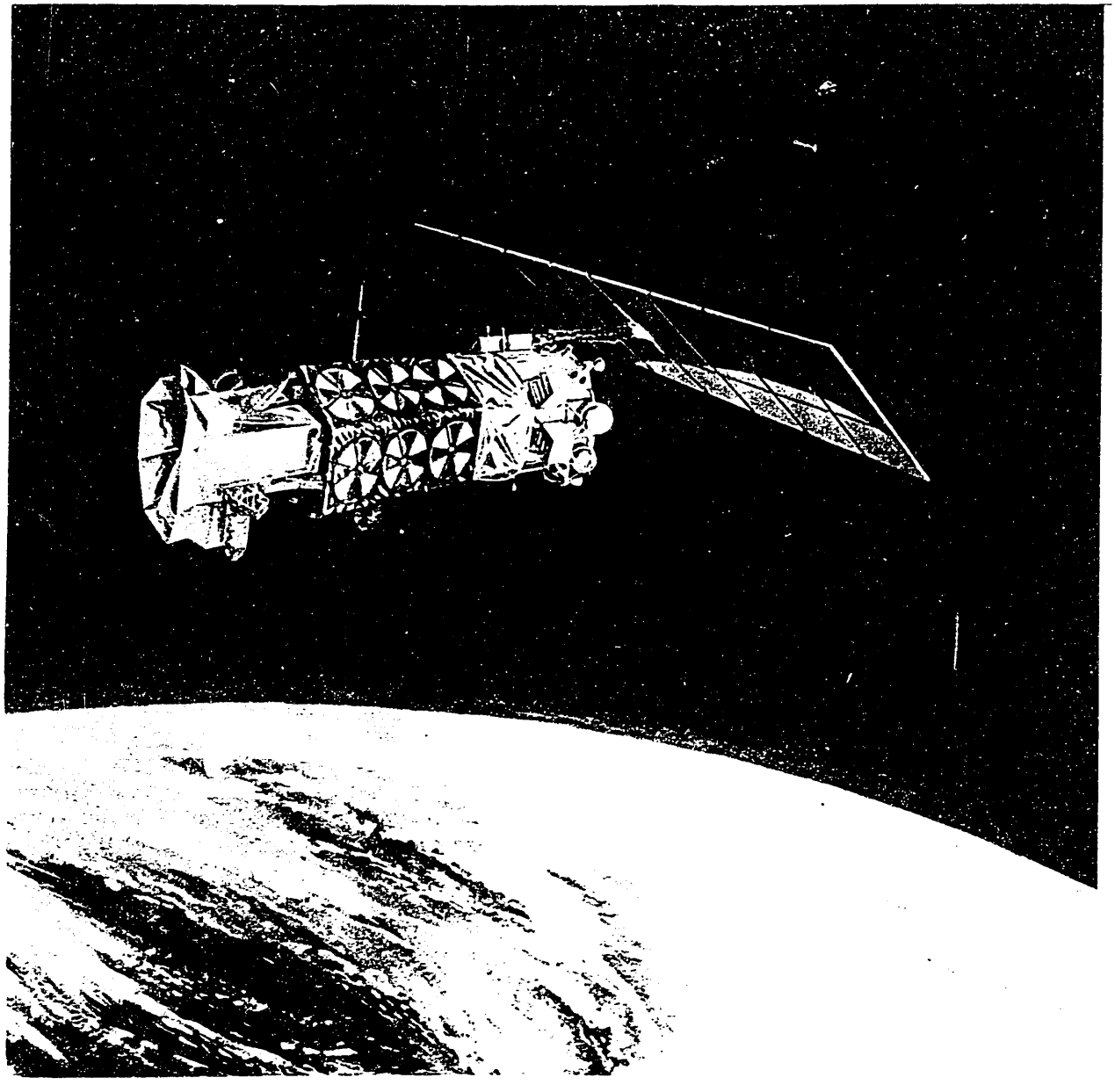
Fact Sheet

United States Air Force

OFFICE OF PUBLIC AFFAIRS, AIR FORCE SYSTEMS COMMAND, ANDREWS AFB, MD 20334, (301) 981-4137

DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP)



(USAF Photo 79-6-518C)

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DEFENSE METEOROLOGICAL SATELLITE PROGRAM

Accurate weather forecasts have always been a basic need of military commanders, and the Defense Meteorological Satellite Program (DMSP) is essential to meet these requirements.

Using data from these satellites, military weather forecasters detect and observe developing cloud patterns and follow existing weather systems. The data help identify severe weather such as thunderstorms, determine the intensity of hurricanes and typhoons, and provide visible and infrared imagery to form three-dimensional cloud plural analyses of various weather conditions. An important feature of this imagery is its near constant resolution.

While the primary mission of DMSP satellites is gathering weather data for military uses, its information is actually a national resource. Data gathered by the satellites are made available to the civilian community through the Commerce Department's National Oceanic and Atmospheric Administration (NOAA).

