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Title: Program 417 (U)

Description (S/SAR): The current Program 417 spacecraft (designated Block IV) is a simple, reliable, spin-stabilized (wheel mode) satellite which takes daily, early morning television pictures of cloud masses over the Eurasian Continent and over selected areas of tactical military interest. In addition, infrared (IR) measurements are made to determine cloud height, and the heat balance of the earth. The Eurasian data is stored on tape recorders and then read out on 40 foot parabolic dish antennas at one of two ground readout stations in the US, (Fairchild AFB and Loring AFB). Local tactical data is transmitted directly in near real-time to ground readout stations at Tan Son Nhut AB, South Vietnam; Udorn, Thailand; Osan AB, South Korea; and Hickam AFB, Hawaii. The Udorn and Osan stations are mobile, air-transportable terminals designed for tactical use. The Tan Son Nhut and Hickam stations are fixed sites. The 417 satellite is launched into a sun-synchronous, circular, near-polar orbit at a 450 n. mi. altitude which provides global coverage. Observation times are selected by controlling the time of launch and 417 satellites have provided data at about 0815 and 1200 hours local time.

Beginning in September 1969, a Block V satellite will be launched to operate in an earth-oriented mode (sensors always pointing toward the earth) instead of the wheel mode. This satellite will carry a visual/infrared, line-scan imaging sensor which will provide day/night observations. Three satellites will be maintained on orbit to provide data at about 0400, 0800 and 1200 hours local time (and at 1600, 2000 and 2400 hours on the nighttime passes).

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Performance Data (S/BAR). The present 417 spacecraft is about 30 inches in diameter and 29 inches high. The spacecraft weight has varied from 120 pounds (Block I) to 175 pounds (Block IV). The Block V spacecraft to be launched in September 1969 will weigh about 225 pounds and will be 36 inches in diameter and 43 inches high. Solar cell arrays and associated batteries provide spacecraft power.

Block I spacecraft carried a single 1/2 inch vidicon television camera, tape recorder, communications, controls, vehicle dynamics, power supply and horizon sensors. Block II spacecraft also carried a multisensor IR subsystem to measure radiation from an 800 n. mi. swath of the earth, its atmosphere and cloud masses. Two spectral regions were measured (0.4-4 microns for heat balance and 8-12 microns for cloud height measurements). In April 1965, the Block III spacecraft incorporated the first tactical direct readout capability for use in Southeast Asia.

The current Block IV spacecraft uses two, one-inch hybrid vidicon television cameras (electrostatic focus and magnetic deflection) canted at 26 degrees from the vertical to give global coverage of the earth (contiguous at the equator) with a 1500 n. mi. swath width. Block IV resolution is about 8/10 n. mi. at the subpoint and 3 n. mi. at the picture edge. In addition to the multisensor IR subsystem, Block IV carries a high resolution radiometer (HRR) IR subsystem (8-12 microns) to provide cloud height profiles along four tracks centered about the satellite track.

The Block IV sensor data transmitter is a 5 watt FM subsystem operating at 230 MHz. A second 1/2 watt FM transmitter (400 MHz) is used for acquisition, tracking, telemetry and confirmation of command functions. Command data is received on a 148 MHz AM receiver.

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The initial Block V spacecraft will carry a line scan sensor which will provide images of the earth and its cloud masses in the visual (0.4 - 1.0 micron) and infrared (8-13 micron) spectral regions. The infrared subsystem will also provide cloud height profile and heat balance data. Both global stored data (strategic) and local direct readout data (tactical) will be provided day and night down to quarter moonlight illumination levels. The daytime tactical data resolution will be about 1/3 n. mi. at the satellite subpoint. The day/night sensor resolution will be about 2 n. mi.

The Block V sensor data transmitter will also be a 5 watt FM system but will operate at an S-band frequency (2207 MHz). The command receiver (148 MHz) and the telemetry transmitter (400 MHz) are the same as the Block IV subsystems.

Beginning in mid-1970, Block V spacecraft will use a 20 watt S-band Traveling Wave Tube (TWT) to provide enough radiated RF power to enable the US Navy to receive 417 data on-board ship. An additional tape recorder will be added to provide full global coverage of the visual/infrared data and to improve satellite lifetime.

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A high resolution IR sensor (1/3 n. mi.) and associated tape recorder will be added in 1971 to provide data which will match the 1/3 n. mi. visual data in selected areas of strategic interest and in tactical areas.

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Beginning in 1972, improvements in sensor resolution will be incorporated to meet the JCS requirement of 1/2 n. mi. across the entire satellite coverage. NASA technology will be closely monitored in this time period to consider ways of meeting the remaining JCS requirements for data on precipitation, water vapor, winds, sea state, soil moisture and clear air turbulence.

Launch Vehicle (C): First stage - modified THOR SM-75 (designated LV-2F space booster). Injection stage - Burner II or Burner IIA, solid propellant with strapped down inertial guidance.

Schedule (S): One launch per quarter.

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