

~~COMPETITION SENSITIVE~~
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BIF003W/B-90 1812-90
9 MARCH 1990

COPY #13

25X1

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SAFSP

7300 MISSION RESTRUCTURE STUDY

417.65

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1

HANDLE VIA **BYEMAN**
CONTROL SYSTEM ONLY

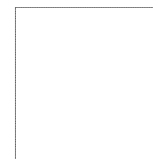
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Section I

INTRODUCTION

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2

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AGENDA

SECTIONS

25X1

I. INTRODUCTION _____

II. MISSION REQUIREMENTS COMPREHENSION _____

III. OPTIONS _____

- DESCOPE FARRAH VI

- _____

- DESIGN-TO-COST ALTERNATIVE

IV. SUMMARY AND CONCLUSIONS _____

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HANDLE VIA BYEMAN
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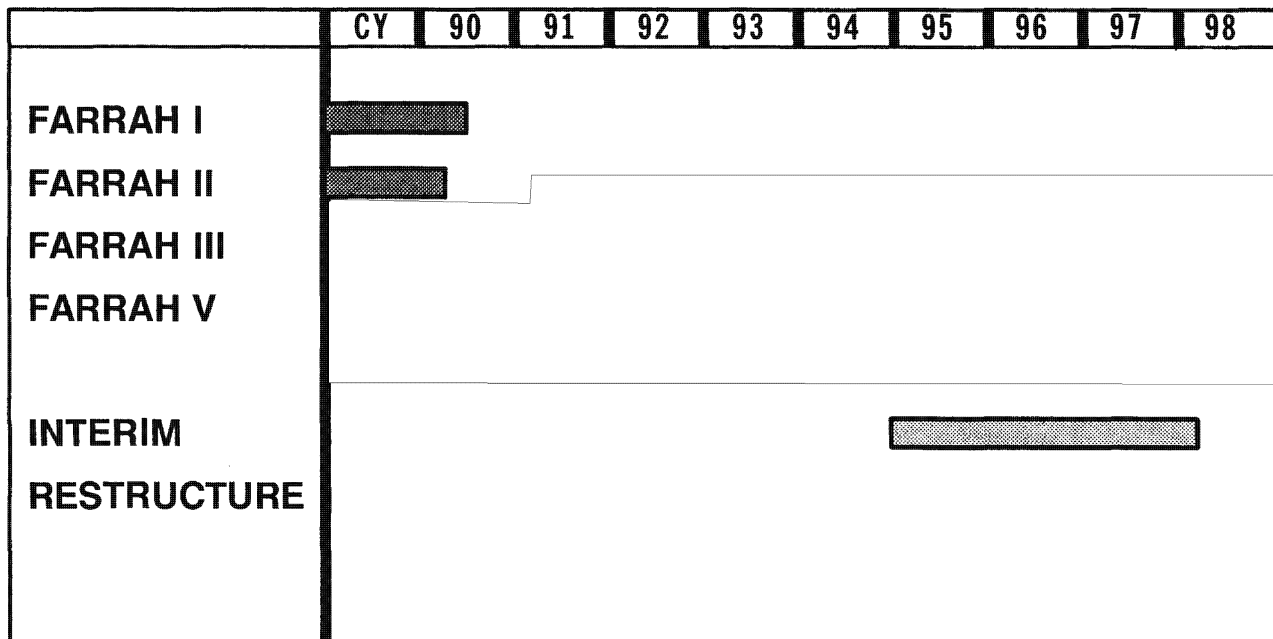
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INTERIM LEO ARCHITECTURE CONTEXT



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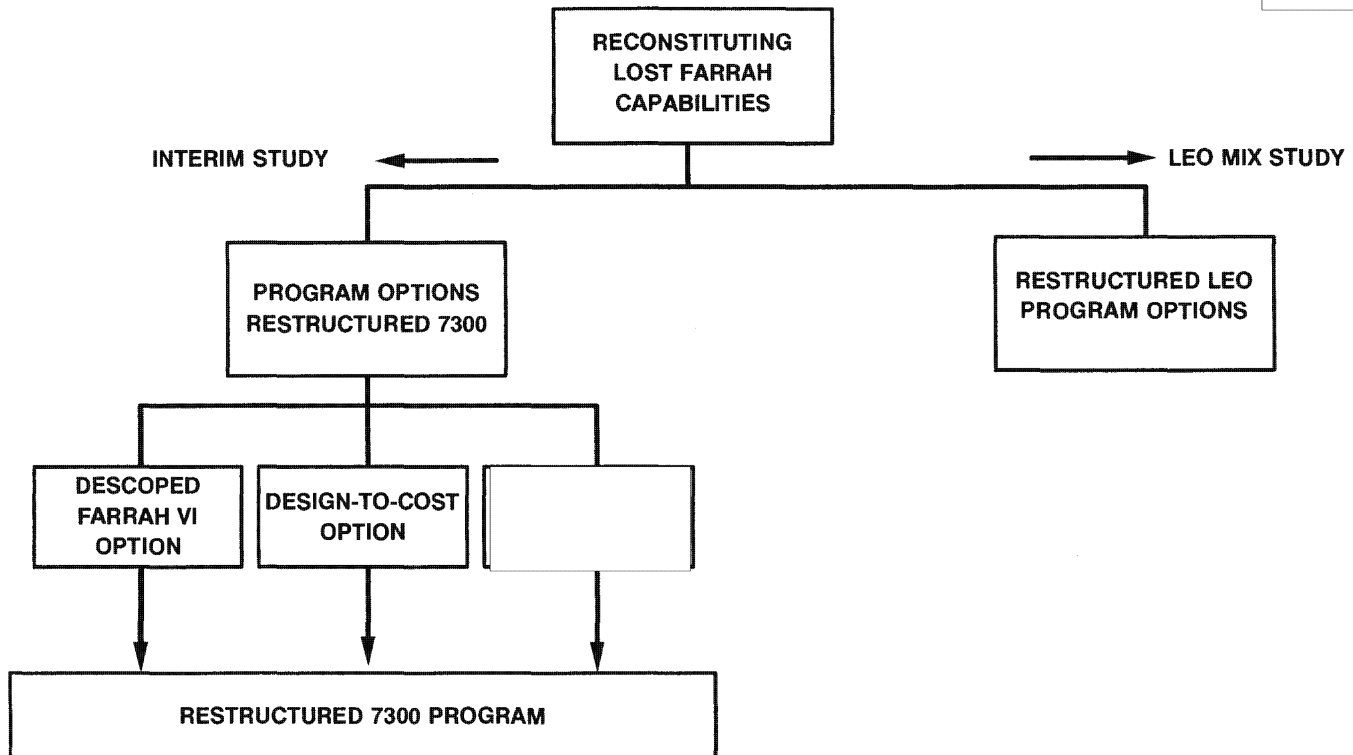
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INTERIM LEO SIGINT RESTRUCTURE STUDY



