AGENDA

DAY 1			
	0830 - 0845	OPENING REMARKS	CAPT WITTE / LISA COLUZZI
	0845 - 0900	PDR PROCESS	STEVE DANIEL
	0900 - 1000	SYSTEM RQMTS	RAD IPT
	1000 - 1430	SYSTEM TOP LEVEL DESIGN	RAD IPT
	1430 - 1530	ILS DESIGN	ILS IPT
	1530 - 1630	TRAINING SYSTEM DESIGN	TRNG SUB-IPT
	1630 - 1730	CONFIGURATION MANAGEMENT	CM IPT
	1730 - 1800	ACTION ITEM REVIEW	PENNY PIERCE
DAY 2			
	0830 - 0845	OPENING REMARKS	STEVE DANIEL
	0845 - 0945	SOFTWARE DESIGN	SW IPT
		ARCHITECTURAL REVIEW	-
		SOFTWARE TOP-LEVEL RQMTS ANALYSIS	-
	0945 - 1600	TOP-LEVEL DESIGN (CSCIs)	-
	1600 - 1630		SW IPT
	1630 - 1700	SOFTWARE TEST	T&D IPT
	1700 - 1730	ACTION ITEM REVIEW	PENNY PIERCE
DAY 3			
	0830 - 0845	OPENING REMARKS	CAPT WITTE / LISA COLUZZI
	0845 - 0900	PROCESS REVIEW	STEVE DANIEL
	0900 - 0915	SUBSYSTEM PRELIMINARY DESIGN & IMPLEMENTATION	RAD IPT
	0915 - 0930	AV COMMUNICATIONS SUBSYSTEM	RAD IPT (INTRO)
	1230 - 1245	LAUNCH & RECOVERY SUBSYSTEM	RAD IPT (INTRO)
	1330 - 1500	REAL-TIME SUBSYSTEM	RAD IPT (INTRO)
	1500 - 1530	PAYLOAD SUBSYSTEM	RAD IPT (INTRO)
	1530 - 1630	OPERATOR STATION SUBSYSTEM	RAD IPT (INTRO)
	1630 - 1700	COMMUNICATIONS SUBSYSTEM	RAD IPT (INTRO)
	1700 - 1730	POWER DISTRIBUTION SUBSYSTEM	RAD IPT (INTRO)
	1730 - 1800	ACTION ITEM REVIEW	PENNY PIERCE
DAY 4			
	0830 - 0845	OPENING REMARKS	STEVE DANIEL
	0845 - 0900	SOFTWARE CSCI / CSC PRELIMINARY DESIGN	SW IPT
	0900 - 0915	COMMON AV SOFTWARE CSCI	-
	1330 - 1400	DATA SERVER CSCI	-
	1400 - 1445	RTP CSCI	-
	1445 - 1530	ROUTE PLANNER CSCI	LOGICON
	1530 - 1600	DCM CSCIs	-
	1600 - 1630	DII CSCI	-
	1630 - 1700	SAR CSCI	NORTHROP / GRUMMAN
	1700 - 1715		-
	1715 - 1730		-
	1730 - 1800	ACTION ITEM REVIEW	PENNY PIERCE

AGENDA - PDR (PART ONE) DAY 1

0830 - 0845	OPENING REMARKS	CAPT WITTE / LISA COLUZZI
0845 - 0900	PDR PROCESS	STEVE DANIEL
0900 -1000	SYSTEM RQMTS	RAD IPT
1000 -1100	SYSTEM TOP LEVEL DESIGN	RAD IPT
	ARCHITECTURE	RAD / SW IPT
	INPUTS	RAD IPT
	OUTPUTS	RAD IPT
1100 -1200	C4I INTERFACES	C4I IPT
	PRESENTATION OF A C4I IDD	-
	IDD RQMTS & DESIGN DETAILS FOR I/F	-
	IDD INTEGRATED INTO SYSTEM DESIGN	-
	IDD INTEGRATED INTO SW & HW DSN DEVLMNT	-
1200 -1230	WORKING LUNCH	
1230 -1430	SUBSYSTEM IDENTIFICATION	RAD IPT
	SUBSYSTEM BLOCK DIAGRAMS	-
	THRESHOLD REQUIREMENTS	-
	SUBSYSTEM FUNCTIONALITY	-
	SUBSYSTEM INTERFACES	-
	HARDWARE CONFIGURATION ITEMS	-
	COMPUTER SOFTWARE CONFIGURATION ITEMS	-
1430 -1530	ILS DESIGN	ILS IPT
	OPERATIONAL TASK ANALYSIS	-
	LOGISTIC MANAGEMENT INFORMATION (LSA)	-
	MAINTENANCE	-
	RELIABILITY	-
	AVAILABILITY	-
1530 - 1630	TRAINING SYSTEM DESIGN	TRNG SUB-IPT
	EMBEDDED TRAINING DESIGN	-
	TECHNICAL MANUAL DESIGN	-
	PAPER	-
	IETM	-
1630 - 1730	CONFIGURATION MANAGEMENT	CM IPT
1730 - 1800	ACTION ITEM REVIEW	PENNY

AGENDA - PDR (PART ONE) DAY 2

0830 - 0845	OPENING REMARKS		STEVE DANIEL
0845 - 0945	SOFTWARE DESIGN		BILL SULLIVAN
	ARCHITECTURAL REVIEW		-
	SOFTWARE TOP-LEVEL RQMTS ANALYSIS		-
	ALLOCATIONS TO CSCIs		-
	SRS		-
0945 - 1200	TOP-LEVEL DESIGN		-
0945 - 1000	SECTION 1:	INTRODUCTION	-
1000 - 1045	SECTION 2:	HCI DESIGN	BRAD HALL
1045 - 1100	SECTION 3:	DCM CSCIs	SW IPT
1100 - 1130		PDCM	GENERAL ATOMICS
1130 - 1200		ODCM	ALLIANT TECHSYSTEMS
1200 - 1230	WORKING LUNCH		
1230 - 1330	SECTION 4:	RTP CSCI	BILL SULLIVAN
1330 - 1430	SECTION 5:	DATA SERVER CSCI	BILL SULLIVAN
1430 - 1530	SECTION 6:	COMMON AV SOFTWARE CSCIs	BILL SULLIVAN
1530 - 1630	SECTION 7:	ROUTE & PAYLOAD PLANNER CSCI	LOGICON
1630 - 1700	SECTION 10:	SAR CSCI	NORTHROP/GRUMMAN (TBD)

-- CSCI DESIGN DESCRIPTIONS - PART OF EACH SECT. ABOVE:
IDENTIFICATION OF CSCs;
CSC REQUIREMENT ALLOCATION;
CSCI INTERFACE DIAGRAMS
HCI RELATED TO CSCI -

1700 - 1730	SOFTWARE TEST & TEST TOOLS	JEFF KEPCKE
1730 - 1800	ACTION ITEM REVIEW	PENNY PIERCE

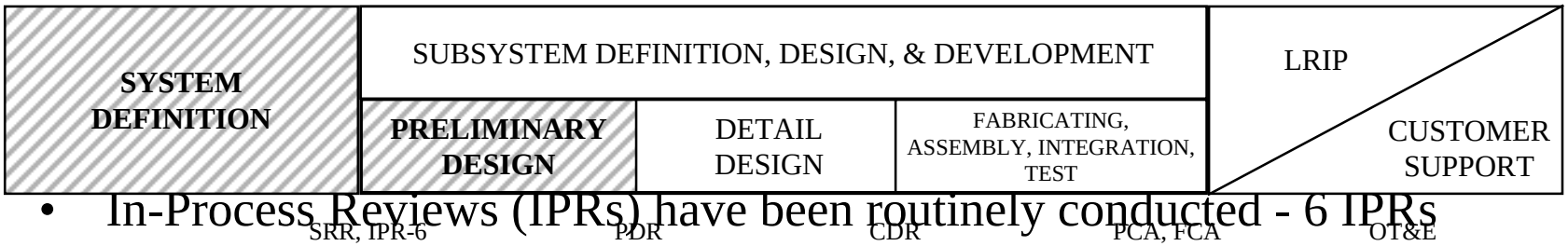
AGENDA - PDR (PART TWO) DAY 1

0830 - 0845	OPENING REMARKS	CAPT WITTE / LISA COLUZZI
0845 - 0900	PROCESS REVIEW	STEVE DANIEL
0900 - 0915	SUBSYSTEM PRELIMINARY DESIGN & IMPLEMENTATION	RAD IPT
0915 - 0930	AV COMMUNICATIONS SUBSYSTEM	RAD IPT (INTRO)
0930 - 1000	C-BAND LOS ANTENNA	JH-APL
1000 - 1030	INTEGRATED DATA TERMINAL	DATA LINK IPT
1030 - 1045	Ku-BAND SATCOM ANTENNA	D/L IPT
1045 - 1100	Ku-BAND DOWNSIZED LMA	D/L IPT
1100 - 1130	PREDATOR DCM	GENERAL ATOMICS
1130 - 1200	OUTRIDER DCM	ALLIANT TECHSYSTEMS
1200 - 1230	WORKING LUNCH	
1230 - 1245	LAUNCH & RECOVERY SUBSYSTEM	RAD IPT (INTRO)
1245 - 1300	UCARS INTEGRATION	DAVE KREIDER
1300 - 1315	IBLS INTEGRATION	-
1315 - 1330	MANUAL L&R	-
1330 - 1500	REAL-TIME SUBSYSTEM	RAD IPT (INTRO)
1330 - 1345	REAL-TIME COMPUTER	DEV IPT
1345 - 1415	MANUAL CONTROLS	TERRY CLAYTON
1415 - 1445	AIR VEHICLE STANDARD INTERFACE	STEVE OWEN
1445 - 1500	DATA SERVER COMPUTER	DEV IPT
1500 - 1530	PAYLOAD SUBSYSTEM	RAD IPT (INTRO)
	EO/IR SUBSYSTEM	RAD IPT
	SAR SUBSYSTEM	NORTHROP / GRUMMAN
1530 - 1630	OPERATOR STATION SUBSYSTEM	RAD IPT (INTRO)
1530 - 1600	NON-REAL TIME COMPUTER	DEV IPT
	CHS II	-
	TAC-4	-
1600 - 1630	VIDEO SUPPORT SUBSYSTEM	BRENT AZZARELLI
1630 - 1700	COMMUNICATIONS SUBSYSTEM	RAD IPT (INTRO)
	C4I SUPPORT EQUIPMENT	C4I / DEV IPT
	EXTERNAL STORAGE	C4I IPT
	INTERCOM EQUIPMENT	DEV IPT
	EXCOM EQUIPMENT	C4I IPT
1700 - 1730	POWER DISTRIBUTION SUBSYSTEM	RAD IPT (INTRO)
	POWER DISTRIBUTION	DEV IPT
	UPS	DEV IPT
1730 - 1800	ACTION ITEM REVIEW	PENNY PIERCE

AGENDA - PDR (PART TWO) DAY 2

0830 - 0845	OPENING REMARKS	STEVE DANIEL
0845 - 0900	SOFTWARE CSCI / CSC PRELIMINARY DESIGN	BILL SULLIVAN
0900 - 0915	COMMON AV SOFTWARE CSCI	BILL SULLIVAN
0915 - 0930	TCS MAIN CSC	-
0930 - 0945	AV FLIGHT MONITOR CSC	-
0945 - 1000	AV FLIGHT MONITOR EXTENDED CSC	-
1000 - 1015	EO/IR/IMAGERY VIEWER CSC	-
1015 - 1030	IMAGERY PROCESSING & DATA EXTRACTION CSC	-
1030 - 1045	EO/IR PAYLOAD CONTROL CSC	-
1045 - 1100	AV CONTROL CSC	-
1100 - 1115	DATALINK MANAGEMENT & CONTROL CSC	-
1115 - 1130	TACTICAL MESSAGES CSC	-
1130 - 1145	COLLECTION TASKING / RETASKING CSC	-
1145 - 1200	SYSTEM SETUP CSC	-
1200 - 1230	WORKING LUNCH	
1230 - 1245	GRAPHIC ENGINE CSC	-
1245 - 1300	TRAINING CSC	-
1300 - 1315	LAUNCH & RECOVERY CSC	-
1315 - 1330	MISC: TOOLS & UTILITIES CSC	-
1330 - 1400	DATA SERVER CSCI	-
1400 - 1445	RTP CSCI	-
	ANTENNA CONTROL CSC	-
	AVSI CONVERSION CSC	-
	MANUAL CONTROLS CSC	-
	RTP DATAFLOW CSC	-
1445 - 1530	ROUTE PLANNER CSCI	LOGICON
1530 - 1600	DCM CSCIs	
	PDCM	GENERAL ATOMICS
	ODCM	ALLIANT TECHSYSTEMS
1600 - 1630	DII CSCI	BILL SULLIVAN
1630 - 1700	SAR CSCI	NORTHROP / GRUMMAN
1700 - 1800	ACTION ITEM REVIEW	PENNY PIERCE

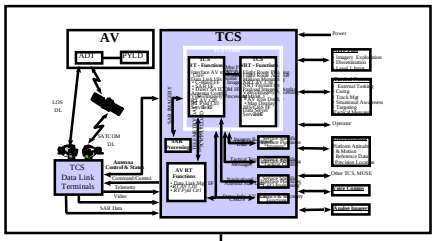
RELATIONSHIP TO SRR, IPRs



- In-Process Reviews (IPRs) have been routinely conducted - 6 IPRs have been held to date. This PDR is a formal in depth review, but is a follow-on to these IPRs.
- IPRs collectively represent the System Design Review (SDR) found in MIL-STD-1521B- the level of detail has been tailored to fit the schedule and program engineering methodologies.
- System Requirements Review was conducted in September 1997 - format was based upon tailored MIL-STD-1521 and EIA IS- 632. See Formal Report distributed under NSWCDD ltr Ser 8800-K05
- Preliminary Design Review (PDR) for this program will also be based upon a tailored MIL-STD-1521, and use guidance from EIA IS-632 and IEEE-1220-1994.

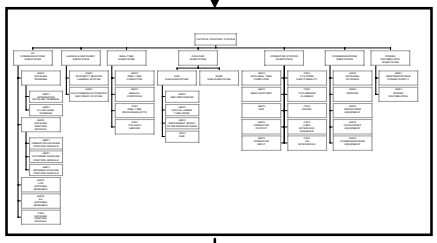
REVIEW FOCUS

• SYSTEM LEVEL DESIGN



- System RQMTS
- RQMTS Allocation
- RQMTS Traceability
- System Top Level Design
- System Inputs / Outputs
- Subsystem Identification

• HWCIs

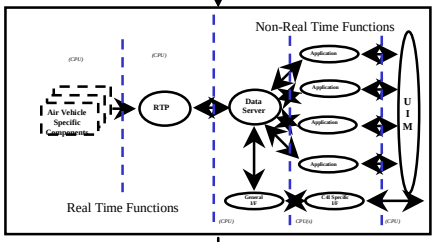


- Hardware Design Overview
- Equipment Layout Drawings
- Environment Control
- Electromagnetic Compatibility
- Power Distribution & Grounding
- Packaging
- Weight Data
- Description of COTS & Documentation

• OPERATOR

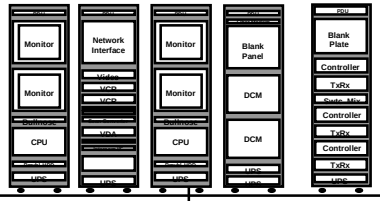
- Operators Manuals
- Technical Manuals
- Maintenance Manuals

• CSCIs



- Software Design
- CSCI Structure
- Operational Flow
- HCI
- Description of COTS & GOTS
- Documentation
- Development Tools (Present & Future)
- TCS/MUSE Integration Plans

• INTEGRATION & TEST



- Test Process
- SW Integration Plans
- Test Tools
- System Integration & Testing
- Demo Plans/Objectives
- DT/OT
- Implementation Plans
- Risks/Mitigation Plans

• LOGISTICS

LSA

TRNG

LSAR

- Logistic Support Analysis
- System Maintenance Concept
- Life-Cycle Cost Analysis
- Design Reliability
- Design Maintainability
- Technical Manual Plans
- Training Plans

