RELIABILITY,
MAINTAINABILITY
&
SUPPORTABILITY

BOEING

OVERVIEW

- BACKGROUND
  - PRODUCT LINES
  - POLICY
  - OPERATING PROCEDURES
- R&D
  - CURRENT
  - FUTURE
- R&M APPROACH
  - REQUIREMENTS
  - DESIGN INTERFACE
  - ANALYSIS TOOLS
  - TESTING
  - DOCUMENTATION
  - POST PRODUCTION SUPPORT

BACKGROUND

- R&M IMPLEMENTED LATE 50s
- STRONG EMPHASIS VIA CORPORATE POLICY IN 1960
- MAJOR EFFORT COMMENCING WITH MINUTE MAN AND CONTINUING ON ALL PROGRAMS THRU 757/767
- LEADER IN AREAS SUCH AS: ANALYSIS, TAF TESTING, POST PRODUCTION SUPPORT, ETC
- CONTINUAL INCREASING R&D EFFORT

CORPORATE POLICY – 4E1 DATED MAY 11, 1983

EXPLAINS R&M RESPONSIBILITIES WITHIN THE BOEING COMPANY

- Conduct a planned and ORGANIZED APPROACH to product safety, RELIABILITY AND MAINTAINABILITY on each product program, with the objective of enhancing product operational safety, dependability, availability, and customer acceptance.
- Implementation will be consistent with applicable CUSTOMER CONTRACTUAL REQUIREMENTS and Boeing standards of product excellence, and will include consideration of human reliability and capability limitation as they relate to all aspects of product performance.
- Planning of each product program will include the IDENTIFICATION OF product safety, RELIABILITY AND MAINTAINABILITY CONSIDERATIONS, and requirements which are applicable to development, design, production, and operational use of that product. Planning of program and functional activities that would influence the product's safety, reliability, or maintainability will be correlated with such considerations and requirements for assurance of compatibility. Provisions will also be made for timely, systematic verifications that the product will meet applicable requirements and standards of safety, reliability, and maintainability.
- The RESPONSIBILITY FOR DESIGNING safety, RELIABILITY, AND MAINTAINABILITY into the product LIES WITH THE DESIGN organization. A technical staff will monitor product design to function as a check and balance through independent appraisals. These technical staffs will (a) conduct research to maintain a high level of competence within their technical disciplines, (b) collect operational data on product performance and maintain a system for assuring experience retention and application to new designs, (c) provide expert counsel and direct support to product design organizations as required, and (d) serve as the focal points for overall planning, coordination, and surveillance in their respective fields.
- Every reasonable effort will be made to aid customer system planning to ASSURE that CUSTOMER FURNISHED EQUIPMENT will sustain the safety, reliability, and maintainability designed into Boeing products.
- Contractual obligations for meeting safety, reliability, and maintainability requirements may be accepted only after careful analysis and coordination which assures that such obligations and their fulfillment can be DEFINED, DEMONSTRATED, ATTAINED, and included in product pricing.
- License agreements with other firms for the manufacture of Boeing products will make provisions for assuring, to the greatest extent practicable, that the LICENSEE'S PERFORMANCE WILL BE CONSISTENT with the objectives of this policy, without assumption by Boeing of any liability for the licensee's failure to do so.
- The COMPANY DIVISION MANAGER will establish and document measures for implementation of this policy as it bears on his organization, its product fields, and customer practices.
- The SENIOR ENGINEERING MANAGER for each company will develop, coordinate, and maintain supplements to this policy to set down standards as needed for the application and integration of engineering disciplines for product safety, reliability, and maintainability. He will foster and guide interdivisional activities to coordinate related matters of interest to more than one division.

OPERATING PROCEDURES 8F00-2
R&M PROGRAM RESPONSIBILITIES

DEFINES THE R&M RESPONSIBILITIES OF EACH BMAC ORGANIZATION

PROGRAM MANAGERS

- REVIEW AND APPROVE R&M PROGRAM PLAN
- ASSURE THAT R&M PROGRAM MEETS ALL CONTRACTUAL REQUIREMENTS

PROGRAM R&M GROUP

- PREPARE R&M PROGRAM PLAN & COORDINATE WITH CUSTOMER
- PROVIDE INPUTS TO DESIGN GROUP AND ASSURE OPTIMUM DEGREE OF R&M
- DEFINE FAILURE CRITERIA AND CHARACTERISTICS FOR PRODUCT EVALUATION
- PROVIDE WRITTEN EVALUATION TO MANAGEMENT & OTHER GROUPS
- CONDUCT ANALYSIS TO DETECT RELAY OR POTENTIAL PROBLEMS
- ISSUE STATUS REPORTS ON PROBLEM AREAS TO CUSTOMER
- DEVELOP AND CONDUCT DEMO TESTS TO MEASURE R&M
- MONITOR SUPPLIER PERFORMANCE AND FEED BACK TO DESIGNERS

DESIGN GROUPS

- REVIEW & APPROVE R&M PROGRAM PLAN
- ASSURE CAPABILITIES EXIST TO PERFORM THE DESIGN R&M FUNCTIONS
- COORDINATE WITH R&M PERSONNEL TO ASSURE OPTIMUM R&M IN THE DESIGN
- UTILIZE TRADE STUDIES TO PROVIDE MANAGEMENT OF R&M EFFORTS ON DESIGN DECISIONS
- COORDINATE WITH R&M IN DEVELOPING DRAWING & SPECS REQUIREMENTS, APPROACHES & CAPABILITIES

ILS R&M GROUP

- PROVIDE R&M POLICIES, PROCEDURES, DIRECTIVES & ASSISTANCE TO ALL ORGANIZATIONS
- PROVIDE GUIDANCE FOR EACH NEW R&M PROGRAM
- REVIEW THE R&M PLAN FOR EACH NEW PROGRAM
- ATTEND ALL PDRs & CDRs FOR ALL PROGRAMS
- RESEARCH & REMAIN AWARE IN INDUSTRY S-O-T-A FOR ALL R&M TECHNOLOGIES
- ACT AS FOCAL POINT FOR ALL R&M ACTIVITIES AND ASSURE THAT R&M PROGRAMS ARE CONSISTENT IN THE COMPANY
- DEVELOP COMPUTER PROGRAMS AND OTHER R&M TOOLS REQUIRED TO ASSURE APPROPRIATE ANALYSIS, TRACKING, AND GROWTH

TECH STAFF

- CONDUCT R&M TESTS REQUESTED AND/OR DEVELOPED BY AN R&M GROUP
- PROVIDE ASSISTANCE TO R&M GROUP IN OBSERVING TEST PERFORMANCE
- REPORT TEST RESULTS TO THE R&M GROUP AND MAINTAIN HISTORICAL FILE OF TEST RESULTS
- USING DATA PROVIDED BY R&M GROUP CONSIDER ACTIONS WHICH MAY BE TAKEN BY OPERATIONS TO IMPROVE PRODUCT R&M

OPERATIONS

- INCLUDE R&M REQUIREMENTS IN PURCHASE ORDERS AS SPECIFIED ON THE SOW/SOURCE CONTROL DOCUMENT
- AS A PART OF SUPPLIER EVALUATION, INCLUDE APPRAISAL OF SUPPLIER R&M PROGRAM
- SERVE AS COORDINATOR BETWEEN SUPPLIER AND ENGINEERING IN THE IMPLEMENTATION OF CONTRACTUAL R&M REQUIREMENTS
- QA WILL PROVIDE SUPPORT TO R&M AS REQUIRED TO IMPLEMENT THE R&M PROGRAM PLAN

CONTRACTS

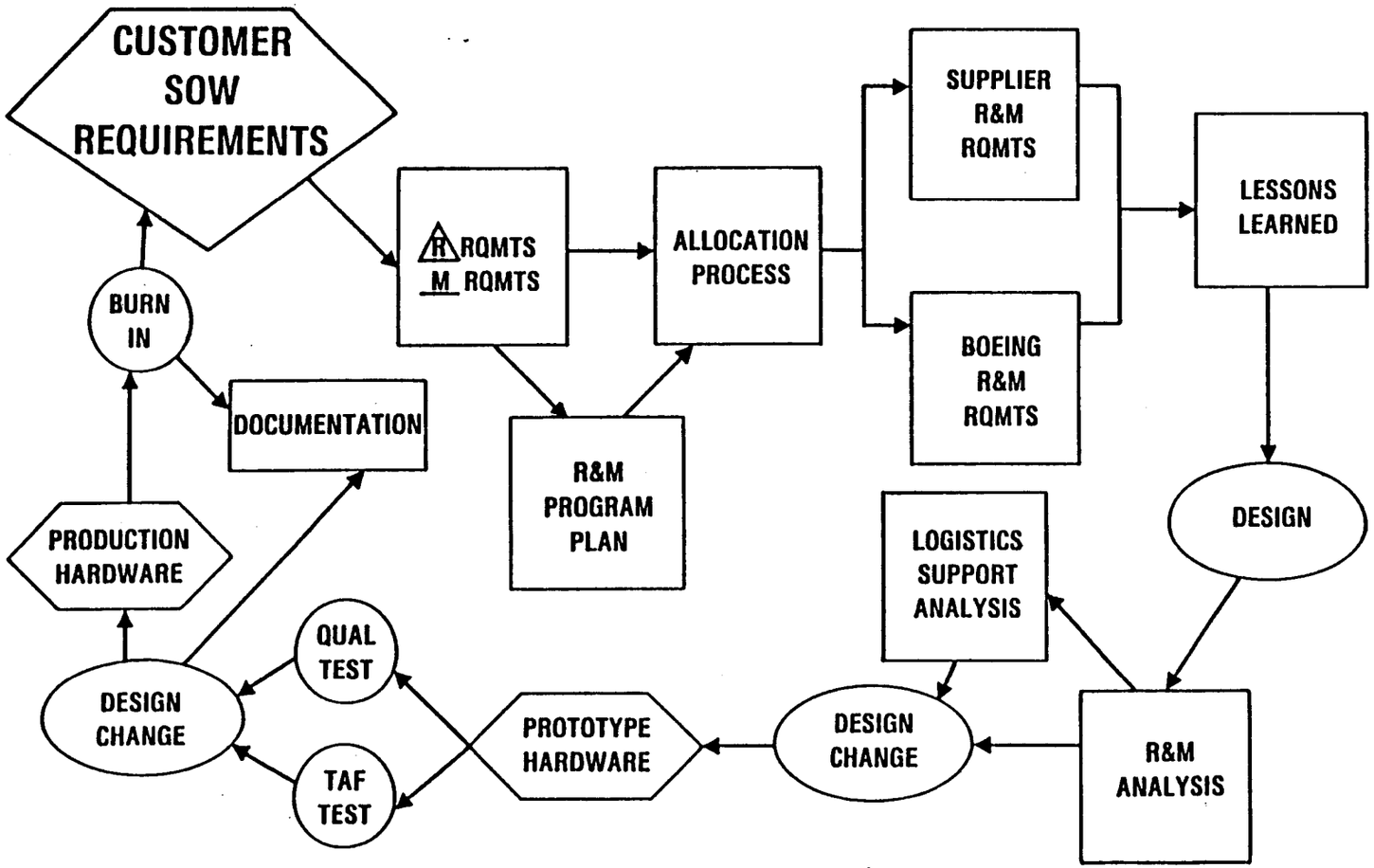
- REVIEW CONTRACTUAL R&M REQUIREMENTS FOR EACH PROGRAM
- ASSURE THE R&M GROUP IS COGNIZANT OF CONTRACTUAL R&M REQUIREMENTS
- VERIFY THAT CONTRACTUAL R&M REQUIREMENTS ARE ACCOMPLISHED AND THAT EVIDENCE OF COMPLIANCE IS SUBMITTED TO THE CUSTOMER