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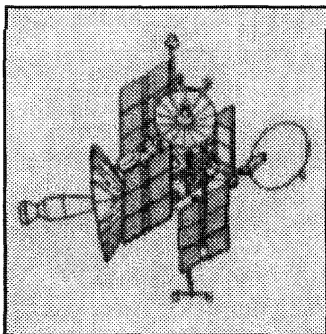
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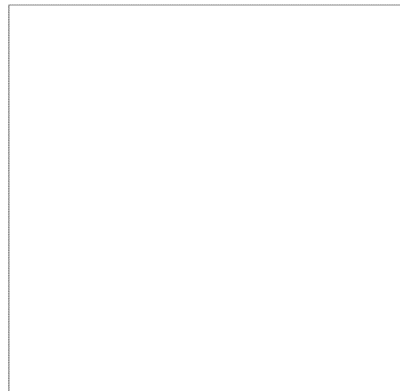
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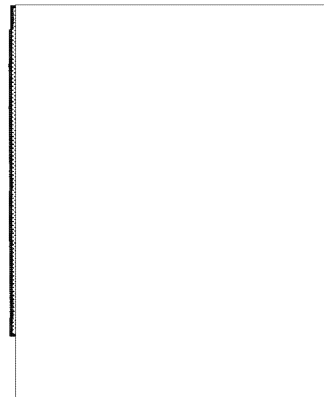
7300 RESTRUCTURE OPTIONS



DESIGN TO COST



DESCOPEF FARRAH



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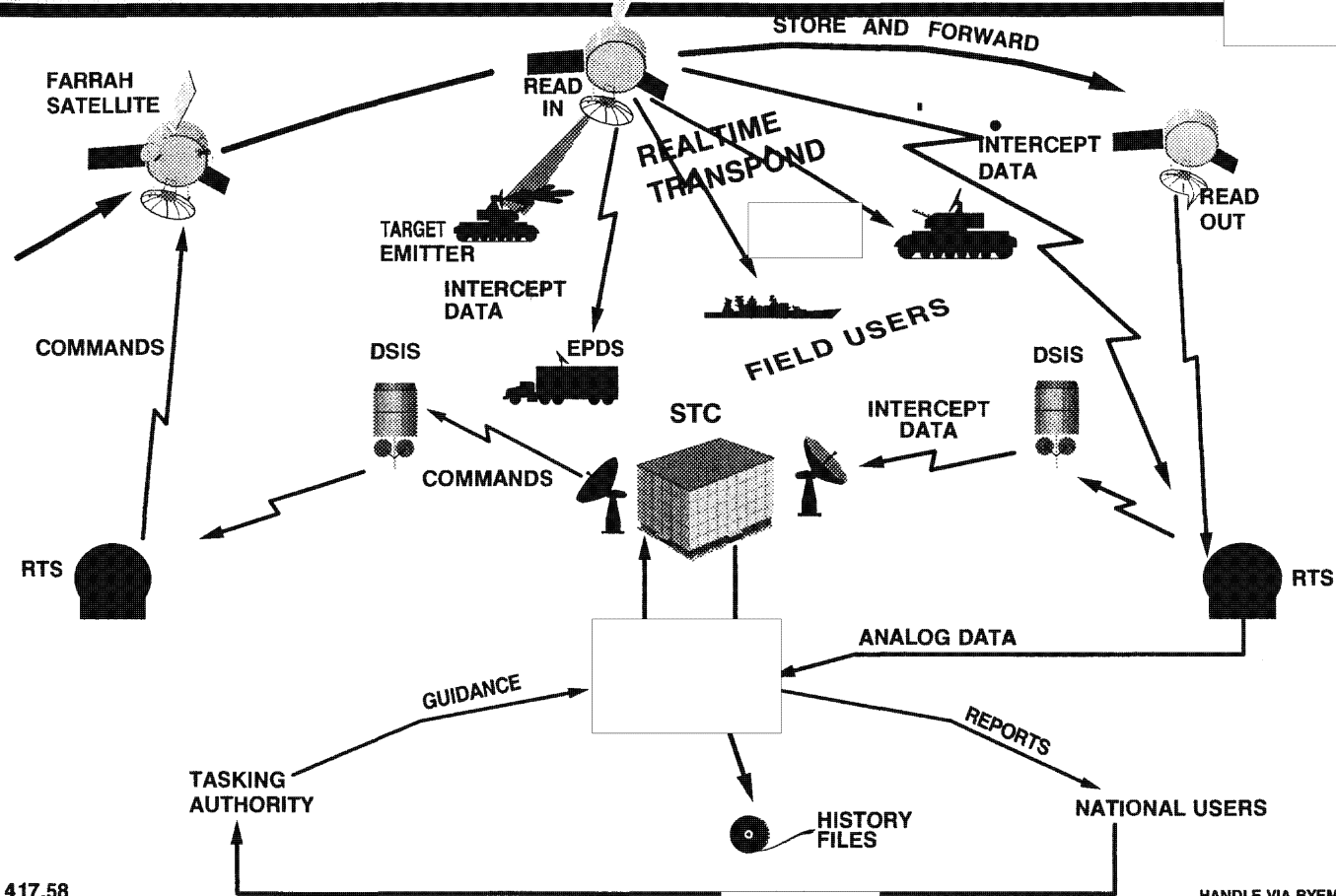
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MISSION 7300 INTEGRATED OPERATIONS



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TECHNICAL INTELLIGENCE

TASKS

MISSIONS

■ DETECT AND MEASURE RF ENERGY ON NEW OR UNUSUAL SIGNALS

(2-GHz INSTANTANEOUS BANDWIDTH AND BLIP-LEVEL GEOLOCATION CRITICAL)

■ DETERMINE EMITTER LOCATIONS

(REQUIRES PULSE AND CW GEOLOCATION)

■ CREATE SIGNAL PARAMETER DATABASE

(2-GHz INSTANTANEOUS BANDWIDTH AND BLIP LEVEL GEOLOCATION ESSENTIAL)

■ INPUT TO OTHER COLLECTION RESOURCES

■ DETERMINE MAINBEAM CHARACTERISTICS

(ERP, POLARIZATION, AND BEAMWIDTH REQUIRE POLARIMETER AND HIGH INCLINED ORBIT)

■ DETERMINE SCAN PATTERN AND LIMITS

■ DETERMINE INTERVAL MODULATION

GENERAL SEARCH/TI

(7300 MSN REPORTS 20 TO 40 "FIRST HEARDS" PER YEAR)

TREATY AND TEST MONITORING

(7300 MSN: AGGRESSOR)

DIRECTED SEARCH

(7300 MSN: REPORTED
FIELD VERSUS
TEST PARAMETERS)

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OPERATIONAL INTELLIGENCE

TASKS*

RAPIDLY INITIALIZE AND UPDATE SIGNAL DATABASES
(War modes, new radars, comm freq assignments)
- 2-GHz bandwidth and blip level geolocation essential

