~~TOP SECRET / E~~

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

Approved for Release: 2024/08/06 C05098592

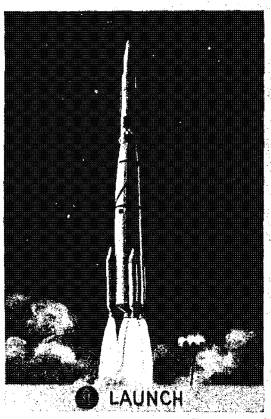
PROGRAM P-11 OVERVIEW

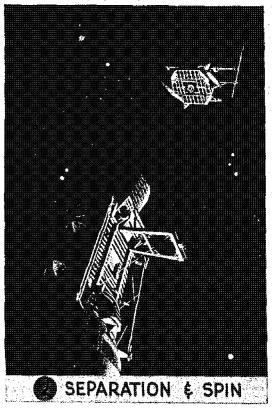
PROGRAM P-11 SPACECRAFT ARE SUBSATELLITES THAT ARE DEPENDENT UPON HOST VEHICLE PROGRAMS FOR LAUNCH AND INSERTION INTO ORBIT. CURRENTLY, PROGRAM P-11 SPACECRAFT ARE BEING LAUNCHED BY BOOSTERS OF THE NEW HOST VEHICLE (NHV) PROGRAM.

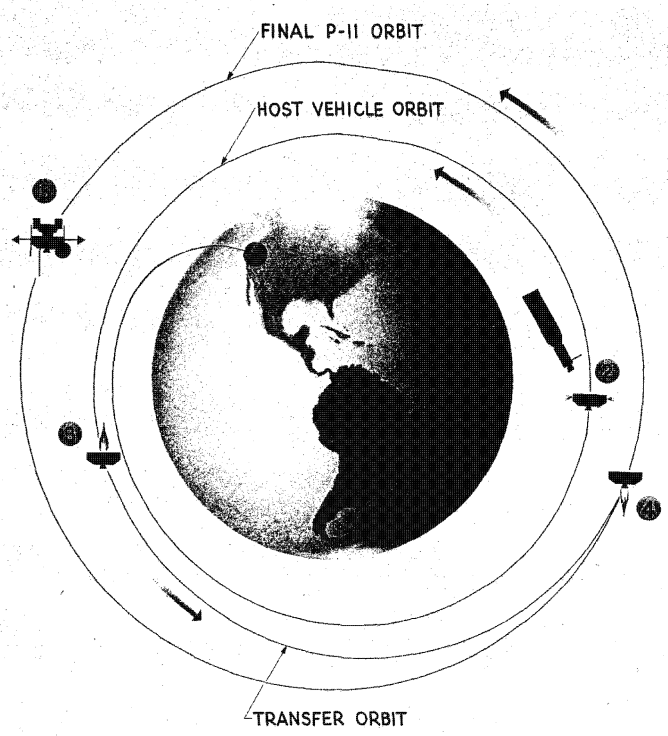
ELINT, COMINT, AND TELINT MISSIONS HAVE BEEN AND ARE NOW BEING ACCOMPLISHED BY PROGRAM P-11 SPACECRAFT. THESE MISSIONS INCLUDE GENERAL SEARCH IN THE FREQUENCY RANGE FROM 50 TO 18,000 MHz, DIRECTED SEARCH IN THE FREQUENCY RANGE FROM 50 TO 4020 MHz, ELECTRONIC ORDER OF BATTLE (EOB) EMITTER LOCATION, AND COMMUNICATIONS INTELLIGENCE.

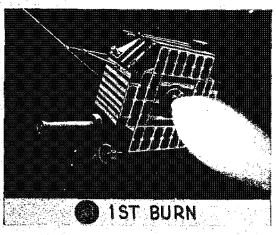
PROGRAM P-11 PROVIDES THE AIR FORCE WITH A QUICK-REACTION CAPABILITY IN THE FIELD OF ELECTRO-MAGNETIC RECONNAISSANCE. FOR EXAMPLE, THE FIRST ABM RADAR SEARCH SYSTEM (SPACECRAFT 4410/ FACADE) WAS DELIVERED READY FOR FLIGHT ONLY SEVEN MONTHS AFTER GO-AHEAD.

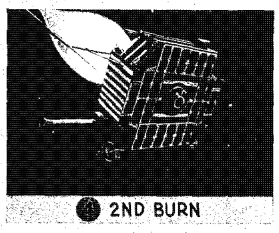
SEQUENCE OF LAUNCH EVENTS

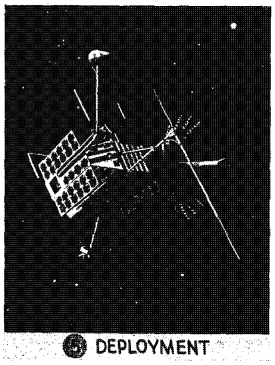












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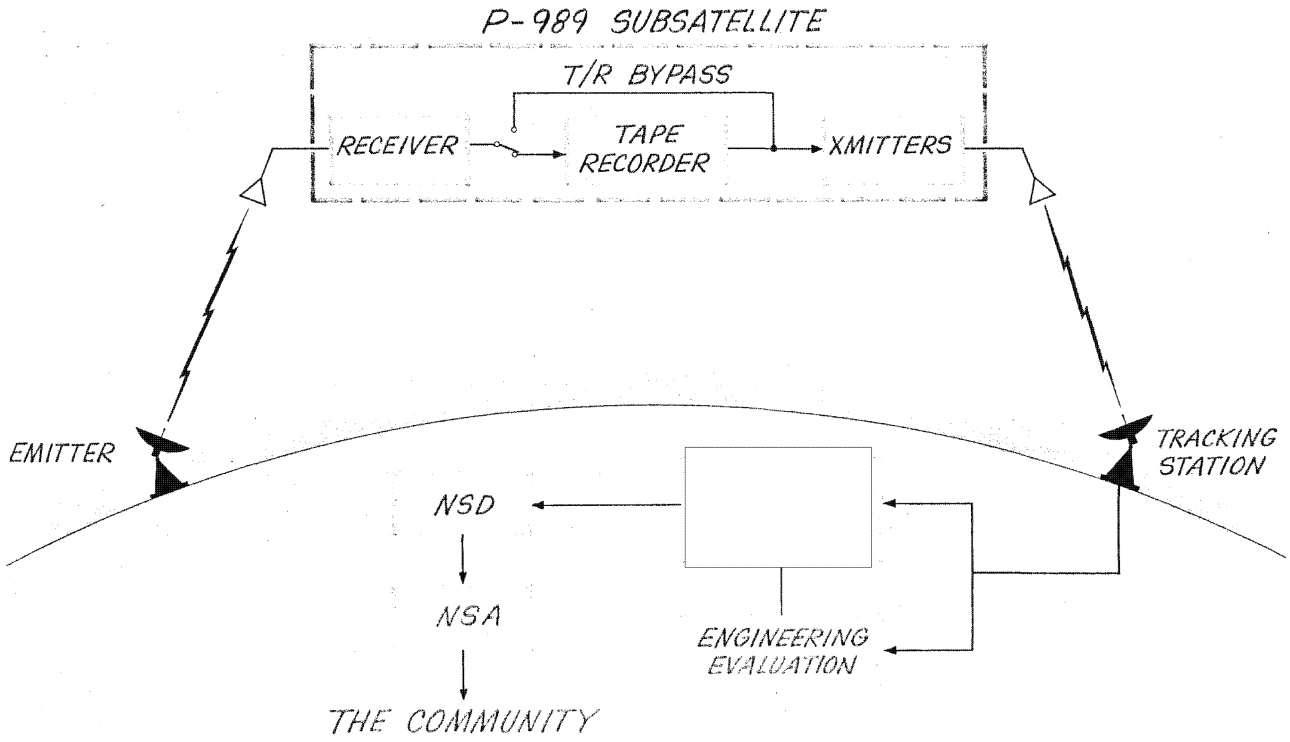
HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

SYSTEMS DATA FLOW



25X1

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HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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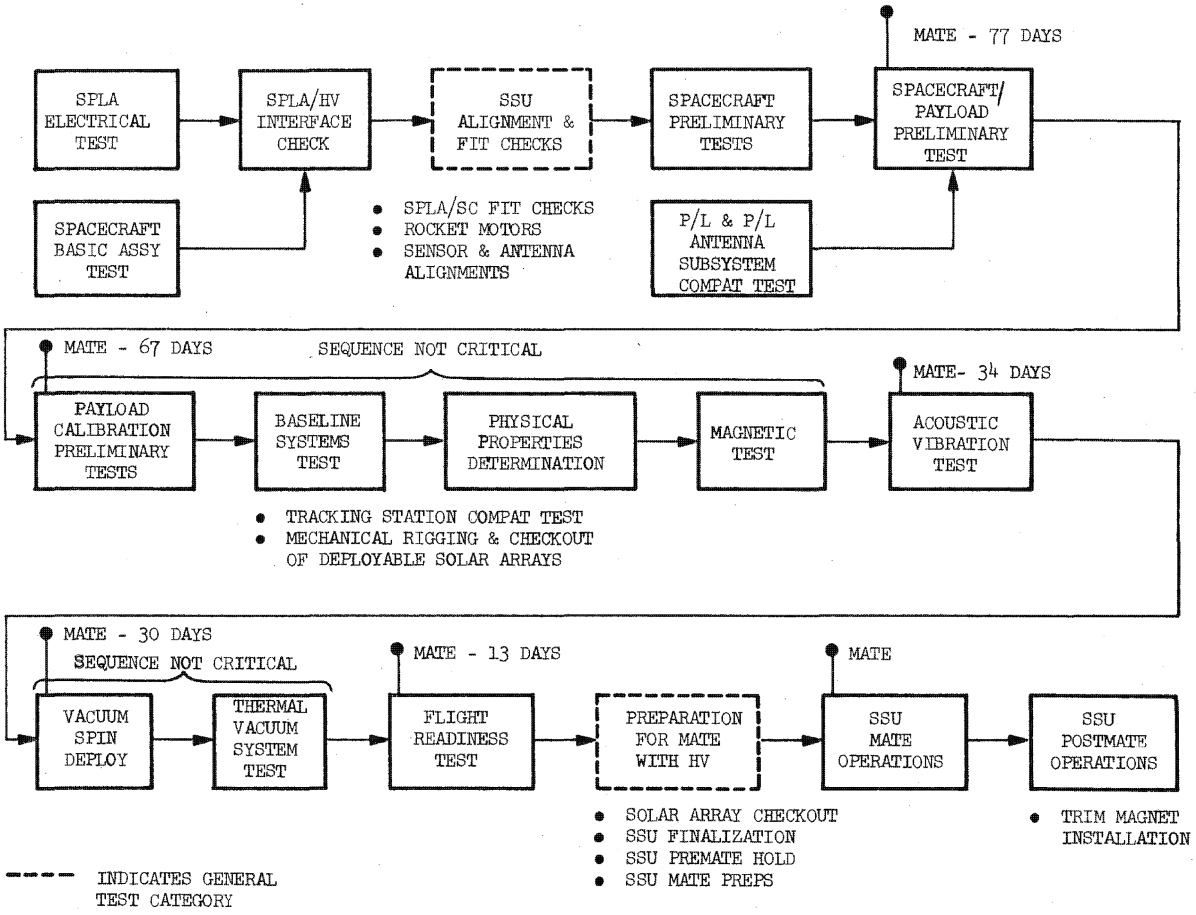
TYPICAL TEST SEQUENCE



