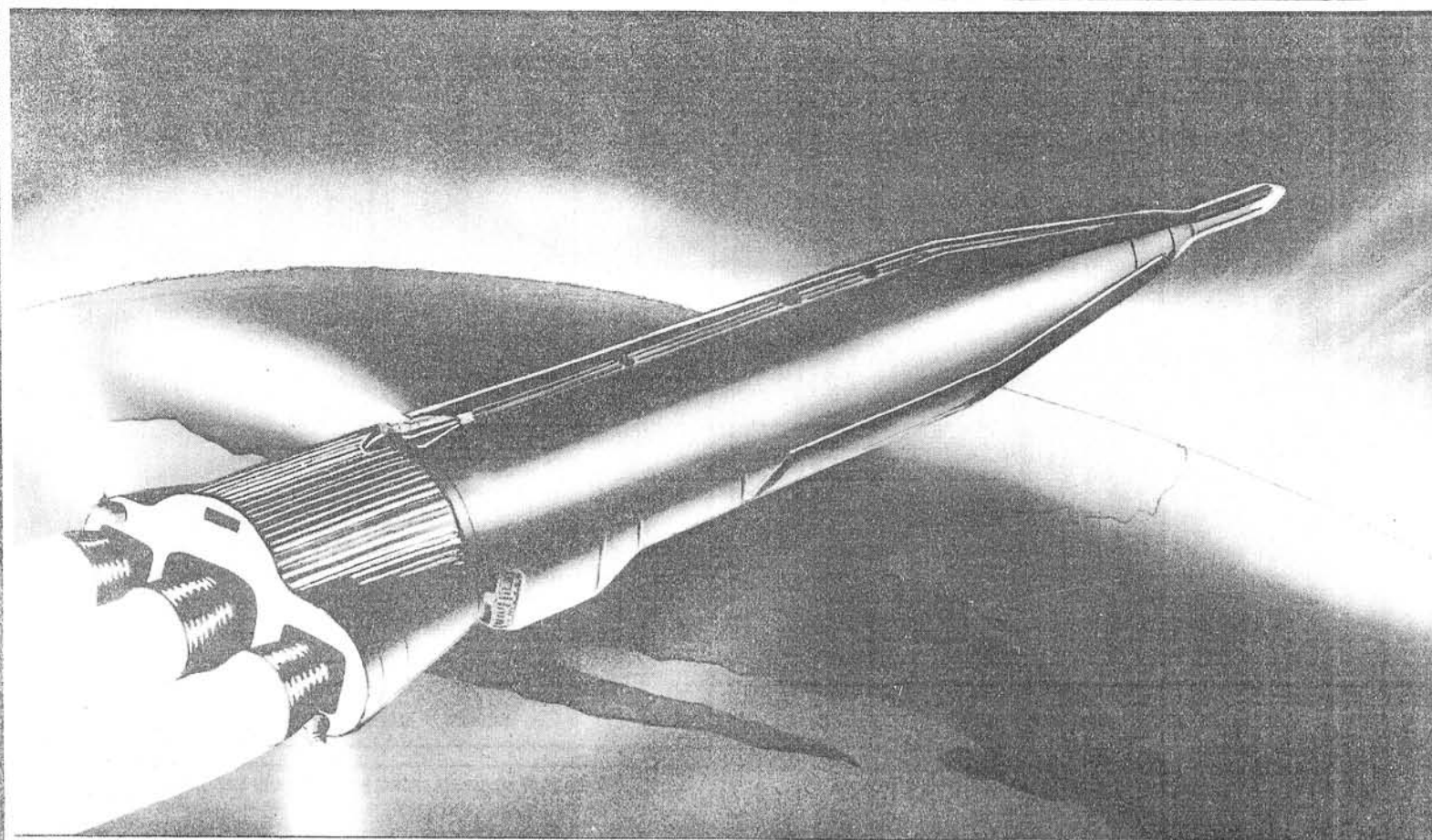


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CG/AT/25 SM-65F/chor

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## Standard Missile Characteristics