ACCESS EMITTER LOCATIONS, MOVEMENT AND DAMAGE
(Sidelobe intercept and geolocation important)

DETERMINE COMMUNICATION CENTERS AND LINKS
(Requires CW geolocation)

TIP OFF OTHER RESOURCES

* WORLDWIDE ACCESS IMPORTANT FOR ALL TASKS

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MISSIONS

INDICATIONS AND WARNINGS
(7300 MSN: EARLY DETECTION OF DEVELOPMENT
AND DEPLOYMENT OF [REDACTED])

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CRISIS MONITORING
(7300 MSN: PRIMARY SOURCE OF LAND-BASED
EMITTERS IN 1987 LIBYAN ENCOUNTER)

ELECTRONIC ORDER OF BATTLE
(7300 MSN: DEVELOPED VIRTUALLY ENTIRE EQB FOR [REDACTED])

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OCEAN SURVEILLANCE
(7300 MSN: CONTINUALLY REPORTS FOREIGN NAVAL/
MARITIME ACTIVITY)

EPDS VANS
(7300 MSN: ONLY SYSTEM REPORTING DIRECTLY TO
TACTICAL COMMANDERS)

COVERT OPERATIONS SUPPORT
SURVIVABILITY

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PRODUCT REPORTING AND DISSEMINATION

OPERATIONAL INTELLIGENCE
I&W MONITORING AND
TACTICAL SUPPORT

OP ELINT NARRATIVE

TK, KL, PR

OPS ELINT DATA

TRAP

THREATS

R-203

BULK DATA

R-200

COMINT SIGNALS

R-203 GROUP

FI&INT, NEW AND UNUSUAL

R-155/174

TECH REPORTS

R-178/184

COMM SIGNAL DATA

R-167

NSA
CIA
DIA
U.S. COMMANDS
USAF WORLDWIDE
USN WORLDWIDE
USA WORLDWIDE
GCHQ (SELECTED)
OTHER

TREs (FIELD UNITS)

NSA → OTHERS
SAC
DIA

NSOC
DEFSMAC
OTHER

NSA → OTHERS

NSA
CIA
FTD
AFESC
OTHER

NSA → OTHERS

EOB

TIPOFF

TECHNICAL INTELLIGENCE
GENERAL
SEARCH

TI

COMINT SEARCH

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Section II

MISSION REQUIREMENTS UNDERSTANDING

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UNIQUE CAPABILITY 1

■ MISSION REQUIREMENT





DETECT AND REPORT ALL KNOWN AND UNKNOWN PULSE AND CW
SIGNALS FROM UNCOOPERATIVE EMITTERS



**NON-A PRIORI SIGNAL DETECTION,
INDEPENDENT OF MODULATION**



■ SYSTEM REQUIREMENTS

-  EMISSIONS DETECTION INDEPENDENT OF EMITTER ORIENTATION
- EMITTER SIDELobe COLLECTION CAPABILITY
-  HIGH-SENSITIVITY DETECTION RECEIVERS
-  SIGNAL CHARACTERIZATION MEASUREMENTS
-  SIGNALS EXTRACTION FROM RAW DATA WITHOUT A PRIORI SIGNAL
KNOWLEDGE

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HANDLE VIA BYEMAN
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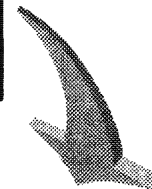
UNIQUE CAPABILITY 2

■ MISSION REQUIREMENT

LOCATE ALL KNOWN AND UNKNOWN PULSE AND CW EMISSIONS
FROM UNCOOPERATIVE EMITTERS



**GEOLOCATION
INDEPENDENT OF MODULATION**



■ SYSTEM REQUIREMENTS



PENCIL BEAM FOR GEOLOCATION



OVERLAPPING RASTER SCAN MOTION FOR COMPLETE COVERAGE



MONOPULSE CHARACTERIZATION AND ACCURATE ATTITUDE
KNOWLEDGE FOR GEOLOCATION ACCURACY



HIGH-THROUGHPUT PROCESSING SOFTWARE TO FORM
GEOLOCATIONS ON ALL SIGNALS

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HANDLE VIA BYEMAN
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UNIQUE CAPABILITY 3

■ MISSION REQUIREMENT




- DETECT AND REPORT WIDE BANDWIDTH SIGNALS WITH EITHER RF AGILE OR MULTIPLE-BEAM SIGNAL CHARACTERISTICS
- ECM REPROGRAMMING SUPPORT



WIDEBAND SIGNAL ACCESS



■ SYSTEM REQUIREMENTS

-  AT LEAST 2 GHz OF INSTANTANEOUS BANDWIDTH FOR:
 - (1) COLLECTING DESIRED SIGNALS
 - (2) MAXIMIZING SEARCH EFFICIENCY
-  AT LEAST THREE SIMULTANEOUS PULSE SIGNAL DETECTIONS AND MEASUREMENTS
-  RF AGILE OR MULTIPLE-BEAM SIGNAL PROCESSING AND REPORTS

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UNIQUE CAPABILITY 4

MISSION REQUIREMENT

OBTAIN MAINBEAM CHARACTERISTICS ON PULSE AND CW
SEARCH AND WEAPON-SYSTEM RADARS

PRECISION ERP AND POLARIZATION MEASUREMENT

SYSTEM REQUIREMENTS

-  DUAL-POLARIZED ANTENNAS AND RECEIVER TO OBTAIN
RHCP AND LHCP DATA
-  WIDEBAND MAINBEAM DETECTION FOR SEARCH EFFICIENCY
-  ORBIT INCLINATION >80 deg TO PROVIDE ACCESS TO
HIGH-LATITUDE NORTH-POINTING SOVIET RADARS
-  ERP, TILT ANGLE, AND POLARIZATION MEASUREMENTS
 - ERP ACCURACY: ± 3 dB
 - TILT ANGLE ERROR: ± 20 deg (FOR LINEARLY POLARIZED
SOIs)

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UNIQUE CAPABILITY 5

MISSION REQUIREMENT

PROVIDE OPERATIONAL COMMANDERS HIGH-CONFIDENCE
SIGINT THROUGH SURVIVABLE LINKS FOR LOCAL ANALYSIS

**DIRECT READOUT OF
RAW SIGNAL DATA TO EPDS VANS**

SYSTEM REQUIREMENTS

- ✦ MAINTAIN EPDS CAPABILITY
- ✦ DATA COMPATIBILITY WITH EPDS MISSIONS
 - HIGH PROBABILITY OF INTERCEPT
 - DATA ONLY FROM AREA OF INTEREST
- ✦ DATA COMPATIBILITY WITH EPDS PROCESSING
 - SINGLE SGLS TRANSMISSION LINK

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HANDLE VIA BYEMAN
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~~COMPETITION SENSITIVE~~~~TOP SECRET~~ [REDACTED]