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HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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SPACECRAFT SUPPORT SYSTEMS

ATTITUDE CONTROL

- MAINTAIN STABLE SPACECRAFT ATTITUDE WITH ANTENNAS EARTH-ORIENTED
- VARY ATTITUDE TO STEER INTERCEPT ANTENNA BEAM FOR OPTIMUM CO-BORESIGHTING WITH TARGET BEAM

ORBIT ADJUST

- MAINTAIN DESIRED ORBITAL PARAMETERS
- MOVE LOGITUDINAL POSITION

COMMUNICATIONS

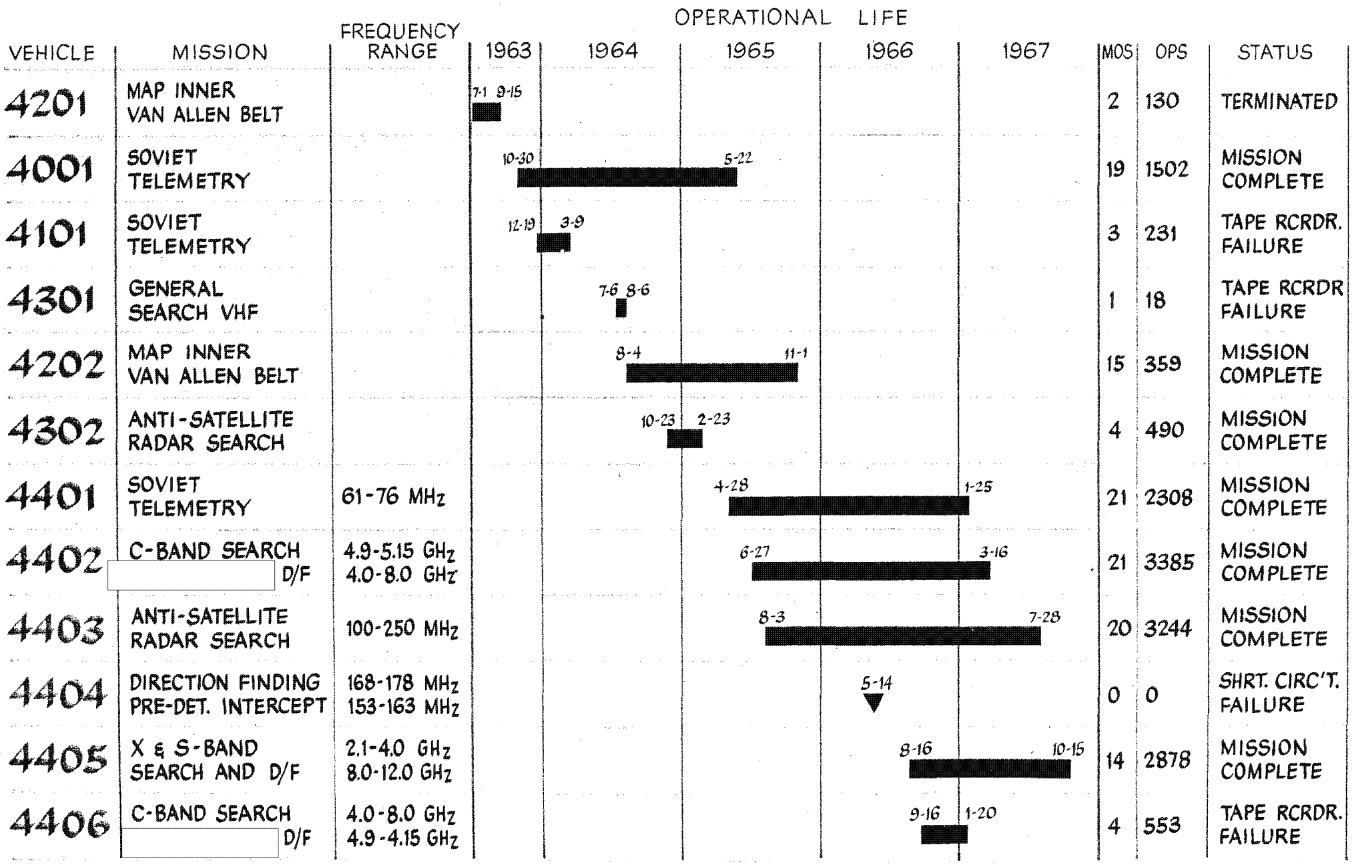
- RELAY INTERCEPTED SIGNAL INFORMATION TO THE GROUND
- COMMAND CONTROL FROM GROUND TO SPACECRAFT
- PROVIDE SPACECRAFT OPERATIONAL AND HEALTH TELEMETRY

POWER

- PROVIDE POWER FOR SPACECRAFT EQUIPMENT EXCEPT DURING ECLIPSE PERIODS

~~TOP SECRET / E~~

FLIGHT SUMMARY



VEHICLE	MISSION	FREQUENCY RANGE	MOS	OPS	STATUS	
4201	MAP INNER VAN ALLEN BELT		2	130	TERMINATED	
4001	SOVIET TELEMETRY		19	1502	MISSION COMPLETE	
4101	SOVIET TELEMETRY		3	231	TAPE RCRDR. FAILURE	
4301	GENERAL SEARCH VHF		1	18	TAPE RCRDR FAILURE	
4202	MAP INNER VAN ALLEN BELT		15	359	MISSION COMPLETE	
4302	ANTI-SATELLITE RADAR SEARCH		4	490	MISSION COMPLETE	
4401	SOVIET TELEMETRY	61-76 MHz	21	2308	MISSION COMPLETE	
4402	C-BAND SEARCH [redacted] D/F	4.9-5.15 GHz 4.0-8.0 GHz	21	3385	MISSION COMPLETE	25X1
4403	ANTI-SATELLITE RADAR SEARCH	100-250 MHz	20	3244	MISSION COMPLETE	
4404	DIRECTION FINDING PRE-DET. INTERCEPT	168-178 MHz 153-163 MHz	0	0	SHRT. CIRC'T. FAILURE	
4405	X & S-BAND SEARCH AND D/F	2.1-4.0 GHz 8.0-12.0 GHz	14	2878	MISSION COMPLETE	
4406	C-BAND SEARCH [redacted] D/F	4.0-8.0 GHz 4.9-4.15 GHz	4	553	TAPE RCRDR. FAILURE	25X1

