
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
U.S.A.

THE BIRTH OF NASA - 1958

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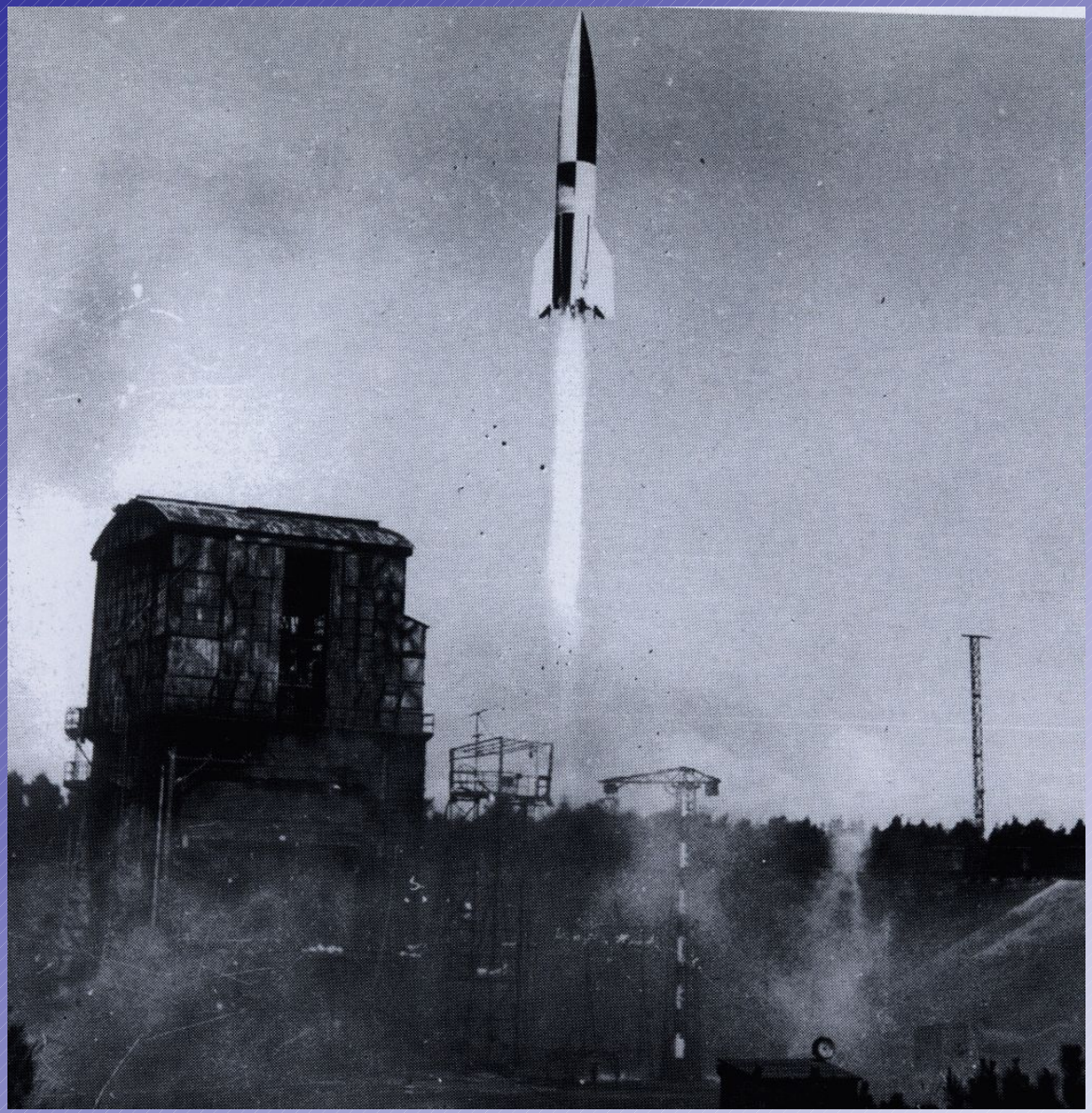
“In this decade...”

- May 25, 1961: JFK starts the Moon race.
- But the Space Age was already in full flow
- NASA was formed in 1958
- The US space effort began long before that

Cue the space race...

October 1942: First into space



America in orbit 1957-1961

- Early program run by military and CIA:
  - US Army (ABMA/Huntsville): Explorer, Pioneer (with JPL)
  - US Navy (NRL/Washington): Vanguard
  - US Navy (NOTS/China Lake): “NOTSNIK”
  - US Air Force (WDD/Los Angeles): Able, Samos, Midas
  - CIA (Langley): CORONA (Discoverer)
- NASA formed 1958 for civilian space programs
- NRO formed 1961 for reconnaissance programs

THE ROCKET'S RED GLARE

ABMA/JPL Explorer

- Werner von Braun's stretched V-2 with spinning upper stages from JPL and tiny 4 kg payload
- Redstone reached apogee, spinning stages fired horizontally to get orbital velocity

XII. DESCRIPTION OF THE LAUNCHING VEHICLES

A. General Description of Explorer I

The *Juno I* configuration (Fig. 50) is similar to that of the *Jupiter-C*, but with the addition of a fourth stage and a payload. Other changes included a different shroud, over the stage 2 motor domeheads, and a new high-performance fuel—unsymmetrical dimethylhydrazine (UDMH) and dietylene triamine (DETA) in the booster.