SP85017-05

RELIABILITY
AND
MAINTAINABILITY

APPROACH

R&M PROCESS

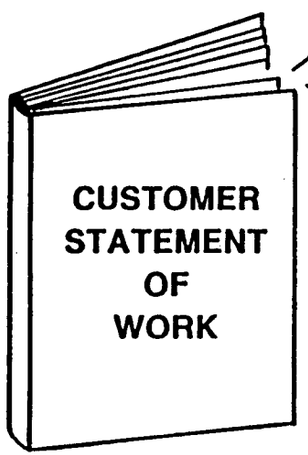

CUSTOMER SOW REQUIREMENTS
R RQMTS
M RQMTS
ALLOCATION PROCESS
SUPPLIER R&M RQMTS
BOEING R&M RQMTS
LESSONS LEARNED
BURN IN
DOCUMENTATION
R&M PROGRAM PLAN
DESIGN
LOGISTICS SUPPORT ANALYSIS
PRODUCTION HARDWARE
QUAL TEST
DESIGN CHANGE
TAF TEST
PROTOTYPE HARDWARE
DESIGN CHANGE
R&M ANALYSIS

R REQUIREMENTS
M REQUIREMENTS

SP85017-01

RELIABILITY & MAINTAINABILITY SPECIFICATIONS

INCLUDED IN THE SOW IN QUALITATIVE AND QUANTITATIVE TERMS



MTBF

MTTR

RELIABILITY		
MTBF	=	1000 FLT. HRS
MISSION (R)	=	96%
LIFE	=	15 YEARS

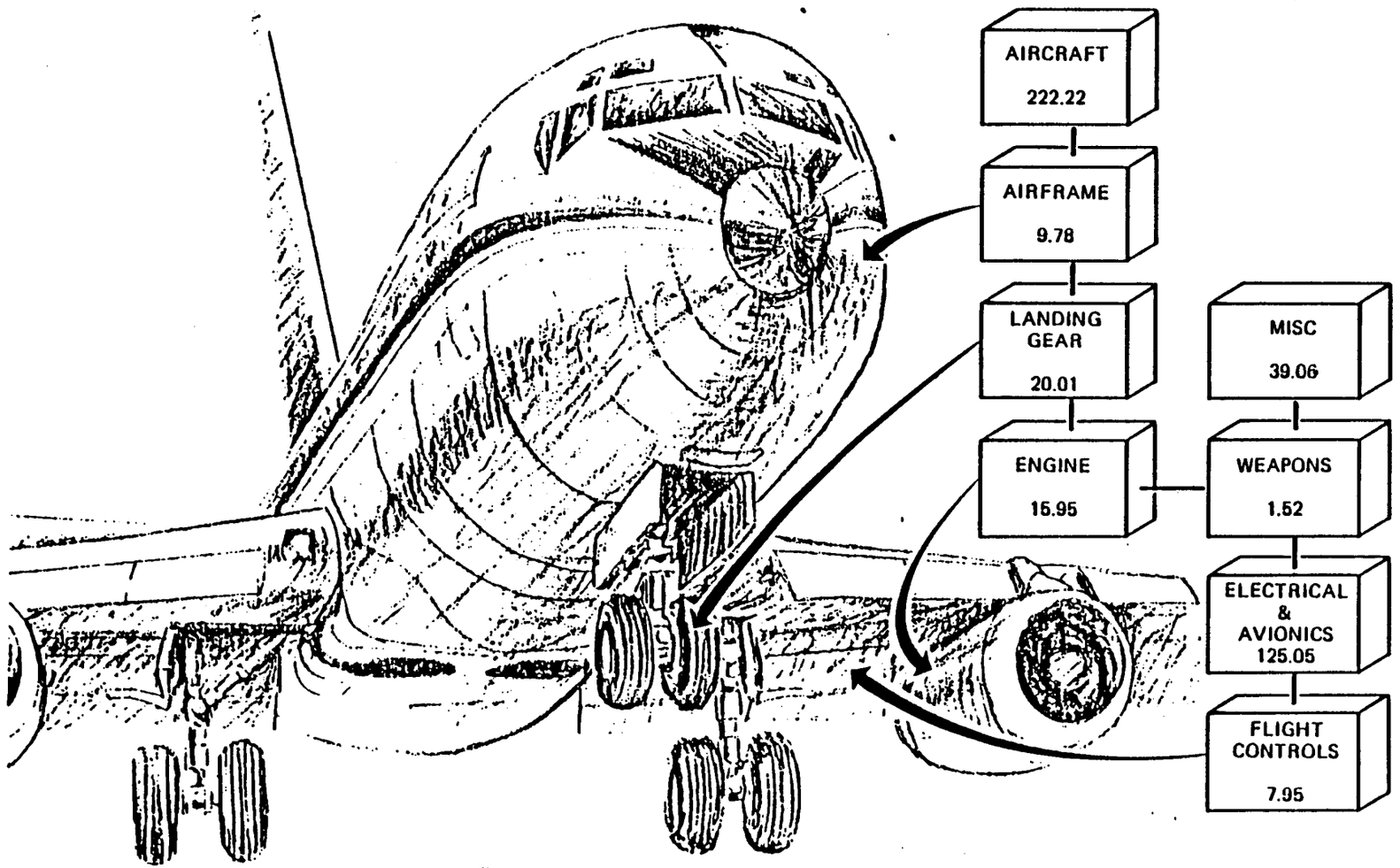
MAINTAINABILITY		
"0" LEVEL MTTR	=	0.5 HRS
"1" LEVEL MTTR	=	1.5 HRS
FAULT DETECTION	≅	90%
FAILURE ISOLATION	≅	95%

