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NASA
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546
TELS. WO 2-4155
WO 3-6925

FOR RELEASE: MONDAY AM'S
May 17, 1965

RELEASE NO: 65-151

PROJECT: PEGASUS II (SA-8)

CONTENTS

To be launched no earlier than May 25.

NEWS NASA

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NASA TO LAUNCH SECOND PEGASUS METEOROID SATELLITE

The National Aeronautics and Space Administration will launch the second Pegasus meteoriod technology satellite no earlier than May 25 from Cape Kennedy, Fla.

The primary purpose of the flight is to gather information on the frequency of meteoroids to be encountered in the near-Earth environment for use in the design of future manned and unmanned spacecraft. This information is vitally needed with the increased emphasis on larger, long-life spacecraft, and the mission of the three-flight Pegasus program is to provide the research and technology to cope with the meteoroid hazard.

Meteoroid protection in spacecraft design at present is based on limited data and conservative estimates of the potential space hazard.

- more - 5/6/65

The one and one-half ton spacecraft is an improved version of Pegasus I which has been circling the Earth since February 16, 1965. The satellite will be launched by Saturn I (SA-8) in its ninth and next to the last flight before NASA begins development flights of Saturn IB next year.

Pegasus B will have orbital elements almost coinciding with those of Pegasus I: perigee, 317 statute miles; apogee 466 statute miles; inclination to equator, 31.8 degrees; and orbital period, 97 minutes. If Pegasus B is successfully placed in orbit, it is expected to send back meteoroid data to ground stations for at least one year. It may remain in orbit around the Earth for three years or more.

Pegasus is the largest instrumented satellite developed by NASA. The large panels which the satellite will expose to the meteoroid environment are 96x14 feet, offering 2,300 square feet of instrumented surface. As particles collide with this surface, the penetrations will be registered and reported to Earth.

The outward appearance of the Saturn I launch vehicle matches that of the last three Saturn I's. Atop a launch vehicle is the Apollo spacecraft: boilerplate command and service modules plus the launch escape system tower. Pegasus will be folded inside the specially-adapted service module. After injection into oribt, the command and service modules will be jettisoned and the Pegasus satellite will be free to deploy its panels. The two Apollo modules will enter a similar but separate orbit.

Except for the operation of the launch excape system tower, no engineering tests are planned with the Apollo hardware being flown.

The SA-8 is 188 feet tall, develops 1.5 million pounds thrust in the first stage, and weighs at liftoff about 1,130,000 pounds.

The Pegasus in orbit will remain attached to the Saturn vehicle's instrument unit and top (S-IV) stage. Overall, this assembly is about 70 feet long and will weigh about 23,000 pounds, although the Pegasus ifself will weigh about 3,200 pounds. A breakdown of the weight follows:

Spent S-IV state	14,600 pounds
Instrument Unit	2,600
Pegasus	3,200
Pegasus support structure and adapter	2,700
	23,100 pounds

At the beginning of the orbit about 1,000 pounds of left-over propellant and gases will remain in the S-IV stage. It will gradually evaporate during the first few orbits, and is not counted in this total.

The weight of the two Apollo modules, plus associated hardware in a separate orbit is 9,700 pounds, so the total weight in orbit as a result of this launching will be 33,800 pounds.

Pegasus will be visible to the unaided eye under favorable conditions near dawn and dusk. As in the cases of previous large satellites, NASA plans to issue predictions of possible sightings for major cites.

The Marshall Space Flight Center under the direction of NASA's Office of Manned Space Flight is in charge of Saturn development. Marshall is also responsible for development of Pegasus under direction of the NASA Office of Advanced Research and Technology. The Kennedy Space Center is in charge of launchings, and the Manned Spacecraft Center provided the Apollo hardware. Marshall Space Flight Center, Huntsville, Alabama.

(END OF GENERAL NEWS RELEASE - BACKGROUND INFORMATION FOLLOWS)

Flight Sequence

SA-8 will be fired from Launch Complex 37, Cape Kennedy. At nine seconds after launch, it will begin a roll into the flight azimuth of 105 degrees. At the same time the pitch program will begin. The following significant events occur in the S-I (booster) phase of powered flight:

Roll maneuver ends, T (time from liftoff) + 24 seconds: Mach one velocity reached, T+56; maximum dynamic pressure enountered, T+68, (975 mph); pitch program arrested, T+138; inboard engines cutoff, T+144; outboard engines cutoff, T+150.

Booster cutoff occurs at 55 miles altitude, 49 miles downrange from the launch site, while the body is traveling at about 6,000 mph.

In the next two seconds, the S-IV separates from the S-I, S-IV stage ullage rockets ignite, S-I retrorockets fire, and the six S-IV engines ignite. Ten seconds later, at T+162, the S-IV ullage motor ceases and the Launch Escape System (LES) tower is jettisoned. Path-adaptive guidance is initiated at T+168 seconds.

The guidance system initiates S-IV cutoff at about T+629 seconds. The satellite is placed in orbit with a velocity of about 16,200 mph. Insertion occurs some 1200 miles downrange from the launch site. Inclination to the equator will be 31.8 degrees.

During flight the vehicle will telemeter to ground stations some 1394 measurements of rocket performance, as follows: S-1 561; S-IV stage, 412; and instrument unit, 242. Additionally, the Pegasus will telemeter 179 measurements.

As on the previous vehicle, SA-8 carries one television camera, mounted on the interior of the service module adapter, which will provide pictures of Pegasus deploying in space.