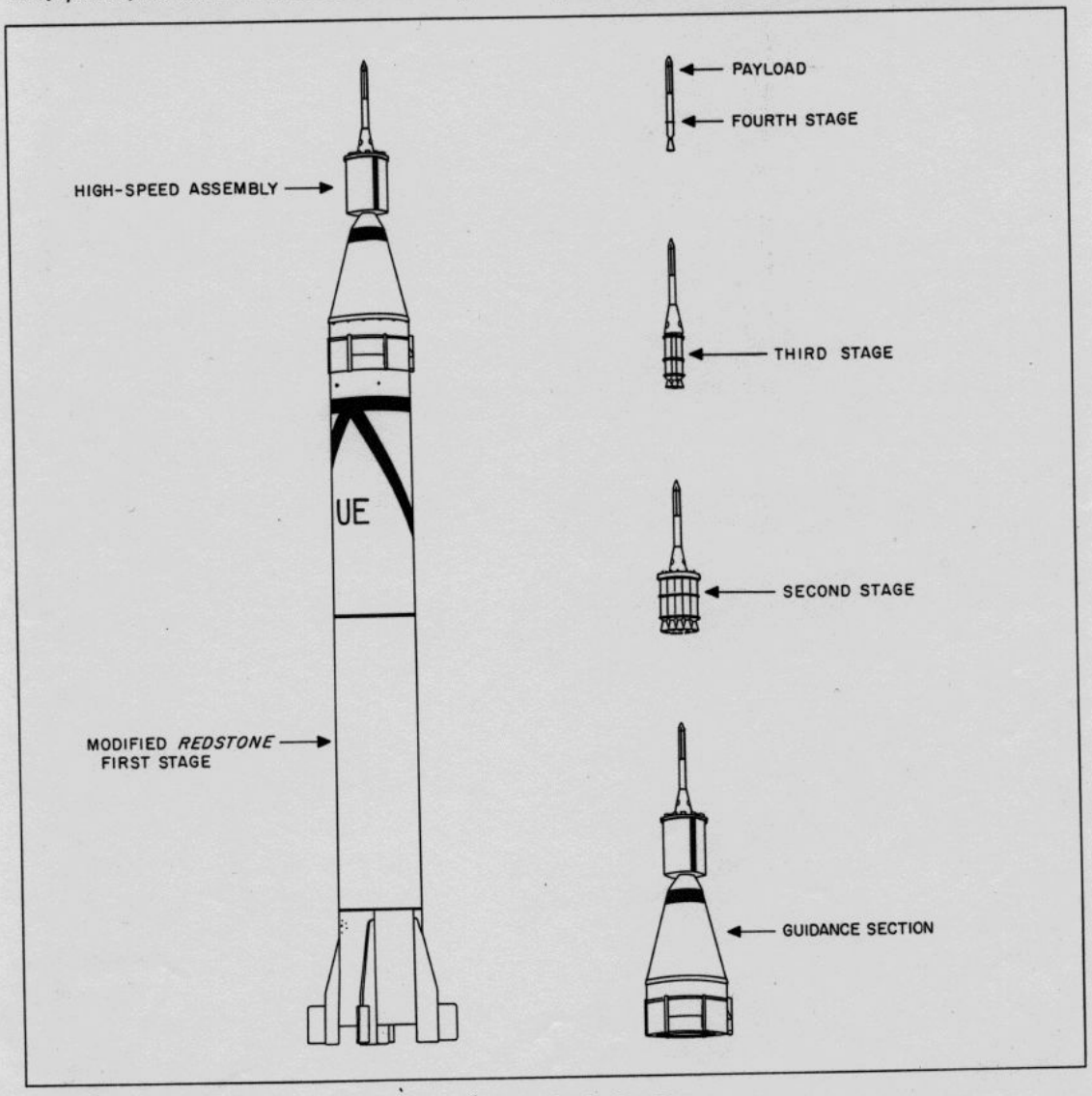


Figure 50. The *Jupiter-C*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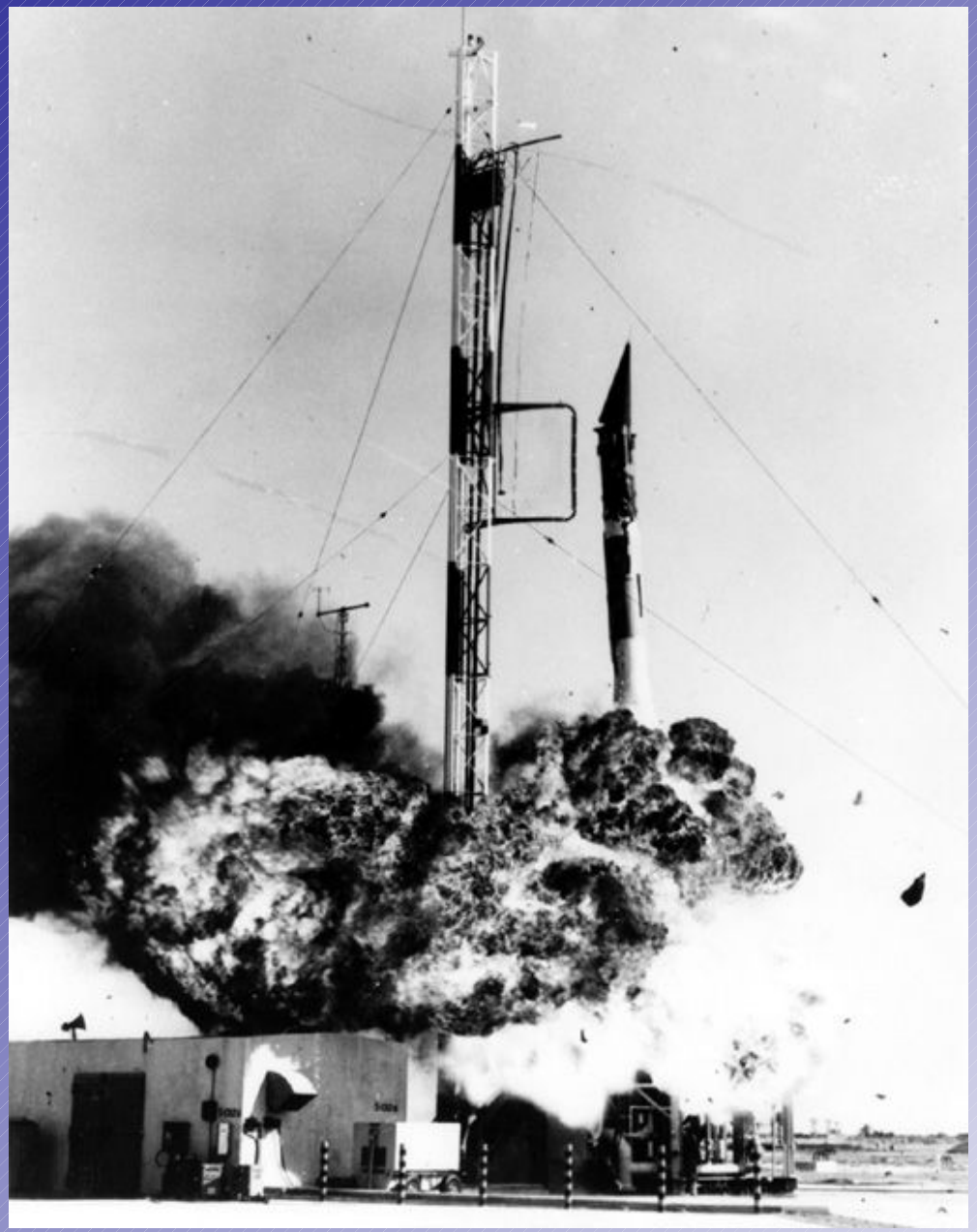
NRL's Vanguard



NRL's Vanguard

- Bad rep - but stage 2 and 3 used for Delta with success
- Early launches used 2 kg test satellite - success on 3rd try
- Standard “Vanguard sphere” was 51cm - 2 of 8 made orbit
- Some of the Vanguard team went to Goddard to do science satellites, but some stayed at NRL
- Now we know: the Vanguard 51-cm sphere satellite had a later, secret history

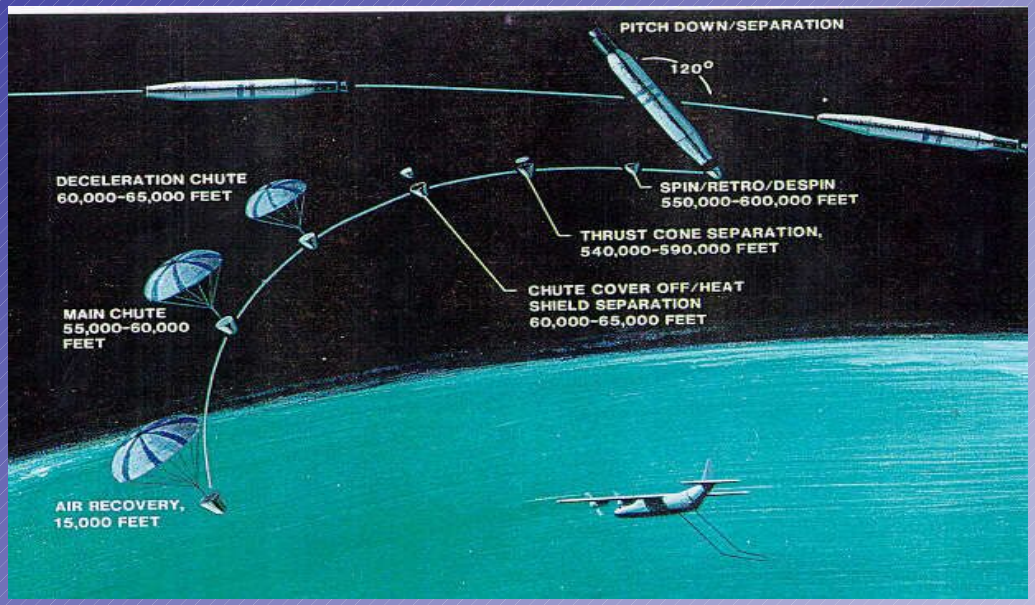
NOTSnik - Jul/Aug 1958

NOTS project

- First air-launched satellite attempt, off California coast
- Six tries, no confirmed successes
- 2 types of payload: radiation diagnostics for Argus artificial radiation belts, and infrared scanner instrument. 1 kg satellite!
- Five stage vehicle very unreliable
- Details did not emerge until 1990s

CIA CORONA/Discoverer

- First polar orbiter (D-1, Feb 59 (?))
- First 3-axis stabilized satellite (D-2, Apr 59)
- First recoverable satellite (D-13, Aug 1960)
- First spy satellite images (D-14, Sep 1960)
- NRO formed 1961



NASA is formed

- NACA Langley lab (Virginia) - Balloon satellites, Scout, Mercury, and aeronautical research
- NACA Ames lab (San Francisco) - aeronautical research
- NACA Lewis lab (Cleveland) - engines
- NRL Vanguard group -moves to new “Beltsville Space Center”, later called Goddard - science satellites
- Army ABMA group (Huntsville) - becomes NASA-Marshall in 1960 - launch vehicles
- Army contract with JPL goes to NASA
- Small group at Canaveral later becomes KSC; Houston develops in mid-1960s

