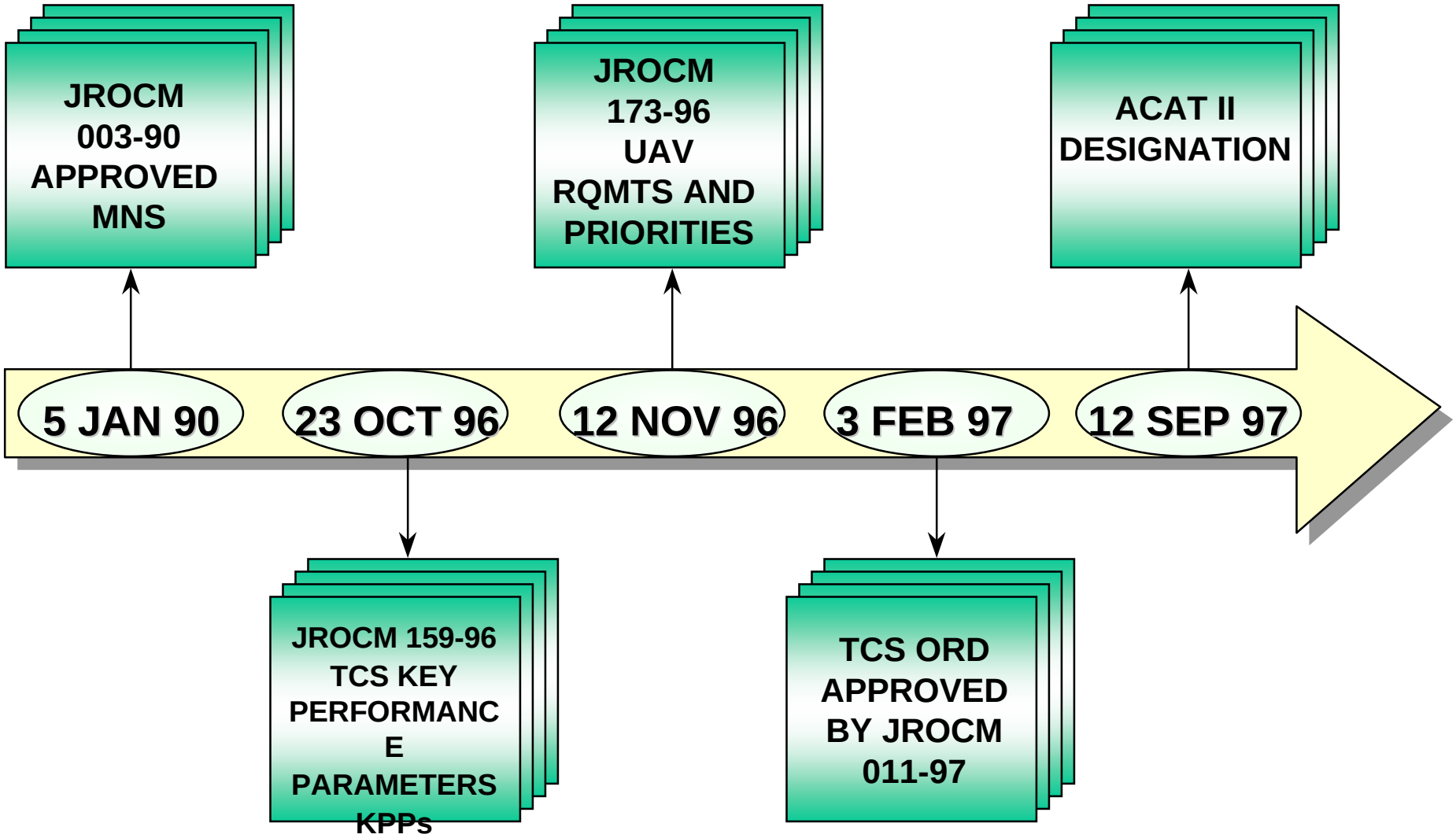
TCS PROGRAM UPDATE
9 DECEMBER 1997

TCS SYSTEM INTEGRATION
PRE-SOLICITATION CONFERENCE

NSWCDD
BRIEF TO INDUSTRY
DECEMBER 9, 1997
JD'S CONFERENCE CENTER
BLDG 216

TOPIC	TIME
INTRODUCTION	0900 - 0915
TCS UPDATE	0915 - 0945
NSWCDD CAPABILITIES	0945 - 1030
CONTRACT DISCUSSION	1030 - 1130
TOUR	1130 - 1230
LUNCH	1230 - 1330
TCS DEMO/HARDWARE DESIGN STATUS	1330 - 1430
QUESTIONS & ANSWERS	1430 - 1500

PROGRAM DIRECTION

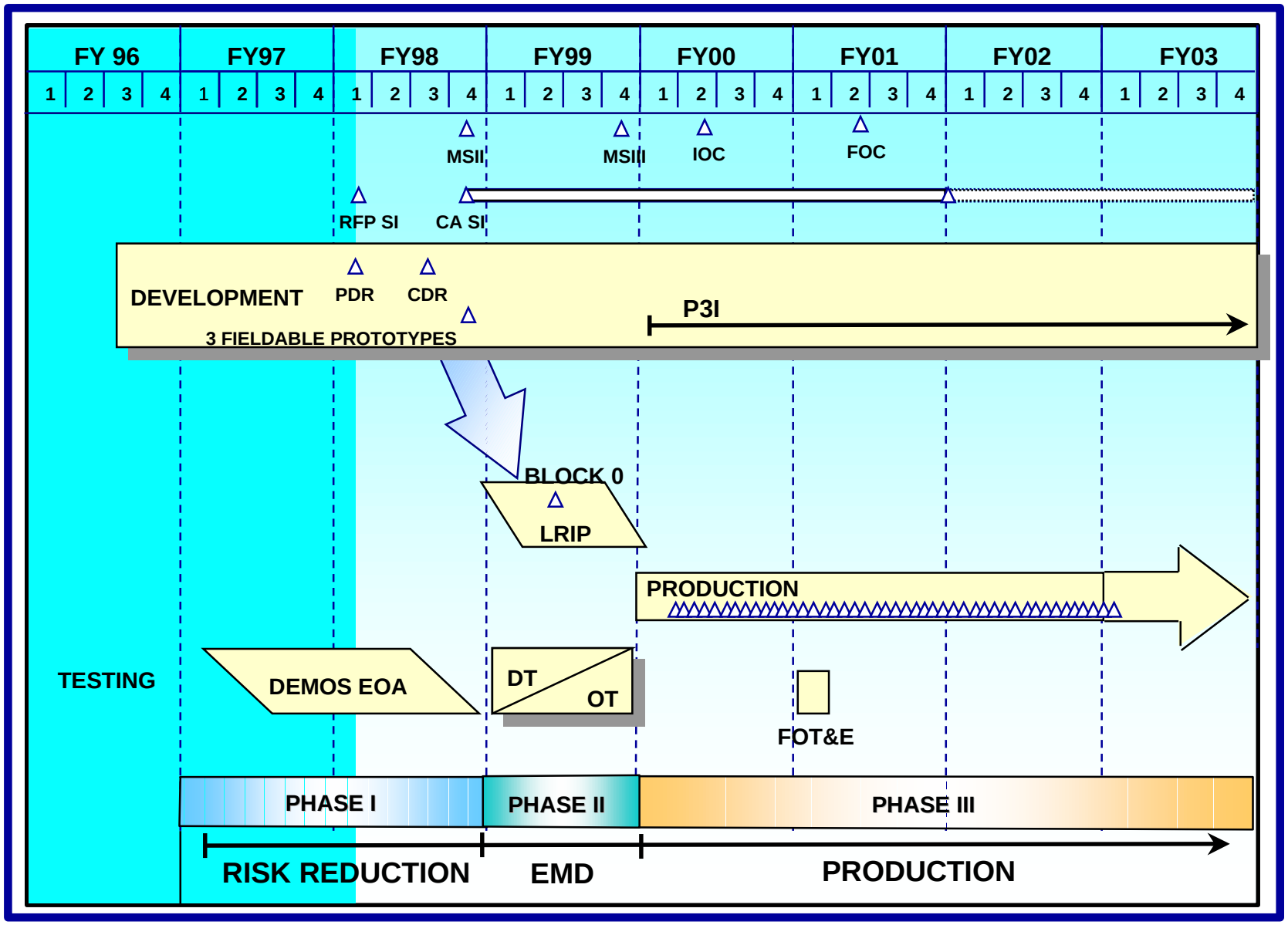


UAV TCS KEY PERFORMANCE PARAMETERS

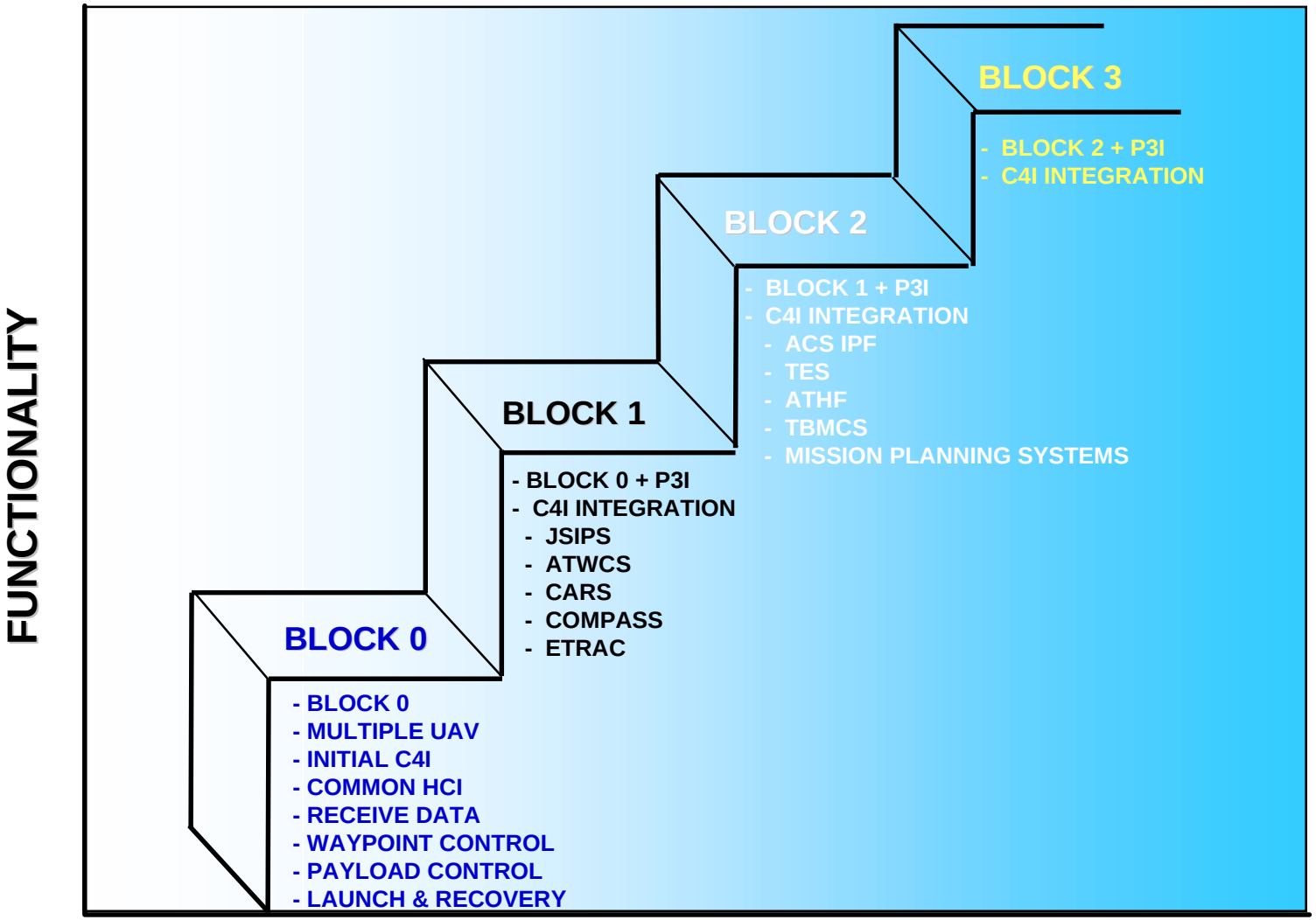
THRESHOLD	SUCCESSFULLY DEMONSTRATED
• MUST BE CAPABLE OF SUPPORTING MISSION PLANNING, MISSION EXECUTION, AND DATA DISSEMINATION FOR TUAV AND MAE UAV SYSTEMS.	• TASK FORCE XXI • DIVISION XXI • JWID 97 • FLEETEX 98 - 1M
• MUST BE INTEROPERABLE WITH SELECT C4I SYSTEMS IN COMPLIANCE WITH ASD (C3I) JOINT TECHNICAL ARCHITECTURE.	• TASK FORCE XXI • DIVISION XXI • JWID 97 • FLEETEX 98 - 1M
• MUST BE CAPABLE OF BEING INTEROPERABLE WITH DIFFERENT TYPES OF UAVs AND UAV PAYLOADS ACROSS THE FIVE LEVELS OF UAV INTERACTION • MUST ALLOW OPERATORS TO HAVE SIMULTANEOUS FLIGHT AND PAYLOAD CONTROL OF AT LEAST TWO AIR VEHICLES, BEYOND LINE OF SIGHT, USING ONE TCS.	• LEVEL 1 THROUGH LEVEL 4 • TASK FORCE XXI • DIVISION XXI • JWID 97 • FLEETEX 98 - 1M

