 063

WE APPRECIATE
YOUR PATRONAGE

D 0950::MS

THANK YOU

434905-6

AIRWAYS RENT-A-CAR

AIRWAYS RENT-A-CAR OF LOS ANGELES

LESSOR

☐ L.A. INT'L AIRPORT
48[illegible] CENTURY BLVD.
674-7176

☐ HOLLYWOOD-BURBANK AIRPORT
2627 N. HOLLYWOOD WAY - BUR
(213) 845-2681

☐ ORANGE CO. AIRPORT
4023 BIRCH ST. NEWPORT BEACH
(714) 979-6990

☐ SAN DIEGO INT'L AIRPORT
2610 CALIFORNIA STREET
(714) 291-9555

☐ _____

AIRWAYS FEATURES FORD THE BETTER IDEA CAR

RENTAL AGREEMENT

No. 693441

1 CUSTOMER INFORMATION

CUSTOMER: Robert J Marks II

CURRENT RESIDENCE: 13005 Oakview Blvd

CITY: Rancho Hts STATE: PHONE NO. VERIFIED

DRIVER'S LICENSE NO.: M339287 STATE: Ohio

EXPIRE DATE	HAIR	EYES	HEIGHT	WEIGHT	DATE OF BIRTH	AGE
76					8-25-56	

COMPANY: NAD CRANE DIV: DNP

ADDRESS: POSITION:

CITY STATE BADGE OR ID NO.

3 ORIGINAL CAR

CAR NO.	LICENSE NO.	MAKE	MODEL
228238	805MIW	Ford	1-B

COLOR	OWNING CITY	RENTING CITY
4 Blue	Lax	Ocio

CHECK-IN AT	DUE BACK DATE
Ocio	6 - 6 75 AM PM

15 EXCHANGE CAR

CAR NO.	LICENSE NO.	EXCHANGE STATION	DATE TIME
			→

	5 ORIGINAL CAR	16 EXCHANGE CAR	
IN	11746		TIME IN → JUN-6 6 10
OUT	11678		14 TIME OUT → JUN-2 15 0
MILES DRIVEN	68	MILES DRIVEN	TIME USED 4 DAYS HOURS

9 RATES

MILES		@ 19 PER MILE	12	92
HOURS		@ 4.75 PER HOUR		
DAYS	4	@ 19.00 PER DAY	76	00
WEEKS		@ 114.00 PER WEEK		

MINIMUM RENTAL CHARGE 24 HOURS PLUS MILEAGE — SUB-TOTAL: 88 92

7 30% Disc: (26 68)

TOTAL TIME & MILEAGE: 62 24

8 INTERCITY CHARGE CARS CHECKED-IN AT OTHER THAN ORIGIN STATION ARE SUBJECT TO A MINIMUM $15.00 INTERCITY FEE UNLESS OTHERWISE NOTED.

COLLISION PROTECTION CHARGE

PERSONAL ACCIDENT INSURANCE $1.00 PER DAY/$5.00 PER WEEK

(GROSS RECEIPTS) SUB-TOTAL

SALES TAX %

MISCELLANEOUS ☐ CHARGE ☐ CREDIT

TOTAL

10 GAS FURNISHED ☐ YES ☐ NO

GAS REFUND $
GAS CREDIT $
TANK FILL $
CHARGE OR CREDIT

CHECKED IN BY: CS

NET REVENUE

11 DEPOSIT CREDITED $

ADD DEP $ DATE

POSTED TO DBCR BY:

ADD DEP $ DATE

BALANCE DUE TO ☐ AIRWAYS ☐ CUSTOMER: 62 24

THIS IS YOUR INVOICE

PAYMENTS DUE UPON RECEIPT OF THIS INVOICE

THANK YOU FOR YOUR PATRONAGE

PLEASE MAIL TODAY!

AIRWAYS RENT-A-CAR

TEAR OFF LOWER PORTION AND MAIL WITH YOUR REMITTANCE

12 CREDIT CARD IDENTIFICATION

TO BE PAID BY

ISSUED BY: Visa To Go EXPIRE DATE:

NUMBER:

NAME: CASH PAID

ADDRESS:

CITY STATE ZIP CODE

DATE

OR NG LIST CHECKED YES ☐ NO ☐

REFUND RECEIVED	CHARGE		PAID
$	$	☐ AMEX ☐ DINER CLUB ☐ CARTE BLANCHE ☐ BANKAMERICARD ☐ INTERBANK ☐ T.W.A. GETAWAY	$
X	☐ DIRECT BILL ☐ AIRWAYS V.I.P. ☐ _____		CASH ☐
RECEIVED BY			CHECK ☐

12 REFERRED BY (SOURCE)

13 I have read the terms and conditions of page 1 (on reverse side) and page 2 of this rental agreement and agree thereto.

CUSTOMER SIGNATURE X Robert J Marks II

APPROVED BY LESSOR Connie Webb

CAR PRESUMED TO BE EMBEZZLED IF REPORTED AND NOT RETURNED WHEN DUE. CUSTOMER IS LIABLE FOR PARKING & TRAFFIC VIOLATIONS

AUTHORIZATION TO DRIVE IN ORIGINATING STATE ONLY

R.A. No. 693441

SHOW RENTAL AGREEMENT NO. PAGE 2

AIRWAYS RENT-A-CAR OF LOS ANGELES

LESSOR

☐ L.A. AIRPORT 4858 ...NTURY BLVD. (213) 674-7176
☐ HOLLYWOOD-BURBANK AIRP' 2627 N. HOLLYWOOD WAY - BUR. (213) 845-2681
☐ ORANGE CO. AIRPORT 4023 BIRCH ST. NEWPORT BEACH (714) 979-6990
☐ SAN DIEGO INT'L AIRPORT 2610 CALIFORNIA STREET (714) 291-9555
☐ _____

ATURES FORD THE "BETTER IDEA" CAR

RENTAL AGREEMENT No. 93441

CUSTOMER INFORMATION

ESIDENCE

STATE | PHONE NO. | VERIFIED

CENSE NO. | STATE

E | HAIR | EYES | HEIGHT | WEIGHT | DATE OF BIRTH | AGE

DIVISION

POSITION

STATE | BADGE OR ID NO.

RESS | LOCAL PHONE

D OTHER DRIVER (NONE UNLESS FILLED-IN) | AGE

CENSE NO. | STATE | EXPIRE DATE

L CONDITIONS

3 ORIGINAL CAR

CAR NO. | LICENSE NO. | MAKE | MODEL

COLOR | OWNING CITY | RENTING CITY

CHECK-IN AT | DUE BACK DATE AM PM

15 EXCHANGE CAR

CAR NO. | LICENSE NO. | EXCHANGE STATION | DATE/TIME →

	5 ORIGINAL CAR	16 EXCHANGE CAR	
IN			TIME IN →
OUT	1 16 78		14 TIME OUT →
MILES DRIVEN			TIME USED (DAYS / HOURS)

6 RATES

MILES	@	PER MILE	
HOURS	@	PER HOUR	
DAYS	@	PER DAY	
WEEKS	@	PER WEEK	

MINIMUM RENTAL CHARGE 24 HOURS PLUS MILEAGE | SUB-TOTAL

7

TOTAL TIME & MILEAGE

8 INTERCITY CHARGE CARS CHECKED-IN AT OTHER THAN ORIGIN STATION ARE SUBJECT TO A MINIMUM $15.00 INTERCITY FEE UNLESS OTHERWISE NOTED.

COLLISION PROTECTION CHARGE

PERSONAL ACCIDENT INSURANCE $1.00 PER DAY/$5.00 PER WEEK

(GROSS RECEIPTS) SUB-TOTAL

SALES TAX %

MISCELLANEOUS ☐ CHARGE ☐ CREDIT

TOTAL

COLLISION PROTECTION

ISION PROTECTION DED IN PARAGRAPH 5 OF THIS GREEMENT (ON REVERSE SIDE)	CUSTOMER INITIAL HERE →	COLLISION PROTECTION $2.00 PER DAY
ION LIABILITY DED IN PARAGRAPH 5 OF THIS GREEMENT (ON REVERSE SIDE)	CUSTOMER INITIAL HERE →	
ION LIABILITY DED IN PARAGRAPH 5 OF THIS GREEMENT (ON REVERSE SIDE)	CUSTOMER INITIAL HERE →	

ERSONAL ACCIDENT INSURANCE TH MEDICAL, BY HIS ACCEPTANCE RENTER ES ACCIDENT INSURANCE AS DESCRIBED ON CHED SYNOPSIS AND AGREES TO PAY THERE- EMIUM AS SHOWN IN ADJOINING COLUMN.

ACCEPTS	DECLINES
X	X

VEHICLE CONDITION INFORMATION

OUT	IN
RE & JACK OK ☐ OMER'S INITIALS AGE	SPARE & JACK OK ☐ CLERK'S INITIALS DAMAGE

CREDIT CARD IDENTIFICATION

D BY | EXPIRE DATE

ER

SS

STATE | ZIP CODE

R NG LIST CHECKED YES ☐ NO ☐

10 GAS FURNISHED ☐ YES ☐ NO

GAS REFUND $
GAS CREDIT $
TANK FILL $
CHARGE OR CREDIT

CHECKED IN BY:

NET REVENUE

11 DEPOSIT CREDITED $

POSTED TO DBCR BY:

ADD DEP $ DATE

ADD DEP $ DATE

BALANCE DUE TO ☐ AIRWAYS ☐ CUSTOMER

REFUND RECEIVED $ X _____ RECEIVED BY

CHARGE $ _____
☐ DIRECT BILL
☐ AIRWAYS V.I.P.
☐ _____

☐ AMEX
☐ DINER CLUB
☐ CARTE BLANCHE
☐ BANKAMERICARD
☐ INTERBANK
☐ T.W.A. GETAWAY

PAID $
CASH ☐
CHECK ☐

12 REFERRED BY (SOURCE)

13 I have read the terms and conditions of page 1 (on reverse side) and page 2 of this rental agreement and agree thereto.

CUSTOMER SIGNATURE X

APPROVED BY LESSOR

ED TO BE EMBEZZLED IF RENTED
TURNED WHEN DUE.
LIABLE FOR PARKING
OLATIONS.

AUTHORIZATION TO DRIVE IN ORIGINATING STATE ONLY

R.A. No. 93441
SHOW RENTAL AGREEMENT NO. ON ALL CORRESPONDENCE

R.M.

J. 1-1-1011-5
C. O. 105-22033

TRAVEL AUTHORIZATION REQUEST
D-NADC 4650/1(Rev. 7/74)

OM (Name of Traveler)	TITLE AND GRADE	SOCIAL SECURITY NO.
Robert J. Marks II	Electronics Engineer GS-9	[redacted]

HOME ADDRESS *(If rural, include directions, when G/V is requested to and from Air Terminal)*

3111 Leonard Springs Road
Apr. 162
Bloomington, IN 47401

OFFICE PHONE 1299
BLDG 38 CODE 3041
HOME PHONE 812-332-3892

TO 011A | VIA (1) 3041 (2) 3041 (3) 304 (4) 30 | DATE

TRAVEL ORDERS ARE REQUESTED AS FOLLOWS

ACTIVITIES TO BE VISITED AND PERSONNEL TO CONTACT	HOUR AND DATE REPORT	HOUR AND DATE COMPLETE
EDMAC Associates, Inc. 333 W. Commercial Street East Rochester, New York 14445	0800 28 May 1975	1200 30 May 1975

PURPOSE OF VISIT

(see attached)

DESIRED MODE OF TRANSPORTATION

[X] AIR [ ] RAIL [ ] BUS [ ] POV [ ] G/V | TO AND FROM COMMERCIAL CARRIER [ ] G/V [X] POV

[X] RENTAL CAR AT TDY STATION *(Justification if required)* Previous experience dictates the necessity of a rental car for transportation to and from contractor facilities.

	YES	NO
WILL YOU PROVIDE POV TRANSPORTATION FOR OTHERS		X
WILL YOU ACCOMPANY OTHERS IN POV		X

ADVANCE OF FUNDS [X] YES [ ] NO [X] MAX

TAD CONNECTED LEAVE IS REQUESTED FOR 0 DAYS

EXCESS BAGGAGE *(Government owned material)* _____ POUNDS [ ] ONE WAY [ ] ROUND TRIP

CLEARANCE REQUIRED [X] SECRET [ ] CONFIDENTIAL [ ] NONE

IF REQUIRED FORWARD TO *(Activity and address)*

REMARKS *(Continue on reverse side if necessary)*

1. Contractor controlled travel.
2. Traveler requests departure from Indianapolis on AL Flight 524 at 1820 connecting to AL Flight 814 in Buffalo on 27 May 1975.
3. Traveler requests departure from Rochester on AL Flight 441 at 1336 connecting to AL Flight 837 in Pittsburg on 30 May 1975.

SIGNATURE *(Department Director)*

SIGNATURE *(Traveler)* Robert J. Marks II

Robert J. Marks II

Purpose of visit:

NAVAIR contracts require contractor to demonstrate that Avionic equipment designed and manufactured by them are capable of meeting the requirements of the contract and/or equipment specification with a specified minimum reliability. Details of the reliability demonstration tests to be performed by contractor are detailed in the reliability test procedures which were previously submitted to Crane for approval for use in conducting these tests. NAD Crane Code 3041 is assigned technical cognizance of production reliability acceptance test programs for Avionics System being procured by NAVAIRSYSCOM.

The purpose of this trip is to audit contractor's test facility, witness initiation of reliability testing and resolve any discrepancies in conducting these tests. Contract N00019-74-C-0539 is for the acquisition and testing of the ARR-75 sonobuoy receiver, Engineering Support Control C112.175.

TRAVEL VOUCHER OR SUBVOUCHER

(Complete with ink, ball-point pen or typewriter. DO NOT use lead pencil.)

BUREAU VOU NO. | SUBVOUCHER NO. | DO. VOUCHER NO. MIP #7146

PAYMENT FOR | PAYMENT REQUIRED | PAID BY

TDY/TAD PER DIEM | TDY/TAD TRAVEL | PCS TRAVEL | X CHECK | CASH

T L ORDERS *(Paragraph, S. O. No., Issuing Hq. Date. Include amending orders.)*
N0016475TO-02977, 3/18/75, NAD Crane, IN

PRIOR TRAVEL PAYMENTS OR ADVANCES UNDER THESE ORDERS *(Amount, DO Vou No., date received, place paid, or DO Station No. If none, so state)*
$140.00, MIP #6913, 3/18/75, NAD Crane, IN

LAST NAME - FIRST NAME - MIDDLE INITIAL *(Soundex Code) (Print/Type)*	GRADE/RANK	SSN
Marks, Robert J. II	GS-9	282-48-2721

CHECK MAILING ADDRESS: NAD Crane, IN

DUTY PHONE NO.: 1299

ORGANIZATION AND STATION: WQEC, NAD Crane, IN

I. ITINERARY *(See Reverse for Definition)*

DATE 19 75		LOCAL STANDARD TIME (24 Hour Clock)	PLACE (Base, Activity, City and State; City and Country, Etc.)	MODE OF TRAVEL	REASON FOR STOP	GOVT QTS USED	GOVT QTS NOT USED	NON-GOVT QTS USED	NUMBER MEALS USED: GOVT	NON-GOVT	OFFICERS OPEN MESS	SPEEDOMETER READING OR MILEAGE
3/25	DEP	0555	Residence Bloomington, In	PA								54
"	ARR	0745			CM							
"	DEP	0835	Indianapolis, IN	CP								3/25
"	ARR	1115			TDY							3/26
3/28	DEP	1010	Philadelphia, PA	CP								3/28
"	ARR	1230			CM							
"	DEP	1345	Indianapolis, IN	PA								
"	ARR	1530	Bloomington, In		MMC							54
	DEP		Residence									
	ARR		Total actual cost of									
	DEP		lodging was $44.72									
	ARR											TRANS 108mi 12.96

3/25 - 3/4 18.75
3/26-27 2 50.00
3/28 3/4 18.75

II. FOR DO USE ONLY

1. COMPUTATIONS

III. REIMBURSABLE EXPENSES

DATE	NATURE AND EXPLANATION	AMOUNT CLAIMED	ALLOWED
3/25 -	Tolls	2.10	2.10
3/28	Parking	7.75	7.75
	Rental car	53.80	53.80

BAS/COLA ADJ ON MP R

BAS/COLA ADJ NOT REQUIRED

BAS/COLA RATE

IV. TRANSPORTATION REQUESTS/MEAL TICKETS USED

NUMBER	FROM	TO
#T-0994218	Indianapolis, IN	Philadelphia, PA (and return)

DD 753 | HI WY | OTD | CC

V. CHARGES - BOQ OR NON-GOVT MEALS AND QTS

FROM (Date)	TO (Date)	TYPE	RATE	TOTAL PAID

VI. LEAVE STATEMENT

I was authorized _____ days leave. _____ days were taken between _____ and _____ inclusive.

I hereby claim any amount due me. The statements on face, reverse, and attached are true and complete. Payment or credit has not been received.

SIGNATURE OF CLAIMANT AND DATE: [signature] 3/31/75

2. SUMMARY OF PAYMENT

PER DIEM (Net Payable)	87.50
MILEAGE OR TRANSPORTATION ALLOWANCES	12.96
REIMBURSABLE EXPENSES	63.65
TOTAL AMOUNT DUE	164.11
LESS PREVIOUS PAYMENTS (Droppage)	
AMOUNT CHARGED TO ACCOUNT'G CLASS.	164.11
LESS VOUCHER DEDUCTIONS	140.00

APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUR. CONT. NO./SUB ALLOT. NO.	AUTH. ACCT'G ACTIVITY	TYPE	TRAVEL ORD. NO. / AUX. COST CODE	COST CODE	AMOUNT
17X4912.2463	000	77777	000164	2E	T0-02977	000190110115	164.11
Stub #11-0077-19263							

COLLECTION DATA:

COMPUTED BY	AUDITED BY	TVL RCRD POSTED BY	RECEIVED *(Payee signature & date, or check no.)*	AMOUNT PAID
			70 122 557	24.11

CLAIMANT'S STATEMENTS

I have included herein all travel and transportation used on leave, delay en route or travel to home or permanent station for personal reasons. If travel by POV was authorized as more advantageous to the Government I, as owner or operator of the vehicle, was primarily responsible for payment of its operating expenses.

I have not included travel, transportation and/or TDY for which I have received pay or credit from any other agency of the U. S., foreign government, or the United Nations, except as jointly authorized by the secretaries concerned.

I actually performed the travel herein. Government quarters and Government mess were not utilized except as indicated.

PENALTY

The penalty for willfully making a false claim is: A maximum fine of $10,000 or maximum imprisonment of 5 years, or both. *(U. S., Code, Title 18, section 287, formerly section 80.)*

REQUIRED ATTACHMENTS

1. Original and/or copies of travel orders and amendments as instructed.
2. Traveler's copy of each transportation request *(SF 1169B)* used.
3. All receipts from transportation officer for unused transportation requests, carriers' tickets, and meal tickets.
4. Receipts from carriers if cost of transportation is claimed.
5. Charge letters for transportation requests received en route.
6. Statements of nonavailability *(quarters, mess and directed mode of transportation).*

SYMBOLS

MEANS *(Mode)* OF TRAVEL

FIRST LETTER		SECOND LETTER	
1. TRNSPN REQ	T	5. AUTO	A
2. GOVT TRNSPN	G	6. BUS	B
3. COML TRNSPN	C	7. PLANE	P
(own expense)		8. RAIL	R
4. PRIVATE VEHICLE	P	9. VESSEL	V

REASONS FOR STOPS

10. AWAITING TRNSPN	AT	16. MISSION COMPLETE	MMC
11. CHANGE MODE OF TRNSPN	CM	17. MECHANICAL DIFFICULTY	
12. CREW REST	CR	18. PICKUP CARGO *(passengers)*	
13. DISCH CARGO *(passengers)*	DC	19. REMAIN OVERNIGHT	RON
14. LEAVE/DELAY EN ROUTE	LV	20. TEMPORARY DUTY	TDY
15. MAINTENANCE *(refuel)*	MA	21. WEATHER ADVERSE	WX

TYPE OF CHARGES

22. BACHELOR OFFICER'S QTS ..... BOQ
23. NON-GOV'T MEALS ..... NGM
24. NON-GOVERNMENT QTS ..... NGQ

DEFINITION *(This definition pertains to military personnel only)*

NON-GOVERNMENT QUARTERS AND MEALS

Meals and quarters furnished *(with or without charge)* incident to temporary duty by: (1) Local or State governments; (2) Foreign governments; (3) Other U. S. Government agencies, (4) U. S. Government contractors; or (5) Private organizations such as the National Red Cross during disasters.

REMARKS

VII. APPROVED FOR PAYMENT *(When required by individual service regulations)*

DATE	SIGNATURE OF AUTHORIZED APPROVING/CERTIFYING OFFICER

☆U.S. GOVERNMENT PRINTING OFFICE: 1973 — 525 - 063

ORIGINAL

Stub No. 11-0077-19263

REQUEST AND AUTHORIZATION FOR TDY TRAVEL OF DOD PERSONNEL

(Reference: Joint Travel Regulations)

Travel Authorized as Indicated in Items 2 through 21.

1. DATE OF REQUEST: 18 Mar 1975

REQUEST FOR OFFICIAL TRAVEL

2. NAME *(Last, First, Middle Initial)*: MARKS, Robert J., II [redacted]

3. POSITION TITLE AND GRADE OR RATING: Elec. Engr.

4. OFFICIAL STATION: NAD Crane, IN
Bldg. 38, Code 304B

5. ORGANIZATIONAL ELEMENT: Weapons Quality Engr. Center
Plans & Programs Div.

6. PHONE NO.: 1299

7. TYPE OF ORDERS: TDY Single

8. SECURITY CLEARANCE:

9. PURPOSE OF TDY: 1. Audit contractor's test facility, witness initiation of reliability testing and resolve any descrepancies. 2. Investigate in-house failure reports, discuss failures encountered and witness reliability testing currently in progress.

10a. APPROX NO. OF DAYS OF TDY *(Including travel time)*: 4 days

b. PROCEED O/A *(Date)*: 24 Mar 1975

11. ITINERARY ☐ VARIATION AUTHORIZED

From: NAD Crane, IN
or
Apt. 162
3111 Leonard Springs Road
Bloomington, IN 47401

To: Microcon Corporation
1115 Mearns Road, Warminster, PA 18974
AEL-EMTECH
PO Box 507, Lansdale, PA 19446
(and return)

$84.84

12. MODE OF TRANSPORTATION

COMMERCIAL				GOVERNMENT		
RAIL	AIR	BUS	SHIP	AIR	VEHICLE	SHIP
A	D	A			A	

☐ AS DETERMINED BY APPROPRIATE TRANSPORTATION OFFICER *(Overseas Travel only)*

PRIVATELY OWNED CONVEYANCE *(Check one)*

RATE PER MILE: 12¢

☒ MORE ADVANTAGEOUS TO GOVERNMENT

☐ MILEAGE REIMBURSEMENT AND PER DIEM LIMITED TO CONSTRUCTIVE COST OF COMMON CARRIER TRANSPORTATION & RELATED PER DIEM AS DETERMINED IN JTR. TRAVEL TIME LIMITED AS INDICATED IN JTR.

13. ☒ PER DIEM AUTHORIZED IN ACCORDANCE WITH JTR. Vol 2

☐ OTHER RATE OF PER DIEM *(Specify)*

14. ESTIMATED COST				15. ADVANCE AUTHORIZED
PER DIEM	TRAVEL	OTHER	TOTAL	
$ 87.50	$ 195.00	$	$ 282.50	$ 140.00

16. REMARKS *(Use this space for special requirements, leave, superior or 1st-class accommodations, excess baggage, registration fees, etc.)*

Authorized to drive POV to Indpls airport and return.

Authorized to drive GSA comm/lease (compact) car from Philadelphia to destinations and return. Vehicle authorized for official travel only. DIRECTED TO PAY CASH FOR RENTAL OF CAR.

17. REQUESTING OFFICIAL *(Title and signature)*: S. S. KALBERER, ACTING DIRECTOR, WQEC

18. APPROVING OFFICIAL *(Title and signature)*: RICHARD L. McGARVEY, Dir., Adm. Dept.

AUTHORIZATION

19. ACCTG. CITATION

APPROPRIATION AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NUMBER	SUB-AUTH.	AUTHORIZATION ACCOUNTING ACTIVITY	TYPE	TRAVEL ORDER *(Tango)* NO.	COST CODE
17X4912.2463	000	77777	0	000164	2E	TO-02977	000190110115

ORDER AUTHORIZING OFFICIAL *(Title and signature)* OR AUTHENTICATION: RICHARD L. McGARVEY, Dir., Adm. Dept., By direction

21. DATE ISSUED: 3/19/75

22. TRAVEL ORDER NUMBER: N0016475TO-02977

DD FORM 1 JUN 67 1610 S/N0102 — 016 7702

ORIGINAL

☆ GPO: 1972—709-110
NAVY OVERPRINT - JAN 1971

ORIGINAL

3/19/75: TC, NAD Crane, Ind., arranged transportation from Indianapolis, Indiana to Philadelphia, Pa. (and return), VIA: REG FARE Y/TW(PHL); S/AL(IND). 1 jet-mixed cl incl coach/std air furnished, est. cost $120.73. Issued against T/R #T-0994218.

V. L. Green
V. L. GREEN
Travel Clerk

DO: NAD CRANE, INDIANA 47522
NIF NO. 6913 DTD 3/20/75
PD ADVANCE PER DIEM 140.00
PD REGISTRATION FEE _____
T. BECKMAN 5132

DO: NAD, CRANE, INDIANA 47522
NIF NO. 7146 DTD 4/2/75
TOTAL PAID 164.11
T. BECKMAN 5132

ORIGINAL

T/O 1-1-1011.5
/O 105-22033

TRAVEL AUTHORIZATION REQUEST
9ND-NADC 4650/1(Rev. 7/74)

FROM (Name of Traveler)	TITLE AND GRADE	SOCIAL SECURITY NO.
ert J. Marks II	Electronics Engineer	[redacted]

HOME ADDRESS (If rural, include directions, when G/V is requested to and from Air Terminal)
Apt. 162
3111 Leonard Springs Road
Bloomington, IN 47401

OFFICE PHONE: 854-1299
BLDG: 38 CODE: 304B
HOME PHONE: 332-3892

TO	VIA	DATE
011A	(1) 30 (2) 304 (3) 3041 (4)	14 Mar 1975

TRAVEL ORDERS ARE REQUESTED AS FOLLOWS

ACTIVITIES TO BE VISITED AND PERSONNEL TO CONTACT	HOUR AND DATE REPORT	HOUR AND DATE COMPLETE
Microcon Corporation 1115 Mearns Road Warminster, PA 18974	25 Mar 75 1300	27 Mar 75 1200
AEL-EMTECH P. O. Box 507 Lansdale, PA 19446	27 Mar 75 1200	27 Mar 75 1730

PURPOSE OF VISIT

Attached

DESIRED MODE OF TRANSPORTATION

[X] AIR [ ] RAIL [ ] BUS [ ] POV [ ] G/V — TO AND FROM COMMERCIAL CARRIER [ ] G/V [X] POV

[X] RENTAL CAR AT TDY STATION (Justification if required) Previous experience dictates the necessity of a rental car for transportation to and from contractor facilities.

	YES	NO
WILL YOU PROVIDE POV TRANSPORTATION FOR OTHERS		X
WILL YOU ACCOMPANY OTHERS IN POV		X

ADVANCE OF FUNDS [ ] YES [ ] NO [X] MAX

TAD CONNECTED LEAVE IS REQUESTED FOR _____ DAYS

EXCESS BAGGAGE (Government owned material) _____ POUNDS [ ] ONE WAY [ ] ROUND TRIP

CLEARANCE REQUIRED
[X] SECRET [ ] CONFIDENTIAL [ ] NONE

IF REQUIRED FORWARD TO (Activity and address)
Send 6 month clearance to above addresses

REMARKS (Continue on reverse side if necessary)
1. Contractor controlled travel.
2. Traveler requests departure from Indianapolis on TWA Flight 266 on 25 Mar 75, and departure from Philadelphia on TWA Flight 961 on 29 Mar 75.