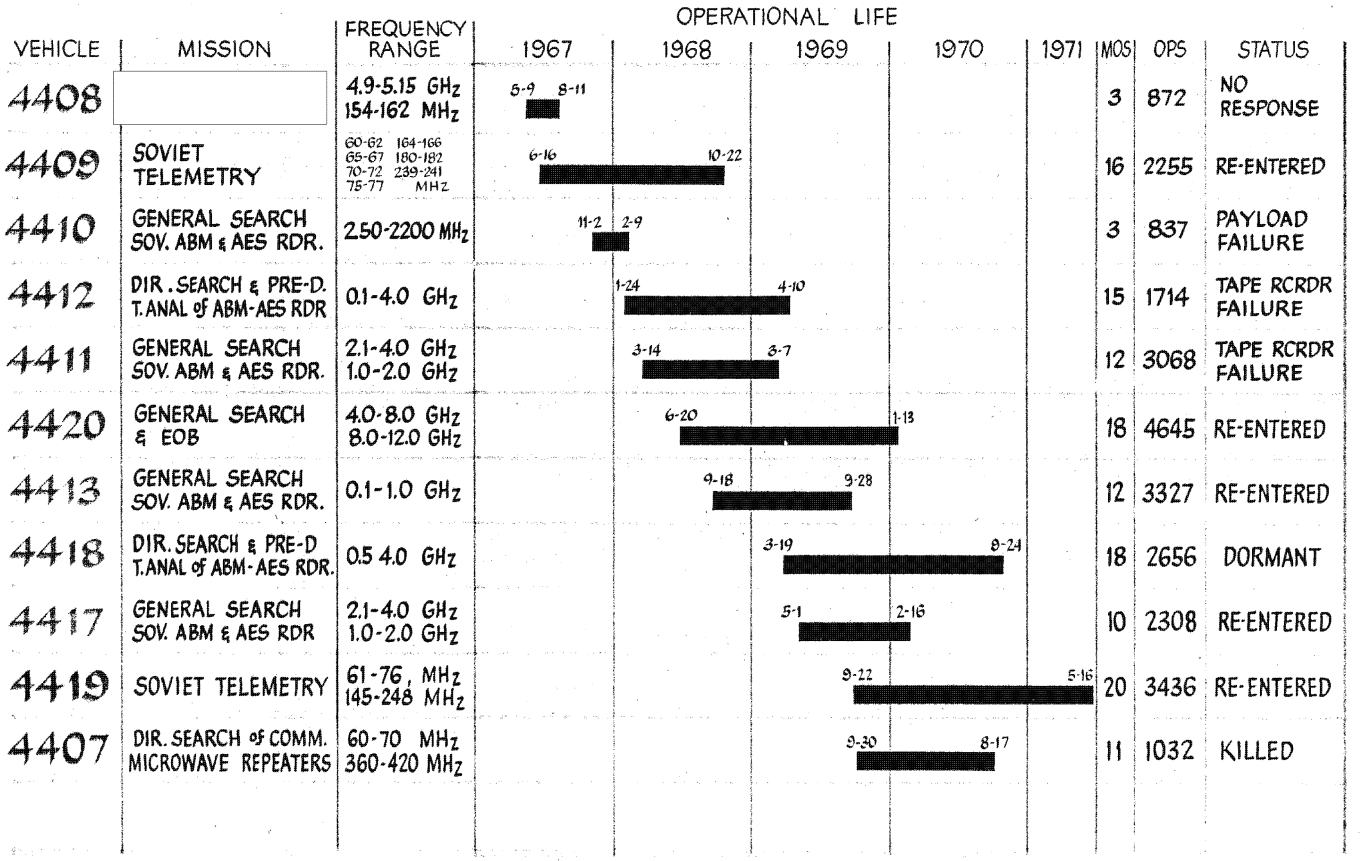
~~TOP SECRET / E~~

HANDLE VIA BYEMAN CONTROL SYSTEM ONLY

25X1

PROGRAM

FLIGHT SUMMARY



VEHICLE	MISSION	FREQUENCY RANGE	MOS	OPS	STATUS
4408		4.9-5.15 GHz 154-162 MHz	3	872	NO RESPONSE
4409	SOVIET TELEMETRY	60-62 164-166 65-67 180-182 70-72 239-241 75-77 MHz	16	2255	RE-ENTERED
4410	GENERAL SEARCH SOV. ABM & AES RDR.	2.50-2200 MHz	3	837	PAYLOAD FAILURE
4412	DIR. SEARCH & PRE-D. T. ANAL of ABM-AES RDR	0.1-4.0 GHz	15	1714	TAPE RCRDR FAILURE
4411	GENERAL SEARCH SOV. ABM & AES RDR.	2.1-4.0 GHz 1.0-2.0 GHz	12	3068	TAPE RCRDR FAILURE
4420	GENERAL SEARCH & EOB	4.0-8.0 GHz 8.0-12.0 GHz	18	4645	RE-ENTERED
4413	GENERAL SEARCH SOV. ABM & AES RDR.	0.1-1.0 GHz	12	3327	RE-ENTERED
4418	DIR. SEARCH & PRE-D T. ANAL of ABM-AES RDR.	0.5 4.0 GHz	18	2656	DORMANT
4417	GENERAL SEARCH SOV. ABM & AES RDR	2.1-4.0 GHz 1.0-2.0 GHz	10	2308	RE-ENTERED
4419	SOVIET TELEMETRY	61-76, MHz 145-248 MHz	20	3436	RE-ENTERED
4407	DIR. SEARCH of COMM. MICROWAVE REPEATERS	60-70 MHz 360-420 MHz	11	1032	KILLED

~~TOP SECRET / E~~

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

~~TOP SECRET / E~~

25X1

PROGRAM

FLIGHT SUMMARY

VEHICLE	MISSION	FREQUENCY RANGE	OPERATIONAL LIFE 1970	1971	1972	1973	MOS	OPS	STATUS
4422	GENERAL SEARCH AND DIRECTED SEARCH - SOV. ABM & AES RADARS	50-4020MHz	3-4 →				15	4016	OPERATIONAL
4421	GENERAL SEARCH AND EOB MISSION FOR PULSED RADARS	4000-8000MHz 8000-12000MHz	5-20 →				12	2470	OPERATIONAL
4423	LOCATION & TECHNICAL INTELL., TROPOSPHERIC SCATTER COMM. LINKS	450-1000MHz	11-18 →				7	2167	OPERATIONAL

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PROGRAM P-11 MAJOR SUBCONTRACTORS

SUBCONTRACTOR	LOCATION	PAYLOAD
MOTOROLA	PHOENIX, ARIZONA	URSALA I, II, III
LTV E-SYSTEMS	DALLAS, TEXAS	TOPHAT I, II, AND RAQUEL

~~TOP SECRET / E~~

989 DATA PROCESSING CHRONOGRAM(S)

25X1

PROGRAM

PRESENT PLAN

TOTAL 4 TO 10 DAYS

ALL 989 DATA VIA MAIL

2 TO 5 DAYS

[redacted]

REVISED URSALA I PLAN

- STATION TAPE PROCESSING

3 TO 6 DAYS

ALL 4425 DATA VIA MAIL

1 DAY

[redacted]

- P/L BURST/DAY COUNTER
- RAPID SAD
- PREDICT VECTORS
- EXTENSIVE PERMANENT FILE UTILIZATION

6 TO 12 HRS

4425 MSORT SELECTED DATA

FUTURE PLAN

- ON-LINE EDITING
- DIRECT & CONTINUOUS DATA FLOW
- AUTOMATIC ACCOUNTING AND STATUS

3 TO 6 HRS

4425 ALL DATA MIL COM

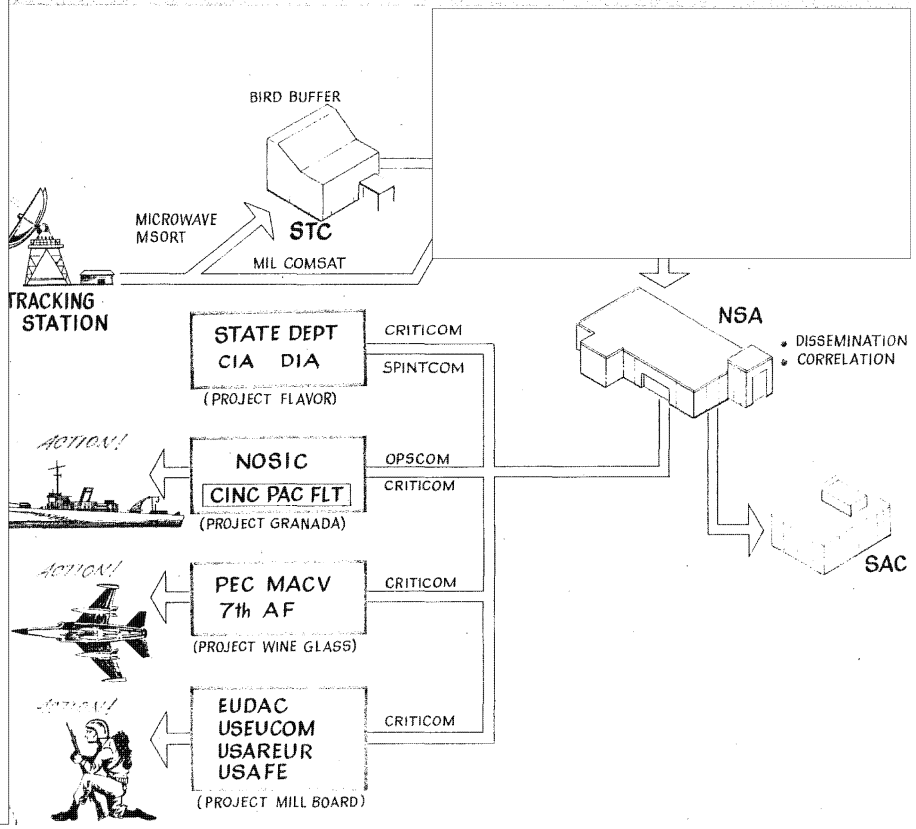
25X1

HANDLE VIA BYEMAN

ELINT DATA CYCLE ~~(S)~~

25X1

25X1
25X1



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HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

~~TOP SECRET / E~~

SYSTEM INTERRELATION ~~(U)~~

25X1

PROGRAM

COLLECTION SYSTEM

DESIGN
DEVELOP
TEST

TASKING

REQUIREMENTS AND DIRECTION

D/NRO

SAFSP | SAFSS

SIGINT REQ

INTELLIGENCE COMMUNITY

USIB (SORS)

- CIA
- NSA
- DIA
- STATE

COLLECTION REQMTS

INTELL DATA

RAW DATA

25X1

NSA

- PROCESSING
- REPORTING

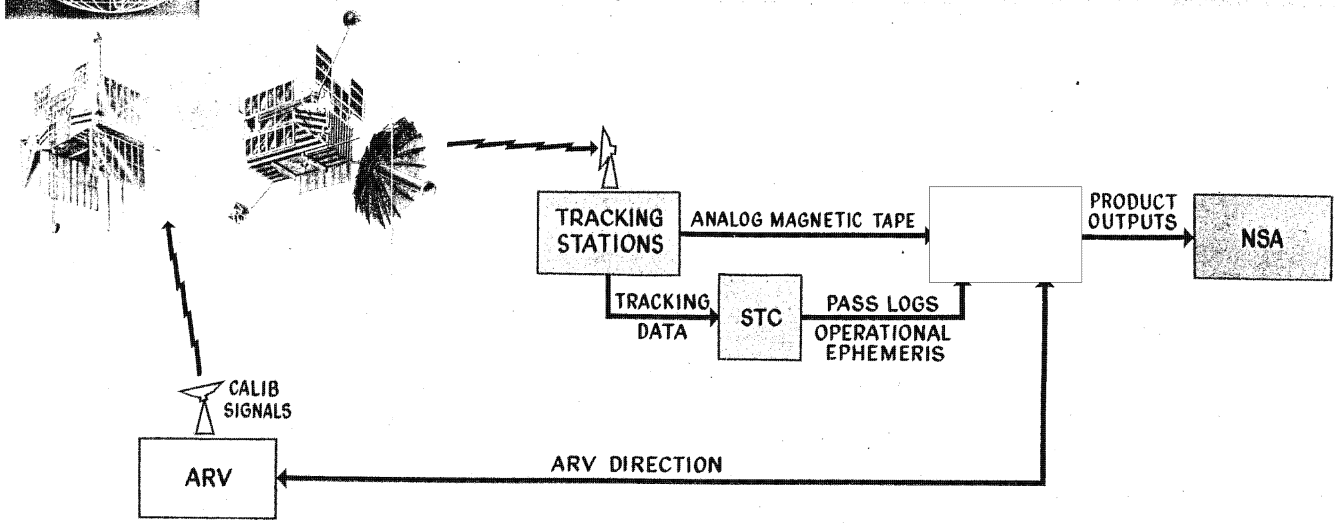
PRE-LAUNCH TEST SUPPORT - DESIGN FEEDBACK