BY AUTHORITY OF  
THE SECRETARY  
OF THE AIR FORCE

# SM-65F

**ATLAS**

**General Dynamics - Astronautics**

MA-3  
SYSTEM

TWO BOOSTER ENGINES  
LR89-NA-5  
TWO VERNIER ENGINES  
LR101-NA-7  
ONE SUSTAINER ENGINE  
LR105-NA-5  
NAA-ROCKETDYNE

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SM-65F

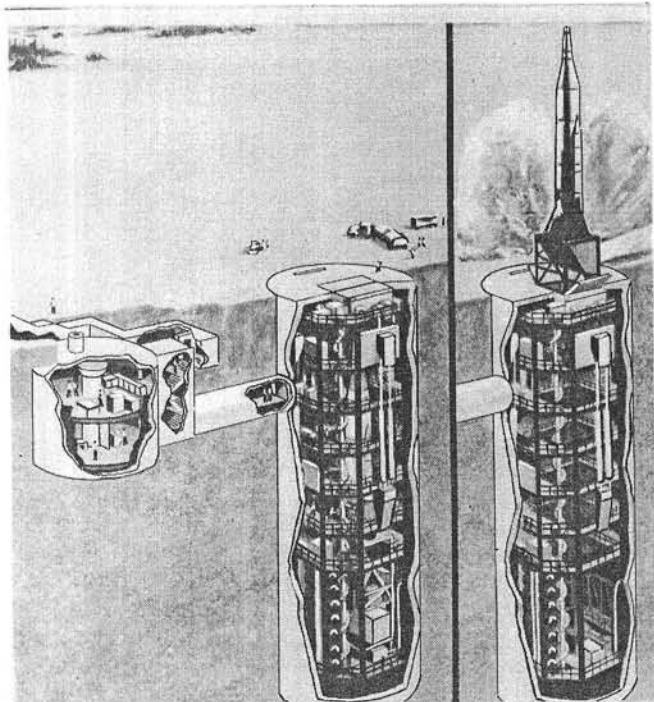
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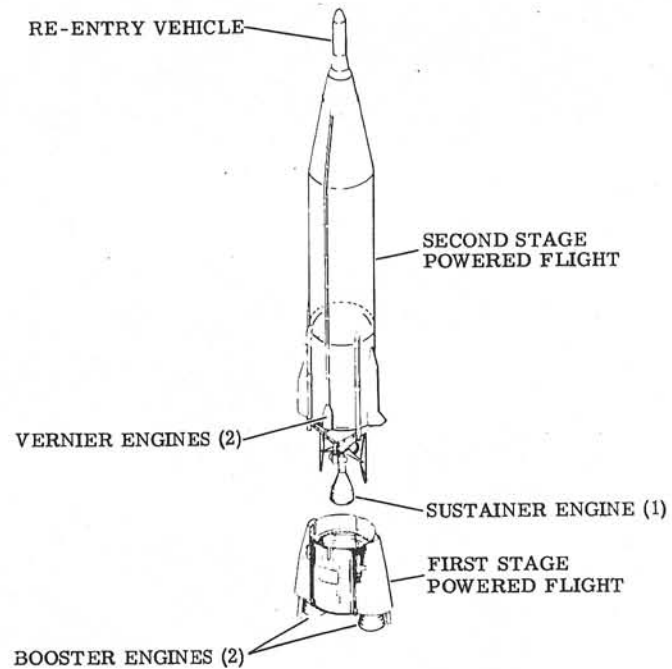
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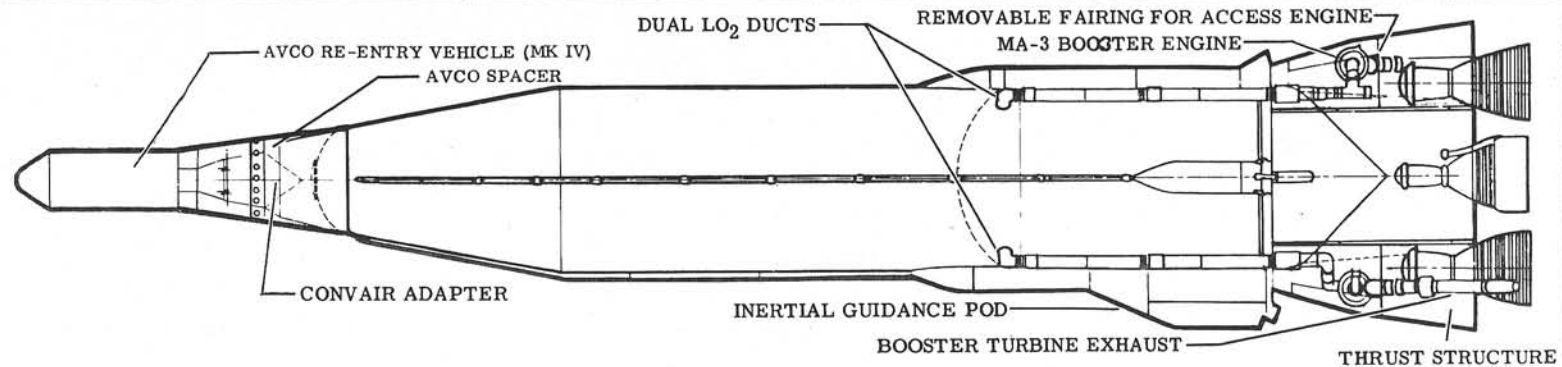
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SERIES F SILO LAUNCHER