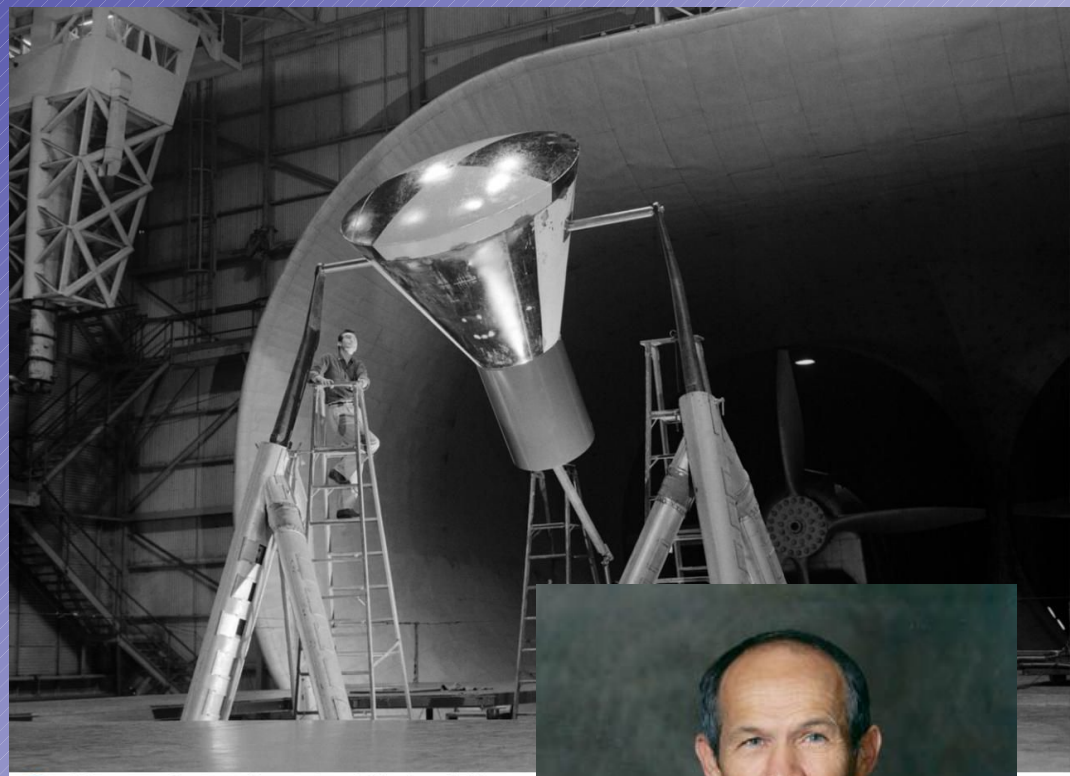
NACA Langley

- The National Advisory Commitee on Aeronautics
  - Formed March 1915
  - Langley Memorial Aeronautical Lab est. 1917 in Virginia
  - The center for wind tunnels
  - developed low drag engines, and theory for supersonic flight
  - Becomes NASA Langley Research Center (LaRC)

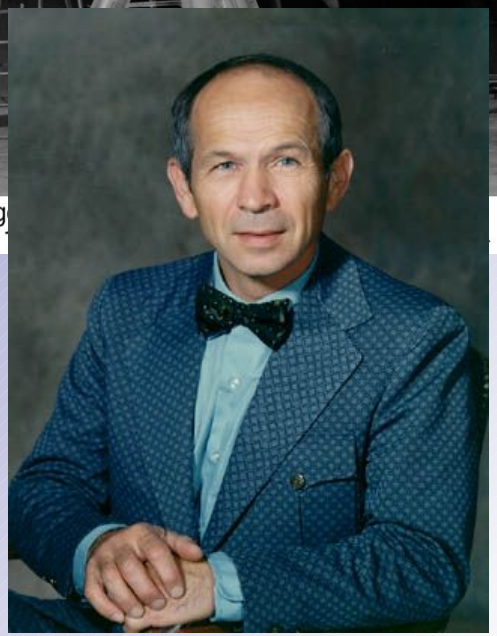
Henry Reid,
Dir.
1926-1960

LaRC's influence

- LaRC was the core of the early NASA
- It was the center of the Mercury program, before astronaut work moved to Houston
- Designer Max Faget
- Some of the early Explorer satellites were from LaRC
- The other 'old' NASA centers - Ames, Lewis, Wallops, Dryden - were offshoots of Langley, and later so was JSC-Houston
- Nowadays LaRC does mostly aeronautics



Mercury Space Capsule– Winds of Chang
NASA Langley Research Center



Apr 1959: The Original Seven

NASA-Langley 2008: Ares/Orion prototype module

NACA-Ames

- Moffett Field Lab est. at San Francisco 1940
- Renamed Ames Aeronautical Lab 1944
- Became NASA Ames Research Center (ARC)

NACA-Lewis

- Founded 1940
- Named Lewis Research Center 1948
- Became NASA-LeRC
- Renamed NASA Glenn Research Center (GRC) after John Glenn in 1999
- Pioneered liquid hydrogen engines (Centaur, Saturn IVB) under Abe Silverstein

NACA-HSFS at Edwards AFB

- Langley Center's Muroc Flight Test Unit at Muroc Army Air Field, 1946
- NACA High Speed Flight Research Stn, 1954; Muroc renamed Edwards Air Force Base 1949
- HSFS is NASA civilian area inside USAF's Edwards
- Renamed Dryden Flight Research Center 1976

Endeavour at Edwards, 2008

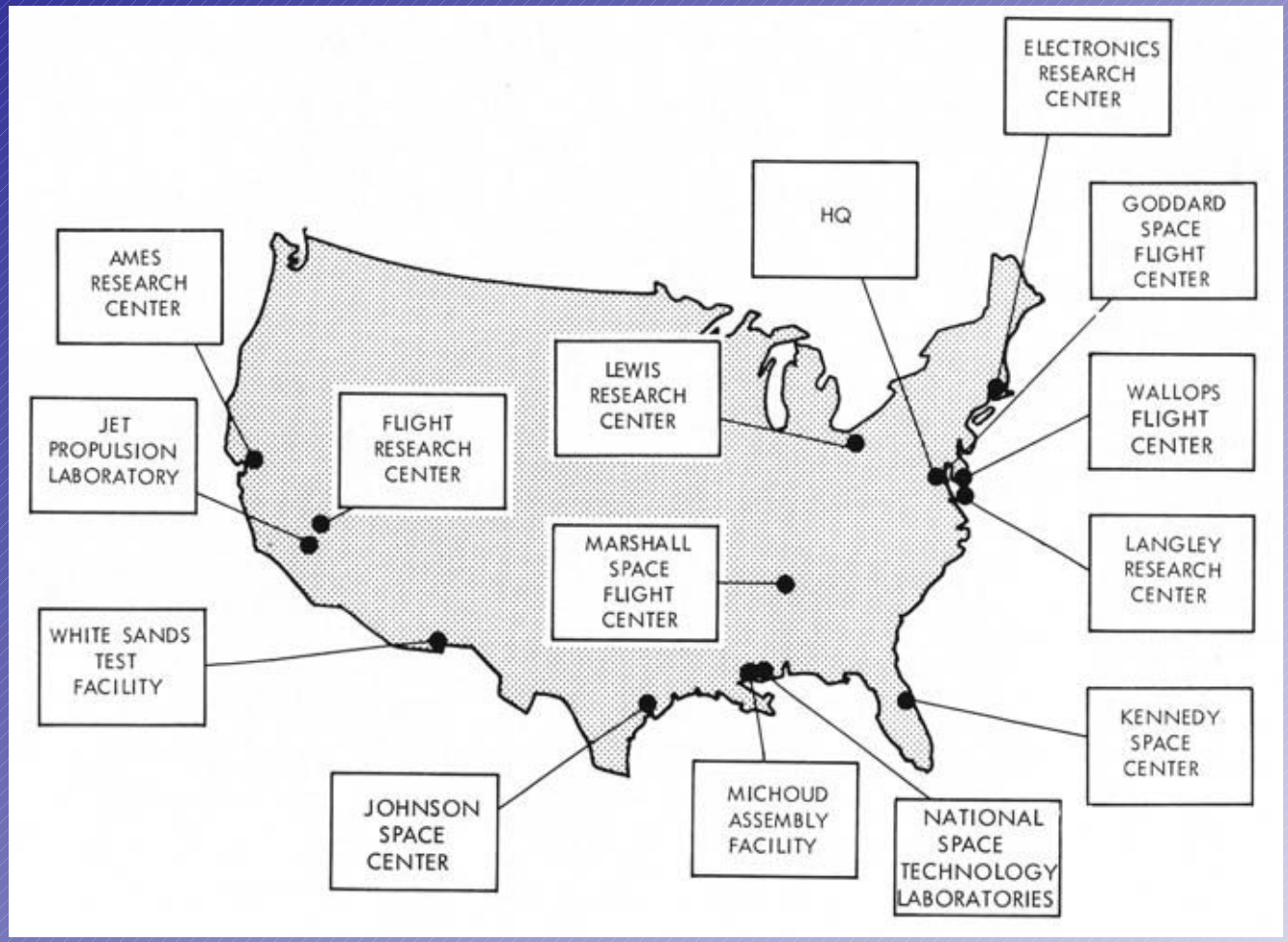
NASA = NACA + Army + Navy
(1) Marshall - the von Braun heritage