APPROVED 23 OCT 96

TCS SCHEDULE

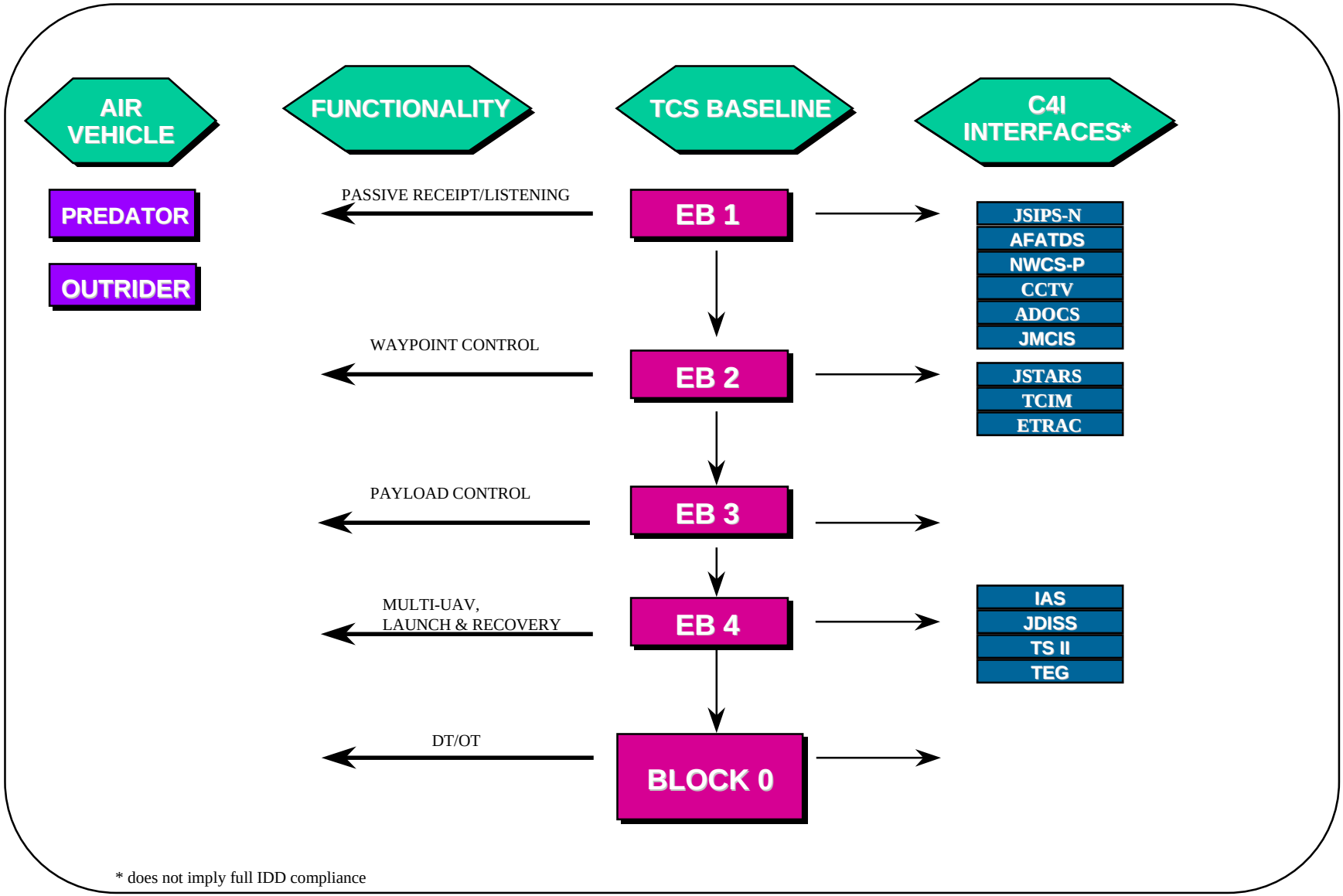


TCS PLAN



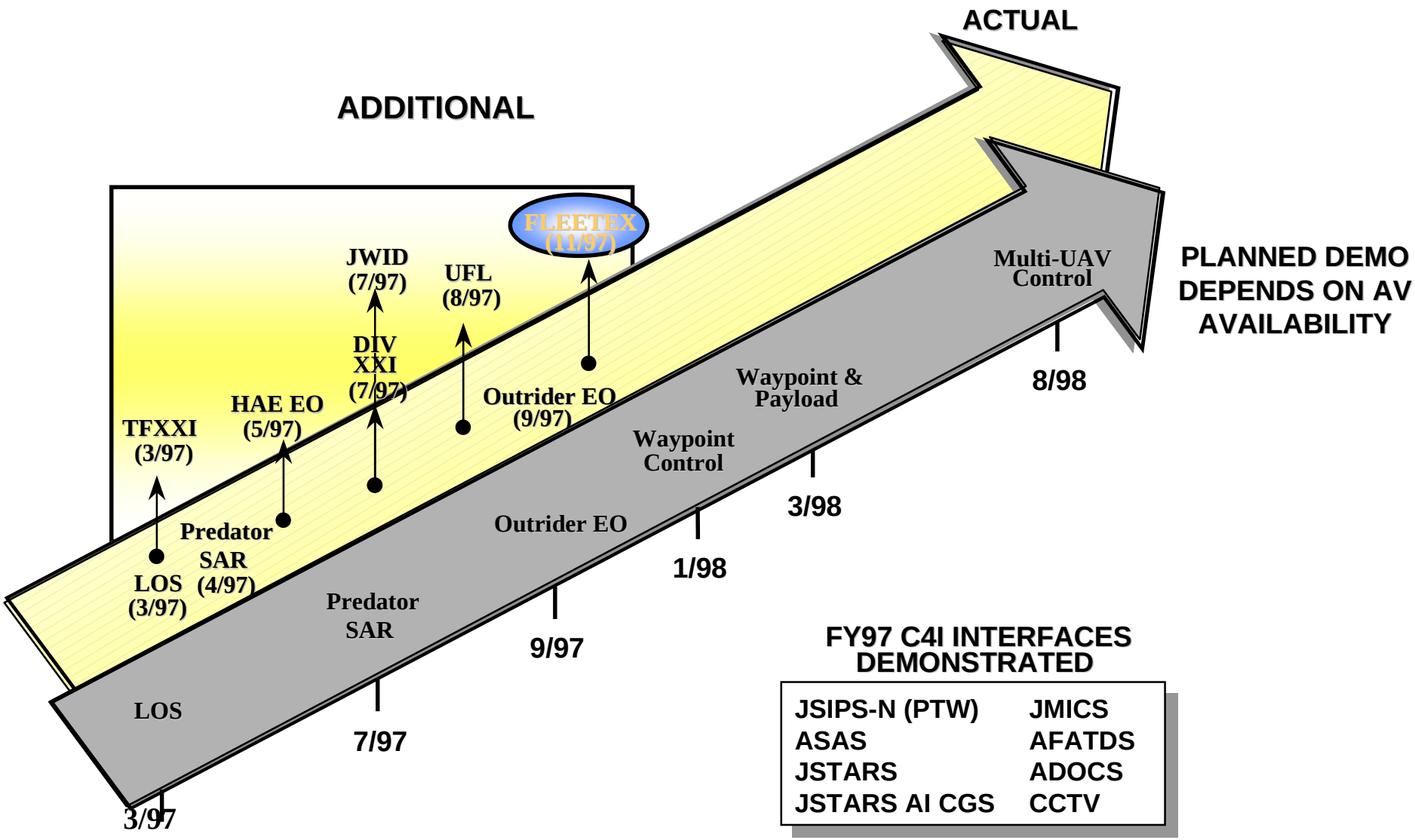
BLOCK PLAN

TCS BLOCK 0



* does not imply full IDD compliance

TCS PHASE I ACCOMPLISHMENTS



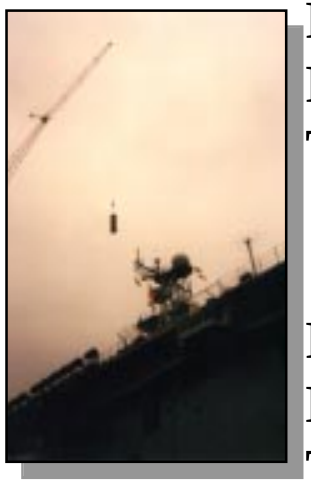
FY97 C4I INTERFACES DEMONSTRATED

JSIPS-N (PTW)	JMICS
ASAS	AFATDS
JSTARS	ADOCS
JSTARS AI CGS	CCTV

TCS INSTALLATION - USS TARAWA

TCS INSTALLATION - USS TARAWA

TARAWA INSTALLATION



R 221810Z OCT 97
FM USS TARAWA
TO PEOCMPANDUAV

. . . "BRAVO ZULU TO YOUR OUTSTANDING PROFESSIONALS WHO WERE RESPONSIBLE FOR EXTREMELY SUCCESSFUL PRE-FLEETEX SIGNAL TEST OF TCS DURING COMPUTEX 98-1M 06-10 OCT 97"

. . . "THE EAGLE OF THE SEA" LOOKS FORWARD TO FLEETEX WHEN TCS WILL CONTROL A LAND BASED PREDATOR-LIKE UAV WITH THIS CUTTING-EDGE TACRECCE SYSTEM.