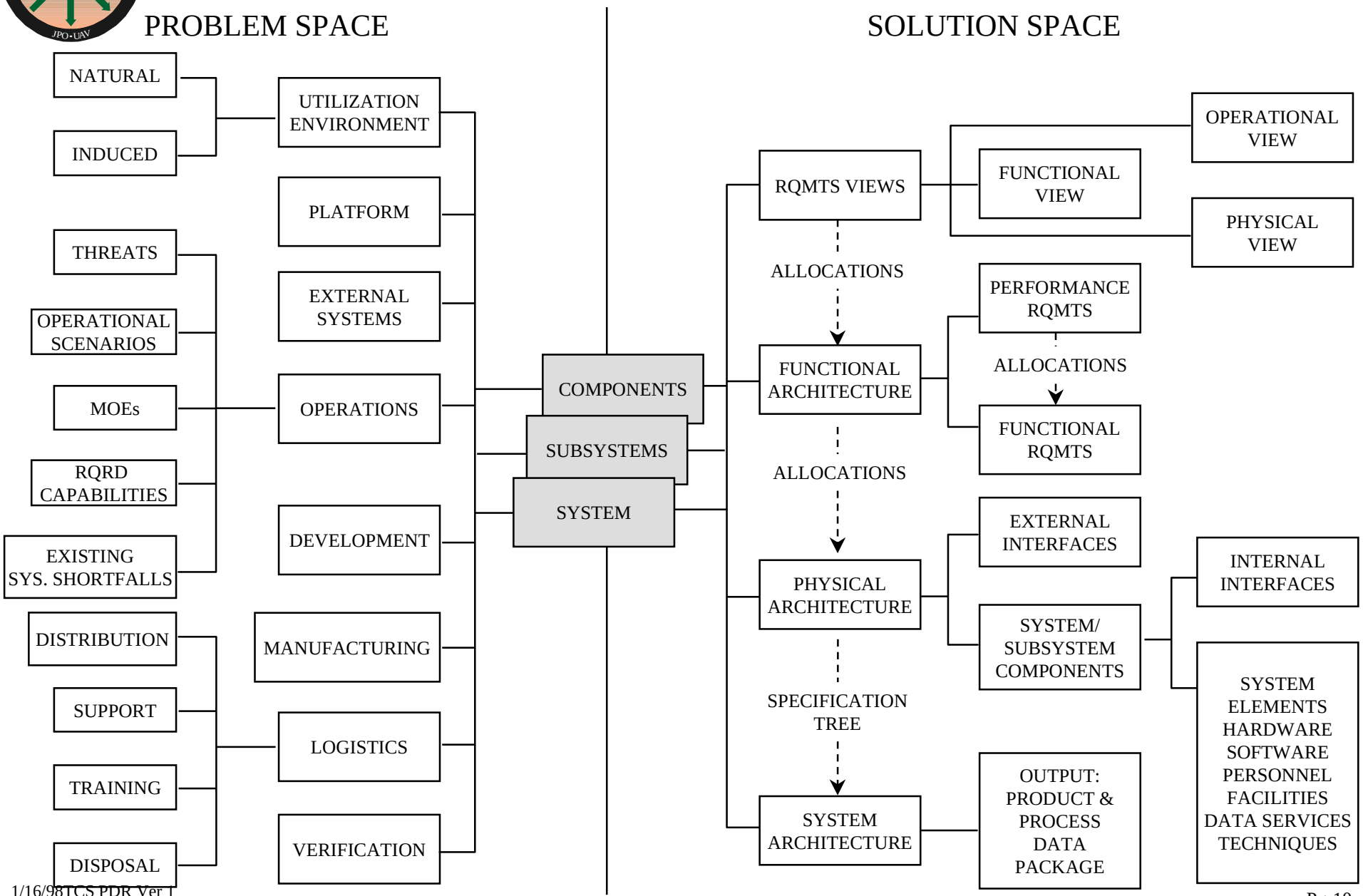
TCS - SYSTEM LEVEL PDR AGENDA

0900 -1000	SYSTEM RQMTS	RAD IPT
1000 -1100	SYSTEM TOP LEVEL DESIGN	RAD IPT
	ARCHITECTURE	RAD / SW IPT
	EXTERNAL I/F	RAD IPT
	INPUTS / OUTPUTS	RAD IPT
1100 -1200	C4I INTERFACES	C4I IPT
	PRESENTATION OF A C4I IDD	-
	IDD RQMTS & DESIGN DETAILS FOR I/F	-
	IDD INTEGRATED INTO SYSTEM DESIGN	-
	IDD INTEGRATED INTO SW & HW DSN DEVLMNT	-
	INTERNAL I/F	RAD IPT
1200 -1230	WORKING LUNCH	
1230 -1430	SUBSYSTEM IDENTIFICATION	RAD IPT
	SUBSYSTEM BLOCK DIAGRAMS	-
	THRESHOLD REQUIREMENTS	-
	SUBSYSTEM FUNCTIONALITY	-
	SUBSYSTEM INTERFACES	-
	HARDWARE CONFIGURATION ITEMS	-
	COMPUTER SOFTWARE CONFIGURATION ITEMS	-
1430 -1530	ILS DESIGN	ILS IPT
	OPERATIONAL TASK ANALYSIS	-
	LOGISTIC MANAGEMENT INFORMATION (LSA)	-
	MAINTENANCE	-
	RELIABILITY	-
	AVAILABILITY	-
1530 - 1630	TRAINING SYSTEM DESIGN	TRNG SUB-IPT
	INSTRUCTIONAL ELEMENT DESIGN	-
	TECHNICAL APPROACH	-
	IMPLEMENTATION CONCEPTS	-
	TRAINING EQUIPMENTS	-
1630 - 1730	CONFIGURATION MANAGEMENT	CM IPT
1730 - 1800	ACTION ITEM REVIEW	PENNY PIERCE

TCS - SYSTEM LEVEL PDR AGENDA

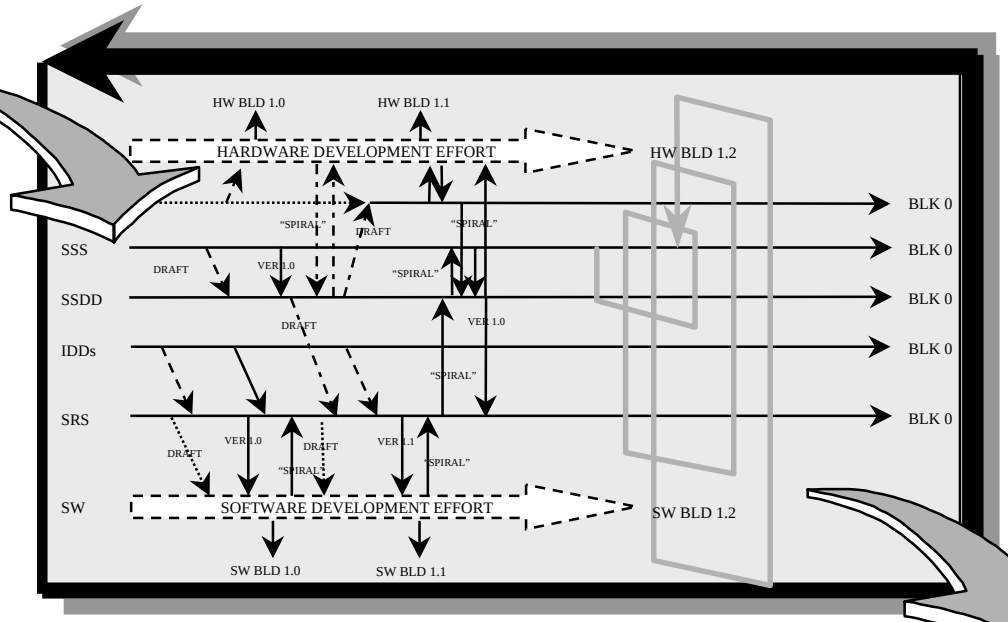
0900 -1000	SYSTEM RQMTS	RAD IPT
1000 -1100	SYSTEM TOP LEVEL DESIGN	RAD IPT
	ARCHITECTURE	RAD / SW IPT
	INPUTS	RAD IPT
	OUTPUTS	RAD IPT
1100 -1200	C4I INTERFACES	C4I IPT
	PRESENTATION OF A C4I IDD	-
	IDD RQMTS & DESIGN DETAILS FOR I/F	-
	IDD INTEGRATED INTO SYSTEM DESIGN	-
	IDD INTEGRATED INTO SW & HW DSN DEVLMNT	-
	INTERNAL I/F	RAD IPT
	EXTERNAL I/F	RAD IPT
1200 -1230	WORKING LUNCH	
1230 -1430	SUBSYSTEM IDENTIFICATION	RAD IPT
	SUBSYSTEM BLOCK DIAGRAMS	-
	THRESHOLD REQUIREMENTS	-
	SUBSYSTEM FUNCTIONALITY	-
	SUBSYSTEM INTERFACES	-
	HARDWARE CONFIGURATION ITEMS	-
	COMPUTER SOFTWARE CONFIGURATION ITEMS	-
1430 -1530	ILS DESIGN	ILS IPT
	OPERATIONAL TASK ANALYSIS	-
	LOGISTIC MANAGEMENT INFORMATION (LSA)	-
	MAINTENANCE	-
	RELIABILITY	-
	AVAILABILITY	-
1530 - 1630	TRAINING SYSTEM DESIGN	TRNG SUB-IPT
	INSTRUCTIONAL ELEMENT DESIGN	-
	TECHNICAL APPROACH	-
	IMPLEMENTATION CONCEPTS	-
	TRAINING EQUIPMENTS	-
1630 - 1730	CONFIGURATION MANAGEMENT	CM IPT
1730 - 1800	ACTION ITEM REVIEW	DICK FEIERABEND

SYSTEMS ENGINEERING



SYSTEMS ENGINEERING PROCESS

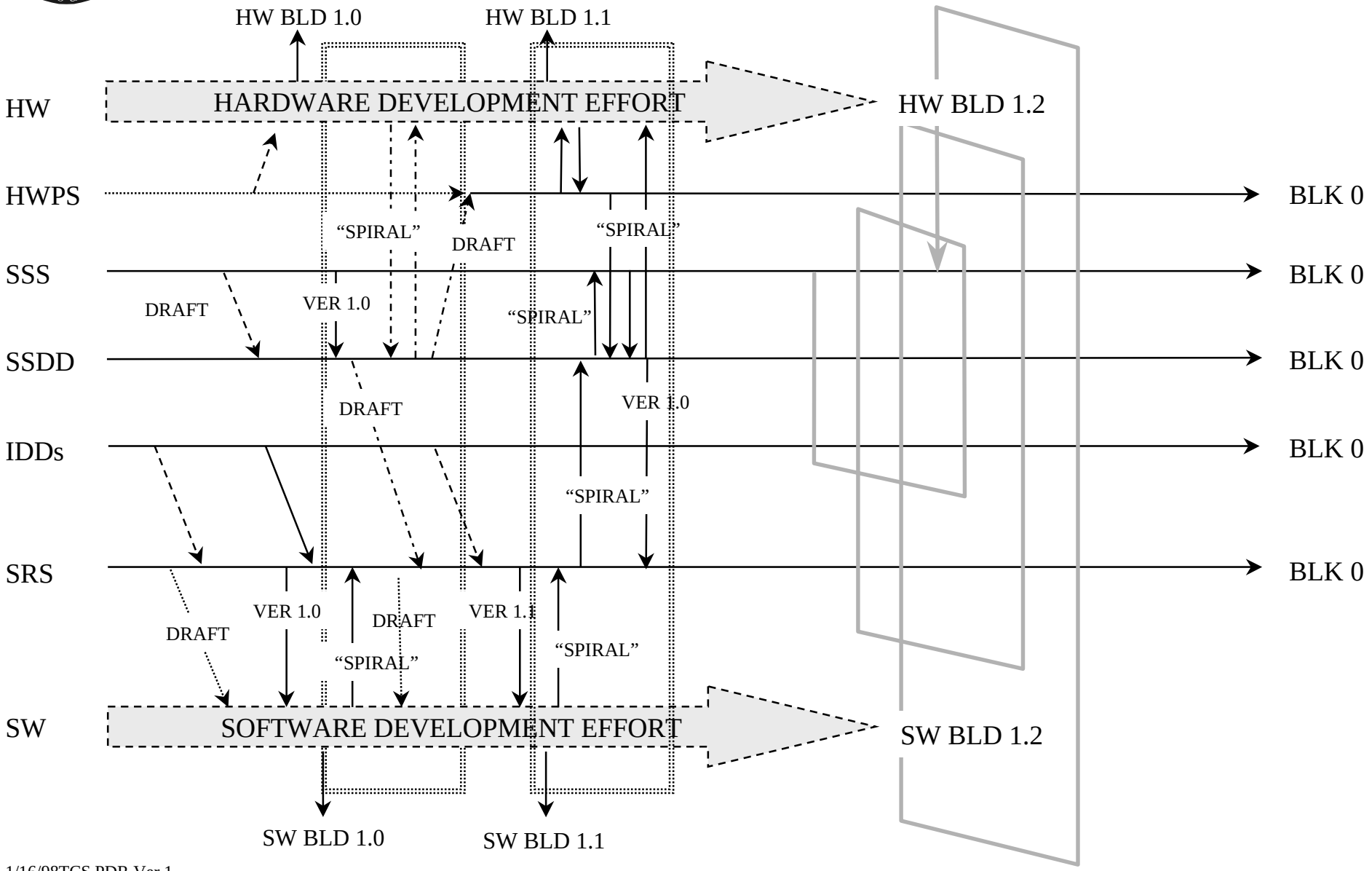
- **PROCESS INPUT**
  - **–Customer Needs/ Objectives**
  - **–Requirements**
    - **Mission/Operations**
    - **Measures of Effectiveness**
    - **Environments**
    - **Constraints**
  - **–Technology Base**
  - **–Prior Output Data**
  - **–Program Decision Requirements**
  - **–Requirements From Tailored Standards and Specifications**



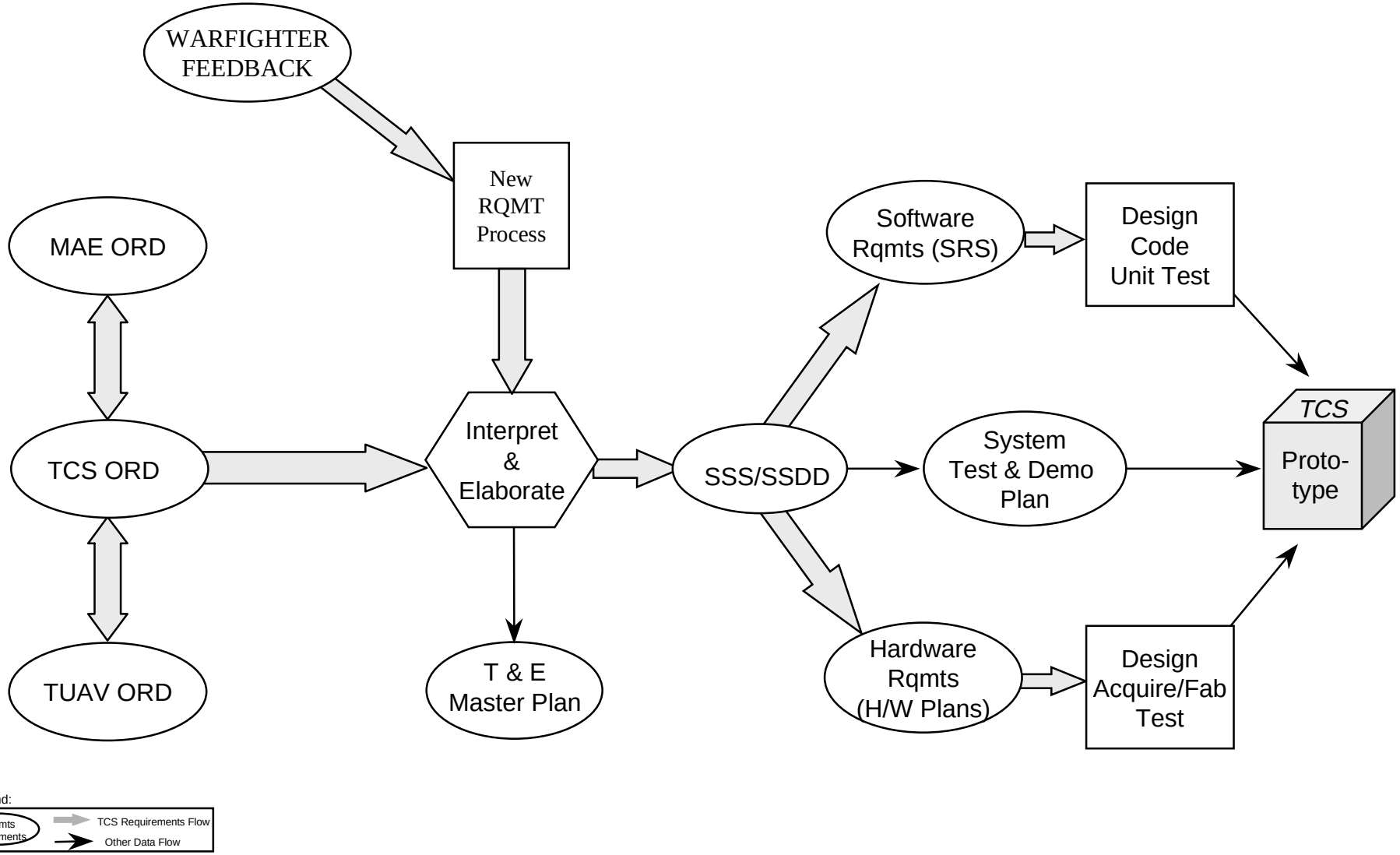
- **PROCESS OUTPUT:**
  - **– SYSTEM SOLUTION (PROTOTYPE)**
  - **– FUNCTIONAL & PHYSICAL ARCHITECTURES**
  - **– SPECIFICATIONS & BASELINES**
  - **– DESIGN DOCUMENTATION**
  - **– LOGISTIC SUPPORT DATA**