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SIGNIFICANT CAPABILITY 1

■ MISSION REQUIREMENT

MAXIMIZE PROBABILITY OF INTERCEPT FOR ALL CLASSES
OF PULSE AND CW SIGNALS



**HIGH-SENSITIVITY
MAIN AND SIDELobe ACCESS**

■ SYSTEM REQUIREMENTS



COLLECTION CAPABILITY FOR ARBITRARY EMITTER
ORIENTATION

- HIGH-GAIN ANTENNAS WITH HIGH-SENS FRONT ENDS AND RCVRS
- OMNI ANTENNAS FOR MAINBEAM COLLECTION



PENCIL-BEAM ANTENNAS TO ALLOW SPATIAL FILTERING
OF TARGETS IN DENSE RF ENVIRONMENTS



HIGH-THROUGHPUT SIGNAL DEINTERLEAVING AND
RAPID REPORTING CAPABILITY

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HANDLE VIA BYEMAN
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SIGNIFICANT CAPABILITY 2

■ MISSION REQUIREMENT

PRODUCE REPORTS ON ALL AREAS OF SIGNIFICANT OR
POTENTIAL INTEREST



WORLDWIDE SIGNAL ACCESS

■ SYSTEM REQUIREMENTS

- ✈ 60° S AND 80° N LATITUDE SIGNAL COLLECTION
 - RECORDING CAPABILITY TO READ OUT DATA TO RTS SITES
- ✈ HIGH-LATITUDE, NORTH-POINTING, AND SECTOR-SCANNING TARGETS COLLECTION
 - ORBIT INCLINATION >80 deg

B415.10

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HANDLE VIA **BYEMAN**
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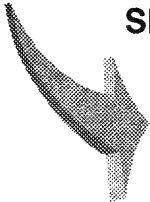
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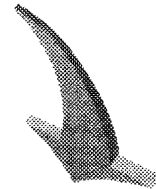
SIGNIFICANT CAPABILITY 3

■ MISSION REQUIREMENT

CHARACTERIZE MODULATION PARAMETERS ON FOREIGN
SIGINT SYSTEMS



**10 MHz PREDETECTION
ANALOG SNAPSHOTS**



■ SYSTEM REQUIREMENTS



HIGH-SENSITIVITY ANALOG DETECTION AND RECORDING SYSTEM

- 10 MHz ANALYSIS BANDWIDTH FOR WIDEBAND SIGNALS

- 750 kHz ANALYSIS BANDWIDTH FOR NARROWBAND SIGNALS



GEOLOCATION DATA CORRELATION WITH ANALOG DATA



NEW AND UNUSUAL SIGNAL MODULATION PARAMETERS REPORTS

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HANDLE VIA BYEMAN
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SIGNIFICANT CAPABILITY 4

MISSION REQUIREMENT

CHARACTERIZE AND TRACK MOBILE AND FIXED COMM SIGNALS
- FORCE STRUCTURE MAPPING

**ONBOARD RECOGNITION OF
COMINT SIGNALS EXTERNALS**

SYSTEM REQUIREMENTS



MEASUREMENTS ON COMM SIGNALS EXTERNALS

- AM/PPM, FM/FDM, BPSK, QPSK, UNMODULATED, UNKNOWN



RF ACCURACY OF ± 10 kHz FOR [REDACTED] UPLINKS



OUTPUT REPORTS

- RF, PILOT TONE (FOR FM/FDM), BAUD RATE, AND
MODULATION TYPE



SIGNAL TYPE AND GEOLOCATION REPORT WITH EACH
SIGNAL COLLECTION

B415.12

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20

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SIGNIFICANT CAPABILITY 5

MISSION REQUIREMENT

PROVIDE REPORTS ON ALL MAJOR ELINT AND COMINT BANDS



FREQUENCY COVERAGE OF 1 TO 18 GHz

SYSTEM REQUIREMENTS



1 TO 18-GHz COLLECTION CAPABILITY FOR

- MAJOR ELINT SYSTEMS (WEAPON SYSTEMS, SEARCH RADARS, AIRBORNE RADARS)
- PRIMARY LONG-RANGE COMM SYSTEMS [REDACTED]

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SEARCH EFFICIENCY OVER 1 TO 18-GHz RANGE

- AT LEAST 2-GHz INSTANTANEOUS BANDWIDTH



MISSION PLANNING PROVIDES BAND SWITCHING OPTIMIZATION

FOR WORLDWIDE COLLECTION OF MAJOR ELINT AND COMINT TARGETS

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HANDLE VIA BYEMAN
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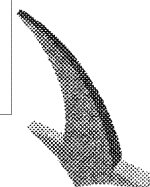
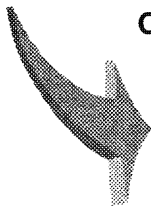
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SIGNIFICANT CAPABILITY 6

MISSION REQUIREMENT

PERFORM REALTIME REPORTING OF SIGNALS OF INTEREST TO TACTICAL
COMMANDS WITHOUT USE OF LAND-BASED COMMUNICATIONS



SYSTEM REQUIREMENTS



SOI LIST >2000 ENTRIES

- ON-ORBIT REPROGRAMMING CAPABILITY



[REDACTED] OUTPUT REPORTS

- SOIs AND SNOIs WITH LOCATIONS



MAXIMUM REPORTING TIME OF 2 min



ENCRYPTED DOWNLINKS TO TREs



MISSION PLANNING AND QA OF PRODUCT FOR REPORT TYPES

- AOI AND SOI

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BENEFICIAL CAPABILITY

■ MISSION REQUIREMENT

PROVIDE CAPABILITY TO MEET RAPIDLY CHANGING SIGINT
ENVIRONMENT AND SPECIAL SITUATIONS



PRECONFIGURED INTERFACE (PCI)



■ SYSTEM REQUIREMENTS



RECEIVER INTERFACE WHICH PROVIDES

- SPACE AND POWER
 - 350 Wh PER DAY, 55 lb, 10 x 18 x 10 in.
- ALL RF INPUTS AND HANDOVERS FROM SEARCH RECEIVERS
- COMMAND AND CONTROL INPUTS
- OUTPUT CAPABILITY, INCLUDING TELEMETRY AND PCM DATA