HANDLE VIA BYEMAN CONTROL SYSTEM ONLY

~~TOP SECRET / E~~

TYPICAL 989 DATA HANDLING ~~(S)~~

25X1



25X1

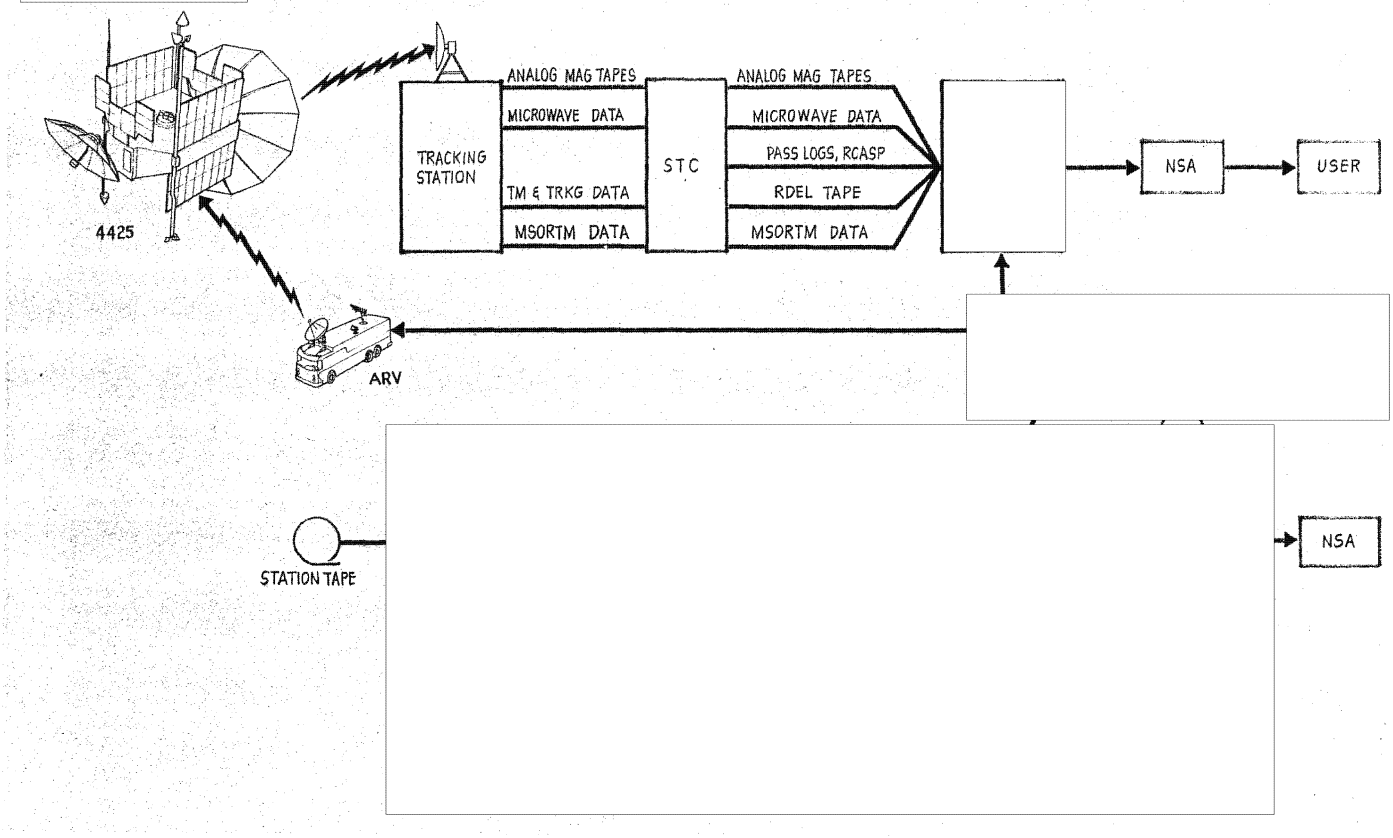
25X1

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

~~TOP SECRET / E~~

URSALA DATA HANDLING ~~(S)~~

25X1



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25X1

25X1

~~TOP SECRET / E~~

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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SPACECRAFT 4421/TRIPOS IV – SOUSEA III

MISSION DESCRIPTION

General search and EOB mission for pulsed radars.

GENERAL DESCRIPTION

Spacecraft 4421 is another of the advanced structure family of spacecraft in this program. Two "firsts" for this spacecraft are its all-UHF telemetry transmission capability and its capability of reading out any two of its three 1-MHz tape recorders without an intervening acquisition.

PAYLOAD DESCRIPTION

The TRIPOS IV (4 to 8 GHz) and SOUSEA III (8 to 12 GHz) payloads measure frequency, pulsewidth, PRF, and power of pulsed radars. Radio frequency is measured on a pulse-by-pulse basis to permit measurement of frequency-jumping emitters. The payloads also measure the several frequencies of emitters operating at simultaneous multiple frequencies. Up to three different frequencies can be measured on a single pulse, and up to six frequencies can be measured on two successive pulses.

The orbital system comprises two separate antenna and receiver front-end subsystems, a common frequency measuring subsystem, three dual-channel tape recorders, two UHF telemetry transmitters, and a command and control subsystem. Each receiver is connected to its own pencil-beam signal antenna and two broadbeam inhibit antennas.