SIGNATURE (Department Director)	SIGNATURE (Traveler)
	Robert J. Marks II

1. MICROCOM

NAVAIR contracts require contractor to demonstrate that Avionic equipment designed and manufactured by them are capable of meeting the requirements of the contract and/or equipment specification with a specified minimum reliability. Details of the reliability demonstration tests to be performed by the contractor are detailed in the reliability test procedures which were previously submitted by them and approved by Crane for use in conducting these tests. The following travel is in support of NAVAIR AIRTASK A5335331/1592/ 50050000002. NAD Crane Code 3041 is assigned technical cognizance of production reliability acceptance test programs for Avionics System being procured by NAVAIRSYSCOM.'

The purpose of this trip is to audit contractor's test facility, witness initiation of reliability testing and resolve any descrepancies in conducting these tests. This Contract N00019-74-C-0106 is for the acquisition and testing of DKT-30 transmitting sets, Engineering Support Control C112.140.

2. AEL-EMTECH

NAVAIR Contract N00019-74-C-0135 is for the acquisition and testing of the AN/ARR-75 sonobuoy receiver. Engineering Support Control C112-158 assigned this activity responsibility for performing production reliability surveillance on this contract.

The purpose of this trip is to further investigate in-house failure reports, discuss failures encountered and witness reliability testing currently in progress.

ROOM			
36	Robert Marks.	14-84	09593
NO. PARTY		DATE	FOLIO NO.
1			
OUT DATE			
3/27		FROM	
ARRIV.			
3/25		TO	

Paid for 2 nights
3/25 + 3/26

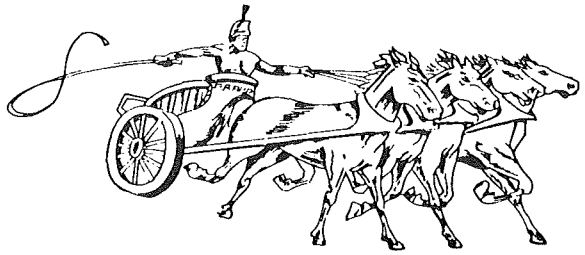
Paid 3/27.

14.81
29.62
44.72

BALANCE FORWARD

Bernie Shay's

GOLDEN CHARIOT MOTEL



RESTAURANT—COCKTAIL LOUNGE—BANQUET ROOMS
ROUTE 309, MONTGOMERYVILLE, PA.
(215) 699-4417

R.A. 541800

CHARGES

CUSTOMER RENTER		VEHICLE NO.	MAKE	LICENSE NO.
CURRENT RESIDENCE				MODEL
	STATE			
DRIVERS LICENSE	STATE			
EXPIRATION DATE	DATE OF BIRTH	VEHICLE DUE BACK	DATE AND TIME	OUT
LOCAL ADDRESS OR REFERENCE	PHONE			
ADDRESS				
REFERENCE				
ADDITIONAL CONDITIONS				
RENTER WILL BE PROSECUTED IF VEHICLE NOT RETURNED WHEN DUE BACK.				

MINIMUM RENTAL ONE DAY PLUS MILEAGE. MILEAGE CHARGES COMPUTED FROM FACTORY INSTALLED ODOMETERS.	HRS.		
	DAYS		
MILEAGE IN	WKS. @		
MILEAGE OUT			
TOTAL MILES	@ PER MILE		
A VEHICLE CHECKED IN AT ANY POINT OTHER THAN ORIGINAL RENTING CITY MAY BE SUBJECT TO AN INTERCITY CHARGE.	TOTAL TIME AND MILES		
ACCEPTS / By his initials, customer accepts or declines Travel Accident Insurance (T.A.I.) as outlined in separate synopsis / DECLINES	SUB-TOTAL		
	INTERCITY DROP FEE		
BY HIS INITIALS IN THE BOX BELOW, CUSTOMER ACKNOWLEDGES THE COLLISION RESPONSIBILITY AS SPECIFIED IN PARAGRAPH 5, PAGE 1, (OTHER SIDE.)	SUB-TOTAL		
$250 Collision Responsibility / $100 Collision Responsibility / Collision Damage Waiver	SUB-TOTAL		
	CDW @ PER DAY		
RATE DOES NOT INCLUDE GASOLINE / GAS REFUND	T.A.I. Days $1.00 Weeks $5.00		
GAS CREDIT	MISC. ADJ.		
TANK FILL	CHARGE (CREDIT)		
GASOLINE LEVEL / INITIAL DEPOSIT	NET REVENUE		
IN / ADD'L. DEPOSIT	DEPOSIT		
OUT / DATE REC'D. BY	BAL. DUE A/(CUSTOMER)		
FINAL RENTAL CHARGE SUBJECT TO CONTRACT AUDIT	R.A. OUT BY	R.A. IN BY	

VEHICLE CONDITION

DAMAGE OUT	DAMAGE IN
Spare and jack OK (Customer's Initials)	Spare and jack OK (Clerk's Initials)

TO BE PAID BY: (CREDIT CARD IMPRINT OR BILLING INFORMATION)

NAME	CHARGE TYPE
COMPANY	☐ AI
ADDRESS	☐ AIR TRAV ☐ AMEX
CITY STATE	☐ B of AM ☐ CARTE B
DIVISION	☐ DINERS ☐ M.CHG.
CLAIM NO.	☐ HOME ☐ CORP. ☐
I HAVE READ THE TERMS AND CONDITIONS ON PAGE 1 (OTHER SIDE) AND PAGE 2 OF THIS AGREEMENT AND AGREE THERETO:	REFUND RECEIVED
REFERRED BY (SOURCE) / Posted / PAID $	CASH / CHECK

CUSTOMER IS LIABLE FOR PARKING & TRAFFIC VIOLATIONS

CUSTOMER'S COPY

THANK YOU

8 0775:1M

WE APPRECIATE YOUR PATRONAGE

ORIGINAL

Stub No. 11-0056-19230

REQUEST AND AUTHORIZATION FOR TDY TRAVEL OF DOD PERSONNEL

(Reference: Joint Travel Regulations)

Travel Authorized as Indicated in Items 2 through 21.

1. DATE OF REQUEST: 25 Feb 1975

REQUEST FOR OFFICIAL TRAVEL

2. NAME (Last, First, Middle Initial)	3. POSITION TITLE AND GRADE OR RATING	
MARKS, Robert J., II [redacted]	Elect. Engr.	
4. OFFICIAL STATION	**5. ORGANIZATIONAL ELEMENT**	**6. PHONE NO.**
NAD Crane, IN Bldg. 38, Code 304B	Weapons Quality Engr. Center Plans & Programs Div.	1299
7. TYPE OF ORDERS	**8. SECURITY CLEARANCE**	**9. PURPOSE OF TDY**
TDY Single		1. NAVAIR Contract N00019-74-C-0135 for the acquisition of AN/ARR-75 Sonobuoy Receiver Set Work Unit Assignment C112.158. 2. Review and discuss Reliability Qualification and Sampling Test Procedures.
10a. APPROX NO. OF DAYS OF TDY *(Including travel time)*	*b.* PROCEED O/A *(Date)*	
3 days	3 Mar 1975	

11. ITINERARY ☐ VARIATION AUTHORIZED

From: NAD Crane, IN
or
Apt. 162
3111 Leonard Springs Rd.
Bloomington, IN 47401

To: AEL-EMTECH, P.O. Box 507
Lansdale, PA 19446
Microcon Corporation, 1115 Mearns Road
Warminster, PA 18974
(and return)

12. MODE OF TRANSPORTATION

COMMERCIAL				GOVERNMENT			PRIVATELY OWNED CONVEYANCE *(Check one)*
RAIL	AIR	BUS	SHIP	AIR	VEHICLE	SHIP	RATE PER MILE: 12¢
	D	A			A		☒ MORE ADVANTAGEOUS TO GOVERNMENT

☐ AS DETERMINED BY APPROPRIATE TRANSPORTATION OFFICER *(Overseas Travel only)*

☐ MILEAGE REIMBURSEMENT AND PER DIEM LIMITED TO CONSTRUCTIVE COST OF COMMON CARRIER TRANSPORTATION & RELATED PER DIEM AS DETERMINED IN JTR. TRAVEL TIME LIMITED AS INDICATED IN JTR.

13. ☒ PER DIEM AUTHORIZED IN ACCORDANCE WITH JTR. Vol 2

☐ OTHER RATE OF PER DIEM *(Specify)*

14. ESTIMATED COST

PER DIEM	TRAVEL	OTHER	TOTAL	15. ADVANCE AUTHORIZED
$ 62.50	$ 175.00	$	$ 237.50	$ 95.00

16. REMARKS *(Use this space for special requirements, leave, superior or 1st-class accommodations, excess baggage, registration fees, etc.)*

Authorized to drive POV to Indpls airport and return.

Authorized to drive GSA comm/lease (compact) car from Philadelphia to destinations and return. Vehicle authorized for official travel only. DIRECTED TO PAY CASH FOR RENTAL OF CAR.

17. REQUESTING OFFICIAL *(Title and signature)*	18. APPROVING OFFICIAL *(Title and signature)*
A. F. WHITNER, DIRECTOR, WQEC	RICHARD L. McGARVEY, Dir., Adm. Dept.

AUTHORIZATION

ACCTG. CITATION	APPROPRIATION AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NUMBER	SUB-AUTH.	AUTHORIZATION ACCOUNTING ACTIVITY	TYPE	TRAVEL ORDER *(Tango)* NO.	COST CODE
	17X4912.2463	000	77777	0	000164	2E	TO-02830	000190110115

ORDER AUTHORIZING OFFICIAL *(Title and signature)* OR AUTHENTICATION

RICHARD L. McGARVEY, Dir., Adm. Dept., By direction

21. DATE ISSUED: 2/26/75

22. TRAVEL ORDER NUMBER: N0016475TO-02830

DD FORM 1 JUN 67 1610 S/N0102 — 016 7702

☆GPO: 1972—708-520
NAVY OVERPRINT - JAN 1971

ORIGINAL

ORIGINAL

2/26/75: TC, NAD Crane, Ind., arranged transportation from Indianapolis, Indiana to Philadelphia, Pa. (and return), VIA: REG FARE Y/TW(PHL); Y/TW(IND). 1 jet coach cl air furnished, est. cost $120.73. Issued against T/R #T-0994213.

V. L. Green
V. L. GREEN
Travel Clerk

248.81 jm

DO: NAD CRANE, INDIANA 47522
NIF NO. 6594 DTD 2/26/75
PD ADVANCE PER DIEM 95.00
PD REGISTRATION FEE _____
T. BECKMAN 5132

DO: NAD, CRANE, INDIANA 47522
NIF NO 6734 DTD 3/10/75
TOTAL PAID 128.08
T. BECKMAN 5132

ORIGINAL

TRAVEL VOUCHER OR SUBVOUCHER

(Cc[illegible]e with ink, ball-point pen or typew[illegible]r. DO NOT use lead pencil.)

BUREAU VOU NO. | SUBVOUCHER NO. | DO. VOUCHER NO. NIF#6734

PAYMENT [illegible] | PAYMENT DE[illegible]ED | PAID BY

TDY/TAD PER DIEM [X] | TDY/TAD TRAVEL [ ] | PCS TRAVEL [X] | CHECK [ ] | CASH

TRAVEL ORDERS *(Paragraph, S. O. No., Issuing Hq. Date. Include amending orders.)*

N0016475TO-02830 2/26/75 NAD Crane, IN

FOR TRAVEL PAYMENTS OR ADVANCES UNDER THESE ORDERS *(Amount, DO Vou No., date received, place paid, DO Station No. If none, so state.)* $95.00, NIF #6594, 2/26/75, NAD Crane, IN.

LAST NAME - FIRST NAME - MIDDLE INITIAL *(Soundex Code) (Print/Type)*	GRADE/RANK	SSN
MARKS, ROBERT J. II	GS-9	282-46-2721

CHECK MAILING ADDRESS	DUTY PHONE NO.
NAD Crane, IN.	1298

ORGANIZATION AND STATION

WQEC, NAD Crane, IN

I. ITINERARY *(See Reverse for Definition)*

DATE 19 75		LOCAL STANDARD TIME (24 Hour Clock)	PLACE (Base, Activity, City and State; City and Country, Etc.)	MODE OF TRAVEL	REASON FOR STOP	GOVT QTS USED	GOVT QTS NOT USED	NON-GOVT QTS USED	NUMBER MEALS USED: GOVT	NON-GOVT	OFFICERS OPEN MESS	SPEEDOMETER READING OR MILEAGE
Mar 3	DEP	0545	Residence	PA								54
	ARR	0730	Weir Cook		CM							
	DEP	0835	Indianapolis, IN	CP								3/3
	ARR	1115	Philadelphia, Intl.		TDY							3/4
Mar 5	DEP	1205	Airport, Phila.,Pa.	CP								3/5
	ARR	1340	Weir Cook		CM							
	DEP	1415	Indianapolis, IN.	PA								
Mar 5	ARR	1600	Residence		MMC							54
	DEP											
	ARR		Total actual cost of									
	DEP		lodging (2 nights)$29.68									
	ARR											TRANS 108mi

II. FOR DO USE ONLY

1. COMPUTATIONS

3/4 18.75

1 25.00

3/4 18.75

12.96

III. REIMBURSABLE EXPENSES

DATE	NATURE AND EXPLANATION	AMOUNT CLAIMED	ALLOWED	BAS/COLA ADJ ON MP R
Mar3,5	Mileage to and from airport 108 mi.	12.96		
	Tolls	2.10	2.10	BAS/COLA ADJ NOT REQUIRED
	Parking	6.00	6.00	
	Rental Car	44.52	44.52	BAS/COLA RATE

IV. TRANSPORTATION REQUESTS/MEAL TICKETS USED

NUMBER	FROM	TO
T/R #T-0994213	Indianapolis, IN	Philadelphia, PA (and return)

DD 753 [ ] HI WY

OTD [ ] CC

V. CHARGES - BOQ OR NON-GOVT MEALS AND QTS

FROM *(Date)*	TO *(Date)*	TYPE	RATE	TOTAL PAID

VI. LEAVE STATEMENT

I was authorized _____ days leave, _____ days were taken between _____ and _____ inclusive.

2. SUMMARY OF PAYMENT

PER DIEM *(Net Payable)*	62.90
MILEAGE OR TRANSPORTATION ALLOWANCES	12.96
REIMBURSABLE EXPENSES	52.62
TOTAL AMOUNT DUE	128.08
LESS PREVIOUS PAYMENTS *(Droppage)*	
AMOUNT CHARGED TO ACCOUNT'G CLASS.	128.08
LESS VOUCHER DEDUCTIONS	95.00

I hereby claim any amount due me. The statements on face, reverse, and attached are true and complete. Payment or credit has not been received.

SIGNATURE OF CLAIMANT AND DATE

ROBERT J. MARKS II

APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUR. CONT. NO./SUB ALLOT. NO.	AUTH. ACCT'G ACTIVITY	TYPE	TRAVEL ORD. NO. / AUX. COST CODE	COST CODE	AMOUNT
17X4912.2463	000	77777	000164	2E	T0-02830	000190110115	128.08
Stub No. 11-0056-19230							

COLLECTION DATA:

COMPUTED BY	AUDITED BY	TVL RCRD POSTED BY	RECEIVED *(Payee signature & date, or check no.)*	AMOUNT PAID
			70 121 934	33.08

DD FORM 1 JUL 65 1351-2 (6 PT) (NAVY OVERPRINT) S/N 0102-013-2802 FORM APPROVED BY COMP. GEN., U.S. APRIL 28, 1972

CLAIMANT'S STATEMENTS

I have included herein all travel and transportation used on leave, delay en route or travel to home or permanent station for personal reasons. If travel by POV was authorized as more advantageous to the Government I, as owner or operator of the vehicle, was primarily responsible for payment of its operating expenses.

I have not included travel, transportation and/or TDY for which I have received pay or credit from any other agency of the U. S., foreign government, or the United Nations, except as jointly authorized by the secretaries concerned.

I actually performed the travel herein. Government quarters and Government mess were not utilized except as indicated.

PENALTY

The penalty for willfully making a false claim is: A maximum fine of $10,000 or maximum imprisonment of 5 years, or both. *(U. S., Code, Title 18, section 287, formerly section 80.)*

REQUIRED ATTACHMENTS

1. Original and/or copies of travel orders and amendments as instructed.
2. Traveler's copy of each transportation request *(SF 1169B)* used.
3. All receipts from transportation officer for unused transportation requests, carriers' tickets, and meal tickets.
4. Receipts from carriers if cost of transportation is claimed.
5. Charge letters for transportation requests received en route.
6. Statements of nonavailability *(quarters, mess and directed mode of transportation).*

SYMBOLS

MEANS *(Mode)* OF TRAVEL

FIRST LETTER	SECOND LETTER
1. TRNSPN REQ.....T	5. AUTO.....A
2. GOVT TRNSPN.....G	6. BUS.....B
3. COML TRNSPN.....C	7. PLANE.....P
(own expense)	8. RAIL.....R
4. PRIVATE VEHICLE.....P	9. VESSEL.....V

REASONS FOR STOPS

10. AWAITING TRNSPN.....AT	16. MISSION COMPLETE.....M
11. CHANGE MODE OF TRNSPN.....CM	17. MECHANICAL DIFFICULTY.....ME
12. CREW REST.....CR	18. PICKUP CARGO *(passengers)*.....PC
13. DISCH CARGO *(passengers)*.....DC	19. REMAIN OVERNIGHT.....RON
14. LEAVE/DELAY EN ROUTE.....LV	20. TEMPORARY DUTY.....TD
15. MAINTENANCE *(refuel)*.....MA	21. WEATHER ADVERSE.....I

TYPE OF CHARGES

22. BACHELOR OFFICER'S QTS.....BOQ 23. NON-GOV'T MEALS.....NGM

24. NON-GOVERNMENT QTS.....NGQ

DEFINITION *(This definition pertains to military personnel only)*

NON-GOVERNMENT QUARTERS AND MEALS

Meals and quarters furnished *(with or without charge)* incident to temporary duty by: (1) Local or State governments; (2) Foreign governments; (3) Other U. S. Government agencies, (4) U. S. Government contractors; or (5) Private organizations such as the National Red Cross during disasters.

REMARKS

VII. APPROVED FOR PAYMENT *(When required by individual service regulations)*

DATE	SIGNATURE OF AUTHORIZED APPROVING/CERTIFYING OFFICER

☆U.S. GOVERNMENT PRINTING OFFICE: 1973 — 525 - 083

Stub No. 11-0056-19230

REQUEST AND AUTHORIZATION FOR TDY TRAVEL OF DOD PERSONNEL

(Reference: Joint Travel Regulations)

Travel Authorized as Indicated in Items 2 through 21.

1. DATE OF REQUEST: 26 Feb 1975

REQUEST FOR OFFICIAL TRAVEL

NAME *(Last, First, Middle Initial)*	3. POSITION TITLE AND GRADE OR RATING	
MARKS, Robert J., II 282-48-2721	Elect. Engr.	
4. OFFICIAL STATION	5. ORGANIZATIONAL ELEMENT	6. PHONE NO.
NAD Crane, IN Bldg. 38, Code 3048	Weapons Quality Engr. Center Plans & Programs Div.	1299

7. TYPE OF ORDERS	8. SECURITY CLEARANCE	9. PURPOSE OF TDY
TDY Single		1. NAVAIR Contract N00019-74-C-0135 for the acquisition of AN/ARR-75 Sonobuoy Receiver Set Work Unit Assignment C112.150. 2. Review and discuss Reliability Qualification and Sampling Test Procedures.
10a. APPROX NO. OF DAYS OF TDY *(Including travel time)*: 3 days	b. PROCEED O/A *(Date)*: 3 Mar 1975	

11. ITINERARY ☐ VARIATION AUTHORIZED

From: NAD Crane, IN
or
Apt. 162
3111 Leonard Springs Rd.
Bloomington, IN 47401

To: AEL-EMTECH, P.O. Box 507
Lansdale, PA 19446
Microcon Corporation, 1115 Mearns Road
Warminster, PA 18974
(and return)

12. MODE OF TRANSPORTATION

COMMERCIAL				GOVERNMENT			PRIVATELY OWNED CONVEYANCE *(Check one)*
RAIL	AIR	BUS	SHIP	AIR	VEHICLE	SHIP	RATE PER MILE: 12¢
	D	A			A		☒ MORE ADVANTAGEOUS TO GOVERNMENT

☐ AS DETERMINED BY APPROPRIATE TRANSPORTATION OFFICER *(Overseas Travel only)*

☐ MILEAGE REIMBURSEMENT AND PER DIEM LIMITED TO CONSTRUCTIVE COST OF COMMON CARRIER TRANSPORTATION & RELATED PER DIEM AS DETERMINED IN JTR. TRAVEL TIME LIMITED AS INDICATED IN JTR.

☒ PER DIEM AUTHORIZED IN ACCORDANCE WITH JTR. Vol 2

☐ OTHER RATE OF PER DIEM *(Specify)*

14. ESTIMATED COST				15. ADVANCE AUTHORIZED
PER DIEM	TRAVEL	OTHER	TOTAL	
$ 62.50	$ 175.00	$	$ 237.50	$ 95.00

16. REMARKS *(Use this space for special requirements, leave, superior or 1st-class accommodations, excess baggage, registration fees, etc.)*

Authorized to drive POV to Indpls airport and return.

Authorized to drive GSA comm/lease (compact) car from Philadelphia to destinations and return. Vehicle authorized for official travel only. DIRECTED TO PAY CASH FOR RENTAL OF CAR.

17. REQUESTING OFFICIAL *(Title and signature)*	18. APPROVING OFFICIAL *(Title and signature)*
A. E. WHITMER, DIRECTOR, WQEC	RICHARD L. McCARVEY, Dir., Adm. Dept.

AUTHORIZATION

ACCTG CITATION	APPROPRIATION AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NUMBER	SUB-AUTH.	AUTHORIZATION ACCOUNTING ACTIVITY	TYPE	TRAVEL ORDER *(Tango)* NO.	COST CODE
	17X4912.2463	000	77777	0	000164	2E	T0-02830	0001901T0115

20. ORDER AUTHORIZING OFFICIAL *(Title and signature)* OR AUTHENTICATION

RICHARD L. McCARVEY, Dir., Adm. Dept., By direction

21. DATE ISSUED: 2/26/75

22. TRAVEL ORDER NUMBER: N0016475T0-02830

DD FORM 1 JUN 67 1610 S/N0102 — 016 7702

☆GPO: 1972—708-520
NAVY OVERPRINT - JAN 1971

B. Marks

TRAVEL AUTHORIZATION REQUEST
9ND-NADC 4650/1(Rev. 7/74)

U.O. [illegible]-1011-5
C.O. [illegible]-22033

FROM (Name of Traveler)	TITLE AND GRADE	SOCIAL SECURITY NO.
Robert J. Marks II	Electronics Engineer	[redacted]

HOME ADDRESS (If rural, include directions, when G/V is requested to and from Air Terminal)

Apt. 162
3111 Leonard Springs Rd.
Bloomington, IN 47401

OFFICE PHONE: 854-1299
BLDG: 38 | CODE: 304B
HOME PHONE: 332-3892

TO	VIA	DATE
011A	(1) 30 (2) 304 (3) 304B (4)	2/20/75

TRAVEL ORDERS ARE REQUESTED AS FOLLOWS

ACTIVITIES TO BE VISITED AND PERSONNEL TO CONTACT	HOUR AND DATE REPORT	HOUR AND DATE COMPLETE
AEL-EMTECH P. O. Box 507 Lansdale, PA 19446	1300 3 Mar 75	1300 4 Mar 75
Microcon Corporation 1115 Mearns Road Warminster, PA 18974	1400 4 Mar 75	1000 5 Mar 75

PURPOSE OF VISIT

Attached

DESIRED MODE OF TRANSPORTATION

[X] AIR [ ] RAIL [ ] BUS [ ] POV [ ] G/V

TO AND FROM COMMERCIAL CARRIER [ ] G/V [X] POV

[X] RENTAL CAR AT TDY STATION (Justification if required) Previous experience dictates the necessity of a rental car for transportation to and from contractor facilities.

	YES	NO
WILL YOU PROVIDE POV TRANSPORTATION FOR OTHERS		X
WILL YOU ACCOMPANY OTHERS IN POV		X

ADVANCE OF FUNDS [ ] YES [ ] NO [X] MAX

TAD CONNECTED LEAVE IS REQUESTED FOR _____ DAYS

EXCESS BAGGAGE (Government owned material) _____ POUNDS [ ] ONE WAY [ ] ROUND TRIP

CLEARANCE REQUIRED
[X] SECRET [ ] CONFIDENTIAL [ ] NONE

IF REQUIRED FORWARD TO (Activity and address)
Send 6 month clearances to above addresses

REMARKS (Continue on reverse side if necessary)

1. Contractor controlled travel
2. Traveler requests departure from Indianapolis on TWA Flight 266 on 3 Mar 75 and departure from Philadelphia on Flight 539 (TWA) on 5 Mar 75.

SIGNATURE (Department Director)

SIGNATURE (Traveler) Robert J. Marks II

Under the authority of Avionics Production Reliability Surveillance AIRTASK A5335331/1592/50050000002 NAD Crane (304) is assigned technical cognizance of production reliability acceptance test programs for Avionics System being procured by NAVAIRSYSCOM.

AEL-EMETCH - NAVAIR Contract N00019-74-C-0135 for the acquisition of AN/ARR-75 Sonobuoy Receiver Set Work Unit Assignment C112.158 from AEL Emtech Corp. The reliability qualification test on this equipment has resulted in a reject decision. The contractor is required conditions set forth in specifications and the contract to propose a plan of corrective action and demonstration of same. The purpose of this meeting is to investigate in-house failure reports, discuss the failures encountered and evaluate contractor's corrective actions to eliminate these failures.

MICROCON - Review and discuss with DCASR and the contractor the Reliability Qualification and Sampling Test Procedures that will be used in conducting the reliability test. Any areas of conflict will be dissolved during this meeting.

WE APPRECIATE YOUR PATRONAGE

PARKING

06.00

THANK YOU

12943-5

INTERNATIONAL RENT-A-CAR

LICENSEE—LESSOR

G.S.A. WEST WING

AGREEMENT PAGE 2

CUSTOMER (RENTER)		VEHICLE NO.	MAKE	LICENSE NO.
CURRENT RESIDENCE		OWNING CITY	RENTING CITY	MODEL
CITY	STATE	PHONE	VEHICLE TO BE CHECKED IN AT	DATE AND TIME IN
DRIVERS LICENSE NO.	STATE	VEHICLE DUE BACK BY	DATE AND TIME OUT 1-3 11:22 AM
EXPIRATION DATE / HAIR / EYES / Height / Weight	DATE OF BIRTH		
LOCAL ADDRESS OR REFERENCE	PHONE	MINIMUM RENTAL-ONE DAY PLUS MILEAGE. MILEAGE CHARGES COMPUTED FROM FACTORY INSTALLED ODOMETERS	HRS. @ / DAYS @ / WKS. @
ADDRESS			
REFERENCE		MILEAGE IN	
ADDITIONAL CONDITIONS:		MILEAGE OUT	
RENTER WILL BE PROSECUTED IF VEHICLE NOT RETURNED WHEN DUE BACK.		TOTAL MILES 189	PER MILE
		A VEHICLE CHECKED IN AT ANY POINT OTHER THAN ORIGINAL RENTING CITY MAY BE SUBJECT TO AN INTERCITY CHARGE.	TOTAL TIME AND MILES
VEHICLE CONDITION			
DAMAGE OUT	DAMAGE IN	By his initials, customer accepts or declines Travel Accident Insurance (T.A.I.) as outlined in separate brochure.	SUB-TOTAL
Spare and Jack OK (Customer's Initials)	Spare and Jack OK (Clerk's Initials)		INTERCITY DROP FEE
TO BE PAID BY (CREDIT CARD IMPRINT OR BILLING INFORMATION)		BY HIS INITIALS IN THE BOX BELOW, CUSTOMER ACKNOWLEDGES THE COLLISION RESPONSIBILITY AS SPECIFIED IN PARAGRAPH 5, PAGE 1, (OTHER SIDE).	SUB-TOTAL
NAME	CHARGE TYPE	$250 Collision Responsibility / $100 Collision Responsibility / Collision Damage Waiver	SUB-TOTAL
COMPANY	☐ AIR TRAV		CDW @ PER DAY
ADDRESS	☐ AMEX	RATE DOES NOT INCLUDE GASOLINE	T.A.I. Days $1.00 Weeks $5.00
CITY STATE	☐ BAC/AM / ☐ CARTE B / ☐ DINERS / ☐ M.CHG. / ☐ HOME / ☐ CORP.	GAS REFUND / GAS CREDIT / TAX / FED.	MISC. ADJ.
DIVISION			CHARGE (CREDIT)
CLAIM NO.			
I HAVE READ THE TERMS AND CONDITIONS ON PAGE 1 (OTHER SIDE) AND PAGE 2 OF THIS AGREEMENT AND AGREE THERETO.	REFUND RECEIVED	GASOLINE LEVEL IN / OUT	INITIAL DEPOSIT / ADD'L. DEPOSIT / DATE REC'D. BY	NET REVENUE / DEPOSIT / BAL. DUE AI (CUSTOMER)
REFERRED BY (SOURCE) / Posted / PAID $	CASH / CHECK		R.A. OUT BY / R.A. IN BY

CUSTOMER IS LIABLE FOR PARKING & TRAFFIC VIOLATIONS

CUSTOMER'S COPY

Stamp: In accordance with G.S.A. contract... invoice(s) conditions of G.S.A. contract; I hereby certify that amounts invoiced do not exceed the contract levels established in accordance with ... Aug. 15, 197_ ... 15.

