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FOR RELEASE: FRIDAY AM'S
June 25, 1965

RELEASE NO: 65-197

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Weather Bureau

PROJECT: TIROS X

PRESS KIT

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NEWS NASA

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NASA TO LAUNCH 10TH TIROS SATELLITE FOR WEATHER BUREAU

The first Weather Bureau-funded TIROS weather satellite will be launched by the National Aeronautics and Space Administration from Cape Kennedy, Fla. no earlier than June 29, 1965.

Like TIROS IX, launched Jan. 22, 1965, the latest TIROS (Television Infrared Observation Satellite) will be launched into a Sun-synchronous, near-polar orbit.

If the launch attempt is successful, the new interim operational satellite will be called TIROS X. It contains two 1/2-inch vidicon cameras.

This spacecraft will join three others (TIROS VII, VIII, and IX) which are still operating, in photographing storm-breeding areas where hurricanes and typhoons are born.

- more - 6/16/65

Launch at this time of the 10th TIROS is designed to make certain at least one storm tracker will be working during the upcoming hurricane season. Just how much longer TIROS VII and VIII will operate is hard to determine.

TIROS VII was launched June 19, 1963 and TIROS VIII Dec. 21, 1963. During much of this year's hurricane season, TIROS IX will be viewing the dark side of the Earth, along the terminator line, and consequently will be unable to photograph hurricanes.

The new 280-pound spacecraft will take pictures of about 60 to 80 per cent of the Earth each day. This is three to four times the coverage of the first eight TIROS.

TIROS IX in its "cartwheel" movement in orbit is able to provide 100 per cent coverage of the Earth daily.

The additional coverage is possible in the Sun-synchronous, near-polar orbit with control system which allows ground controllers to change the satellite's attitude with respect to the Earth. Thus specific areas of the Earth can be selected for observation.

NASA's Delta launch vehicle will be used to put the spacecraft into a circular, 460-statute-mile orbit inclined 82 degrees retrograde to the Equator. Orbital period will be 100 minutes. This will be the 32nd launching for the Douglas-built Delta which has had 29 successes.

The satellite will be controlled during its lifetime by the NASA ground station complex as were the previous nine research and development TIROS. Weather data will be analyzed by the Weather Bureau for use in daily forecasting. All of the TIROS satellites have been built by the Radio Corp. of America.

Although it is an interim operational satellite, this newest TIROS will not be part of the NASA Weather Bureau TOS (TIROS Operational System) program which begins early next year. It is one of three satellites purchased by the Weather Bureau in 1963 to be used to assure continuity of satellite observations for operational purposes.

The TIROS research and development program began with the successful launching of TIROS I April 1, 1960, and has achieved nine consecutive successful launchings in as

many attempts. TIROS satellites recently passed the 1/2-million-picture-mark (507,705 pictures as of June 25, 1965) with more than 90 per cent being usable by meteorologists for daily weather analysis.

Program management for TIROS is the responsibility of NASA's Office of Space Science and Applications. Technical direction is assigned to the Goddard Space Flight Center, Greenbelt, Md. All weather information is used by the U.S. Weather Bureau of the Department of Commerce for distribution to weather men around the world.

Major contractors include the Missile & Space Systems Division of Douglas Aircraft Co., Inc., for the Delta launch vehicle, and the Astro Electronics Division of the Radio Corp. of America for the TIROS spacecraft.

BACKGROUND INFORMATION FOLLOWS

TECHNICAL INFORMATION

Spacecraft	Cylindrical, 18-sided polygon, 22 inches high and 42 in diameter. Weighing 280 pounds. (Similar to the TIROS VI)
Mission objectives	To obtain maximum photo coverage of the hurricane belt for this year's hurricane season. To continue the development of a meteorological satellite system and to continue to provide observations of the Earth's cloud cover for operational daily use on a real time basis.