MISSION SUCCESS

- 5 OF 5 PLANNED MISSIONS, 1 ADDITIONAL COMPLETED
  - TOTAL 41.1 HOURS
- GNAT UNDER TCS CONTROL FOR 17.5 HOURS
- CONTROLLED GNAT AT A MAX RANGE OF 53NM*
- CONDUCTED 15+ HAND-OFFS
- RECEIVED VIDEO AT 81NM
- CAPTURED 2.3 HOURS OF PIONEER VIDEO
- CAPTURED 111 NITF 2.0 FILES FOR TRANSMISSION TO JMCIS, JDISS, & PTW

* DUE TO AIRSPACE CONSTRAINTS

RESULTS

- TCS SIMULTANEOUSLY RECEIVED AND DISPLAYED GNAT 750 AND PIONEER* IMAGERY AND TELEMETRY
- PROVIDED REAL TIME EO/IR IMAGERY TO MEU/ARG COMMAND AND STAFF
- DEMONSTRATED MUSE IN USMC MEU ENVIRONMENT

* VIDEO ONLY

EXERCISE RESULTS TO DATE

C4I CONNECTIVITY

ASAS

ADOCS

AFATDS

CCTV

JMCIS

JSIPS-N/PTW

NWCS

JDISS

GNAT 750

11 FLIGHTS

78 HOURS

FLEETEX & TASK FORCE XXI

PIONEER

2 FLIGHTS

2.3 HOURS

FLEETEX

HUNTER

50 FLIGHTS

250 HOURS

TASK FORCE XX1

TCS PRELIMINARY DESIGN REVIEW SCHEDULE

16 DEC 17 DEC — **PDR PART 1**

- INTRODUCTION
- PROCESS
- SYSTEM REQUIREMENTS
- SYSTEM TOP LEVEL DESIGN
  - ARCHITECTURE
  - INPUTS
  - OUTPUTS
    - C4I INTERFACES
      - PRESENTATION OF C4I IDD
        - IDD REQUIREMENTS & DESIGN
        - DETAILS FOR I/F
        - IDD INTEGRATED INTO SYSTEM DESIGN
        - IDD INTEGRATED INTO SW & HW
  - SUBSYSTEM IDENTIFICATION
    - SUBSYSTEM BLOCK DIAGRAMS
    - SUBSYSTEM FUNCTIONALITY
    - SUBSYSTEM I/Fs
    - HWCI
    - CSCI
- ILSI
- TRAINING SYSTEM DESIGN

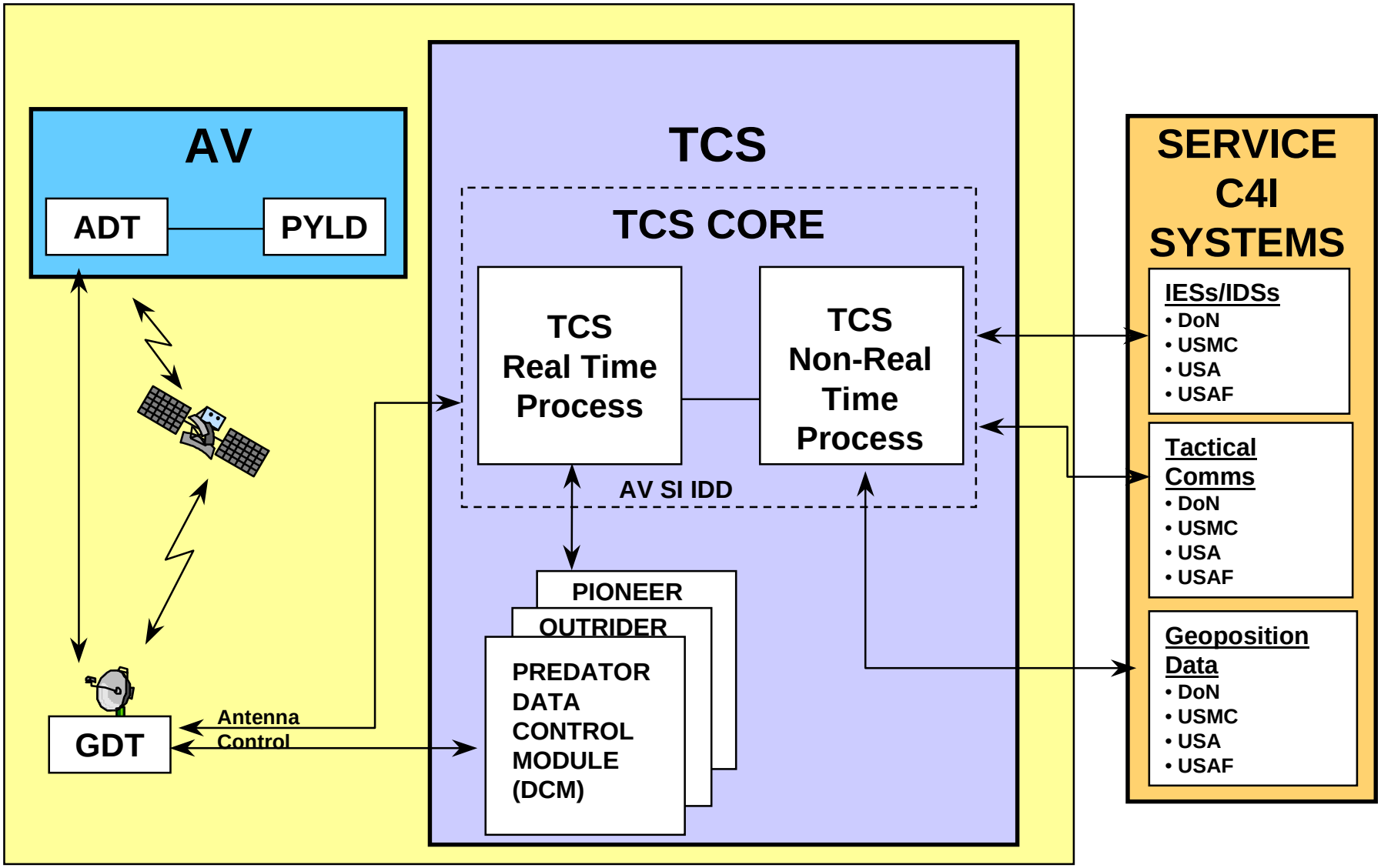
- INTRODUCTION
- SOFTWARE REQUIREMENTS
  - SRS
  - SHOW ALLOCATIONS TO CSCI s
  - SHOW ALLOCATION FROM CSCI DOWN TO CSCs
- SOFTWARE DESIGN
  - ARCHITECTURE
  - CSCI DESIGN
  - HCI DESIGN
    - TCS COMMON UAV FUNCTIONS
    - DATA SERVER
    - RTP
    - ROUTE PLANNER
    - DCM
    - DII
    - SAR
    - FDL/DIAGNOSTICS
  - CSC TOP LEVEL DESIGN
    - FUNCTIONALITY
    - DESIGN DESCRIPTION
- SOFTWARE TOOLS
- SYSTEM INTEGRATION TEST BED DESIGN
- MUSE SYSTEM DESIGN

27 JAN 28 JAN — **PDR PART 2**

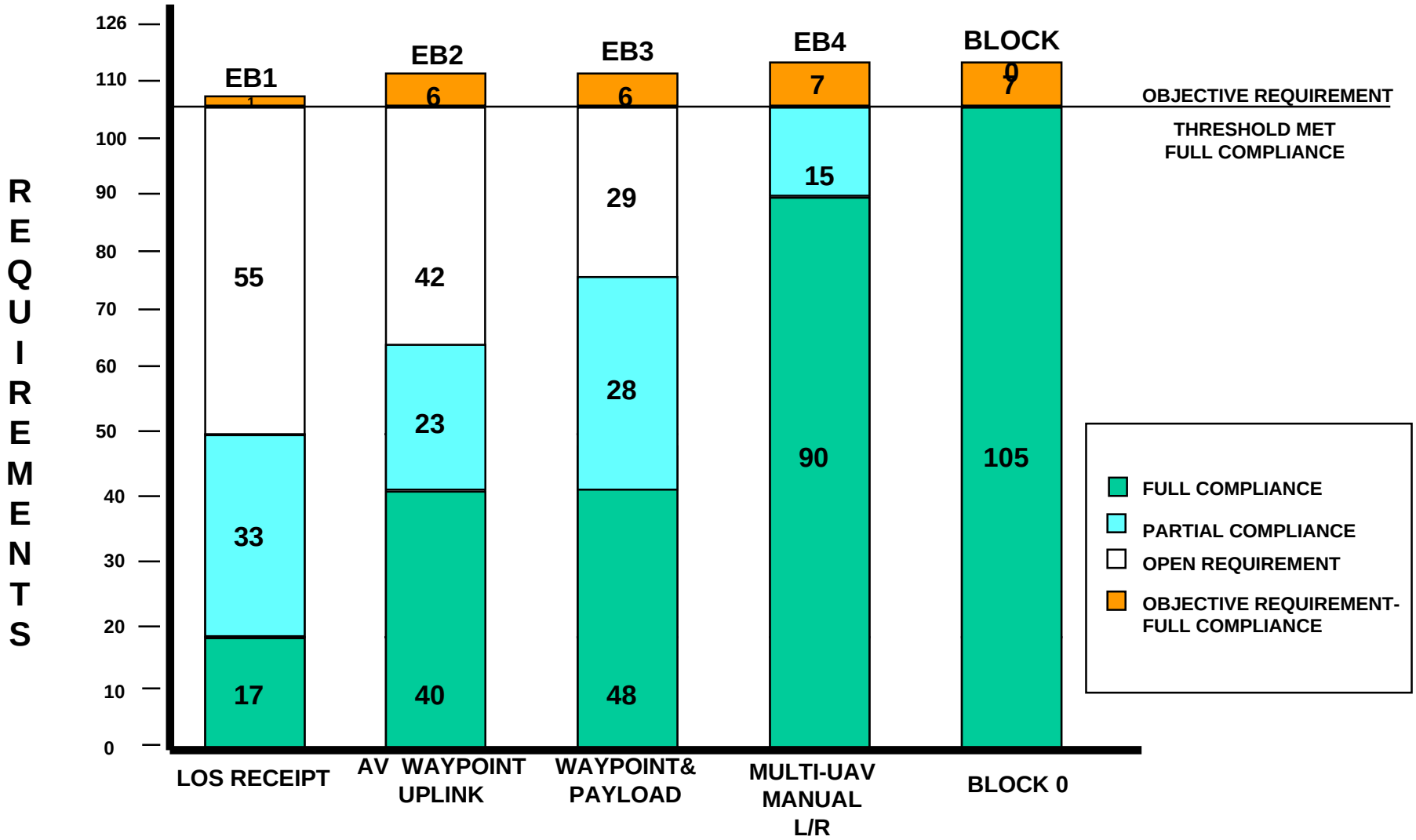
- TCS SYSTEM DESIGN INTRO
- SUBSYSTEM PRELIMINARY DESIGN & IMPLEMENTATION
- AV COMMUNICATIONS SUBSYSTEM
  - C-BANDS LOS ANTENNA
  - INTEGRATED DATA TERMINAL
  - Ku-BAND SATCOM ANTENNA
  - Ku-BAND DOWNSIZED LMA
  - PREDATOR DCM
  - OUTRIDER DCM
- LAUNCH & RECOVERY SUBSYSTEM
  - UCARS INTEGRATION
  - IBLS INTEGRATION
  - MANUAL L & R
- REAL-TIME SUBSYSTEM
  - REAL-TIME COMPUTER
  - MANUAL CONTROLS
  - AIR VEHICLE STANDARD INTERFACE
  - DATA SERVER (LVL 4, 5)
- PAYLOAD SUBSYSTEM
  - EO/IR SUBSYSTEM
  - SAR SUBSYSTEM
- OPERATOR STATION SUBSYSTEM
  - NON-REAL TIME COMPUTER
  - VIDEO SUPPORT SUBSYSTEM
- COMMUNICATIONS SUBSYSTEM
  - C4I SUPPORT EQUIPMENT
  - EXTERNAL STORAGE
  - INTERCOM EQUIPMENT
  - EXCOM EQUIPMENT
- POWER DISTRIBUTION SUBSYSTEM
  - POWER DISTRIBUTION
  - UPS