G.S.A.

Stub No. 11-0326-0042

ORIGINAL

REQUEST AND AUTHORIZATION FOR TDY TRAVEL OF DOD PERSONNEL

(Reference: Joint Travel Regulations)

Travel Authorized as Indicated in Items 2 through 21.

1. DATE OF REQUEST: 22 Nov 1974

REQUEST FOR OFFICIAL TRAVEL

2. NAME *(Last, First, Middle Initial)*	3. POSITION TITLE AND GRADE OR RATING	
MARKS, ROBERT J. [redacted]	Elect. Engr., GS-9	
4. OFFICIAL STATION	**5. ORGANIZATIONAL ELEMENT**	**6. PHONE NO.**
NAD Crane, IN Bldg. 120, Code 304B	Weapons Quality Engr. Center Plans & Programs Divn.	1370

7. TYPE OF ORDERS	8. SECURITY CLEARANCE	9. PURPOSE OF TDY
TDY Single		Training: Elements of Reliability & Maintenance Training Course.
10a. APPROX NO. OF DAYS OF TDY *(Including travel time)*	***b.* PROCEED O/A *(Date)***	
21 days	1 Dec 1974	

11. ITINERARY ☐ VARIATION AUTHORIZED

From: NAD Crane, IN
or
311 Leonard Springs Rd., Apt. 162
Bloomington, IN

To: AMETA
Rock Island, IL
(and return)

12. MODE OF TRANSPORTATION

COMMERCIAL				GOVERNMENT			PRIVATELY OWNED CONVEYANCE *(Check one)*
RAIL	AIR	BUS	SHIP	AIR	VEHICLE	SHIP	RATE PER MILE: 12¢
							☒ MORE ADVANTAGEOUS TO GOVERNMENT
							☐ MILEAGE REIMBURSEMENT AND PER DIEM LIMITED TO CONSTRUCTIVE COST OF COMMON CARRIER TRANSPORTATION & RELATED PER DIEM AS DETERMINED IN JTR. TRAVEL TIME LIMITED AS INDICATED IN JTR.

AS DETERMINED BY APPROPRIATE TRANSPORTATION OFFICER *(Overseas Travel only)*

13. ☒ PER DIEM AUTHORIZED IN ACCORDANCE WITH JTR Vol 2.
☐ OTHER RATE OF PER DIEM *(Specify)*

14. ESTIMATED COST				15. ADVANCE AUTHORIZED
PER DIEM	TRAVEL	OTHER	TOTAL	
$ 493.75	$ 90.00	$	$ 583.75	$ 550.00

16. REMARKS *(Use this space for special requirements, leave, superior or 1st-class accommodations, excess baggage, registration fees, etc.)*

Authorized to drive POV to destination and return.

POV not authorized for daily transportation - several motels in Rock Is. area furnish daily transportation to AMETA and return.

DD Form 1556 approved by James E. Fultz, Mgr., Training Div., 11/25/74.

17. REQUESTING OFFICIAL *(Title and signature)*	18. APPROVING OFFICIAL *(Title and signature)*
A. E. WHITNER, Director, WQEC	RICHARD L. McGARVEY, Director, Adm. Dept.

AUTHORIZATION

19. ACCTG. CITATION	APPROPRIATION AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NUMBER	SUB-AUTH.	AUTHORIZATION ACCOUNTING ACTIVITY	TYPE	TRAVEL ORDER *(Tango)* NO.	COST CODE
	17X4912.2463	000	77777	0	000164	2E	TO-02146	000190110115

20. ORDER AUTHORIZING OFFICIAL *(Title and signature)* OR AUTHENTICATION

RICHARD L. McGARVEY, Director, Adm. Dept., By direction

21. DATE ISSUED: 11/27/74

22. TRAVEL ORDER NUMBER: N0016475TO-02146

DD FORM 1 JUN 67 1610 S/N0102 — 016 7702

ORIGINAL

☆ GPO: 1972—709-110
NAVY OVERPRINT - JAN 1971

DO: NAD CRANE, INDIANA 47522
NIF NO. 4801 DTD 11/27/74
PD ADVANCE PER DIEM 550.00
PD REGISTRATION FEE _____
for Lee Sicard
T. BECKMAN 5132

DO: NAD, CRANE, INDIANA 47522
NIF NO 5983 DTD 1/21/75
TOTAL PAID 580.15
for Lee Sicard
T. BECKMAN 5132

TRAVEL VOUCHER OR SUBVOUCHER

(Complete with ink, ball-point pen or typewriter. DO NOT use lead pencil.)

BUREAU VOU NO. | SUBVOUCHER NO. | DO. VOUCHER NO. NIF 5983

PAYMENT FO. | PAYMENT DESIRED | PAID BY

X	TDY/TAD PER DIEM	X	TDY/TAD TRAVEL		PCS TRAVEL	X	CHECK		CASH

T N RDERS *(Paragraph, S. O. No., Issuing Hq. Date. Include amending orders.)*

N001647TO-02146, 11/27/74, NAD Crane, IN

PRIOR TRAVEL PAYMENTS OR ADVANCES UNDER THESE ORDERS *(Amount, DO Vou No., date received, place paid, or DO Station No. If none, so state.)*

$550.00, NIF 4901, 11/27/74, NAD Crane, IN

LAST NAME - FIRST NAME - MIDDLE INITIAL *(Soundex Code) (Print/Type)*	GRADE/RANK	SSN
MARKS, Robert J. II	GS-7	382-48-2721

CHECK MAILING ADDRESS	DUTY PHONE NO.
NAD Crane, IN	1285

ORGANIZATION AND STATION

WQEC, NAD Crane, IN

I. ITINERARY *(See Reverse for Definition)*

DATE 1974	LOCAL STANDARD TIME (24 Hour Clock)		PLACE (Base, Activity, City and State; City and Country, Etc.)	MODE OF TRAVEL	REASON FOR STOP	GOVT QTS USED	GOVT QTS NOT USED	NON-GOVT QTS USED	NUMBER MEALS USED: GOVT	NUMBER MEALS USED: NON-GOVT	NUMBER MEALS USED: OFFICERS OPEN MESS	SPEEDOMETER READING OR MILEAGE
12/1	DEP	0730	Bloomington, IN	PA								0
"	ARR	1600			TDY							390
12/20	DEP	1330	Rock Island, IL	PA								0
"	ARR	2130			PMC							387
	DEP		Bloomington, IN									12/1
	ARR											1/22-20
	DEP											
	ARR											
	DEP											
	ARR											
	DEP											TRANS
	ARR											

II. FOR DO USE ONLY

1. COMPUTATIONS

3/4 18.75

19 475.00

720mi 86.40

III. REIMBURSABLE EXPENSES

DATE	NATURE AND EXPLANATION	AMOUNT CLAIMED	ALLOWED
12/1&12/20	Mileage to and from Rock Island (See Remarks)	93.24	
12/1-12/20	Actual total cost of lodging at TDY location		XX
	was	264.84	
			XX

BAS/COLA ADJ ON MP R

BAS/COLA ADJ NOT REQUIRED

BAS/COLA RATE

IV. TRANSPORTATION REQUESTS/MEAL TICKETS USED

NUMBER	FROM	TO

DD 753 | HI WY | OTD | CC

V. CHARGES - BOQ OR NON-GOVT MEALS AND QTS

FROM (Date)	TO (Date)	TYPE	RATE	TOTAL PAID

VI. LEAVE STATEMENT

I was authorized _____ days leave. _____ days were taken between _____ and _____ inclusive.

2. SUMMARY OF PAYMENT

PER DIEM *(Net Payable)*	493.75
MILEAGE OR TRANSPORTATION ALLOWANCES	86.40
REIMBURSABLE EXPENSES	
TOTAL AMOUNT DUE	580.15
LESS PREVIOUS PAYMENTS *(Droppage)*	
AMOUNT CHARGED TO ACCOUNT'G CLASS.	
LESS VOUCHER DEDUCTIONS	580.15

I hereby claim any amount due me. The statements on face, reverse, and attached are true and complete. Payment or credit has not been received.

SIGNATURE OF CLAIMANT AND DATE: Robert J. Marks II 11/6/75

APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUR. CONT. NO./SUB ALLOT. NO.	AUTH./ ACCT'G ACTIVITY	TYPE	TRAVEL ORD. NO. / AUX. COST CODE	COST CODE	AMOUNT
17X4912.2463		77777	164	2E		000190110115	
Stub #11-0326-19042							580.15

COLLECTION DATA:

COMPUTED BY	AUDITED BY	TVL RCRD POSTED BY	RECEIVED *(Payee signature & date, or check no.)*	AMOUNT PAID
			70 120 965	30.15

DD FORM 1 JUL 65 1351-2 (6 PT) (NAVY OVERPRINT) S/N 0102-013-2802

FORM APPROVED BY COMP. GEN., U.S. APRIL 28, 1972

CLAIMANT'S STATEMENTS

I have included herein all travel and transportation used on leave, delay en route or travel to home or permanent station for personal reasons. If travel by POV was authorized as more advantageous to the Government I, as owner or operator of the vehicle, was primarily responsible for payment of its operating expenses.

I have not included travel, transportation and/or TDY for which I have received pay or credit from any other agency of the U. S., foreign government, or the United Nations, except as jointly authorized by the secretaries concerned.

I actually performed the travel herein. Government quarters and Government mess were not utilized except as indicated.

PENALTY

The penalty for willfully making a false claim is: A maximum fine of $10,000 or maximum imprisonment of 5 years, or both. *(U. S., Code, Title 18, section 287, formerly section 80.)*

REQUIRED ATTACHMENTS

1. Original and/or copies of travel orders and amendments as instructed.
2. Traveler's copy of each transportation request *(SF 1169B)* used.
3. All receipts from transportation officer for unused transportation requests, carriers' tickets, and meal tickets.
4. Receipts from carriers if cost of transportation is claimed.
5. Charge letters for transportation requests received en route.
6. Statements of nonavailability *(quarters, mess and directed mode of transportation).*

SYMBOLS

MEANS *(Mode)* OF TRAVEL

FIRST LETTER		SECOND LETTER	
1. TRNSPN REQ	T	5. AUTO	A
2. GOVT TRNSPN	G	6. BUS	B
3. COML TRNSPN *(own expense)*	C	7. PLANE	P
4. PRIVATE VEHICLE	P	8. RAIL	R
		9. VESSEL	V

REASONS FOR STOPS

10. AWAITING TRNSPN	AT	16. MISSION COMPLETE	MMC
11. CHANGE MODE OF TRNSPN	CM	17. MECHANICAL DIFFICULTY	[illegible]
12. CREW REST	CR	18. PICKUP CARGO *(passengers)*	
13. DISCH CARGO *(passengers)*	DC	19. REMAIN OVERNIGHT	[illegible]
14. LEAVE/DELAY EN ROUTE	LV	20. TEMPORARY DUTY	TDY
15. MAINTENANCE *(refuel)*	MA	21. WEATHER ADVERSE	WX

TYPE OF CHARGES

22. BACHELOR OFFICER'S QTS ..... BOQ
23. NON-GOV'T MEALS ..... NGM
24. NON-GOVERNMENT QTS ..... NGQ

DEFINITION *(This definition pertains to military personnel only)*

NON-GOVERNMENT QUARTERS AND MEALS

Meals and quarters furnished *(with or without charge)* incident to temporary duty by: (1) Local or State governments; (2) Foreign governments; (3) Other U. S. Government agencies, (4) U. S. Government contractors; or (5) Private organizations such as the National Red Cross during disasters.

REMARKS

VII. APPROVED FOR PAYMENT *(When required by individual service regulations)*

DATE	SIGNATURE OF AUTHORIZED APPROVING/CERTIFYING OFFICER

☆U.S. GOVERNMENT PRINTING OFFICE: 1973 — 525 - 063

Stub No. 11-0326-0042

ORIGINAL

REQUEST AND AUTHORIZATION FOR TDY TRAVEL OF DOD PERSONNEL

(Reference: Joint Travel Regulations)

Travel Authorized as Indicated in Items 2 through 21.

1. DATE OF REQUEST: 22 Nov 1974

REQUEST FOR OFFICIAL TRAVEL

2. NAME *(Last, First, Middle Initial)*: MARKS, ROBERT J. [redacted]

3. POSITION TITLE AND GRADE OR RATING: Elect. Engr., GS-9

4. OFFICIAL STATION: NAD Crane, IN
Bldg. 120, Code 304B

5. ORGANIZATIONAL ELEMENT: Weapons Quality Engr. Center
Plans & Programs Divn.

6. PHONE NO.: 1370

7. TYPE OF ORDERS: TDY Single

8. SECURITY CLEARANCE:

9. PURPOSE OF TDY: Training: Elements of Reliability & Maintenance Training Course.

10a. APPROX NO. OF DAYS OF TDY *(Including travel time)*: 21 days

b. PROCEED O/A *(Date)*: 1 Dec 1974

11. ITINERARY ☐ VARIATION AUTHORIZED

From: NAD Crane, IN
or
311 Leonard Springs Rd., Apt. 162
Bloomington, IN

To: AMETA
Rock Island, IL
(and return)

12. MODE OF TRANSPORTATION

COMMERCIAL				GOVERNMENT		
RAIL	AIR	BUS	SHIP	AIR	VEHICLE	SHIP

AS DETERMINED BY APPROPRIATE TRANSPORTATION OFFICER *(Overseas Travel only)*

PRIVATELY OWNED CONVEYANCE *(Check one)*

RATE PER MILE: 12¢

☒ MORE ADVANTAGEOUS TO GOVERNMENT

☐ MILEAGE REIMBURSEMENT AND PER DIEM LIMITED TO CONSTRUCTIVE COST OF COMMON CARRIER TRANSPORTATION & RELATED PER DIEM AS DETERMINED IN JTR. TRAVEL TIME LIMITED AS INDICATED IN JTR.

13. ☒ PER DIEM AUTHORIZED IN ACCORDANCE WITH JTR Vol 2.

☐ OTHER RATE OF PER DIEM *(Specify)*

14. ESTIMATED COST

PER DIEM	TRAVEL	OTHER	TOTAL	15. ADVANCE AUTHORIZED
$ 493.75	$ 90.00	$	$ 583.75	$ 550.00

16. REMARKS *(Use this space for special requirements, leave, superior or 1st-class accommodations, excess baggage, registration fees, etc.)*

Authorized to drive POV to destination and return.

POV not authorized for daily transportation - several motels in Rock Is. area furnish daily transportation to AMETA and return.

DD Form 1556 approved by James E. Fultz, Mgr., Training Div., 11/25/74.

17. REQUESTING OFFICIAL *(Title and signature)*: A. E. WHITNER, Director, WQEC

18. APPROVING OFFICIAL *(Title and signature)*: RICHARD L. McGARVEY, Director, Adm. Dept.

AUTHORIZATION

19. ACCTG. CITATION

APPROPRIATION AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NUMBER	SUB-AUTH.	AUTHORIZATION ACCOUNTING ACTIVITY	TYPE	TRAVEL ORDER *(Tango)* NO.	COST CODE
17X4912.2463	000	77777	0	000164	2E	TO-02146	000190110115

20. ORDER AUTHORIZING OFFICIAL *(Title and signature)* OR AUTHENTICATION: RICHARD L. McGARVEY, Director, Adm. Dept., By direction

21. DATE ISSUED: 11/27/74

22. TRAVEL ORDER NUMBER: N0016475TO-02146

DD FORM 1 JUN 67 1610 S/N0102 — 016 7702

ORIGINAL

☆ GPO: 1972—709-110
NAVY OVERPRINT - JAN 1971

DO: NAD CRANE, INDIANA 47522
NIF NO. 4801 DTD 11/27/74
PD ADVANCE PER DIEM 550.00
PD REGISTRATION FEE _____
for Dee Hicard
T. BECKMAN 5132

( )

DO: NAD, CRANE, INDIANA 47522
NIF NO 5983 DTD 1/21/75
TOTAL PAID 580.15
for Dee Hicard
T. BECKMAN 5132

Issued By SOLD SUBJECT TO CONDITIONS OF CONTRACT ON PASSENGER'S COUPON

TW PASSENGER TICKET AND BAGGAGE CHECK PASSENGER'S COUPON

AMERICAN AIRLINES, INC.

If the passenger's y involves an ultimate dest n or stop in a country other than the cou f departure, the Warsaw Co ion may be applicable and the Convention governs and in most cases limits the liability of carriers for death or personal injury and in respect of loss of or damage to baggage.

DATE OF ISSUE

NAME OF PASSENGER NOT TRANSFERABLE

ORIGIN

DESTINATION

1	2 NOT VALID BEFORE	3	4
1	2 NOT VALID AFTER	3	4

ORIGINALLY ISSUED AGAINST BY AGENTS NUMERIC CODE AT ON DATE YR.

TICKET DESIGNATOR & TOUR CODE

THIS TICKET ISSUED IN EXCHANGE FOR

NOT GOOD FOR PASSAGE		FARE BASIS	ALLOW	CARRIER	FLIGHT/CLASS	DATE	TIME	STATUS
FROM INDIANAPOLIS	Y			AA				
TO [illegible]	Y			AA				
TO SAN DIEGO	Y			AA				
TO DALLAS	Y			AA				
TO INDIANAPOLIS		BAGGAGE CHECKED UNCK'D	PCS. WT.	UNCK. WT.	PCS. WT.	UNCK. WT.	PCS. WT.	UNCK. WT.

FARE CY

TAX CY

EQUIV AMT PD. CY

TOTAL CY

ROUTE CODE | ENCODE | CPN | AIRLINE CODE 001 | FORM AND SERIAL NUMBER 5853003408 0 | CK

FROM TO	CAR-RIER	FARE CALCULATION

FARE CY

5853003408

DATE AND PLACE OF ISSUE

TWA

Agent

CONJUNCTION TICKET(S)

FORM OF PAYMENT

ENDORSEMENTS (Carbon)

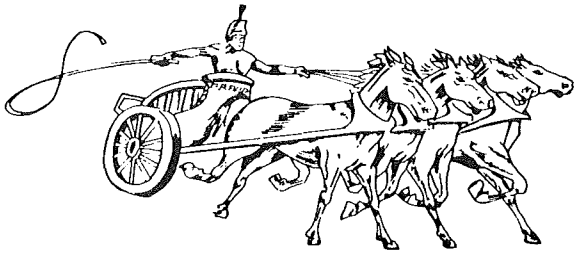
TWA FORM T-40

ROOM			
32	Bob. Marks.	14-	09053
NO. PARTY		E	FOLIO NO.
1			
OUT DATE			
3/4		FROM	
ARRIV.			
3/3/75		TO	

BALANCE FORWARD

Bernie Shay's

GOLDEN CHARIOT MOTEL



RESTAURANT—COCKTAIL LOUNGE—BANQUET ROOMS
ROUTE 309, MONTGOMERYVILLE, PA.
(215) 699-4417

ROBERT J. MARKS II - POV to Indpls airport and return

Lv Indpls.....TW#266-X.....0835.....3/3 (EST)
Ar Phila.....1101.....
Lv Phila.....TW#539-X.....1205.....3/5
Ar Indpls.....1338..... " (EST)

Please report to airport 45 min. prior to flight time.
Reconfirm return reservation.

computer generated **boarding pass**

TWA

PASSENGER COPY please present to flight attendar when boarding

ZONE	ROW	SEAT
RED	16	E

FLIGHT	CLASS	DATE	DESTINATION
0539	COACH	05MAR	IND

PAS-2454 (1-74)
PRINTED IN U.S.A.

NO._____

MARCH 4 19 75

RECEIVED FROM ROBERT MARKS, BLOOMINGTON INDIANA

FOURTEEN AND 84/100 DOLLARS

Room 32 - March 4 through 5, 1975

Account Total $ 14 84

Amount Paid $ 14 84 BERNIE SHAY'S GOLDEN CHARIOT

Balar Due $ _____

EFFICIENCY LINE AN AMPAD PRODUCT

TRAVEL

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
3041-RJM:sh
12340/2
11 Jun 1975

MEMORANDUM

From: 3041 (R. J. Marks)
To: 3041 (G. Allen)

Subj: Trip Report for the period of 2 Jun 1975 to 6 Jun 1975

Encl: (1) Verdin location and installation schedule

1. Activities Visited and persons contacted:

a. Naval Electronics Laboratory Center (NELC), San Diego, CA

b.

Roger Dishong	Project Engineer
Herb Greenstein	Reliability Engineer
George Pillion	Reliability Engineer
Al Villerreal	Installations
G. Hudnall	Verdin Shore Installation
J. Richter	Program Manager

2. Purpose of visit:

a. Review documents on the Verdin system for familiarization with operation and determination of past system effectiveness measures.

b. Determine location of Verdin equipment in the fleet including installation schedules.

c. Determine the extent of involvement of NELC in the Verdin effort and NELC's overall temperment in possible future consultation and support.

3. Discussion:

a. Verdin related documents which were reviewed during the NELC visit along with relevant content are:

(1) Preliminary Operational Instructions for Receiving Set Digital Data (U) AN/WRR7, NAVELEX 0976-462-3031.

(2) Special Operational Instructions for Transmitting Set AN/ART50, NAVELEX 0967-462-5010, NAVAIR 16-30 ART 50-2.

(3) NELC Contract Specification VLF/LF Radio Receiving Set Digital Data (U) ELEX R119B (24 Sep 1973) AN/WRR-7.

(a) Specified MTBF: θ_0 = 1000 hrs.

(b) Reliability via MIL-STD-785.

(c) Reliability prediction required via MIL-HNBK-217 at 65° at Class IV environment.

(d) Maintainability program required via MIL-STD-470.

(e) Maintainability prediction required via MIL-HNBK-472.

(f) Reliability qualification: test plan V, level A of MIL-STD-781

(g) Maintainability demonstration required: method III of MIL-STD-471.

(h) Operating life = 10 years.

(i) Operational stability: must operate continuously for a period of 24 hours without adjustment.

(4) Naval Air Systems Command: Specification for Radio Group AN/ARA-(#)(U) AS-1238B (AV) (24 Sep 1973).

(a) ". . . (a) VLF/LF digital data communication system consisting of the transmitting set, digital data AN/ART-50 and a radio receiving set AN/ARR# . . . " for aircraft.

(b) Operating life = 50,000 hours.

(c) Specified MTBF including BIT electronics = 750 hours.

(d) BIT via AR 10.

(e) All equipment screening required via test plan II (reject line) test level E (cycle limits of -10° to 50°C) of MIL-STD-781.

(f) Operational stability: must operate continuously for 1500 hours without adjustment.

(5) NELC: Contract Specification Fixed Plant Digital Data Transmitting Set AN/URT 30 (U) ELEX-T84B (24 Sep 1973).

(a) Maintainability program from MIL-STD-470.

(b) Maintainability prediction from procedure II of MIL-HDBK 472.

(c) Total operating life = 10 years.

(d) Operational stability: Must operate 24 hours continuously without adjustment.

(e) Specified MTBF: θ_0 = 1000 hours.

(f) Reliability prediction required via MIL-HDBK 217.

(g) Reliability Qualification via test level A, test plan V of MIL-STD-781.

(h) Reliability Sampling via test level A, test plan V of MIL-STD-781.

(i) Operational stability: Must operate continuously for 24 hours without control adjustment.

(6) Collins Radio Group: Verdin Field Failure (1 May 1975)

(a) This report, issued first in April 1975 and generated monthly, lists all Verdin equipment returned to Collins for repair.

(b) Also listed are failure trends and suggested corrective action.

(7) Collins Radio Group: Verdin first article tests and documents

(a) Introduction and Summary

(b) Environmental Test Report AN/WRR-7 Vols I and II.

(c) Environmental Test Report AN/ART-50 Vols I and II

(d) Performance Test Report AN/VRC-62 Vols I, II, III, and IV.

(e) Tempest Test Report AN/WRR-7

(f) Tempest Test Report AN/ART-50

All first article testing has been completed successfully.

(8) NELC: Shore Installation Planning Guide

(a) This document contains the best overview of Verdin yet encountered by this activity.

b. The Verdin system consists of a shore transmitter, an aircraft relay, and a ship receiver. For the most part, Verdin has been installed on all the SSBN (ballistic) submarines. Installation on shore and in Tacamo aircraft is scheduled for initiation in June of this year. A more detailed schedule is included in enclosure (1).

c. The reception of this activity by NELC by those involved directly with Verdin was for the most part formal. The reliability group at NELC, which was initially assigned TSA responsibility in the FRAP effort prior to travel restrictions, was most helpful to this activity during visitation. Ideas and thoughts concerning implementation of FRAP were shared freely and are discussed in section 4.

(1) NELC is extensively involved in the Verdin effort including participation in the following:

(a) Awarding and performance surveillance on the Trident radio room contract. At the time of visit the awarding of the contract to either ITT or RCA (to which the Collins Radio Group is subcontracted) was being determined.

(b) Verdin shore installation.

(c) Logistic support

(d) Design and production of Verdin software (Collins was unable to successfully fulfill this contractual area).

(e) Verdin first article test surveillance.

(f) NELC was also extensively involved in the early development of Verdin.

(2) NELC was initially assigned TSA responsibilities in the FRAP effort. Lack of travel however, prohibited their participation. This activity was informed that travel was again allowed at NELC almost immediately after cancellation of their TSA status, is still allowed, and is not expected to be restricted in the future.

4. Recommendations:

a. During the visitation, FRAP philosophy and ideas were discussed by Herb Greenstein and this activity. Mr. Greenstein has been involved in the area of reliability since its birth over twenty years ago and seems to mix well the statistical and physics aspects of reliability in his

engineering philosophy. He said he would have been involved extensively in the FRAP effort had NELC retained its TSA status.

b. Upon being told that FRAP might be collecting its own data from the fleet, Mr. Greenstein replied that this would largely be a duplication of effort with some of the many already existing governmental data collection effort. When told that the MDCS system had been determined inadequate as is for FRAP, he stated that most people, being only exposed to the MDCS data itself, did not appreciate the total capability of the MDCS data when coupled with the other available information. He suggested contacting Mr. J. Bell at Naval Ship Engineering Center at Norfolk for further information concerning MDCS capabilities.

c. Mr. Greenstein also offered other advice on execution of FRAP. Do not be overly concerned with exact data such as operating time per month or down times. Estimates suffice. Look, rather, for failure trends and other problems. The purpose of FRAP, he stated, is finding new system problems in the fleet in a timely manner, determining the physics of the failure or problem mode, and recommending timely corrective action. The purpose is not to measure exact MTBF's and generate lengthy reports.

