THE WASHINGTON POST *Thursday, June 23, 1960*

Piggy-Back Satellites Hailed As Big Space Gain for U. S.

By Charles Corddry
United Press International

Two new American satellites circuited the earth today after a spectacular "double-header" launching with a single rocket. Officials hailed their success as proof that America is "moving into space for real."

The moonlets, launched piggy-back fashion from Cape Canaveral, Fla., at 1:54 a. m. EDT Tuesday, were sent aloft to provide the world a precise all-weather navigation system, to improve the accuracy of its clocks and to measure the sun's radiation.

The larger satellite also carried a space experiment for Canada—a receiver to study background radio noises from the galaxies.

America now has 11 satellites in orbit around the earth, compared with Russia's two.

New Space First

The feat of putting up a pair of sattellites simultaneously with a single booster was a new space 'first" for the United States. This has not been attempted, so far as is known, by Russia.

A two-stage, Thor-able-star, an Air Force rocket, accomplished the feat.

The Transit II-A sattellite, the navigational aide and time-measuring sphere, soared into a near-circular orbit that will carry it over all of the earth's land masses—including Russia—except certain arctic and antarctic points.

As soon as orbit was achieved, this 223-pound aluminum space probe gave birth to the smaller basketball-sized satellite, which checks on solar radiation. It was ejected by spring action.

Payloads Function

Rear Adm. T. F. Connolly, chief of the Navy Bureau of weapons, told a news conference here that the payloads of the two satellites were functioning properly.

"There are no problems," he said.

Cmdr. R. F. Freitag of the Weapons Bureau said Navy officials are confident now that a system of four Transit satellites, to be in operation by 1962, will be able to fix positions on land and sea within one-tenth of a mile.

The first Transit, launched last April, is giving fixes within a quarter of a mile, they said, and the one launched yesterday will do better.

When all four Transits are in orbit, ships at sea can interrogate them by radio at any time regardless of weather and the satellites will give them "fixes" in code that will tell them where they are.

Moving for Real

Connolly said the launching of a pair of satellites with a single rocket showed that space operations are becoming "something we can count on."

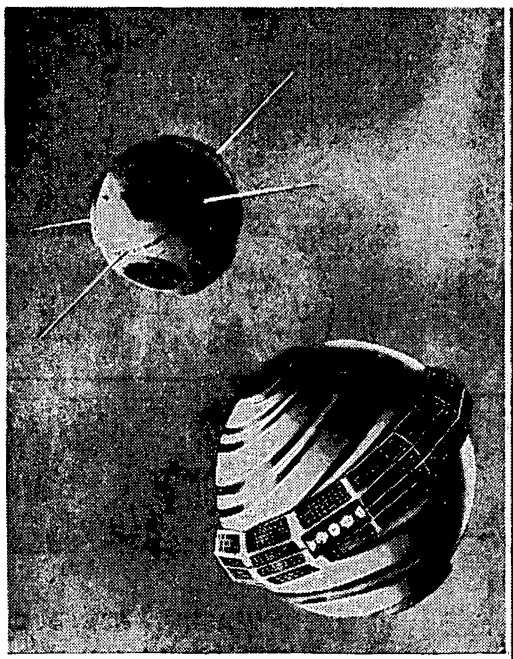
"We are rapidly moving into space for real," he said.

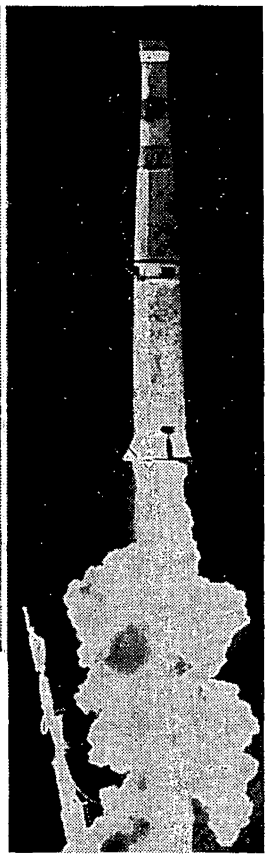
R. B. Kershner of the Johns Hopkins Applied Physics Laboratory said the navigation satellite's orbit was taking it to a maximum of 563 miles from earth and bringing it to within 460 miles.

Its orbiting time is 101.5 minutes. The orbit is inclined 65 degrees to the equator.

The smaller, 42-pound solar radiation sphere probably has fallen behind Transit II-A, Kershner said. It will settle into a somewhat larger orbit and circuit the earth more slowly.

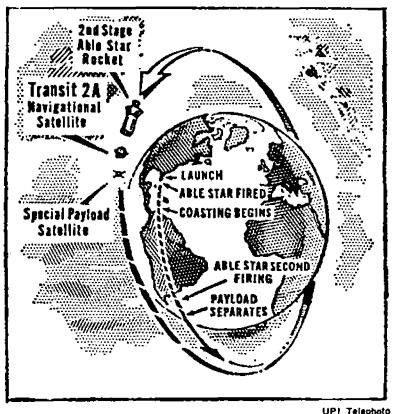
The II-A, in addition to the Canadian experiment, carries a new feature not on the first Transit satellite—an electronic or "digital" clock which the Navy said could "lead to a new global time system."





Associated Press

The drawing above shows how the Transit II-A satellite and its "piggyback" package, a solar radiation measurement satellite, appeared just after separation in outer space yesterday. The larger satellite was developed by the Applied Physics Laboratory of Johns Hopkins University at Silver Spring and the smaller vehicle by the Naval Research Laboratory here. At right: the double-header satellite rocket takes off at Cape Canaveral.