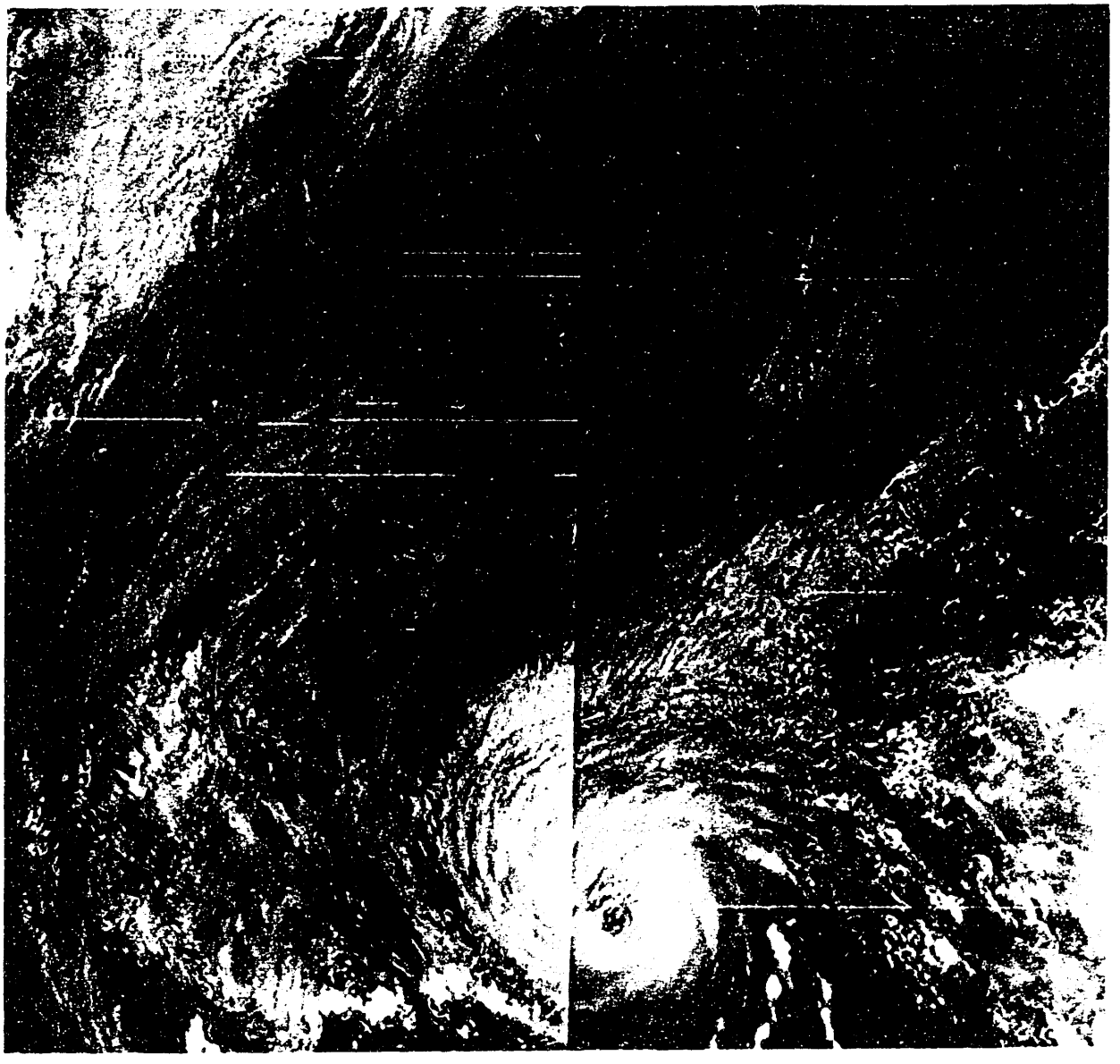
DMSP satellites are capable of providing weather data on a real-time basis to the Air Weather Service and Navy and can store these data in on-board recorders for later transmission to Air Force readout sites at Fairchild AFB, WA, or Loring AFB, ME. These sites, as well as the Command Control Center at Offutt AFB, NE, are operated by the Strategic Air Command's (SAC) 4000th Satellite Operations Group. Recorded data are also received in Hawaii at a remote tracking station managed by the Air Force Satellite Control Facility (SCF) at Sunnyvale AFS, CA. The recorded data are then relayed by satellite from both readout sites and the SCF's Hawaii Tracking Station to the Air Force Global Weather Central at Offutt.

TERMINALS: Mobile ground terminals provide military commanders in the field with photographic-quality prints of cloud cover four times a day. The Mark IV mobile ground terminal is a compact unit consisting of the 19 ft. (3 m) parabolic antenna, the Mark IV van and an auxiliary power generator. With the antenna stored in the van the Mark IV transportable terminal is compact enough to carry in a C-130 aircraft.