ALLOCATION PROCESS

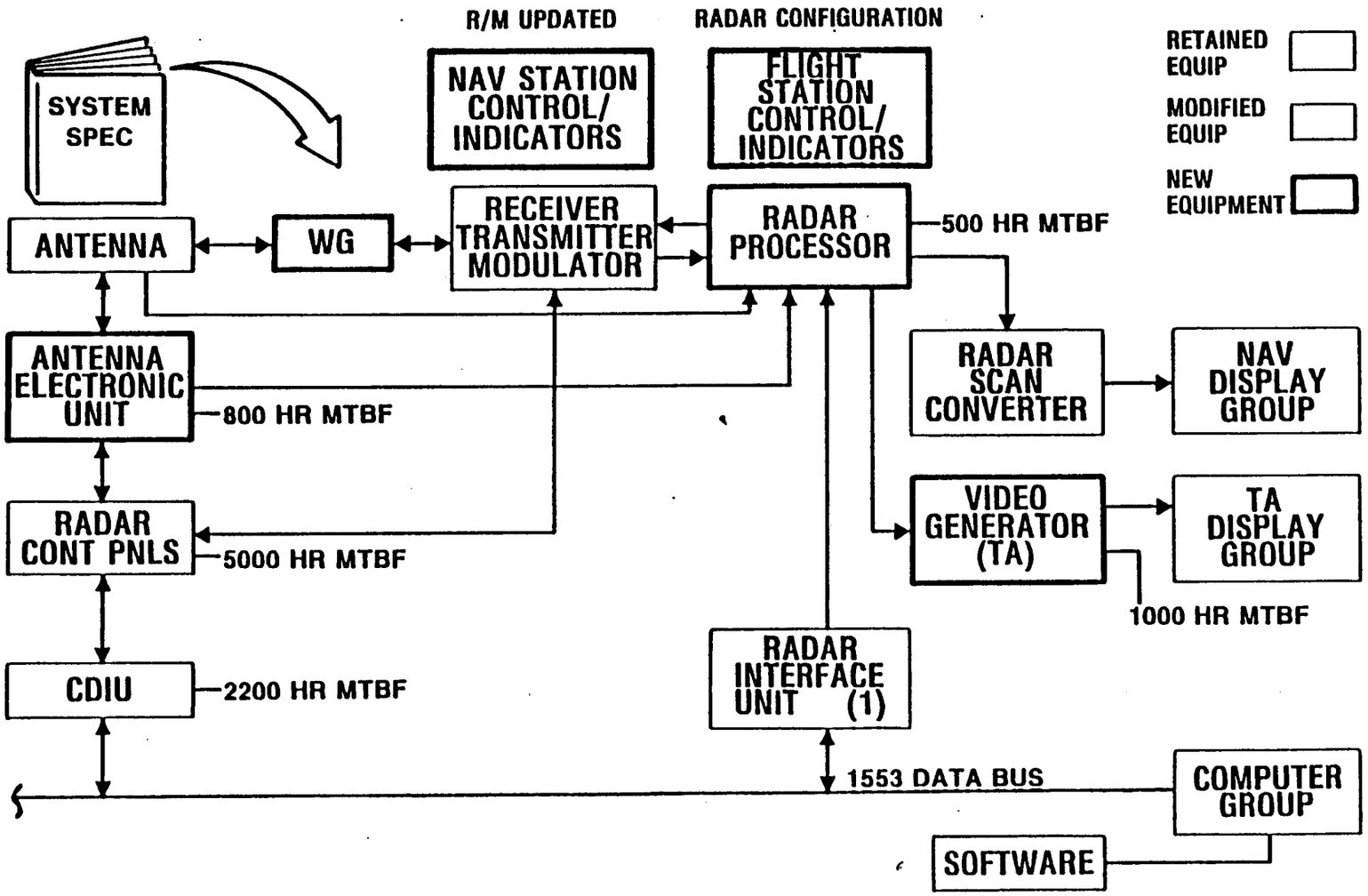
SP85017-03

RELIABILITY ALLOCATION

ALL TOP LEVEL RELIABILITY VALUES ARE PRORATED TO LOWER LEVELS OF ASSEMBLY

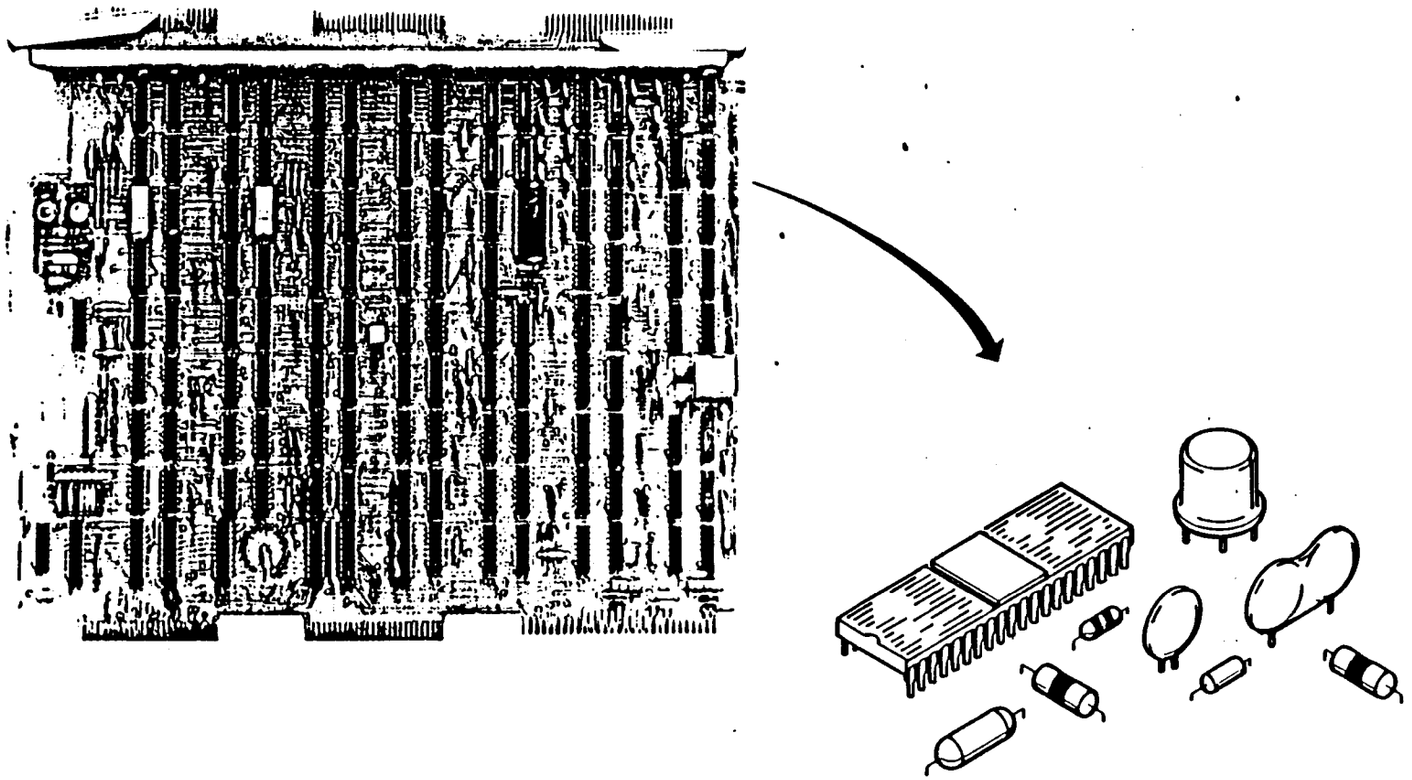


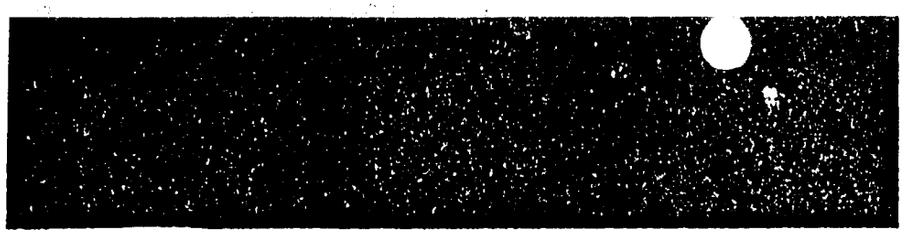
RELIABILITY ALLOCATIONS TO SUBSYSTEM



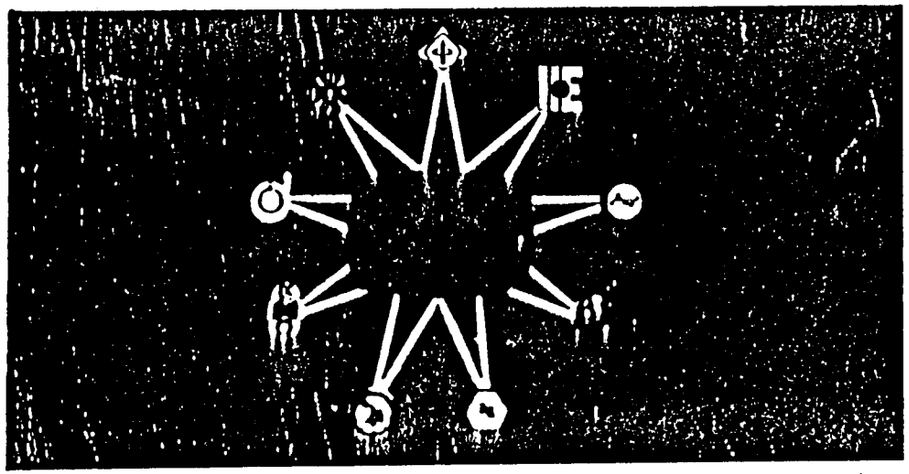
LINE REPLACEABLE UNIT (LRU) SPECIFICATION

R&M REQUIREMENTS ARE SUBSEQUENTLY ALLOCATED TO THE LOWEST POSSIBLE LEVEL OF ASSEMBLY





1985 PROCEEDINGS ANNUAL RELIABILITY AND MAINTAINABILITY SYMPOSIUM



DISTRIBUTION

- LIBRARY
- RELIABILITY AND MAINTAINABILITY
- DESIGN
- INTEGRATED LOGISTICS SUPPORT
- SOFTWARE
- SYSTEMS

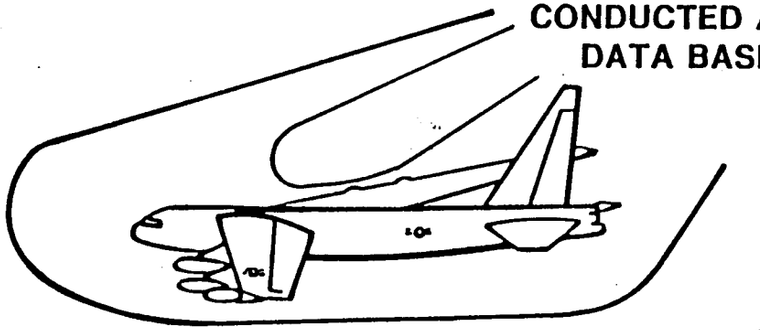
ANNUAL R&M SYMPOSIUM ATTENDED BY BMAC PERSONNEL TO MAINTAIN CURRENCY WITH STATE-OF-THE-ART ADVANCEMENTS

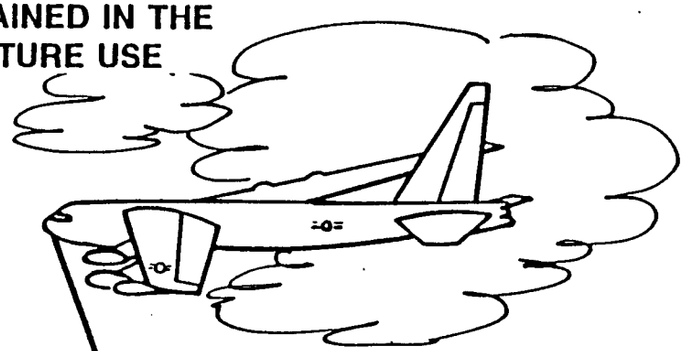
- RELIABILITY AND MAINTAINABILITY
- DESIGN
- INTEGRATED LOGISTICS SUPPORT
- SOFTWARE
- SYSTEMS

HISTORICAL DATA PROVIDED TO DESIGN ENGINEERS TO AID IN THE DESIGN OF ADVANCED TACTICAL FIGHTERS

BOEING CUSTOMER SUPPORT

ENGINEERING AND FLIGHT SAFETY REQUESTS FOR ASSISTANCE ARE CONDUCTED AND RETAINED IN THE DATA BASE FOR FUTURE USE





MAINTENANCE

OPERATIONS

BOEING CUSTOMER SUPPORT

- FLIGHT TEST
- ENGINEERING
- SAFETY
- PUBLICATIONS
- SPARES

- BACKGROUND DATA
- RECOMMENDATIONS
- ALC COORDINATION

HQTRS COMMAND POST

BASE COMMAND POST

BOEING CUSTOMER SUPPORT

- FLIGHT TEST
- ENGINEERING
- SAFETY

- PROBLEM ANALYSIS
- FLIGHT RECOMMENDATIONS
- LANDING RECOVERY RECOMMENDATIONS

FOLLOW-ON ACTIVITY

- DOCUMENT CIRCUMSTANCES FOR REFERENCE
- TECHNICAL MANUAL CHANGES
- INSPECTION REQUIREMENTS
- TCTO RECOMMENDATIONS
- ENGINEERING CHANGES
- FIELD TEAM SUPPORT

DESIGN R&M ANALYSIS

SP85017-04

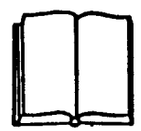
RELIABILITY PREDICTOR MODEL

MODEL USED BY BOEING PERSONNEL TO CALCULATE THE FAILURE RATE OF EACH PIECE/PART OF AN ASSEMBLY

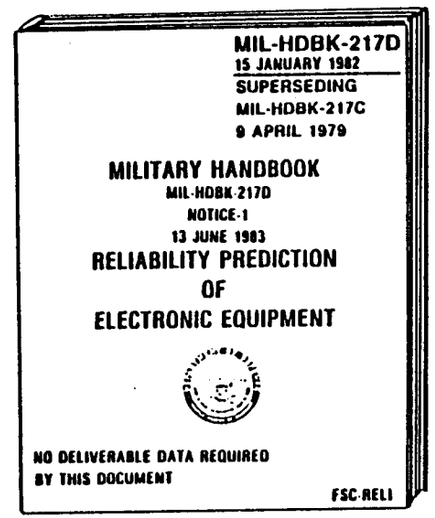
Management Sciences Inc.

PROPRIETARY SOFTWARE OF MANAGEMENT SCIENCES, INC.