UPI Telephoto

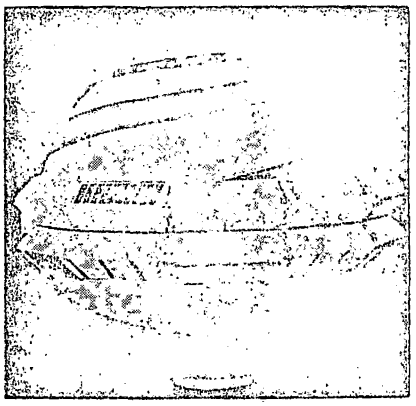
DIAGRAM SHOWS ORBIT
. . . of "mother and daughter" satellites

SPACE WORLD " 1961

NAVSATS, TRANSIT SERIES

TRANSIT I-B (1960 GAMMA)

Date orbited .....13 April 1960 (7:03 a.m. EST)
Other name ....."Navigation Beacon" "Radio Star" "Space Lighthouse"
Launch Site .....Cape Canaveral
Diameter .....36 in. (sphere)
PAYLOAD:
Net wt.....265 lbs.
Orbit .....Equatorial-polar (slantwise), circular
Inclination to equator .....51°
Perigee .....233 m.
Apogee .....479 m.
Period (min.) 96
LAUNCH VEHICLE:
Name .....Thor-Able-Star
Lift-off wt. .....105,000 lbs.
Vel. at cut-off .....16,590 mph
Spin rate .....170 rpm (after launch); 4 rpm (20 April, reduced by two cabled spin-weights)
INSTRUMENTATION:
➔ 2 Oscillators in Dewar flasks
➔ Infrared rotation-sensing scanner
Transmission ceased .....July 11, 1960
Radio/telemetry frequencies: 4 telemetry transceivers; 54 mc, 162 mc, 216 mc, 324 mc
Power supply ..Nickel-cadmium batteries recharged by two banks of solar-cells
Lifetime..Original estimate, 16 months; New estimate, 6 years
DISCOVERIES, FEATS, SPACE FIRSTS:
➔ First prototype of navigation guidance satellite for ships.
➔ Tested Doppler effects (for navigational "fixes" by determining when satellite passes directly over)
➔ Tested ionospheric refraction of radio-waves (part of ship-orienting calculations, plus satellite ephemeral table)
➔ Provided geodetic data on earth's shape and distances between continents
➔ Indicated that the satellite ship-fix system can reach an accuracy of ½ mile by 1962, 1/10 of a mile later
SPECIAL NOTES:
Navigation guidance by a planned series of satellites, of which Transit is the forerunner, will have many priceless applications in the future:
➔ An unfailing guide to ships day and night, in the heaviest fog, storms or any other adverse conditions
➔ The future guide-satellite chain will service every remote corner of all the Seven Seas so that no ship (with the required tracking apparatus) need ever be lost
➔ Trans-oceanic airliners can also be equipped to utilize the satellites for guidance
➔ In America's military program, the Transit system will afford reliable fixes for all naval surface units (a crucial matter in time of war)

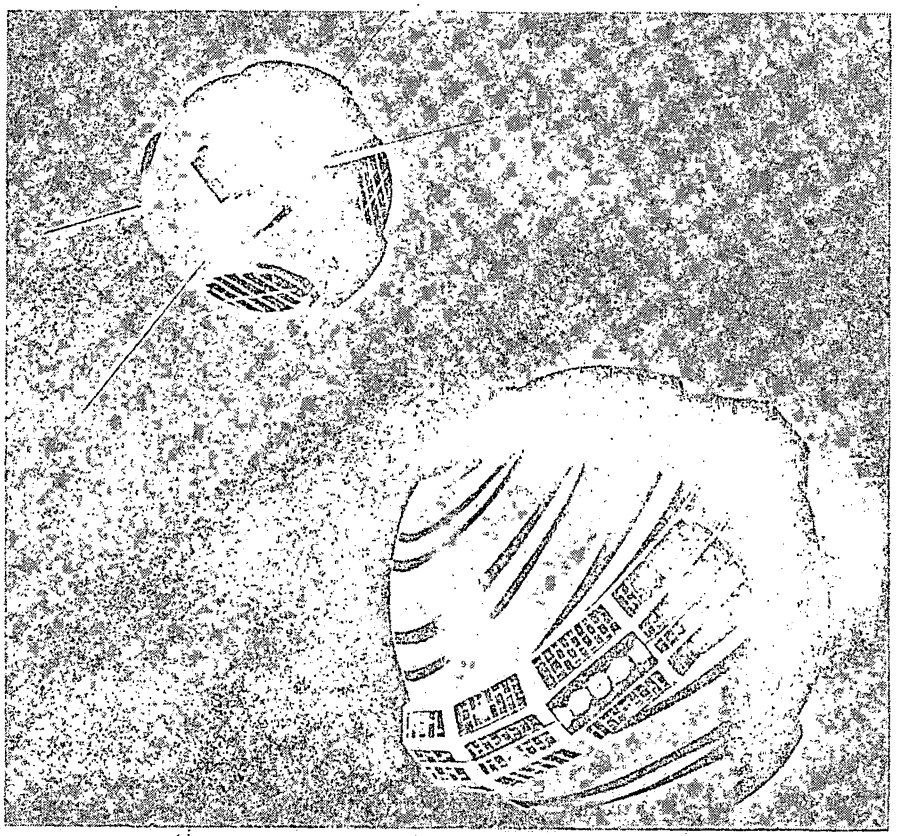


TRANSIT I-B

➔ Submarines too, will be able to surface and take a fix from the Transit. Nuclear subs can use the fix for a double-check of their inertial guidance system, if the time ever comes for launching their Polaris missiles
➔ Since the Transits pass over land as well as sea, they can guide explorations in unknown territory—Antarctica, for example
➔ Also, ships in space, returning from orbit or the moon, may someday be partially guided by the Transit beacons.

TRANSIT II-A (1960 ETA I)

Date orbited .....22 June 1960 (1:54 a.m. EDT)
Other name ....."Piggyback" Satellite (two attached satellites were launched together, separating in orbit. See next item for piggyback satellite, Greb I)
Launch site .....Cape Canaveral
Diameter .....36 in. (spherical)
PAYLOAD:
Gr. wt. .....265 lbs. (both satellites)
Net wt. .....223 lbs. (Transit only)
Orbit .....Equatorial-polar (slantwise); circular
Inclination to equator .....66.7°
Perigee .....389 m.
Apogee .....665 m.
Period (min.) 101.7
Launch vehicle and lift-off wt. ..... Same as Transit I-B
Vel. at cut-off.....Same as Transit I-B
INSTRUMENTATION:
Transit-I-B devices plus following:
➔ Electronic clock
➔ Receiver measuring galactic noise in 3.8 mc range
➔ Solar-radiation sensors
Transmission .....Still on, estimated to last a year.
Radio/telemetry frequencies..... Same as Transit I-B
Power supply .....Half the batteries in Transit I-B but double the number of solar-cells



TRANSIT II-A AND GREB

Lifetime .....50 to 200 years

DISCOVERIES, FEATS, SPACE FIRSTS:

- World's first launching of double satellite
- Added ship-guidance, geodetic and ionospheric data
- Electronic clock timing experiments proved out Doppler fixing for latitude and longitude of ships
- Solar radiation and galactic noise data are being gathered for later evaluation

GREB I (1960 ETA 2)