"INCREMENTAL, EVOLUTIONARY, CONCURRENT, SPIRAL ENGINEERING"

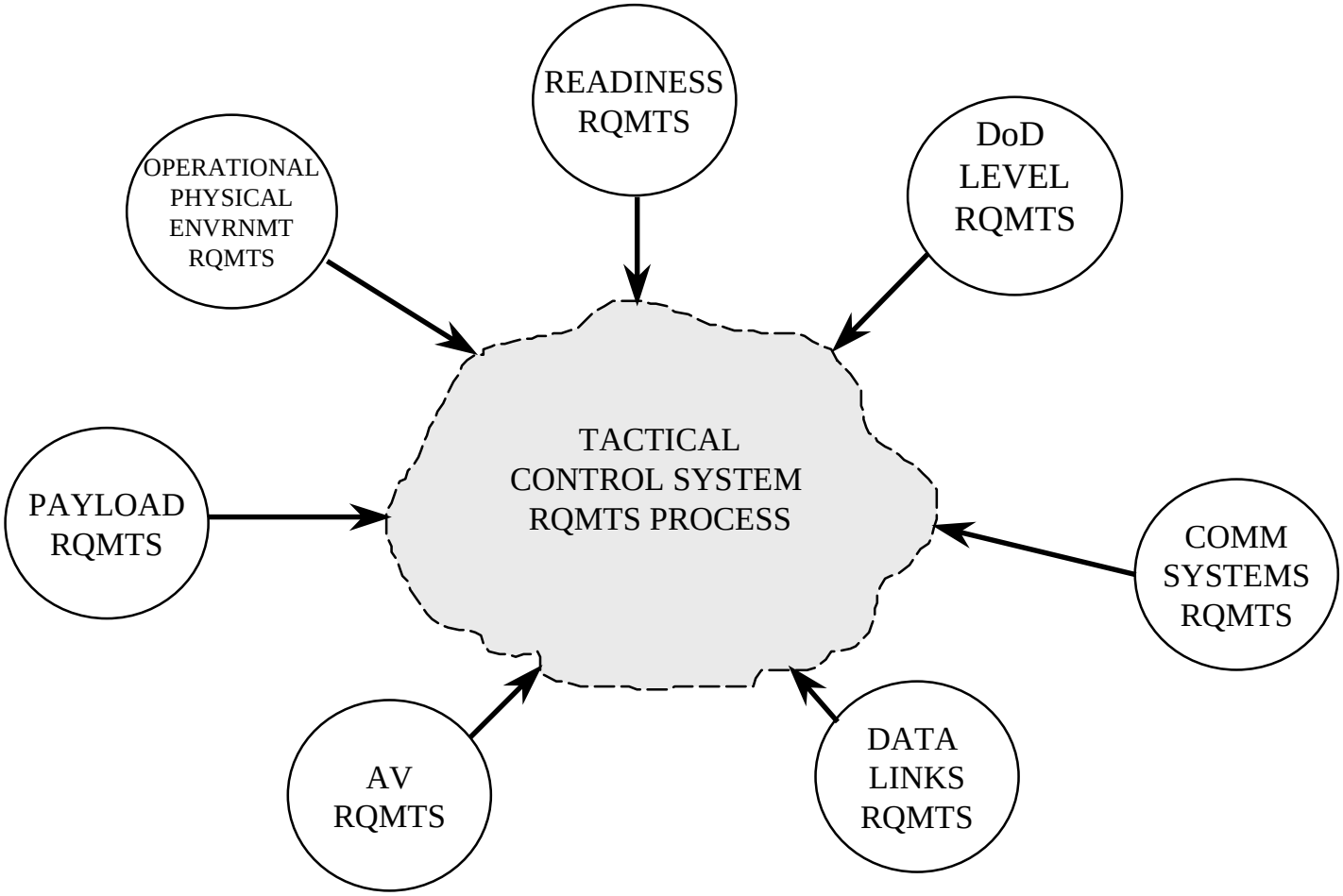
INCREMENTAL, EVOLUTIONARY, CONCURRENT, SPIRAL ENGINEERING



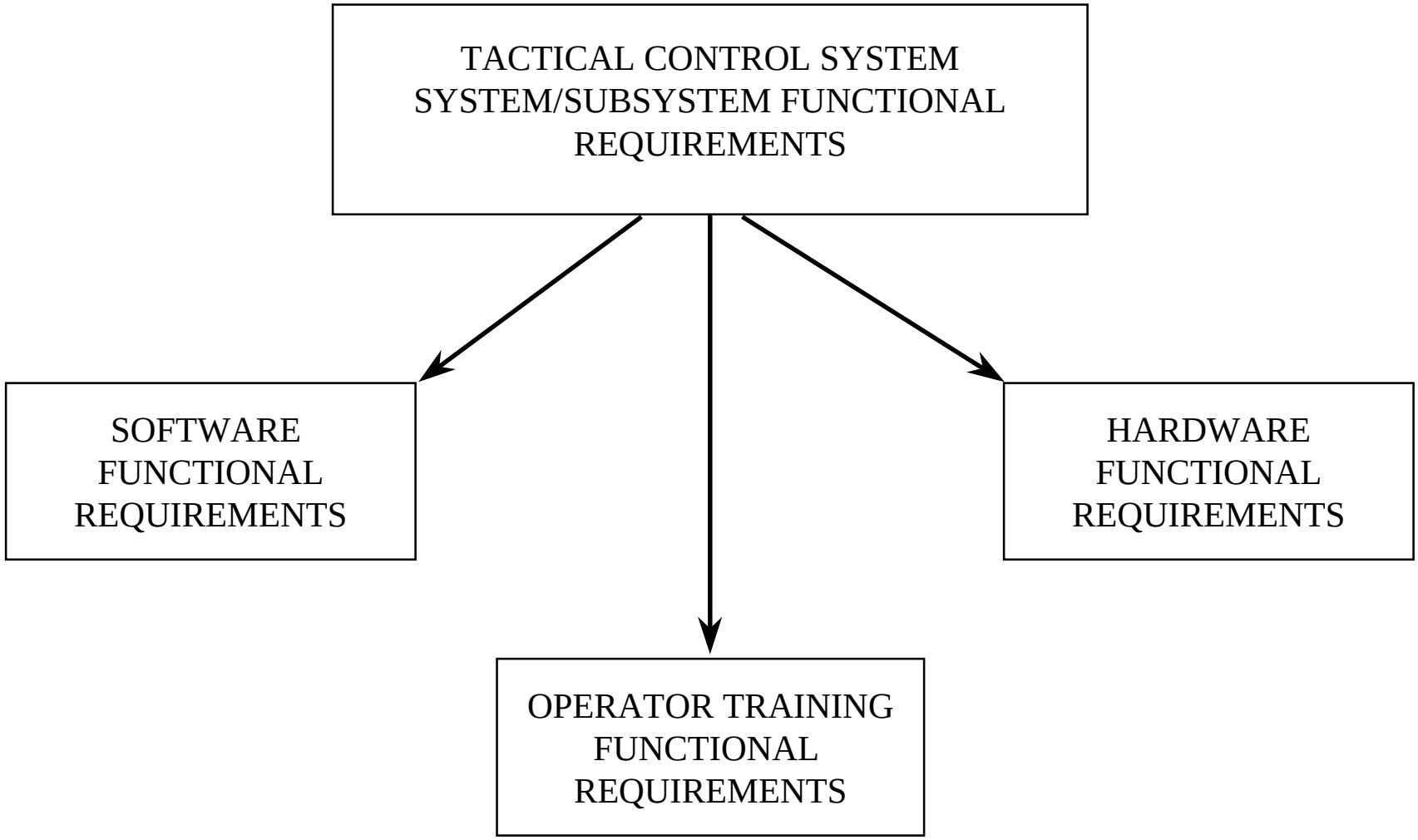
REQUIREMENTS PROCESS
OPERATIONAL REQUIREMENTS FLOW MODEL



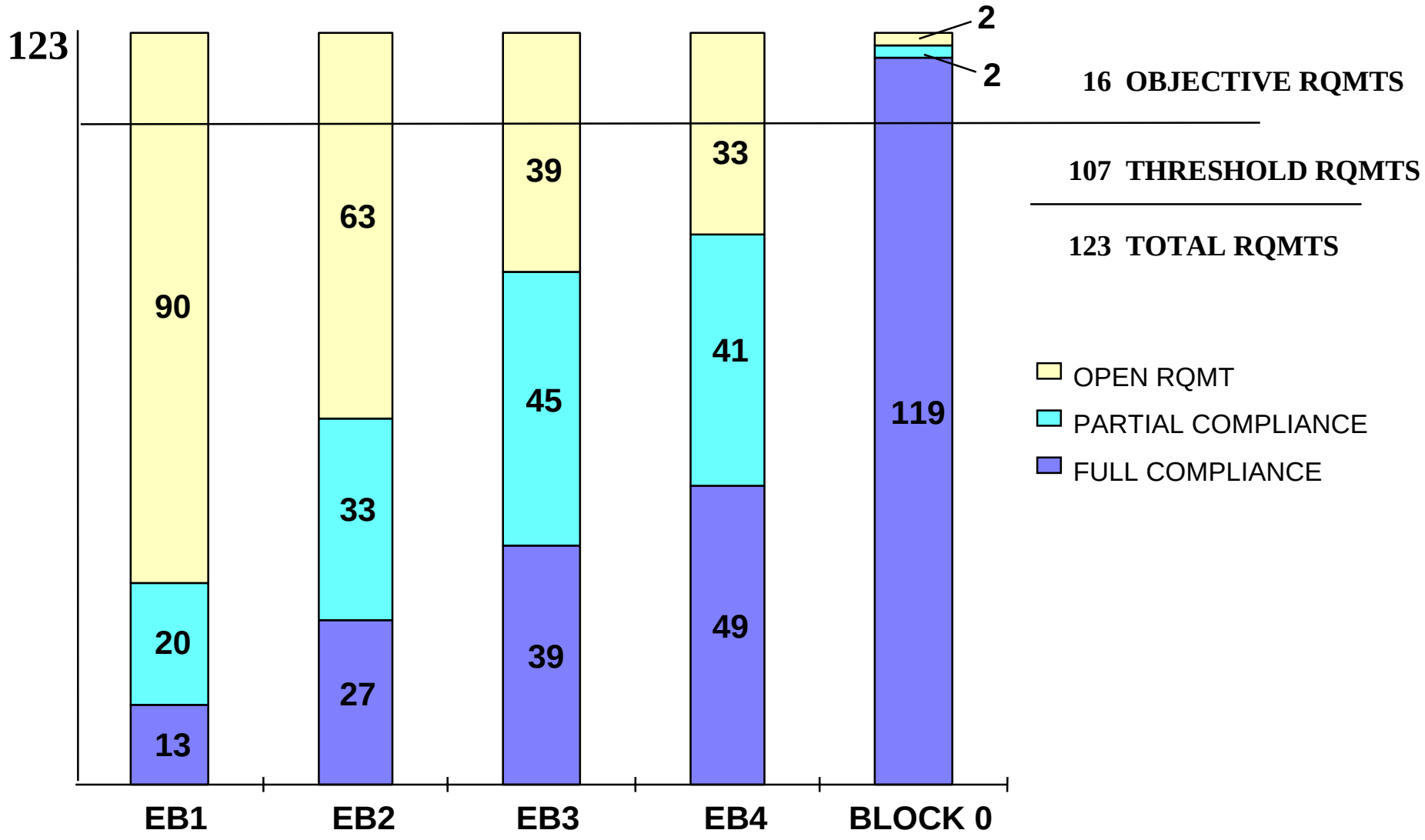
PHYSICAL, FUNCTIONAL AND PERFORMANCE TECHNICAL REQUIREMENTS



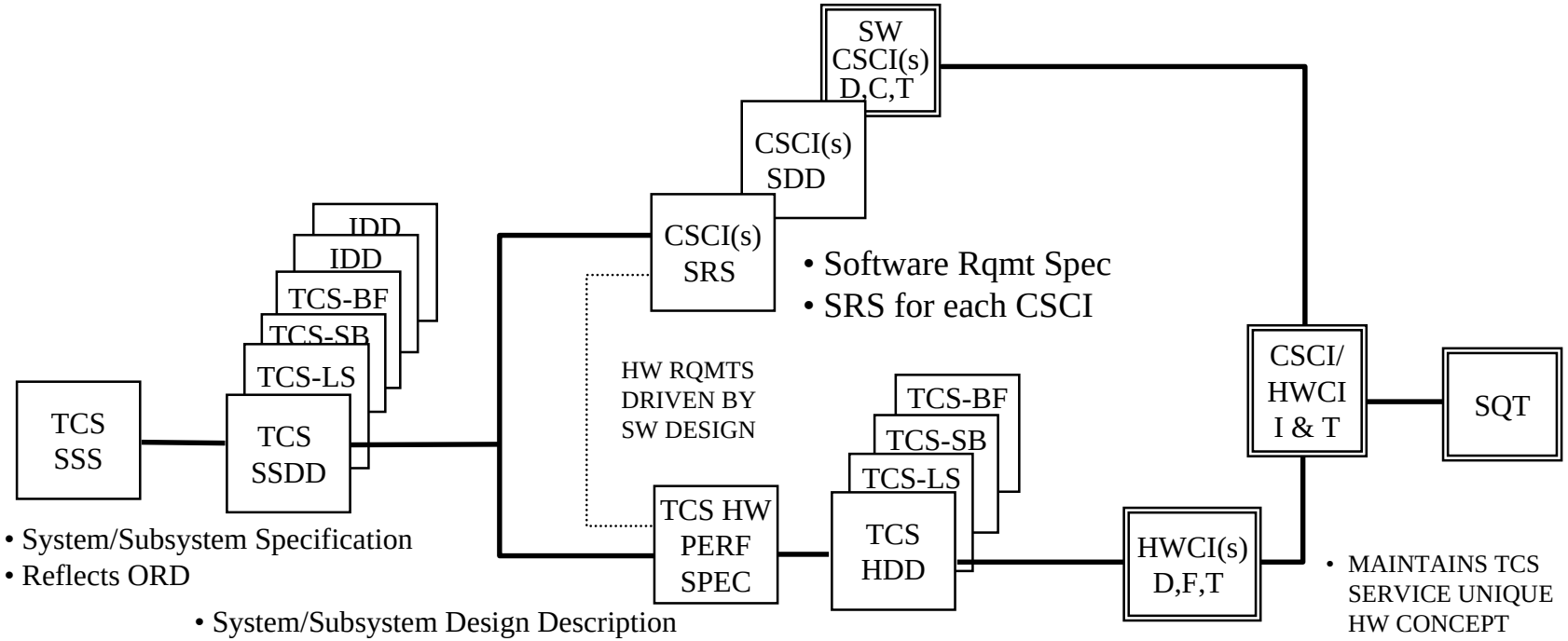
REQUIREMENTS ALLOCATION



ORD IMPLEMENTATION BY ENGINEERING BUILD



TCS REQUIREMENTS DOCUMENTATION MODEL



- Software Rqmt Spec
- SRS for each CSCI

- System/Subsystem Specification
- Reflects ORD

- System/Subsystem Design Description
- Appendices for Each TCS Type
- IRS/IDDs for Each Interface

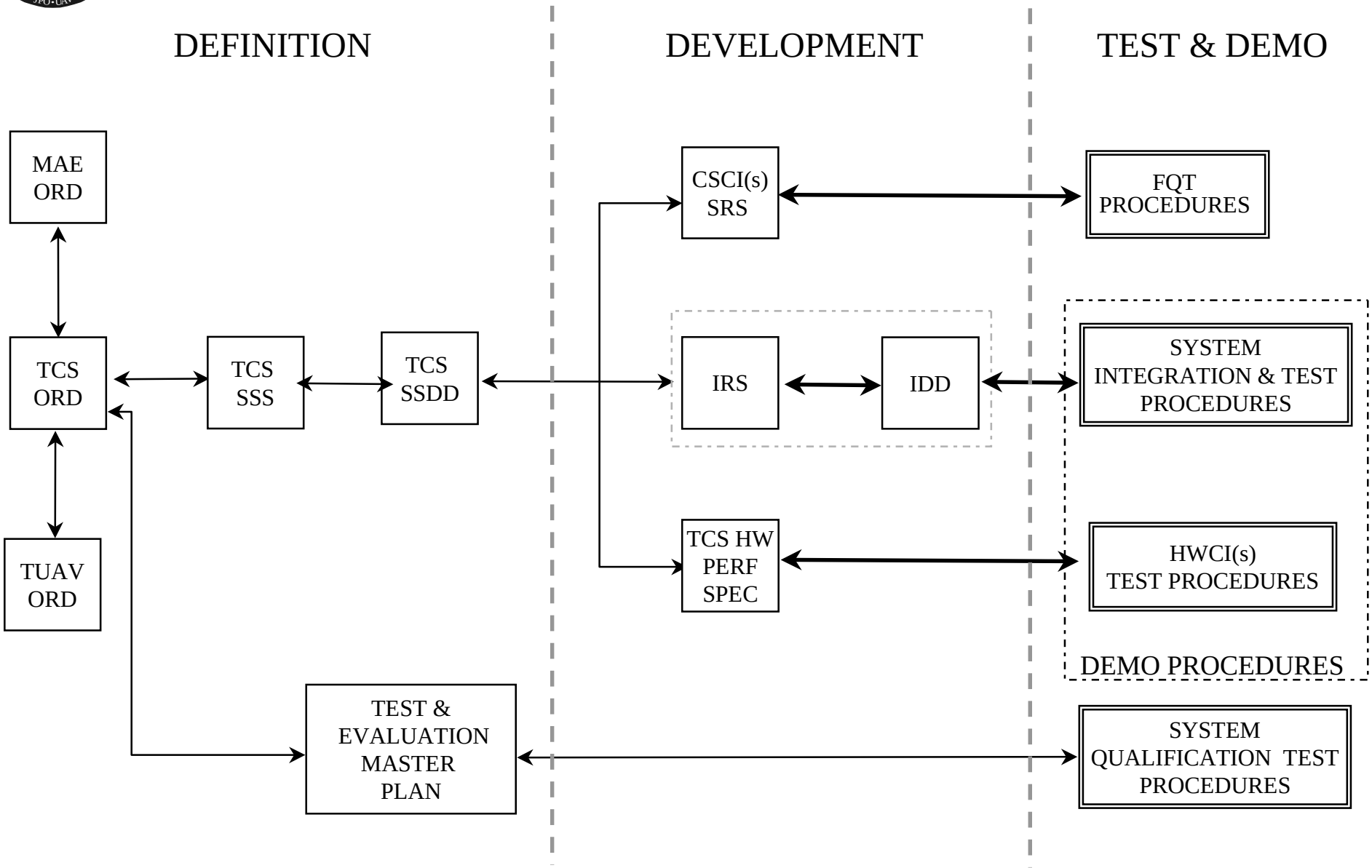
- TCS Hardware Performance Spec
- HW Perf. Rqmts for each HWCI
- Compatibility Rqmts
- Power Budgets, etc.