- Redstone Arsenal in Huntsville, Alabama was the home of the Army Ballistic Missile Agency (ABMA), with rocketeer Werner von Braun
- A piece of ABMA became NASA-Marshall in 1960, and built the Saturn rockets
- ABMA worked closely with Caltech's JPL, whose army contract was transferred to NASA

NASA = NACA + Army + Navy
(2) Goddard - seeded by Naval Research Lab

- The Beltsville Space Center was built in Greenbelt, MD and then renamed Goddard (GSFC)
- It was staffed partly by the Navy's Vanguard team among 200 transferred from NRL
- GSFC became the center for scientific satellites
- First director was Harry Goett

NASA across the country

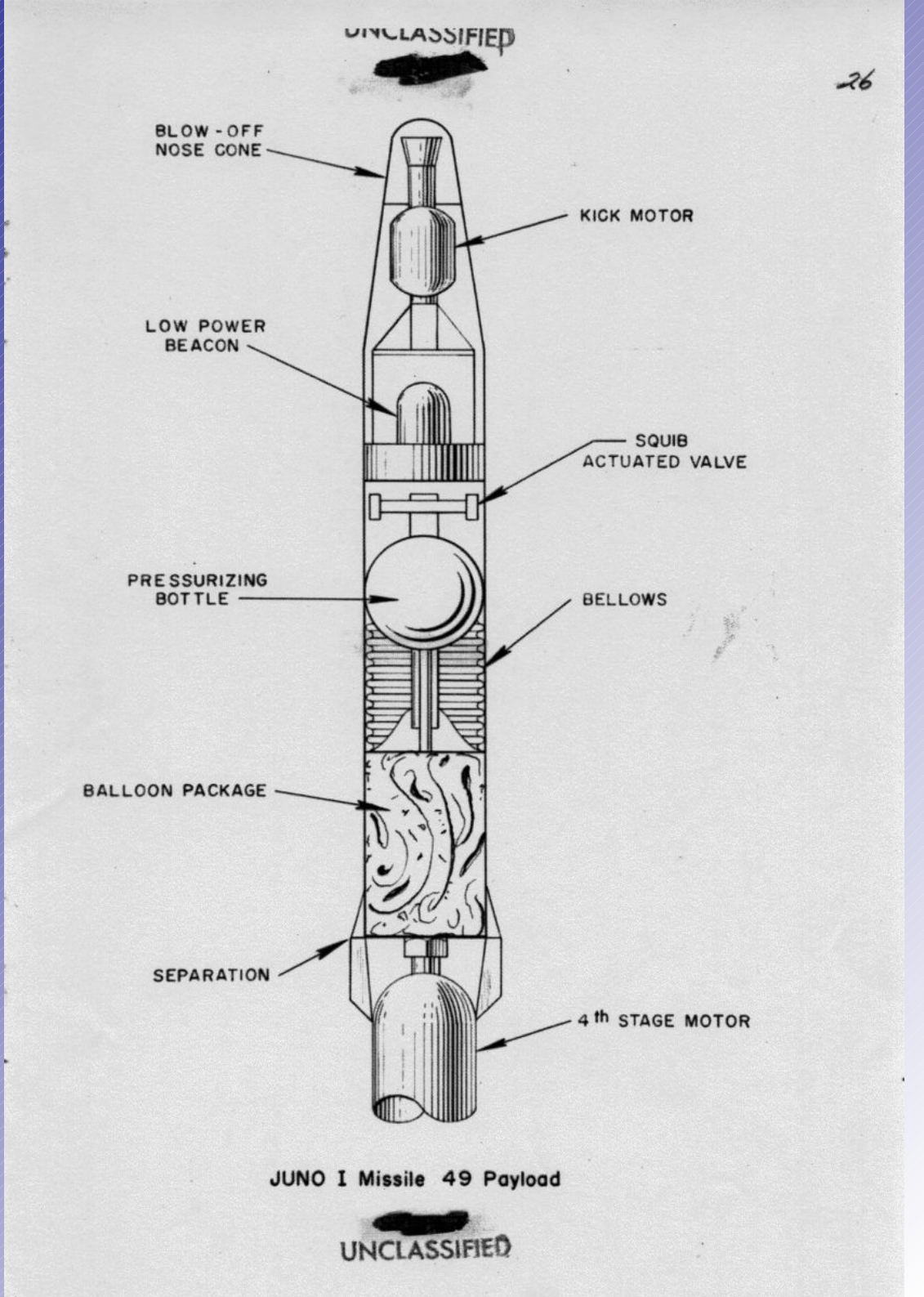


The first NASA launch

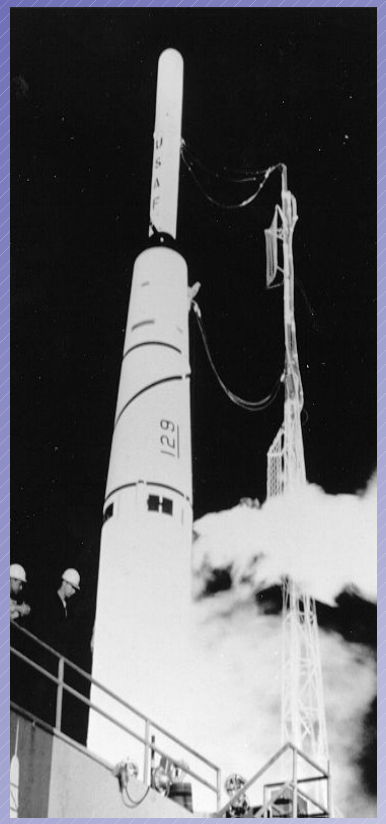
- Pioneer I was really an Air Force project run by the Los Angeles team who are now USAF Space and Missile Center
- NASA created Oct 1, 1958 and given nominal ownership of civil space programs including this one.
- Launch Oct 11, 1958
- Got altitude record of over 100 000 km but failed to reach Moon

Oct 23: A Kick In the Apogee

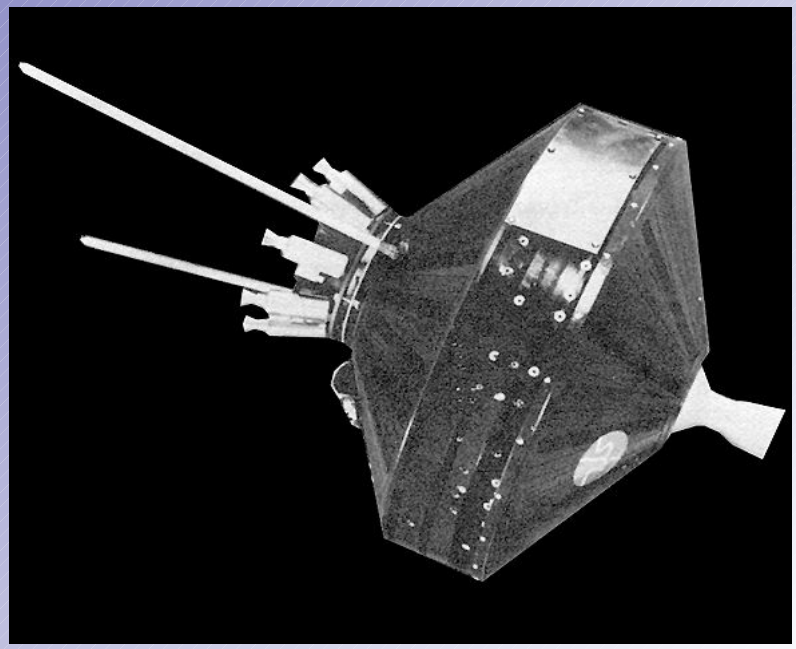
- First ever apogee motor (1 kg mass)
- First balloon satellite, from NASA Langley - main satellite built by US Army
- Known as Beacon 1
- Would have been Explorer 6
- Alas, fell in ocean; first full success not till Syncom 2 in 1963
- Pickering (JPL) coined “kick in the apogee” - hence, “Apogee kick motor”