Other name .....NRL (Navy Research Laboratory) radiation vehicle; "Piggyback" satellite
Diameter .....20 in. (spherical)

PAYLOAD:

Net wt. .....42 lbs.
Inclination to equator .....66.8°
Perigee .....382 m.
Apogee .....657 m.
Vel. at perigee .....17,146 mph
Vel. at apogee .....16,125 mph
Period (min.) 101.6

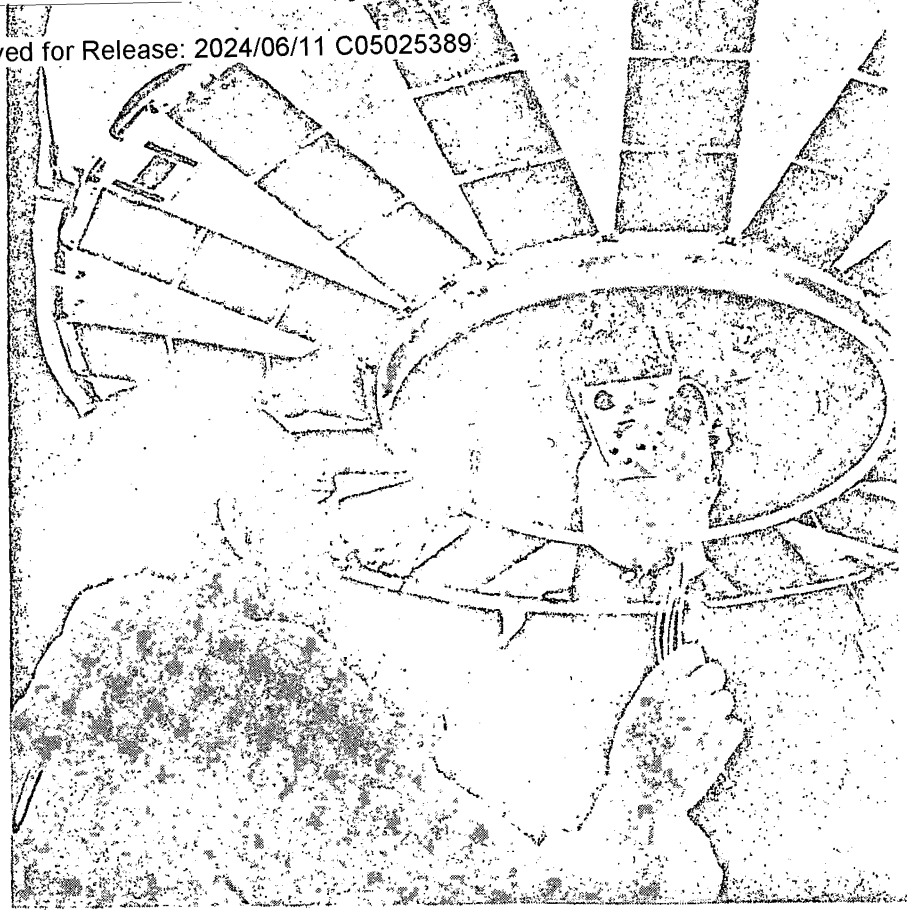
INSTRUMENTATION:

- Ion chamber for X-ray detection
- Ion chamber for ultra-violet radiation in Lyman-alpha band

Transmission ceased .....June 27, 1960
Radio/telemetry frequency .....108 mc
Lifetime .....50 to 200 years

DISCOVERIES, FEATS, SPACE FIRSTS:

- Refined data on X-ray and ultra-violet emissions from the sun



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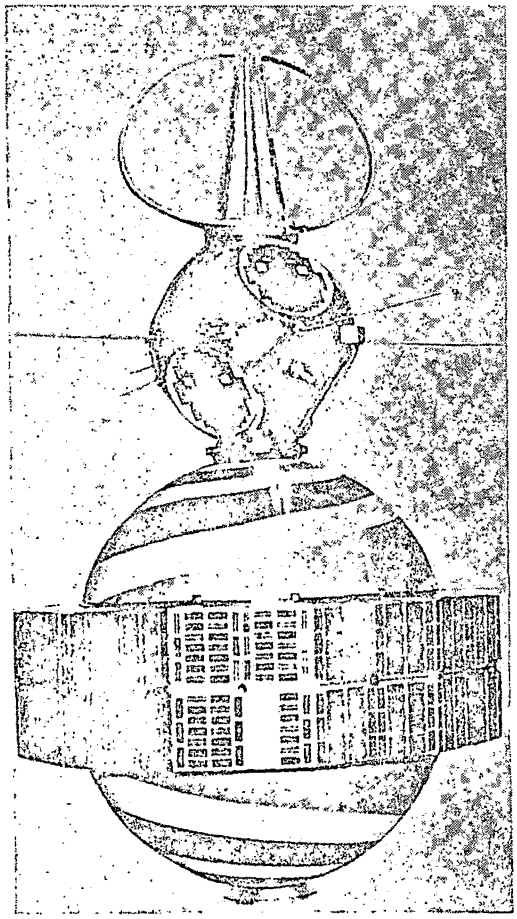
SNAP UNIT ON TRANSIT IV-A



TRANSIT III-B AND LOFTI

TRANSIT III-B (1961 ETA 1)

Date orbited .....21 Feb. 1961 (10:45 p.m. EST)
Launch site .....Cape Canaveral; second double-satellite launch but they failed to separate (see next item for data on Lofti)
Diameter .....Same as previous Transits

PAYLOAD:

Gr. wt. .....307 lbs. (both satellites)
Net wt. .....250 lbs. (Transit only)
Orbit .....Equatorial, ellipse
Inclination to equator .....28.36°
Perigee .....117 m.
Apogee .....511 m.
Vel. at perigee .....17,911 mph
Vel. at apogee .....16,102 mph
Period (min.) 94.5

LAUNCH VEHICLE:

Name .....Thor-Able-Star
Lift-off wt. .....120,000 lbs.

INSTRUMENTATION:

Standard Transit devices plus following:

- SECOR (*Se*quential *Co*llation *o*f *R*ange) transponder, to test geodetic triangulations for Army Map Service
- Magnetic memory system (to keep track of U.S. Navy ships in all seas)
- Relay system for ground-computer orbital corrections available to ships for navigational fixes

Transmission ceased Upon fall from orbit
Radio/telemetry frequencies: 4 telemetry circuits, same as previous Transits; SECOR, 224 mc, 241 mc, 448 mc
Power Supply .....Batteries recharged by 6,600 solar cells
Re-entered .....In about 6 weeks

DISCOVERIES, FEATS, SPACE FIRSTS:

- Gave groundwork for all-weather ship guidance
- Established earth-map triangulation system using three ground stations

LOFTI (1961 ETA 2)

Other name .....LOFTI is from *Lo*w *F*requency *T*rans-*I*onospheric satellite
Diameter .....20 in. (spherical)

PAYLOAD:

Net wt. .....57 lbs.