BASIC RELIABILITY PREDICTIONS BASED ON

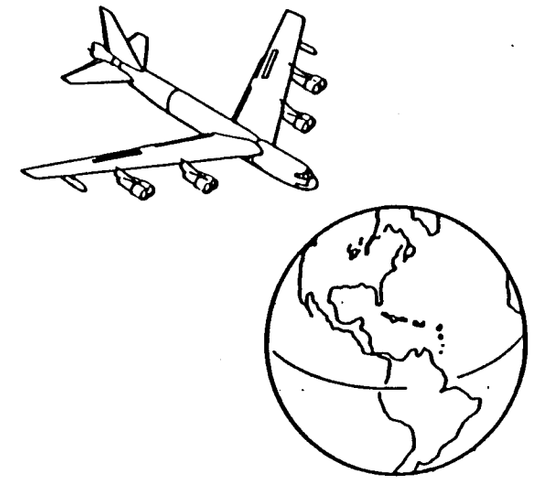


USER FAILURE RATE TABLES



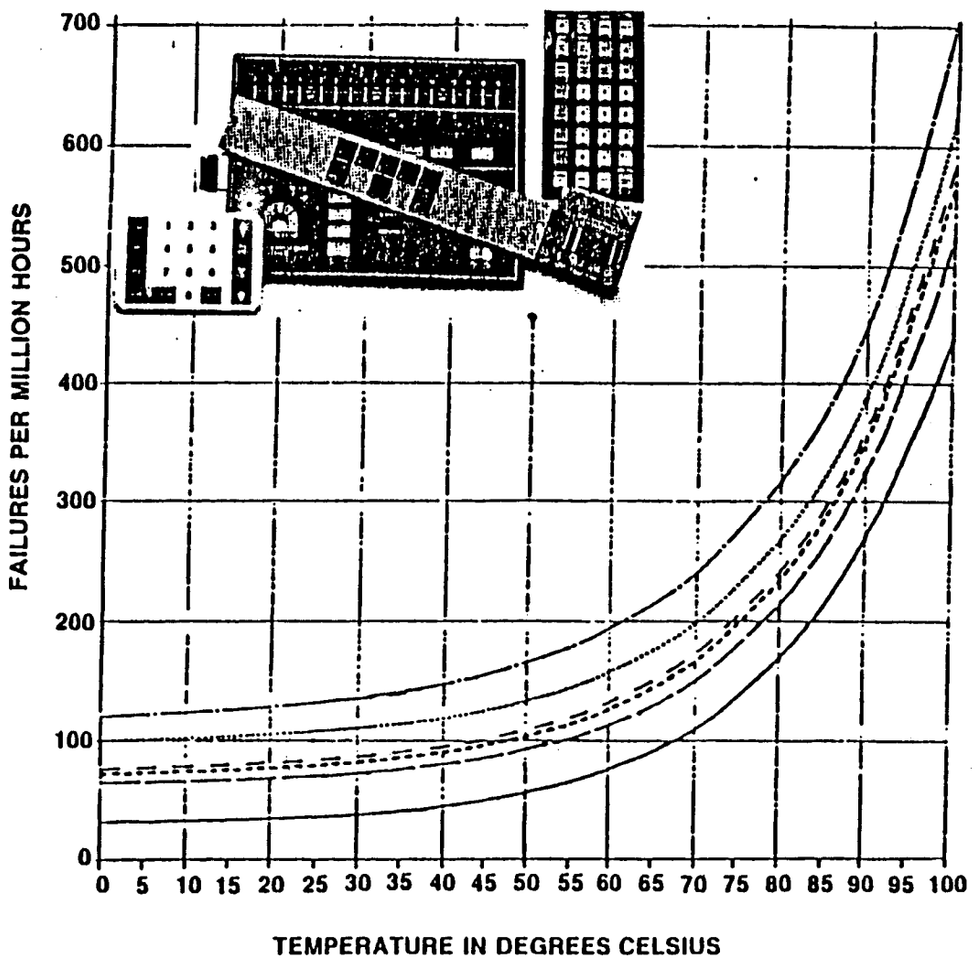
MIL-HDBK-217 (ALL VERSIONS)

MISSION RELIABILITY



EFFECT OF TEMPERATURE ON FAILURES

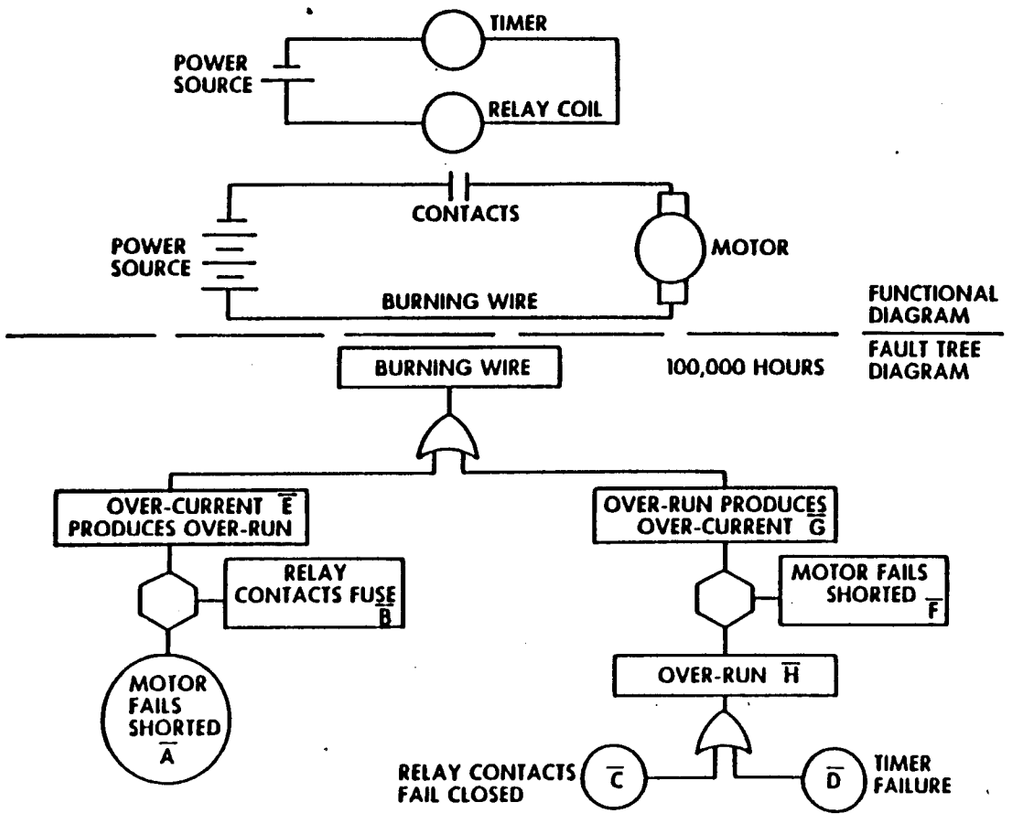
TECHNIQUE USED BY BOEING PERSONNEL TO APPLY OPTIMUM COOLING TO PIECE PARTS LEVEL TO OBTAIN OPTIMUM LRU RELIABILITY



SAFETY ANALYSIS

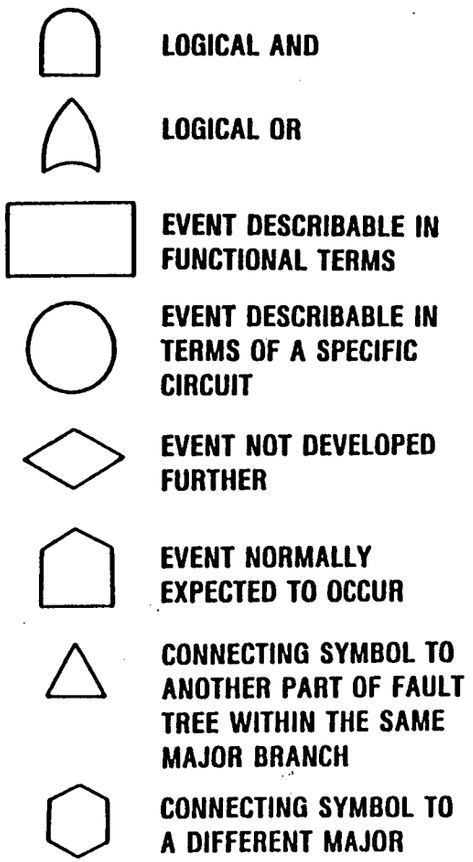
DESIGNED TO DETECT FAILURE SEQUENCES THAT COULD RESULT IN CATASTROPHIC FAILURE EVENTS

SUBSYSTEM SAFETY ANALYSIS TECHNIQUES

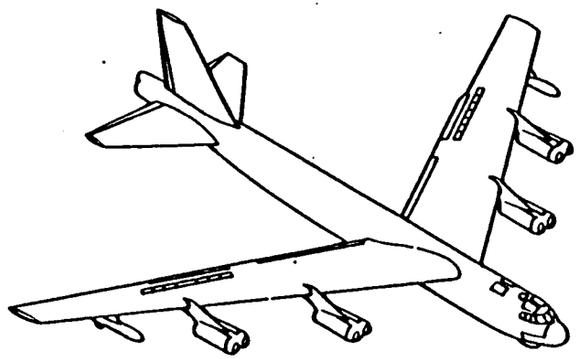


MIL-STD 882

STANDARD FAULT TREE SYMBOLS



MILITARY HISTORICAL DATA USE



R&M DATA USED IN DESIGNING NEW EQUIPMENT

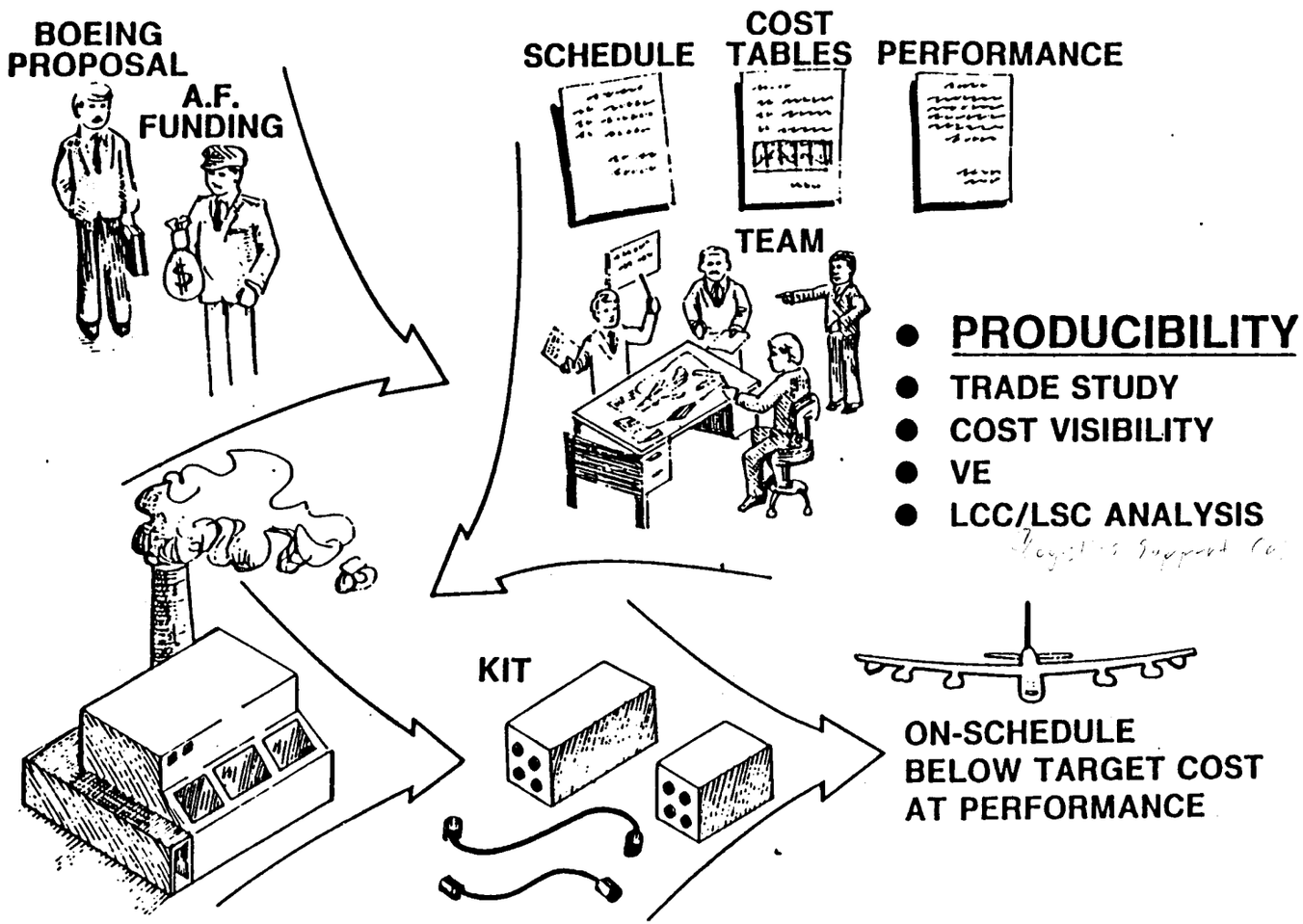
B-52 Fuel Quantity Indicating System

Modernized vs Existing

WUC	NOMENCLATURE	FAILURE RATE PER 10^3 FLIGHT HOURS		OLD DESIGN	NEW DESIGN
		EXISTING	MODERNIZED		
518AA 518AB	TOTALIZER INDICATOR	10 28	.488 .059	– Potentiometer Breakdown – Servo(damper) Breakdown – Recalibration of Gauges (Indicators) When Other System Components are Replaced	– Higher Reliability Potentiometers, New or Improved Design to Lower Stress on Pots – Possible Improvement in Materials and/or Design. Replace analog gauges with digital gauges & smooth out fuel level fluctuations with built-in electronic hardware – All parts of the Fuel Quantity Indicating System (FQIS) will be bench checked and bench calibrated to keep onboard aircraft calibration to a minimum