The S-IV spacecraft unit will "coast" for three minutes following S-IV cutoff. At T+810 seconds the Apollo command and service modules will be separated from the S-IV, through the use of spring mechanisms leaving the Pegasus ready to expand. One minute later, at T+870 seconds, motors are energized and the structure is deployed in steps covering a period of about 60 seconds.

Pegasus Satellite

Pegasus B follows its successful predecessor as the second major satellite in the meteoroid technology research program. Pegasus I, launched February 16, is presently in an elliptical orbit ranging from about 309 to 463 statute miles altitude. Primary mission data -- meteoroid penetration measurements -- are being accumulated continuously, but data analysis is not yet complete.

Meteoroid hit data gathered by Pegasus B will add to the knowledge gained by Pegasus I as to the hazard to spacecraft from meteoroids in near-Earth space. This information is becoming increasingly more important to designers as the emphasis on larger, long-life spacecraft increases.

NASA began development of the Pegasus, named for the mythical flying horse, in February, 1963. Pegasus B will be followed later this year by Pegasus C, the last of three such satellites planned for launch by Saturn I vehicles.

Project Pegasus is directed by the NASA Office of Advanced Research and Technology. The Marshall Space Flight Center has project management responsibility for Pegasus. The prime contractor on Pegasus is the Fairchild Hiller Corp. Design and electronics work was done by the firm's Space Systems Division at Bladensburg and Rockville, Md. Final assembly and checkout was completed at the Aircraft-Missiles Division facility at Hagerstown, Md.

Description of Spacecraft

With its detector panels folded inside the Apollo service module, Pegasus B is 17 feet 4 inches high, 7 feet wide and 7 feet 11 inches deep. Its two main sections are the center section and "wing" assemblies. The satellite's framework is made of riveted aluminum alloy extrusions.

The center section is mounted on an adapter permanently attached to the forward end of the launch vehicle's second stage, the S-IV. The center section provides a mounting for the satellite's electronics cannister, solar power panels, sensors and the wing deployment mechanism.

Each wing consists of seven frames joined by hinges which are spring-loaded to unfold the wings in accordion fashion. The unfolding action is controlled by a scissors linkage connected to a motor and torque tube assembly. The assembly prevents the wings from deploying too rapidly and serves as a stand-by source of force to complete wing deployment in the event the spring-loaded hinges fail.

Rectangular panels measuring 20 by 40 inches are mounted in the wing frames. Each wing has one eight-panel frame and six 16-panel frames, or a satellite total of 14 frames providing mountings for 208 panels.

The outer surface of each panel carries a "target" sheet of aluminum. A sheet of Mylar plastic, coated with a thin layer of copper is bonded to the back of the aluminum target sheet. This "sandwich" forms a capacitor when an electrical potential is established between the two metals.

Each capacitor sandwich is mounted on a 20 by 40-inch piece of foam about one inch thick. On the opposite side of the foam "core" another capacitor sandwich is mounted. In this manner a total of 416 capacitors are mounted back-to-back in the 208 spaces in the wing frames.

Eight panels have aluminum sheets .0015 inch (1.5 mils) thick. Data from these panels can be compared with data from similar panels on Explorers XVI and XXIII, earlier, smaller meteoroid satellites launched by Scout vehicles. Aluminum sheets of 17 panels are .008 inch (8 mils) and of the remaining 183 panels .016 inch (16 mils) thick Back-to-back capacitors are identical.

The panels are subdivided into 62 logic groups of from two to eight capacitors each. The capacitors are interconnected so that the satellite electronics package sees each logic group as one capacitor. A meteoroid hit on any panel will be registered as a hit on the logic group in which that panel is located.

Some capacitors on Pegasus I shorted in orbit, and it was necessary to disconnect the logic groups in which the defective capacitors were located. Disconnecting these logic groups prevented the further transmission of false information from the satellite to Earth and eliminated the logic groups as drains on the Pegasus power supply. However, disconnecting logic groups removed good as well as bad capacitors from the overall detection system.

The exact cause of the short circuts has not been determined but investigation has revealed that all but three of the capacitors which shorted did so only at temperatures above 160 degrees F. Such high temperatures could occur when panel aluminum surfaces are directly facing the Sun.

An improved manufacturing technique is producing capacitor panels which, it appears, will be better able to withstand the high temperatures without shorting.

A new fusing arrangement has also been incorporated in the meteoroid detection system of Pegasus B to fuse individually each capacitor. This will enable project personnel to disconnect a single malfunctioning capacitor but leave the other capacitors in the same logic group operating. If a malfunction occurs which is serious enough to warrant disconnection of the entire logic group, this can still be done by ground command.

The fuses can be blown by 100 milliamps (.1 amps) of current. The ground command to blow a capacitor fuse may "heal" the capacitor instead of blowing the fuse, depending upon the cause of the short. Each capacitor "healed" in this manner would be a bonus benefit.

Each time a capacitor is penetrated by a meteoroid, the material removed by the impact is vaporized, forming a conducting gas which discharges the capacitor. The gas, called plasma, dissipates almost immediately and the capacitor recharges within three one-thousandths of a second. If seen on the screen of an oscilloscope, the "blip" caused by a penetration and momentary discharge of the capacitor would be a sharp saw-tooth below the horizontal line. These blips are characteristic for each group of panels, providing a means of determining which group contained the penetrated panel.