Launch Information:

Vehicle	Three-stage Delta developing 170,000 pounds of thrust at liftoff.
Launch Pad	Complex 17, Pad B at the Eastern Test Range, Cape Kennedy, Fla.
Date	No earlier than June 29, 1965

Orbital Elements:

Inclination	Near-polar and Sun synchronous, 82 degrees retrograde to the equator.
Period	About 100 minutes.
Orbit	Circular, 460 statute miles high.
Velocity	Approximately 18,000 miles per hour

Cameras	Two 1/2 inch vidicon cameras which take more than 400 pictures daily with a resolution of about two miles at picture center. The cameras are positioned on the bottom of the spacecraft and will be programmed to take a picture every 60 seconds.
Power System	9,100 solar cells, P on N (positive on negative) which convert Sun energy to electrical energy to keep 63-nickel cadmium batteries charged.
Control System	Spin stabilized at 10 revolutions per minute. The satellite's attitude can be changed by sending electrical currents from ground stations through the Quarter Orbit Magnetic Attitude Control (QOMAC) system in the spacecraft.
Tracking	15 stations of the world-wide Space Tracking and Data Acquisition Network (STADAN) operated by the Goddard Space Flight Center.
Command and Data Acquisition Stations	Wallops Island, Va., Gilmore Creek, Alaska.
Program Management	Office of Meteorological Programs Office of Space Science and Applications, NASA Headquarters.
Project Management	Goddard Space Flight Center (spacecraft, launch vehicle, launch operations and tracking).
Major Contractors:	
Delta vehicle	Missile & Space Systems Division Douglas Aircraft Co., Inc., Santa Monica, Calif.

Spacecraft.....Astro Electronics Division Radio Corp. of America, Hightstown, N.J.

THE FLIGHT PLAN

The next TIROS will be the second NASA satellite fired into a polar orbit from Cape Kennedy, Fla. The flight plan for the Delta launch vehicle is identical to the one used for the TIROS IX launching Jan. 22, 1965.

Delta will leave Complex 17, Pad B, and must perform two precise "dog-leg" maneuvers before it reaches its orbital injection point over the Pacific Ocean. All commands during the maneuvers will come from the airborne autopilot system.

Lift-off is scheduled for 1:07 A.M. EST. The launch window is about 45 minutes. A launch at this time of day provides maximum power for spacecraft operations and maximum lighting for photography.

During first stage burning, from T plus 90 to T plus 111 seconds, commands from the autopilot will turn the vehicle to the right changing the trajectory.

When the second stage burns out and the 440-second coast period begins, Delta will perform its final maneuver. During this coast period the vehicle will be pitched down 47 degrees

and the nose will be turned left eight degrees so that it is in the proper attitude and trajectory for third stage ignition and injection into orbit over the Pacific Ocean about 300 miles West of Quito, Ecuador (84 degrees West longitude, 0 degrees latitude).

THE SPACECRAFT

The 280-pound spacecraft is almost identical to TIROS VI. It is an 18-sided polygon which stands 22 inches high and measures 42 inches in diameter.

Two, $\frac{1}{2}$ inch vidicon television cameras stick out of the bottom, or baseplate, of the spacecraft. Each picture will cover an area 800 miles square (640,000 square miles) when the cameras are looking straight down. Radio commands from the ground will set a clock in the spacecraft to trigger the cameras for picture sequences every 60 seconds, or more than 400 pictures daily. Resolution is about two miles at the center of each picture.

Pictures can be stored on one of two tape recorders in the spacecraft or be sent directly to a Command and Data Acquisition (CDA) station when the satellite is within a 1,500 mile radius of the station. The CDA stations are at Wallops Island, Va., and Gilmore Creek, Alaska.

These stations will receive pictures and telemetry data on spacecraft performance on 12 of the 14.5 daily orbits. The San Nicolas Island station 65 miles off the coast of California, which has been used for previous TIROS missions, will not be used.

The station was closed down in May because the Alaskan and Virginian stations can receive data on a sufficient number of orbits on a daily basis because of the near polar orbit.

POLAR SUN-SYNCHRONOUS ORBIT

Approximately 60 to 80 percent of the sunlit world will be photographed daily by the spacecraft due to a combination of a polar, Sun-synchronous orbit plus a control system which can change the satellite's attitude in space relative to the earth.