DESIGN TO COSTS/LIFE CYCLE COSTS

TRADE STUDIES ARE CONDUCTED THROUGHOUT THE DESIGN PHASE TO ACHIEVE LOWER COSTS WITHOUT JEOPARDIZING SPECIFIED REQUIREMENTS



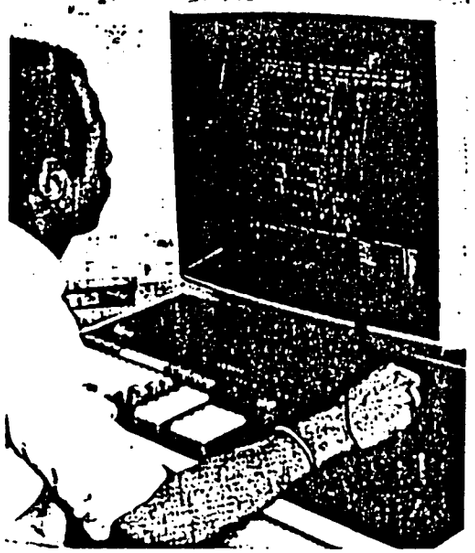
- **PRODUCIBILITY**
- TRADE STUDY
- COST VISIBILITY
- VE
- LCC/LSC ANALYSIS

TESTING

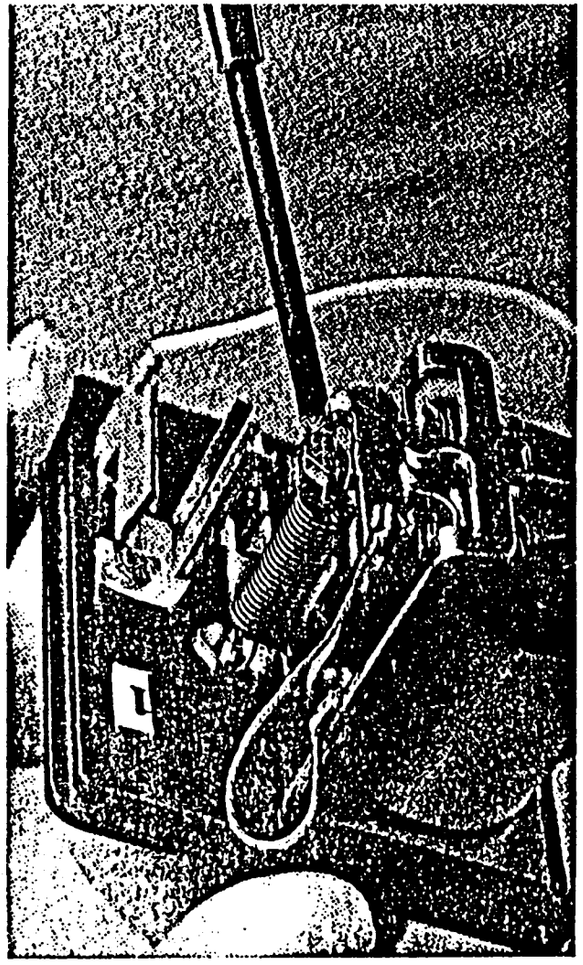
TEST ANALYZE AND FIX (TAF)

DETECTS AND ELIMINATES DESIGN AND MANUFACTURING ERRORS PRIOR TO PRODUCTION DELIVERY

TEST



ANALYZE



FIX

ENVIRONMENTAL STRESS SCREENING (ESS)

ELIMINATES INFANT MORTALITY AND ENHANCES RELIABILITY GROWTH TO MATURITY

PURPOSE

INCREASE MATURITY OF DELIVERED EQUIPMENT

SCOPE

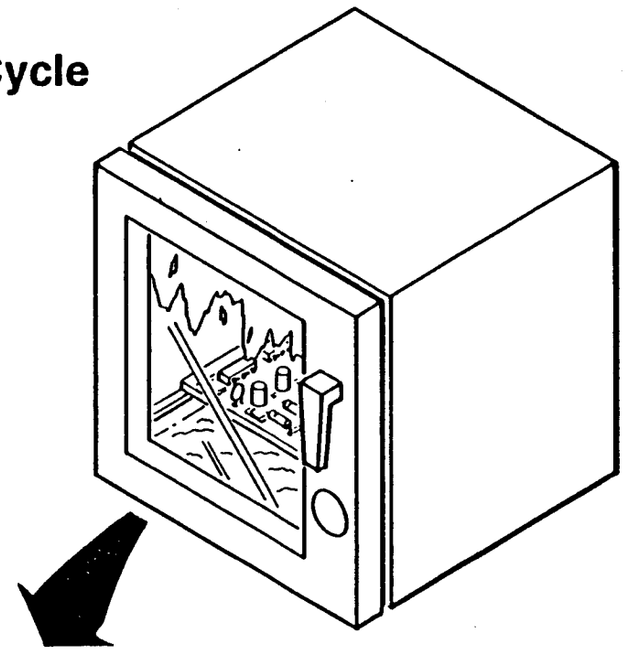
INDUCE ENVIRONMENTAL STRESSES ON NEW EQUIPMENT

- **THERMAL**
- **VIBRATION**
- **POWER**
- **ETC**

ENVIRONMENTAL STRESS SCREENING

CONDUCTED IN AN ENVIRONMENTAL CHAMBER THAT REPRESENTS ACTUAL STRESSES

Typical Environmental Cycle



TEMPERATURE

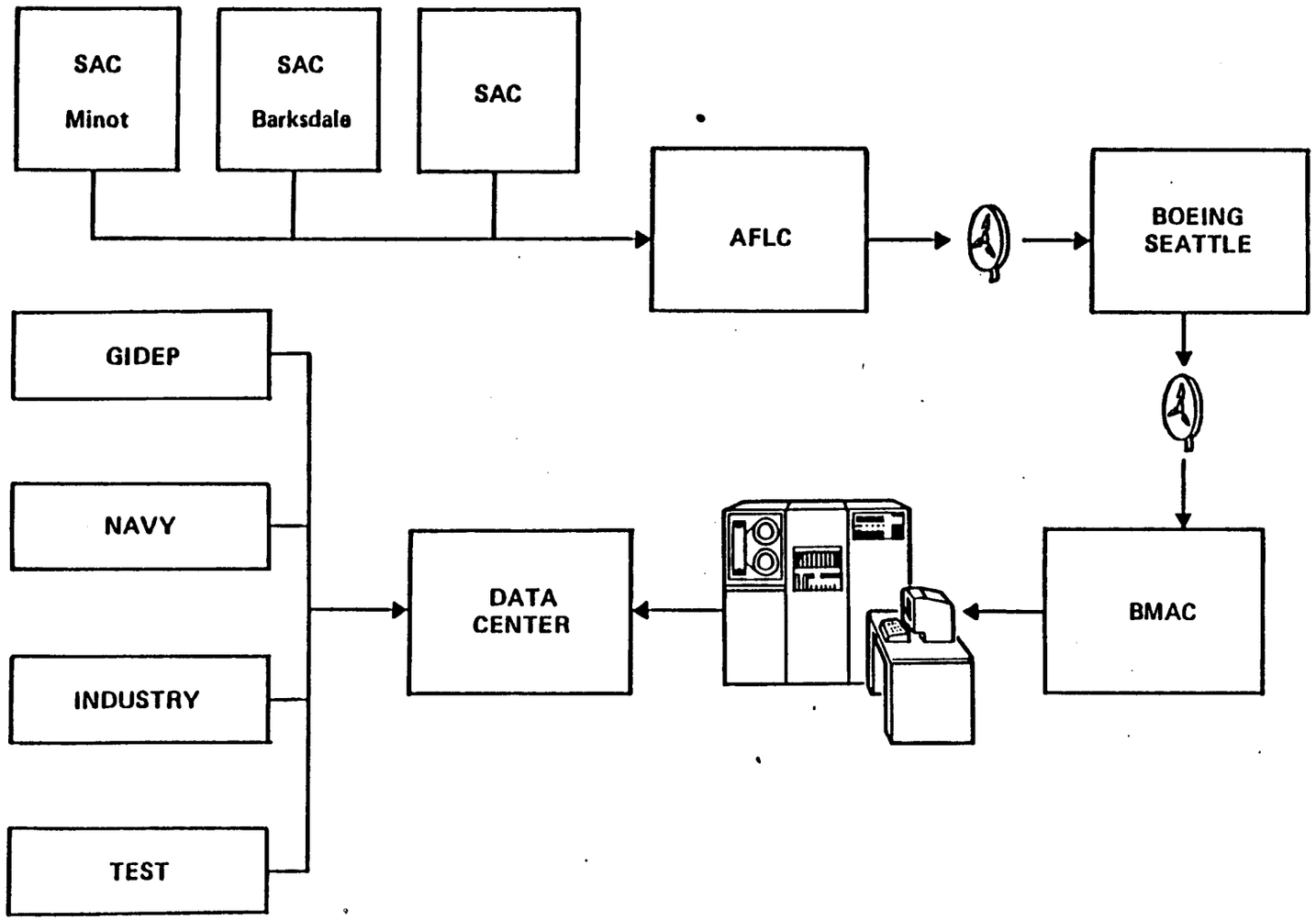
PRE ATP	VIBRATION	THERMAL CYCLING	FOR 7 CYCLES (THE LAST BEING FAILURE FREE)	FINAL ATP
	5.1G FOR 15 MIN POWER ON	60°C → 5°C/MIN -54°C 3.3 HRS		

DOCUMENTATION

26.