- TCS Hardware Design Description
- Appendices for Each TCS Type

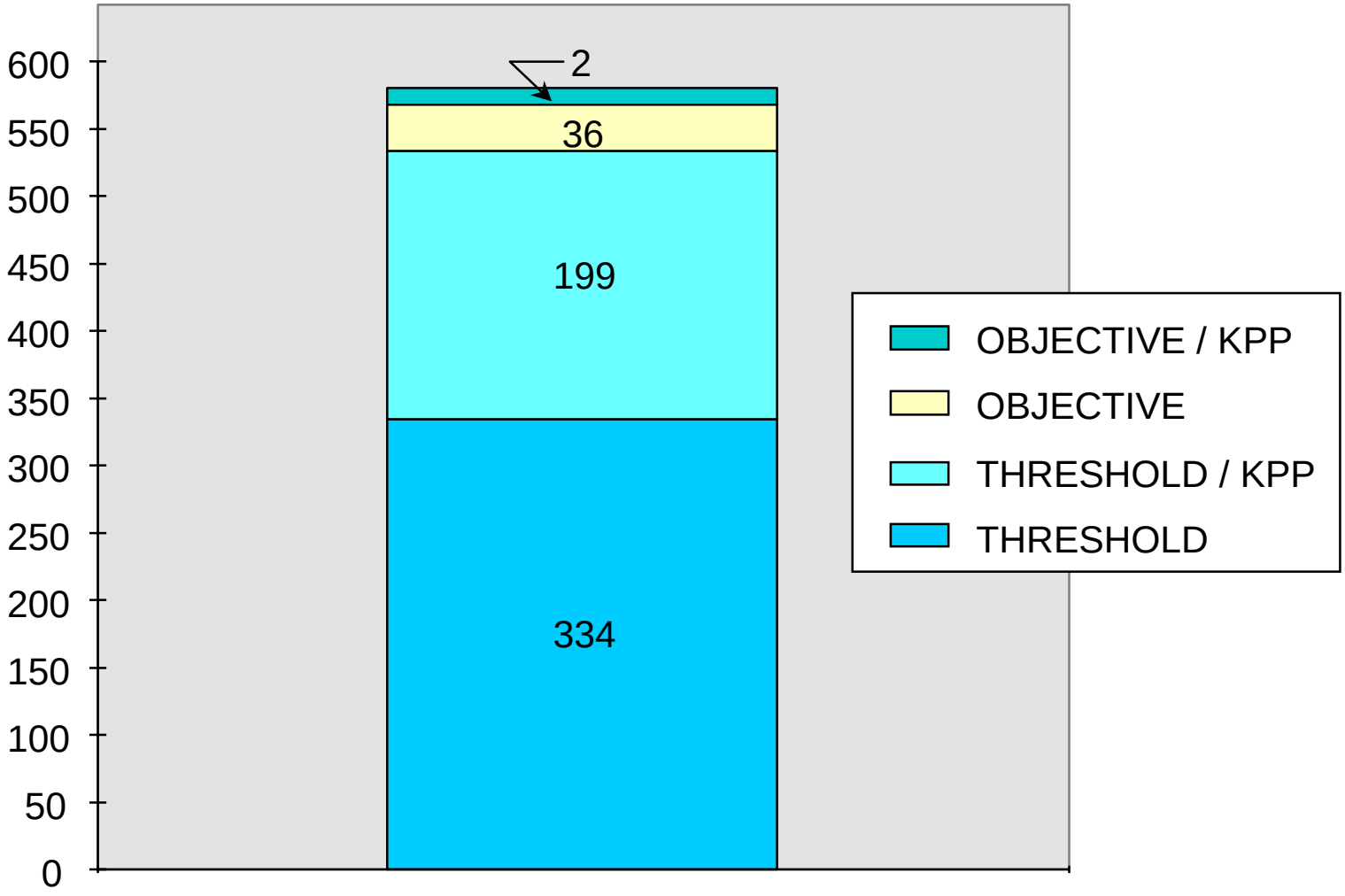
- MAINTAINS TCS SERVICE UNIQUE HW CONCEPT

- Processes Shown for Illustration Only

TRACEABILITY MODEL

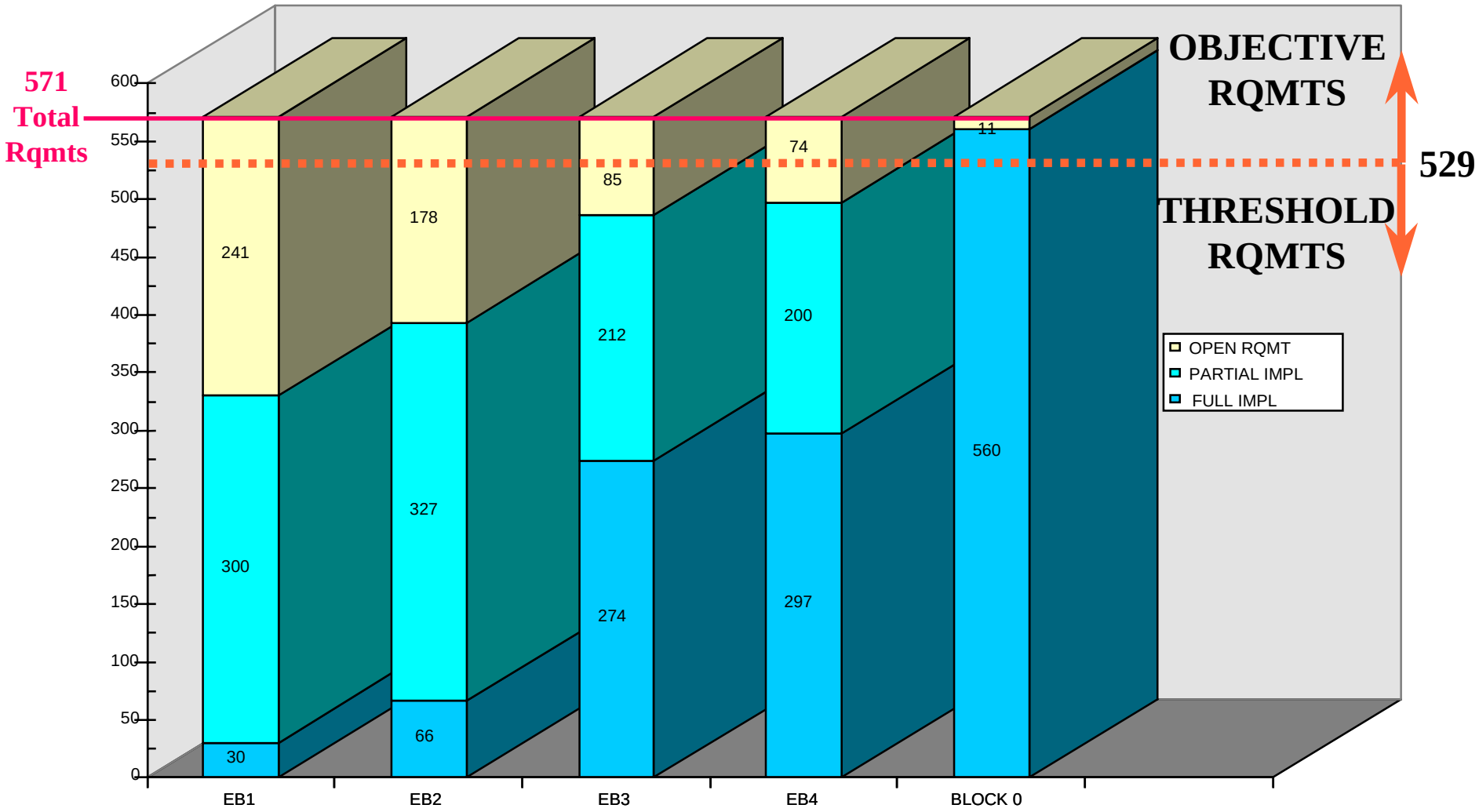


SSS REQUIREMENTS BY CATEGORY



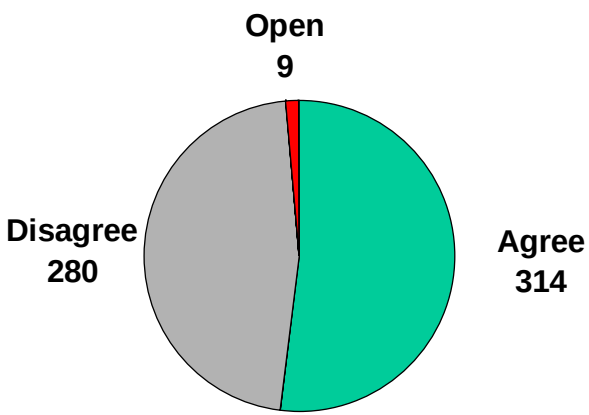
571 TOTAL REQUIREMENTS

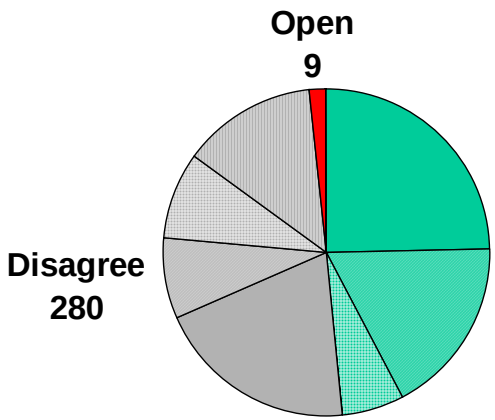
SSS RQMTS IMPLEMENTATION BY ENGINEERING BUILD



SSS VERSION 1.0
REQUEST FOR ACTION SUMMARY

DOCUMENT TITLE/NUMBER	AGREE	DISAGREE	OPEN	TOTAL
Tactical Control System (TCS) System/Subsystem Specification TCS 102	314	280	9	603

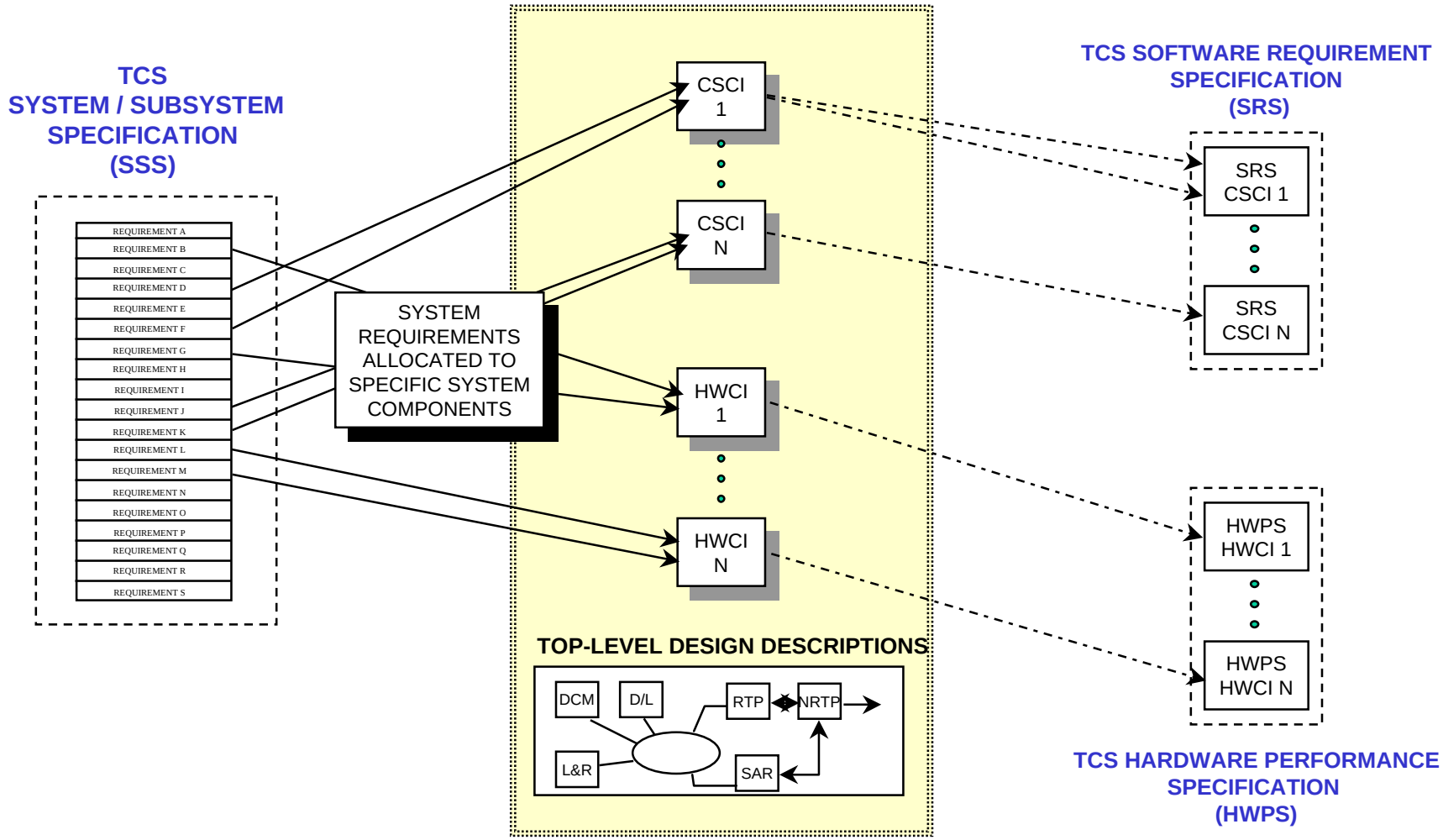




- AGREE, TECHNICAL
- AGREE, EDITORIAL
- AGREE, REQUEST FOR CLARIFICATION
- DISAGREE, TECHNICAL
- DISAGREE, EDITORIAL
- DISAGREE, REQUEST FOR CLARIFICATION
- DISAGREE, STATEMENT
- OPEN