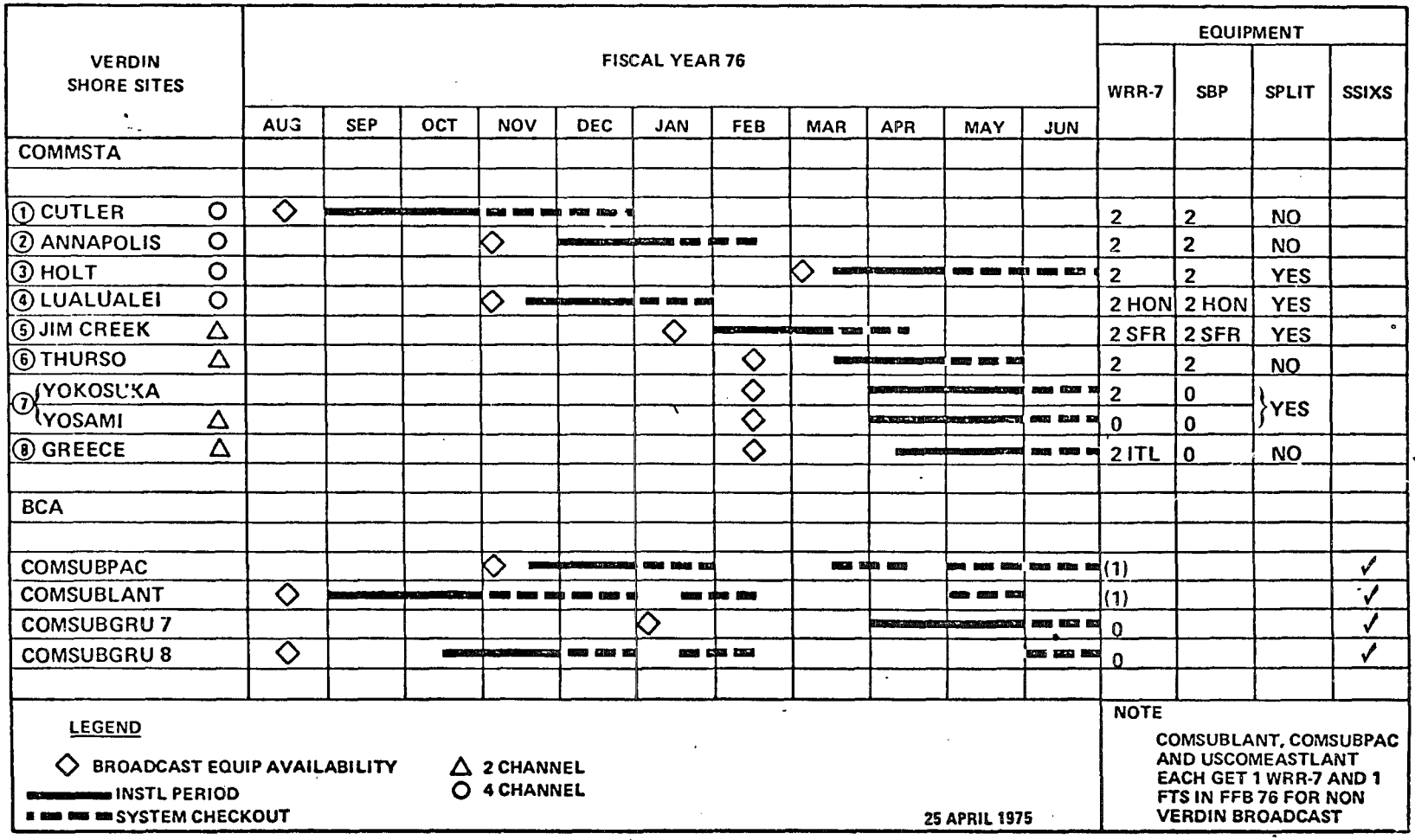
R. J. MARKS II

VERDIN INSTALLATION SCHEDULES

(this page unclassified)

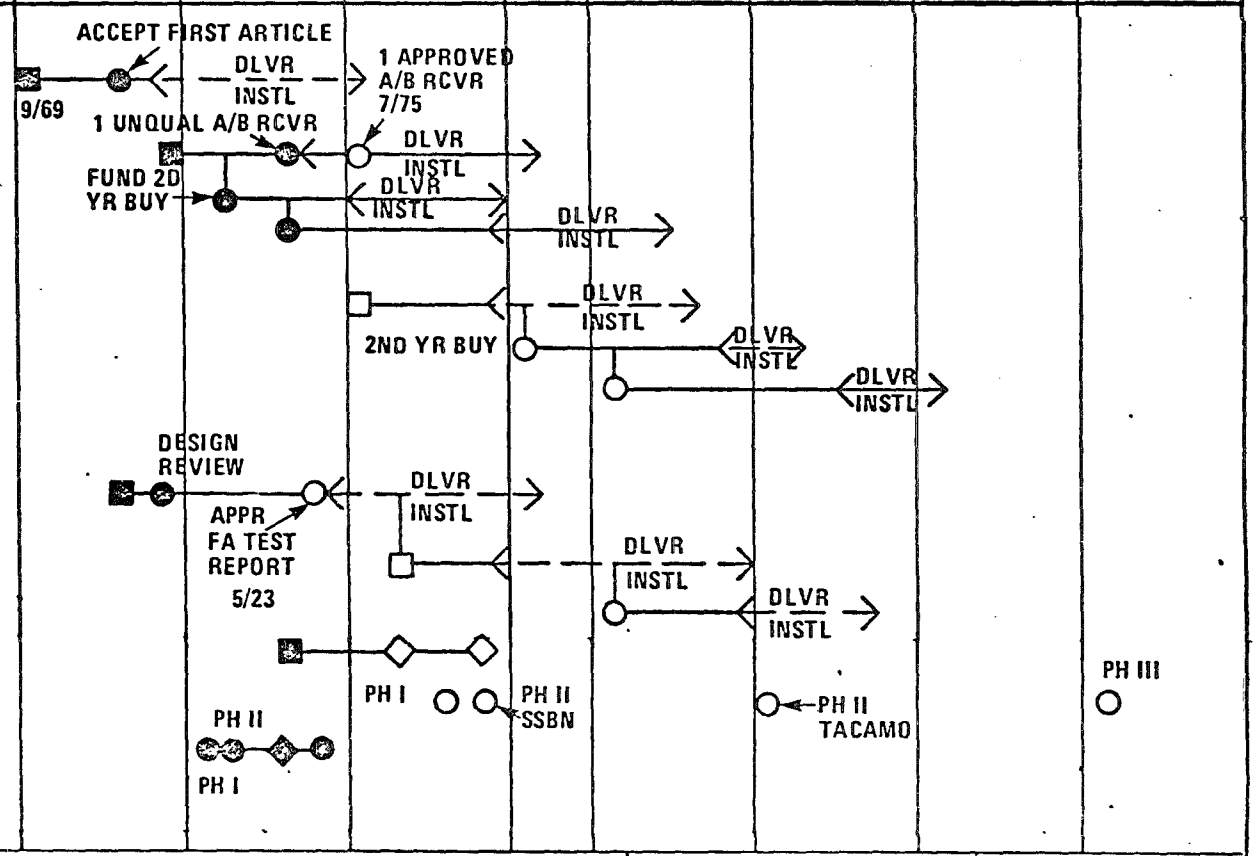
(enclosure 1)

COMMSTA/BCA VERDIN INSTALLATIONS



UNCLASSIFIED

PROJECT: VERDIN	FY 74-PRIOR	FY 75	FY 76	7T	FY 77	FY 78	FY 79	FY 80
FUNDING: OPN-2 (RDT&E)	25.027 (15.642)	8.200	8.900	1.600	12.1/12.0	1.3/6.9	.9/6.3	0.0/4.9
(MILLIONS) O&MN	2.460	1.934	2.600	.608	3.0/ 3.9	3.6/ 3.6	2.8/3.6	2.4/3.5
SCN	5.157	.437	.266	–	–/ .80	–/ 1.1	–/ .68	–/ .47



STATUS
1. FUNDS
2. SCHEDULE
3. TECHNICAL
4. SUPPORT

KG 38 28V DC POWER SUPPLY; PROVISIONING/SYSTEMS STOCK
KG 38s; SHIP/SHORE INSTL; 3RD BUY.
FTS RELIABILITY
SUPPLY SUPPORT

FUNDING
FY 74 PRIOR – PROC SUM
FY 75/76 – SPENDING PLAN
FY 7T – FYDP
FY 77 → FYDP/POM 77

SYMBOLS
□ CONTRACT
◇ DLVRY/INSTALL
○ CRITICAL EVENT

DATE OF REPORT: 25 APRIL 1975

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF: LF/MF COMMUNICATIONS

REV NO:

TYPE OF ALTERATION: [ ] TECH [X] MIL

EIC NO.: 0 1 0 7 0 0 0

CIP - OPNAV INST 4720.XX: 2 6 D

CIP DATE: 6 F E B 7 1

SHIP ALTERATION
TYPE: C V A / C V A N / C V S
CLASS:
NUMBER: 4 3 5 9 / 4 3 6 0 / 8 0 3

SIG. NO.:

CAT FUNCT:

PRIORITY:
[ ] SHIP SAFETY
[ ] PERSONNEL SAFETY
[X] MISSION RELIABILITY
[ ] MAINTENANCE

ASSOCIATED WITH:
[ ] ORDALT
[ ] MIPALT
[ ] FIELD CHANGE

APPROVAL
SIGNATURE: L R Jones
TITLE: Mgr. Aircraft Carrier Ship Log Di
DATE (Mo., Da., Yr.): 10/10/72

SCOPE DWG #:
BY:
DATE:

PURPOSE

Provide flexibility and increased capability needed for communication on the VLF/LF bands.

References:
See Page 3

APPLICABLE SHIPS		TITLE CATEGORY
HANCOCK CVA	19	K2265
ORISKANY	34	K1394
MIDWAY	41	K1173
F D ROOSEVELT	42	K1296
CORAL SEA	43	K1269
FORRESTAL	59	K 944
SARATOGA	60	K 655
RANGER	61	K 925
INDEPENDENCE	62	K 721
KITTY HAWK	63	K 612
CONSTELLATION	64	K 583
AMERICA	66	K 347
J F KENNEDY	67	K 469
ENTERPRISE CVAN	65	K 518
INTREPID CVS	11	K1435
TICONDEROGA	14	K1475

DESCRIPTION PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH THE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D. C. 20360.

1. This alteration has been developed to define the LF/MF portion of the radio communications system installation required to support assigned missions of the CVA/CVS ship types. Other closely associated radio communications systems functional capabilities are defined in the following Ship Alterations:

   SINGLE SIDEBAND COMMUNICATIONS - CVA-4355/CVS-801/CVAN-4356
   UHF COMMUNICATIONS-CVA-4357/CVS-802/CVAN-4358
   VHF COMMUNICATIONS - CVA-4361/CVS-804/CVAN-4362

THIS ALTERATION HAS BEEN ENTERED IN THE CSMP-DO NOT RESUBMIT

SHIP ALTERATION RECORD NAVSHIPS 4720/4 (REV. 1-69) (Formerly NAVSHIPS 99)

PAGE 1

UNCLASSIFIED

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF	RE
INSTALL VLF/LF/MF RECEIVE CAPABILITY	0

SHIP ALTERATION		
TYPE	CLASS	NUMBER
CLG		380

TYPE OF ALTERATION: ☐ TECH ☒ MIL

SIG. NO.	CAT./FUNCT	CIP - OPNAV INST 4720.xx	CIP DATE	EIC NO.
0132a	13000	077	9JAN69	FF0900

PRIORITY: ☐ SHIP SAFETY ☐ PERSONNEL SAFETY ☐ MISSION RELIABILITY ☐ MAINTENANCE

ASSOCIATED WITH: ☐ ORDALT ☒ MIPALT ☐ FIELD CHANGE

APPROVAL		
SIGNATURE Gustav F. Swanson, GUSTAV F. SWANSON,		
SCOPE DWG #	BY	DATE
N/A	N/A	N/A
TITLE CAPT USN, AAW SHIPS MAINT MGR	DATE (Mo, D	8/7/69

PURPOSE Provide VLF/LF/MF Radio Reciver Capability

APPLICABLE SHIPS	TITLE CATEG
GALVESTON CLG 3	K
LITTLE ROCK 4	
OKLAHOMA CITY 5	
PROVIDENCE 6	
SPRINGFIELD 7	
TOPEKA 8	

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

Install in appropriate spaces the equipment listed in Section II Paragraph I to achieve Radio Receiving capabilities in the VLF/LF/MF frequencies. Install additional air conditioning and ventilation as necessary.

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF: INSTALL AN/WRR-7 (VERDIN) RECEIVE SYS

REV NO.

SHIP ALTERATION — TYPE: SSN | CLASS: 594 | NUMBER: 1491

TYPE OF ALTERATION: [ ] TECH [x] MIL

CIP - OPNAV INST 4720.xx	SIG. NO.	CAT./FUNCT	CIP DATE	EIC NO.
33E	3860Q	1300	180769	QB1L000

PRIORITY: [ ] SHIP SAFETY [ ] PERSONNEL SAFETY [x] MISSION RELIABILITY [ ] MAINTENANCE

ASSOCIATED WITH: [ ] ORDALT [ ] MIPALT [ ] FIELD CHANGE

APPROVAL

SIGNATURE: /s/ P. R. Sacilotto

SCOPE DWG #	BY	DATE	TITLE	DATE (Mo, Da, Yr)
0441-065-015	NAVSHIPYD CHASN	11-5-72	DEP. LOG. MGR. SHIPS 425	7-19-72

PURPOSE

To install an on-line multichannel VLF/LF communications system (Type "Q").

This alteration developed from Provisional Alteration A1491

This alteration should be accomplished concurrently with SHIPALT SSN-1363, or subsequent there-to.

APPLICABLE SHIPS	TITLE CATEGORY
SSN 594	K
SSN 595	K
SSN 596	K
SSN 603	K
SSN 604	K
SSN 605	K
SSN 606	K
SSN 607	K
SSN 612	K
SSN 613	K
SSN 614	K
SSN 615	K
SSN 621	K

13

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

EACH TRANSMITTAL OF THIS DOCUMENT OUTSIDE THE AGENCIES OF THE U.S. GOVERNMENT MUST HAVE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D.C. 20360

1. The following items are to be installed in the Radio Room under this ShipAlt:

a. R-1738/URR Receiver (replaces AN/BRR-3 receiver)

b. O-1612/URC Frequency and Time Standard (replaces AN/URQ-9 or AN/URQ-10)

CONT'D ON PAGE 1 A

THIS ALTERATION HAS BEEN ENTERED IN THE CSMP---DO NOT RESUBMIT CODE C

K-5

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF	REV NO.
INSTALL VERDIN (AN/WRR-7) RCVR SYS	

SHIP ALTERATION

TYPE	CLASS	NUMBER
SSN		1546

TYPE OF ALTERATION: ☐ TECH ☒ MIL

SIG. NO.	CAT./FUNCT	CIP - OPNAV INST 4720.XX	CIP DATE	EIC NO.
386Q		33E	180769	QB1L000

PRIORITY: ☐ SHIP SAFETY ☐ PERSONNEL SAFETY ☒ MISSION RELIABILITY ☐ MAINTENANCE

ASSOCIATED WITH: ☐ ORDALT ☐ MIPALT ☐ FIELD CHANGE

APPROVAL

SCOPE DWG #	BY	DATE	SIGNATURE / TITLE	DATE (Mo, Da, Yr)
See Ref 16	CHASN N.S.Y.	1/13/72	DEP LOG. MGR. SHIPS 425	10/13/72

PURPOSE

To install Verdin Receiver System (AN/WRR-7)

This ShipAlt developed from Provisional ShipAlt A1491.

APPLICABLE SHIPS	TITLE CATEGORY
SSN 571	K
SSN 575	K
SSN 578	K
SSN 579	K
SSN 583	K
SSN 584	K
SSN 585	K
SSN 587	K
SSN 588	K
SSN 590	K
SSN 591	K
SSN 592	K
SSN 597	K

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

EACH TRANSMITTAL OF THIS DOCUMENT OUTSIDE THE AGENCIES OF THE U.S. GOVERNMENT MUST HAVE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D.C, 20360

1. The VERDIN (AN/WRR-7) Receiver System is to be installed in the Radio Room on applicable submarines. VERDIN equipment consists of one R-1738/URR VLF/LF Receiver; one OR-1612/URC Frequency and Time Standard; one CP-1071/WR Processor and one MD-855/WRR-7 Demodulator-Power Supply in a CY-7113/WR Enclosure; two TSEC/KG-38 Key Generators; one 310275 Teletypewriter Power Supply; and one RA-8 Relay Panel with four R-91 Relays. (CONT'D ON PAGE 1A)

THIS ALTERATION HAS BEEN ENTERED IN THE CSMP---DO NOT RESUBMIT CODE C

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND
WASHINGTON, D. C. 20360

SECTION I - IDENTITY

SHIPALT BRIEF	REV NO.
INSTL VERDIN (AN/WRR-7) REC SYS	

SHIP ALTERATION

TYPE	CLASS	NUMBER
SSN	637	1547

TYPE OF ALTERATION: ☐ TECH ☒ M/L

SIG. NO.	CAT./FUNCT	CIP - OPNAV INST 4720.xx	CIP DATE	EIC NO.
386Q	1300	33E	180769	QB1L000

PRIORITY: ☐ SHIP SAFETY ☐ PERSONNEL SAFETY ☒ MISSION RELIABILITY ☐ MAINTENANCE

ASSOCIATED WITH: ☐ ORDALT ☐ MIPALT ☐ FIELD CHANGE

APPROVAL

SIGNATURE /s/ P. R. SACILOTTO

SCOPE DWG #	BY	DATE	TITLE	DATE (Mo, Da, Yr)
	NSY CHASN	4/17/72	DEP. LOG. MGR. SHIPS 425	10/12/72

PURPOSE

To install VERDIN System (AN/WRR-7)

This alteration developed from Provisonal Alteration A1491.

DESCRIPTION/PHYSICAL BOUNDARIES (Describe the SHIPALT and area of the ship and compartment involved. Refer to scoping documents as necessary.)

EACH TRANSMITTAL OF THIS DOCUMENT OUTSIDE THE AGENCIES OF THE U.S. GOVERNMENT MUST HAVE PRIOR APPROVAL OF THE COMMANDER, NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D.C. 20360

(1) Install one VERDIN Receive System (AN/WRR-7) in the radio room as outlined below.

SSN637 Class Short Hull (Refer to Ref 13)
(SSN 637-639), SSN 646-653, SSN660-670, SSN672-677)

A. Install (1 each) 0-1612 frequency and time standard and (1 each) CY 7113 Cabinet (containing the

CONT'D ON PAGE 1A)

THIS ALTERATION HAS BEEN EXTENDED IN THE CSMP---DO NOT RESUBMIT CODE C K-15

APPLICABLE SHIPS	TITLE CATEGORY
SSN 637	K
SSN 638	K
SSN 639	K
SSN 646	K
SSN 647	K
SSN 648	K
SSN 649	K
SSN 650	K
SSN 651	K
SSN 652	K
SSN 653	K
SSN 660	K
SSN 661	K
SSN 662	K
SSN 663	K
SSN 664	K
SSN 665	K
SSN 666	K
SSN 667	K
SSN 668	K
SSN 669	K
SSN 670	K
SSN 671	K
SSN 672	K
SSN 673	K
SSN 674	K
SSN 675	K
SSN 676	K
SSN 677	K

SHORE STATIONS

VERDIN SCHEDULE
AN/URT-30

3 GFE	Oct 1974 Nov 1974 Dec 1974
1 NORVA (Training)	Jan 1975
1 Spare	Jan 1975
1 Spare/Support	Feb 1975
2 Cutler Key/XMT	Del Jul 1975 Inst Sep 1975
2 Holt Key/XMT	Del Oct 1975 Inst Nov 1975
2 Lualualei Key/XMT	Del Nov 1975 Inst Dec 1975
2 Annapolis Key/XMT	Del Nov 1975 Inst Dec 1975
2 Jim Creek Key/XMT	Del Dec 1975 Inst Jan 1976
2 Thurso Key/XMT	Del Jan 1976 Inst Feb 1976
2 Greece Key/XMT	Del Feb 1976 Inst Mar 1976
2 Yosami XMT	Del Feb 1976 Inst Mar 1976
2 Yokosuka Key	Del Feb 1976 Inst Mar 1976
4 COMSUBLANT) WRR-7	Inst Feb 1976
3 COMSUBPAC)	Inst Feb 1976
2 USCOMEASTLANT	Inst Jun 1976
2 COMSUBGRU 7	Inst Jul 1976
2 COMSUBGRU 8	Inst Aug 1976

Pgs 9, 10, 11, 12 of THIS ENCLOSURE NOT INCLUDED IN THIS EDITION
Bob Marks
7/1/75

UNCLASSIFIED

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
3041-RJM:lcb
12340/2
1 April 1975

MEMORANDUM

From: 3041 (R. J. Marks II)
To: 3041 (R. Saum)
Via: 3041 (C. Rice)

Subj: Trip Report for the Period of 25 Mar to 28 Mar 1975

Ref: (a) Trip report for period 3 Mar to 5 Mar 1975, 304B-RJM:lcb, 12340/2 6 Mar 1975
(b) Acceptance Test Procedure, Part III, Reliability Qualification Test for AN/DKT-30 Transmitting Set Contract N00019-74-C-0106 Procedure AS2185B of 18 Apr 1974

1. Activities Visited and Persons Contacted

a. AEL-EMTECH Corporation, Lansdale, PA.

George McCumber	Engineering Manager
Howard Nobel	Contract Administrator
Jim Deering	Project Engineer

b. Microcom Corporation, Warminster, PA.

Morris Levine	Quality Control Manager
J. Reis	Production Manager
T. Azzaro	Technician

2. Purpose of Visit

a. AEL-EMTECH

Further investigation and consultation concerning failures encountered during the Reliability Qualification Test (RQT) on the ARR-75 sonobuoy receiver as discussed in paragraph 2a and 3a of reference (a) was the aim of this visitation.

b. Microcom

The RQT test on the DKT-30 transmitting set was executed during the visitation period. This activity's policy is to audit the contractor's test facility and witness initiation and resolve descrepancies for these tests.

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47822

IN REPLY REFER TO:
3041-RJM:lcb
12340/2
1 April 1975

MEMORANDUM

From: 3041 (R. J. Marks II)
To: 3041 (R. Saum)
Via: 3041 (C. Rice)

Subj: Trip Report for the Period of 25 Mar to 28 Mar 1975

Ref: (a) Trip report for period 3 Mar to 5 Mar 1975, 304B-RJM:lcb, 12340/2 6 Mar 1975
(b) Acceptance Test Procedure, Part III, Reliability Qualification Test for AN/DKT-30 Transmitting Set Contract N00019-74-C-0106 Procedure AS2185B of 18 Apr 1974

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a. AEL-EMTECH Corporation, Lansdale, PA.

George McCumber	Engineering Manager
Howard Nobel	Contract Administrator
Jim Deering	Project Engineer

b. Microcom Corporation, Warminster, PA.

Morris Levine	Quality Control Manager
J. Reis	Production Manager
T. Azzaro	Technician

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b. Microcom

The RQT test on the DKT-30 transmitting set was executed during the visitation period. This activity's policy is to audit the contractor's test facility and witness initiation and resolve descrepancies for these tests.

3. Discussion

a. AEL-EMTECH

(1) On production Failures

With reference to reference (a), two hand soldered connectors were recently discovered open prior to unit burn-in on the Reliability Acceptance Test (RAT). Even though the status of these failures is non-relevant, a production procedure change has been initiated to prevent future failures of this type. Failure analysis revealed that solder used in manufacturing the connectors was melting upon hand soldering leads in the production process. The vender, Sealectro, is presently producing the connectors with solder of a higher melting temperature (SP-5 type). The contractor has likewise abandoned hand mounting of the connectors in favor of the previously employed flow solder process. No further connector problems have been experienced after initiation of the above changes.
The mixers which are responsible for a gross pattern failure in the RQT and a single failure in the RAT are now being screened by thermal shock by the vender (MCL). In-house screening of the mixers, which is still in practice, has reduced in rejection of these mixers from 50% to about 5%.
The soldering and screening changes, as outlined above, will be incorporated into the production of the final 34 units.

(2) On Failure Reclassification Action

The contractor has forwarded, official letters of reclassification request for all RQT failures to Jim McHugh (NAVAIR), this activity, and other concerned parties. The contractor was advised that this activity has no authority for reclassification of failures unless such responsibility is assigned by NAVAIR. In view of the lack of action on the subject letter, the contractor was advised to telephone to speed resolution of the failure reclassification matter. No commitment was made on this activity's view concerning the RQT failure reclassification status.

b. Microcom

The RQT was undertaken at the AEL enviornmental test facilities. Eight units were pretested for preformance and then subjected to four thermal cycles which altogether spanned approximately 21 hours. Testing was performed at the end of each temperature plateau of each cycle. To facitate testing, the temperature cycling was completed before vibration in accordance with footnote on page 4 of reference (b). After cycling, the units were vibrated for four minutes. Due to the shortness of these vibration period and the length of time needed for an entire performance test, measurements were made only after the vibration was completed. No relevant failures were

experienced. One non-relevant failure occurred due to faulty test equipment wiring.
It is this witness's opinion that the RQT on the DKT-30 was executed in a completely professional and conscientious manner by the contractor.

ROBERT J. MARKS II

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
304B-RJM:lcb
12340/2
6 March 1975

MEMORANDUM

From: 304B (R.J. Marks II)
To: 304B (R. Saum)
Via: 304B (C. Rice)

Subj: Trip report for the period 3 March to 5 March 1975

1. Activities Visited and Persons Contacted

a. AEL-EMTECH Corporation, Lansdale, Pa.

George McCumber	Engineering Manager
Art Freedman	Quality Control Manager
Bill Haas	Design Engineer
Howard Nobel	Contract Administrator
John Carnevalle	DCAS
C. Garron	Head DCAS at AEL-EMTECH
Dick Hay	Test Manager (RQT)
Bob Lohmas	Test Manager (RAT)
Bill Latimer	Test Engineer
Harold Casale	VP and General Manager EMTECH
Jim Deering	Project Engineer

b. Microcom Corporation, Warminster, Pa.

Morris Levine	Quality Control Manager
Charles King	DCAS

2. Purpose of Visit

a. AEL-EMTECH

The contractor is presently required to propose corrective action on numerous failures encountered in the Reliability Qualification Test (RQT) of the ARR-75. The purpose of the meeting was to investigate in-house failure reports, discuss the failures encountered, and evaluate the contractor's corrective action to eliminate these failures.

b. Microcom

The Reliability Qualification Test on the DKT-30 is scheduled for initiation on 26 March 75. The purpose for Microcom visitation was for familiarization with facilities and personnel and for discussion of test procedures.

3. Discussion

a. AEL-EMTECH

On Failure Status: A total of thirteen failures, including two pattern and one dependent failure, have occured in the now aborted Reliability Qualification Test on the ARR-75:

i. 1 - Resistor (dependent)
ii. 6 - Mixers (pattern)
iii. 3 - Transformers (pattern)
iv. 1 - RF Filters (isolated)
v. 1 - RF Filters (isolated)
vi. 1 - Connector (isolated)

Failure analysis reports have been officially received by this activity on all but three of the above. Through these reports and information gained during the visit, respective corrective actions are as follows:

i. None (The contractor was informed that substantiation of the dependenency of the resistor failure must be made before official failure reclassification)

ii. Noisey diodes manufactured by HP for the MCL mixer have been isolated as the failure mode. Presently, the contractor is screening mixers for all production units.

iii. Open windings induced by thermal shock are the mode of these failures seemingly resulting from the fineness of the winding wire. In concurrance with vender's (United Transformer Company's) analysis, the corrective action presently incorperated into production units is use of a pre-thermal shocked transformer. An alternative under consideration for future units is use of a "dilesil" type transformer which has a much higher thermal enertia. Choice of corrective action will depend primarily upon required testing and cost effectiveness.

iv-v. All RF filters are presently being subjected to in-house screening procedures.

vi. Faulty mechanical soldering techniques have been determined to be the failure mode of the subject connectors. These connectors are presently being mounted by hand.