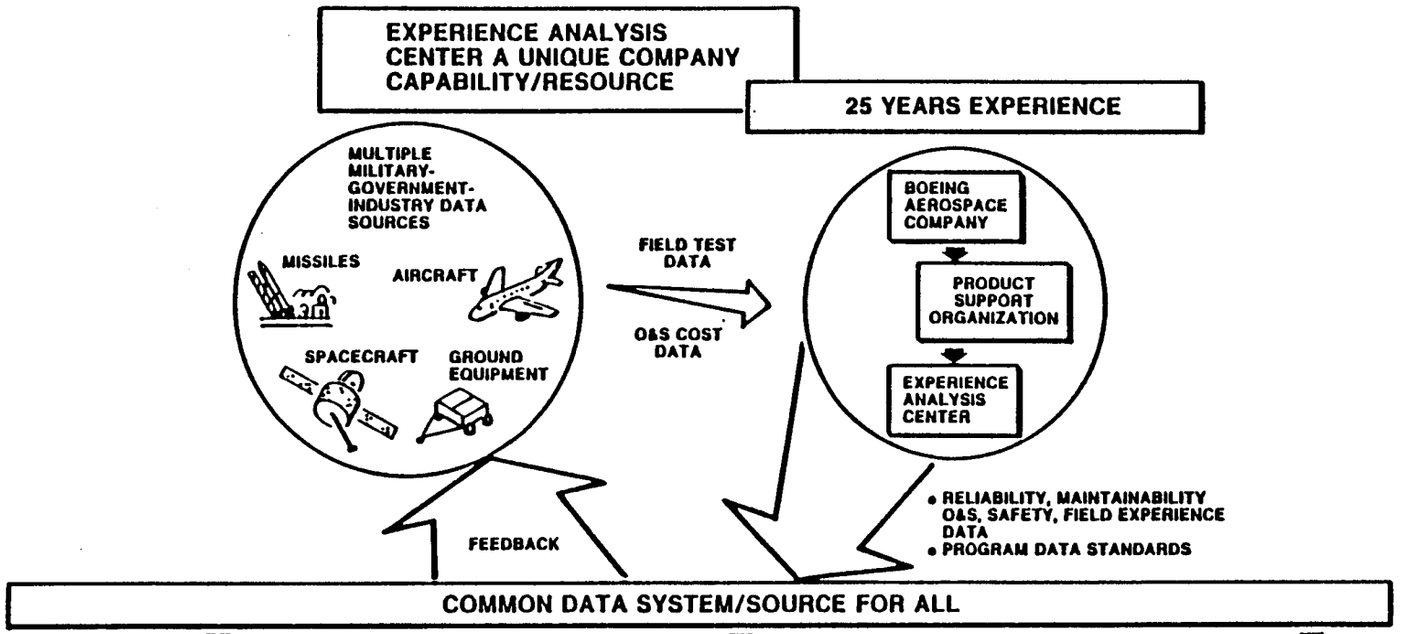
BMAC DATA COLLECTION

INDUSTRY AND MILITARY (AFR 66-1) DATA IS COLLECTED, SUMMARIZED, AND RETAINED IN A BMAC CENTRAL DATA BASE



BOEING (SEATTLE) EXPERIENCE CENTER

COLLECTS AND STORES DATA FROM VARIOUS EQUIPMENT TYPES AND CONDUCTS RESEARCH UPON REQUEST FROM BOEING DESIGNERS



FUNCTIONS

- MARKETING
- PROPOSAL PREPARATION
- DESIGN
- RESEARCH
- MANAGEMENT
- LIFE CYCLE COST
- TEST
- RELIABILITY
- LOGISTICS
- MAINTAIN-ABILITY
- QUALITY CONTROL
- MATERIEL

PROGRAMS

- E-3A
- E-4A
- E-4B
- DECOY
- SRAM/ESTS
- ALCM
- ROLAND
- IUS
- PMALS
- C-X
- ECX
- SPACE SYSTEMS
- ATS
- UDAC
- POWER SYSTEMS
- CREW SYSTEMS
- SHUTTLE
- SR & QA
- MM/MX
- WASP
- MISSILE SYSTEMS
- B-1 AVIONICS
- ASW/SOW
- VIKING

APPLICATION

- RESEARCH, O&S REALISTIC REQUIREMENTS
- TECHNOLOGY TRANSFER PROGRAM-TO-PROGRAM
- TRADE STUDIES AND ANALYSIS

SPECIAL DATA ANALYSIS – SPECIAL REPORTS

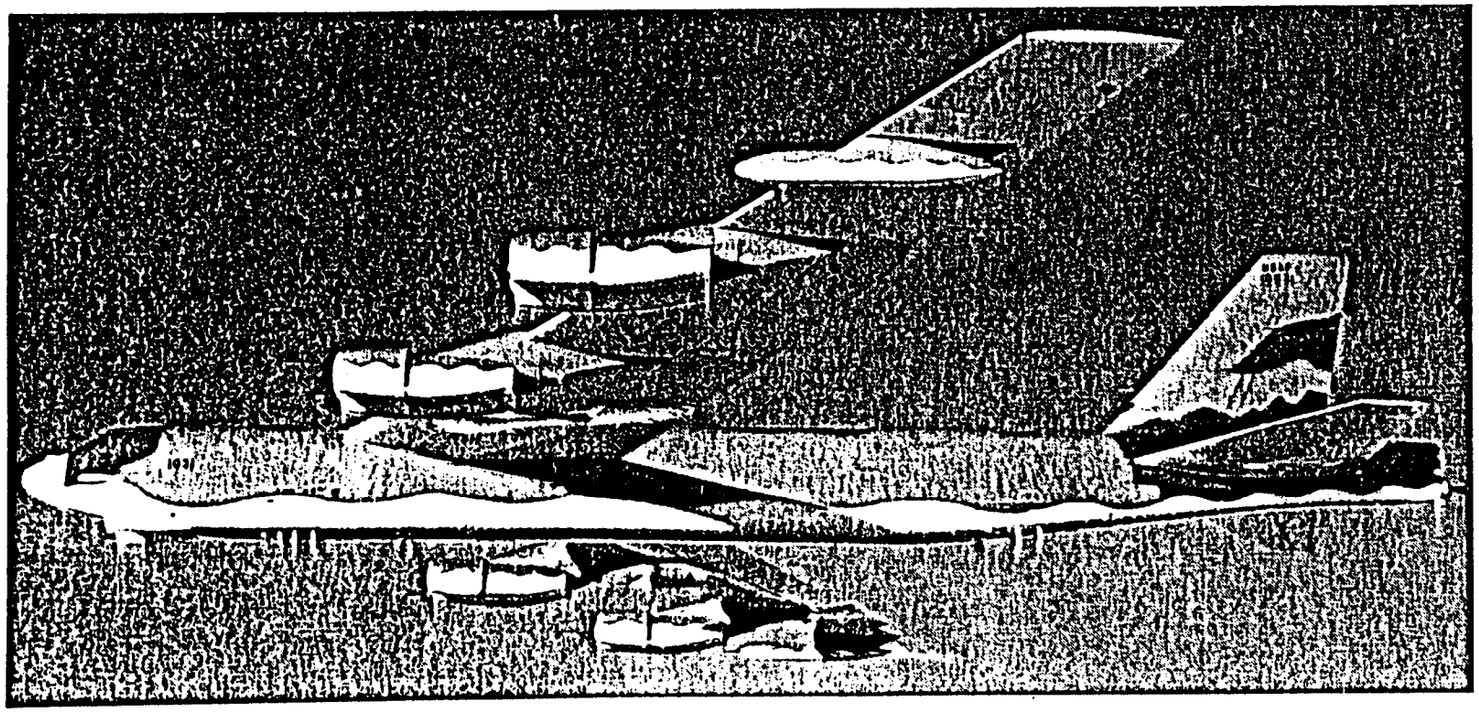
EXAMPLE OF AFR 66-1 SPECIAL DATA REPORTS THAT CAN BE EXTRACTED BY THE COMPUTER

- BY TAIL NUMBER
- BY BASE
- BY LOCATION – CLIMATE CONDITIONS
- BY COMPONENT TYPE
- BY HOW MAL
- TREND DATA, I.E.
  - MANHOURS
  - FAILURES
  - REGRESSION ANALYSIS

POST PRODUCTION SUPPORT

B-52 15-YEAR FLEET PRESERVATION PLAN

MISSION RELIABILITY & HIGH LOGISTIC SUPPORT COST ANALYSIS



AUGUST 4, 1983

31.

SITUATION

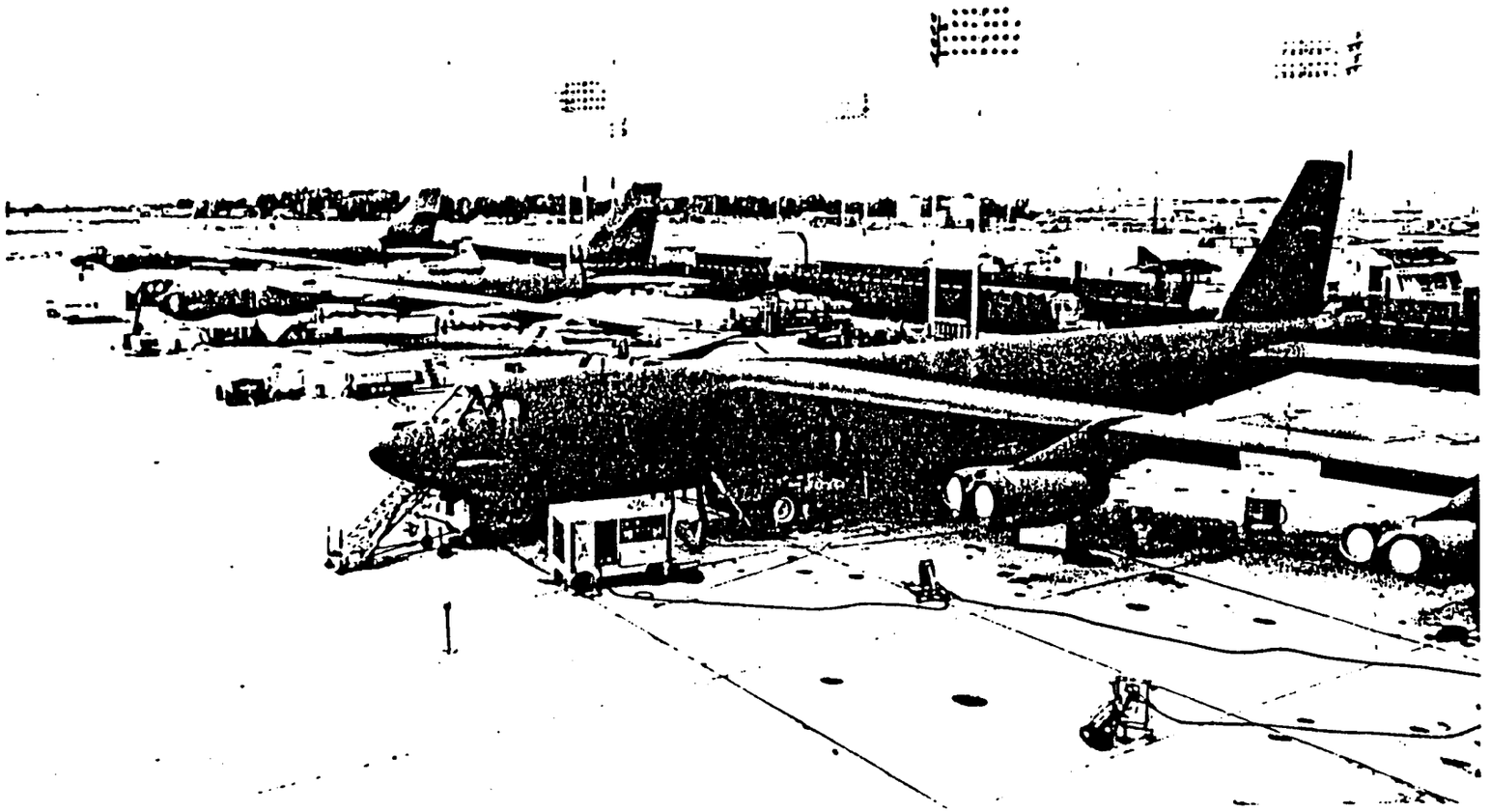
FOR THE B-52 TO REMAIN OPERATIONAL FOR THE NEXT 15 YEARS SPECIAL ANALYSES AND ACTIONS ARE REQUIRED