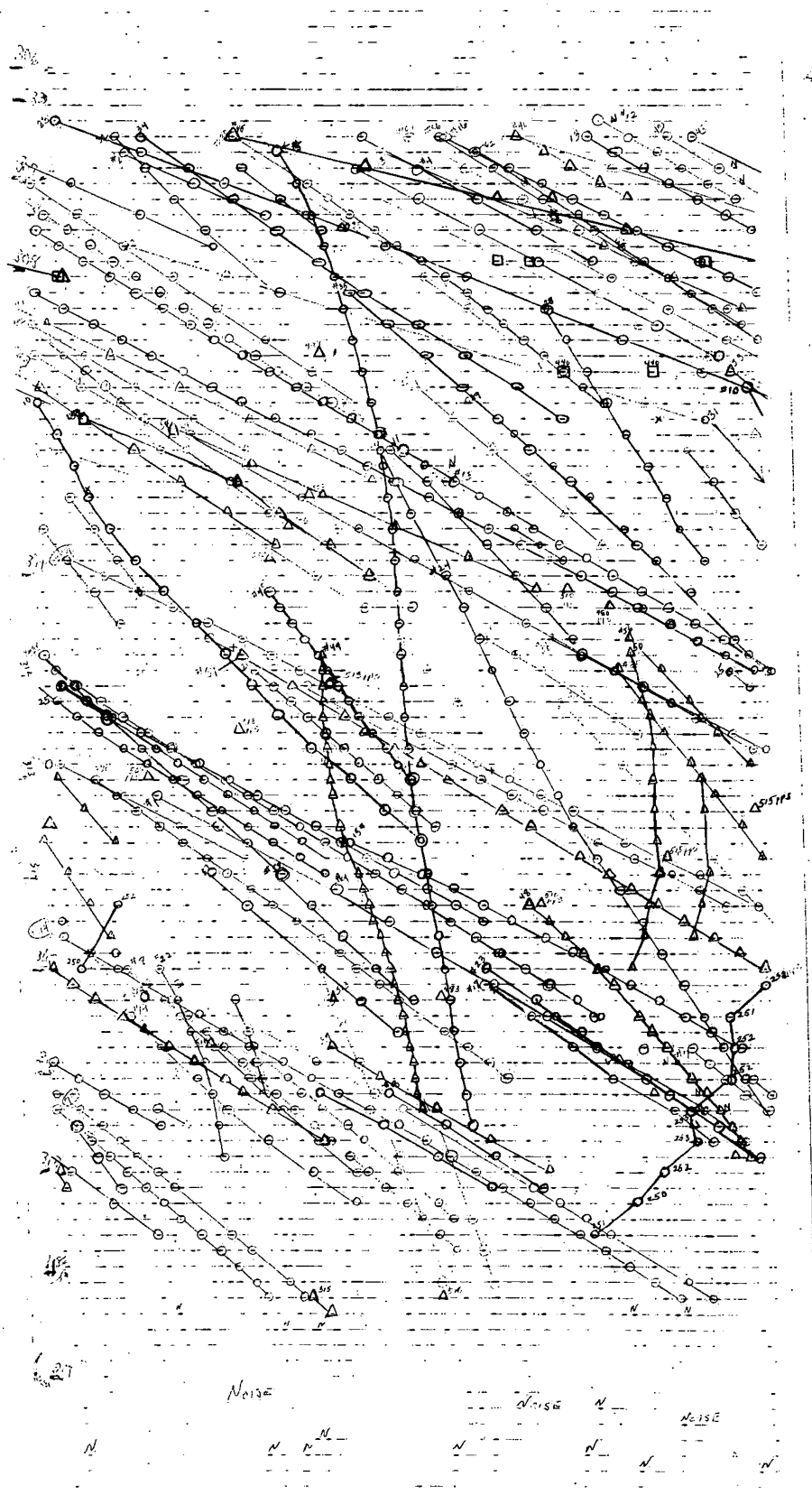
INSTRUMENTATION:

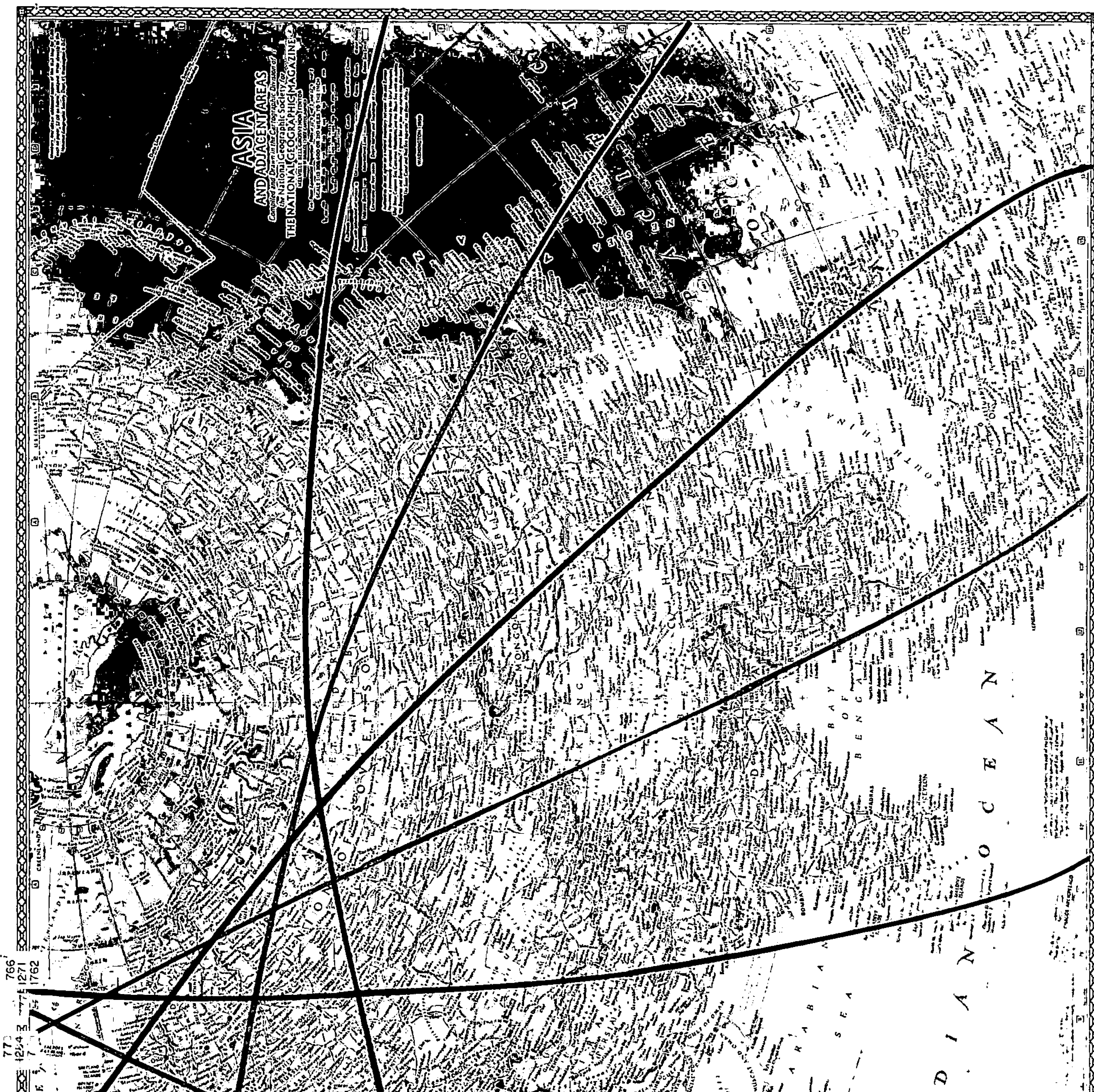
- Transmitter, command receiver, 5-channel telemetry, 2 VLF (Very Low Frequency) receivers