ANALYSIS REPORTS ON PCI DATA

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Section III-A

DESCOPEF F-VI OPTION

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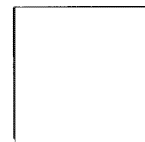
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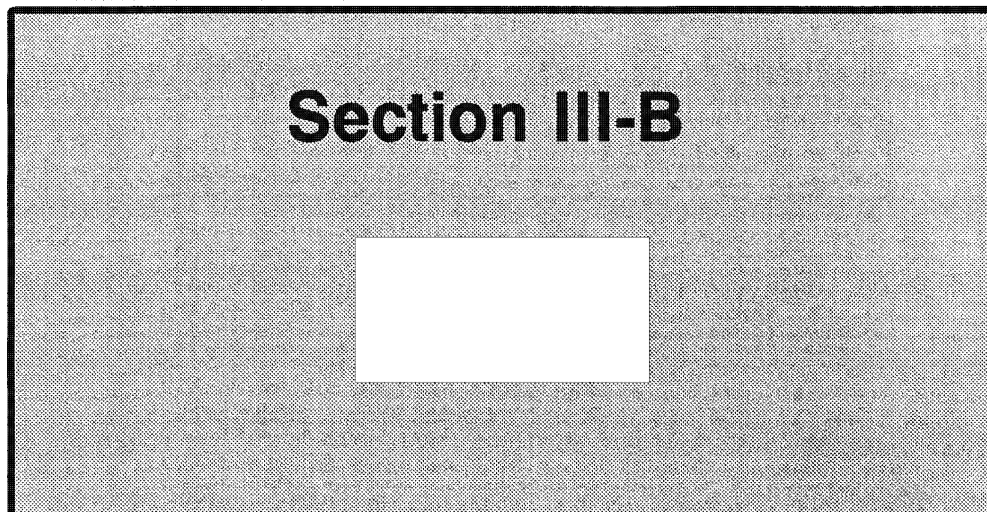
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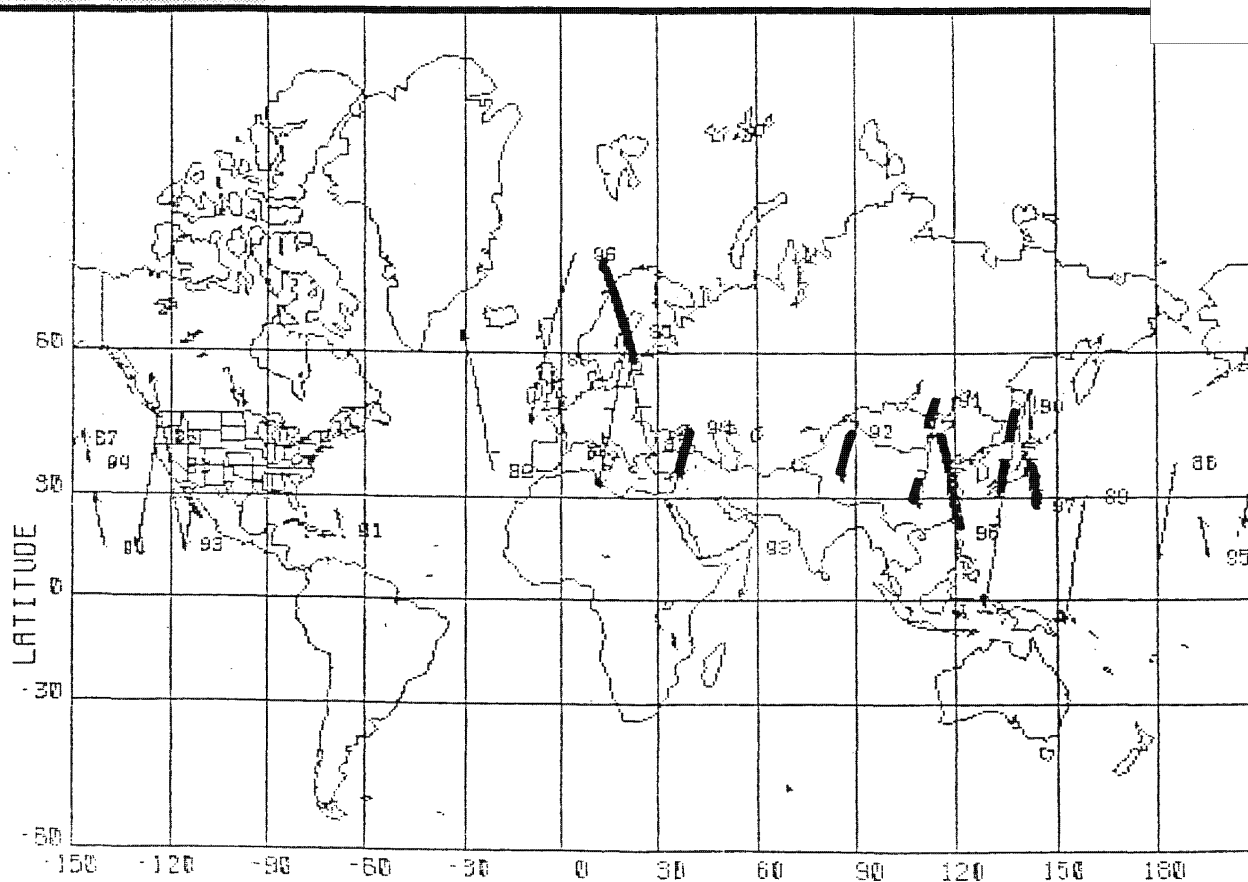
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Section III-C