- **TRENDS ON FMC AND CANNIBALIZATION RATES AND FLEET LOGISTIC SUPPORT COSTS ARE UNSATISFACTORY**
- **SOME SUBSYSTEMS/PARTS ARE AT OR APPROACHING WEAR-OUT**
- **SOME SUBSYSTEMS HAVE SUPPORTABILITY PROBLEMS. INCREASE ANTICIPATED IN FUTURE**
- **FIELD PROBLEMS CONTINUE TO SURPRISE US**
- **FUNDING IS PROBLEM AND WILL PROBABLY BECOME MORE DIFFICULT IN FUTURE**
- **MORE EMPHASIS NEEDED ON "PREDICTIVE" AS OPPOSED TO "REACTIVE" APPROACH FOR PLANNED ACTION**

1-27-83

CONDITION ASSESSMENT/INSPECTION PROGRAM (CA/IP)

A PROGRAM TO IDENTIFY CURRENT A/C CONDITION AND PROJECT WHAT ACTIONS ARE REQUIRED TO PREVENT DOWNSTREAM PROBLEMS



CA/IP ANALYSIS RESULTS

(EXAMPLES)

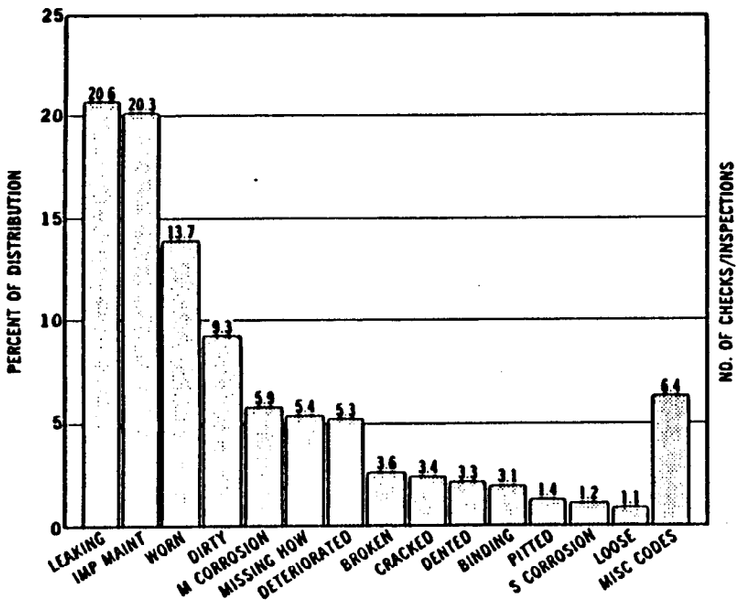


FIGURE 6 HOW MAL CODE DISTRIBUTION

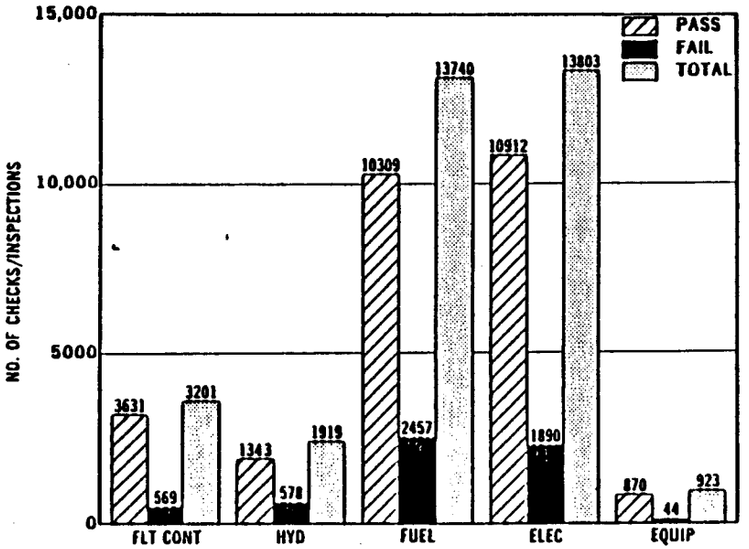
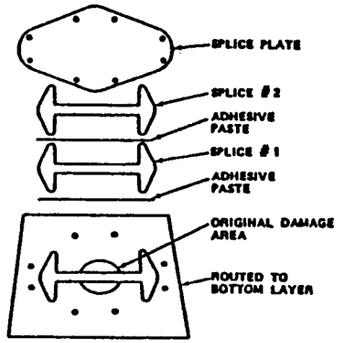


FIGURE 3 (SHEET 1 OF 2) PASS/FAIL DISTRIBUTION OF SUBSYSTEM

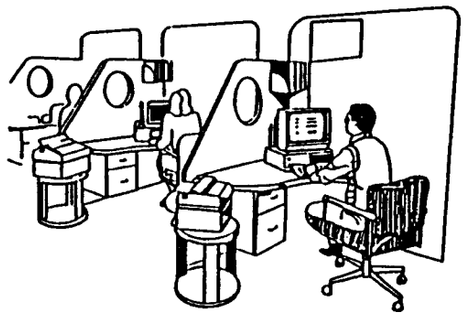
RESEARCH
&
DEVELOPMENT

IR&D PROJECTS

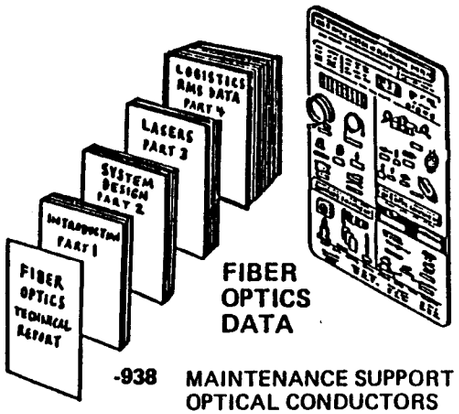
-057 LOGISTICS SUPPORT CONCEPTS AND METHODS FOR MILITARY AIRCRAFT



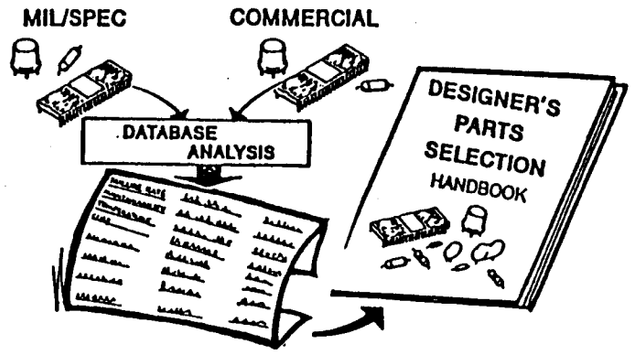
-059 SUPPORTABILITY AND REPAIR OF NEW STRUCTURAL MATERIALS



-932 COMPUTERIZED TECH DATA SYSTEM



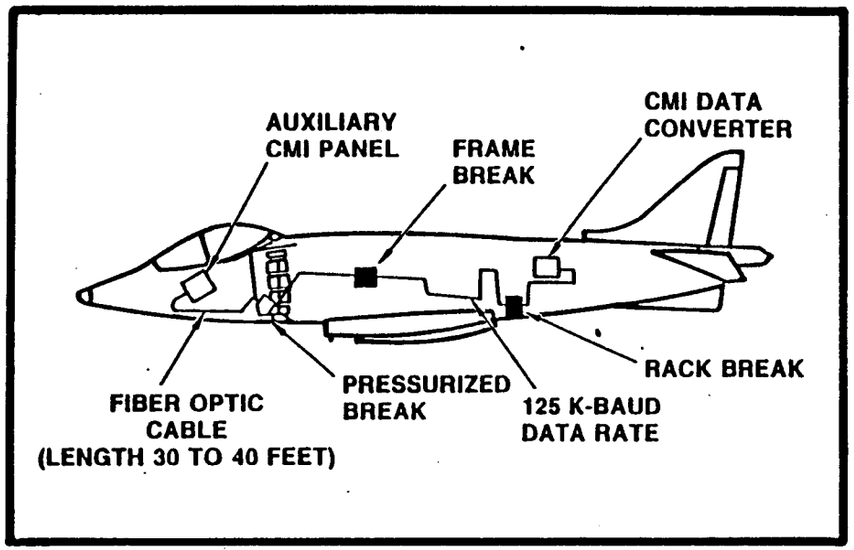
-938 MAINTENANCE SUPPORT FOR OPTICAL CONDUCTORS



-939 ELECTRONIC COMPONENTS EFFECTIVE RELIABILITY

SP86090-28

FIBER OPTICS IR&D

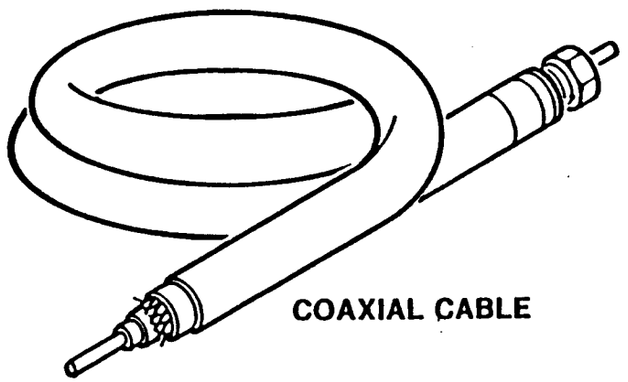


IR&D OBJECTIVES

- OBTAIN A DATA BASE FOR FIBER OPTICS STATE OF THE ART LOGISTICS SUPPORT
- DEVELOP AN EFFECTIVE FIBER OPTICS MAINTENANCE STRATEGY
- DEFINE ELEMENTS WHICH CONTRIBUTE TO MAINTENANCE COSTS
- DATA BASE WILL IDENTIFY THOSE FIBER OPTICS ELEMENTS TO DETERMINE MANUFACTURING AND SUPPORT REQUIREMENTS

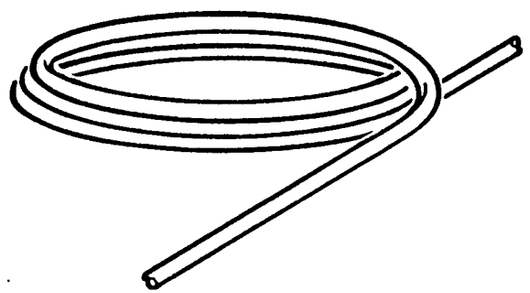
FIBER OPTICS VS COAXIAL CABLE

COMPARISON SHOWS FIBER OPTICS TO BE COST EFFECTIVE AND MORE RELIABLE AND MAINTAINABLE



COAXIAL CABLE

FIBER OPTICS



PARAMETER	WEIGHT POUNDS	NO. LINE TO TRANSMIT 1344 VOICE SYSTEMS	TYPE OF TRANS-MISSION	TRANS-MISSION RATE	DIAMETER	COST APPROX	MTBF APPROX	MTBF TRANS-MITTER	MTTR APPROX
COAXIAL CABLE	3.0	115 COPPER WIRES	DIGITAL OR ANALOG	MEGAHERTZ RATE	5 MM	$4.00 METER	1×10^4 HRS	1×10^3 HRS	0.5 HR
FIBER OPTICS	1.5	4 FIBERS	DIGITAL AND ANALOG TOGETHER	GIGAHERTZ RATE	0.125 MM	$1.00 METER	1×10^6 HRS	LED 1×10^7 HRS	1.0 HR