- SOFTWARE CSCI/CSC PRELIMINARY DESIGN
- TCS COMMON UAV CONTROL
  - TCS MAIN
  - AV FLIGHT MONITOR
  - AV FLIGHT MONITOR EXTENDED
  - EO/IR IMAGERY VIEWER
  - IMAGERY PROCESSING & DATA EXTRACTION
  - EO/IR PAYLOAD CONTROL
  - AV CONTROL
  - DATALINK MANAGEMENT & CONTROL
  - TACTICAL MESSAGES
  - COLLECTION TASKING/RETASKING
  - SYSTEM SETUP
  - UIM GE
  - TRAINING
  - LAUNCH & RECOVERY
  - MISC: TOOLS & UTILITIES
- DATA SERVER
- RTP
  - ANTENNA CONTROL
  - AVSI CONVERSION
  - MANUAL CONTROL
- ROUTE PLANNER
- DCM
- DII
- SAR
- FDL/DIAGNOSTICS
- AV DIAGNOSTICS

UAV CONTROL SYSTEM INTEROPERABILITY



ORD THRESHOLD REQUIREMENTS BY ENGINEERING BUILD - BLOCK 0



TCS PROGRAM DOCUMENT STATUS
BLOCK 0

SYSTEM BLOCK 0 DOCS

- TCS HWDD 2.0
- TCS HWPS 2.0
- TCS SW BUILD 1.5 SDD
- TCS SRS VERSION 1.5 (VTOL)
- TCS SW BUILD 1.4 SDD
- TCS SRS VERSION 1.4 (PIONEER/SEAMOS)
- TCS SW BUILD 1.3 SDD
- TCS SRS VERSION 1.3 (MULTI UAV CTRL)
- TCS SSDD 2.0
- TCS SSS 2.0
- TCS HWDD 1.0
- TCS HWPS 1.0
- SATCOM ANTENNA SYSTEMS SPEC VER 1.0
- C-BAND LOS ANTENNA SYSTEMS SPEC VER 1.0
- TCS SW BUILD 1.2 SDD
- TCS SRS VERSION 1.2 (PYLD CTRL)
- TCS SW BUILD 1.1 SDD
- TCS SW BUILD 1.0 SDD
- TCS SRS VERSION 1.1 (WYPNT CTRL)
- TCS SSDD 1.0
- HCI RQMTS SPECIFICATION (INITIAL)
- TCS SRS VERSION 1.0.1 (PSSV RCPT SAR)
- TCS SRS VERSION 1.0 (PSSV RCPT EO/IR)
- TCS SSS 1.0

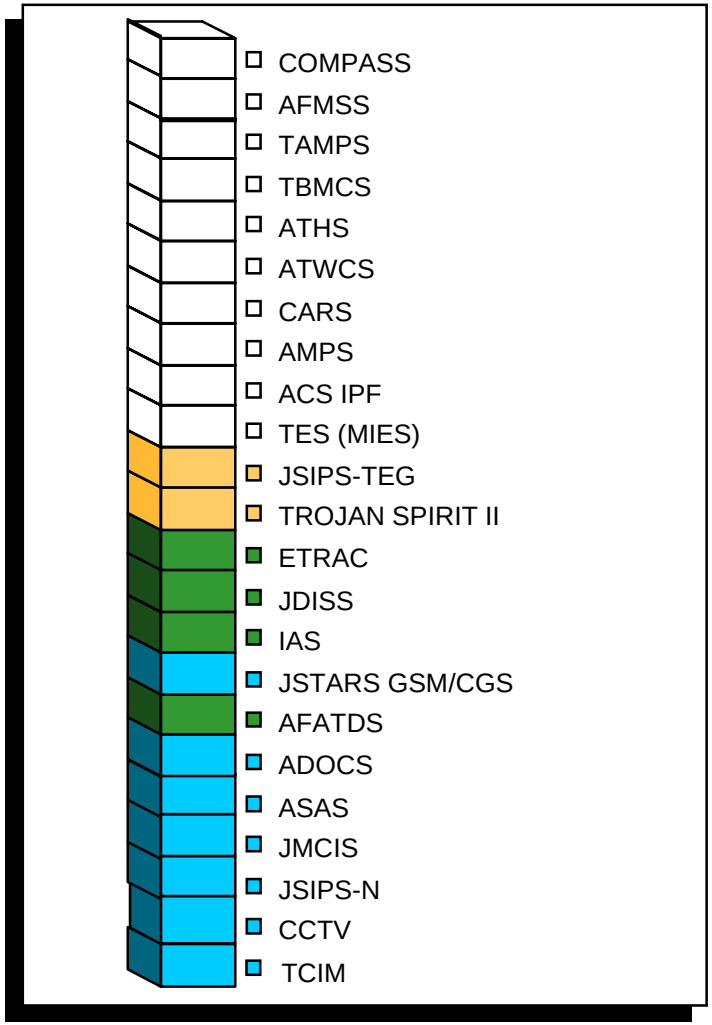
SYSTEM I/F DESIGN DOCS

- VCR CONTROL I/F IDD VERSION 1.0
- INTERCOM I/F IDD VERSION 1.0
- INTERNAL POWER DISTRIBUTION I/F IDD VERSION 1.0
- EXTERNAL POWER SYSTEMS I/F IDD VERSION 1.0
- INTEGRITY BEACON LANDING SYSTEM (IBLS) I/F IDD VERSION 1.0
- EXTERNAL NETWORK I/F IDD VERSION 1.0
- EXTERNAL VOICE I/F IDD VERSION 1.0
- EXTERNAL PRINTER I/F IDD VERSION 1.0
- TCS TO INTEGRATED DATA TERMINAL INTERFACE VERSION 1.0
- KU-BAND GDT I/F IDD VERSION 1.0
- C-BAND LOS ANTENNA CONTROL I/F IDD VERSION 1.0
- SATCOM ANTENNA CONTROL I/F IDD VERSION 1.0
- COMMON AUTOMATED RECOVERY SYSTEM (CARS) I/F IDD VERSION 1.0
- NAVIGATION/GEOPOSITION SYSTEMS I/F IDD VERSION 1.0
- A/V STANDARD I/F IDD VERSION 2.0 (PREDATOR/OUTRIDER UP/DN)
- A/V STANDARD I/F IDD VERSION 1.0 (PREDATOR/OUTRIDER DN)
- TCS TO SAR IDD VERSION 2.0
- SYNTHETIC APERTURE RADAR (SAR) I/F IDD VERSION 1.0
- SBPCS IDD VERSION 1.0 (DWN LNK)