When a panel is penetrated, several items of related information must be recorded: a cumulative count of hits classified according to panel thickness; an indication of the panel group penetrated; attitude of the sattelite with respect to both the Earth and the Sun; temperature at various points on the spacecraft; the time at which each hit is recorded; and the condition of the power supply and other equipment supporting overall spacecraft operation.

Various levels of impact energy will be differentiated through use of the panels of three different thicknesses. Directional information will be gained by using a combined solar sensor-Earth sensor system.

The Pegasus electronic system registers meteoroid penetrations of panel groups and stores a record of panel thickness, group number and time of penetration. Pegasus attitude and certain temperatures are recorded on a timed schedule.

Upon ground command, all recorded information is read out of the Pegasus memory system and telemetered to the ground. A second beacon telemeter transmits "housekeeping" and total meteoroid count data continuously throughout the mission. The spacecraft has two telemetry links with a total of 179 measurements.

A digital command system provides for on-off control of various system components, circuit replacement, certain in-flight tests and other control functions. A solar cell battery (nickel-cadmium) power supply provides all power for Pegasus for its one-year life. The batteries are recharged by energy from the solar cells.

Other Industrial Participants

Other industrial firms involved in significant aspects of Pegasus development and their contributions include: Adcole Corp., Cambridge, Mass., solar aspect sensors; Barnes Engineering Co., Stamford, Conn., horizon sensor system; Aluminum Co. of America, Pittsburgh, structural extrusions; Di/An Controls, Boston, system clock and core memory; Space Craft Inc., Huntsville, beacon transmitter; United Electro-dynamics Corp., Pasadena, temperature sensor; United Shoe Machinery Corp., Beverly, Mass., harmonic drive; G. T. Schjeldahl Co., Northfield, Minn., detector panels; Bulova Watch Co., Flushing, N. Y., timer; Norden Division, United Aircraft Corp., Norwalk, Conn., shaft encoder; Keltec Industries, Alexandria, Va., antenna, batteries and other components; Motorola, Scottsdale, Ariz., diplexer, hybrid ring, low pass filter, RCA, Montreal, FM transmitter; AVCO Corp., Cincinnati, command receiver; Consolidated Systems Corp., Monrovia, Calif., command decoder; Applied Electronics Corp., Metuchen, N.J., PCM and PAM commutators; Space Technology Labs., Redondo Beach, Calif., electron spectrometer; General Electric Co., Philadelphia, RTV-11 sealant and enviromental testing; Corning Glass Works, Electronic Products Division, New York, glass resistors; Vinson Engineering, Van Nuys, Calif., actuator (back-up for the motor gearbox); Eastern Air Devices, Dover, N. H., drive motor; Ion Physics Corp., Burlington, Mass., design assurance radiation testing; Washington Video Productions, Washington, D.C., technical documentation films; Hayes International Corp., Birmingham, Ala., design assurance particle impact testing; and Dynatronics, Orlando, Fla., specialized PCM Data Readout Units (GSE).

SA-8 Launch Vehicle

The Pegasus B satellite will be launched by a two-stage Saturn I rocket designated SA-8. It is virtually identical to the Saturn I (SA-9) which was used in February to launch the first Pegasus into orbit.

All Saturn I boosters (S-I stages) launched to date have been built and tested by the NASA-Marshall Space Flight Center. The SA-8 booster, however, was built and ground-tested by the Chrysler Corp.--the first flight unit to come from the prime S-I contractor, and the first peice of flight hardware to be produced at the large Michoud Operations in New Orleans. Michoud is a former Ordnance plant which was taken out of mothballs by NASA and converted into a Saturn I and Saturn V booster production plant. Its reactivation was begun in late 1961.

The secnd stage (S-IV) of the Saturn I, was built and tested by Douglas Aircraft Missiles and Space Division. It was produced at Santa Monica and tested at Sacramento.

This will be the fifth flight of the Saturn I with a Douglas-built S-IV stage.

The SA-8's instrument unit (IU) is an unpressurized version which has been trimmed to about half the weight of the instrument units flown on several earlier Saturn I's. The first unpressurized instrument unit was aboard the Saturn I (SA-9) launched in February. These IU's were built and tested by MSFC.

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S-I STAGE -- Chrysler built the S-I stages for the SA-8 and SA-10 at Michoud Plant in New Orleans. The firm is also providing first stages for the more advanced Saturn I-B vehicle.

The S-I stage is 21.4 feet in diameter and 80.3 feet long. It will weigh almost a million pounds when fueled with some 880,000 pounds of liquid oxygen and RP-1 (kerosene) propellants.

Eight Rocketdyne H-1 engines power the stage. Each H-1 engine produces 188,000 pounds of thrust. The engines will run at a rated thrust of 1,500,000 pounds or 32,000,000 horesepower at maximum velocity.

The S-I was developed by the Marshall Center. The S-I-8 and all other Chrysler-made stages are tested by the company at the Marshall Center.

S-IV STAGE -- The SA-8's Douglas-built second stage (S-IV-8) is 18.5 feet in diameter, 41.5 feet long and weighs some 14,600 pounds empty. It carries about 100,000 pounds of propellant for about eight minutes of propelled flight.

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Six Pratt and Whitney RL-10 engines, each having 15,000 pounds thrust for a combined output of 90,000 pounds, power the stage. The engines burn liquid hydrogen and liquid oxygen, a high-energy combination which produces more than one-third additional thrust per pound of propellants than hydrocarbon combinations.

The RL-10 engine is the country's pioneer LH2 power plant. It underwent its first in-space operation serving as the Centaur propulsion system late in 1963. The engines functioned well in Saturn flights SA-5, 6, 7, and 9.