MISSION SUCCESS

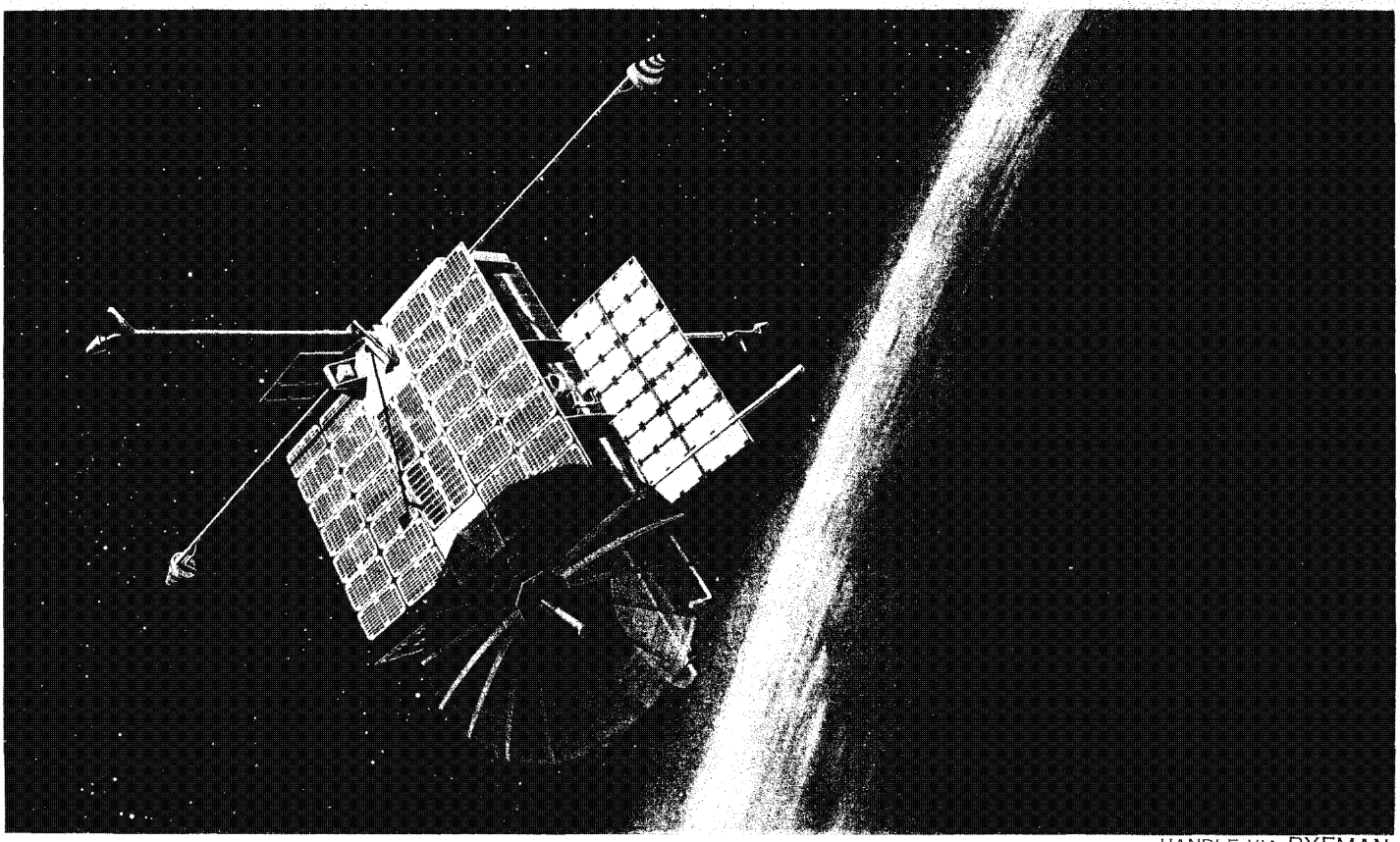
Excellent

~~TOP SECRET / E~~

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

~~TOP SECRET / E~~

SPACECRAFT 4421-TRIPOS/SOUSEA-GS/EOB-4000-8000MHz 8000-12000MHz



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HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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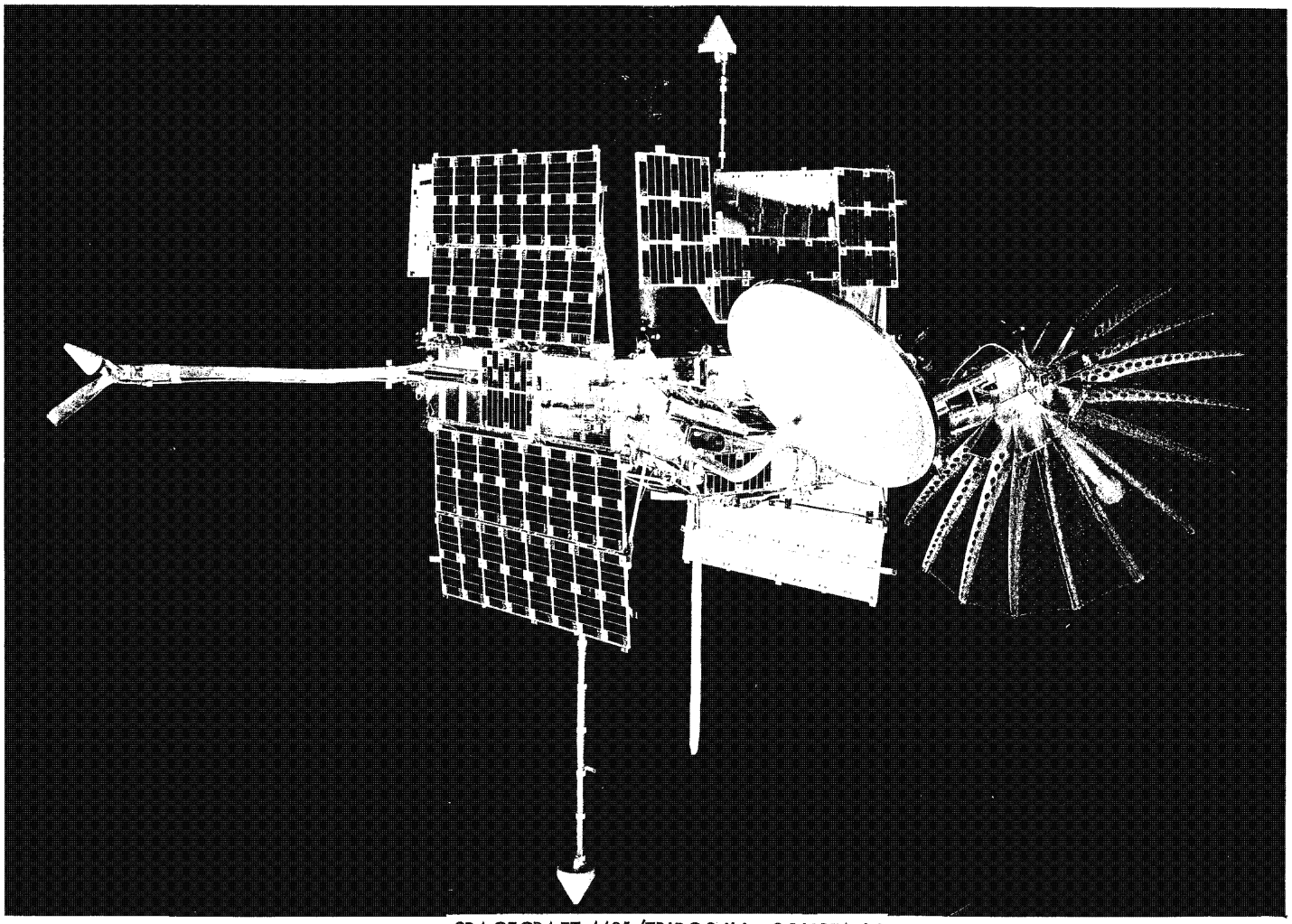

SPACECRAFT 4421/TRIPOS IV – SOUSEA III

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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SPACECRAFT 4422/TIVOLI III

MISSION OBJECTIVES

Limited general search and directed search of Soviet ABM and AES radars.

GENERAL DESCRIPTION

This spacecraft is similar to Spacecraft 4419 in that it also contains the advanced power subsystem, solar power subsystem, and a third tape recorder. The payload antennas are essentially similar to those used on Spacecraft 4418. The unique features of this spacecraft are all-UHF telemetry and an experimental attitude control subsystem that uses the interaction of a magnetic field on the spacecraft and the earth's magnetic field to move the spacecraft's spin axis.

PAYLOAD DESCRIPTION

TIVOLI III consists of a frequency translator, a receiver, a signal conditioner, and a programmer. The receiver/frequency translator combination can tune to any integer frequency from 50 to 4020 MHz. Received signals are processed into a form compatible with the telemetry system by the signal conditioner. The programmer decodes, stores, and executes the commands necessary to select, initiate, and control the desired system operational mode.

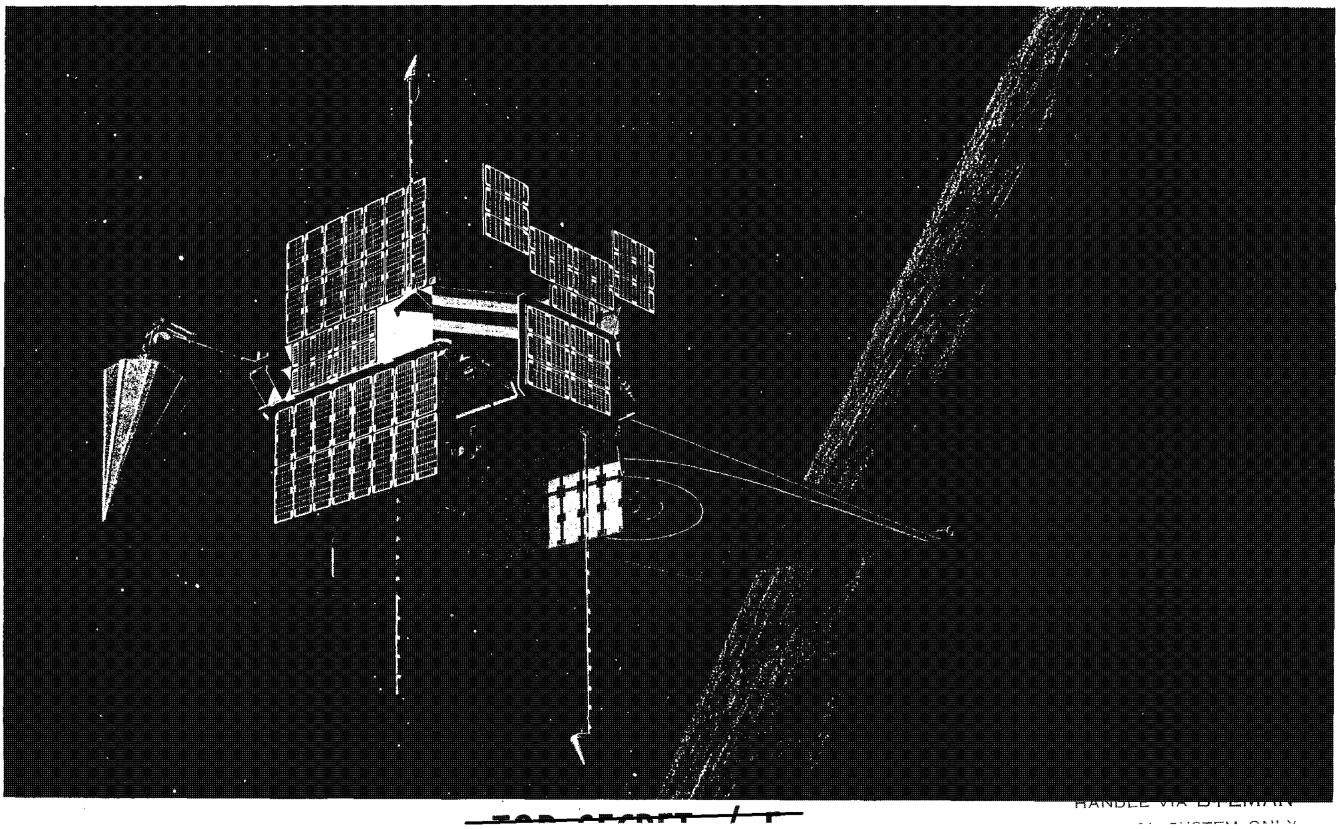
Payload antennas consist of five broad-beamwidth antennas covering the frequency range from 50 to 4020 MHz. Low- and high-band monopoles cover from 50 to 75 MHz and from 75 to 100 MHz, respectively. A VHF planar spiral covers the range from 100 to 500 MHz, and a conical spiral and conical spiral array provide UHF coverage from 400 to 2020 MHz and 1980 to 4020 MHz, respectively.