Nov 8: Pioneer II - another Moon failure

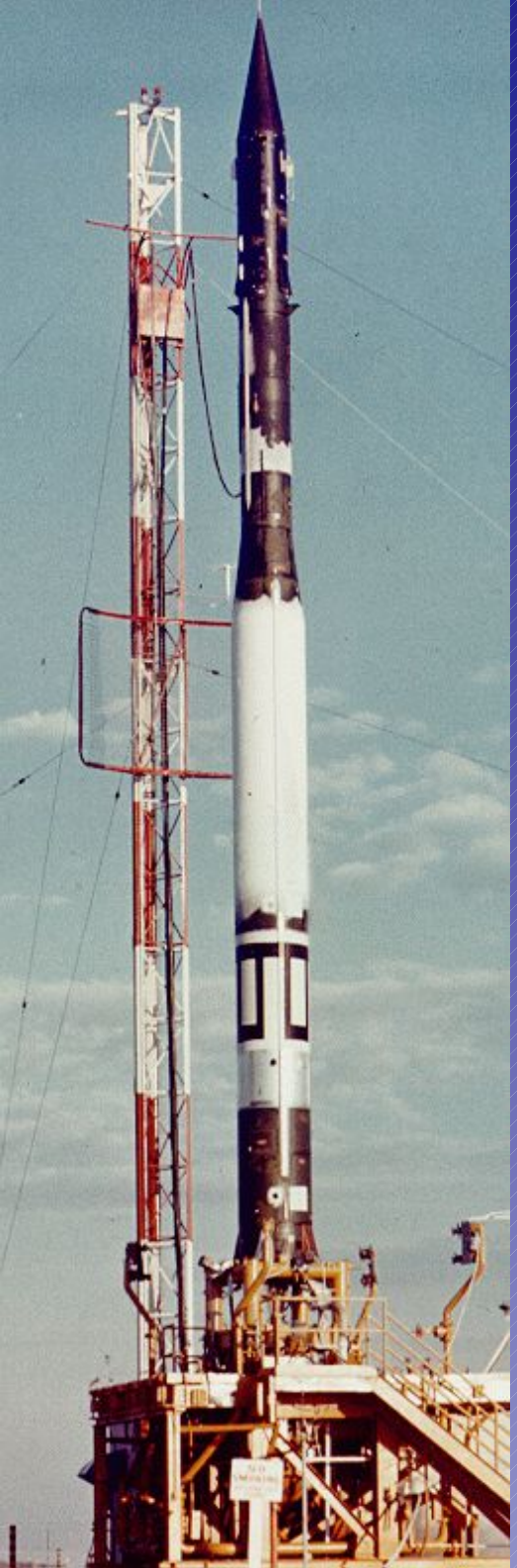


- Three-stage rocket
- Meant to sent USAF/TRW Able probe on translunar flight
- Rocket motor would put it in lunar orbit - way too ambitious for the day
- No third stage burn, fell in Africa



Dec 6: The Army's turn

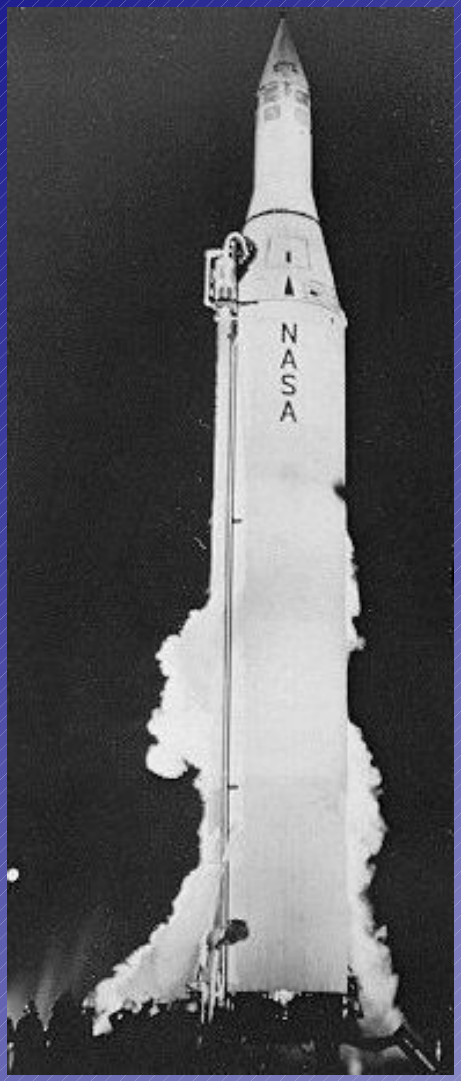
- Pioneer 3 was a JPL/Huntsville project
- NASA's painted on the side of the rocket now
- Less ambitious probe, much smaller
- Sucky guidance
- Reached only 100,000 km
  Africa gets it again...

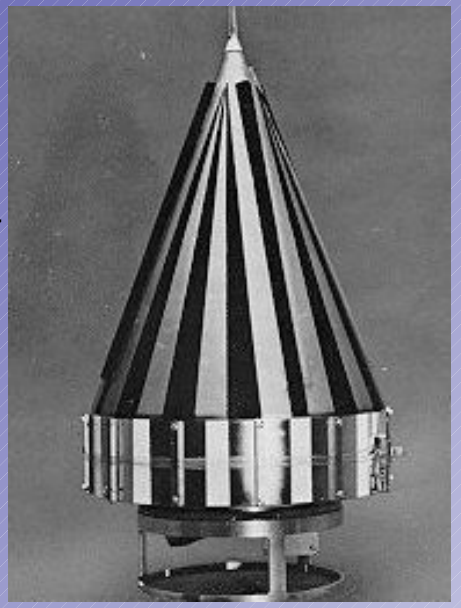


Feb 17, 1959: a Navy success

- Vanguard II is the ancestor of all weather sats
- returned crude cloud images; developed by Naval Research Lab
- Still in orbit today
- Was the first 'proper' Vanguard satellite in orbit (Vanguard I was a small test payload)

Mar 3, 1959: An Artifical Planet

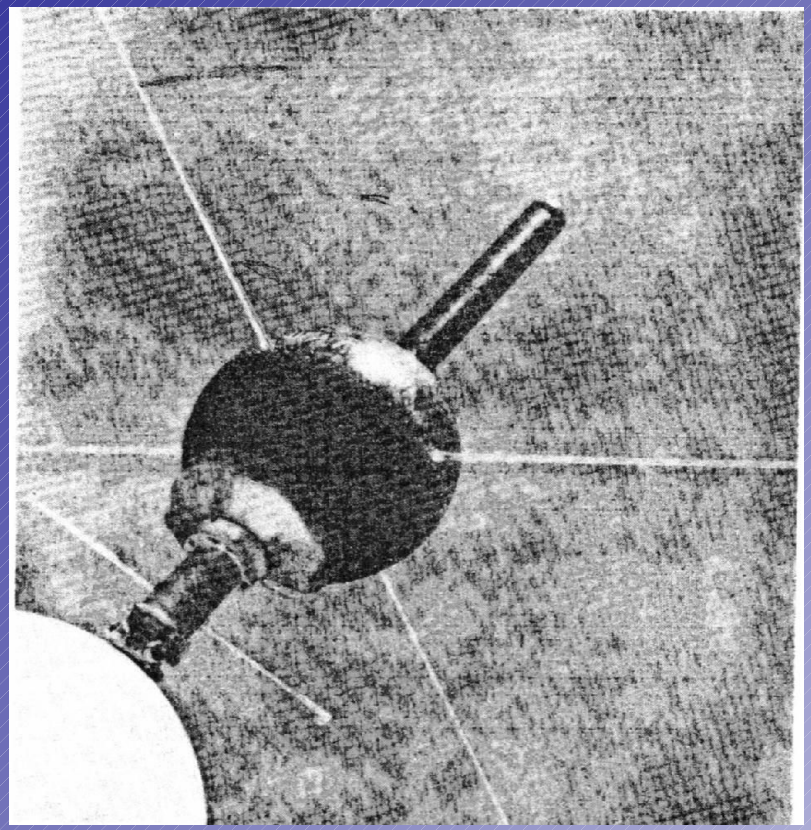




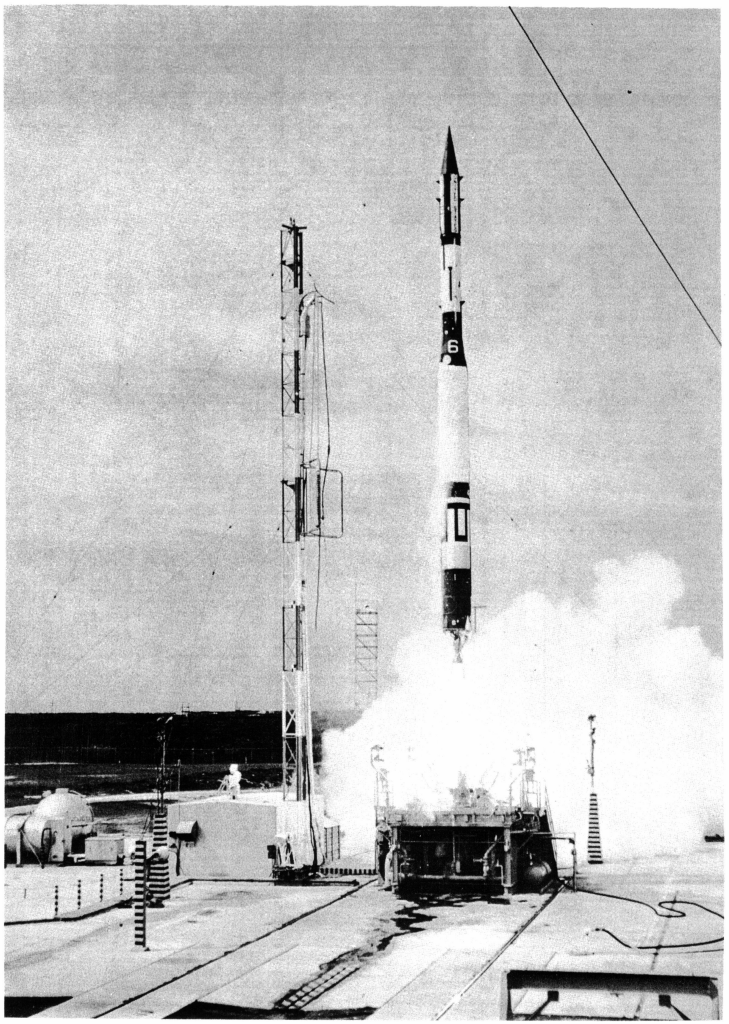
- Second Army/JPL probe,
  - Pioneer IV
  - Missed moon by 60000 km
  - Entered orbit around Sun (second artificial planet after USSR Luna probe)