<u>INSTRUMENT UNIT</u> -- The instrument unit (IU) is the "brain" or "nerve center" of the SA-8 vehicle. Commands for engine gimbaling, inflight sequencing of engine propulsion system, staging operations and all primary timing signals originate in the IU.

Pressurized units were flown on the fifth, sixth, and seventh Saturn I vehicles.

The SA-8 unpressurized instrument unit is 154 inches in diameter, 34 inches high and weighs some 2,600 pounds. Components are mounted on the inside perimeter of the IU wafer. The unit has a preflight nitrogen purge system to prevent gaseous oxygen and gaseous hydrogen from collecting in the unit and possibly being ignited by a spark.

The Marshall Center is responsible for integration of the SA-8 instrument unit. International Business Machines Corp. will assume full integration responsibilities as "prime contractor" early in the Saturn IB program.

Major suppliers of instrumentunit components are Electronics Communications Inc., St. Petersburg, Fla., control computer; Bendix Corp., Teterboro, N.J., ST-124-M inertial platform; and IBM Federal Systems Division, Owego, N.Y., launch vehicle digital computer and launch vehicle data adapter.

SATURN I LAUNCHES -- Previous Saturn I rockets were launched Oct. 27, 1961; April 25 and Nov. 16, 1962; March 28, 1963; Jan 29, May 28, and Sept. 18, 1964; and Feb. 16, 1965.

Launch Preparations

The SA-8 launch team, headed by Kennedy Space Center personnel, conducts the countdown from Launch Complex 37, Cape Kennedy. During the final count, the blockhouse will be manned by about 250 launch personnel from the KSC, MSFC, and the major Saturn and Pegasus contractors.

The location of Pegasus I in orbit will be a determining factor on SA-8 liftoff time, since plans call for maintaining a considerable distance -- about 60 degrees -- between the two satellites as they circle the Earth.

The vehicle's first stage was erected on pad 37B shortly after its arrival at the Saturn dock aboard the barge, Promise, Feb. 28. The S-IV second stage was flown in two days earlier, Feb. 26.

On March 17, the S-IV and instrument unit were taken to Complex 37 for erection and mating to the booster. The series of systems tests of the launch vehicle followed, including radio frequency checks, tanking procedures, and simulated flights.

The Pegasus spacecraft was shipped to the Cape in a Boeing 377 (PG) aircraft (modified Stratocruiser) April 15. Final pre-mating systems tests and panel deployment checks from the 96-foot satellite were run as it was enclosed in its Apollo shell housing. The satellite was mated to the launch vehicle April 28 when final overall systems test began.

This will be the fifth Saturn launching conducted at pad B, complex 37. The first four Saturns in the program, designated Block I, were launched from Complex 34 nearby. Complex 34 is now being modified for the Saturn IB program, with the first launch planned for early 1966.

Complex 37, on the northern tip of Cape Kennedy, has two launch pads, designated A and B, and covers some 120 acres. The 310-foot mobile service structure weighs 10,000,000 pounds. The tower and the blockhouse serve both launch pads at Complex 37.

The launchpad consists of a 47-foot metal pedestal, which in its center has a 12-sided, 32-foot diameter opening for escape of rocket exhaust. At liftoff, the exhaust will be dissipated by a twin-sloped flame deflector directly beneath the launch pedestal. The deflector, which is moved into position by rails, is coated with a concrete-like heat resistant material which minimizes damage from the rocket exhaust.

The launch countdown is conducted in two sections, the first covering a period of 400 minutes on T-1 day. The final countdown covers 605 minutes leading up to ignition of the eight engines and liftoff.

The highlights of the final phase of the count are as follows, with the last two minutes, 43 seconds controlled by an automatic sequencer system:

T-35 minutes -- S-IV liquid hydrogen loading complete.

T-25 minutes -- Radio frequency systems on

T-24 minutes -- Telemeter on

T-20 minutes -- C-Band, MISTRAM and ODOP (tracking systems) on

T-15 minutes -- Range safety command transmitter on

T-13 minutes -- Final phase internal power tests begin

T-10-12 minutes -- Telemetry calibration

T-5 minutes -- Ignition arming on

T-4 minutes -- Range clearance for launch

T-3 minutes, 40 seconds -- Arm destruct system

T-2 minutes, 43 seconds -- Launch sequence starts

T-2 minutes, 33 seconds -- S-IV power transferred to internal

T-28 seconds -- S-I, instrument power transferred to internal

T-3 seconds -- Ignition of eight booster engines

T-0 -- Liftoff.

Pegasus Tracking and Data Acquisition

The Pegasus mission requires extensive ground tracking and data acquisition support. To meet this requirement the Manned Space Flight Tracking Network along with certain elements of the Department of Defense Gulf and Eastern Test Ranges will support the Pegasus spacecraft through its first five orbits, after which Goddard Space Flight Center's STADAN (Space Tracking and Data Acquisition Network) will assume responsibility for monitoring and tracking the satellite.

On-board instrumentation will include a telemetry transmitter scheduled to last about 90 minutes and a C-Band radar beacon scheduled for a 20-minute life. The instrument unit and the Pegasus each have two 136-mc telemetry transmitters, one set to close down automatically after 18 months of continuous operation and one to remain dormant until interrogated. An interrogation command will activate the transmitter for 90 seconds. Performing only on command, this transmitter will not be shut down after a specified time.