MISSION SUCCESS

Excellent

~~TOP SECRET / E~~

SPACECRAFT 4422/TIVOLI



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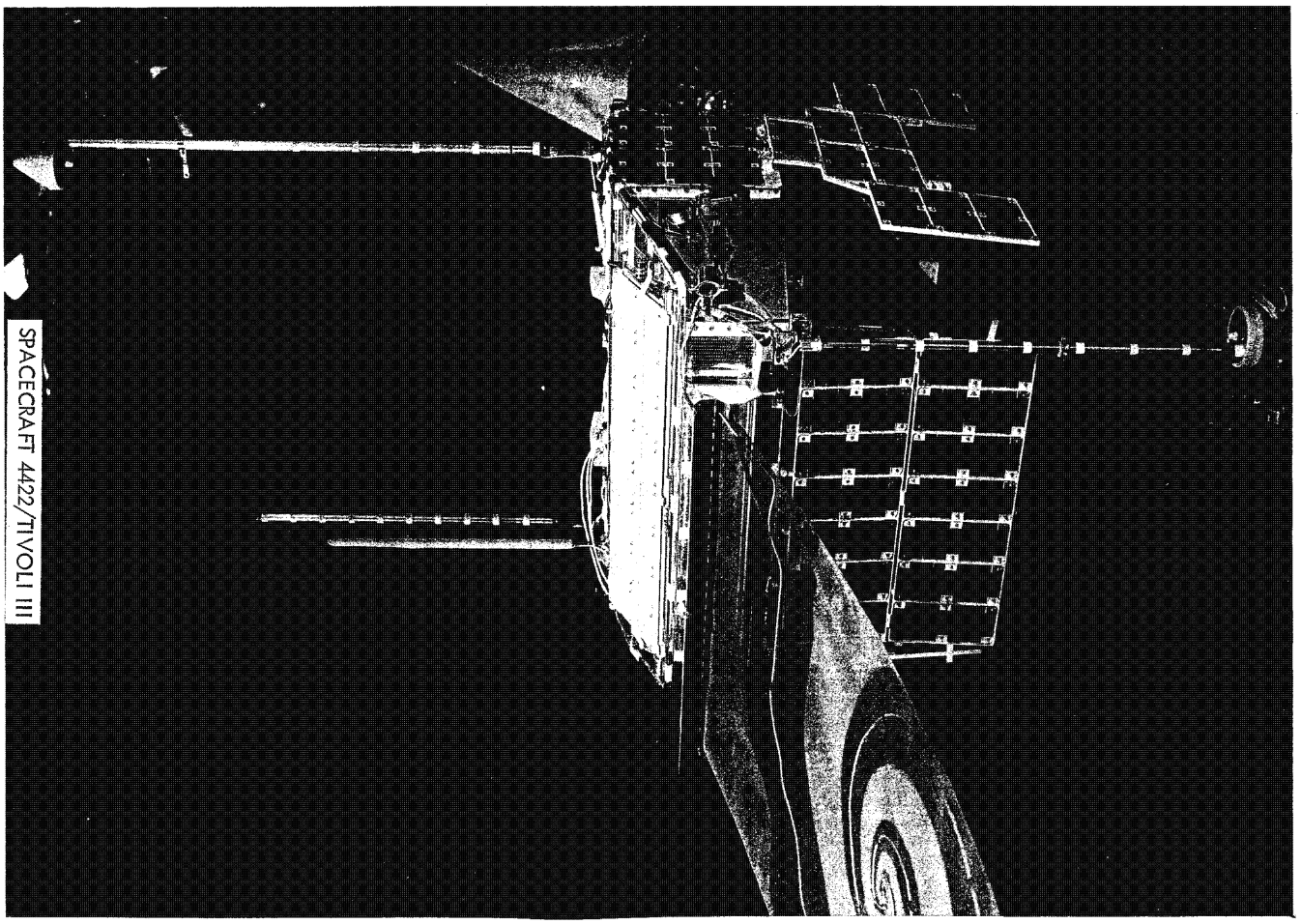

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HANDLE VIA BYEMAN

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SPACECRAFT 4423

MISSION DESCRIPTION

Electromagnetic reconnaissance and geopositioning of tropospheric-scatter communications links operating in the 450- to 1000-MHz freauency range.

GENERAL DESCRIPTION

This spacecraft is unlike any other in the program in that it uses a single power system and three tape recorders (any two of which can be read in or read out at one time). All status and payload data are transmitted by two UHF transmitters. The spacecraft antennas consist of two selectable UHF telemetry antennas (one on the -Y side and one on the +Y side of the spacecraft), a pop-up command antenna, and four conical spiral payload antennas (two sets of two antennas diametrically opposed along the Y-Y axis). Three solar aspect sensor are used for data accuracy purposes.

PAYLOAD DESCRIPTION

The TOPHAT payload consists of a main-beam receiver [redacted] 25X1

[redacted] 25X1

MISSION SUCCESS

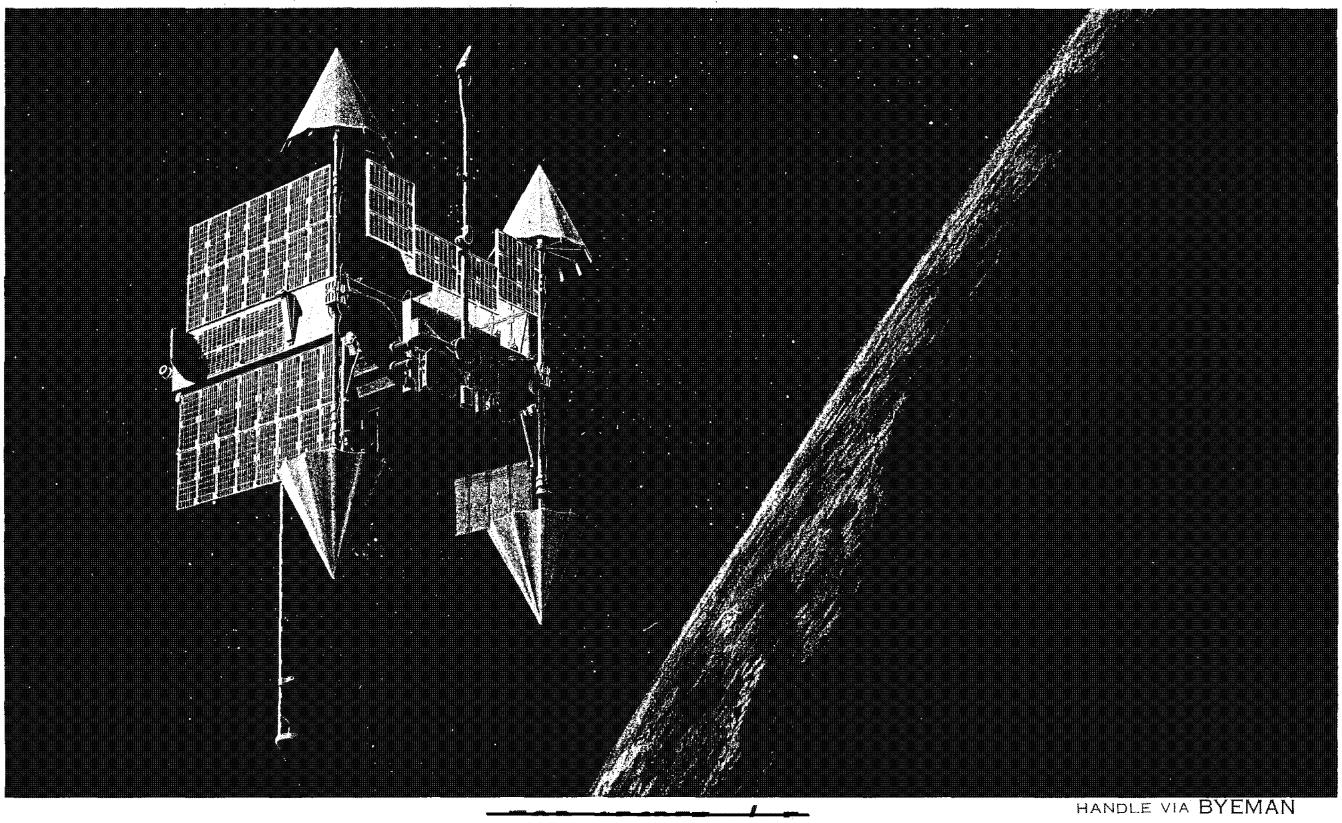
Excellent.

~~TOP SECRET / E~~

HANDLE VIA BYEMAN CONTROL SYSTEM

~~TOP SECRET / E~~

SPACECRAFT 4423/TOPHAT



HANDLE VIA BYEMAN

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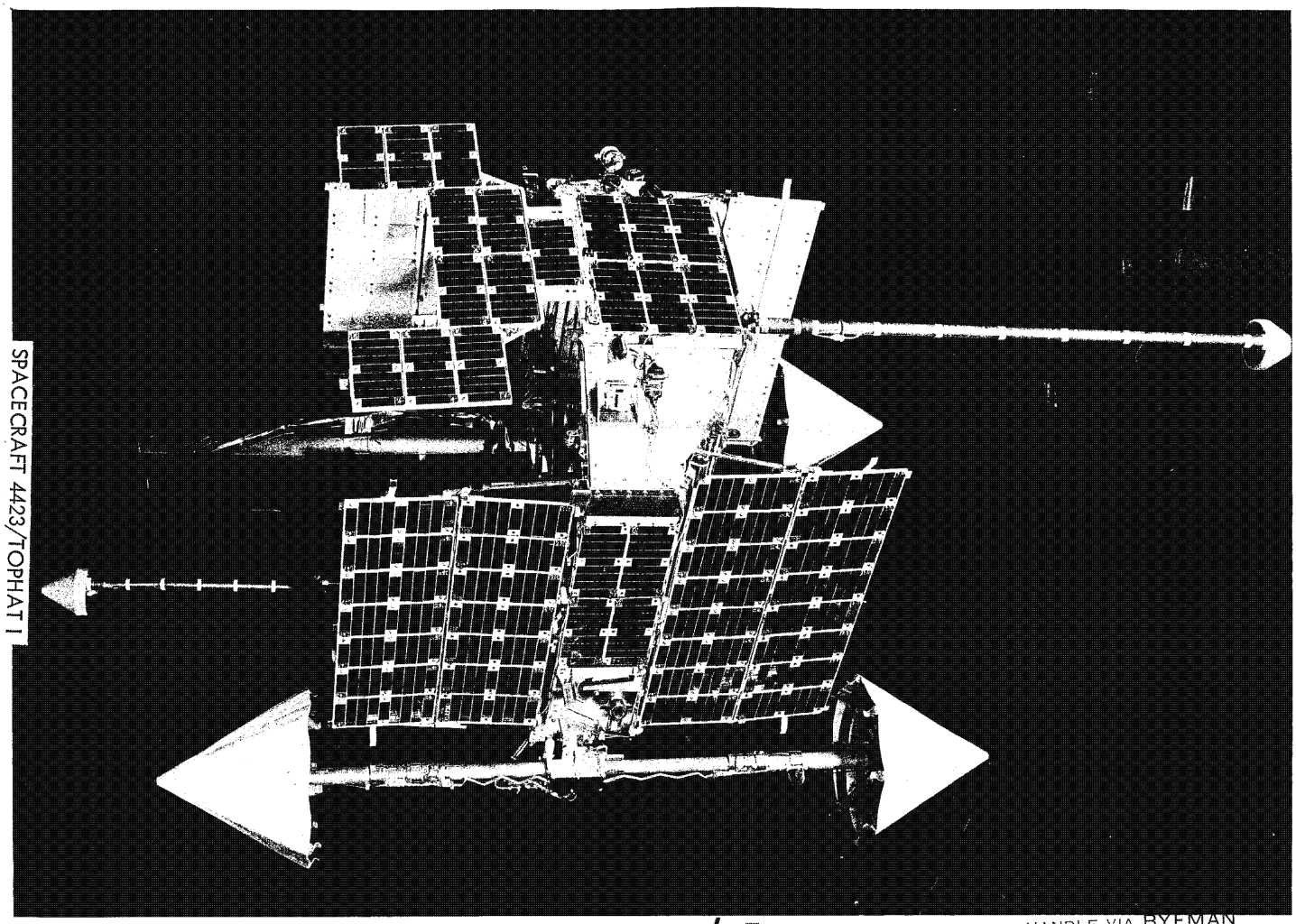

SPACECRAFT 4423/TOPHAT I

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HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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SPACECRAFT 4424/MABELI

MISSION OBJECTIVES

Measure emitter main-beam polarization and power.