BASELINED | IN REVIEW | IN DEVELOPMENT

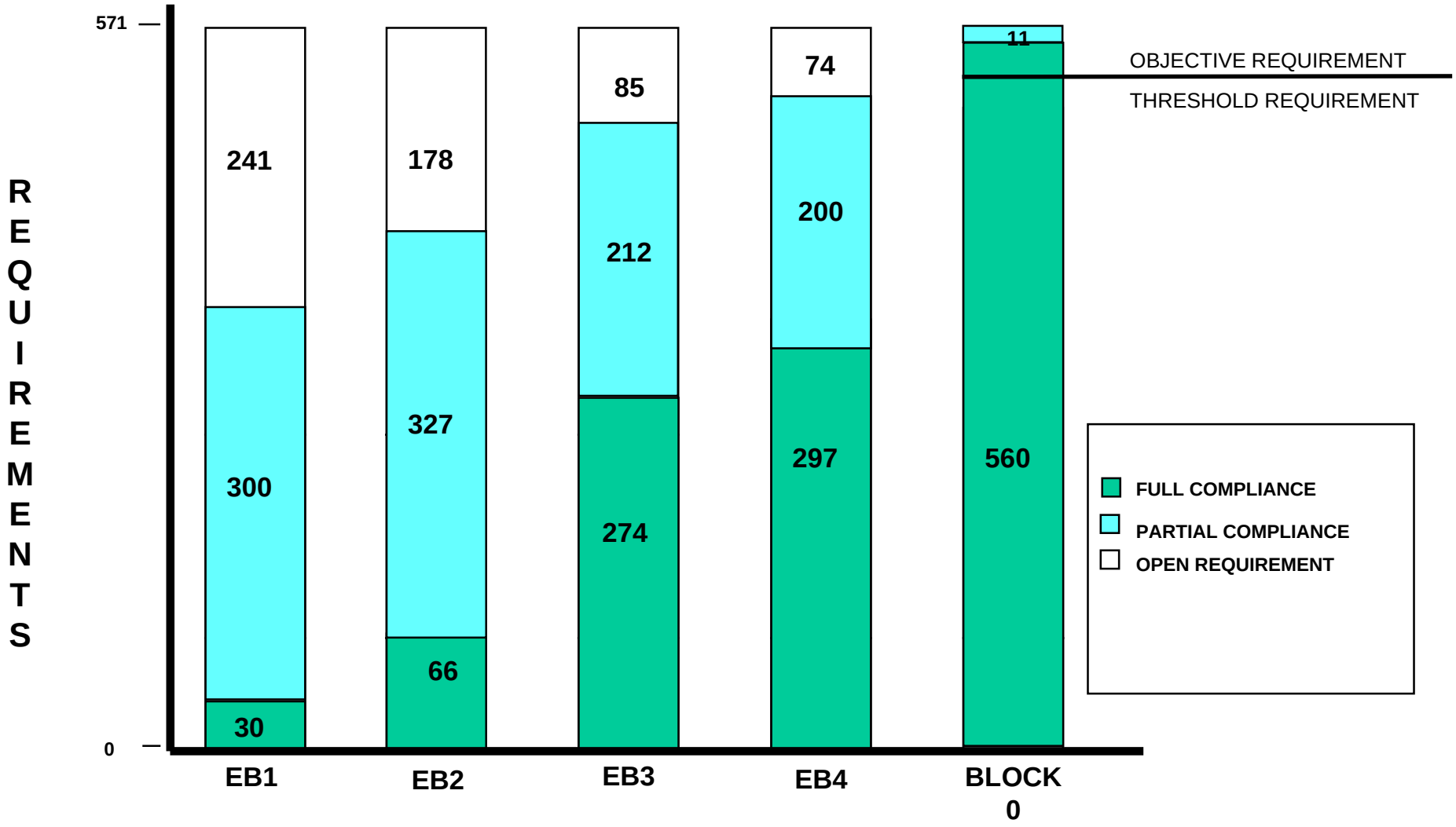
TCS PROGRAM DOCUMENT STATUS
BLOCK 0

C4I I/F DESIGN DESCRIPTIONS

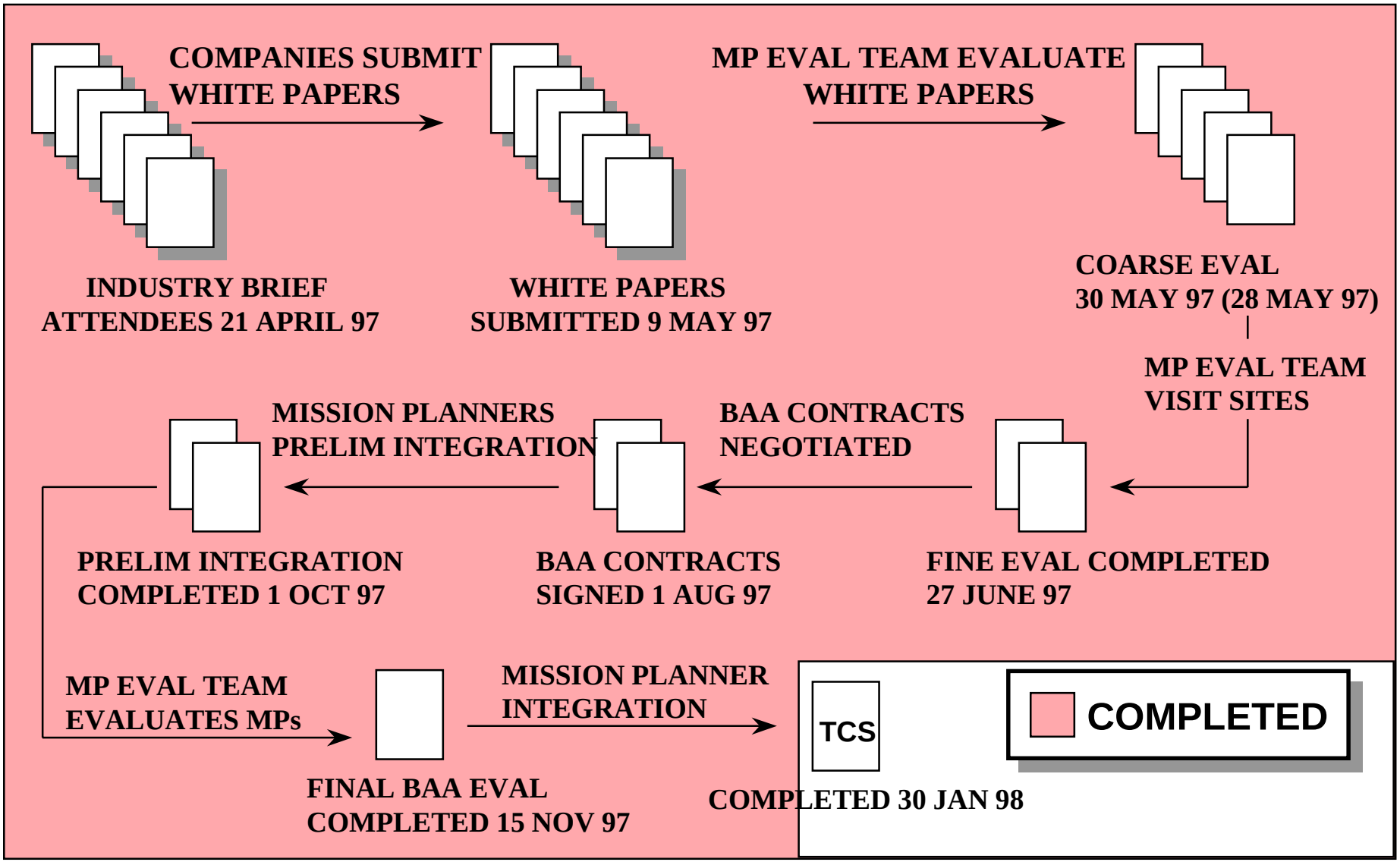


BASELINED IN REVIEW IN DEVELOPMENT

SSS REQUIREMENTS IMPLEMENTATION BY ENGINEERING BUILD - BLOCK 0



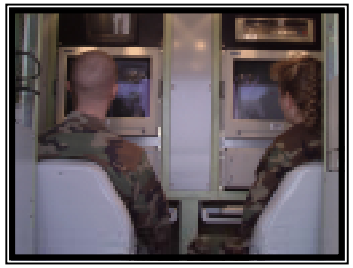
TCS MISSION PLANNER BAA PROCESS



SUMMARY

FIELDABLE PROTOTYPE EMPLOYED IN EXERCISES

LANDBASED

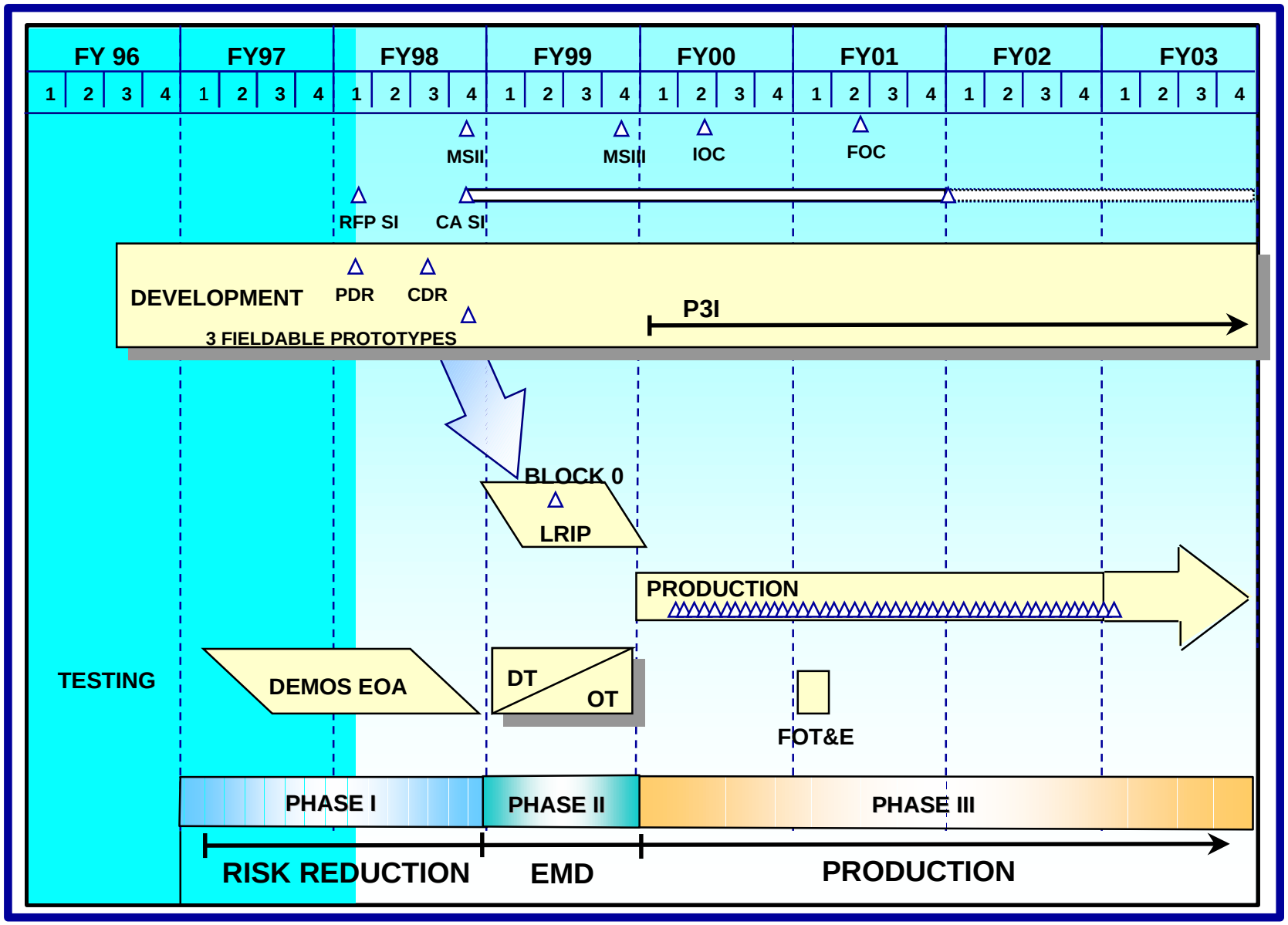


SEABASED

- TCS IS ON SCHEDULE
- SIMULTANEOUS RECEIPT AND DISSEMINATION OF MULTIPLE UAV TYPES DEMONSTRATED WITH ARMY, NAVY, MARINE, AND AIR FORCE UNITS
- PROVIDES CONNECTIVITY WITHIN EXISTING/FUTURE C4I ARCHITECTURES
- SCALEABLE TO SATISFY USER REQUIREMENTS
- OPERATING ON EXISTING SERVICE COTS COMPUTERS
- INTEROPERABLE WITH ENTIRE UAV FAMILY (TUAV/MAE/HAE)
- WILL PROVIDE TOTAL UAV MISSION PLANNING, AV CONTROL, PAYLOAD CONTROL, AND DATA DISSEMINATION