Corrective action, as outlined above, has been incorporated into over 90% of the production units. The effect of the corrective action as reflected in the Reliability Acceptance Test (RAT) and screening efforts is as

follows:

i. Not applicable

ii. In-house screening has resulted in rejection of approximately 50% of the MCL mixers. Jim Deering estimated that the screening procedure is roughly 95% effecient. A mixer that failed in the RAT had gone through the screening process and is thought to be a result of the lack of totally efficient screening procedures.

iii. No transformer failures have occured in the RAT. The thermal shock burn in, in this sense, has been effective.

iv-v. All filters have passed in-house screening procedures and no RAT failures have occurred. To date, the filter failures have thus truely earned the "isolated failure" title.

vi. No connector problems have been encountered since initiation of the hand mounting corrective action.

Concern was expressed for the large number of failures encountered in view of the lack of such failures on a previous EDMAC contract for the ARR-75. The AEL unit has identical parts, design, and test requirements. The contractor (AEL) is presently in the red on the subject contract and is anxious to take action toward reclassification of the RQT failures. Direction was promised concerning these matters during the week of 10 March 1975.

On Visitations and Observations

A Tour of AEL-EMTECH Facilities Founded the Following Remarks:

The Reliability testing facilities were impressive in size and diversity.

All calibration can be traced to NBS.

Different DCAS inspect different reliability aspects of the program due to the distance between AEL and EMTECH plants.

No specific failure analysis facilities exist. Dr. Pessel, a consultant, does much of this type of work. Other analysis is done employing available facilities.

Screening locations for the mixers and filters were visited. One individual is responsiable for each effort.

DCAS primarily observes testing by contractor invitation. Testing of all final production units is observed by DCAS.

b. Microcom

A tour of facility areas included the engineering design, production, thin film product fabrication, reliability test facilities, and machine shop. The contractor employs extremely rigorous step testing in production and part fabrication. The DKT-38 was observed in such a production profile.

ROBERT J. MARKS II

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
304B-RJM:sh
12340/2
7 Jan 1975

MEMORANDUM

From: 304B (R. J. Marks II)
To: 304B

Subj: TDY Training Report for period 2 - 20 Dec 1974

1. Activities Visited and Persons Contacted: United States Army Management Engineering Training Center (AMETA), Rock Island, IL.

   a. Cary Chittenden
   b. George Kalemkarian

2. Purpose of visit:

   a. To attend course entitled "Elements of Reliability and Maintainability".

   b. To find out information concerning the AMETA course on probabalistic design.

3. Discussion:

   a. An outline of the material covered in the course with corresponding description follows:

      (1) Introduction

         (a) History of and need for reliability and maintainability (R&M).

         (b) Definitions of R&M.

         (c) R&M program philosophy.

      (2) Probability and Statistics

         (a) Review of basic probability definitions and laws.

         (b) Review of probabistic tools.

            1. Set theory.

            2. "Tree" solutions to problems.

         (c) Common Probability Distributions

1. Weibull

2. Exponential

3. Binomial

4. Bernoulli

5. Poissan

6. Normal

7. Lognormal

8. Gamma

(d) Probability functions used in R & M.

1. Failure density

2. Cumulative failure

3. Reliability

4. Hazard

(e) Statistics

1. Distribution measures.

a. Central tendency (ex: mean, median).

b. Dispersion measures (ex: variance, range).

(3) System and Subsystem Reliability Models

(a) Models

1. General procedure

2. Series, parallel and mixed models.

3. Partial and standby redundancies.

4. Reliability apportionment.

a. AGREE method.

b. ARINC method.

(a) MonteCarlo simulation

(4) Reliability Demonstration and Testing

(a) Parameter estimation

1. Non-parametric analysis

2. Parametric Analysis

a. Graphical procedures

b. Goodness of fit tests.

c. Normal, Exponential, and Weibull parameter estimations.

(b) Test of hypotheses (for)

1. Normal distributions

2. Weibull distributions

3. Exponential distributions

(c) Acceptance life testing

1. Exponential (MIL-HDBK-H108)

2. Weibull

a. Mean life criterion (MIL-TR3)

b. Reliable life criterion (MIL-TR6)

c. Hazard rate criterion (MIL-TR4)

3. Normal (MIL-STD-414)

4. Non-Parametric (MIL-STD-105)

(d) Accelerated life testing

(5) Stress-Strength Analysis

(a) For known distributions

1. Graphical Solutions

2. For Normal densities

3. Reliability and Safety Margin approaches.

(b) Strength distribution determination

(c) For one-shot items

(6) Maintainability Analysis

(a) Concepts of Maintainability

(b) Maintainability functions

(c) Maintainability indices

1. Time

2. Cost

3. Effectiveness

(d) Probabilistic Aspects of Maintainability.

(e) Maintainability Apportionment

(f) Maintainability Predictions (RCA method).

(7) Introduction to Systems Effectiveness

(a) The Systems Effectiveness Model (-a function of Availability, Dependability and Capability) from WSEIAC effort.

Course materials obtained are:

1. Text: "Elements of Reliability and Maintainability".

2. Book of problem solutions from text.

3. Book of common probability tables and graphs.

4. Copies of:

a. MIL-STD-470: Maintainability Program Requirements.

b. MIL-STD-471: Maintainability Demonstration.

c. MIL-STD-785A: Reliability Programs for Systems and Equipment Development and Production.

d. Air Force Systems Command Manual: R & M research and development procedures manual.

All above material is published by AMETA, Rock Island, Illinois. Also obtained were copies of probalistic paper for plotting of exponential, weibull, and normal statistics.

b. The first week course entitled "Introduction to Probabalistic Design for Reliability" will be offered by AMETA starting on 9 June 1975. The course text has not yet been printed, but a copy will be forwarded on completion by request. A bibliography of recent work in probabalistic design may be found in the most recent issue of the IEEE Transactions on Reliability. Materials obtained concerning AMETA include:

(1) AMETA Course book including course listings and abstracts.

(2) A bar graph in time of courses offered by AMETA through 1975.

4. Recommendations:

a. The course taken provides an introductive overview of the philosophy and theory of reliability, maintainability, and systems effectiveness. Although integral and differential calculus are listed as prerequisities, the mechanics of the course can be executed with a firm knowledge of algebra and graph techniques if the concept of topic can be grasped intuitively. Basic probability theory is reviewed, making an apriori knowledge unnecessary. The listed prerequisites are thus thought strong in comparison to the course demands.

b. The quality of instruction, including materials, text, and instructor, was excellent. A slide rule calculator, however, is a helpful, yet unprovided tool for problem working and tests.

c. Overall, the course met its purpose and is recommended as a theoretical introductive overview to all concerned with R & M.

R. J. MARKS II

Copy to:
G. Allen, C. Rice, R. Saum

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
3041-RJM:sh
3010
2 Jun 1975

MEMORANDUM

From: 3041 (R. J. Marks II)
To: 3072 (J. Tumey)
Via: 3041 (C. Rice)

Subj: Review of Acceptance Test Procedure, Part III, Reliability Qualification Test for Sonobuoy Receiver System, An/ARR-72 by Edmac Associates Incorporated, Contract N00019-74-C-0538

Ref: (a) MIL-R-81859

1. The subject test procedure's reliability provisions have been reviewed for compliance with applicable documents and specifications and has been found to be in need of revision.

2. The following comments apply to the subject test procedure:

a. It is implied on page 9 and elsewhere that the thermal survey on the ARR-72 has not yet been run. If subsequent running of the thermal surveys concurs with estimate, the procedure should be revised accordingly.

b. If the thermal survey concurs with estimate:

(1) Paragraph 3.2, paragraph 4 - substitute "45" for "43" so that paragraph 5 follows.

(2) Similarly, substitute "45" for "43" on the top of page 6.

(3) Page 6, last sentence - substitute "5" for "6" and delete "plus the test time required to stabilize at the high temperature".

c. Paragraph 3.6 - include: the requirements delineated in sections 3 and 4 of the specification (reference (a)).

d. Paragraph 3.7, end of paragraph 4 - after "has been obtained" add the following sentence: "The procuring activity shall be notified immediately upon the occurrence of a suspicioned pattern failure".

e. Paragraph 3.7, paragraph 5 - change the phrase "cannot be determined to be determined" to "cannot be determined".

f. Paragraph 3.9.1 - The first "sentence" is truncated prematurely. Add, at its end, "the equipment will be tested to assure satisfactory operation".

3. It is requested that a copy of your letter be forwarded to Code 3041 (C. Rice).

R. J. MARKS

3041-RJM:sh
3010/1
14 MAY 1975

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana
To: Kollsman Instrument Company (Mr. J. Micali), 3 Capitol Street, Nashua, NH 03060

Subj: Reliability Test Procedures and Reports for the AAU-31/A Altimeter Contract N00019-74-C-0212 and AAU-32/A Altimeter Contract N00019-73-C-0541

Ref: (a) Kollsman ltr BS/mdk of 25 Oct 1974
(b) Kollsman ltr LS/75-0031 of 26 Feb 1975
(c) NAD Crane ltr JWS/ofw 13920 of 8 Nov 1974
(d) NAD Crane ltr 3041-RJM:sh 13070 of 27 Mar 1975
(e) NAD Crane ltr 3048-RJM:sh 13070 of 17 Mar 1975
(f) Production Reliability Test Report AAU-32A Report No. KSL-A-81852-32-001 submitted by Kollsman ltr AJ/hl of 3 Apr 1975

1. Naval Air Systems Command has assigned this activity the responsibility to determine that the Reliability Program requirements for the AAU-31A and AAU-32A altimeters procured under the subject contracts conform to the applicable contractual requirements. This assignment includes the responsibilities for reviewing and taking appropriate action on various aspects of the data requirements.

2. Reliability Test Procedures for the AAU-31/A were submitted by reference (a), revised by the contractor, and resubmitted by reference (b). The necessary modifications required before approval could be granted were requested by reference (c) and reiterated in reference (d). This activity is awaiting resubmittal of this test procedure so that final approval can be granted.

3. Reference (e) requested that copies of test results, failures, and corrective actions be forwarded to this activity on all phases of reliability testing. Reference (f) partially fulfilled this request.

4. During review of reference (f) it was noted that this report was insufficient in meeting requirements delineated in MIL-STD-781B, paragraph 5.11.1. The Reliability Test Reports should also include any testing executed previous to aborts, failures encountered, and the corrective action initiated.

3041-BJM:sh
3010/1

5. Concern is expressed that although Reliability testing on the subject contracts has been in progress several months, reference (f) is the only Reliability Report received to date.

6. Comments contained herein do not authorize or imply any changes in requirements or conditions of the contract or applicable specification.

7. If further information or clarification is required concerning this letter, please contact Mr. J. Seib or Mr. P. J. Marks II at 912-854-1299.

S. S. [illegible]
By direction

Copy to:
NAVAIRSYSCOM (AIR-53302), (AIR-53351B)
DCASR (Mr. Maneely, Kollsman)

Blind copy to:
3073 (J. Seib)

DEPARTMENT OF THE NAVY
NAVAL AMMUNITION DEPOT
CRANE, INDIANA 47522

IN REPLY REFER TO:
3041-RJM:rjr
13070

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana 47522
To: Commander, Naval Air Systems Command (AIR-53341B)

Subj: Contract N00019-74-C-0135 for Sonobuoy Receiver AN/ARR-75, Work Unit Assignment C112.158, Reliability Qualification Test, Failure Reclassification Requests

Ref: (a) AEL-EMTECH Reliability Reclassification Request (20136-0049) of 17 Mar 1975 to NAD Crane

1. As requested by Naval Air Systems Command, the Naval Ammunition Depot (Code 3041) has been given responsibility for review and recommendations for NAVAIRSYSCOM action upon reference (a).

2. Reference (a) requests authorization to reclassify 12 relevant failure to non-relevant. Each failure will be listed by part number (P/N) and recommended or not recommended for reclassification. For those not recommended, reasons will be given.

a. Failure on P/N 99992901 (RF filter) is recommended for reclassification.

b. Failure on P/N 9999-2900001 (RF filter) is recommended for reclassification.

c. The three failures on P/N TF5RX13YY (transformers) are recommended for reclassification.

d. Failure of the Sealectro connector (no P/N) is recommended for reclassification.

e. The six failures on P/N MCLSRA-1M (mixers) are not recommended for reclassification.

(1) The occurrence of a similar failure in the Reliability Acceptance Test (RAT), after corrective action was imposed, suggests that the corrective action taken was not totally effective.

(2) A total of 1650 hours of RAT time has accumulated as of February 1975. In view of this test history and the recently initiated vendor screening, this activity feels that sufficient test data for a reasonable confidence of reclassification would exist upon completion of an additional 350 hours of RAT time without recurrence of the subject failure.

3041-RJM:rjr
13070

3. If further information or clarification is required, it should be directed to Commanding Officer, Naval Ammunition Depot (Code 3041), Crane, Indiana 47522 or by contacting Mr. R. J. Marks II or Mr. Claude Rice at (812) 854-1299.

Copy to:
NAVAIRSYSCOM (AIR-533D2)

3041-RJM:sh
13070
MAR 27 1975

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana
To: Kollsman Instrument Company, 3 Capitol Street, Nashua, NH 03060

Subj: Production Reliability Test Procedure for Altimeter AAU-31/A of 20 Feb 1975, Contract N00019-74-C-0212

Ref: (a) NAD Crane ltr 3073-MS:ofw 13920 of 8 Nov 1975
(b) Production Reliability Test Procedure (not dated) for Altimeter AAU-31/A submitted Kollsman ltr BS/mdk of 25 Oct 1975 to NAD Crane

1. Reference (a) directed that reference (b) was insufficient in some areas and required revisions prior to final approval.

2. The subject revised test procedure has been reviewed for compliance with reference (a) and the following discrepancies were still noted:

a. Paragraph 2.5.1.1 Relevant Failure, subparagraph (2) - Delete entirely and rewrite to comply with 5.5.1(2) and 5.5.3 MIL-STD-781B. It should be noted that the, "non-reoccurance of a failure is insufficient grounds for deletion of failures".

b. Paragraph 2.2.1.4 Attitude Cycle - Include after the first sentence -- "The lower cycling limit shall not exceed 1500 ft. and the upper cycling limit shall not be less than 48,500 ft. In the second sentence delete "such" and insert "altitude".

3. The above comments must be incorporated in the subject test procedures and resubmitted to this activity before approval can be granted. If any questions arise, please contact Mr. J. Seib or Mr. C. Rice, 812-854-1299.

4. No change in the terms or conditions of the subject contract is implied or authorized by this letter.

[illegible]
By direction

Copy to:
NAVAIRSYSCOM (AIR-533D2), (AIR-53351B)
DCASR (Mr. G. Maneely, Kollsman)

Blind copy to:
3073 (J. Seib)

3048-RBM:sh
13070
[illegible]

From: Commanding Officer, Naval Ammunition Depot, Crane, Indiana
To: Kollsman Instrument Company, 3 Capitol Street, Nashua, NH 03060

Subj: Reliability Test Status Monthly Reports for Altimeter AAU-31/A, Contract N00019-74-C-0212 and Altimeter AAU-32/A, Contract N00019-73-C-0541

Ref: (a) Kollsman Instrument Company ltr AU-2.5-75 of 25 Feb 1975
(b) MIL-A-81851(AS) - "Altimeter AAU-31/A"
(c) MIL-A-81852(AS) - "Altimeter AAU-32/A"
(d) MIL-STD-781B - "Reliability Tests: Exponential Distribution

1. Reference (a) was reviewed and found insufficient in fulfilling subject contractual reliability data reporting requirements.

2. The subject contracts delineates the Reliability Sampling Phase tests requirements.

3. Paragraph 4.4.3.2.1 of reference (b) and (c) states in part, "at the conclusion of each test, the test results shall be sent to the procuring activity and Naval Air Systems Command. At any time that the test results show a reject situation, the procuring activity shall be notified". The Naval Air Systems Command has assigned this activity the responsibilities for reviewing and taking appropriate action on various aspects of these reports. Therefore, it is requested that copies of test results, failures and corrective actions be forwarded to this activity on all phases of reliability testing of the subject contracts. These reports should include, but not limited to, information specified in reference (d), paragraph 5.11.1.

4. All correspondence concerning reliability sent to this activity shall be addressed to the Commanding Officer, Naval Ammunition Depot (Code 3048), Crane, Indiana. All correspondence addressed to this activity shall be submitted via the cognizant Defense Contract Administration Services Office.

5. Comments contained herein do not authorize or imply any changes in requirements or conditions of the contract or applicable specifications.

3048-RJM:sn
13070

6. If further information or clarification is required concerning this letter, it should be directed to Commanding Officer, Naval Ammunition Depot (Code 304B), Crane, Indiana or by telephoning Mr. Robert Marks at 812-854-1299.

S. N. KALBERER
By direction

Copy to:
NAVAIRSYSCOM (AIR-533D2), (AIR-533571B)
DCASR (Mr. G. Maneely)

Blind copy to:
3073 (J. Sieb)

TRIP REPORTS

E/F

U.S. NAD, CRANE, INDIANA	2. PAYROLL PERIOD	3. BLOCK NO.	4. SLIP NO.
1. EE'S NAME MARKS ROBERT J II	6. (FOR AGENCY USE)		1

PART A—NOTIFICATION OF BASIC PAY

8. NATURE OF ACTION CODE	892 QUALITY INCREASE 893 WITHIN GR. INCREASE 894 PAY ADJUSTMENT	896 ADMINISTRATIVE PAY INCREASE 897 ADMINISTRATIVE PAY DECREASE OTHER *(Specify)*	9. EFFECTIVE DATE	10.
893			03-30-75	01

12. (FOR AGENCY USE)	13. GRADE OR LEVEL	14. NEW STEP OR RATE	
	GS 00855	09/02	$ 13269 PA

X	16. WORK IS OF AN ACCEPTABLE LEVEL OF COMPETENCE.	18. SIGNATURE	DATE
X	17. PERFORMANCE IS SATISFACTORY OR BETTER	J. Strawn STAFFING CLERK	01-01-75

PART B—DATA ON UNPAID ABSENCE

19. PERIOD(S)	20. TOTAL EXCESS	21. IN PAY STATUS AT END OF WAITING PERIOD?	22. INITIALS
	NONE	1 1. YES 2. NO	DP

PART C—PAYROLL CHANGE DATA

	BASE PAY	OVERTIME		GROSS PAY	FEDERAL TAX	FICA	STATE TAX	BOND
23. PREV. NORM.								
24. NEW NORM.								
25. THIS PRD.								
	CSR	GROUP LIFE INS.	HEALTH BENEFITS	ORGAN. DUES				NET PAY
23a. PREV. NORM.								
24a. NEW NORM.								
25a. THIS PRD.								

26. APPROPRIATION(S)	27. PREPARED BY	28. AUDITED BY

PART D—REMARKS

I CERTIFY THAT THE ABOVE-NAMED EMPLOYEE'S WORK (IS~~, IS NOT~~) OF AN ACCEPTABLE LEVEL OF COMPETENCE AS REQUIRED BY THE FEDERAL SALARY REFORM ACT OF 1962 AND FPM 531 AND HAS BEEN DISCUSSED WITH EMPLOYEE CONCERNED. (EMPL INIT)

SUPERVISOR'S SIGNATURE

REVIEWING OFFICIAL SIGNATURE

STANDARD FORM 1126 (5-part Carbonless)
February 1966
1126-127

PAYROLL CHANGE SLIP — EMPLOYEE'S COPY

U.S. CIVIL SERVICE CO
FPM SUPPLEMENT 29(

ACCOMPLISHMENTS, DUTIES AND RESPONSIBILITIES (1974-5)

Thermal Stability Program
-Generation of all reports (weekly, quarterly, etc)
-Formulation of test procedure
-Unofficial supervision and training of three engineering aids
-Unofficial supervision of electronic technition
-Responsibility for all testing
-Coordination of computer Data Analysis effort

Production Reliability Surveillance
-Projects Responsibilities
Attend and participate in conferences as necessary
Advise contractor of appropriate action for facilitation of testing
Review contractor's proposed test procedures and reliability system's analysis
Update and maintain test data files
Determine adequacy of contractor's test facilities via in-plant surveillance
Establish liaison with Inspector in order to give assistance in test supervision and test procedure interpretation
Report to procuring activity any poor design or production practices and recommend improvements
Obtain and review reliability test reports
-Other efforts
Expansion of Built-in Test System Effectiveness measures
Revision of statistical portions of in-house documents

Preferred Parts List
-Developement of categories
-Assistance in first draft listing
-Unofficial supervision of Engineer

AMENDMENT TO PERSONAL QUALIFICATIONS STATEMENT

OMB APPROVED 50-R

IMPORTANT: Read these instructions carefully before completing this form.

This form may be used to update your Personal Qualifications Statement provided you have had no more than three additional positions since the statement bein updated was completed. Agencies are required to accept a previously completed Personal Qualifications Statement as current when this form is attached. Befo completing this form, review carefully your answers to all items on the statement being updated. Use typewriter if available. Otherwise write or print legibly dark ink.

1. NAME *(Last) (First) (Middle) (Maiden, if any)* ☒ MR. ☐ MISS ☐ MRS.
AND ADDRESS *(Number, Street, City, State, and ZIP Code)*

Marks, Robert, Jackson II
Apt 162, 3111 Leonard Springs Rd.
Bloomington Ind. 47401

2. DATE OF THIS STATEMENT: 3-10-75

3. BIRTH DATE *(month, day, year)*: 8-25-50

4. KIND OF POSITION YOU ARE FILING FOR *(Or title and number of announcement)*

5. REASON FOR SUBMISSION *(Check One)*

- ☐ To update Personal Qualifications Statement in my Official Personal Folder
- ☐ To update Personal Qualifications Statement on file with you
- ☐ To update attached Personal Qualifications Statement
- ☐ As requested

6. LOWEST PAY OR GRADE YOU WILL ACCEPT
PAY: $ per — or — GRADE

7. EXPERIENCE *(Start with your PRESENT position and work back. Account for periods of unemployment in separate blocks in order.)*

May inquiry be made of your present employer regarding your character, qualifications, and record of employment? ☐ Yes ☐ No *(A "No" will not affect consideration for employment opportunities.)*

DATES OF EMPLOYMENT *(month, year)*	EXACT TITLE OF POSITION	IF FEDERAL SERVICE, CIVILIAN C MILITARY GRADE
FROM 3-25-74 TO PRESENT TIME	Electronics Engineer	GS9

SALARY OR EARNINGS	AVG. HRS. PER WEEK	PLACE OF EMPLOYMENT	NUMBER AND KIND OF EMPLOYEES SUPERVISED	KIND OF BUSINESS OR ORGANIZ *(manufacturing, accounting, ance, etc.)*
STARTING $12841 PER yr FINAL $ PER	40	CITY: Crane STATE: Ind.		

NAME OF IMMEDIATE SUPERVISOR	NAME OF EMPLOYER *(firm, organization, etc.)* AND ADDRESS *(including ZIP Code, if kno*
Bob Saum	NAD Crane
AREA CODE AND PHONE NO. IF KNOWN 812-854-1370	

REASON FOR WANTING TO LEAVE

DESCRIPTION OF DUTIES, RESPONSIBILITIES, AND ACCOMPLISHMENTS See attached sheet

FOR AGENCY USE *(skill codes, etc.)*

DATES OF EMPLOYMENT *(month, year)*	EXACT TITLE OF POSITION	IF FEDERAL SERVICE, CIVILIAN OR MILITARY GRADE
FROM TO		

SALARY OR EARNINGS	AVG. HRS. PER WEEK	PLACE OF EMPLOYMENT	NUMBER AND KIND OF EMPLOYEES SUPERVISED	KIND OF BUSINESS OR ORGAI *(manufacturing, accounting, insurance, etc.)*
STARTING $ PER FINAL $ PER		CITY: STATE:		

NAME OF IMMEDIATE SUPERVISOR	NAME OF EMPLOYER *(firm, organization, etc.)* AND ADDRESS *(including ZIP Code, if*
AREA CODE AND PHONE NO. IF KNOWN	

REASON FOR LEAVING

DESCRIPTION OF DUTIES, RESPONSIBILITIES, AND ACCOMPLISHMENTS

FOR AGENCY USE *(skill codes, etc.)*

POSITION OR JOB DESCRIPTION

NAVSO 12510/7 (REV. 10-67)
(See Instructions on Reverse)

'42 4940

[X] PD [ ] JD NO. ~~1219~~ 304000 13

'ON OR JOB TITLE	SCHED. OR SERV.	SERIES	GRADE/ PAY LEVEL /FORMULA	CLASSI-FIERS INITIALS	CLASSIFICATION OR RATING OFFICIAL *(Signature, Title and Date)*
.TION					
IRST ACTION					
ECOMMENDED ...tronic Engineer	GS	855	11		5. NAME OF EMPLOYEE George Allen & Charles Welp

POSITION OR JOB LOCATION

CTIVITY - NAME AND LOCATION ... Crane, Indiana	9. *(3rd)* Avionics Equipment Branch
RGANIZATIONAL SUBDIVISIONS *(1st)* ...lity Evaluation Department	10. *(4th)* Systems Effectiveness Section
2nd) ...tronic Systems & Components Division	11. ORGANIZATIONAL TITLE OF POSITION OR JOB *(If any)*

12. EMPLOYEES NOW PERFORMING DUTIES *(Ungraded jobs only)*

..:)	*(Title:)*	*(No.:)*	*(Title:)*

REASON FOR SUBMISSION

13. DUTIES AND RESPONSIBILITIES NOT ELSEWHERE DESCRIBED - COMPLETE DESCRIPTION ATTACHED.

	POS. OR JOB #	CLASS. OR RATING
ATTACHED AMENDMENT NO. ______ TO-		
IDENTICAL TO-		
ATTACHED STATEMENT OF DIFFERENCE TO-		
REPLACES-		

OTHER *(Specify)*

CERTIFICATIONS:

The description of the duties and responsibilities of this position or job is complete and accurate.

19. SIGNATURE *(Employee)* DATE

20. SIGNATURE AND TITLE *(Immediate supervisor)* DATE

R. SNIM
Mgr. Systems Effectiveness Section
(Position No., Classification or Rank)

21. SIGNATURE AND TITLE *(Person authorized to establish position or job)* DATE

W. YEAGER, Deputy Director, QE Dept.

...ification of this position may be appealed by the incumbent at any time. Appeals from classification ac-...ch result in demotion or reduction in compensation must be timely in order for retroactivity to apply. ...our classifier or appropriate activity instruction for procedures. Civil Service Commission classifica-...dards and Department of the Navy classification guides are available for review in the Wage and ...ation Office.

ICATION OR RATING ERTIFICATION:					

POSITION OR JOB DESCRIPTION

NAVSO 12510/7 (REV. 10-67)

(See Instructions on Reverse)

42 4340

[X] PD [ ] JD NO. ~~1218~~ 8040004

...ON OR JOB TITLE	SCHED. OR SERV.	SERIES	GRADE/ PAY LEVEL /FORMULA	CLASSI-FIERS INITIALS	CLASSIFICATION OR RATING OFFICIAL (Signature, Title and Date)
...TION					
... FIRST ACTION					
4. RECOMMENDED Electronic Engineer	GS	855	11	5. NAME OF EMPLOYEE George Allen + Charles Welp	

POSITION OR JOB LOCATION

6. ACTIVITY - NAME AND LOCATION: NAD Crane, Indiana
7. ORGANIZATIONAL SUBDIVISIONS (1st): Quality Evaluation Department
8. (2nd): Electronic Systems & Components Division
9. (3rd): Avionics Equipment Branch
10. (4th): Systems Effectiveness Section
11. ORGANIZATIONAL TITLE OF POSITION OR JOB (If any):

12. EMPLOYEES NOW PERFORMING DUTIES (Ungraded jobs only)

(No.:)	(Title:)	(No.:)	(Title:)

REASON FOR SUBMISSION

[X] 13. DUTIES AND RESPONSIBILITIES NOT ELSEWHERE DESCRIBED - COMPLETE DESCRIPTION ATTACHED.

	POS. OR JOB #	CLASS. OR RATING
14. ATTACHED AMENDMENT NO. ______ TO-		
15. IDENTICAL TO-		
16. ATTACHED STATEMENT OF DIFFERENCE TO-		
17. REPLACES-		

18. OTHER (Specify)

CERTIFICATIONS:

The description of the duties and responsibilities of this position or job is complete and accurate.