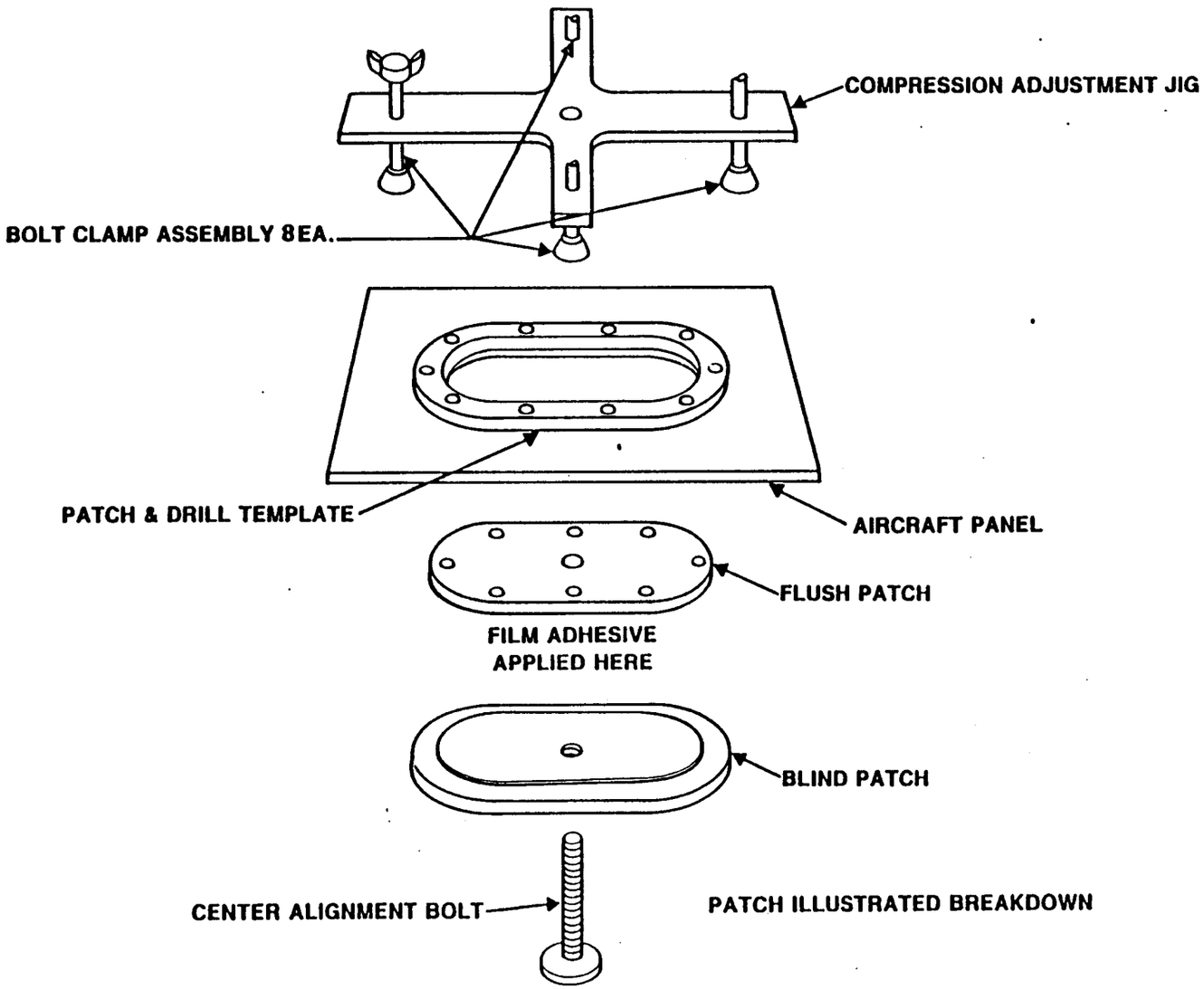
COMPOSITE BATTLE DAMAGE REPAIR

BLIND FLUSH PATCH CONCEPT

NEW BASE LEVEL REPAIR TECHNIQUES ARE REQUIRED TO FIX DAMAGED COMPOSITE

- USED FOR EITHER BATTLE OR FLIGHT LINE DAMAGE
- FEATURES KITTED COMPONENTS IN VARIOUS SIZES
- OVAL TEMPLATE USED FOR REMOVING AROUND DAMAGED AREA
- COMPRESSION ADJUSTMENT TOOL USED TO HOLD PATCH
- 'DIME' AND 'DOLLAR' PATCH APPROACH
- AIRCRAFT MAY BE FLOWN IMMEDIATELY
- HEAT MAY BE APPLIED LATER TO SET ADHESIVE OR IMMEDIATELY IF SEALING IS REQUIRED SOONER
- VACUUM NOT REQUIRED – CLAMPING PROVIDED BY RIVETS

REPAIR CONCEPT

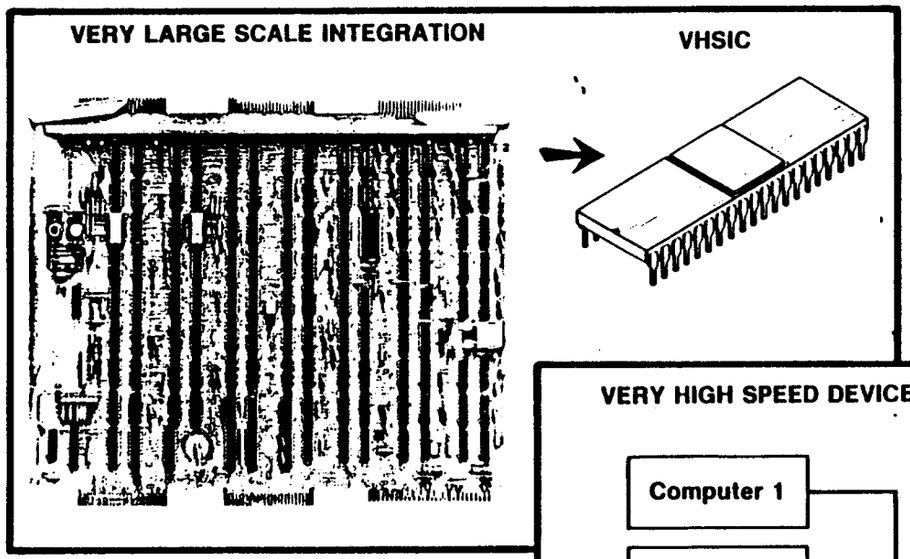


PATCH ILLUSTRATED BREAKDOWN

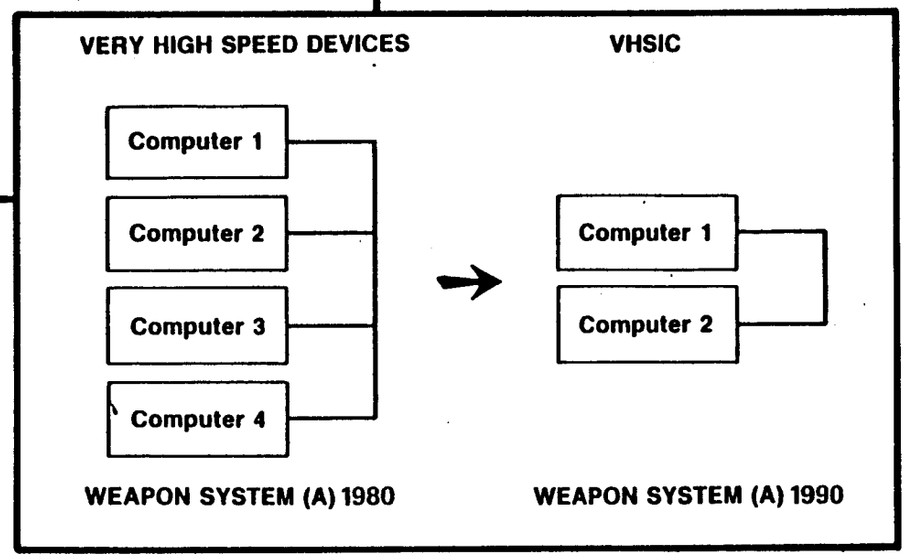
VERY HIGH SPEED INTEGRATED CIRCUITS

IMPACT OF VHSIC TECHNOLOGY

USE HIGH TECHNOLOGY TO LOWER SUPPORT COST



ICs REPLACE CARDS
FEWER LRUs
LESS WEIGHT
LESS COOLING
HIGHER SYSTEM RELIABILITY
MORE FUNCTIONS
FEWER SPARES
MORE REDUNDANCY
LOWER SUPPORT COST



RELIABILITY AND MAINTAINABILITY
ACTION PLAN

R&M 2000

APPROVED 1 FEBRUARY 1985

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.

1 FEB 1985

MEMORANDUM FOR ALL MAJOR COMMANDS-SEPARATE OPERATING AGENCIES/CC

SUBJECT: Reliability and Maintainability of Air Force Weapon Systems - ACTION MEMORANDUM

In our September 17, 1984 policy memorandum on this subject, we emphasized the need to increase Air Force operational effectiveness through improved Reliability and Maintainability (R&M). An effective R&M program can make our weapon systems more available, mobile, and durable, as well as reduce manpower and support costs.

To achieve these objectives, R&M must be considered coequal with cost, schedule, and performance when we develop and modify weapon systems. This R&M 2000 action plan will guide the program to institutionalize R&M throughout the Air Force.

We have established a Special Assistant for Reliability and Maintainability on the Air Staff to serve as the focal point for R&M (AF/LE-R). The Special Assistant will integrate the efforts of the Research and Development and Logistics communities and oversee the execution of R&M 2000. Please give him your full support.

The Air Force must be committed to the R&M 2000 plan. By working together we can ensure air power will be ready and able wherever and whenever it is needed.

Charles A. Gabriel

CHARLES A. GABRIEL, General, USAF
Chief of Staff

VERNE ORR
Secretary of the Air Force

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R&M 2000 IMPACT ON BMAC

- OUR R&M RESPONSES TO RFPs MUST BE GREATLY IMPROVED.
- WE NEED TO UPGRADE THE QUALITY & QUANTITY OF OUR R&M ENGINEERS.
- DESIGN ENGINEERS MUST BE TRAINED TO IMPROVE R&M IN THE CONCEPTUAL & PRELIMINARY DESIGN PHASES.
- MORE EMPHASIS MUST BE EXPENDED ON R&M RESEARCH TO STAY CURRENT WITH SOTA ADVANCEMENTS.
- BETTER CONTROL OF SUPPLIERS R&M EFFORTS MUST BE INITIATED.
- R&M EDUCATION AT VARIOUS MANAGEMENT LEVELS WILL BE IMPLEMENTED. R&M BUDGETS MUST EQUAL THE ADDED EMPHASIS.
- ADDITIONAL EXPERTISE IS REQUIRED IN THE AREA OF R&M WARRANTIES.
- IMPROVE OUR HISTORICAL DATA BASE AND FURTHER OUR USE OF LESSONS LEARNED IN FUTURE DESIGNS.

RELIABILITY
MAINTAINABILITY
SUPPORTABILITY
BMAG