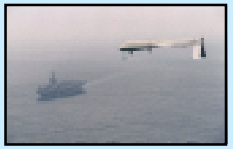
TCS SYSTEM INTEGRATION CONTRACT DISCUSSION
9 DECEMBER 1997

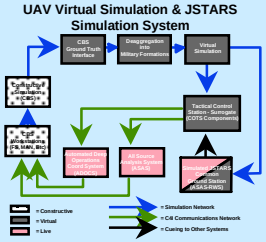
TCS SCHEDULE



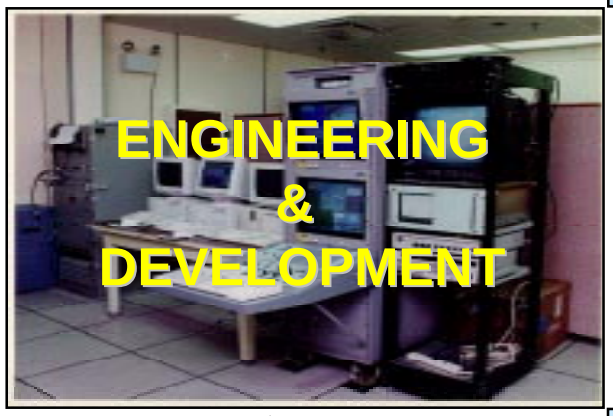
TCS DEVELOPMENT PROCESS

DEMONSTRATIONS





& WARFIGHTING EXERCISES



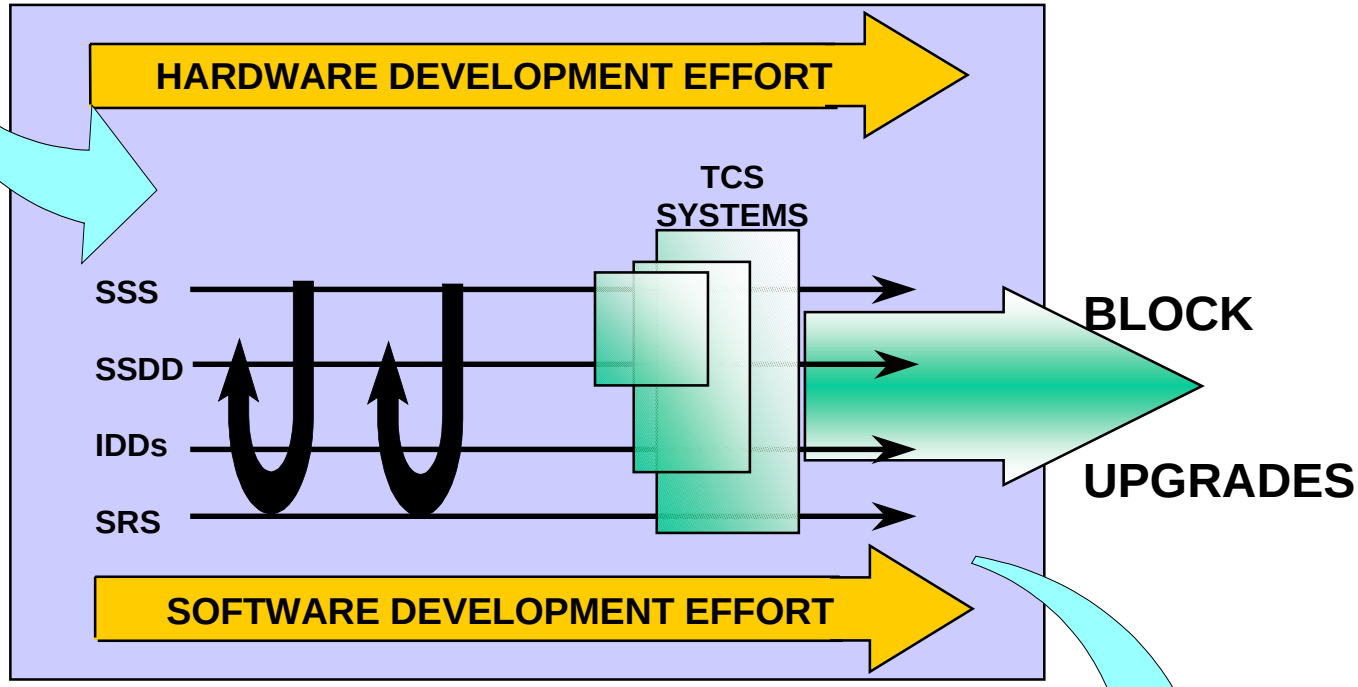
ENGINEERING & DEVELOPMENT

USER REVIEW & FEEDBACK

REVIEW FEEDBACK & REVISE SYSTEM FUNCTIONAL REQUIREMENTS

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

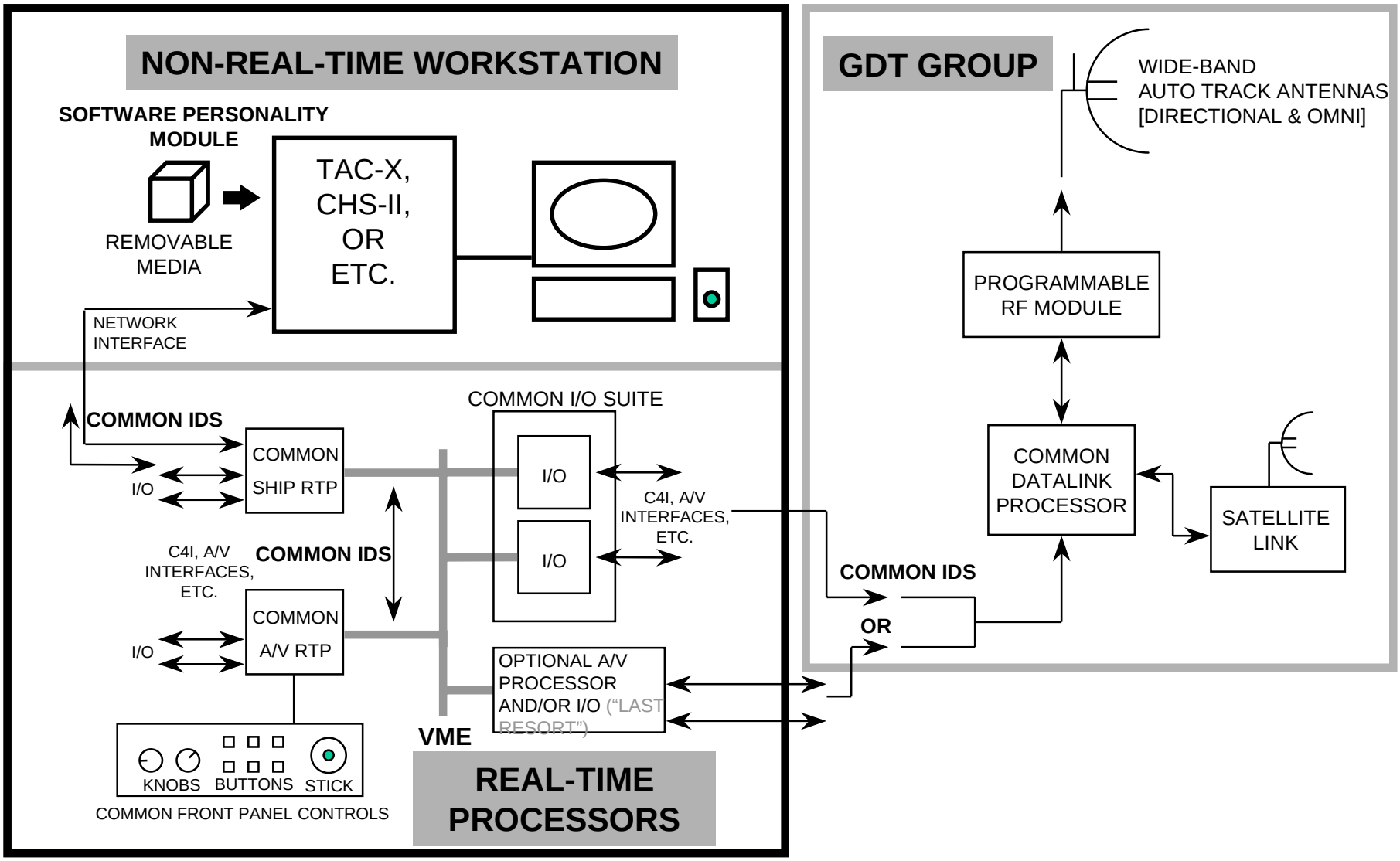


CONCURRENT
INCREMENTAL
SPIRAL

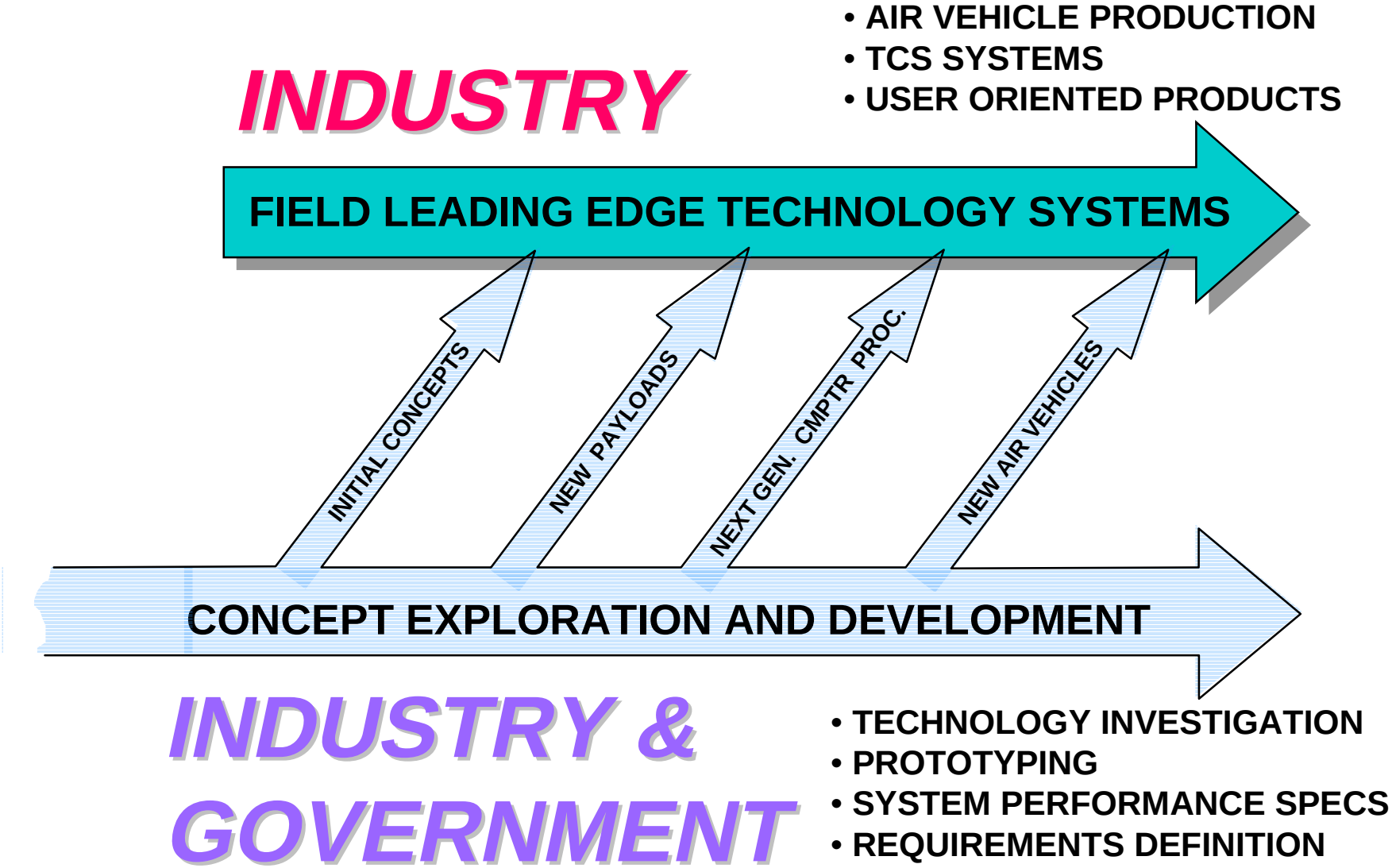
PROCESS OUTPUT
- SYSTEM SOLUTION (PROTOTYPE)
- FUNCTIONAL & PHYSICAL
- ARCHITECTURES
- SPECIFICATIONS
- DESIGN DOCUMENTATION
- LOGISTIC SUPPORT DATA