Vanguard SLV-5, SLV-6

- Apr 14, Jun 22: two Navy Vanguard launch failures
- SLV-5 second stage separation problem, fell from 100 km
- SLV-6 reached 140 km before stage 2 failure



CONFIDENTIAL



SLV-6 Launch

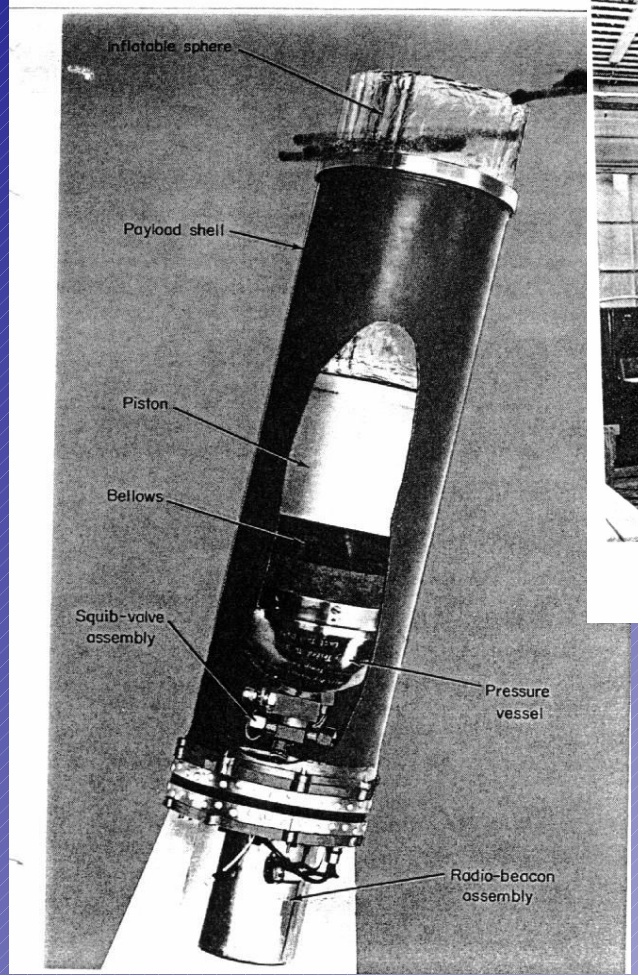
CONFIDENTIAL

Aug 7 - S-2

- S-2 was named Explorer VI after launch
- S-2 is the first probe to get a designation in the NASA system (Scientific Satellite Project No 2) but is really an Able probe
- Nominally under NASA-Goddard

Aug 15 - Beacon in the ocean

- Second US Army/NASA-Langley balloon satellite
- Launched by Army Juno II
- Reached 800 km high, but failed to enter orbit



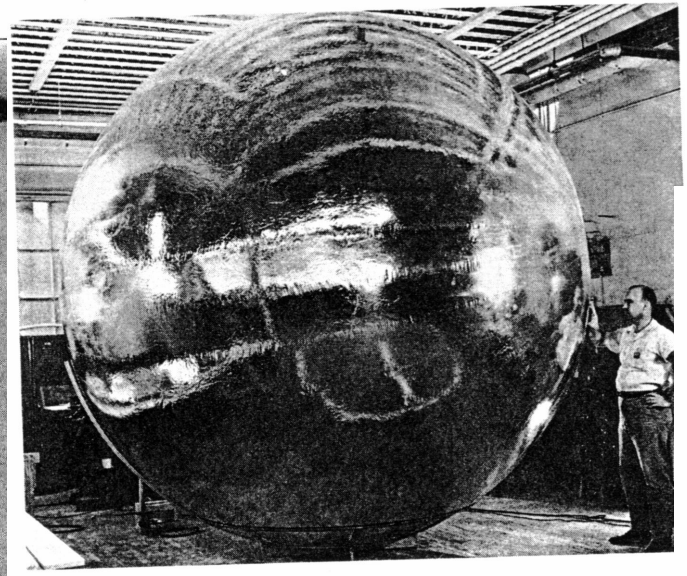


Figure 120. Inflatable sphere, 12 foot

Rockets Busy But 'Busting'

Associated Press

The United States had its busiest day of rocketry yesterday since it began reaching for space. But the main effort failed—an attempt to send a 12-foot inflatable balloon into orbit.

The Juno II rocket roared spaceward from Cape Canaveral, Fla., bearing the unusual balloon-moon. Its three stages ignited successfully, but the last one apparently went in the wrong direction and carried the satellite back into the earth's atmosphere.

Another failure was a giant Titan missile that blew up on its launching pad at the Cape earlier in the day.

On the plus side at Cape Canaveral was a successful launching of a Polaris missile from a three-million-dollar machine that simulates the motion of a submarine at sea.

The weapon is designed to be fired from a sub anywhere in the world.

At Vandenberg Air Force Base, Calif., a British Air Force training crew successfully launched a 1,500-mile Thor missile, the kind being set up at bases in England.

Another Thor was launched at Cape Canaveral. It carried a movie camera to photograph the earth from an altitude of 300 miles. But the capsule carrying the camera was not found.

In Hawaii, Air Force planes equipped with dangling trapeze devices tried to snare a capsule returning to earth from the satellite Discoverer V, which was fired into orbit Thursday from the West Coast base. They failed to get any sight of the capsule.

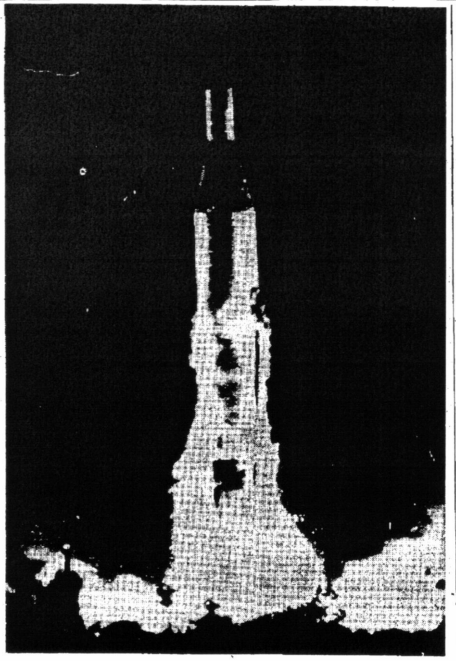
If the Cape Canaveral balloon had gone into orbit, it would have been the third successful U.S. satellite to circle the earth in a week.

Last Friday a Thor-Able rocket shoved a 142-pound "paddlewheel" satellite into orbit which still is radioing back important space information.

The baloon-moon was designed to show just how much drag the super-thin atmosphere up to an altitude of 1,000 miles or so would have on such a large, light object.

This moon would have been the first launched by the U.S. visible to the naked eye.

It was to be the forerunner of other balloon satellites as big as a house. These are to be used to set up a worldwide communications network, by bouncing radio signals off them.