GENERAL DESCRIPTION

Spacecraft 4424 is another of the advanced structure type and is configured for a single power control unit (PCU) battery power system. This is the first spacecraft that provides on-orbit selection of the tape recorder read-in/readout ratio (i.e., 4:1 or 1:1). Also, Spacecraft 4424 is the first to make extensive use of a function bit driver to expand the real time command capability.

PAYLOAD DESCRIPTION

The MABELI system covers selected portions of the frequency spectrum from 151 MHz to 2.5 GHz in three bands: low band (151 to 165 MHz), medium band (387 to 426 and 861.8 to 964.2 MHz), and high band (1.5 to 2.5 GHz). The low-band antenna consists of a truncated cone containing two 4-arm spirals fed from the center to provide both senses of circular polarization. A pair of similar conical spiral antennas covers the medium band. The high-band antennas are similar in design to the intermediate-band antennas and perform the same function.

The payload itself consists of four dual-channel receivers, parameter encoders, and signal recognizer and threshold circuitry. A frequency-tracking predetection subsystem provides predetection recording of frequency-agile emitters operating in the lower frequency bands. A polarimeter subsystem permits polarization measurements to be made. The encoded data are applied to a data handler and PCM formatter subsystem for recording and later transmission

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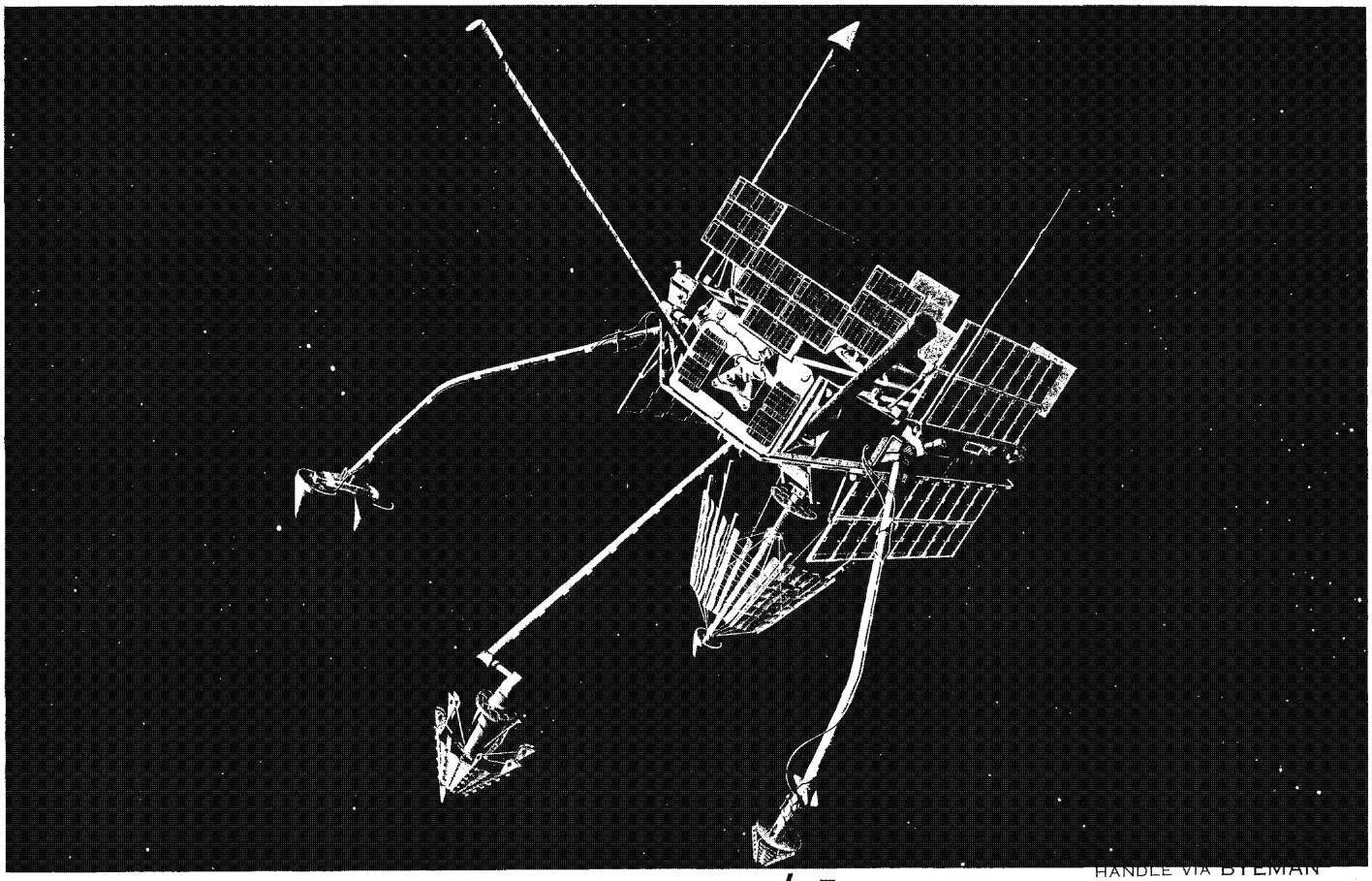
SPACECRAFT 4424/MABELI ~~(S)~~



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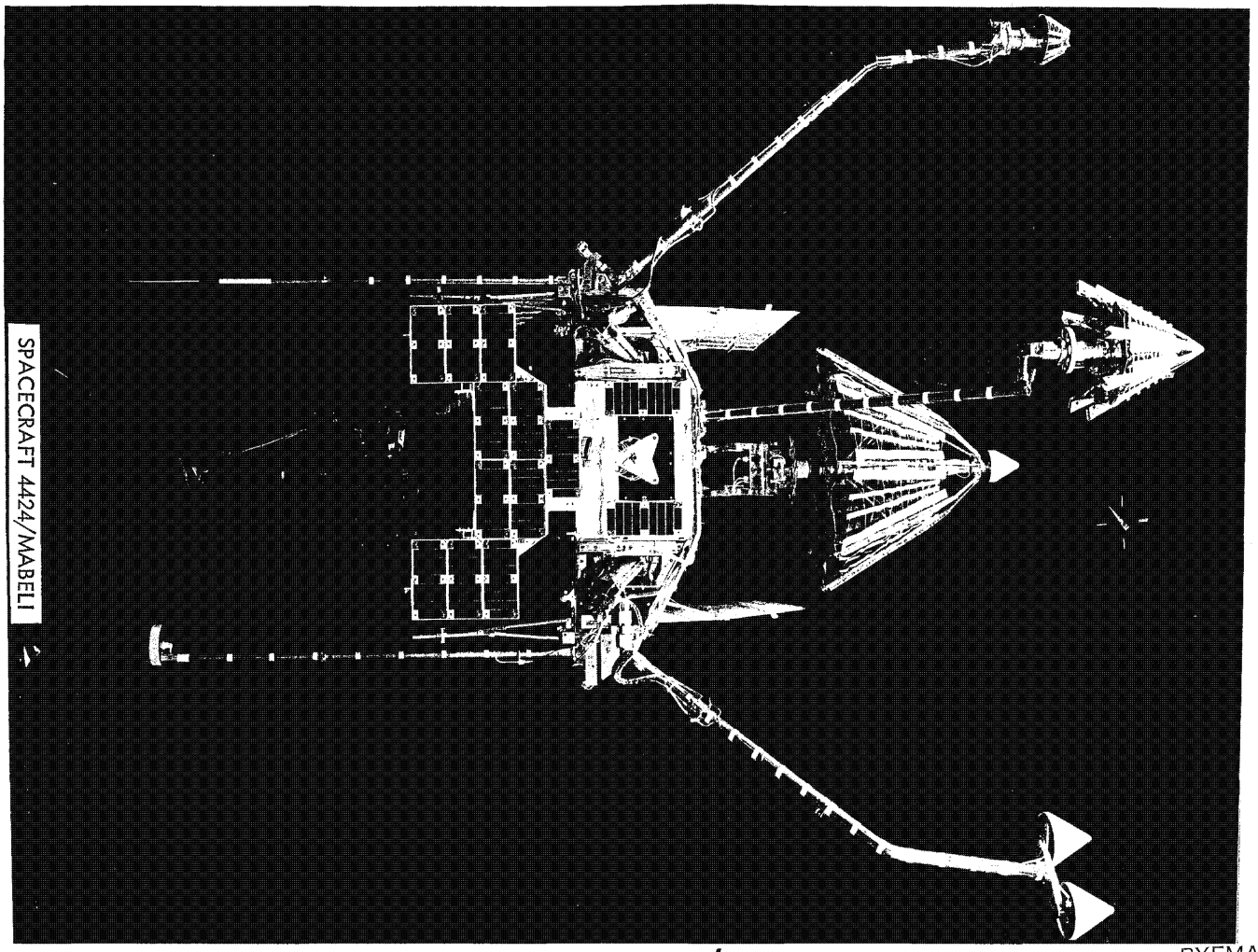

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HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

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SPACECRAFT 4427/ARROYO

MISSION OBJECTIVE

Recognition and geopositioning of microwave communications repeaters.

GENERAL DESCRIPTION

Spacecraft 4427 is the first of the program spacecraft to have the electrical axis of its parabolic DF antenna parallel to the spacecraft spin axis. [redacted] 25X1
This spacecraft is also the first to make operational use of a magnetic attitude control system (ACS) in support of mission tasking. The ACS maintains the spacecraft spin axis to within a few degrees of the orbit plane at a nominal inclination of 55°N latitude.