TACTICAL CONTROL SYSTEM

"EVENTUAL SYSTEM DIAGRAM"



ACQUISITION PROCESS



TCS REQUIREMENTS (AS OF 6 NOV)

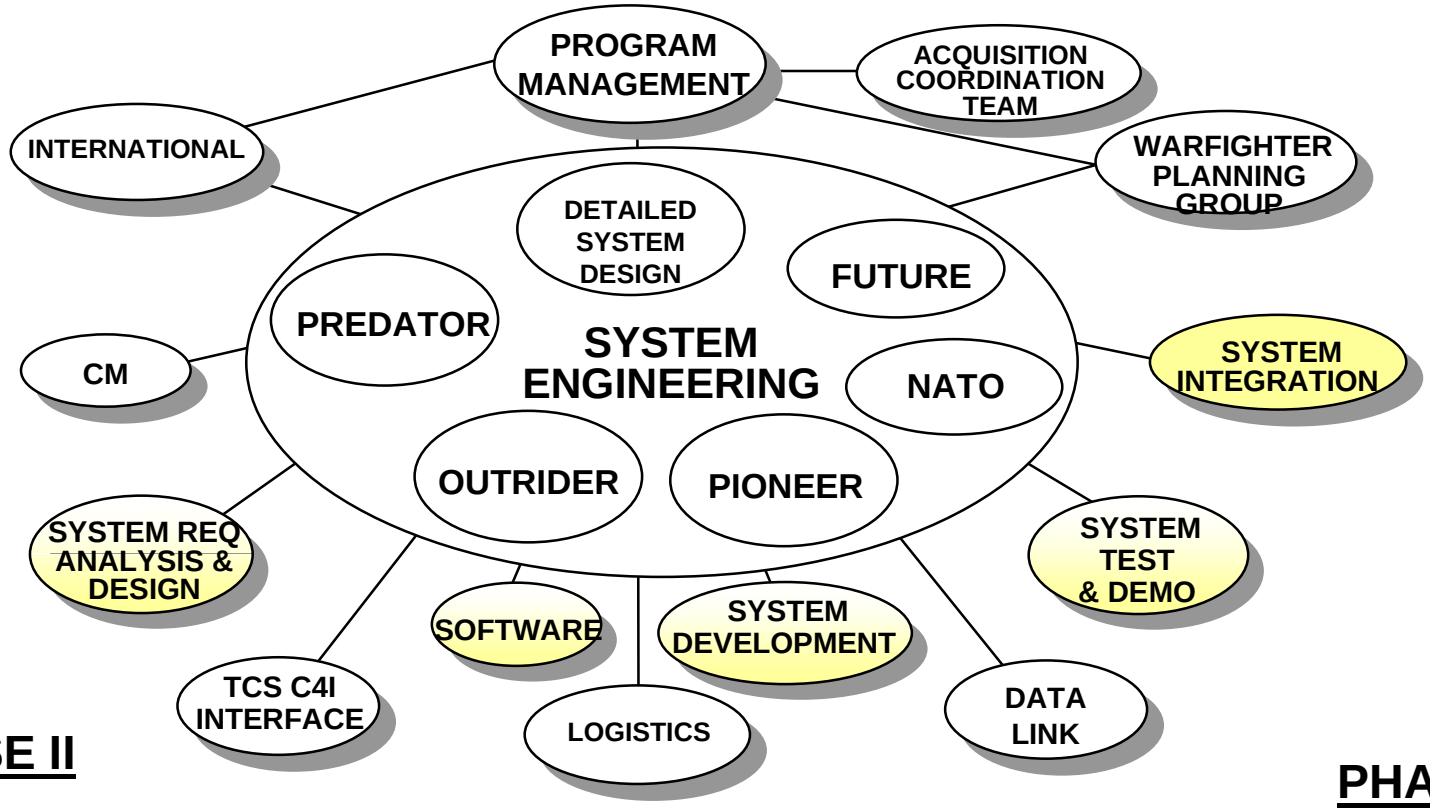
PREDATOR - 12 SYSTEMS (USAF)
- FORWARD FIT # 11 & 12 POSSIBLE
- BACKFIT # 1 - 10

OUTRIDER - 38 SYSTEMS (ARMY)
- 11 SYSTEMS (MARINES)
- 12 SYSTEMS (NAVY)
- 1 VC-6
- 4 TRAINING (ALL SERVICES)
- ALL FORWARD FIT

PIONEER - 9 SYSTEMS (NAVY)
- ALL BACKFIT VIA ECP

OTHER
+ 24 US ARMY TCS NODES
+ 6 US MARINE CORP TCS NODES
+ 88 US NAVY TCS NODES
+ 14 TCS TRAINING SYSTEMS

PHASE II BLOCK 0 TCS SYSTEM INTEGRATION/ROLES AND RESPONSIBILITIES



PHASE II

- FORM SYSTEM INTEGRATION IPT
- DEVELOP AND MAINTAIN SI IPT INTEGRATION MASTER PLAN
- PLAN, COORDINATE AND EXECUTE DESIGN REVIEWS (CDR)
- PERFORM SYSTEM INTEGRATION
- CONDUCT SYSTEM TESTING
- PERFORM SERVICE INTEGRATION AND INSTALLATION