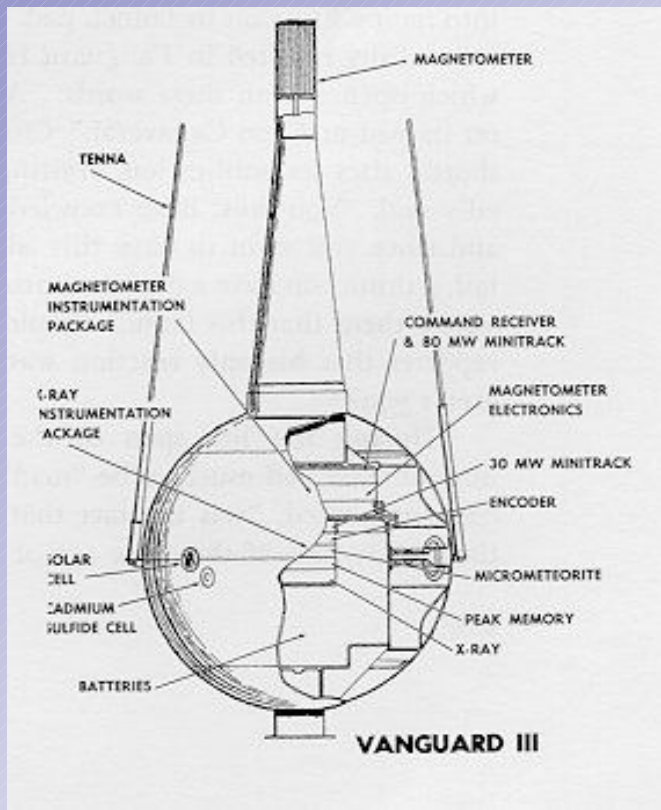


SATELLITE ROCKET — This Juno II rocket blasted away last night carrying a 12-foot inflatable balloon which was intended to orbit around the earth for reporting weather information. However, effort failed. — (AP Wirephoto.)

A-Ban Talks More Successful | Quake Kills

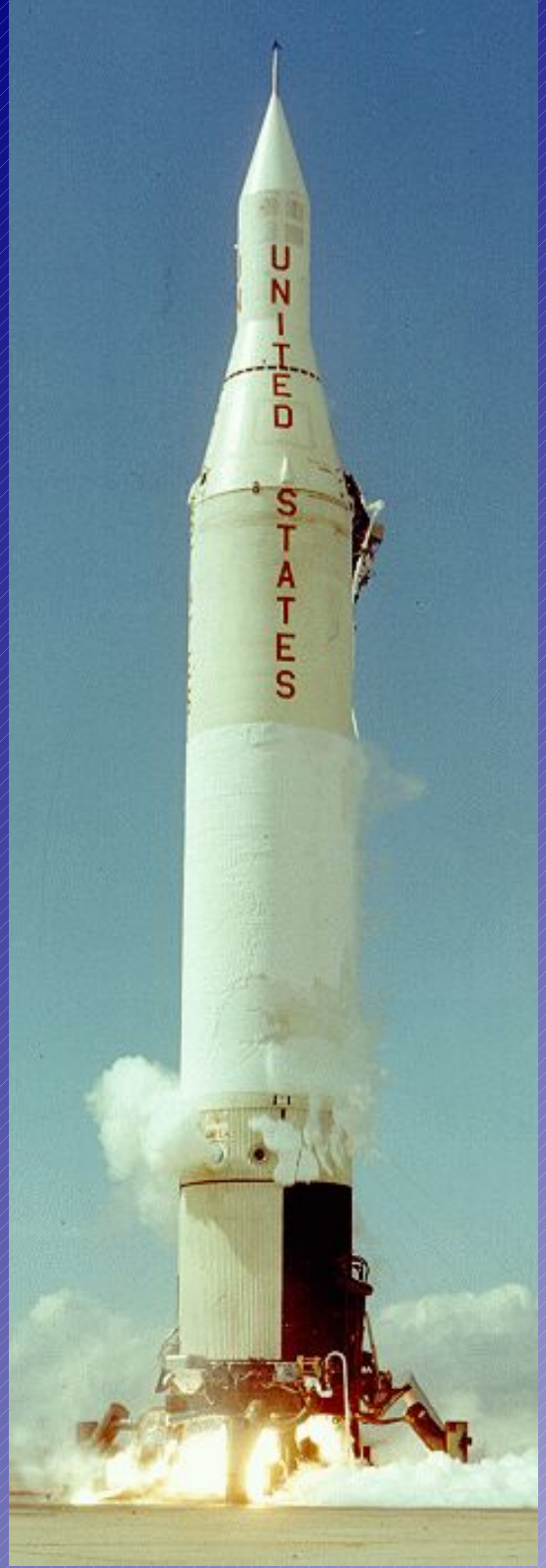
Sep 18 - Vanguard III

- Navy satellite and launch under NASA auspices
- Last 'NASA' launch of NASA's first year



NASA's second year

- October 1959 sees NASA really open for business
- The Army, Navy, Air Force satellites that had been in the pipeline start to be replaced by projects from NASA-Goddard and NASA-Langley
- In 1960, the Army space group becomes part of NASA too



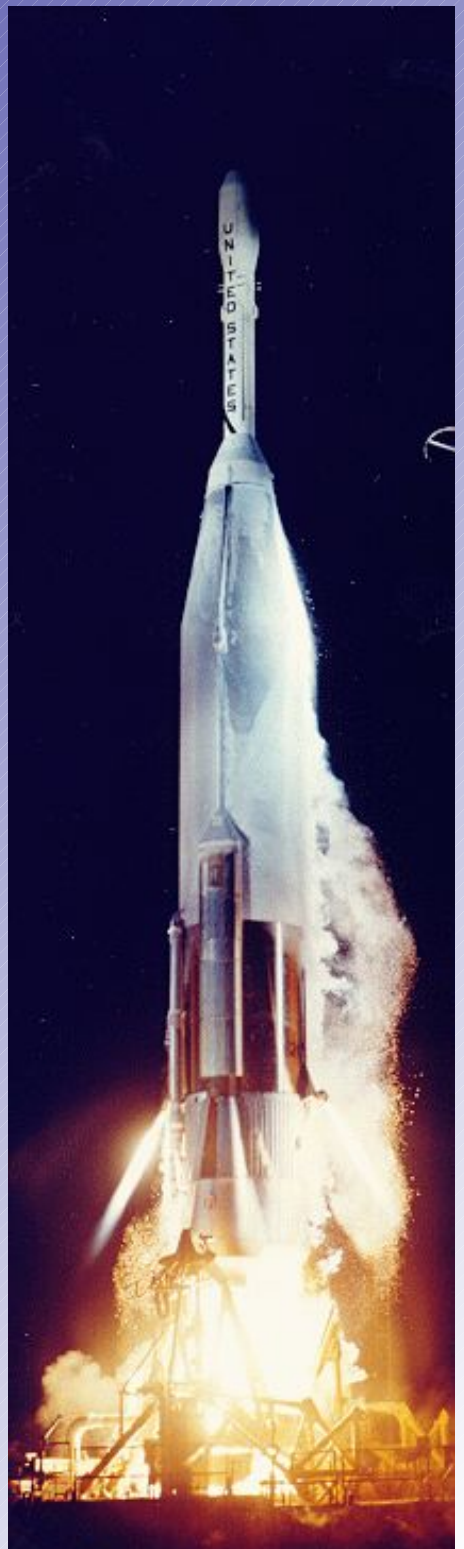
Oct 13, 1959 - S-1

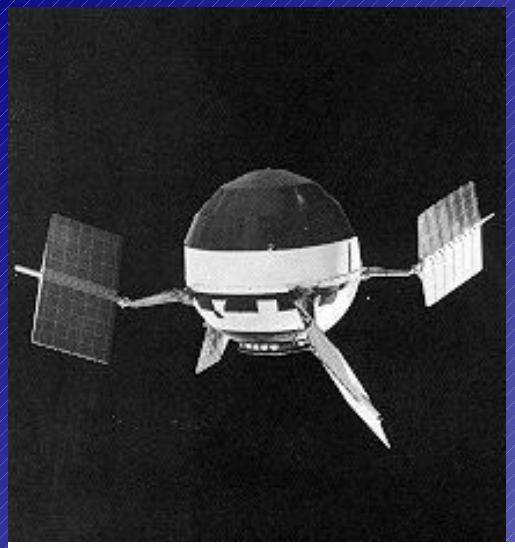
NASA S-1, the first NASA scientific satellite, and NASA-Goddard's first product, carried an array of experiments to study the space environment.