Radar tracking will be accomplished by stations of NASA's Manned Space Flight Network while the C-Band beacon is active. During the first orbit, acquisition aid antennas associated with the C-Band radars will be used while the UHF telemetry beacon is active. After the C-Band beacon ceases to transmit, the radars will employ "skin" tracking (beam-bouncing) techniques until the end of the fifth orbit.

The STADAN will then track Pegasus for the full 18-month lifetime of the 136-mc telemetry transmitters. Upon beginning of reentry or 136-mc transmitter decline, orbital data responsibility will be shifted from Goddard's Data Systems Division (STADAN) to its Manned Space Flight Tracking Network computers. The MSFN will simultaneously resume tracking and data acquisition responsibility throughout reentry.

Optical tracking coverage will be provided by the Smithsonian Astrophysical Observatory's Optical Tracking Network (SAO) whenever visibility conditions permit. MOTS (Minitrack Optical Tracking System) will also be utilized.

Operational control of the Pegasus will be through the Pegasus Operations Control Center, Goddard Space Flight Center, Greenbelt, Md. Command functions required by the Marshall Space Flight Center will be accomplished through STADAN command facilities.

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NASCOM (NASA Communications Network) will utilize its SCAMA (Station Conferencing and Monitoring Arrangement) capability to interconnect the STADAN Control Center with network stations, Marshall Space Flight Center and Kennedy Space Center. Located within the Goddard Space Flight Center, SCAMA is an auxiliary, manually operated, switching console that instantaneously connects, disconnects or brings together any combination of STADAN and/or MSFN Tracking stations throughout the world. It is "home office" and operational nerve center of NASA's worldwide voice communications network.

Goddard's MSFN real-time computing system will determine orbital insertion conditions, provide the network with acquisition information during early phase of the mission. During reentry period the real-time system will be used for predictions and impact determination. For the Pegasus during deployment phase, GSFC Data Systems Division will provide the network with orbital and prediction data utilizing Minitrack tracking data.