PHASE III

TRANSITION

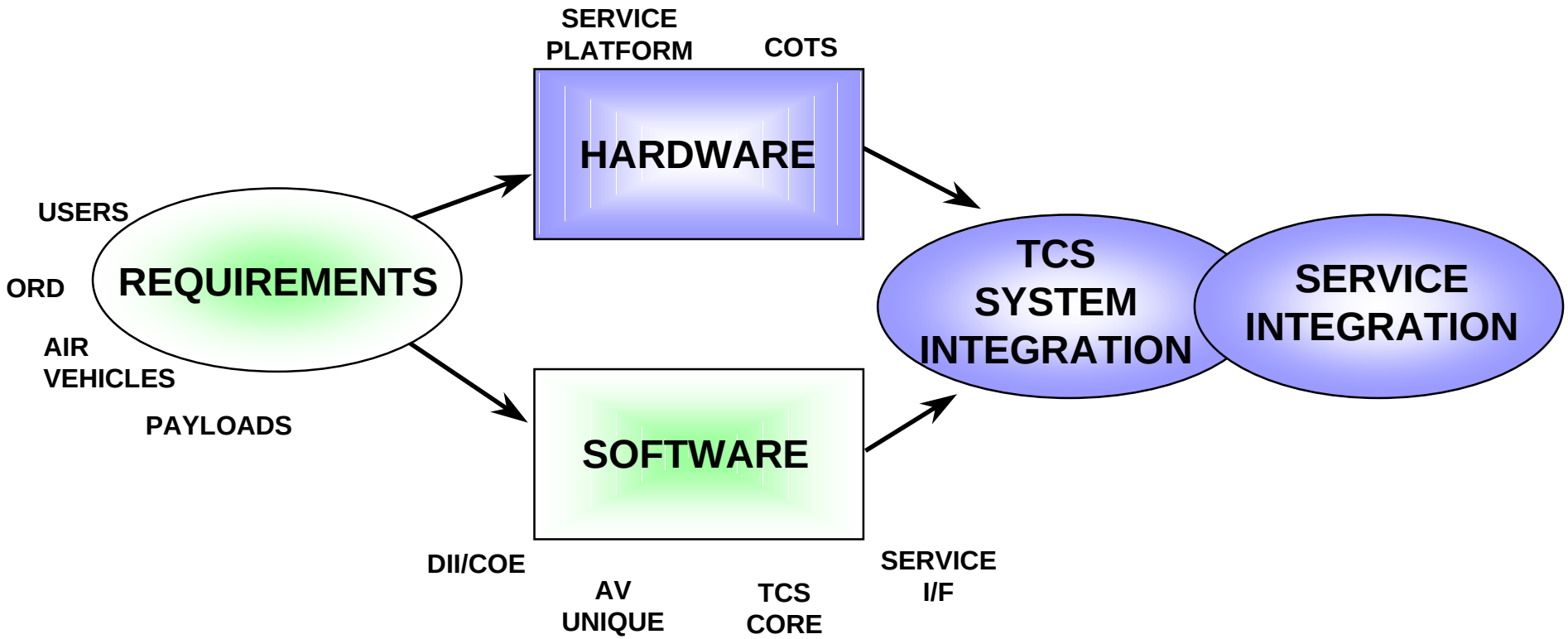
TO

INDUSTRY

BLOCK DESIGN LEAD RESPONSIBILITY

	BLOCK 0 (PHASE I)	BLOCK 1 (PHASE II)	BLOCK 2 (PHASE III) →	BLOCK 3
PDR	GOV	GOV/SI	SI	SI
CDR	GOV	SI/GOV	SI	SI

SYSTEM INTEGRATION
BLOCK 0 LEAD

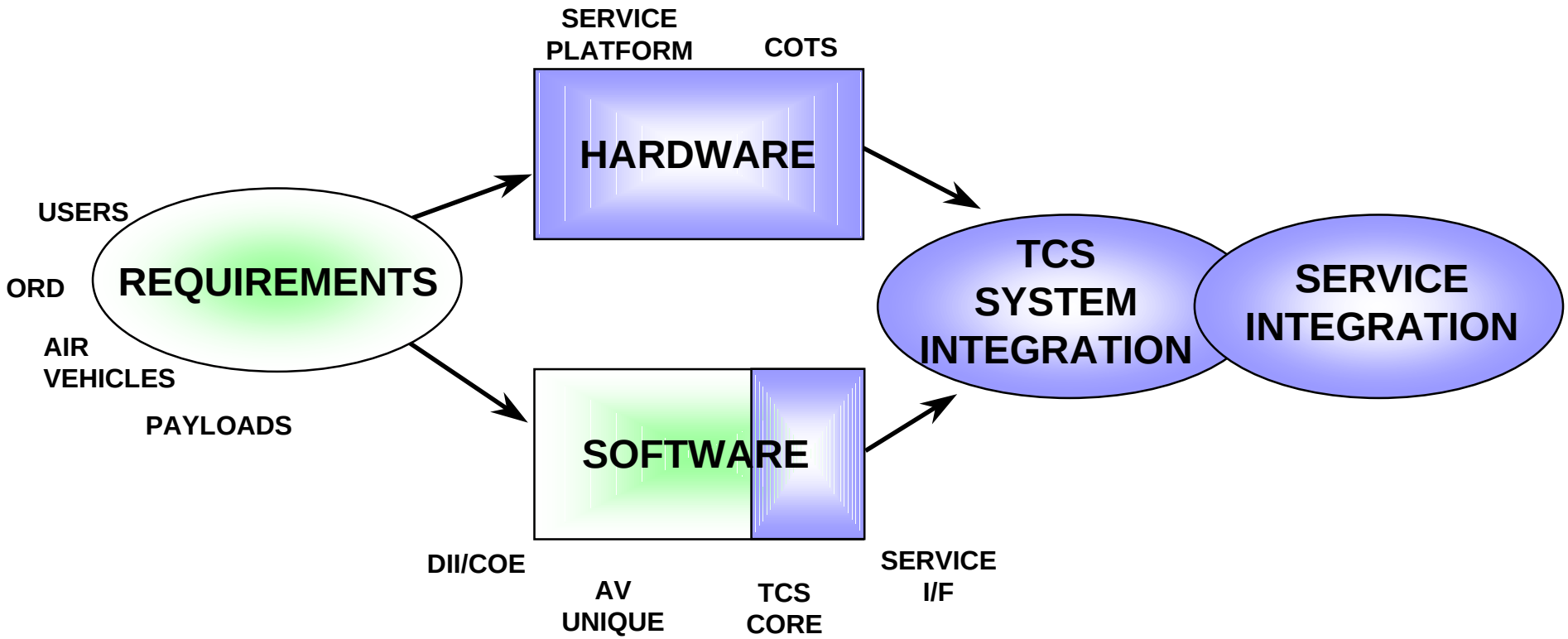


BLOCK 0 LEAD

GOVERNMENT -

SYSTEM INTEGRATOR -

SYSTEM INTEGRATION
BLOCK 1 LEAD

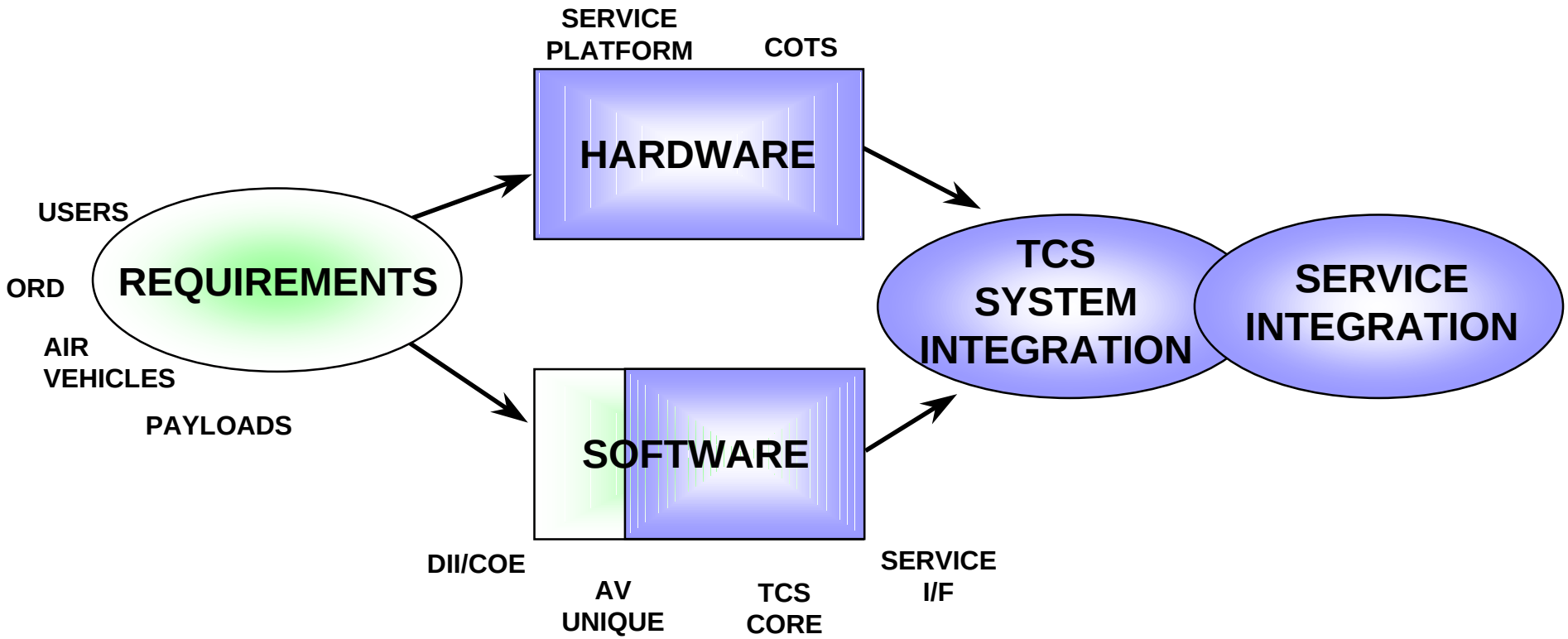


BLOCK 0 LEAD

GOVERNMENT -

SYSTEM INTEGRATOR -

SYSTEM INTEGRATION
BLOCK 2, ... LEAD



BLOCK 0 LEAD

GOVERNMENT -

SYSTEM INTEGRATOR -

SYSTEM INTEGRATION TEST CONCEPT

BUILD A LITTLE - TEST A LOT

DESIGN AGENT UNIT TESTS

HARDWARE & SOFTWARE INTEGRATION TESTS

TCS SYSTEM TESTS

SYSTEM INTEGRATION
- AV
- C4I
- DATA LINK

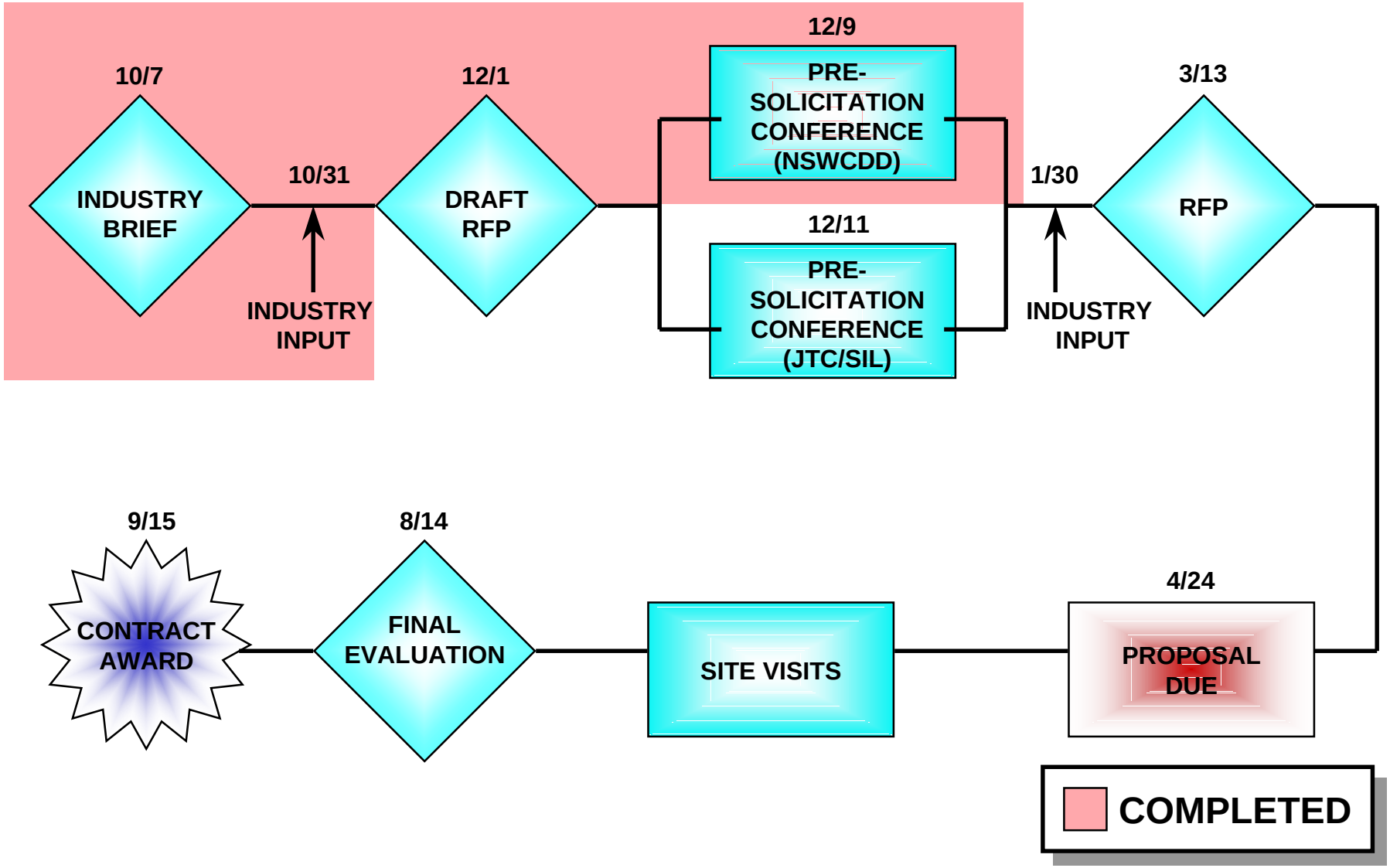
SERVICE SYSTEM INTEGRATION

MULTIPLE V & V & TEST OPPORTUNITIES

LIFETIME SUPPORT

- HARDWARE IS COTS - SERVICE SUPPORT
- DEVELOPER OF ELEMENTS AND APPLICATIONS WILL ALSO BE MAINTAINER
- INTEGRATION AND TEST PROCESS WILL BE SAME AS DEVELOPMENT PHASE

SYSTEM INTEGRATION



USN/USMC/USA FIELDING PLAN (AS OF 9 DEC 97)

ORGANIZATION	CAPABILITY			PLATFORM	FY00	FY01	FY02	FY03	FY04	FY05	TO COMPLETE	TOTALS
	LEVEL	SAR	BLOS									
NAVY N85	5			VC - 6	1							1
	5	X	X	LHA/LHD	2	2	2	2	2	1		11
	5			LPD	2	4						6
	4			LPD-17			2	1				3
N86				LCC			1	2				
				SURFACE			3	3	3	3	46	58
N87				SUB			1	1	1	1	4	8
N88				CV/CVN		2	2	2	2	2	3	13
N85/86/87/88				TRAINER	1		1	1				3
USMC LAND					4	2	2	2	2	2	4	18
NAVY/USMC TOTAL					10	10	14	14	10	9	57	124
ARMY					97	32	40	19	39	TBD	310	537
TOTAL SYSTEMS					107	42	54	33	49	TBD	367	661

USN/USMC/USA FIELDING PLAN (AS OF 9 DEC 97)

ORGANIZATION	FY00	FY01	FY02	FY03	FY04	FY05	TO COMPLETE	TOTALS
NAVY	6	8	12	12	8	7	53	106
USMC LAND	4	2	2	2	2	2	4	18
ARMY	97	32	40	19	39	TBD	310	537
TOTAL SYSTEMS	107	42	54	33	49	TBD	367	661

USN/USMC/USA FIELDING PLAN
BY FUNCTIONALITY (AS OF DEC 9 DEC 97)

ORGANIZATION	CAPABILITY LEVEL 2	CAPABILITY LEVEL 3	CAPABILITY LEVEL 4	CAPABILITY LEVEL 5	CAPABILITY TBD	TOTAL
NAVY			16	37	53	106
USMC LAND					18	18
ARMY	307	12	34	184		537
TOTAL	307	12	50	221	71	661