S-1 was launched by an Army Juno II and was named Explorer VII in orbit, continuing the name of the Army satellite series

Nov 26, 1959: P-3

- The P series stood for 'Probe', either suborbital or interplanetary.
- P-3 was the first to be launched, would have been Pioneer V if successful; target was the Moon
- The Atlas Able rocket's first voyage was not a happy one and once again ended in Africa
- P-3 was a TRW/USAF project following on from Pioneer 1 and 2, but management now at Goddard
- P-1 was destroyed when an earlier Atlas Able exploded on the launch pad in a static test





Mar 11, 1960: P-2

- P-2 was originally intended as a Venus probe, but was delayed until after the Venus window
- Goddard/STL mission
- Launched into solar orbit to study interplanetary space, and renamed Pioneer V
  First NASA interplanetary success

Mar 23: Goddard/ABMA S-46 satellite fails to orbit

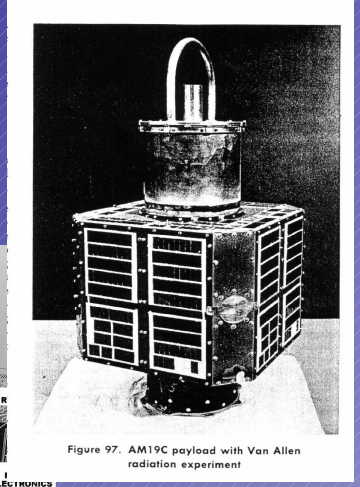
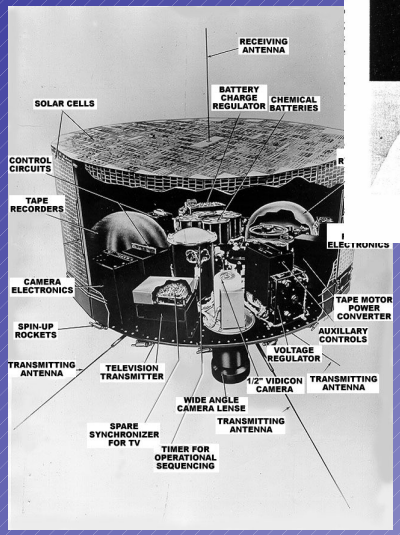
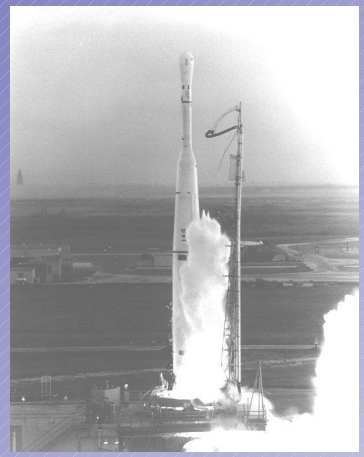


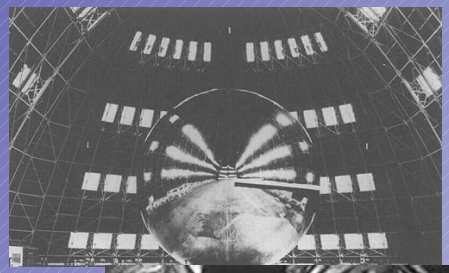
Figure 97. AM19C payload with Van Allen radiation experiment





Apr 1: Goddard's A-1 (Tiros I) weather satellite flies

May 13: Goddard/Langley A-10 (Echo) balloon fails to orbit on first Delta rocket



Aug 12: A-11 (Echo I) reaches orbit on second Delta

Sep 25: Goddard/STL P-30 moon probe fried by another Atlas Able

Atlas 80D (Pioneer P-30) 25 Sep 1960 ETR LC-12 0216

Early US programs: non-NASA

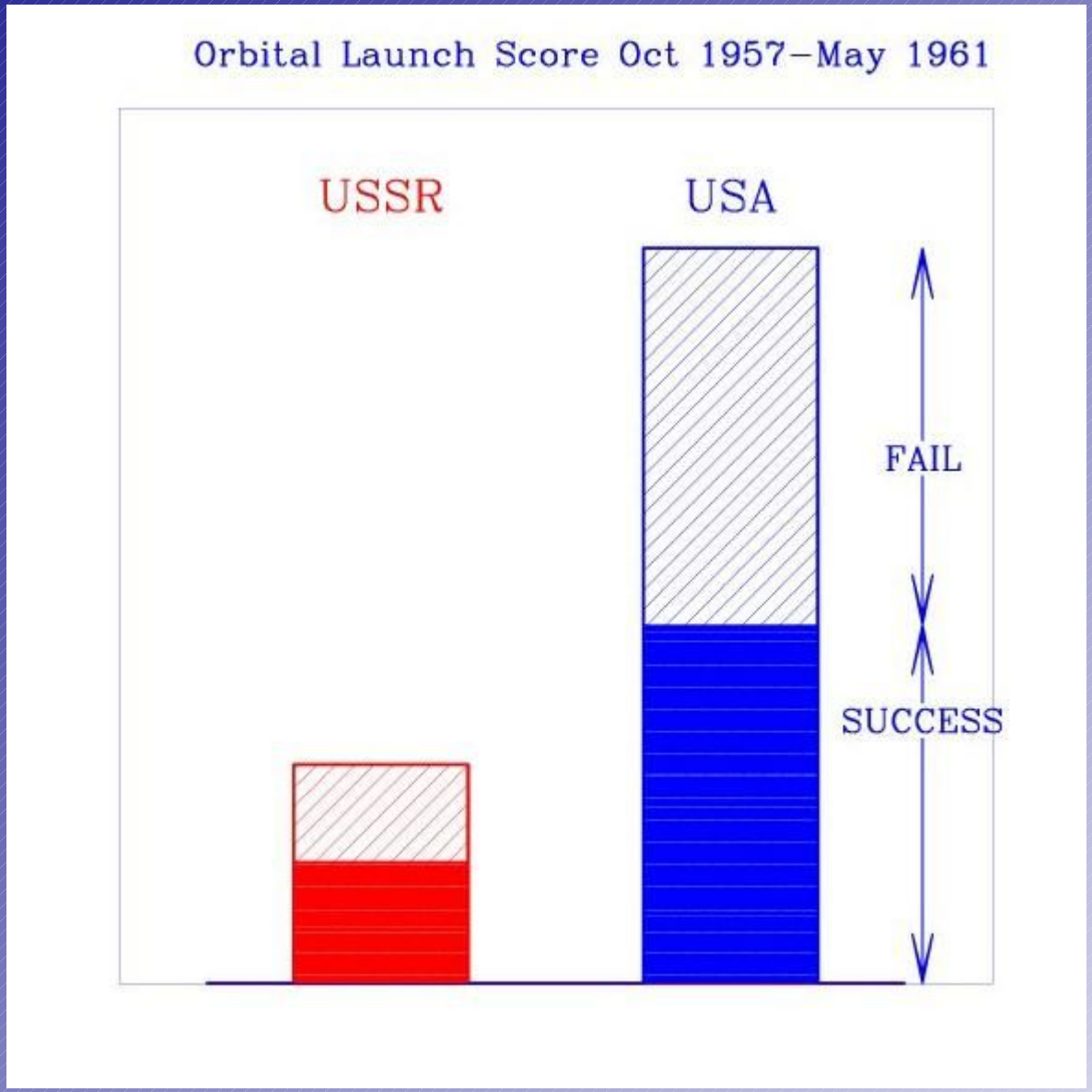
- US Army Explorer (ABMA)
- Navy Vanguard
- Navy NOTS satellite
- CIA (later NRO) CORONA spy satellite
- USAF Able lunar probes
- US Army Pioneer 3 , 4 lunar probes
- US Army SCORE and Courier communications sats (1958-60)
- Navy /APL Transit navigation satellite (1959)
- USAF Midas early warning satellite (1960)
- USAF Samos spy satellite (1961)

Early NASA programs

- NASA Explorer space physics: ABMA/Marshall
- NASA Explorer air density: Langley Research Center
- NASA Explorer space physics: Goddard Space Flight Center
- NASA Tiros weather satellite (1960)
- NASA Echo communications satellite (1960)
- NASA Mercury astronaut program (1961)

Space Race: Who won? Oct 1957- May 1961

- Total orbital attempts 109
- USSR attempts 14 out of 25 successful (+1 failed in parking orbit) which is 56 percent (or 60 percent)
- US attempts 41 of 84 successful, or 49 percent
- Marginal case: USSR Apr 1960 moon launch counted, had 200000 km apogee, better than Pioneer 1 and 3
- If these probes are excluded rates are 52 percent to 46 percent
- Within root-n Poisson standard deviation, both countries had 50 percent success rate
- Note the small number of early USSR launches despite large number of “firsts”


Orbital Launch Score Oct 1957–May 1961
USSR
USA
FAIL
SUCCESS

Space launches Oct 1957- May 1961

- Von Braun's Jupiter/Juno: 50 percent (16 launches)
- Douglas Thor: 65 percent (40 launches)
- NASA-Langley Scout: 50 percent (2 launches)
- Karel Bossart's Convair Atlas: 33 percent (9 launches)
- Rosen's Vanguard: 27 percent (11 launches)
- NOTS: 0 percent (6 launches)
- Yet within 5 years success rates rose to 92-97 percent
- Similar improvement for USSR rockets

New horizons 1962

- Ariel (UK owned, UK-built instruments, US-built satellite)
- Alouette (Canadian built and owned, US launched)
- The satellite age begins to reach beyond the superpowers

NASA's rocky early days soon led to the glory of the 1960s