-End-

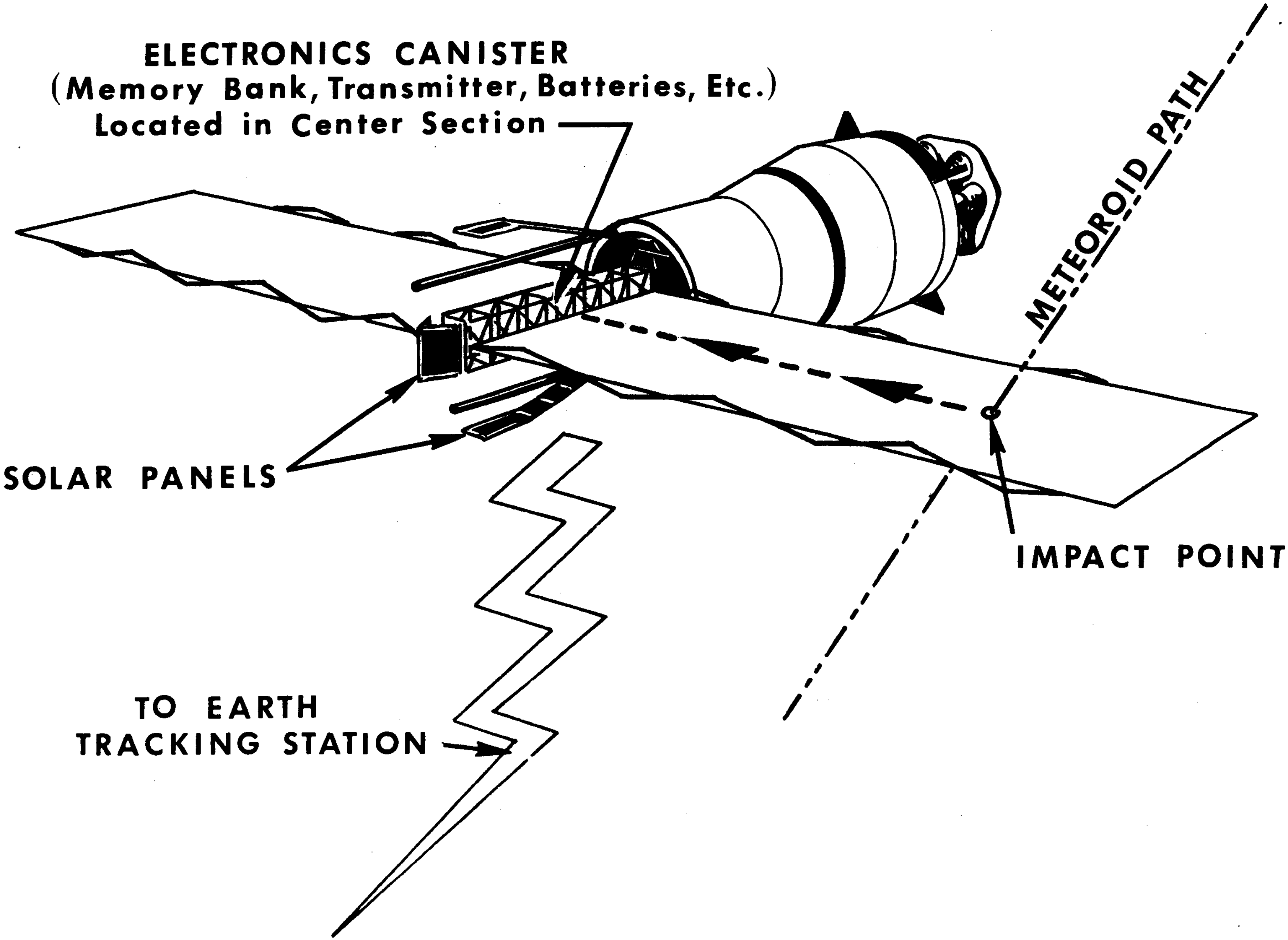
Network Configuration and Control

MSFN		STADAN		SAO	
Cape Kennedy	T	Fort Myers	MON	Organ Pass	B
Patrick AFB	R	Johannesburg	MON	Jupiter	B
Merritt Island	R	Woomera	MON	Curacao	B
Bermuda	RT	Goldstone	MON	Villa Dolores	B
Grand Turk Island	RT	Santiago	MON	San Fernando	B
Antigua	NRT	Quito	MON	Shiraz	B
Ascension	NRT	Lima	MON	Olifantsfon-tein	B
Pretoria	NRT			Naini Tal	B
Tananarive	T			Tokyo	B
Carnarvon	RT			Maui	B
Hawaii	RT			Island Lagoon	B
California	RT			Arequipa	B
Guaymas	T				
White Sands	R				
Texas	T				
Eglin	RT				

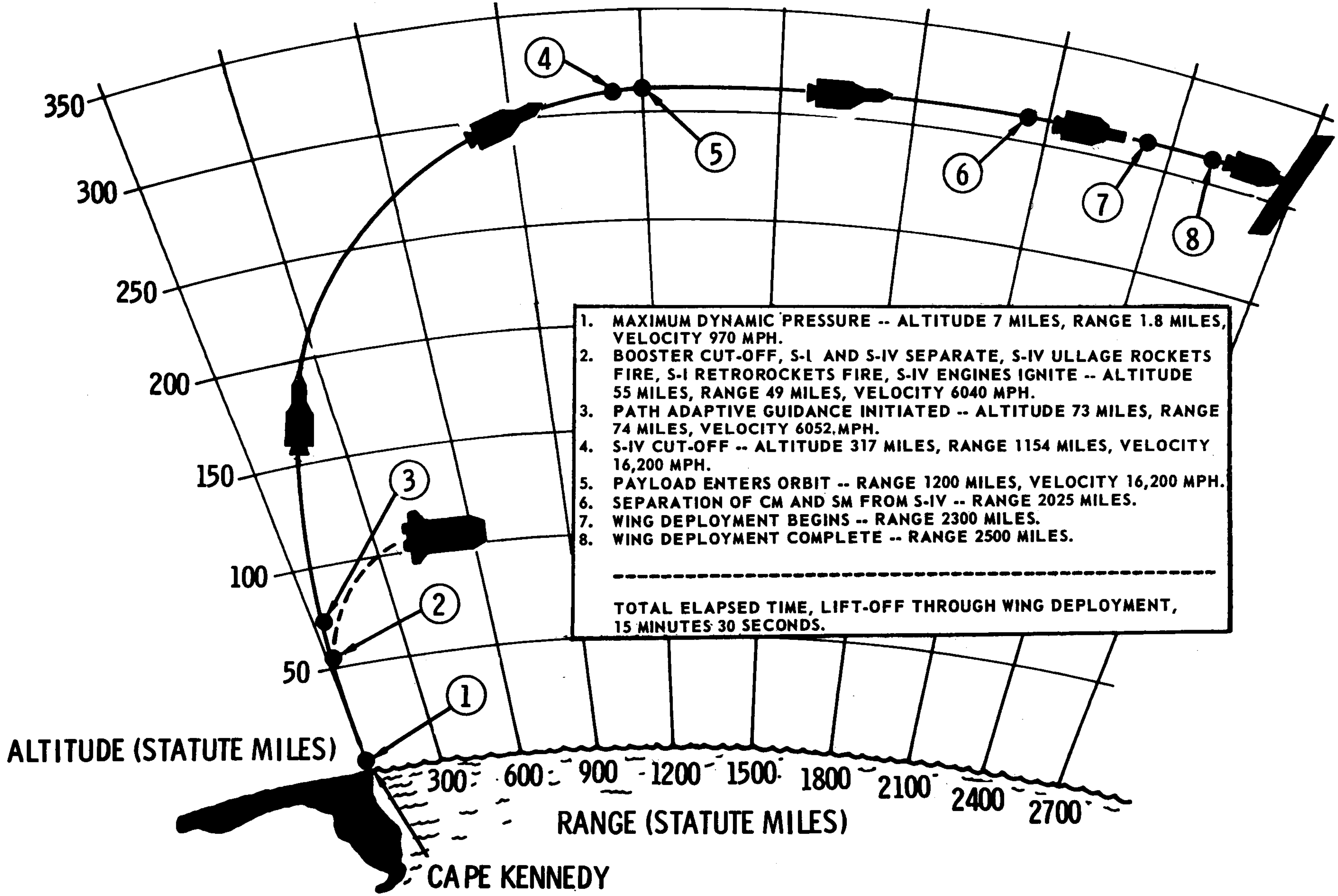
Legend:

R-C-Band Radar
T-UHF Telemetry (255-260 mc)
M-Minitrack Tracking (136 mc)
B-Baker-Nunn Optical Tracking
O-STADAN Optical Tracking System
N-Pegasus Spacecraft Telemetry (136 mc)