DESIGN-TO-COST OPTION

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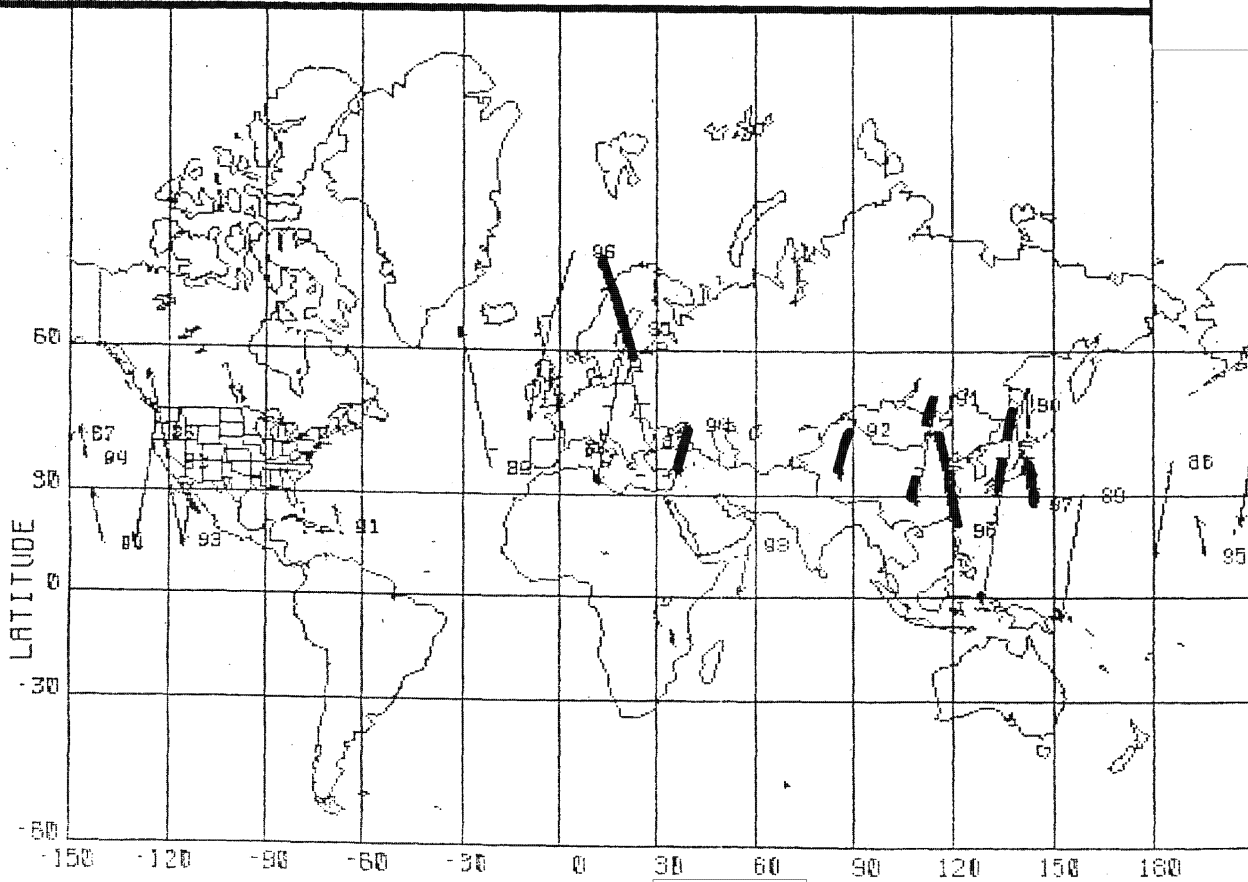
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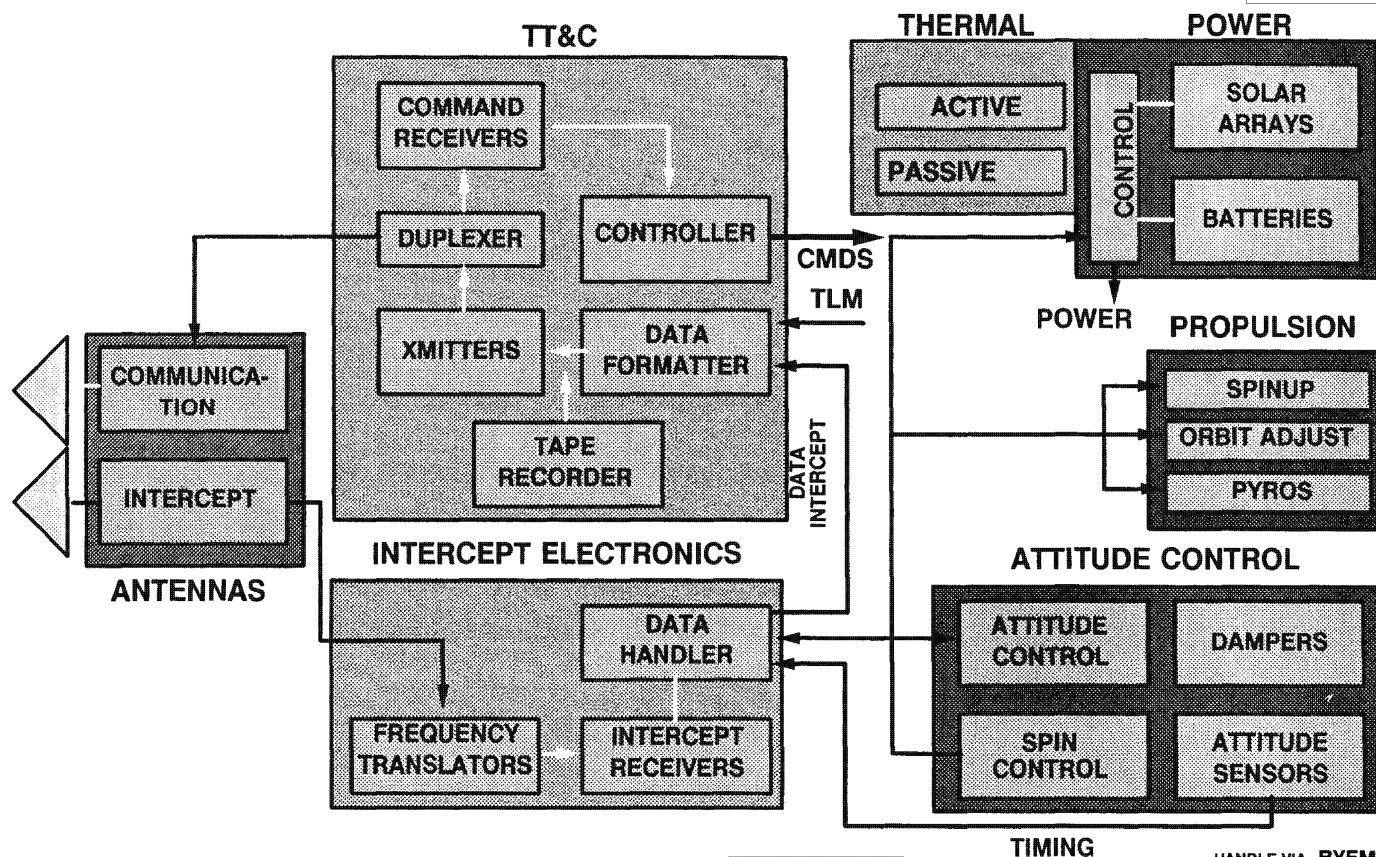
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DESIGN-TO-COST SPACECRAFT BLOCK DIAGRAM