Transmission ceased ....upon orbital fall
Radio/telemetry frequency .....136 mc
Power supply .....6 solar-cells (9 in. diameter each)

DISCOVERIES, FEATS, SPACE FIRSTS:

- Proved that VLF waves penetrate down through ionosphere to earth stations
- Laid groundwork for use of VLF guidance links between earth stations and satellites
- Established feasibility of relaying signals from land to satellite to submerged submarine (VLF waves can penetrate water and ice)
- Indicated for the first time that some electromagnetic waves (VLF in this case) do not travel at the speed of light





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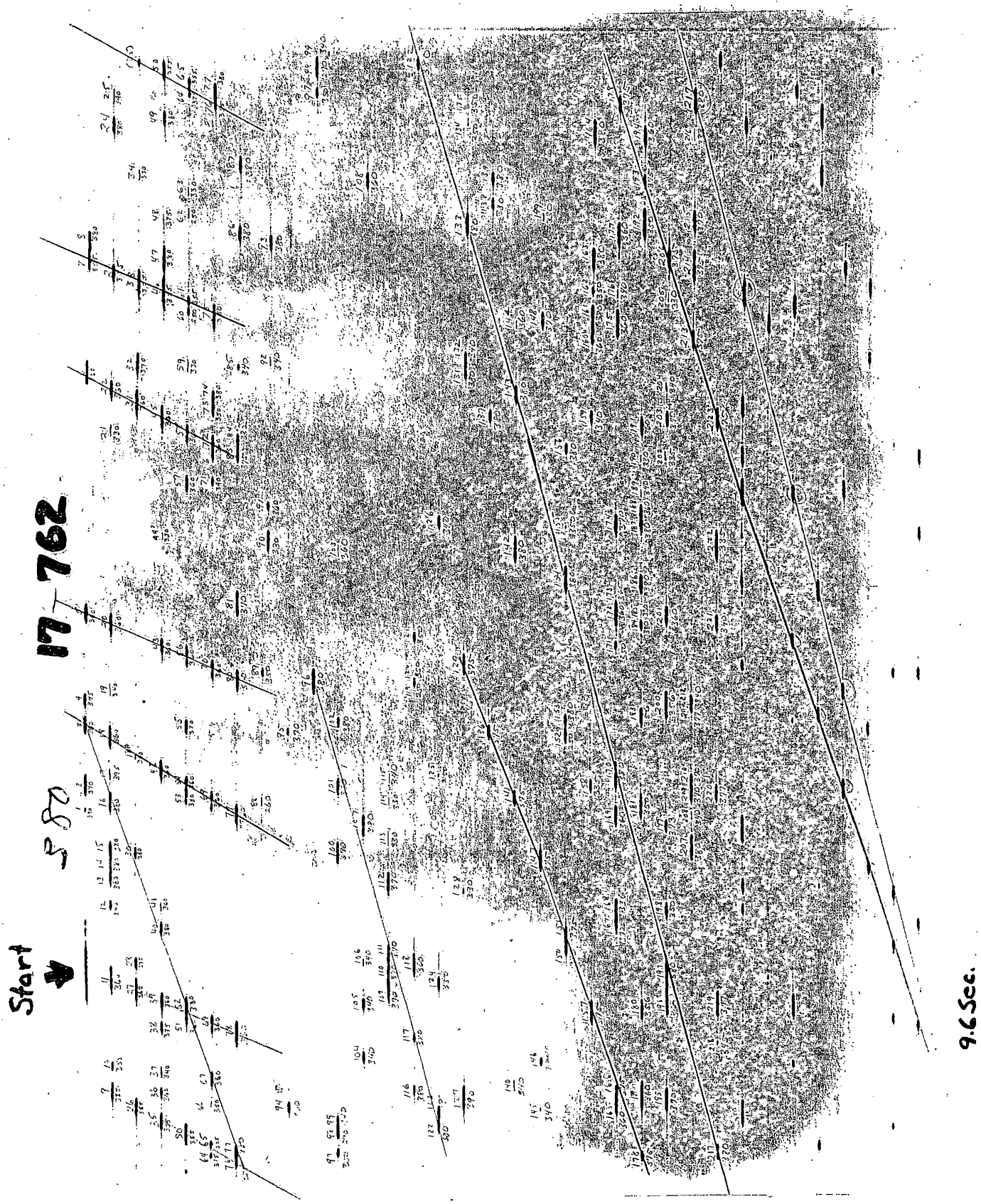