19. SIGNATURE (Employee) DATE

20. SIGNATURE AND TITLE (Immediate supervisor) DATE

R. SNIM
Mgr. Systems Effectiveness Section
(Position No., Classification or Rank)

21. SIGNATURE AND TITLE (Person authorized to establish position or job) DATE

W. YEAGER, Deputy Director, QE Dept.

... REMARKS

The classification of this position may be appealed by the incumbent at any time. Appeals from classification actions which result in demotion or reduction in compensation must be timely in order for retroactivity to apply. Consult your classifier or appropriate activity instruction for procedures. Civil Service Commission classification standards and Department of the Navy classification guides are available for review in the Wage and Classification Office.

. CLASSIFICATION OR RATING RECERTIFICATION:					

INSTRUCTIONS FOR COMPLETING FORM NAVSO 12510/7

FOR GRADED POSITIONS

e: Optional Form 8 is to be used for proposed cations to GS-16, GS-17, or GS-18 - see NCPI General instructions for preparing position riptions are contained in NAVSO 12510/7A. ial instructions are contained in applicable ial Question Lists.)

, & 3. To be executed only by persons who been officially authorized to take classi- ion action. Space is provided for taking separate actions on the same position; the d and third actions may be on maintenance re- the result of application of new standards review by higher authority, etc. The *posi- title* must be the official title authorized C or Navy standards, NAVEXOS P-2440, or other priate instructions. The *classification ial* must be a person officially authorized to ify the position.

otional. A recommendation should reflect the dered judgment of the originator.

ter name of employee regularly performing ork. If not regularly performed, enter NT."

Location" means city and state.

ugh 10. Enter as many organizational sub- ons as necessary to show the one in which sition is located.

ptional.

ough 16. Self-explanatory.

omplete whenever the position supersedes r, out of which it has developed in whole part. This information is necessary for al continuity and to provide accurate other personnel processes.

amples of "other" reasons are "Survey," anization," and "Checklist."

gnature optional unless required by the y or a higher management authority.

21. MUST be executed before forwarding to ication official.

r special notations by classification e.g., brief evaluation reports, reference or CSC postaudits, competitive levels, tions on filling position, or requirements iewing position later.
is space should also be used to (a) iden- y IA and "statement of difference" posi- nd the date each was established, and (b) ernative series on interdisciplinary ns.

be initialed and dated by the classifica- ecialist whenever he has subsequently the position (e.g., on maintenance review) d that the description is still current rate and that the classification assigned correct.

ion of duties and responsibilities. s is normally typed on plain bond and l to the NAVSO 12510/7. Very brief descrip- owever, such as short amendments, state- differences, or checklist descriptions if space permits, be inserted in Item 22.

FOR UNGRADED POSITIONS

(Note: General instructions for preparing job descriptions are contained in NAVSO 12510/7B. Special instructions for Masters and Foremen are given in NCPI 531, Encl. 5.)

In upper right-hand corner, check the "JD" box.

1, 2, & 3. To be executed only by persons who have been officially authorized to take a rating action. Space is provided for taking three separate actions on the same job. This permits recording subsequent re-rating actions taken by the activity, as on maintenance review or application of new rating definitions, or by management bureaus or OCMM.

Job Title. Enter the official title authorized in NCPI 531, current OCMM Notices, or OCMM letters of authorization. (For a supervisory rating with a special designator, such as "Public Works," indicate the "rating concerned" in Item 22.)

Service. Enter appropriate Service, such as "W" (General Wage), "C" (Commissary), etc.

Pay Level or Formula. Enter pay level for rating, e.g., "W-11" for Plumbers; or pay formula, e.g., "WF-18" for Leadingmen Carpenter.

Rating Official. This is a person officially authorized to make rating determinations.

4 & 5. Optional.

6. "Location" means city and state.

7 through 10. Enter as many subdivisions as needed to locate the job.

11. Optional.

12. Enter the number of employees, by title, now performing work of the job, or "none," as appropriate.

13 and 14. Self-explanatory.

15 and 16. Optional. Activities may cite the appropriate P-1005 rating definition by number, in lieu of describing the job, when the P-1005 definition adequately covers most or all of the duties performed.

17. Self-explanatory.

18. For actions not covered by items 13 through 17.

19. Optional.

20 and 21. MUST be completed before forwarding to rating official.

22. To be used by rating office for purposes similar to those described in Item 22 for graded positions.

23. Optional. May be used for recording findings on maintenance review.

I. Introduction

This position is located in the Systems Effectiveness Section, Avionics Equipment Branch, Electronic Systems and Components Division, Q. E. Department. This section is responsible for development and implementation of a program for analysis and prediction of reliability and maintainability of aircraft electronic equipment and systems. The incumbent will perform engineering studies and analysis in implementing various aspects of the program as assigned.

II. Major Duties and Responsibilities

As assigned, accomplishes project work of the following nature in connection with the full range of Avionics equipments and systems under section cognizance:

A. Reviews and evaluates the reliability and maintainability portions of technical development plans and proposals submitted by the avionics equipment manufacturers to NAVAIRSYSCOM. For projects assigned to this activity by NAVAIRSYSCOM, will serve as project manager with responsibilities of keeping NAVAIRSYSCOM fully informed of progress and major obstacles requiring program changes for the R & M portions of major NAVAIRSYSCOM R & D or production contracts. In this capacity, the incumbent will review and provide detailed comments and/or recommendations on program plans, test procedures, math models, predictions, and testing reports as pertain to the reliability and/or maintainability of the system.

6. Develops specifications for reliability and maintainability testing, prediction, estimations, calculations, and design analysis for a wide range of electronic and electromechanical equipment.

C. Evaluates contractors' work on projects involving studies in various aspects of systems effectiveness including writing of handbooks on failure rates and general reliability techniques, computer techniques for reliability analysis and specification writing. Participates in and coordinates continuing survey of electronic industry to maintain up-to-date knowledge of reliability testing and assurance methods and procedures.

D. Performs or coordinates studies for the purpose of establishing optimum methods and procedures for determining reliability and operation problem areas of avionics equipments in Fleet use. This includes performing reliability and maintainability analyses on this equipment as necessary as well as intensive study of methods used in the Fleet for trouble-shooting, repairing and reporting failures and problem areas. Develops or participates in development of methods for the efficient handling and analysis of this data (including computer application) and generates reports and recommendations to Naval Air Systems Command for implementation of same. This function requires considerable liaison effort between the Fleet, prime contractors, manufacturers, and Naval Air Systems Command. This liaison is usually accomplished by the incumbent.

E. Performs special engineering investigations on electronic systems which are performing below the specified reliability level in the Fleet. The incumbent will gather such failure data as is available, review the applicable specifications, review the design and installation of the system

and utilizing such techniques as circuit analysis, math modeling, failure rate predictions, redundancy, etc. will provide to NAVAIRSYSCOM such recommendations as will correct the areas of deficiency and improve the reliability of the systems. Such recommendations might include changing the inherent design, changing materials or circuitry, requiring new tests or methods of testing in the applicable specifications.

F. Performs tests on selected avionics equipment to determine the Mean-Time-Between-Failures. This includes responsibility for assuring adequacy of both the environmental and testing set-ups, for performing the tests, for evaluating the data, and for preparing the final report.

III. Controls Over the Position

This position is under the supervision of the Manager of the Systems effectiveness Section, Electronic Engineer. Instructions as to priorities and time limitations are normally provided with new assignments. The incumbent is responsible for determining the proper approach, planning, and carrying out the project assignments with assistance only on the more unprecedented problems encountered. Technical problems of this nature as well as those involving policy matters are usually discussed jointly with the Section and Branch Managers. Completed work is reviewed for general adequacy in meeting program objectives and policy conformance. Written guides utilized include engineering handbooks and textbooks, military specifications, technical reports and studies, etc. A portion of the work includes consideration of areas for which little or no precedent exists.

IV. Qualification Requirements of the Work

This position requires knowledge of scientific and engineering principles and theories in the field of electronics and related fields such as can be learned through completion of a full four-year curriculum in electronic engineering or physics plus appropriate experience in the particular area of application or work closely related thereto.

Personal — Married 6' 1" 190lbs 8-25-50

References

Paul Dean Ford
Pres. of Ford FM Inc.
RR2, Box 50, W. Terre Haute, Ind.

Dr. Thomas F. Krile
Prof. of Electrical Engineering

Dr. Harold A. Sabbagh
Prof. of Electrical Engineering and Physics

(Both Dr. Krile and Dr. Sabbagh are employed at NAD Crane and may be reached during regular working hours at Bldg. 2530, 854-1363)

ADDITIONAL REFERENCES FURNISHED ON REQUEST

STANDARD FORM 171 0622-C

Office of Management and Budget
Approved 50-RO388

PERSONAL QUALIFICATIONS STATEMENT

1A. Kind of position (job) you are filing for (or title of announcement)
OPTICS RESEARCH AND RELATED AREAS

B. Announcement No.
—

C. Options for which you wish to be considered (if listed in announcement)
—

RECEIVED DAO

D. Primary place(s) you wish to be employed
CRANE NAVAL AMMUNATIONS DEPOT.

1974 FEB 13 PM 2: 11

2. Home phone (including Area Code)
812-234-2570

3. Office phone (including Area Code)
NONE

4. Name (Last) (First) (Middle) (Maiden, if any) [X] Mr. [ ] Miss [ ] Mrs.
and Address (Number, Street, City, State and ZIP Code)

MARKS ROBERT JACKSON II
13008 OAKVIEW BLVD.
GARFIELD HTS., OHIO 44125

5. Legal or voting residence (State)
INDIANA

6. Height without shoes
6 Feet 1 Inches

7. Weight
185 LBS.

8. Birthplace (City and State, or foreign country)
SUTTON, WEST VIRGINIA

9. Birth date (Month, day, year)
8/25/50

10. Social Security Account Number
[redacted]

11. If you have ever been employed by the Federal Government as a civilian, give your last classification series, grade, and job title.

N.A.

Dates of service in that grade
From N.A. To N.A.

12. If you are currently on a list of eligibles for appointment to a Federal position, give the name of the announcement, the name of the office maintaining the list, the date on your notice of rating, and your rating.

N.A.

13. Lowest pay or grade you will accept

PAY		GRADE
$9400 per YEAR	OR	

14. When will you be available?
IMMEDIATELY

DO NOT WRITE IN THIS BLOCK
FOR USE OF EXAMINING OFFICE ONLY

	Material	Entered Register:
[ ] Appor.	[ ] Submitted	
[X] Nonappor.	[ ] Returned	

Notations:

Form Reviewed:

Form Approved:

Option	Grade	Earned Rating	Preference	Aug. Rating
			[ ] 5 points (Tent.)	
			[ ] 10 Points Comp.Dis.	
			[ ] Other 10 Points	
			[ ] Disal.	
Initials and Date			[ ] Being Investi-gated	

ANNOUNCEMENT NO.

STATEMENT NO.

RECEIVED 23 AUG 1974 EMPLOYMENT BRANCH

FEB 20 1973

THIS SPACE FOR USE OF APPOINTING OFFICER ONLY
Preference has been verified through proof that the separation was under honorable conditions, and other proof as required.

[ ] 5-Pt. [ ] 10-Pt. Comp. Disab. [ ] 10-Pt. Other

Signature and Title

Agency

Date

[ ] Refer for medical action

282-48-3221

15. Will you accept temporary employment for:
(Acceptance or refusal of temporary employment will not affect your consideration for other appointments.)

	YES	NO
1 month or less?		
1 to 4 months?		
✓ 4 to 12 months?	X	

16. Where will you accept a job?

	YES	NO
Washington, D.C.		
Any place in the United States.		
Outside of the United States.		
X Only in (specify): CRANE, IND.		

17. Will you accept less than full time work?
(Less than 40 hours per week) [ ] Yes [X] No

18. Are you willing to travel? (Check one)

NO	SOME	OFTEN
	X	

19. VETERAN PREFERENCE. Answer all parts. If a part does not apply to you, answer "No."

	Yes	No
A. Have you ever served on active duty in the United States military service? (*Exclude tours of active duty for training as a reservist or Guardsman.*)		X
B. Have you ever been discharged from the armed services under other than honorable conditions? (You may omit any such discharge changed to honorable by a Discharge Review Board or similar authority.) ... *If "Yes," give details in Item 37.*		N.A
C. Do you claim 5-point preference based on active duty in the armed forces? ... *If "Yes," you will be required to furnish records to support your claim at the time you are appointed.*		X
D. Do you claim 10-point preference? ...		X

If "Yes," check type of preference claimed and complete and attach Standard Form 15, "Claim for 10-point Veteran Preference," together with the proof called for in that form
TYPE: [ ] Compensable disability [ ] Disability [ ] Wife [ ] Widow [ ] Mother

E. List Dates, Branch, and Serial or Service Number of All Active Service (*Enter "N/A" if not applicable*)

From	To	Branch of Service	Serial or Service Number
N.A.	N.A.	N.A.	N.A.

THE FEDERAL GOVERNMENT IS AN EQUAL OPPORTUNITY EMPLOYER

Standard Form 171
September 1971 U.S. Civil Service Commission
171-103

ATTACH SUPPLEMENTAL SHEETS OR FORMS HERE
• ANSWER ALL QUESTIONS CORRECTLY AND FULLY

21 A. Special qualifications and skills *(skills with machines; patents or inventions; your most important publications (do not submit copies unless requested); your public speaking and publications experience; membership in professional or scientific societies; etc.)*

1) OPTICS: "HOLOGRAPHIC RECORDING OF OPTICAL SPACE VARIANT SYSTEMS" (MASTER'S THESIS). FAMILIARITY WITH FOURIER OPTICS AND HOLOGRAPHY THEORY. EXPERIENCE IN THE OPTICS LAB AND IN OPTICS RESEARCH.
2) MEMBER OF IEEE
3) TEACHING EXPERIENCE (PHYSIC'S LAB INSTRUCTOR)
4) FIFTY THREE MUSICAL COMPOSITIONS COPYRIGHTED

B. Kind of License or Certificate *(For example, pilot, registered nurse, lawyer, radio operator, C.P.A., etc.)*	C. State or other licensing authority	D. Year of first license or certificate	E. Year of latest license or certificate	F. Approximate number of words per minute: Typing	Shorthand
F.C.C. THIRD PHONE LICENSE	FEDERAL COMM. COMM.	~1971	~1971	0	0

22. A. Did you graduate from high school, or will you graduate within the next nine months?

YES	MONTH/YEAR	NO	HIGHEST GRADE COMPLETED
X	6-68		

B. Name and location *(city and State)* of last high school attended: GARFIELD HTS. HIGH SCHOOL, GARFIELD HTS., OHIO

C. Name and location *(city, State, and ZIP Code if known)* of college or university. *(If you expect to graduate within 9 months, give MONTH and year you expect degree.)*	Dates attended From	Dates attended To	Years Completed Day	Years Completed Night	No. of credits compl. Semester hours	No. of credits compl. Quarter hours	Type of degree *(B.A., etc.)*	Year of degree
ROSE HULMAN INSTITUTE OF TECHNOLOGY	9-68	6-72	4	—	—	194	B.S.	1972
ROSE HULMAN INSTITUTE OF TECHNOLOGY	9-72	8-73	1	—	—	64	M.S	1973
(5500 WABASH, TERRE HAUTE, INDIANA)								

D. Chief undergraduate college subjects	No. of credits compl. Semester hours	No. of credits compl. Quarter hours	E. Chief graduate college subjects	No. of credits compl. Semester hours	No. of credits compl. Quarter hours
FOURIER OPTICS		4	THESIS (OPTICS RESEARCH)		12
COMMUNICATION SYSTEMS		4	ACOUSTICS		8
(SEE ATTACHED TRANSCRIPT)			(SEE ATTACHED TRANSCRIPT)		

F. Major field of study at highest level of college work: ELECTRICAL ENGINEERING

G. Other schools or training *(for example, trade, vocational, armed forces, or business)*. Give for each the name and location *(city, State, and ZIP Code if known)* of school, dates attended, subjects studied, number of classroom hours of instruction per week, certificates, and any other pertinent data.

SANDERSON GROUND SCHOOL (CHAGRIN FALLS AIRPORT, CHAGRIN FALLS, OHIO ~1968)

23. HONORS, AWARDS, AND FELLOWSHIPS RECEIVED

(1) ROSE HONOR KEY - FOR OUTSTANDING ACADEMIC AND EXTRA-CURRICULAR ACTIVITIES
(2) TUITION GRANT (1972-73 AT ROSE-HULMAN)

24. LANGUAGES OTHER THAN ENGLISH

List the languages and indicate your knowledge of each by placing "X" in proper columns	Reading Excl	Reading Good	Reading Fair	Speaking Excl	Speaking Good	Speaking Fair	Understanding Excl	Understanding Good	Understanding Fair	Writing Excl	Writing Good	Writing Fair
NONE												

25. REFERENCES. List three persons who are NOT related to you and who have definite knowledge of your qualifications and fitness for the position for which you are applying. Do not repeat names of supervisors listed under Item 20, EXPERIENCE.

FULL NAME	PRESENT BUSINESS OR HOME ADDRESS *(Number, Street, City, State and ZIP Code)*	BUSINESS OR OCCUPATION
DR. THOMAS F. KRILE	118 LASALLE DR., TERRE HAUTE, IND. 47802	PROF. OF ELECTRICAL ENGINEERING AT ROSE-HULMAN
DR. HAROLD A. SABBAGH	20 DOUGLAS PLACE, TERRE HAUTE, IND. 47805	PROF. OF ELECTRICAL ENGINEERING AND PHYSICS AT ROSE-HULMAN
DR ARMAND V. SMITH	130 BLUEBIRD DR, TERRE HAUTE, IND 47802	PROF. OF MATHEMATICS AT ROSE-HULMAN INSTITUTE

PLEASE BE SURE TO READ ATTACHED INSTRUCTIONS BEFORE COMPLETING ITEM 20

20. EXPERIENCE *(Start with your PRESENT position and work back. Account for periods of unemployment in separate blocks in order.)*

May inquiry be made of your present employer regarding your character, qualifications, and record of employment? ☒ Yes ☐ No
(A "No" will not affect your consideration for employment opportunities except for HEARING EXAMINER positions.)

1

Dates of employment *(month, year)*	Exact title of position	If Federal service, civilian or military grade
From ~9-71 To PRESENT TIME	DISC JOCKEY (PROGRAM DIRECTOR)	N.A.

Salary or earnings	Avg. hrs. per week	Place of employment	Number and kind of employees supervised	Kind of business or organization *(manufacturing, accounting, insurance, etc.)*
Starting $ ~$1.85 per HOUR Present $ $2.00 per HOUR	FULL TIME ~42 PART TIME 12	City: W. TERRE HAUTE State: INDIANA	NONE	COMMERCIAL RADIO

Name of immediate supervisor	Name of employer *(firm, organization, etc.)* and address *(including ZIP Code, if known)*
PAUL DEAN FORD Area Code and phone No. if known 812-533-1661	FORD, F.M. INC. R.R. 2, BOX 50 WEST TERRE HAUTE, INDIANA

Reason for wanting to leave NO PROFESSIONAL FUTURE IN FIELD OF INTEREST

Description of duties, responsibilities, and accomplishments (1) COMPLETE RESPONSIBILITY FOR RADIO STATION WPFR-FM (TERRE HAUTE) WHILE ON DUTY (2) MAINTAINING UP TO DATE MUSIC SELECTION (3) HOSTING "TELETALK", A PERIODIC "TALK" PROGRAM (4) PERFORMANCE AT REMOTE BROADCASTS (5) OCCASIONAL AIR SHIFTS AT WKZI (CASEY ILLINOIS) (6) F.C.C. RADIO-TELEPHONE LICENSE (7) LIMITED SALES

For agency use *(skill codes, etc.)*

2

Dates of employment *(month, year)*	Exact title of position	If Federal service, civilian or military grade
From To		

Salary or earnings	Avg. hrs. per week	Place of employment	Number and kind of employees supervised	Kind of business or organization *(manufacturing, accounting, insurance, etc.)*
Starting $ per Final $ per		City: State:		

Name of immediate supervisor	Name of employer *(firm, organization, etc.)* and address *(including ZIP Code, if known)*
Area Code and phone No. if known	

Reason for leaving

Description of duties, responsibilities, and accomplishments

For agency use *(skill codes, etc.)*

3

Dates of employment *(month, year)*	Exact title of position	If Federal service, civilian or military grade
From To		

Salary or earnings	Avg. hrs. per week	Place of employment	Number and kind of employees supervised	Kind of business or organization *(manufacturing, accounting, insurance, etc.)*
Starting $ per Final $ per		City: State:		

Name of immediate supervisor	Name of employer *(firm, organization, etc.)* and address *(including ZIP Code, if known)*
Area Code and phone No. if known	

Reason for leaving

Description of duties, responsibilities, and accomplishments

For agency use *(skill codes, etc.)*

IF YOU NEED ADDITIONAL EXPERIENCE BLOCKS USE STANDARD FORM 171-A OR BLANK SHEETS
SEE INSTRUCTION SHEET

ANSWER ITEMS 26 THROUGH 36 BY PLACING AN "X" IN THE PROPER COLUMN	Yes	No
26. Are you a citizen of the United States? If "No," give country of which you are a citizen:	X	
Before answering these questions read Items 27 and 28 in the attached instructions. Are you now, or within the last ten years have you been, a member of:		
27. The Communist Party, U.S.A., or any subdivision of the Communist Party, U.S.A.?		X
28. An organization that to your present knowledge seeks the overthrow of the constitutional form of government of the United States by force or violence or other unlawful means?		X
If your answer to Item 27 or 28 is "Yes," write your answers to the following questions in Item 37 or on a separate piece of paper: (A) The name of the organization? (B) The dates of your membership? (C) Your understanding of the aims and purposes of the organization at the time of your membership?		
29. To insure that you are not placed in a position which might impair your health, or which might be a hazard to you or to others, we need information about the following: Do you have, or have you had, heart disease, a nervous breakdown, epilepsy, tuberculosis, or diabetes? *If your answer is "Yes," concerning any one of these, identify which one(s) and give details in Item 37.*		X
30. Within the last five years have you been fired from any job for any reason?		X
31. Within the last five years have you quit a job after being notified that you would be fired? *If your answer to 30 or 31 above is "Yes," give details in Item 37. Show the name and address (including ZIP Code) of employer, approximate date, and reasons in each case. This information should agree with your answers in Item 20, EXPERIENCE.*		X
32. Have you ever been convicted of an offense against the law or forfeited collateral, or are you now under charges for any offense against the law? (You may omit: (1) traffic violations for which you paid a fine of $30.00 or less; and (2) any offense committed before your 21st birthday which was finally adjudicated in a juvenile court or under a Youth Offender law.)		X
33. While in the military service were you ever convicted by general court-martial? *If your answer to 32 or 33 is "Yes," give details in Item 37. Show for each offense: (1) date; (2) charge; (3) place; (4) court; and (5) action taken.*		N.A.
34. Does the United States Government employ in a civilian capacity or as a member of the Armed Forces any relative of yours (by blood or marriage)? (See Items 34 and 35 in the attached instruction sheet.)	X	
35. Do you live with, or within the past 12 months have you lived with, any of these relatives who are employed in a civilian capacity? *If your answer to 34 is "Yes," give in Item 37 for such relatives: (1) full name; (2) present address (including ZIP Code); (3) relationship; (4) department, agency, or branch of the Armed Forces. If your answer to 35 is "Yes," also give the kind of appointment held by the relative(s) you live with or have lived with within the past 12 months.*		X
36. Do you receive or do you have a pending application for retirement or retainer pay, pension, or other compensation based upon military, Federal civilian, or District of Columbia Government service? *If your answer is "Yes," give details in Item 37.*		X

Your Statement cannot be processed until you have answered all questions, including Items 26 through 36 above. Be sure you have placed an "X" to the left of EVERY marker (◀) above, either in the "Yes" or the "No" column.

37. Space for detailed answers. Indicate Item number to which answers apply.

Item No.	
34	(1) EDWARD HERSMAN - UNCLE (NASA: CHEMICAL ENGINEER) 237 FAIRVIEW AVE., DOYLESTOWN, OHIO. (2) JOHN ANDERSON - UNCLE (IRS) 4415 ISLAND RD., 305 BAY POINT, MIAMA FLORIDA 33137 (3) TROY MILLER - SPOUSE OF FIRST COUSIN (U.S. AIR FORCE) BASE TRAILER COURT, GOLDSBORO, N. CAROLINA 27530 (4) RAY HERSMAN - UNCLE {DECEASED} (CIVIL ENGINEER) c/o RT. 2, BOX 4960, NEW ALBANY, INDIANA

If more space is required, use full sheets of paper approximately the same size as this page. Write on EACH sheet your name, birth date, and *announcement or position* title. Attach all sheets to this Statement at the top of Page 3.

ATTENTION — THIS STATEMENT MUST BE SIGNED

Read the following paragraph carefully before signing this Statement

A false answer to any question in this Statement may be grounds for not employing you, or for dismissing you after you begin work, and may be punishable by fine or imprisonment (U.S. Code, Title 18, Sec. 1001). All statements are subject to investigation, including a check of your fingerprints, police records, and former employers. All the information you give will be considered in reviewing your Statement and is subject to investigation. A false answer to items 27 or 28 could deprive you of your right to an annuity when you reach retirement age in addition to the penalties described above.

CERTIFICATION	SIGNATURE *(Sign in ink)*	DATE SIGNED
I CERTIFY that all of the statements made in this Statement are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.	Robert J. Marks II	8-20-73

* GPO : 1972 O 459-330

1. WORKING OUTSIDE OF P.D.'S (A.R. 34 REVISION)
2. IMPLIED → NO 11'S UNTIL 13'S, BUT 13'S ARE FROZE (PASSING THE SOUR GRAPES)
3. PERSONAL, UPON HIRING, STATES 11 IS ENGINEER'S JOURNEYMAN LEVEL
4. STATEMENT: 120 WORK WILL GET AN 11.
5. 4 TOTAL IN THE SAME BOAT
6. GEORGE ALLEN & BRIAN PROMOTED IN B.S.'S ABSENCE
7. SPONSORS FUND FOR 11 POSITION (AVE) (GS-11 STEP 2)
8. LOW OPINION OF POSITION
9. WE HAVE BEEN GIVEN NO 11 CRITERIA.

I. INTRODUCTION

This position is located in the System's Effectiveness Branch, Plans and Programs Division, Weapons Quality Engineering Center.

The incumbent will perform within a group ~~That~~ that has broad responsibilities in program management, systems effectiveness analysis and evaluation, preparation and evaluation of specifications and standards, testing and professional consulting. The incumbent will also perform engineering studies and analysis in implementing various aspects of the program.

II. MAJOR DUTIES AND RESPONSIBILITIES

The incumbent accomplishes project work of the following nature in connection with the full range of Avionics systems and instruments branch cognizance:

A. Reviews and evaluates the reliability and maintainability portions of technical development plans and proposals submitted by the equipment manufacturers to customers including ASO, NAVAIR, NAVSEA and NAVELEX. For projects assigned to this activity by the customer, THE INCUMBANT will serve as project manager with responsibilities of keeping customer fully informed of progress and major obstacles requiring program changes for the R & M portions of major R & D or production contracts. In this capacity, the incumbent will review and provide detailed comments and/or recommendations on program plans, test procedures, math models, predictions, and testing reports as pertain to the reliability and/or maintainability of the system. Reliability testing will include Reliability Development (Test, Analyze, and Fix) Tests, Reliability Demonstration (Qualification) Tests, and Reliability Production Acceptance Tests. Maintainability testing consists of the maintainability demonstration.

B. Writes, reviews, AND revises specifications for reliability and maintainability testing, prediction, estimations, calculations, and design analysis for a wide range of electronic and electromechanical equipment.

C. Evaluates contracters' work on projects involving studies in various aspects of systems effectiveness including writing of handbooks on failure rates and general reliability techniques, computer techniques for reliability analysis and specification writing. Participates in and coordinates continuing survey of electronic industry to maintain up-to-date knowledge of reliability testing and assurance methods and procedures.