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TIMING

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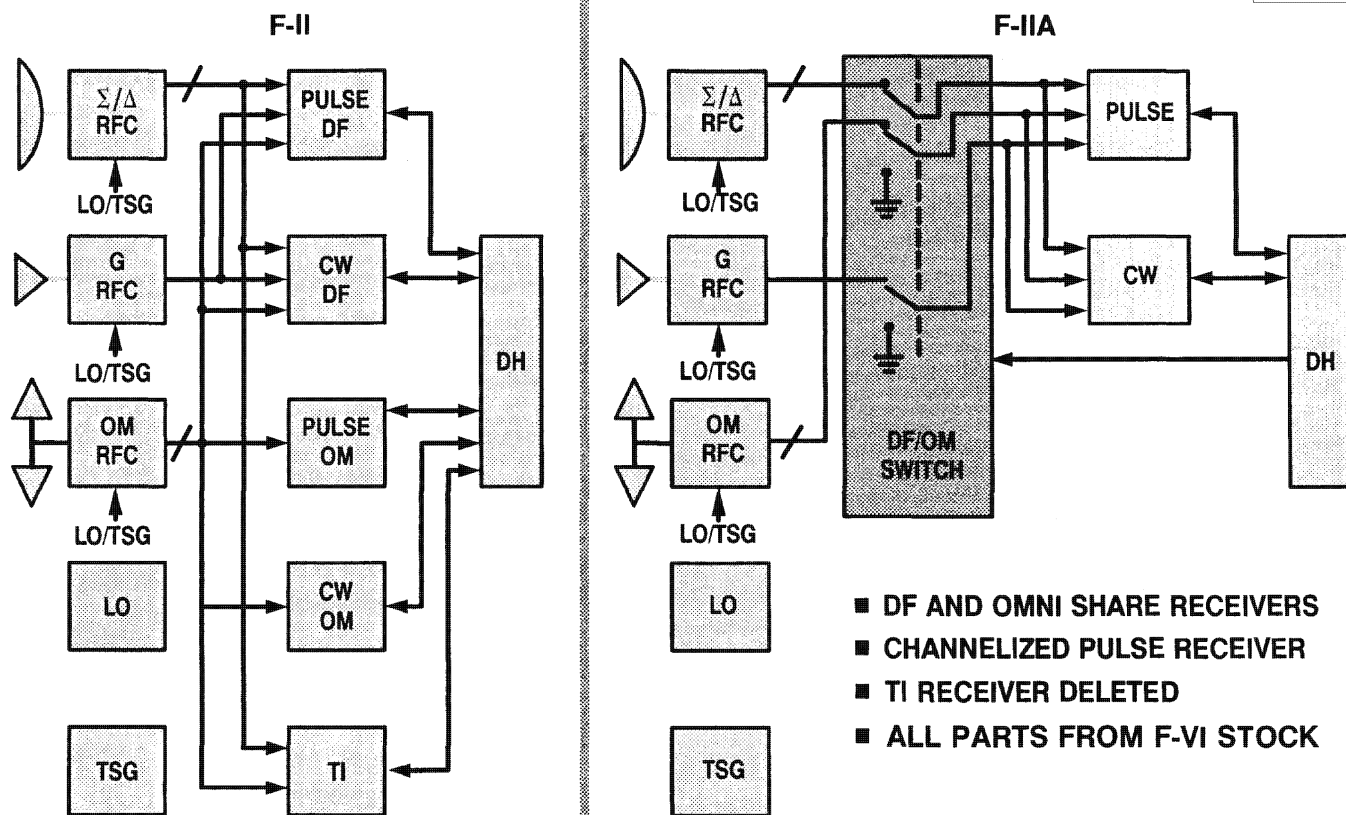
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FARRAH II/IIA PAYLOAD BLOCK DIAGRAMS



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WEIGHT AND POWER SUMMARIES

DESIGN TO COST

WEIGHT CAPABILITY REQUIRED

SUBSYSTEM	% CONTINGENCY	TOTAL WT
STRUCTURE	5	74.7
PYRO	10	53.2
ACS	10	20.2
EPS	15	171.7
C ³	15	79.3
ANTENNA	15	73.9
PAYLOAD	10	216.0
THERMAL	5	6.5
BALLAST	0	10.0
TOTAL		705.5

POWER REQUIRED

MODE	P/L (W)	S/C (W)	TIME (h)	DAILY POWER (Wh)
READIN	303	54	3.5	1,250
READOUT				
TRANSPOND		121	0.9	109
READOUT (4:1)		202	0.9	182
CONTINUOUS	7.5	5.5	VARIOUS	280.9
TOTAL				1,822 Wh
SOLAR ARRAY REQUIREMENT				(80%EFF) 2,277 Wh

S/A AVERAGE CAPABILITY >2,283 Wh PER DAY

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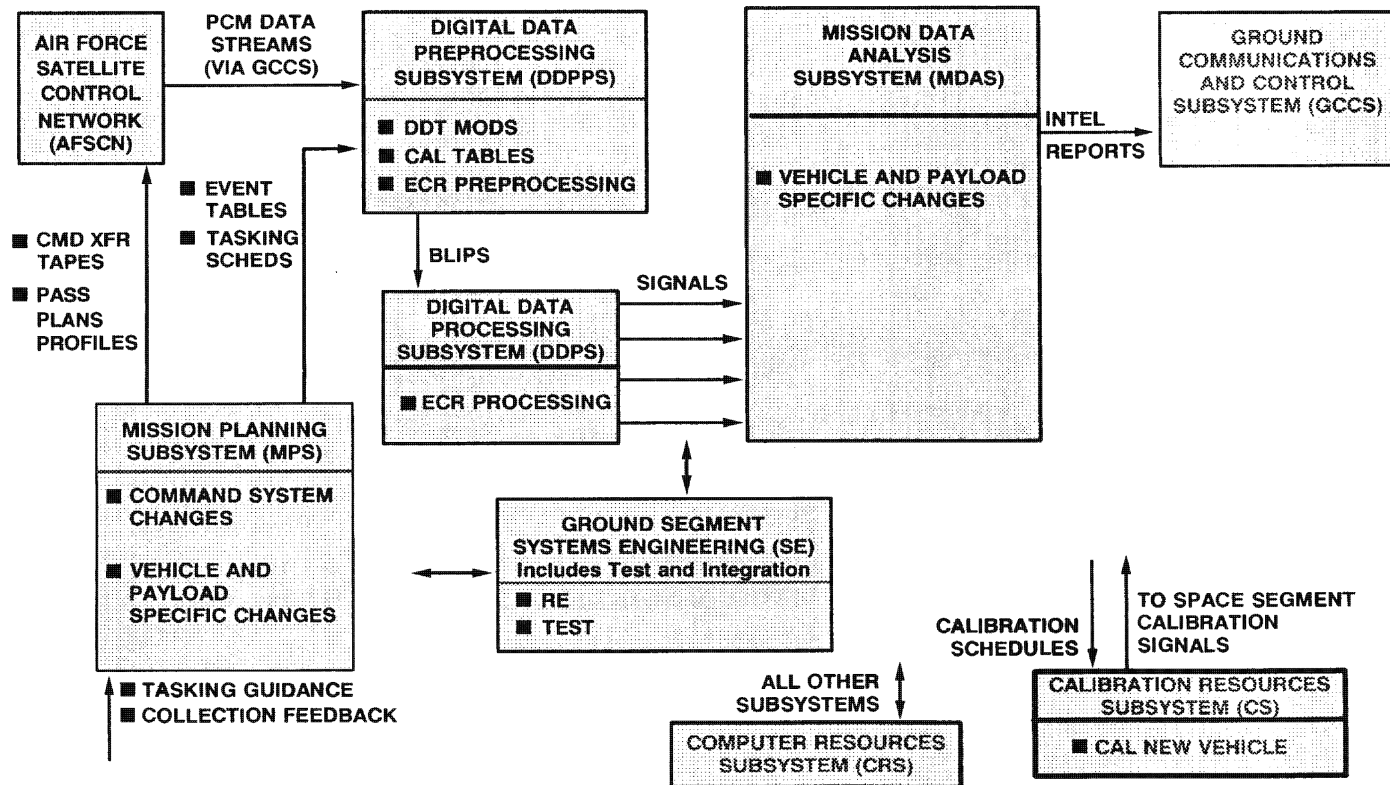
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SAFSP