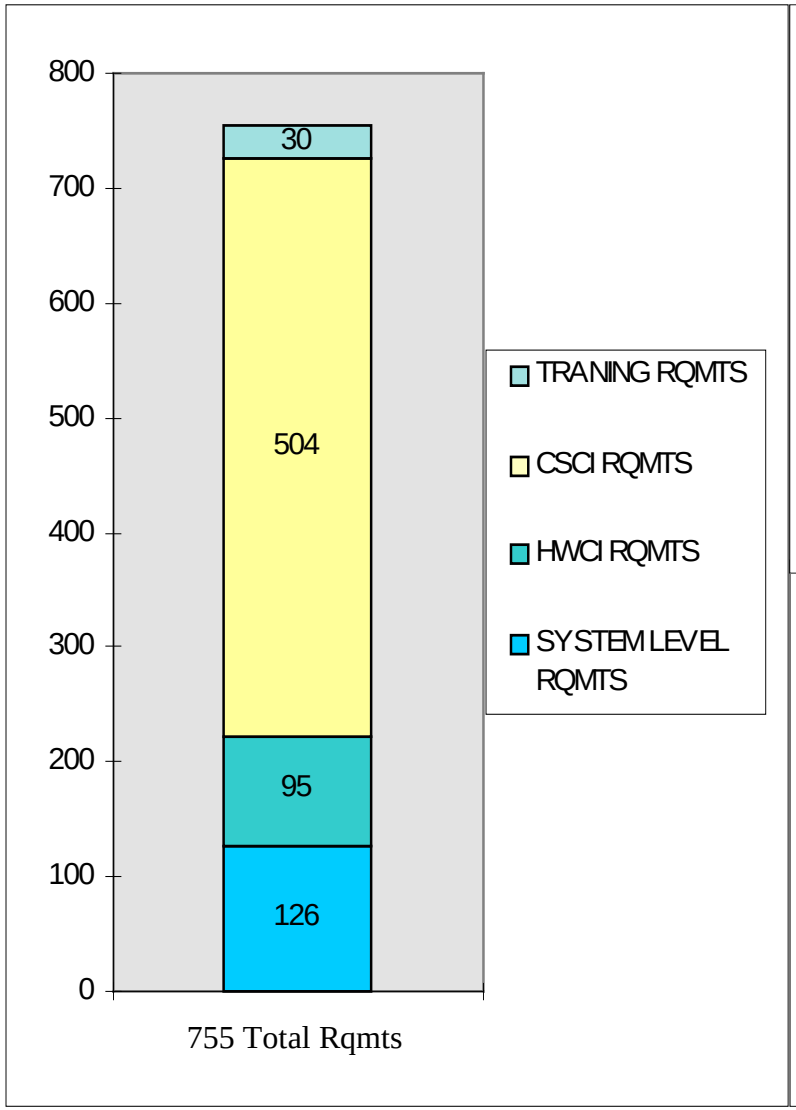
- **OPEN STRs: 66**
  - **56 NEW REQUIREMENTS FROM UAV ORDs**
    - **REVIEWING RECOMMENDATION FOR INCORPORATION**
  - **10 TROUBLE REPORTS FROM CONTINUED REVIEW**
  - **ASSESSMENTS SUBMITTED**
  - **DOCUMENT CHANGE PAGES BEING PREPARED**

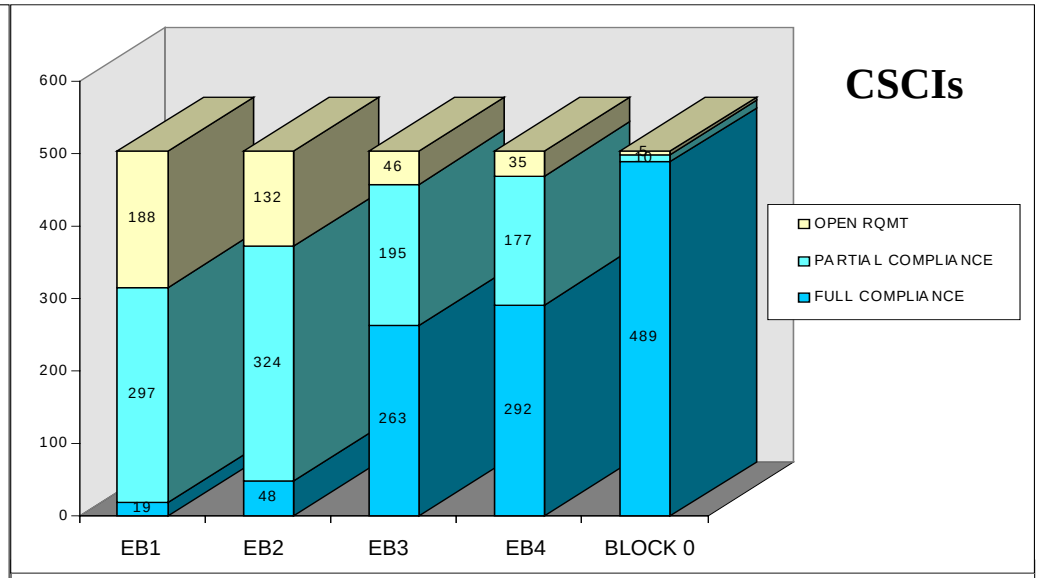
SYSTEM / SUBSYSTEM DESIGN DESCRIPTION

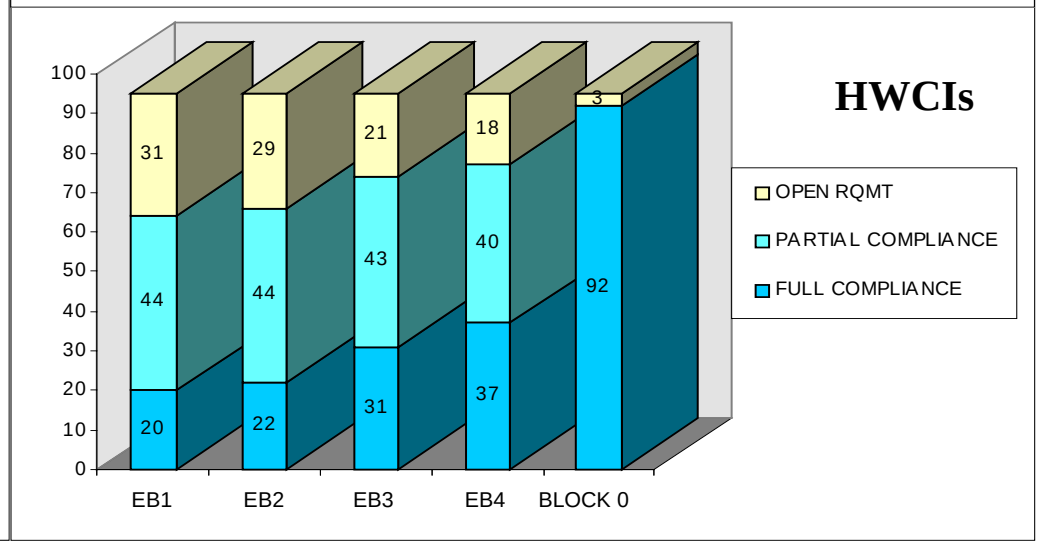


TCS SYSTEM / SUBSYSTEM DESIGN DESCRIPTION (SSDD)

SSDD RQMTS ALLOCATIONS



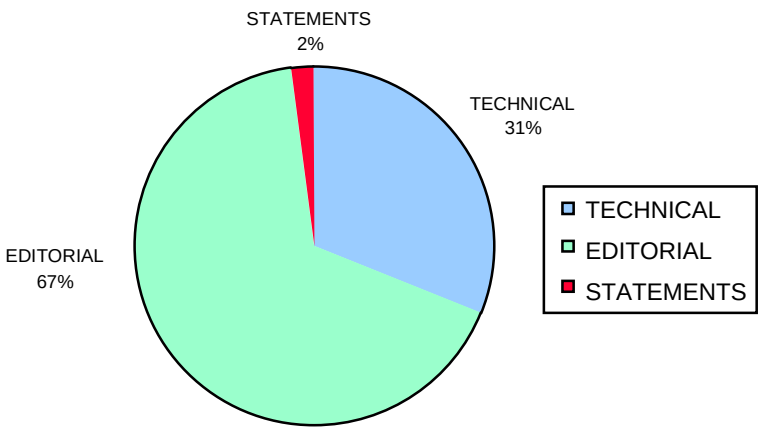




SSDD REQUEST FOR ACTION SUMMARY

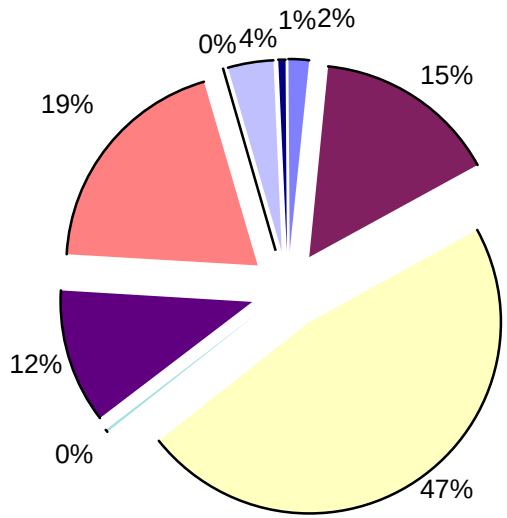
DOCUMENT TITLE/NUMBER	AGREE	DISAGREE	OPEN	TOTAL
Tactical Control System (TCS) System/Subsystem Design Description TCS 104	356	728	52	1136

- **REVISED DOCUMENT UNDER INTERNAL REVIEW**
- **PLANNED RELEASE TO IPTs - 15 DEC 97**



- **VERSION: 0.01**
- **DATE: 5 SEPTEMBER 1997**
- **STATUS: DRAFT DISTRIBUTED FOR REVIEW**
- **REVIEW PERIOD: 8 SEP - 10 OCT**

SSDD INSPECTION RESULTS



DISAGREE STATEMENT	20
DISAGREE TECHNICAL	176
DISAGREE EDITORIAL	532
AGREE STATEMENT	3
AGREE TECHNICAL	132
AGREE EDITORIAL	221
OPEN STATEMENTS	0
OPEN TECHNICAL	46
OPEN EDITORIAL	6
TOTAL	1136

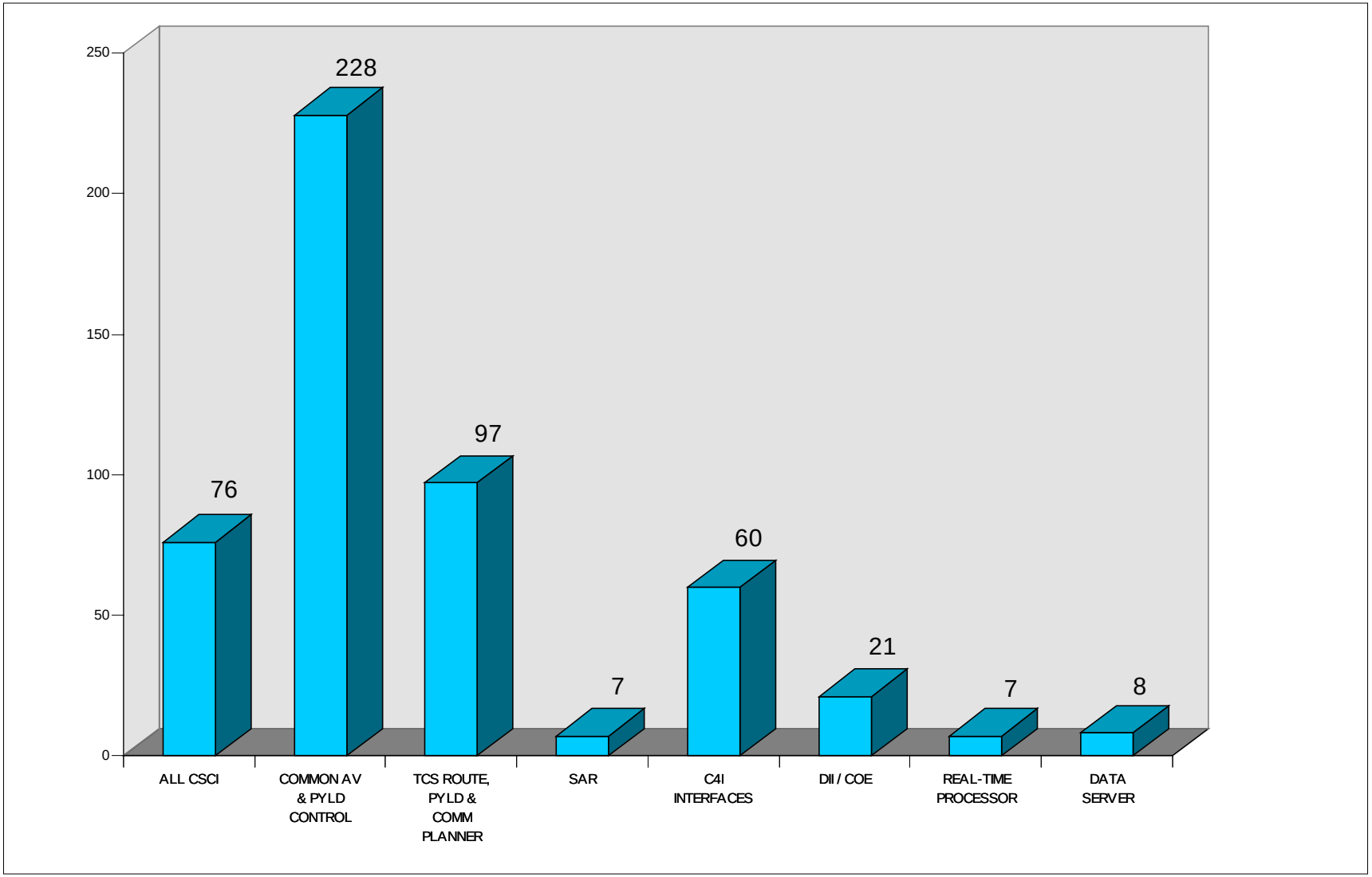
SYSTEM LEVEL REQUIREMENT ALLOCATIONS

SYSTEM DESIGN REQUIRMENTS	126
TRAINING RQMTS	30

SSDD ALLOCATIONS TO CSCIs

CSCI	RQMTS
ALL CSCI	76
COMMON AV & PYLD CONTROL	228
TCS ROUTE, PYLD & COMM PLANNER	97
SAR	7
C4I INTERFACES	60
DII / COE	21
REAL-TIME PROCESSOR	7
DATA SERVER	8
TOTAL	504

SSDD ALLOCATIONS TO CSCIs



ALLOCATIONS TO CSCI REPRESENTATIVE LOWER LEVEL ELEMENTS

ALL CSCIs	RQMTS
DESIGN STANDARDS	13
SECURITY	8
RELIABILITY	3
TRAINING	2
HCI	35
WARNINGS	12
STATUS	3

C4I INTERFACES	60
C4I MESSAGES	10

TCS COMMON AV & PYLD CONTROL	2
SYSTEM SETUP	38
NITF FILES	5
TARGETING	5
COLLECTION TASKING / RETASKING	4
LAUNCH & RECOVERY	4
TRAINING	8
MAINTENANCE	32
TCS MAIN	6
AV CONTROL	30
AV FLIGHT MONITORING	8
DATALINK MGMT & CTRL	37
EO/IR PYLD CTRL	6
IMAGERY VIEWER	28
EO/IR IMAGERY ACQUISITION	4
USER INTERFACE MANAGER	1

TCS ROUTE, PYLD, COMMS PLANNER	38
ROUTE PLANNER	34
PAYLOAD PLANNER	10
DATALINK PLANNER	7
COMMUNICATIONS PLANNER	4
PLAN MONITORING	4