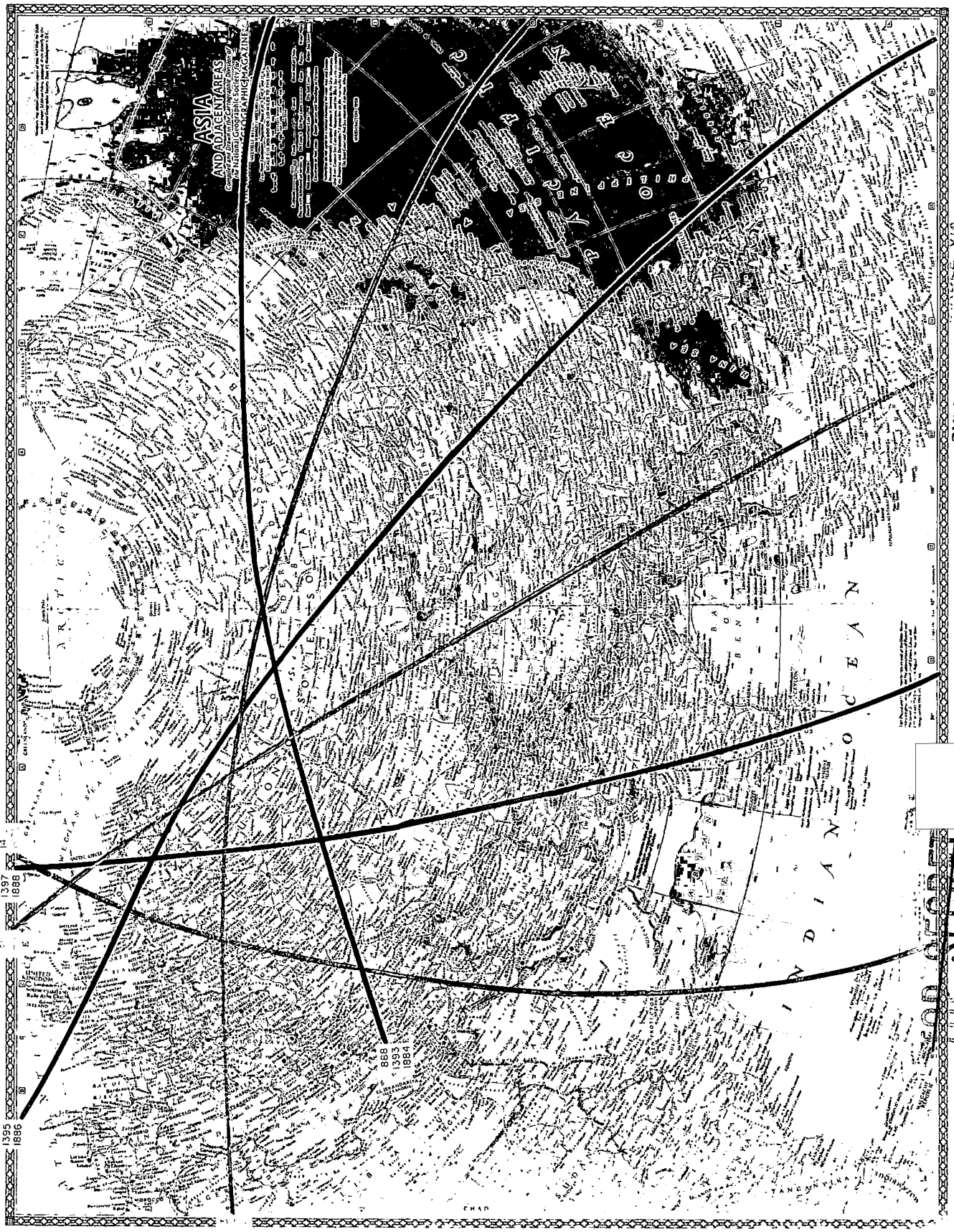

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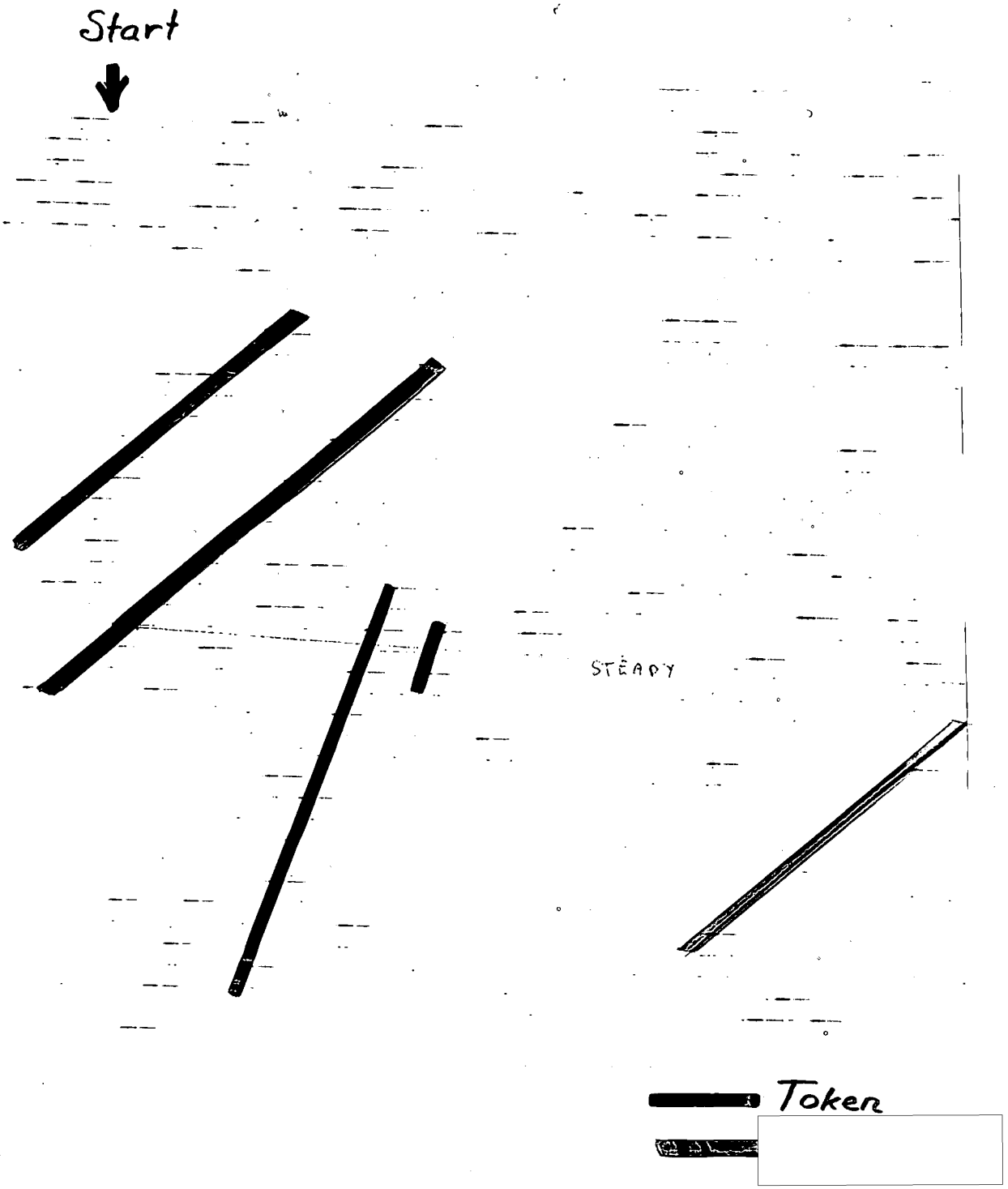