D. Performs or coordinates studies for the purpose of establishing optimum methods and procedures for determining reliability and operation problem areas of avionics equipments in Fleet use. This includes performing reliability and maintainability analyses on this equipment as necessary as well as intensive study of methods used in the Fleet for trouble-shooting, repairing and reporting failures and problem areas. Develops or participates in development of methods for the efficient handling and analysis of this data (including computer application) and generates reports and recommendations to the customer for implementation of same. This function requires considerable liaison effort between high level management personnel within governmental agencies and industry. This liaison is accomplished by the incumbent.

E. Performs special engineering investigations on electronic systems which are performing below the specified reliability level in the Fleet. The incumbent will gather such failure data as is available, review the applicable specifications, review the design and installation of the system

and utilizing such techniques as circuit analysis, math modeling, failure rate predictions, redundancy, etc. will provide the customer such recommendations as will correct the areas of deficiency and improve the reliability of the systems. Such recommendations might include changing the inherent design, changing materials or circuitry, requiring new tests or methods of testing in the applicable specifications.

F. Reviews specifications of equipment containing Built-In-Test features for compliance with AR-10 and related publications. Prepares special reports on BIT functions for these equipments.

G. Performs Reliability and maintainability surveillance and engineer support which includes the following functions:

1. Attends and participates in program reviews and other conferences as necessary and as requested by the customer.

2. Becomes informed and involved during development stage of the R/M programs in order to assure the intent of the contract is achieved.

3. Becomes thoroughly familiar with the design and performance requirements of equipments by reviewing applicable specifications and documents through contracts with management personnel within industry and government.

4. Assist customer in evaluating the contractors Reliability and Maintainability program plans and any associated test plans. Make recommendation to customer for approval or disapproval of plans. Approve or disapprove associated test procedures. Assist contractor in preparation or correction of these plans and procedures as necessary.

5. Review reliability and maintainability prediction analyses and derating analyses and provide comments to customer.

6. Monitor thermal surveys and comment to customer upon appropriateness.

7. Assist the customer and contractor in interpretation of reliability results and classification of failures. Analyze the test rationale and report to customer on all findings. Coordinate with DCAS for their witnessing of equipment performance testing and for verifying reliability test time. Provide guidance to DCAS in performing this function. Review failure analyses and failure reports, failure analysis reports and corrective actions, and provide recommendations to the customer regarding their appropriateness. Review the reliability test reports and recommend action to the customer.

8. Conduct periodic surveillance of the contractor's facilities assuring the adequacy of the test equipment and the adherence to the approved test procedure. For all reliability tests, assist in classification of failures into either relevant or non-relevant categories.

9. Study and analyze the Maintainability and Support Equipment reports. These reports will contain the Maintainability Program Plan, the Maintainability Prediction, the Maintainability Analysis, and reports of maintainability considerations applied to design reviews. Report significant conclusions and/or recommendations regarding these reports to customer.

III. CONTROLS OVER THE POSITION

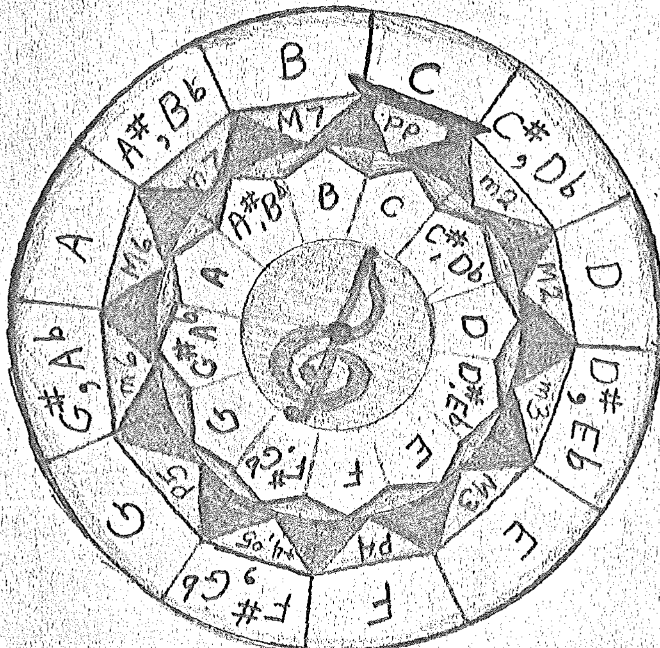
This position is under the supervision of the Manager of the Systems Effectiveness Section, Electronic Engineer. The incumbent is ~~responsible~~

responsible for determining the proper approach, planning, and carrying out the project assignments. Technical problems involving policy matters or of an unprecedented nature are usually discussed jointly with the Division and Branch Managers. Work is periodically reviewed for general policy conformance and meeting program objectives. Written guides utilized include engineering handbooks and textbooks, military specifications, technical reports and studies, etc. A portion of the work includes consideration of areas for which little or no precedent exists.

IV. QUALIFICATION REQUIREMENTS OF THE WORK

This position requires knowledge of scientific and engineering principles and theories in the field of electronics and related fields such as can be learned through completion of a full four-year curriculum in electronic engineering or physics plus appropriate experience in the particular area of application or work closely related thereto. The incumbent must also have an understanding of statistics, reliability and maintainability, and experience in preparing test plans, specifications, procedures and program plans. This requires an understanding and working knowledge of such documents as AR-104, AR-10, AR-34, MIL-HDBK-217B, MIL-STD-781, etc. An understanding of the 3-M data acquisition is also required.

PERSONAL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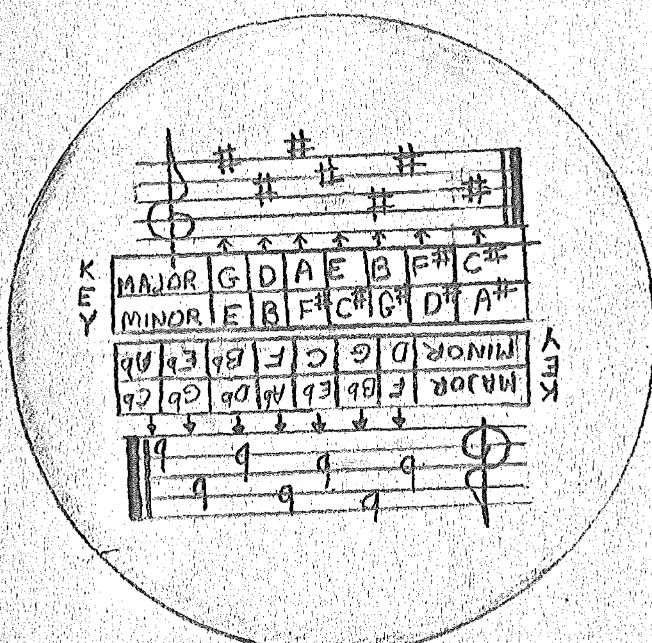
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MINOR E B F# C# G# D# A#
KEY
MAJOR F Bb Eb Ab Db Gb Cb
MINOR D G C F Bb Eb Ab

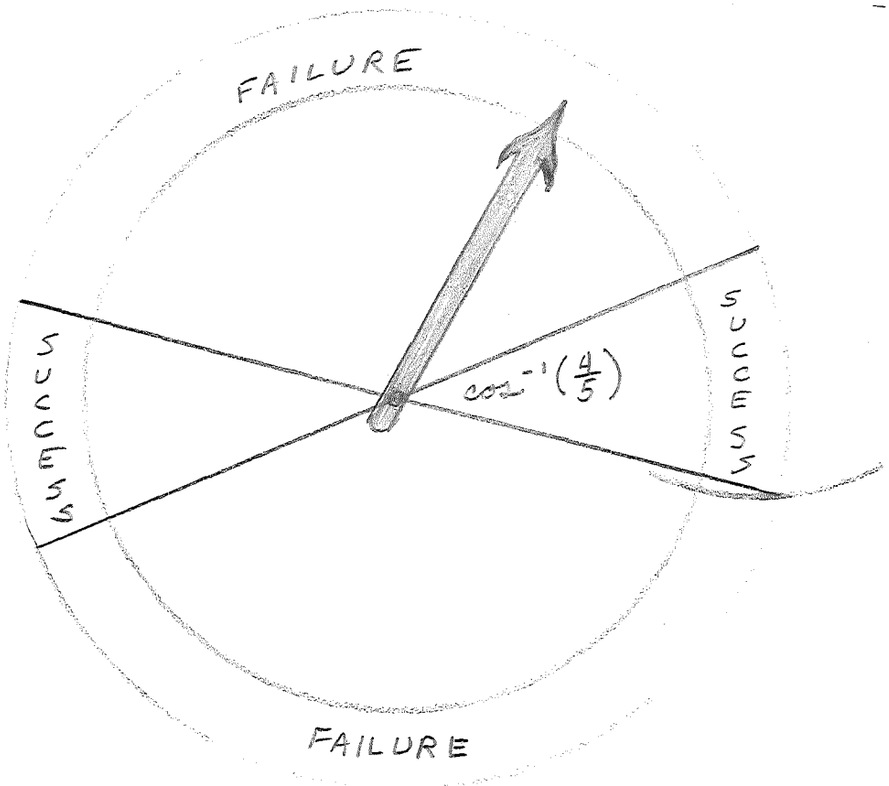
BACK

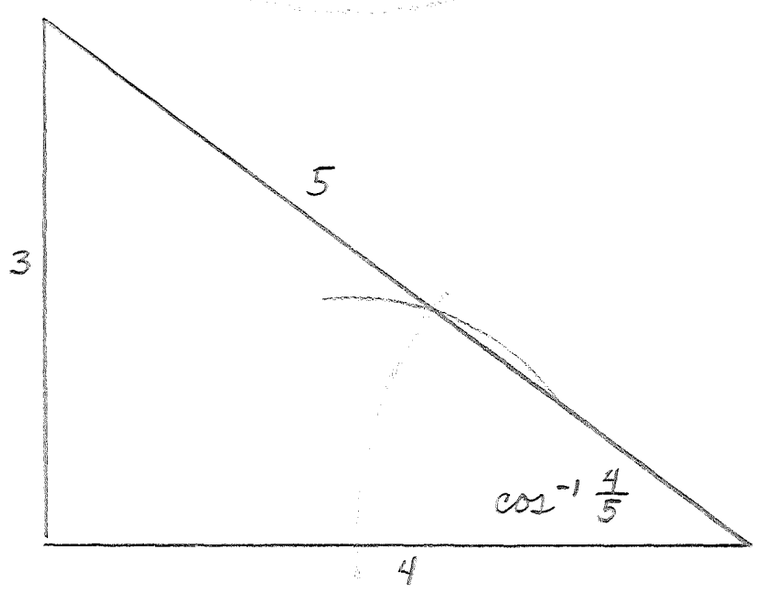
TECHNICAL REPORT GENERATOR

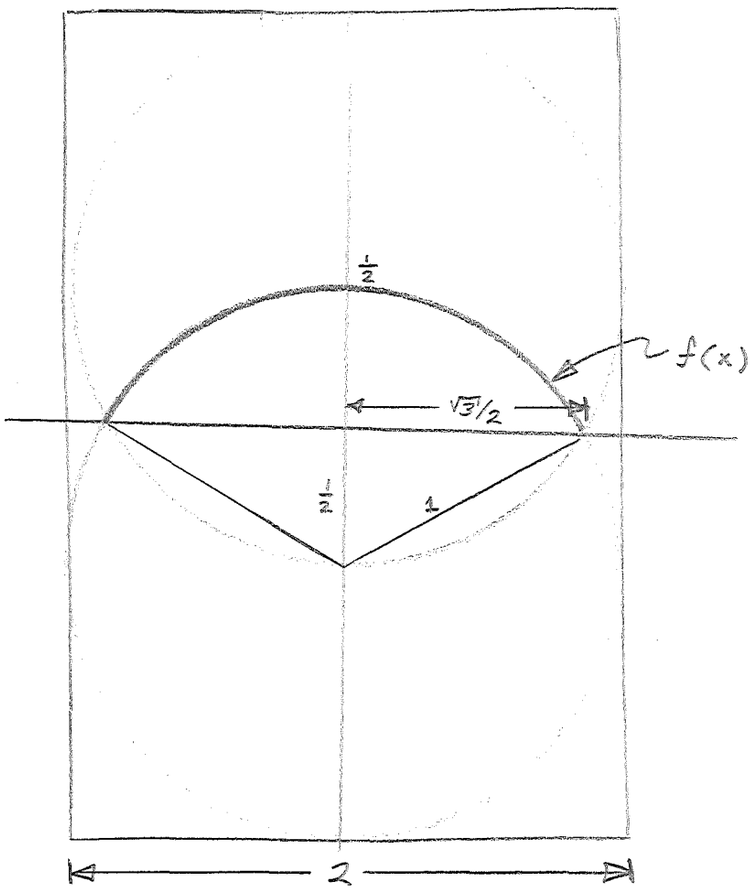
A	B	C	D
1) IN PARTICULAR	1. A LARGE PORTION OF THE INTERFACE COMMUNICATION COORDINATION	1. ADDS SPECIFIC PERFORMANCE LIMITS TO	1. THE ANTICIPATED FOURTH GENERATION EQUIPMENT
2) ON THE OTHER HAND	2. A CONSTANT FLOW OF INFORMATION	2. MAXIMIZES THE PROBABILITY OF PROJECT SUCCESS WHILE MINIMIZING THE COST AND TIME OF	2. REPRESENTATIVE SYSTEM CHARACTERIZATION
3) AS A RESULTANT IMPLICATION	3. THE CHARICTERIZATION OF SPECIFIC CONCERNS.	3. MOST BE UTILIZED AND BE FUNCTIONALLY INTERWOVEN WITH	3. THE OVERALL PROJECT OBJECTIVE DEFINITION
4) IN THIS REGARD	4. INITIATION OF INTEGRAL SUBSYSTEM DEVELOPMENT	4. NECESSITATES THAT URGENT CONSIDERATION BE APPLIED TO	4. THE ALREADY SUBJECTIVE SYSTEM DEVELOPMENT STATUS
5) BASED ON INTEGRAL SUBSYSTEM CONSIDERATIONS	5. THE FULLY INTEGRATED TEST PROGRAM	5. REQUIRES CONSIDERABLE SYSTEMS ANALYSIS AND TRADE OFF STUDIES TO ARRIVE AT	5. THE PHILOSOPHY OF COMMONALITY
6) WITH RESPECT TO SPECIFIC GOALS	6. THE INCORPORATION OF ADDITIONAL MANAGERIAL CONSTRAINTS	6. IS FURTHER COMPOUNDED WHEN TAKEN INTO ACCOUNT	6. THE CONFINEMENT OF STANDARDIZATION
7) FOR EXAMPLE	7. ANY ASSOCIATED SUPPORTING ELEMENT	7. PRESENTS DIFFICULT CHALLENGES TO	7. THE TOTAL SYSTEM PROFILE
8) IN A CONVERSE SENSE	9. THE INDEPENDENT FUNCTIONAL PRINCIPLE	8. RECOGNIZES THE IMPORTANCE OF OTHER SYSTEMS AND THE NECESSITY FOR	8. THE SEEMINGLY INADEQUATE DATA COLLECTION PLAN.
9) ON THE OTHER HAND	10. A PRIMARY INTERRELATIONSHIP BETWEEN SYSTEM AND SUBSYSTEM TECHNOLOGIES	9. EFFECTS A SIGNIFICANT IMPLEMENTATION OF	9. OPERATIONAL MODE DOCUMENTATION
10) AS A RESULT OF COST-EFFECTIVENESS CONSTRAINTS	11. COMPLEX ANALYSIS IN THIS AREA	10. ADDS OVERRIDING PERFORMANCE CONSTRAINTS TO	10. PRELIMINARY FUNCTIONAL TASKS
11) WITHIN SPECIFIED BOUNDS	12. STATE-OF-THE ART GROWTH	11. WOULD SIGNIFICANTLY DEGRADE EFFORTS TOWARD	11. THE DEVELOPMENT PHASE OF THE SYSTEM
12) FURTHERMORE	13. THE RESULT IF IN FACT DIFFERENT FROM THOSE PREDICTED,	12. IS, IN THE BROADEST OF SENSES, A DUPLICATION OF EFFORT WITH RESPECT TO	12. MORE IMPORTANT - BEAURACRATIC NECESSATIES
13) WHICH LEADS ONE TO THE CONCLUSION THAT	14. EXTENSIVE SURVEILLANCE	13. WOULD NOT BE REPRESENTATIVE OF PRESENT THOUGHT CONCERNING	13. THE SPECIFICATION REQUIREMENTS
14) BASED ON PRIOR CONCERNS	15. STATISTICAL ANALYSIS OF THE TYPE REQUIRED	14. ADDS ADDITIONAL BURDEN TO THE ALREADY FINANCIALLY STRESSED EFFORT OF	14. THE PRESENT INVESTIGATIVE EFFORTS
15) WITH REFERENCE TO AVAILABLE RESOURCES	16. ISOLATED OCCURANCES OF THE TYPE UNDER INVESTIGATION		15. PREVIOUS ATTEMTS AT OPERATIONAL ENVIORNMENTAL MEASURES
16) IN A MORE RIGOUROUS SENSE	17. PRELIMINARY INVESTIGATION HAS REVEALED THAT A ANY SYSTEM REDESIGN		
17) PREVIOUS EFFORTS TOWARD RESOLUTION HAVE CONCLUDED THAT			
18) WITHIN THE LIMITS OF PRESENT DIRECTION			
19) THEREFORE			
20) WITHIN THE SCOPE OF THESE CONSIDERATIONS			
21) DISREGARDING MISCELLANEOUS DIFFERENCES IN INTERPRETATION OF THE SYSTEM METHODOLOGY			
22) IDEALLY			
23) WITH RESPECT TO CONFLICTING VIEWS			
24) WITH REGARD TO THE IMPLIMENTATION PLAN			

$$P[\text{SUCCESS}] = \frac{\cos^{-1}\left(\frac{4}{5}\right)}{\pi}$$

$$= \frac{\sin^{-1}\left(\frac{3}{5}\right)}{\pi}$$







$$f(x): \quad x^2 + \left(y + \tfrac{1}{2}\right)^2 = 1$$

$$f(x) = \sqrt{1 - x^2} - \tfrac{1}{2}$$

$$\frac{A_s}{2} = 2\int_0^{\sqrt{3}/2} \left[\sqrt{1 - x^2} - \tfrac{1}{2}\right] dx$$

$x = \sin\phi$

$dx = \cos\phi\, d\phi$

$x = 0 \Rightarrow \phi = 0 \quad ; x = \frac{\sqrt{3}}{2} \Rightarrow \phi = \frac{\pi}{3}$

$$\therefore A_s = \int_0^{\pi/3} \left[\cos\phi - \tfrac{1}{2}\right] \cos\phi\, d\phi$$

$$= \int_0^{\pi/3} \left[\cos^2\phi - \tfrac{1}{2}\cos\phi\right] d\phi$$

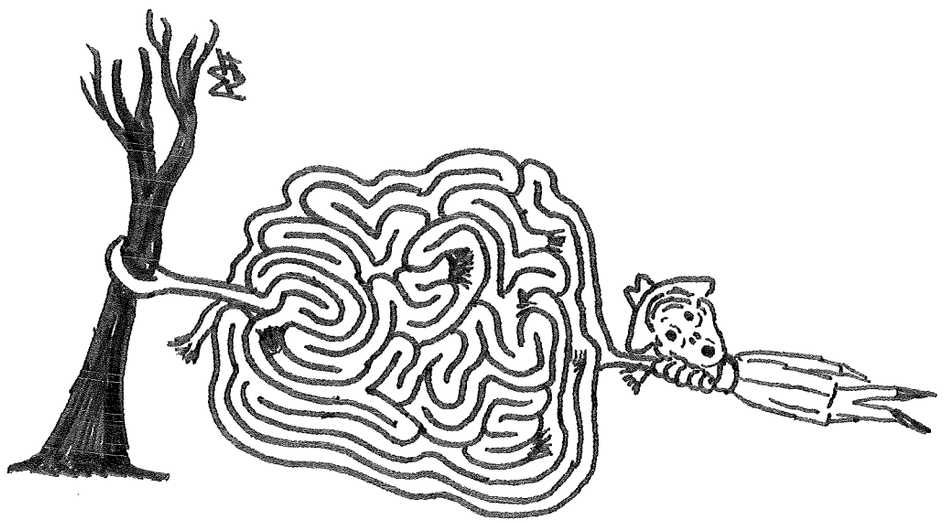
$$= \tfrac{1}{2}\sin\phi\cos\phi + \tfrac{1}{2}\phi - \tfrac{1}{2}\sin\phi \Big|_0^{\pi/3}$$

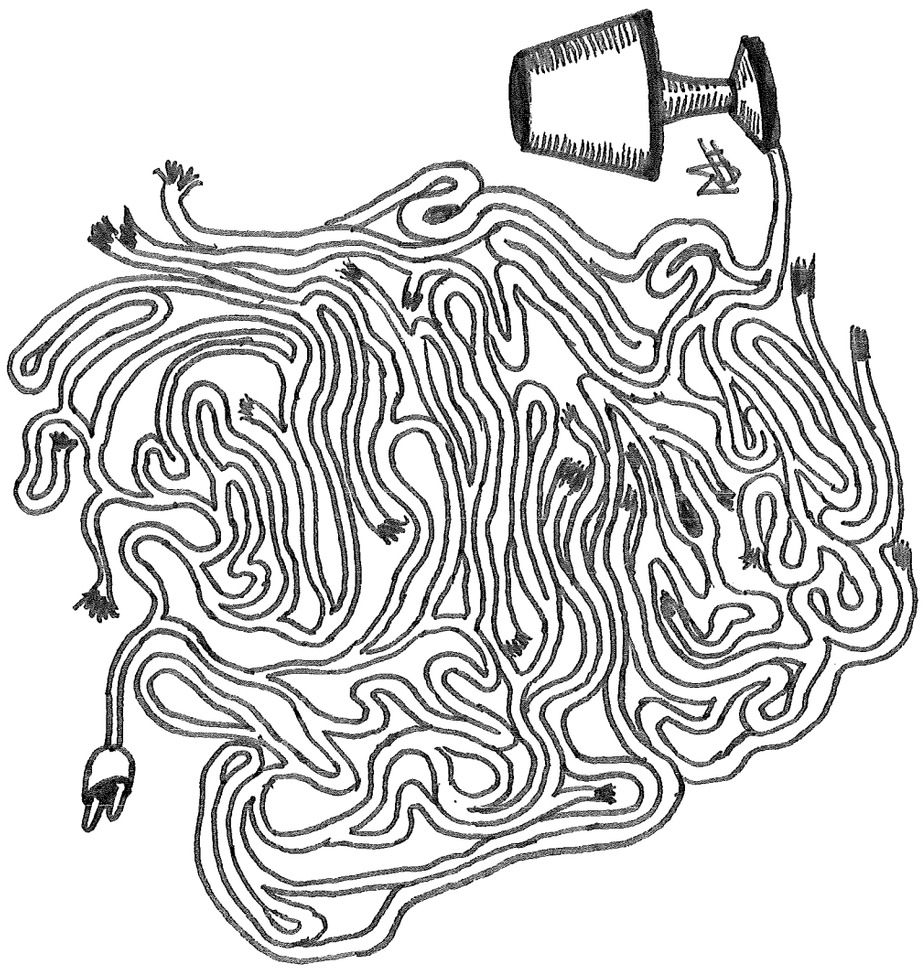
$$= \tfrac{1}{2}\left[\frac{\sqrt{3}}{2} \times \frac{1}{2} + \frac{\pi}{3} - \frac{\sqrt{3}}{2}\right]$$