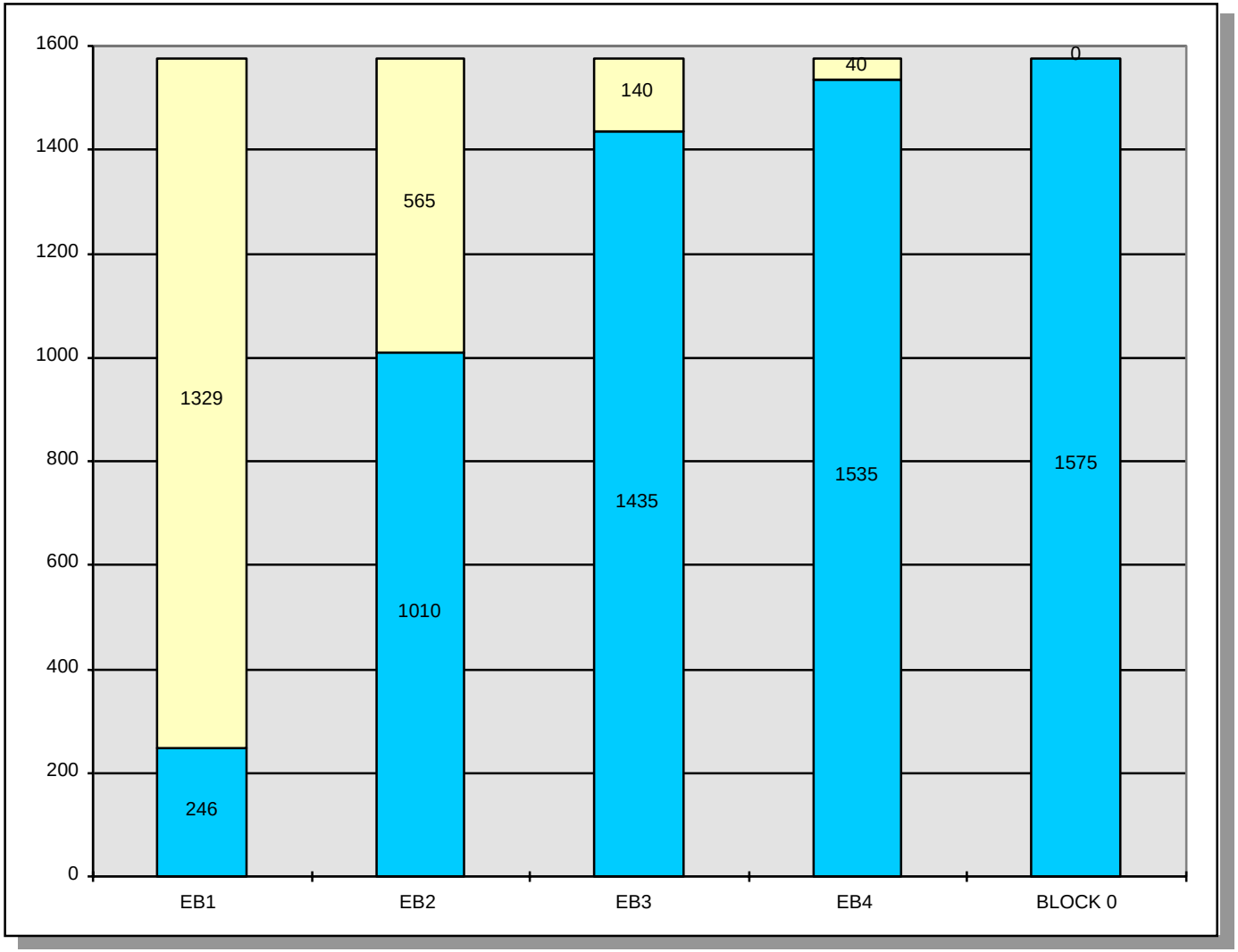
DII / COE	21

DATA SERVER	8

SAR	
SAR PAYLOAD CTRL	2
SAR IMAGERY VIEWER	2
SAR DATA ACQUISITION	1
SAR NITF FILES	2

REAL-TIME PROCESSOR	1
ANTENNA CONTROL	1
AVSI CONVERSION	3
CARS CONVERSION	1
IBLS CONVERSION	1

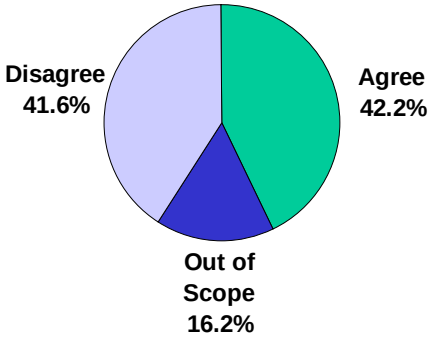
PROJECTED SOFTWARE REQUIREMENTS BY ENGINEERING BUILD



Software Requirements Document (SRS) Version 1.1

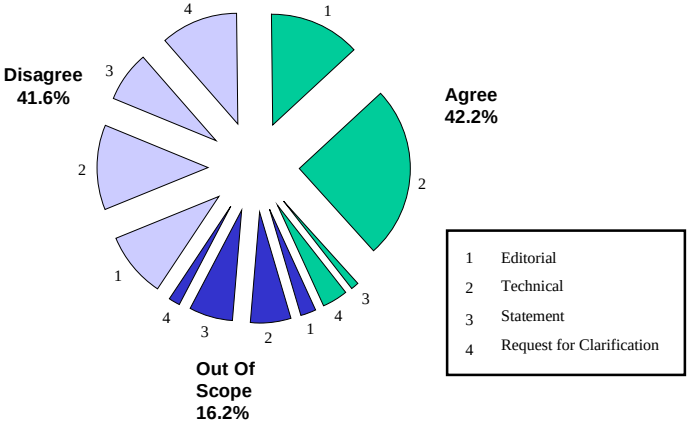
SRS VER 1.1 REQUEST FOR ACTION SUMMARY

DOCUMENT TITLE/NUMBER	AGREE	OUT OF SCOPE	DISAGREE	TOTAL
Tactical Control System (TCS) Software Requirements Specification TCS 103	73	28	72	173



- **SRS Draft distributed 1 Aug 97**
- **Received 173 Requests for Action**
- **SRS Final due out 24 Sept 97**

SRS VER 1.1 INSPECTION RESULTS



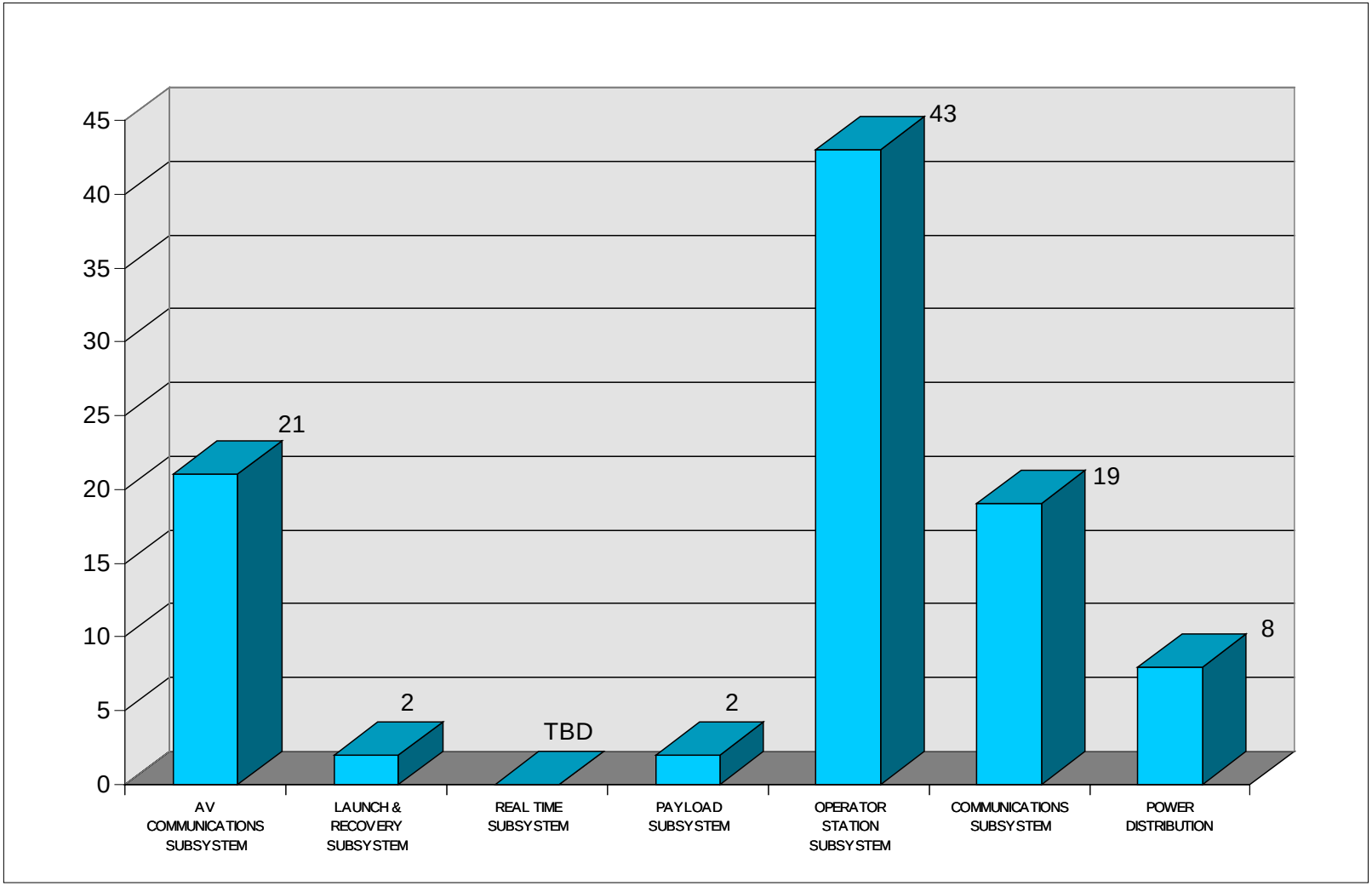
Change Request Development

10 Pending Change Requests
- **7 Change Requests Developed by Software Requirements Team**
  SRS Draft distributed 1 Aug 97
- **7 Change Requests derived from Build Review Board Meeting**
- **8 Change Requests generated from 173 Requests for Action**
  SRS Final due out 24 Sept 97

SUBSYSTEMS REQUIREMENT ALLOCATIONS

SUBSYSTEMS	RQMTS
AV COMMUNICATIONS SUBSYSTEM	21
LAUNCH & RECOVERY SUBSYSTEM	2
REAL TIME SUBSYSTEM	TBD
PAYLOAD SUBSYSTEM	2
OPERATOR STATION SUBSYSTEM	43
COMMUNICATIONS SUBSYSTEM	19
POWER DISTRIBUTION	8
TOTAL	95

SUBSYSTEMS REQUIREMENT ALLOCATIONS



TCS HARDWARE CONFIGURATION ITEMS (HWCIs)

- Integrated Data Terminal
- Ku Datalink Terminal
- C-Band LOS Antenna Assy.
- Ku SATCOM Antenna Assy.
- Predator DCM
- Outrider DCM
- Pioneer DCM
- IBLS Subsystem
- UCARS Subsystem
- Real-Time Computer
- Manual Controls
- SAR Processor
- Digital Linear Tape Recorder
- RAID

- Link Manager Assy.
- Integ. Interface Unit (IIU)
- Non-Real time Computer
- Video Support
- Operator Output
- Operator Input
- External Storage
- TCS Printer
- Intercommunications Eqpt.
- C4I support Eqpt.
- Communications Eqpt
- UPS
- Power Distribution

- TCS-LS Unique
- TCS-SB Unique
- TCS-BF Unique

REQUIREMENTS ALLOCATIONS TO HWCIs

AV COMMUNICATIONS SUBSYSTEM	RQMTS
DATATERMINAL	9
INTEGRATED DATA TERMINAL	2
KU DATA TERMINAL	2
C-BAND LOS ANT. ASSM.	1
KU SATCOM ANT ASSM.	1
DCM	2
PREDATOR DCM	1
OUTRIDER DCM	1
PIONEER DCM	2

LAUNCH & RECOVERY SUBSYSTEM	
IBLS	1
UCARS	1

REAL TIME SUBSYSTEM	
REAL TIME COMPUTER [VME]	TBD
MANUAL CONTROLS (NEW)	TBD

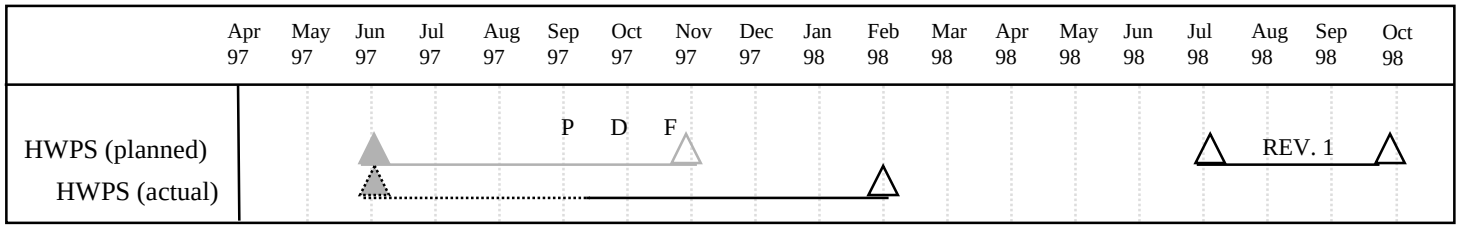
POWER DISTRIBUTION	2
UPS	6
POWER DISTRIBUTION	TBD

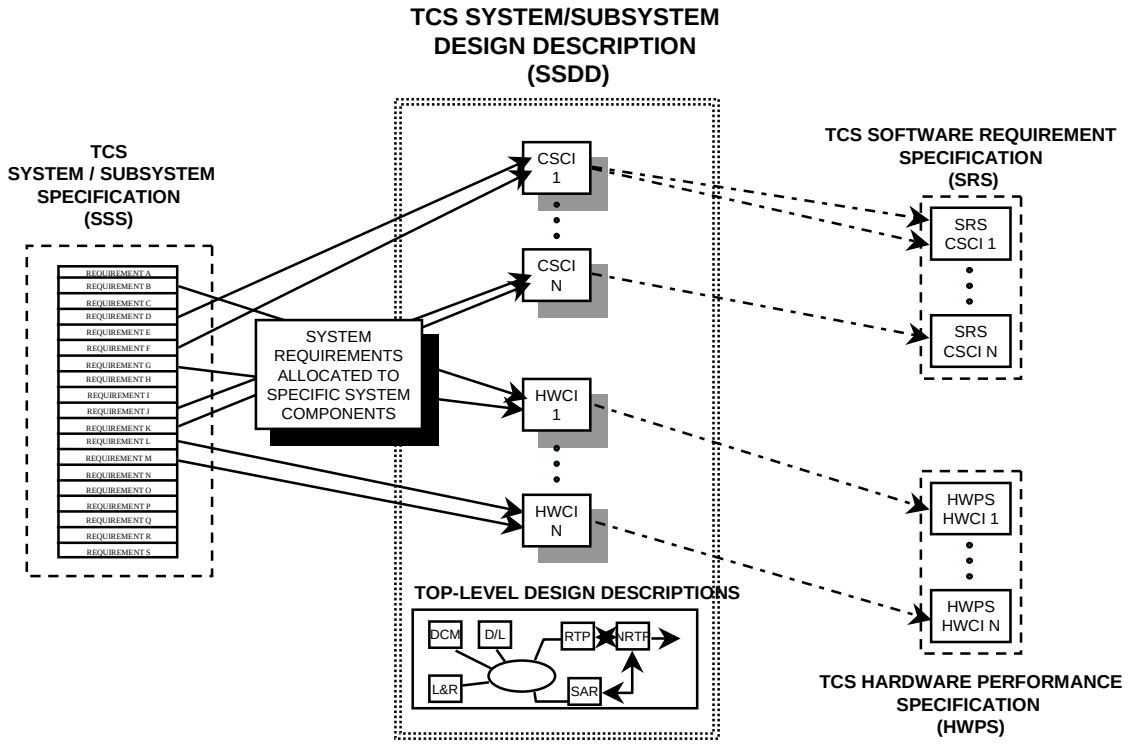
PAYLOAD SUBSYSTEM	
EO/IR (TBD)	TBD
SAR PROCESSOR	1
DIGITAL LINEAR TAPE	1
RAID	0
LMA (NEW)	TBD
INTEGRATED INTERFACE UNIT (IIU) [NEW]	TBD

OPERATOR STATION SUBSYSTEM	
NON-REAL TIME COMPUTER	19
VIDEO SUPPORT	7
OPERATOR OUTPUT	10
OPERATOR INPUT	7

COMMUNICATIONS SUBSYSTEM	
EXTERNAL STORAGE	11
TCS PRINTER	2
INTERCOMM EQPT	2
C4I SUPPORT EQPT	2
COMMUNICATIONS EQPT	2

HARDWARE PERFORMANCE SPEC IMPLEMENTATION





- **ENVIRONMENTAL RQMTS BASED ON IEEE STANDARD FOR RACK MOUNTED COMPUTER EQUIPMENT**
- **SPECIFIC HARDWARE PERFORMANCE RQMTS AND CONFIGURATIONS IDENTIFIED FOR PARTICULAR HWCI**

HARDWARE PERFORMANCE SPEC CONTENTS

The HWPS Will Contain the Following Type of Information:

- Design and Construction Requirements
- Physical Form Factors
- Weight Limitations
- Connectorization
- Power Requirements
- Air Flow and Cooling Requirements
- Environmental Conditions
- Maintainability/Reliability
- Performance Requirements
- Configuration Requirements

IEEE P1156.X (DRAFT)

IEEE STANDARD FOR MICROCOMPUTER ENVIRONMENTAL SPECIFICATIONS FOR RACK MOUNTED COMPUTER EQUIPMENT

Scope.
This standard is intended to be used as a core specification. It contains the minimum environmental withstand conditions which cover the natural and artificial environments to which rack mounted equipment may be exposed. Performance of the rack mounted equipment can be assessed under the withstand conditions for use, transport and storage as in practice. Withstand conditions include, but are not limited to thermal, mechanical, electrical and atmospheric stresses.

Purpose.
The purpose of this standard is to provide a common set of specifications for physical integrity and environmental performance levels for rack mounted computer equipment.