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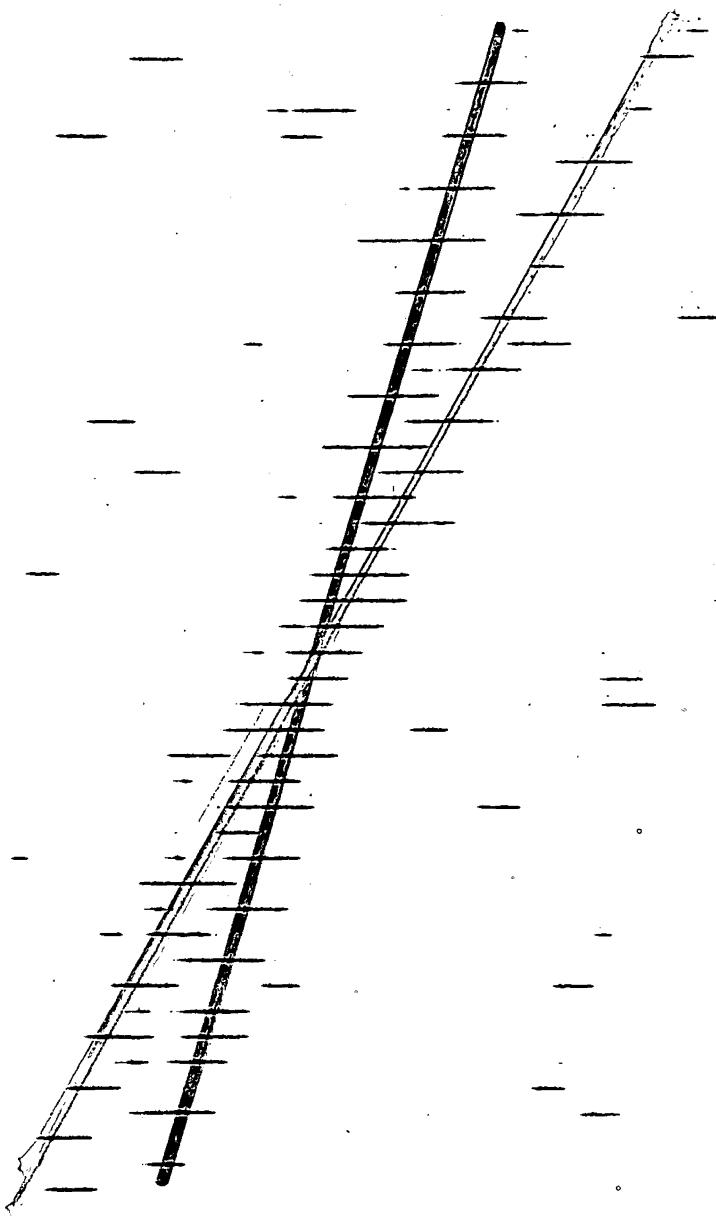

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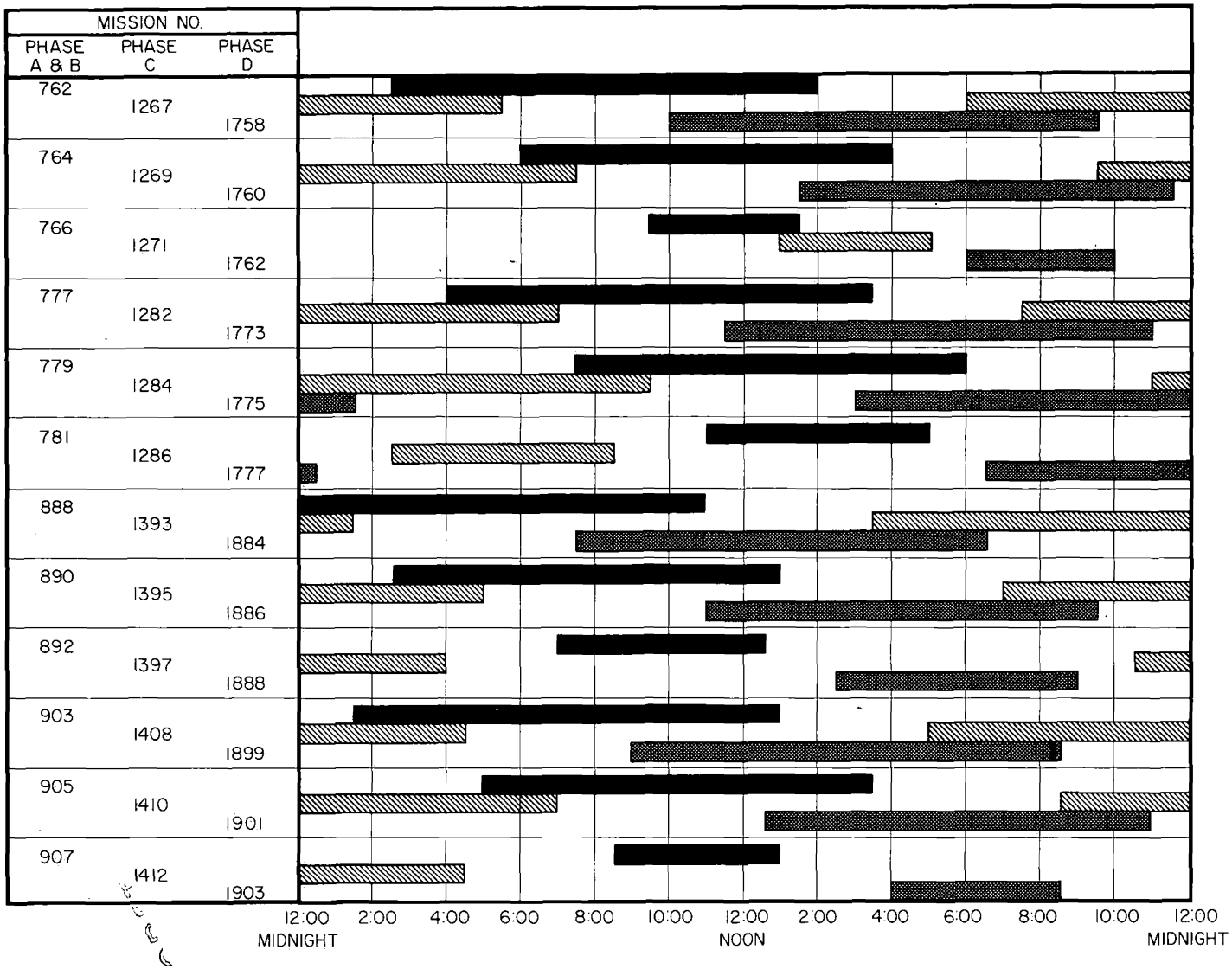