A satellite in a perfect Sun-synchronous orbit drifts westward about one degree daily, the same direction and rate as the Earth moves around the Sun. The orbital plane of the satellite always remains at a constant angle to the Earth-Sun line.

Thus, the spacecraft will be in sunlight during each orbit with Sun being behind the satellite. This results in maximum illumination for photography. Additionally, because it will be in optimum position relative to the Sun on each orbit, the satellite's batteries will remain fully charged.

To achieve a Sun-synchronous orbit, the spacecraft must achieve a given altitude and a given inclination to the equator.

STABILIZATION AND CONTROL SUBSYSTEMS

The Quarter Orbit Magnetic Attitude Control (QOMAC) system, first tested on TIROS IX to turn the satellite on its side into the cartwheel attitude, will be used on this spacecraft to change its attitude. To change the satellite's attitude, one of the CDA stations sends a command which causes an electric current to be generated and pulsed through the QOMAC in the spacecraft. This current working in conjunction with the Earth's magnetic field causes the satellite to turn and change its attitude.

To get maximum photo coverage of the hurricane belt, the area where most tropical storms are born, the spacecraft will be programmed to be vertical with the earth at 20 degrees north latitude. Usable pictures for meteorological purposes will be taken from the North Pole to 50 degrees south latitude.

TIROS SCOREBOARD

	LAUNCH DATE	USEFUL LIFE	INCLINATION	PICTURES TAKEN
TIROS I	Apr. 1, 1960	2 1/2 months	48 degrees	22,952
TIROS II	Nov. 23, 1960	10 months	48 degrees	36,156
TIROS III	July 12, 1961	4 1/2 months	48 degrees	35,033
TIROS IV	Feb. 8, 1962	4 1/2 months	48 degrees	32,593
TIROS V	June 19, 1962	10 1/2 months	58 degrees	58,226
TIROS VI	Sept. 18, 1962	13 months	58 degrees	66,674
TIROS VII	June 19, 1963	Still Operating	58 degrees	114,960*
TIROS VIII	Dec. 21, 1963	Still Operating	58 degrees	83,285* Total APT pictures 4,067
TIROS IX	Jan. 22, 1965	Still Operating	83.6 degrees retrograde	57,826*

*Total pictures 507,705
As of June 25, 1965

DELTA LAUNCH VEHICLE

The Delta project management plus launch operations is under the direction of the Goddard Space Flight Center. The Delta vehicle has the following general characteristics:

Height	90 feet
Maximum diameter	8 feet
Lift-off weight	about 57 tons

First Stage: Modified Air Force Thor, produced by Douglas Aircraft Co., engines produced by Rocketdyne Division of North American Aviation.

Fuel: Liquid (Kerosene with liquid oxygen as oxidizer).

Thrust: 170,000 pounds.

Burning time: About 2 minutes and 27 seconds.

Weight: More than 50 tons.

Second Stage: Douglas Aircraft Co., utilizing the Aerojet-General Corp., JA 10-118 propulsion system; major contractors for the autopilot are: Minneapolis-Honeywell, Inc., Texas Instruments, Inc., and Electrosolids Corp.

Fuel: Liquid (UDMH and Inhibited Red Fuming Nitric Acid).

Thrust: About 7,500 pounds.

Burning time: Approximately 1 minute 40 seconds.

Guidance: Western Electric Co.

Weight: 2 1/2 tons.

Third Stage: Allegany Ballistics Laboratory X-258 motor.

Fuel: Solid.

Thrust: Approximately 5,700 pounds.

Burning time: 26 seconds.

Weight: 576 pounds.

PROJECT OFFICIALS

NASA Headquarters:

Dr. Homer E. Newell, Associate Administrator for Space Science & Applications

Dr. Morris Tepper, Director, Office of Meteorological Programs

Michael J. Garbacz, Program Manager, Meteorological Flight Projects

Vincent L. Johnson, Director of Launch Vehicle & Propulsion Programs Division

T. B. Norris, Delta Program Manager

Goddard Space Flight Center:

Dr. Harry J. Goett, Director

Nelson W. Spencer, Acting Chief, Aeronomy & Meteorology Division

Herbert I. Butler, Associate Chief for Projects, Aeronomy & Meteorology Division

Robert M. Rados, TIROS Project Manager

William R. Schindler, Delta Project Manager

Robert H. Gray, Chief, Goddard Launch Operations Division, Cape Kennedy, Fla.