Environmental Classifications
Environmental classifications are grouped into Environmental Codes to delineate degrees of environmental hardening required by each piece of equipment. Table I specifies which requirements are applicable to each code. In general the codes are qualitatively defined as follows:

RED	Shipboard Severe-Service. Intended primarily for shipboard situations where severe temperature and shock extremes are likely. Survival of mission critical systems is paramount.
WHITE	Shore-based (benign). Intended primarily for office and laboratory use.
BLUE	Shipboard Benign-Service. Intended primarily for shipboard subsystems which are NOT considered mission critical but must survive a maritime environment.
GOLD	Transport. Intended primarily for transit cases which shall protect equipment in the non-operating state.
SILVER	Airborne. Intended primarily for use in an airborne environment including takeoff and landing.
GREEN	Wheeled and tracked vehicle. Intended primarily for use ashore aboard wheeled and tracked vehicles in expeditionary situations.
TAN	Outdoors. Intended primarily for use in expeditionary situations in an unsheltered uncontrolled environment.

ENVIRONMENTAL REQUIREMENTS APPLICABILITY

	RED	WHITE	BLUE	GOLD	SILVER	GREEN	TAN
1. Altitude, Operating					X	X	X
2. Altitude, Non-Operating	X		X	X		X	X
3. DC Magnetic Field Environment	X, a		X, b				
4. Dust and Sand				X	X	X	X
5. EMI, Emissions	X, b	X, a	X, c		X, d	X, b	X, b
6. EMI, Susceptibility	X, a	X, b	X, c		X, e	X, d	X, d
7. Electrostatic Discharge (ESD)	X		X		X	X	X
8. Fungus				X	X	X	X
9. Humidity	X, a	X, a	X, a	X, a, b	X, b	X, a, b	X, a, b
10. Immersion				X			X
11. Leakage Current	X	X	X		X	X	X
12. Noise, Airborne	X, a	X, a	X, a		X, b	X, a	X, a
13. Noise, Structureborne	X	X	X		X	X	X
14. Power	X a,b,c	X d,e	X a,b,c		X c	X b,c,f	X a,b,c,d,e,f
15. Rain				X			X
16. Salt Fog				X	X		X
17. Ship Motion and Attitude	X		X	X	X	X	
18. Shock, High-Impact	X, a		X, b		X, c	X, b	
19. Shock, Storage and Transportation							
20. Solar Radiation				X			X
21. Temperature	X, a, b	X, a, b	X, a, b	X, a	X, a, c	X, a, b	X, a, c
22. Vibration	X, a		X, a	X, a	X, c	X, b	X, a

HWPS DEVELOPMENT STATUS

SUBSYSTEM	HWCI HWPS	SOURCE	STATUS	RESPONSIBLE IPT
Operator Station Subsystem				
	Non-Real Time Computer	Capture / Mod	TAC / CHS Specs - In Process	DEV / RAD
	Video Support	Capture / Mod	In Process	C4I / RAD
	Operator Output	Capture / Mod	TAC / CHS Specs - In Process	DEV / RAD
	Operator Input Devices	Capture / Mod	TAC / CHS Specs - In Process	DEV / RAD
Real-Time Subsystem				
	Real-Time Computer	Develop	VME / RTP Spec - Modify	Detail Design Team
	Operator Input (Manual Control)	Develop	In Process	Detail Design Team
Data Server Subsystem				
	Data Server Computer	Develop	P/O VME / RTP Spec	Detail Design Team
AV Communications Subsystem				
	Datalink Terminal			
	IDT	Capture / Mod	In Process	Data Link
	Ku Data Terminal	Capture / Mod	In Process	Data Link
	Datalink Control Module (DCM)		In Process	
	Predator DCM	Develop	In Process	Detail Design Team
	Outrider DCM	Develop	In Process	Detail Design Team
	Pioneer DCM	Develop	In Process	Detail Design Team
	LOS Antenna Assembly	Capture / Mod	In Process	Data Link
	Ku Antenna Assembly	Capture / Mod	In Process	Data Link
Launch & Recovery Subsystem				
	Integrated Beacon Landing System (IBLS)	Capture / Mod	TUAV IBLS Spec	RAD / SE
	UAV Common Automated Recovery System (UCARS)	Capture / Mod	UCARS Spec	RAD / SE
Payload Subsystem				
	Synthetic Aperture Radar Subsystem		TESAR / CSARP Spec	
	TCS SAR Processor	Capture / Mod		RAD
	Digital Linear Tape Drive	Capture / Mod		RAD
Communications Subsystem				
	External Storage	Develop	Open	RAD/C4I
	TCS Printer	Capture / Mod	Printer Tech Manual	DEV / RAD
	Intercom Equipment	Develop	Open	DEV / RAD
	C4I Support Equipment	Capture / Mod	Open	C4I
	EXCOMM Communication Equipment	Develop	SSDD Appn A & B	DEV / RAD

SECURITY REQUIREMENTS

TCS ORD REQUIREMENT:

4. a. (1) (j) [TCS shall] "Be capable of meeting the operational and physical security requirements of the systems with which it is interoperable (threshold)" [ORD027].

ORD RQMT	SSS RQMT	SSDD RQMT	
ORD027	SSS361	SSDD009	SYSTEM LEVEL RQMTS
ORD027	SSS362	SSDD010	
ORD027	SSS364	SSDD011	
ORD027	SSS365	SSDD012	
ORD027	SSS363	SSDD014	
ORD027	SSS367	SSDD017	
ORD027	SSS368	SSDD018	
ORD027	SSS369	SSDD019	
ORD027	SSS370	SSDD020	
ORD027	SSS371	SSDD021	
ORD027	SSS366	SSDD056	
ORD027	SSS361	SSDD198	SOFTWARE RQMTS
ORD027	SSS362	SSDD199	
ORD027	SSS363	SSDD200	
ORD027	SSS364	SSDD201	
ORD027	SSS367	SSDD202	
ORD027	SSS368	SSDD203	
ORD027	SSS369	SSDD204	
ORD027	SSS370	SSDD205	

SECURITY REQUIREMENTS

- Types of Security:
  - Physical Security:
    - Prevention of Un-Authorized Access to Classified System
    - Prevention of Un-Authorized Access to Classified Plans and Procedures
  - Communication Security:
    - Prevention of Transmission of Classified Information via non-secure path
    - Prevention of Un-Authorized Interception of Transmitted Classified Information
    - Prevention of Receipt of Information Classified at Level Above Local Clearance Level
  - Operational Software Security
    - Prevention of Un-Authorized Access to Software Files

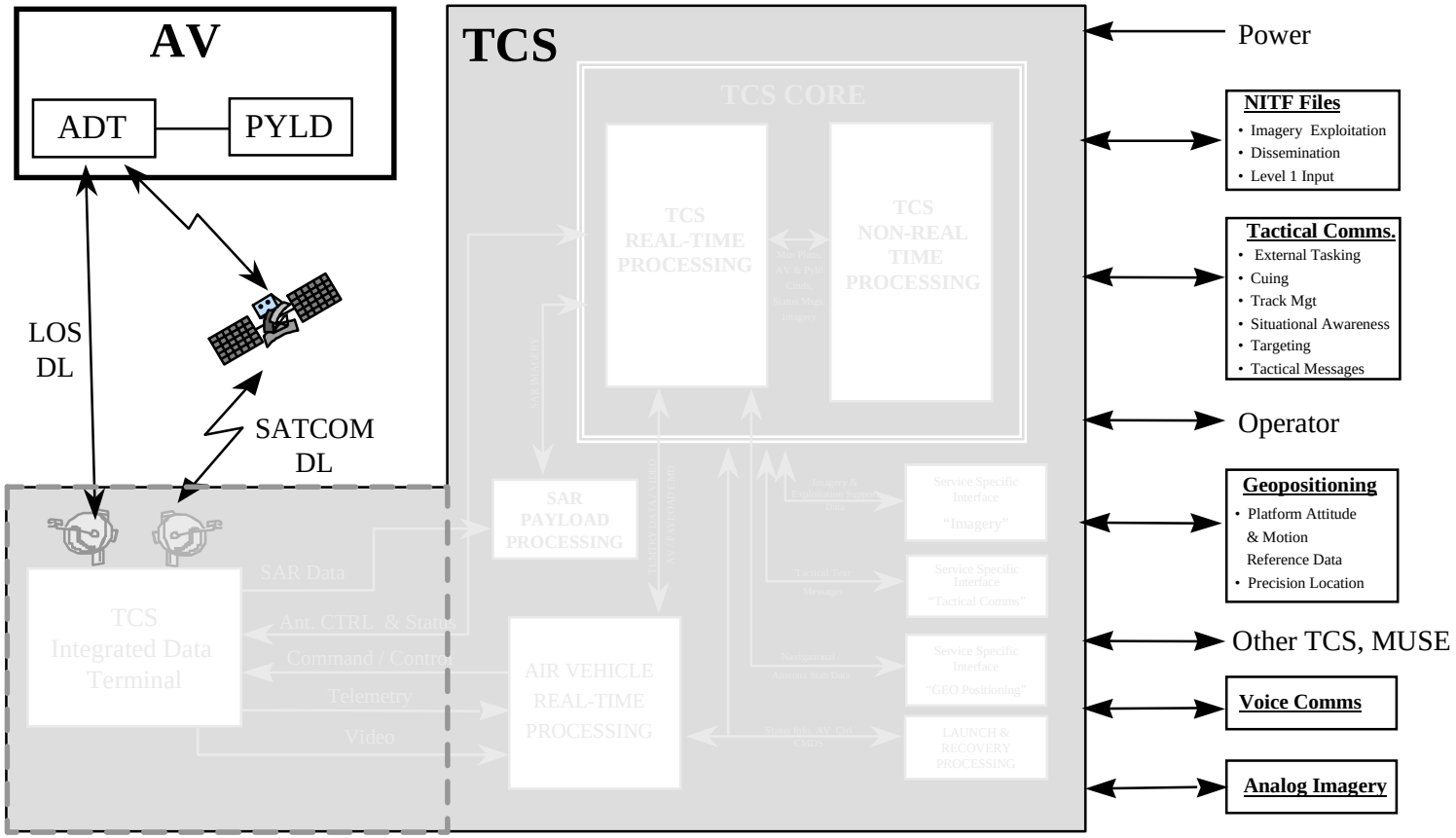
INPUTS & OUTPUTS

EXTERNAL INTERFACES

EXTERNAL INTERFACES

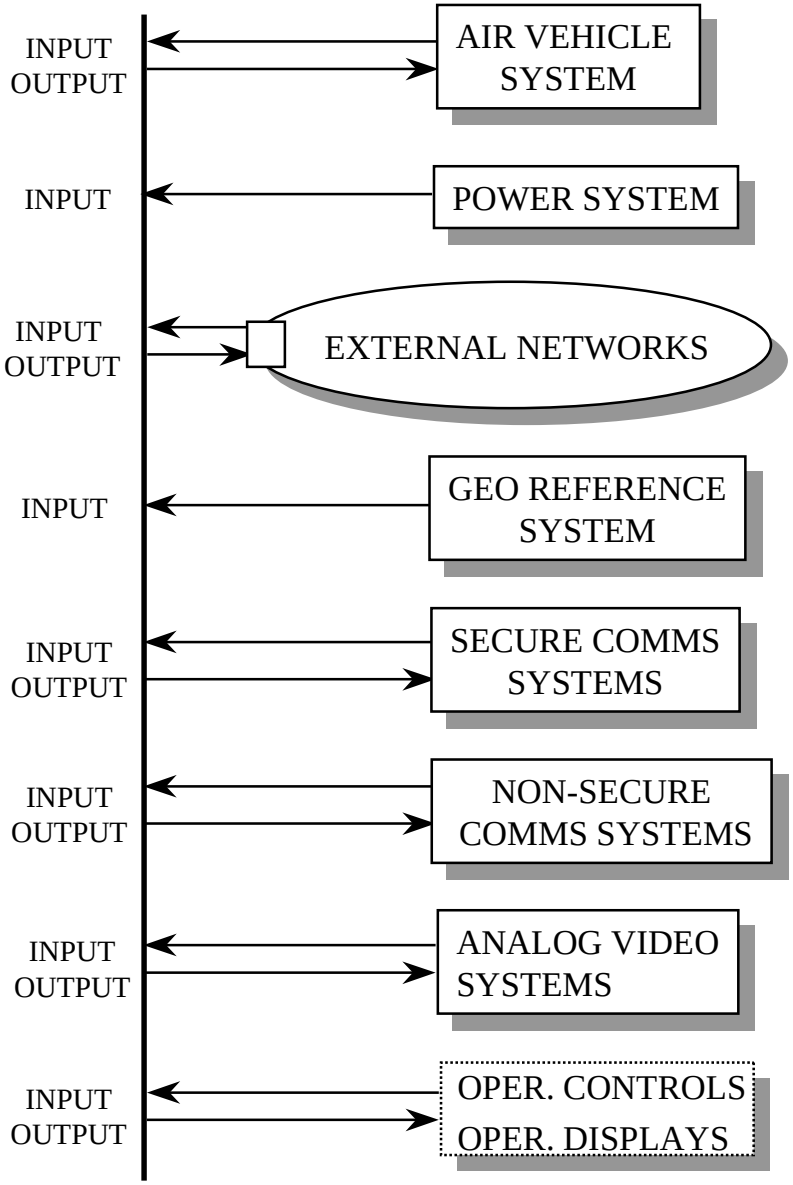
EXTERNAL INTERFACE	DESCRIPTION
TCS to Air Vehicle	
	Predator MAE C-Band LOS Datalink
	Predator MAE Ku-Band SATCOM Datalink
	Outrider TUAV C-Band Datalink
TCS to Power System	
	TCS-LS to External Power Source
	TCS-SB to Ships Power
TCS to External Networks	
Security Guard	
	TCS Operator Station to C4I System (Through LAN Guard)
Non-Guard	
	TCS Operator Station to C4I System
	TCS Operator Station to Remote TCS
TCS to Geopositional Reference System	
	TCS-LS to GPS Receiver (C/P Code)
	TCS-SB to AN/SSN-6(V) NAVSSI
TCS to Communications Systems (Data)	
Secure	
	TCS to Tactical Communications Interface Module (TCIM)
TCS to Communications Systems (Voice)	
Secure	
	TCS Operator Station to Secure Radio (Red)
	TCS Operator Station to Secure Telephone (Non-Radio) (Red)
Non-Secure	
	TCS Operator Station to Non-Secure Radio (Black)
	TCS Operator Station to Non-Secure Telephone (Non-Radio) (Black)
TCS to Analog Video Systems	
	TCS Operator Station to C4I System

EXTERNAL INTERFACES

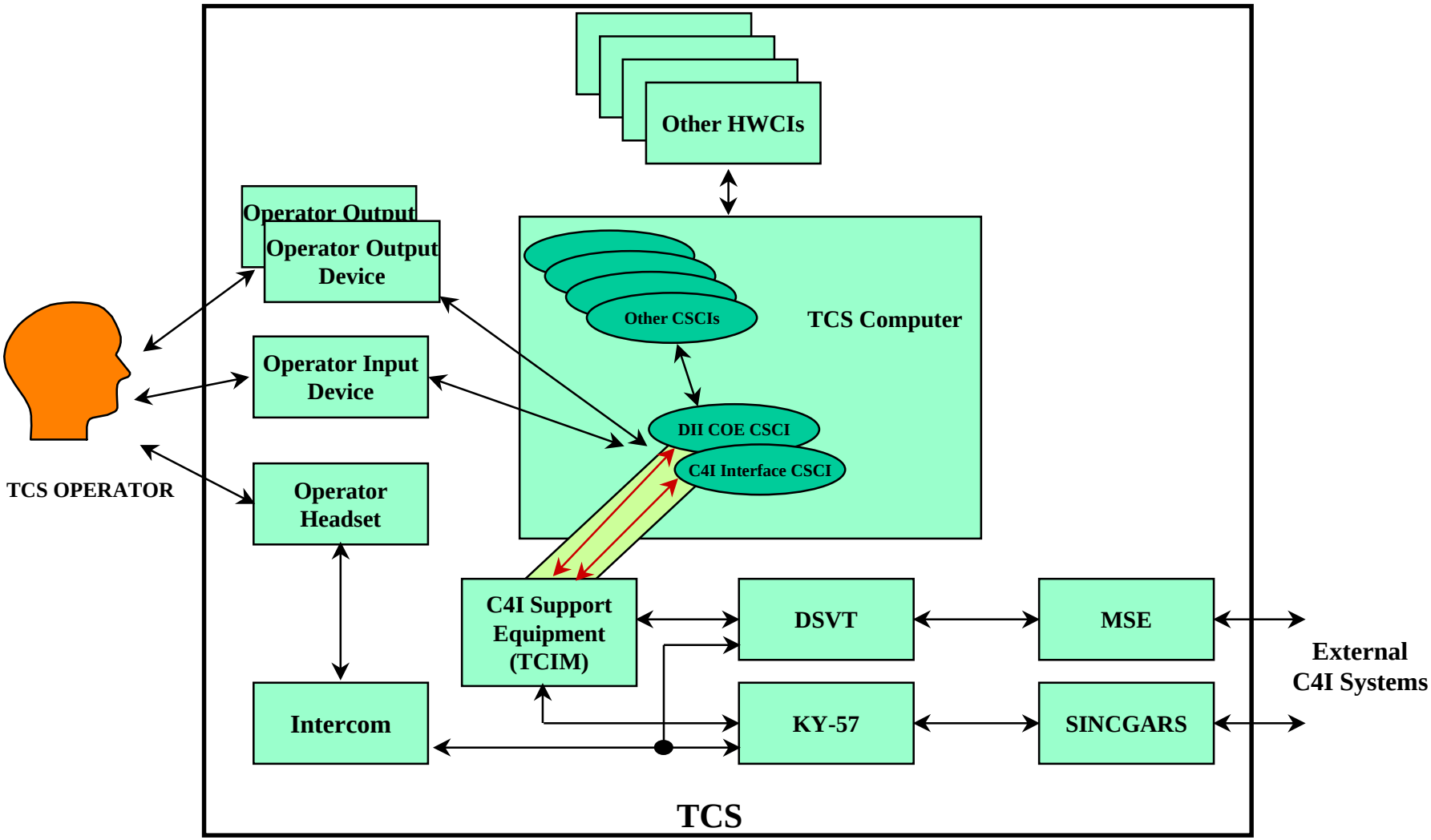


EXTERNAL INTERFACES

- TCS to Air Vehicle
- TCS to Power System
- TCS to External Networks
  - Imagery File I/O
  - Digital Message I/O
    - Tasking, Cueing
    - Track Data, Situational Awareness
    - Reporting, External Printing
  - Other TCS
  - Simulation Systems
- TCS to Geopositional Reference System
    - Precision Location Data Input
    - Platform Attitude & Motion Data Input
    - Reference Data (Time) Input
- TCS to Communications Systems (Voice, Data)
  - Secure
  - Non-Secure
- TCS to Analog Video Systems
- TCS to Operator



SECURE VOICE & DATA COMMUNICATION (TCS-LS)



TCS to External C4I Systems, Highlighting the C4I Interface CSCI to C4I Support Equipment Interface.