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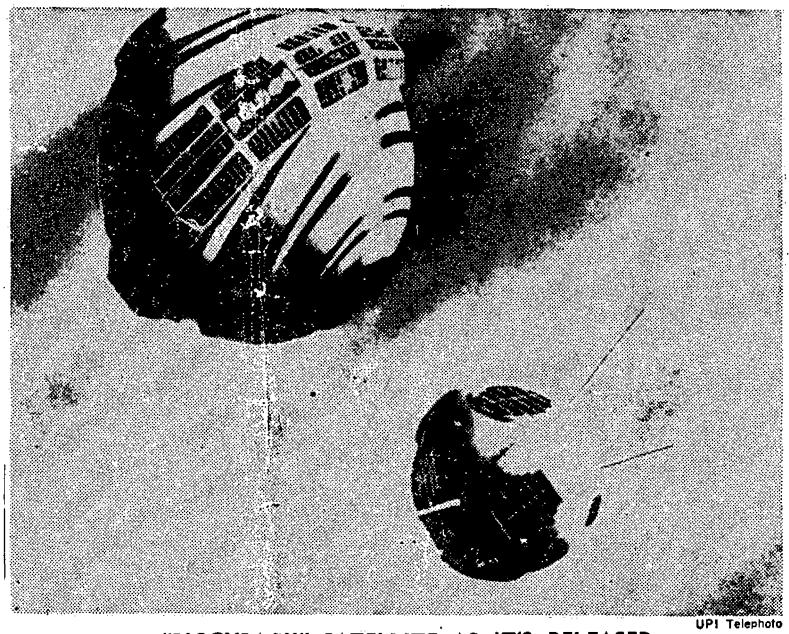
Piggyback Gives U.S. Space Refill

One Rocket Orbits Twin Moons



UPI Telephoto

"PIGGYBACK" SATELLITE AS IT'S RELEASED
. . . from Transit 2-A satellite [bottom] by spring force

Satellites At Glance

CAPE CANAVERAL (AP) Here are the facts about the two "piggyback" satellites placed in orbit by a two-stage Thor-Able-Star rocket today:

Transit II-A

Size — 36-inch sphere.

Weight — 223 pounds.

Purpose — one of several experimental vehicles designed as fore-runners of an operational network of navigation satellites.

Equipment — two oscillators to send back radio waves on four fixed frequencies; solar cells and storage batteries for power; infrared scanner to measure satellite's rotation; antenna painted in spiral on outside of sphere; electronic clock as time standard; receiver to measure galactic noise.

Radio frequencies — 54, 162, 216 and 324 megacycles.

'Piggyback' Satellite

Size — 20-inch sphere.

Weight — 42 pounds.

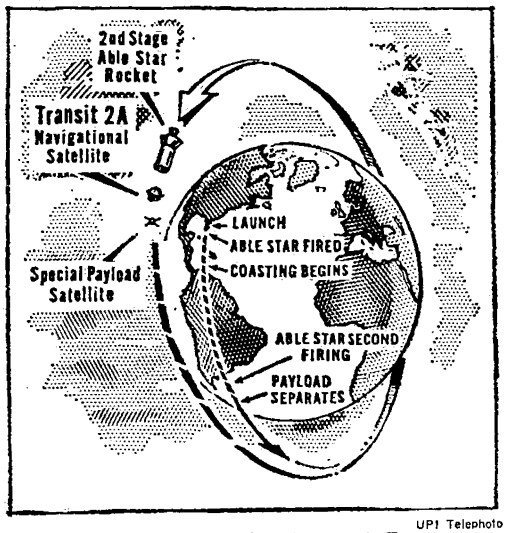
Purpose — To measure solar radiation in the ionosphere.

Equipment — Radio transmitter; solar cells and storage battery; radiation measuring instruments; four antennas extending from the waist of the satellite.

Radio frequency — 108 megacycles.

Expected life of both satellites — about 50 years.

Intended orbits — nearly circular, about 500 miles up.



UPI Telephoto

DIAGRAM SHOWS ORBIT
. . . of "mother and daughter" satellites

 plans continuing programs in an effort to figure out the
mecnanism of these radiation belts.
enough so that the detection of "secret" high-altitude nuclear tests poses no problems. These artificial belts may pose problems, however, to designers of space electronics. Depending on the altitude of the orbit, an added shielding-weight penalty may have to be paid.

CAPITAL CAPSULES

- The Federal Aviation Agency has initiated a $3.8-million Instrument Landing System (ILS) improvement program—through the addition of wave guide localizers, modified glide slope antenna systems (to minimize local signal distortions), and glide slope monitors.
- NASA and the Dept. of Defense have signed a Transit navigation satellite agreement whereby NASA will evaluate Transit equipment for non-military navigation uses, and wherein Navy and NASA will co-operate and exchange information with one another.
- The FAA has ordered two private contractors doing economic studies on the supersonic transport to get their reports in by May 1, so that it can follow shortly with its long-delayed recommendations to the White House.
- Navy's Solar Radiation I satellite has been turned back on after 22 months of silently orbiting the earth. Though magnetic drag long ago reduced the satellite's spin below tolerable levels from the point of view of its original purpose, successful operation of the satellite otherwise proves its tolerance to space radiation.
- Among Navy's priority electronics R&D projects is an airborne advanced ASW electronics system, the purpose of which is to integrate subsystems, thus reducing the number and size of displays, and enabling a reduction in both weight and number of operating personnel.

April 12, 1963