U. S. Weather Bureau:

Dr. Robert M. White, Chief of U.S. Weather Bureau

David S. Johnson, Director, National Weather Satellite Center

Douglas Aircraft Co.

Jack Kline, Director, Delta Programs

Marcus F. Cooper, Director, Florida Test Center

Radio Corp. of America:

Abraham Schnapf, RCA TIROS Project Manager

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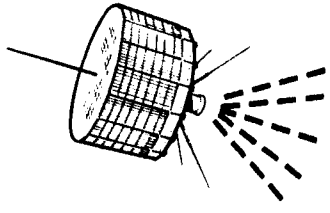
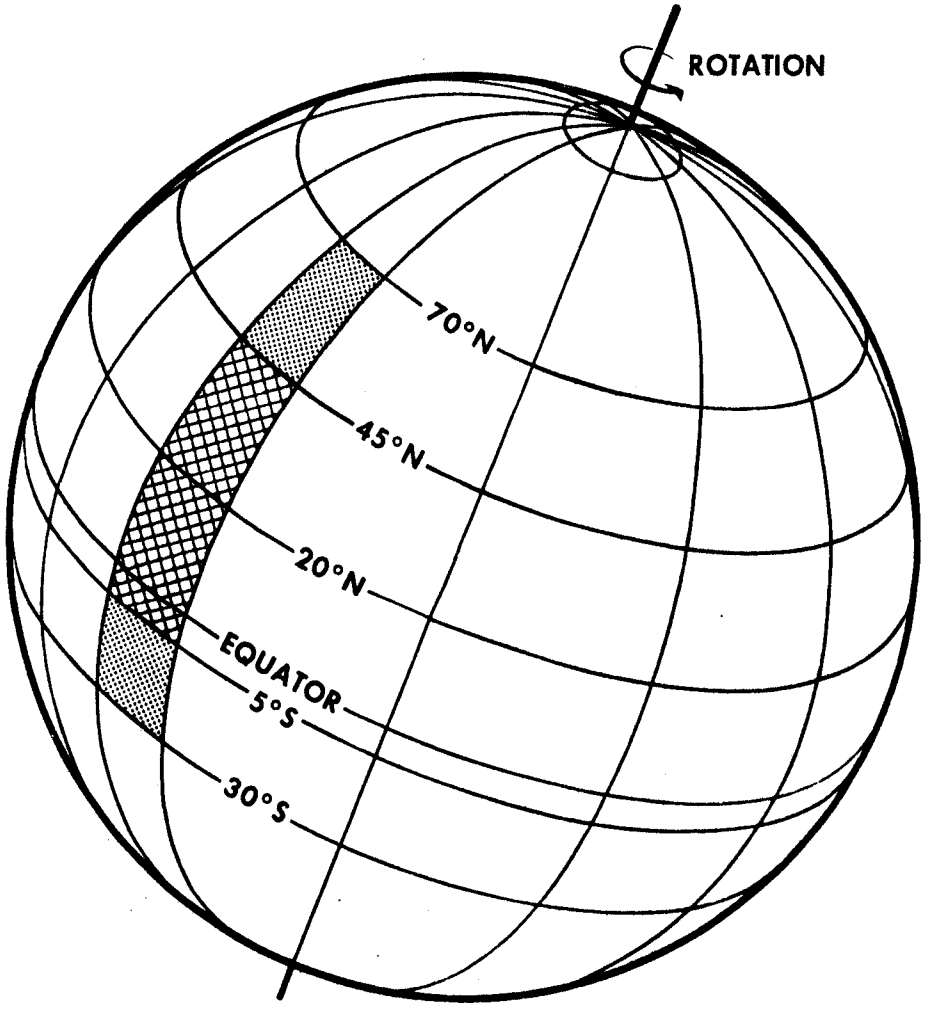
TIROS





LEGEND

AREA OF USABLE PHOTOS

AREA OF HIGH RESOLUTION PHOTOS