As DMSP satellites pass overhead, the mobile ground terminals receive pictures of a section of the earth and its cloud cover. Weather data transmitted from the DMSP satellites to the ground terminal can be gridded and labeled for clarification. Mark IV technology also permits weather watchers to enlarge and print selected portions of infrared and visual weather data from both the military DMSP and civilian NOAA satellites.

ORBIT: The satellites — there are normally two in orbit at any one time — orbit at an altitude of approximately 450 nm (833 km) in a near-polar, sun-synchronous orbit. They take about 101 minutes to complete their orbits, and each scans a 1,600 nm (2,960 km) wide area. Each satellite can cover the entire earth in about 12 hours.

SIZE: The Block 5D-2 satellite weighs approximately 1,660 lb. (732 kg), including approximately 400 lb. (180 kg) of sensor payload and is 21 ft. (6.2 m) long with solar array deployed.



HURRICANE FREDERIC IN THE GULF OF MEXICO (USAF Photo 114840)

SPACECRAFT: A launch vehicle upper stage is integrated into the satellite with the spacecraft providing for ascent phase guidance for the upper stage from liftoff through orbit insertion, as well as electrical power, telemetry, altitude control and propulsion.

The spacecraft is divided into four major sections:

- a precision mounting platform for sensors and other equipment requiring precise alignment,

- an equipment support module which encloses the bulk of the electronics,

- a reaction control equipment support structure containing the spent upper-stage rocket motor and supporting the ascent phase reaction control equipment, and

- a solar array.

LAUNCH VEHICLE: Block 5D-2 satellites will be launched on Atlas boosters.

ORBITAL CONTROL: Spacecraft three-axis attitude control is maintained by automatic momentum exchange between three momentum wheels. On-board magnetic coils provide controlled interaction with the earth's magnetic field to prevent accumulation of secular momentum. The momentum wheels are backed by a fourth skewed unit for redundancy.

POWER: The power subsystem is a direct energy transfer system. Power from the solar cell array is either conditioned for direct use by the spacecraft components, stored in nickel-cadmium storage batteries or shunted through resistive power dissipators on the array. The Block 5D-2 will support power requirements up to 370 watts.

IMAGERY: The Operational Linescan System (OLS) is the primary sensor on board the spacecraft, providing visual and infrared imagery. The OLS uses a linescanning radiometer to take visual and infrared (day and night) imagery in both .3 nm (.55 km) and 1.5 nm (3 km) resolution. These data are used to analyze cloud patterns in support of a wide range of military requirements.

A major improvement of the OLS over past generation scanning radiometers is its ability to produce imagery with a near constant resolution across scan. This is accomplished by using segmented visual and infrared detectors and employing a detector switching technique as the OLS scans away from satellite subpoint nadir towards the edge-of-scan. This detector switching is combined with a basic sinusoidal scan pattern to produce the near constant resolution.

An additional imaging system will be flown starting on the fourth 5D-2 sateilite. Called the SSM/I (Mission Sensor System, Microwave Imager), the sensor is a passive microwave radiometer that detects and images microwave energy emitted by the atmosphere and the surface of the earth. These measurements will provide military meteorologists information about ocean-surface wind speed, ice coverage and age, areas and intensity of precipitation, amount of water and clouds, and soil moisture. The Microwave Imager is described in more detail in a separate fact sheet.

TEMPERATURE/MOISTURE MEASUREMENTS: The infrared temperature/moisture sounder measures infrared radiation emitted from different heights within the atmosphere, allowing forecasters to plot curves of temperature and water vapor versus altitude. A microwave temperature sounder is also used to measure microwave radiation emitted from different heights within the atmosphere. This instrument allows forecasters to plot curves of temperature versus altitude even over cloudy regions of the globe.

IONOSPHERIC MEASUREMENTS: Three sensors observe the state of the earth's ionosphere. The first, called a precipitating electron and proton spectrometer, is used to count electrons and protons at different energies spiralling down ("precipitating") along the earth's magnetic field lines. These data are used to accurately forecast the location and intensity of the aurora and to aid radar operations and long-range ground communications in the Northern Hemisphere. Another sensor measures energy in the high energy gamma and x-ray portion of the spectrum. Aurora emit in this part of the spectrum. A third ionospheric sensor, the ionspheric plasma monitor, measures electron and ion densities and temperatures at spacecraft altitude. Data from this sensor is used in ionospheric weather models to predict the state of the ionosphere as it affects communications and navigation.

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CONTRACTORS:

Spacecraft — RCA Government Systems Division, Astro-Electronics, Princeton, New Jersey.

Primary Sensor — Westinghouse Electric Corp., Defense & Electronics Systems Center, Baltimore, Maryland.

Special Sensors — Barnes Engineering Co., Stanford, CT; Aerojet Electro-Systems Co., Azusa, CA; Hughes Aircraft Co., Space & Communcations Group, El Segundo, California.

Ground Terminals — Harris Corp., Government Systems Group, Melbourne, Florida.

Launch Vehicle — McDonnell Douglas Astronautics Co., Huntington Beach, California.

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