PEGASUS 'FINDS' A METEOROID

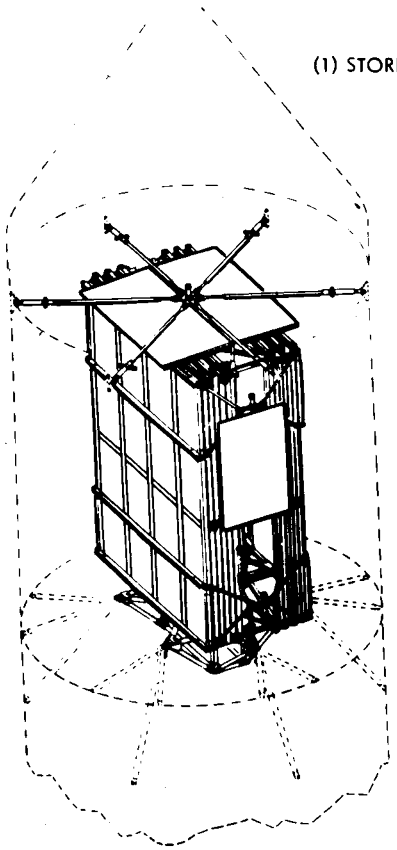


SATURN SA-8 TRAJECTORY

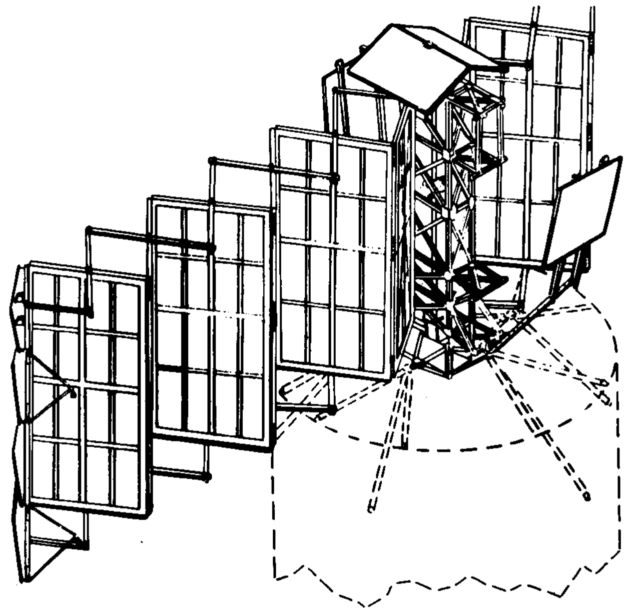


1. MAXIMUM DYNAMIC PRESSURE -- ALTITUDE 7 MILES, RANGE 1.8 MILES, VELOCITY 970 MPH.
2. BOOSTER CUT-OFF, S-I AND S-IV SEPARATE, S-IV ULLAGE ROCKETS FIRE, S-I RETROROCKETS FIRE, S-IV ENGINES IGNITE -- ALTITUDE 55 MILES, RANGE 49 MILES, VELOCITY 6040 MPH.
3. PATH ADAPTIVE GUIDANCE INITIATED -- ALTITUDE 73 MILES, RANGE 74 MILES, VELOCITY 6052 MPH.
4. S-IV CUT-OFF -- ALTITUDE 317 MILES, RANGE 1154 MILES, VELOCITY 16,200 MPH.
5. PAYLOAD ENTERS ORBIT -- RANGE 1200 MILES, VELOCITY 16,200 MPH.
6. SEPARATION OF CM AND SM FROM S-IV -- RANGE 2025 MILES.
7. WING DEPLOYMENT BEGINS -- RANGE 2300 MILES.
8. WING DEPLOYMENT COMPLETE -- RANGE 2500 MILES.

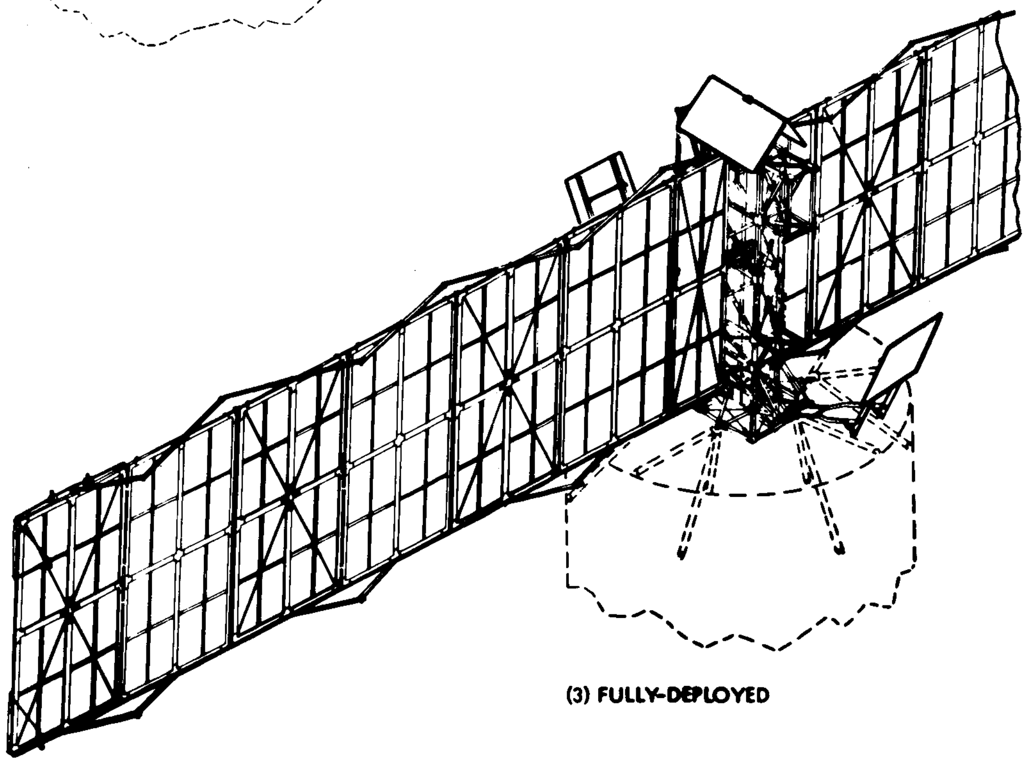
TOTAL ELAPSED TIME, LIFT-OFF THROUGH WING DEPLOYMENT, 15 MINUTES 30 SECONDS.