$$= \tfrac{1}{2}\left[\frac{\pi}{3} - \frac{\sqrt{3}}{4}\right]$$

A_T


RING






NAVAL
APEX BELLY BUTTON SWAG
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CHEIF OF NAVAL MATERIALS
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#86-A-429
BELLY BUTTON LENT
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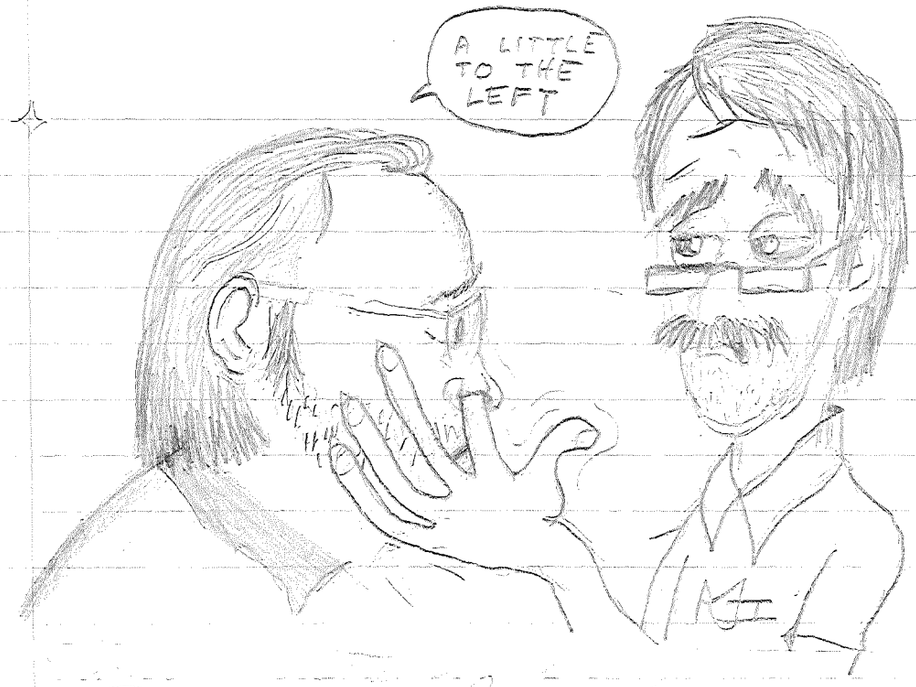
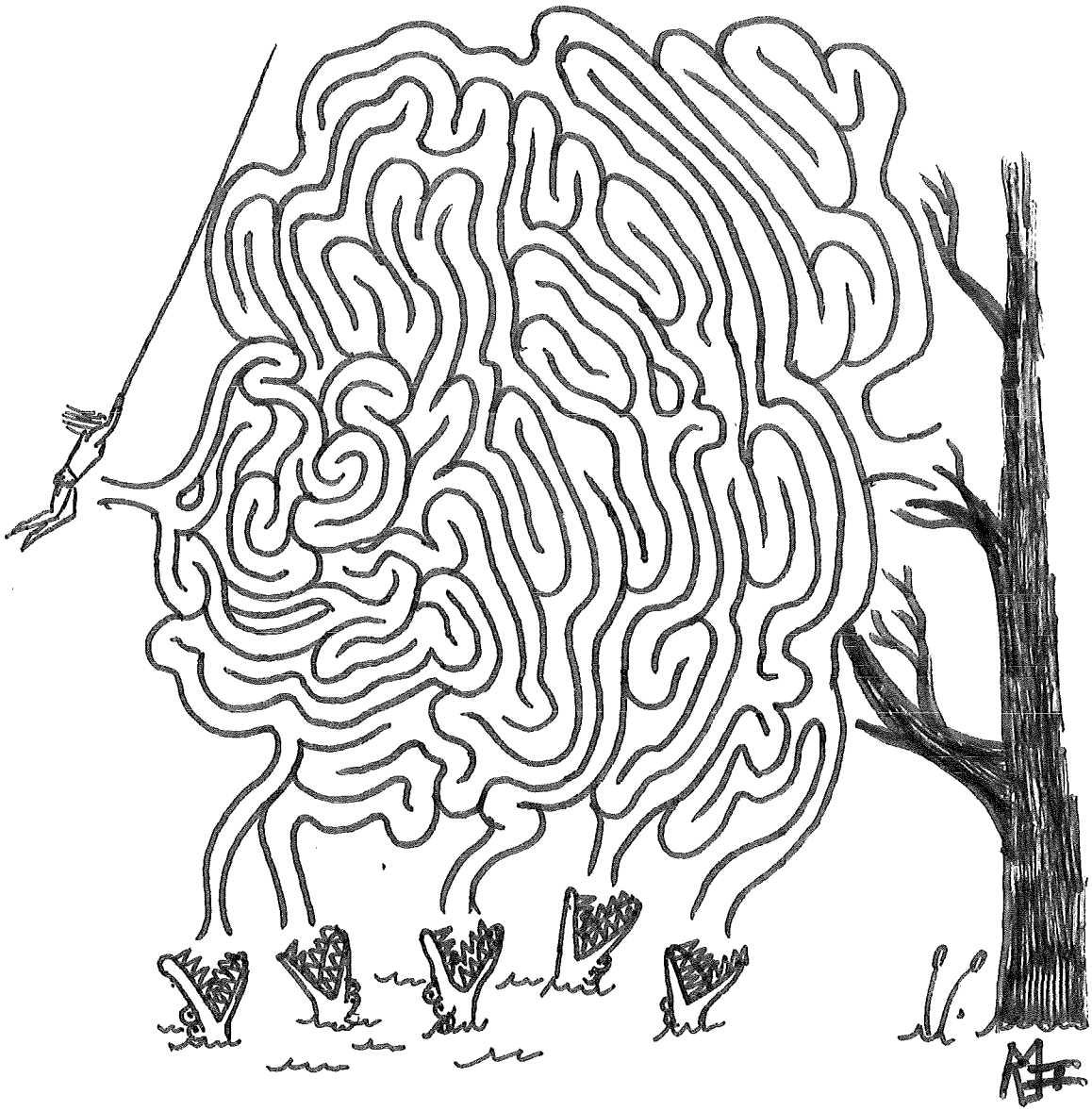
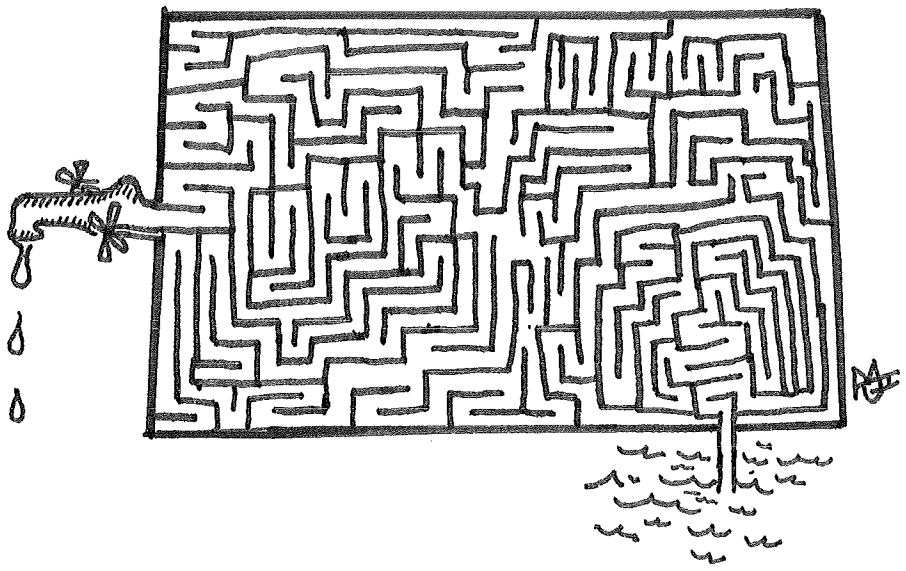
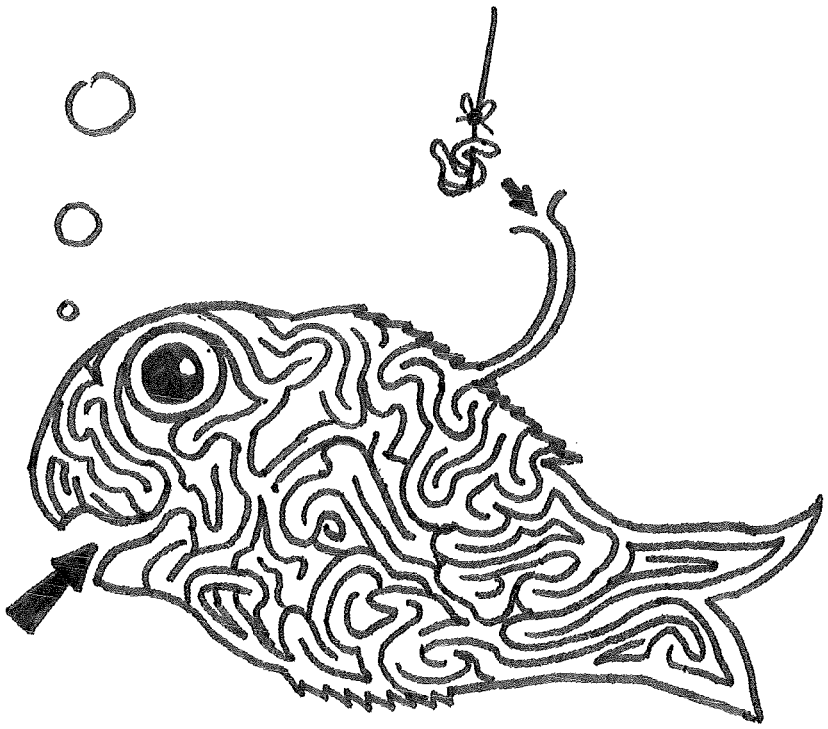
CAN 43
NAVAL SALT (FOR EATING CELERY IN BED)
2D TYPE A EMBILICLE CORDS

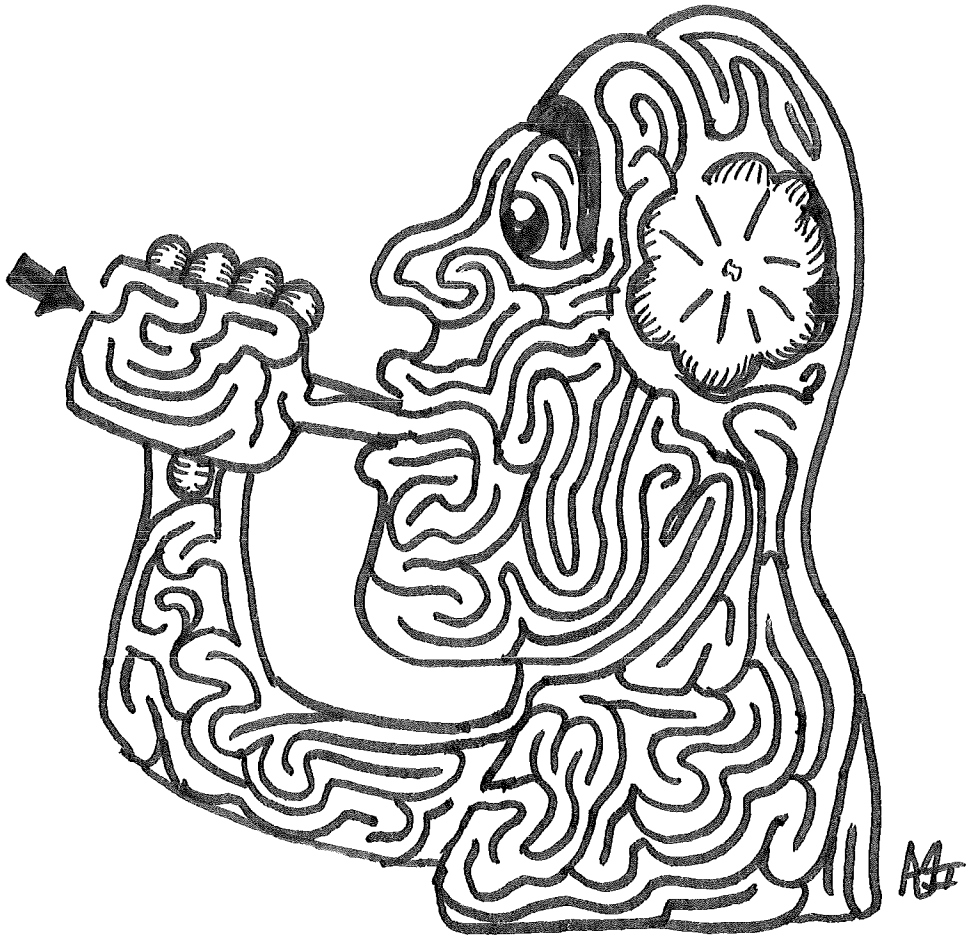
"I SLEPT WITH MY MOUTH OPEN.... HONEST"

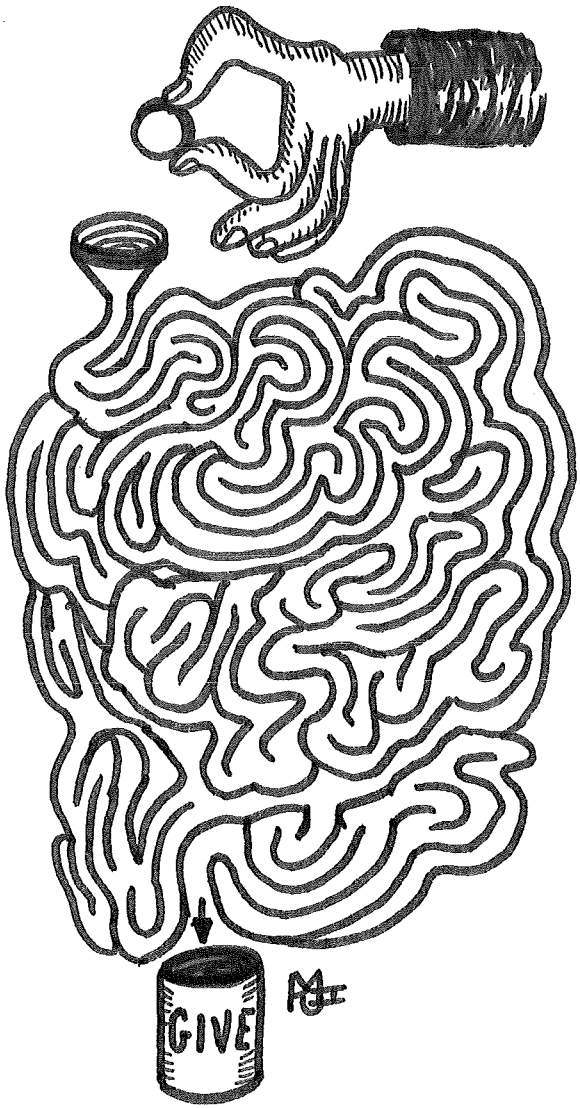

A LITTLE TO THE LEFT







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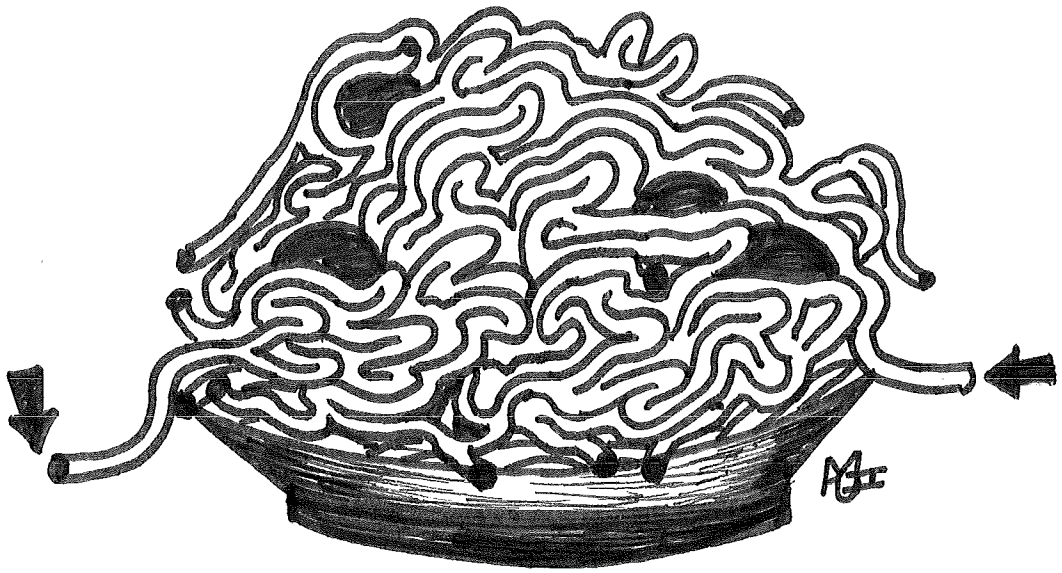

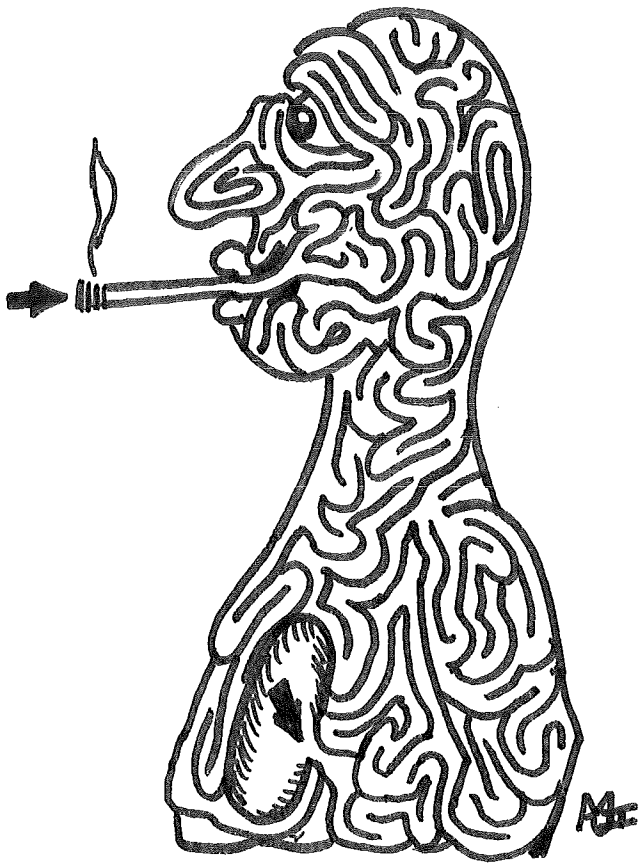

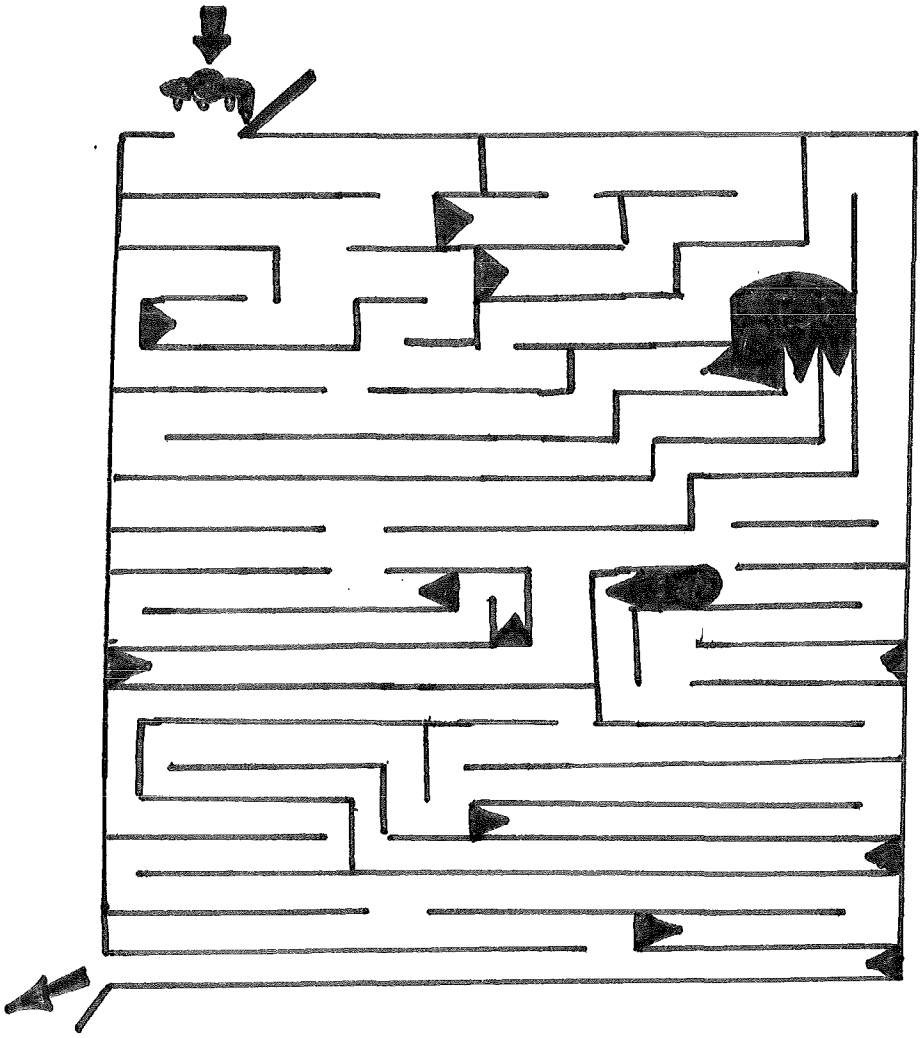

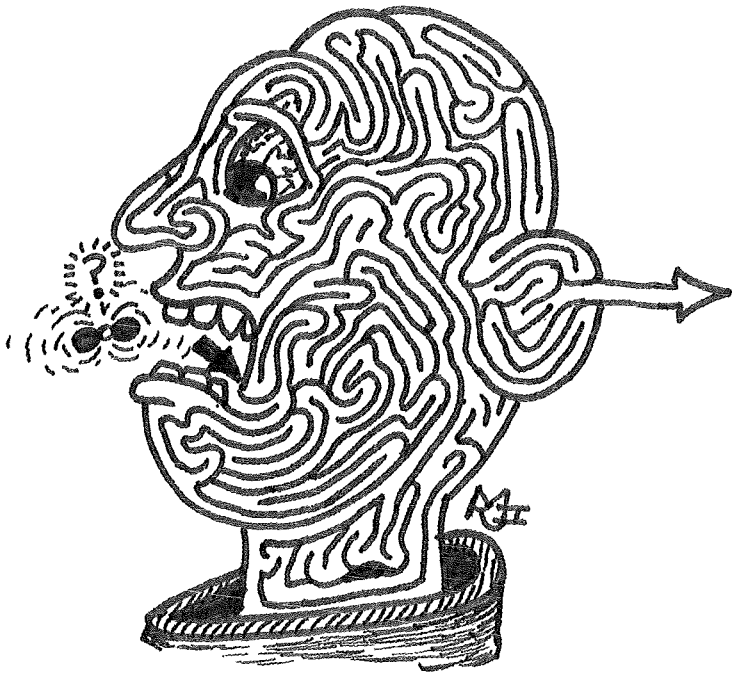

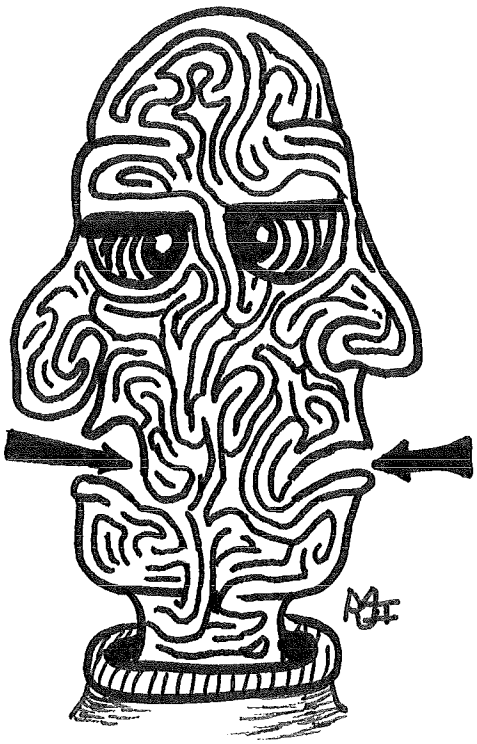

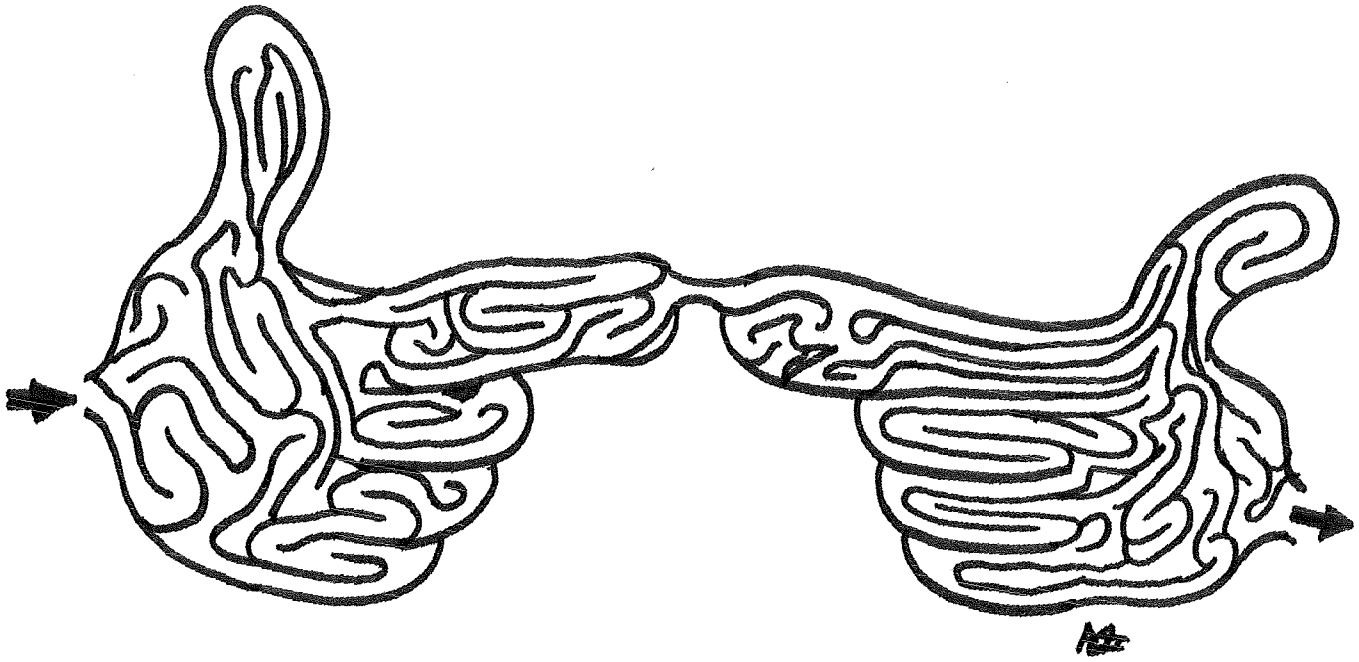

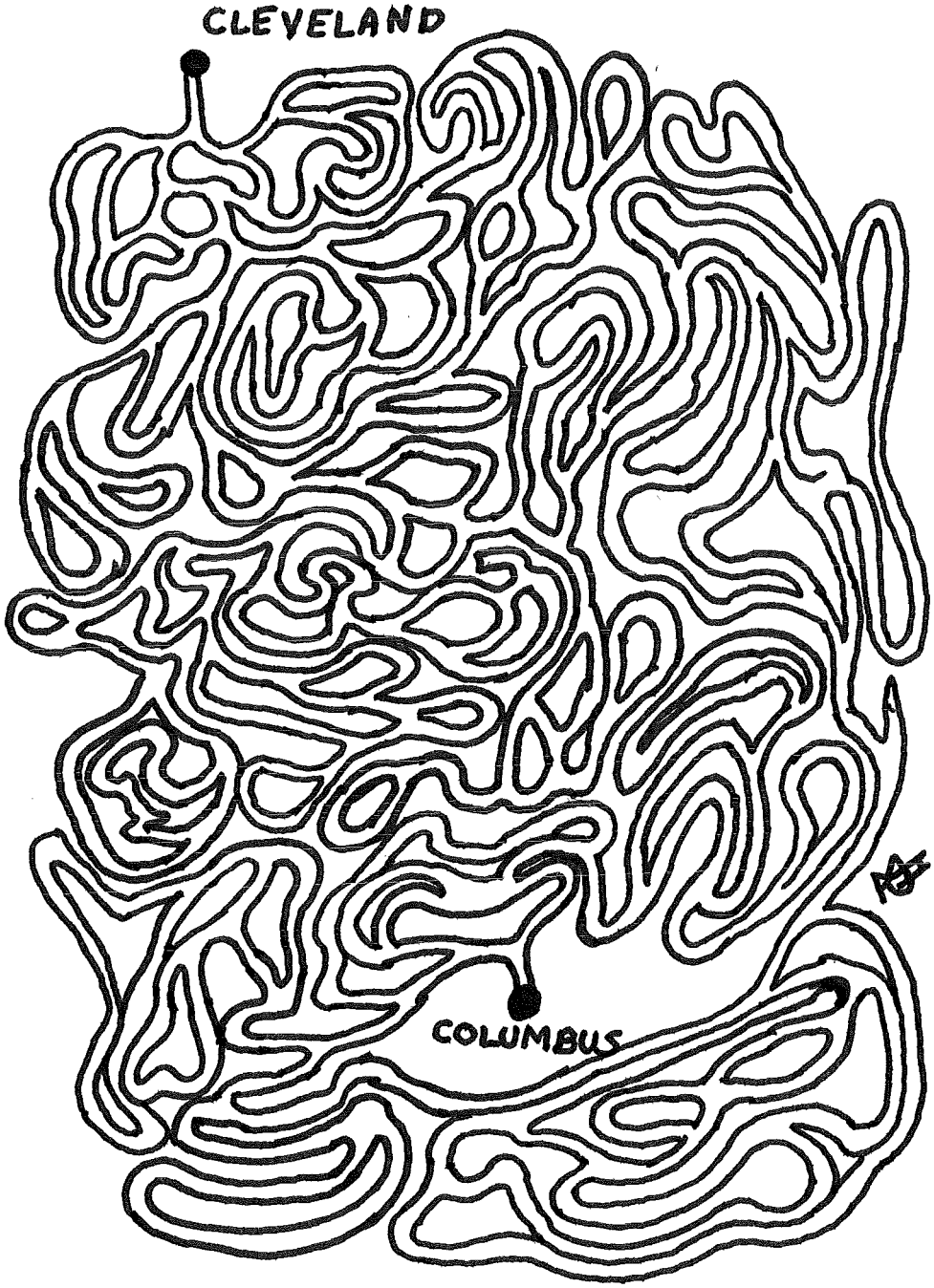
CLEVELAND
COLUMBUS

PROBLEM

MINIMIZE

$$R(\vec{\ell},\vec{\chi}) = \int_{-\infty}^{\infty} \left| \sum_{n=1}^{m} \int_{\ell_n}^{\ell_{n+1}} g_i(\xi)\left[h(x-\xi;\xi) - h(x-\xi;\chi_n)\right] d\xi \right|^2 dx$$

$$= \int_{-\infty}^{\infty} \left| \sum_{n=1}^{m} \mathcal{F}_{\xi}\left[g_n(\xi-\chi_n)\, \mathcal{F}_x\{ h(x;\xi) - h(x;\chi_n)\}\right] \right|^2 df_x$$

WITH RESPECT TO

$$\vec{\ell} = [\ell_1, \ell_2, \ldots, \ell_n, \ldots, \ell_m, \ell_{m+1}]$$
$$\vec{\chi} = [\chi_1, \chi_2, \ldots, \chi_n, \ldots, \chi_m]$$

WHERE:

$$\ell_n \leq \chi_n \leq \ell_{n+1}$$

ℓ_1 AND ℓ_{m+1} ARE FIXED

m IS FIXED

NOTATION REMARKS:

$$g_n(\xi-\chi_n) = g_i(\xi)\,\mu(\xi-\ell_n)\,\mu(\ell_{n+1}-\xi)$$

$$\mu(\xi) = \begin{cases} 1 & ; \ \xi \geq 0 \\ 0 & ; \ \xi < 0 \end{cases}$$

$$\mathcal{F}_{\xi}[f(x;\xi)] = \int_{-\infty}^{\infty} f(x;\xi)\, e^{-j2\pi\xi f_x} d\xi$$

$$\mathcal{F}_{x}[f(x;\xi)] = \int_{-\infty}^{\infty} f(x;\xi)\, e^{-j2\pi x f_x} dx$$