SECURE DATA RADIO COMMUNICATION

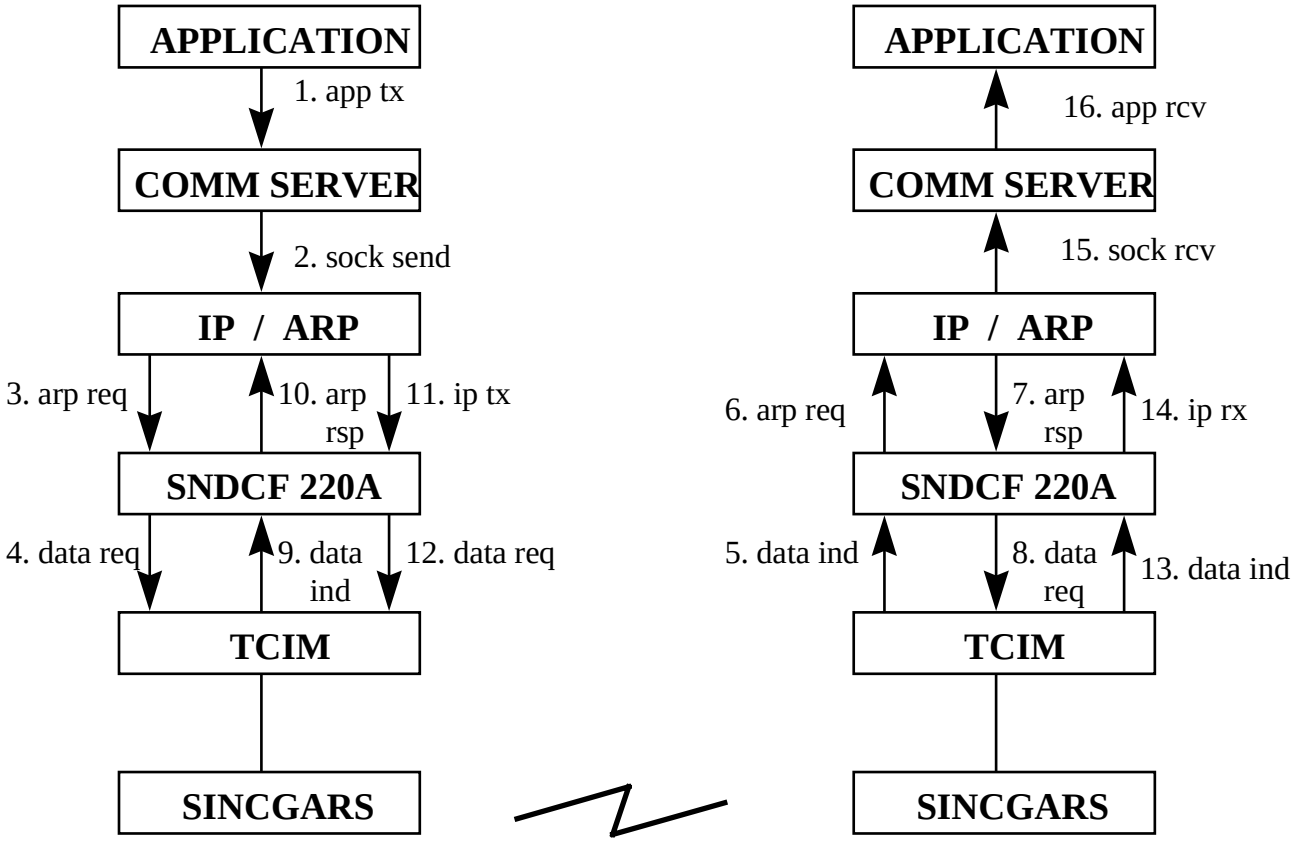


Figure .2.2.2-1. Data flow between TCS and DII COE Compliant Applications (From TCS to TCIM IDD)

SECURE RADIO COMMUNICATIONS TO NON DII SYSTEM

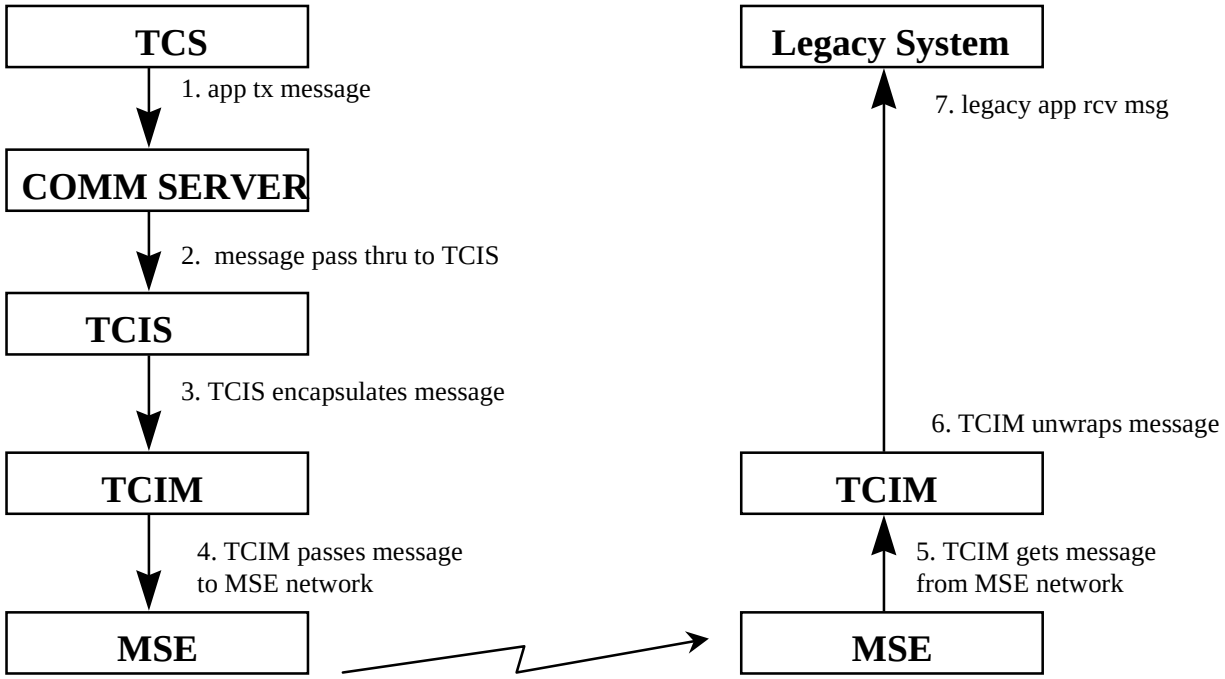
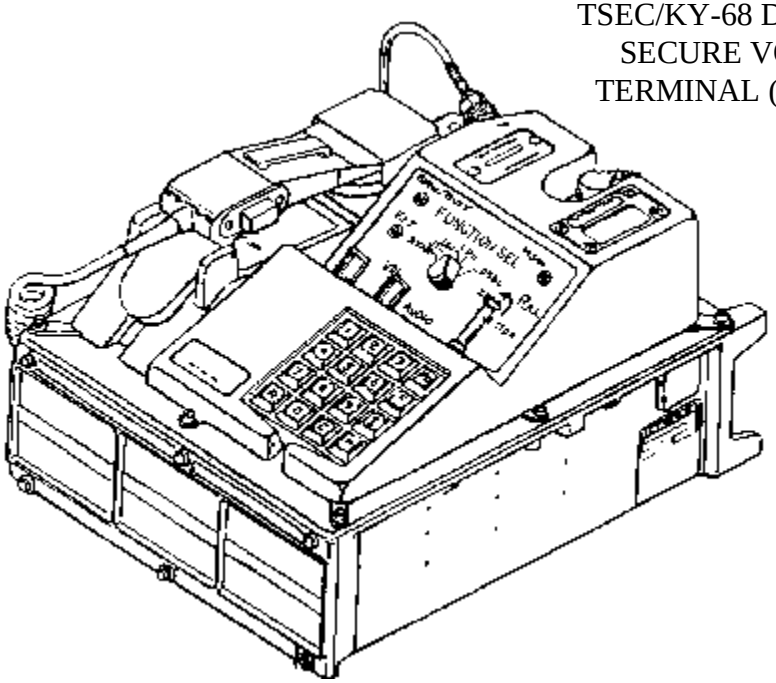


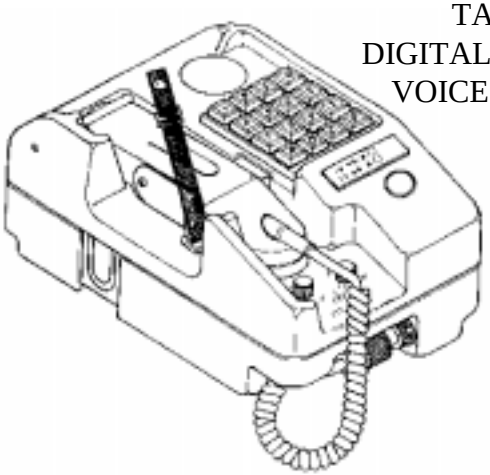
Figure .2.2.3-1. Message Transmission to a Non-DII COE Compliant Legacy System (From TCS to TCIM IDD) [modified]

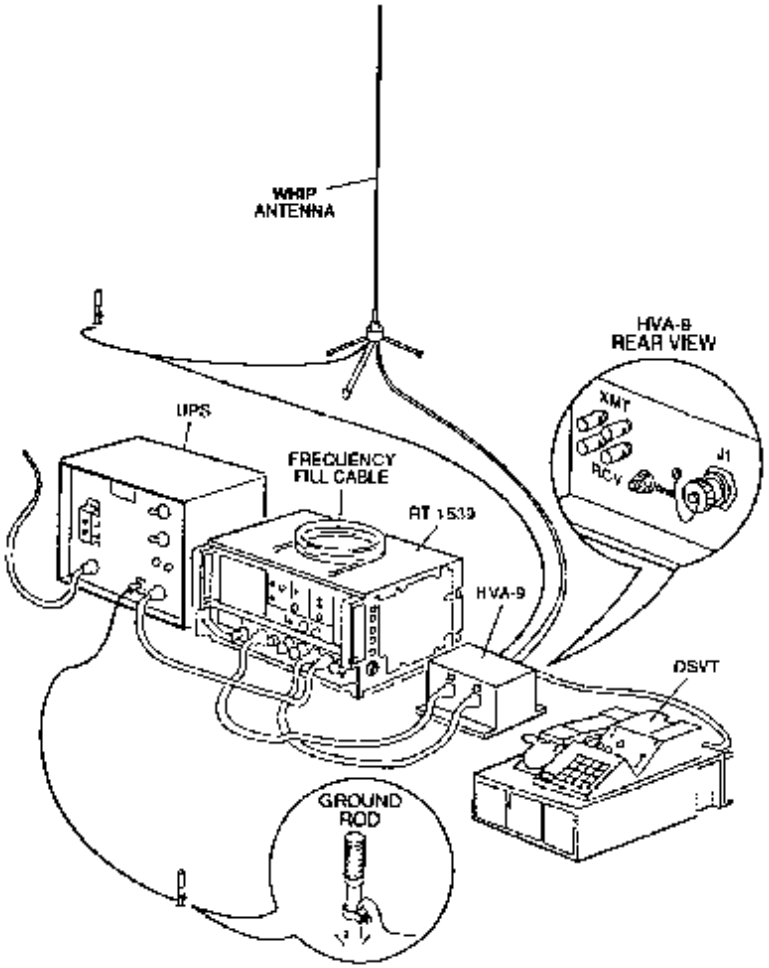
COMMUNICATIONS EQUIPMENT

TSEC/KY-68 DIGITAL
SECURE VOICE
TERMINAL (DSVT)



TA-954/TT
DIGITAL NONSECURE
VOICE TERMINAL

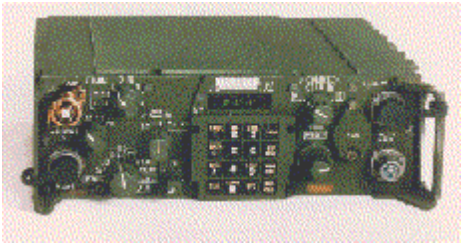




AN/VRC-97
MOBILE SUBSCRIBER
RADIOTELEPHONE TERMINAL

SINCGARS RADIO

- **Communication Security (COMSEC) is integrated in currently produced versions of the ground and airborne models**



Frequency:	30 to 87.975 Mhz
Steps:	25 kHz
Channels:	2320
Offsets:	+/-5 and +/-10 kHz Single Channel
Presets:	8 Single Channels, 6 FH Channels/Nets
Modes:	FM Voice, AD1, AD2, TACFIRE, FSK Digital Data 600, 1.2K, 2.4K, 4.8K, 9.6K, 16K bps Fixed and Frequency Hopping, Plain Text, Cipher Text Encryption.
TOD:	+/-10 PPM Accuracy
Night Vision:	Gen II Compatible
BIT:	Background, Power-up, and Extensive Operator Diagnostics
Power (manpack):	13 Volt (10.5V to 15V, Lithium BA-5590, Rechargeable Ni-Cad BB-590
Power (HUB):	Lithium BA-5372/U
Vehicular:	+24 Volts (22 to 32V)
Consumption:	Radio: 433 Milliamps average. HUB 110 Microamps average
EMI:	MIL-STD-461A, MIL-STD-462A
TEMPEST:	Certified
Temperature:	-51C to 71C (-60F to 160F)
Immersion:	3 feet
Reliability:	>7000 hours typical
Maintainability:	Failure isolation to single circuit card without additional equipment
Weight:	6.9Kg (15.5 lbs)
Size:	W 27.8 cm (10.99 in.), D 25.4 cm (10.00 in.), H 8.7cm (3.42 in.)
Remote Control:	Full 2 Wire FSK Remote Control (10.99 in.), 2880 Hz (Control), 40 kHz (Voice)
Remote Fill:	Over-the-air rekeying
COMSEC:	Internal Encryption /Decryption, NSA approved
ECCM:	Internal Frequency Hop Module
Transmit Output:	Manpack: 0.5mw, 160 mw, 4W. Vehicular: 50W
Transmit Noise floor:	<= -181 dBc/Hz at +/-10 Mhz from 30, 50, 75 Mhz
Transmit Harmonics:	<= -47 dBc for <= 3rd harmonics | <= -75 dBc for >= 3rd harmonics
Receive Sensitivity:	-116 dBM for 10 dB SINAD. | -115 dBM for FH. 10% BER
Receive Selectivity:	For Undesired above ref., +/-100kHz >= 78 dB | +/-200 kHz >= 90 dB | +/-1.0 Mhz >= 113 dB | +/-5 Mhz >= 127 dB | +/-1.0 Mhz >= 141 dB
Distortion:	< 4%
Lo Radiation:	<= 24 dB uV
Squelch:	U.S. and NATO STANAG
Spurious Response:	<= 85 dB