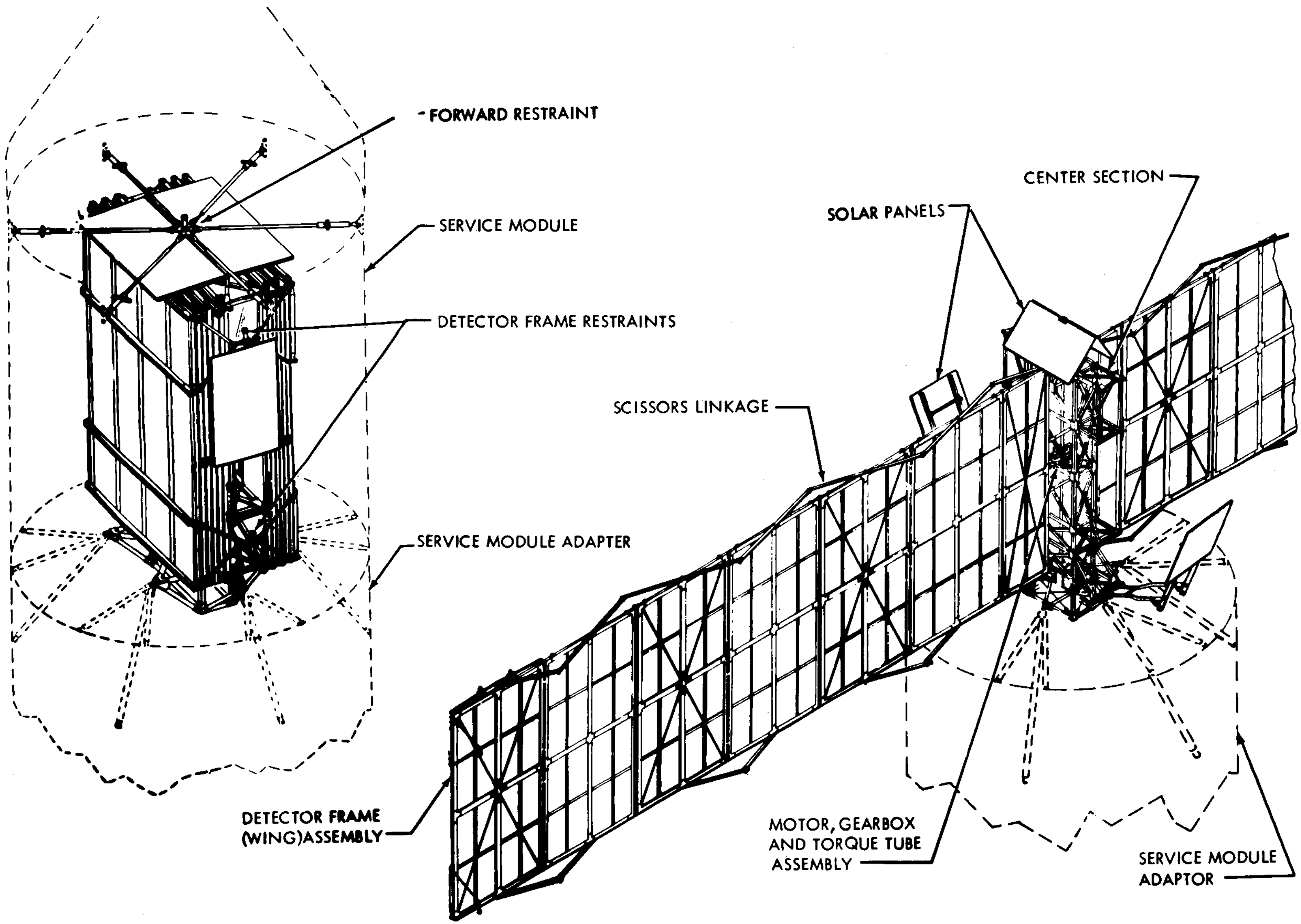
(1) STORED



(2) SEMI-DEPLOYED



(3) FULLY-DEPLOYED


FORWARD RESTRAINT
SERVICE MODULE
DETECTOR FRAME RESTRAINTS
SERVICE MODULE ADAPTER
DETECTOR FRAME (WING)ASSEMBLY
SCISSORS LINKAGE
SOLAR PANELS
CENTER SECTION
MOTOR, GEARBOX AND TORQUE TUBE ASSEMBLY
SERVICE MODULE ADAPTOR


FORWARD SOLAR PANELS
CENTER SECTION
DETECTOR PANELS
LATERAL SOLAR PANEL
ELECTRONIC CANISTER

SATURN SA-8 VEHICLE