PAYLOAD DESCRIPTION

The ARROYO system consists of a dual-channel monopulse receiver having two RF front ends per channel, a receiving antenna system, a signal recognizer, and a data handler. The low-band (1.2 to 2.2 GHz) and high-band (3.4 to 3.9 GHz) front ends each receive signals from two low-gain, spiral omni inhibit antennas and from a dual-feed 6-foot parabolic antenna.

Direction finding using the 6-foot antenna is accomplished by sensing the amplitude ratio between two feeds, converting this ratio to a phase difference, and measuring the phase difference to establish direction of arrival. Direction finding using the omni antennas is done by measuring the phase difference of signals received by the two omni antennas.

Valid signals are processed by the signal recognizer and routed to the data handler where digital and analog data signals are combined with certain spacecraft-generated signals and applied to a two-channel tape recorder for later transmission to selected ground stations via two S-band transmitters.

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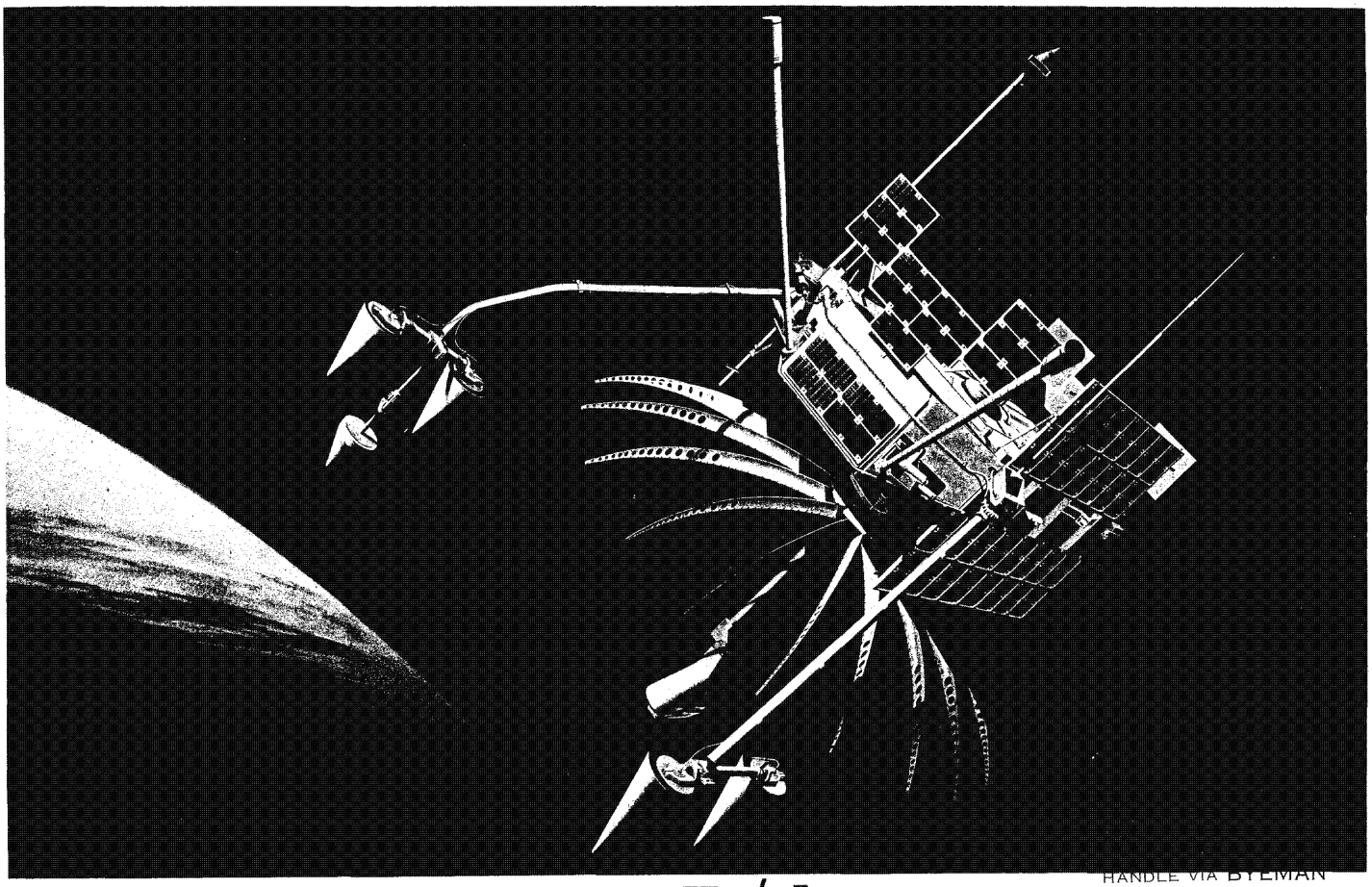
SPACECRAFT 4427 /ARROYO



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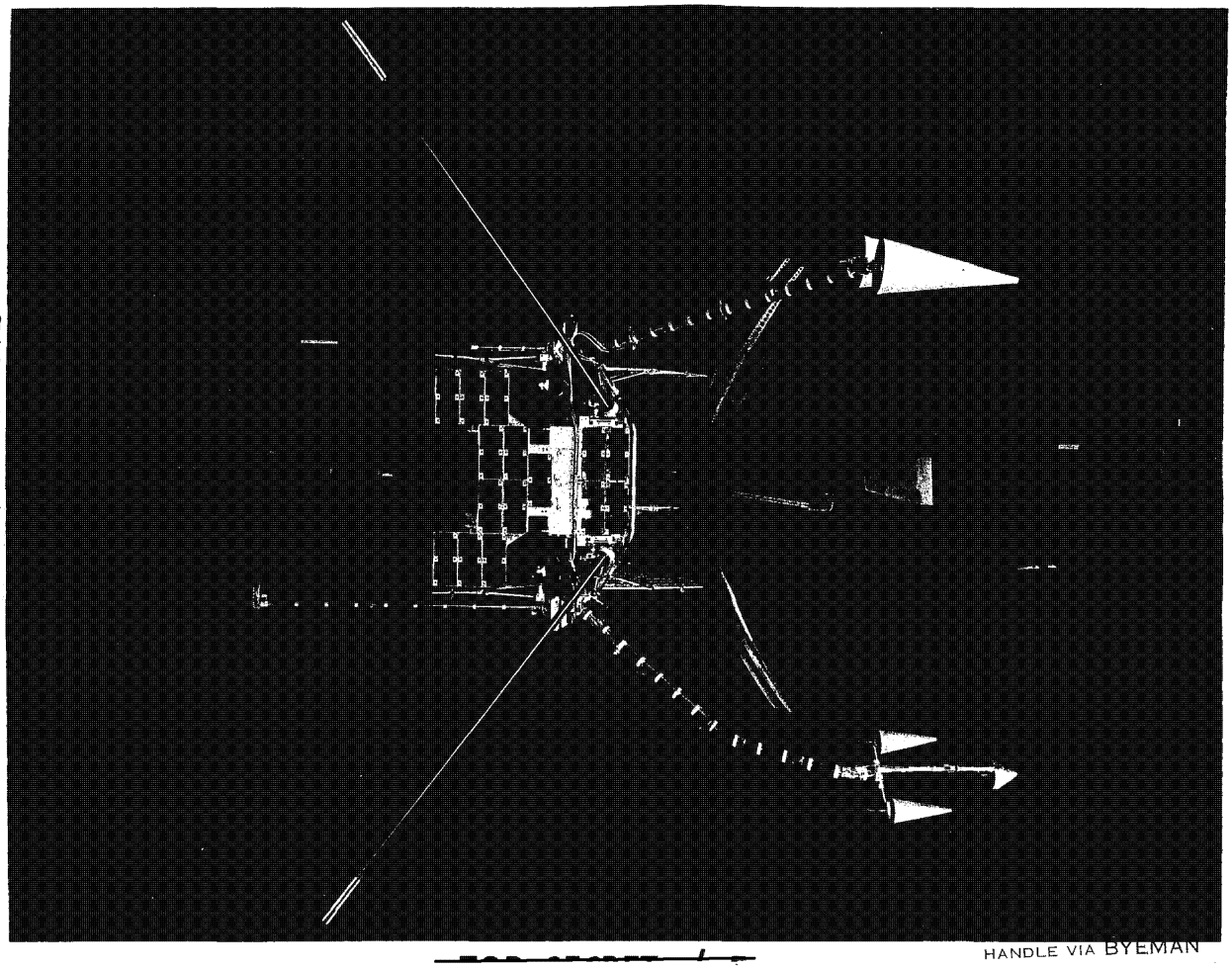
CONTROL SYSTEM ONLY



SPACECRAFT 4427/ARROYO

Approved for Release: 2024/08/06 C05098592

SPACECRAFT 4425/URSALA I

MISSION DESCRIPTION

General search for pulse emitters.

GENERAL DESCRIPTION

Spacecraft 4425 will incorporate an attitude control subsystem (ACS) to control the position of its spin axis for better sun angles and for better target interceptions. In addition, it will use a spin rate control system to maintain the spacecraft spin rate at approximately 55 rpm.

PAYLOAD DESCRIPTION

Target signals will be collected by two antennas: a high-gain, 6-foot-diameter parabolic antenna (2 to 8 GHz), and a high-gain, 3-foot-diameter parabolic antenna (4 to 12 GHz). A beam-forming network in each antenna feed will generate sum and difference antenna patterns to develop monopulse DF error signals. Two 2- to 12-GHz conical spirals will be used to inhibit reception on the side-lobes and back-lobes of the parabolic antennas.

The URSALA system differs from previous EOB systems in two principal respects: use of a monopulse DF capability and digitization of most system data. To accomplish the unambiguous direction-of-arrival determination on a pulse-by-pulse basis, error signal are generated in two orthogonal planes on a single pulse. Sum and difference signals from the high-gain parabolic antennas are compared. [redacted] 25X1 and the phase difference determines the azimuth angle about the boresight. Most system outputs will be digitized to provide maximum compatibility with ground data processing systems and to provide greater immunity to bit error resulting from random noise effects.

~~TOP SECRET / E~~

SPACECRAFT 4425/URSALA I ~~(S)~~