DESIGN-TO-COST OPTION GROUND SEGMENT



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PRODUCT ANALYSIS REPORT TIMELINES

TECHNICAL INTELLIGENCE

R-155 R-174	FISINT NEW OR UNUSUAL SIGNALS	55 SIGNALS PER DAY 220 PER DAY	M-F ONCE PER DAY REPORT
R-178 RX, ITN, R-184 ELT, OTHER	TECH REPORTS WITH INDEPTH ANALYSIS	40 PER YEAR 30 PER YEAR	AS PRODUCED
R-167	CW COMINT SIGNALS	280 PER DAY	M-F ONCE PER DAY REPORT

OPERATIONAL INTELLIGENCE

REPORT	CONTENT	DESIGN-TO-COST VOLUME	DATA PROCESSING TIME (h)*
BLIP LEVEL TO EPDS	SIGINT SIGNAL LEVEL DATA	~ 5,600 PER DAY	NEAR-REALTIME
R-203 TACREP KLIEGLIGHT PROD REPORT TRAP	THREAT EMITTERS AND MILITARY COMM OP ELINT NARRATIVE REPORT OP ELINT DATA	720 PER DAY 1,200 PER YEAR 1,400 PER YEAR 420 PER YEAR 3,200 PER WEEK	0.5 TO 1.0 (0.1 TO 1.0 CRITICAL OPS) 0.1 TO 2 0.5 TO 1.0
R-200	SIGINT SIGNAL LEVEL DATA	4,200 PER DAY	2 TO 6
R-203 GEO TIP	COMINT SIGNALS	200 PER DAY	0.5 TO 1.0 (0.1 TO 1 CRITICAL OPS)

* DATA RETRIEVAL TIME IS SUBJECT TO RTS AVAILABILITY AND ORBIT/GEOGRAPHIC RELATIONSHIPS**X415.82**~~TOP SECRET~~

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Section IV
SUMMARY, CONCLUSIONS,
AND
RECOMMENDATION

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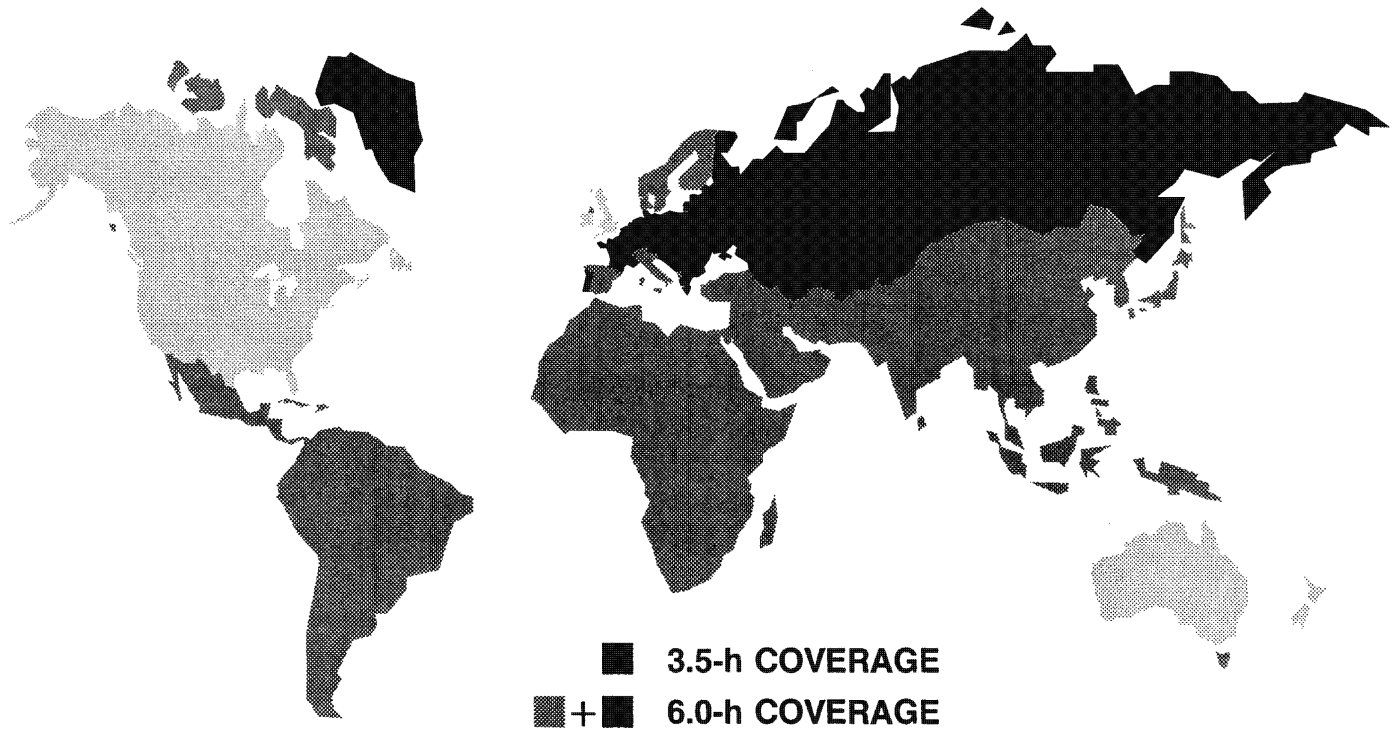
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TASKING COVERAGE COMPARISONS



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FUTURE LEO MIX

■ INTELLIGENCE REQUIREMENTS EVOLVING

- SUSTAINING PRIORITY FOR AVOIDANCE OF TECHNOLOGICAL SURPRISE (SEARCH, S&T)
- INCREASING PRIORITY FOR WORLDWIDE COVERAGE (SEARCH, EOB)
 - PROLIFERATION OF SOPHISTICATED STRATEGIC SYSTEMS
- SHIFTING PRIORITY IN SUPPORT TO MILITARY OPERATIONS
 - INCREASING GLOBAL EMPHASIS FOR LOW-INTENSITY CRISIS AND COVERT ACTIONS SUPPORT

■ SCOPE OF LEO MIX

- FOCUS ON APPORTIONMENT OF SEARCH, S&TI, AND SMO
- 7100 EMPHASIS ON REVISIT AND THROUGHPUT
 - IMPLIES MANY REALTIME COLLECTORS WITH FOCUSED FUNCTIONS
- 7300 EMPHASIS ON SEARCH AND S&T
 - IMPLIES FEW SOPHISTICATED GLOBAL COLLECTORS
- COMBINED MISSIONS OPTIONS

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