SERIES F MISSILE SEPARATION



## PROPULSION

Rocket Engine Prop. System . . . . . MA-3  
 Nr & Model  

<u>Booster</u>	<u>Sustainer</u>	<u>Vernier</u>
2*LR89-	1**LR105-	2***LR101-
NA-5	NA-5	NA-7

 Mfr . . . . . North American-Rocketdyne  
 Type . . . . . Liquid Rocket  
 Thrust @SL. (lb)  
 165,000(ea) 57,000 1000(ea)  
 Duration (sec)  
 124.8\*\*\*\* 312.0  
 Total Thrust at launch . . . . . 389,000 lb

\*Gimbale Yaw . . . . .  
 . . . . .  $\pm 5.0^\circ$  Pitch & Roll  $\pm 5.0^\circ$   
 \*\*Gimbale Pitch  $\pm 3.0^\circ$  Yaw  $\pm 3.0^\circ$   
 \*\*\*Gimbale Yaw - Roll  $\pm 70^\circ$   
 \*\*\*Gimbale Pitch . . . . .  
 . . . . .  $28^\circ$  to  $50^\circ$  (Missile ctr line)  
 \*\*\*\*Jettisoned at the end of 1st stage  
 \*Includes  $0.5^\circ$  snubbing and  $0.5^\circ$   
 overtravel  
 |\*\*Includes  $0.5^\circ$  snubbing and  $1.0^\circ$   
 overtravel  
 \*\*\*\*Includes  $4.0^\circ$  snubbing and  $2.0^\circ$   
 overtravel

## PROPELLANT

Fuel . . . . . Rocket Engine  
 Grade RP-1  
 Tanked aboard . . . . . 77,031 lbs  
 Oxidizer . . . . . Liquid Oxygen  
 Tanked aboard . . . . . 175,226 lbs

## WEIGHTS

Dry weight . . . . . 16,123  
 Residuals . . . . . 1981  
 Propellants, expendable . . . . . 249,032  
 Re-entry vehicle . . . . . 3825  
 Launching weight . . . . . 267,136

## Mission and Description

Navy Equivalent: None

Mfr's Model: -

The SM-65F is an operational long range missile. In addition the missile is further described by its operational characteristics, which are surface to surface, ballistic, hypersonic, control system stabilized and propelled by a liquid fuel MA-3 rocket engine system and launched from an underground silo. The mission of the SM-65 F is: (1) Provide proficiency training for operating personnel; (2) Establish confidence in the reliability and performance of the weapon system. (3) Tactical use in the performance of missions as required by the Strategic Air Command.

The airframe consists of the forward section, the mid section and the aft section. There are no aerodynamic control surfaces. The forward section consists of the re-entry vehicle and the attaching hardware. The mid section consists of a monocoque structure divided by a bulkhead to form the propellant tanks. Attached to the mid section are the vernier engines, sustainer engine, re-entry vehicle adapter, vernier fairings and two equipment pods. The aft section consists of two booster engines, booster structure, and associated equipment and systems.

The launching concept for Series F missiles is referred to as a free launch type. The controlled release type has been used in previous series.

The SM-65F is a one-and-one-half stage spacecraft; vernier engines are ignited 2.5 sec after lift-off. The aft section is jettisoned at the end of the first stage of powered flight; however no tankage is jettisoned. The sustainer and vernier engines remain in operation during the second stage. At the end of the second stage, the sustainer engine shuts down leaving the vernier engines operating for a short period of time. Shortly after the vernier engines shut down, the mid section separates from the re-entry vehicle permitting the re-entry vehicle to follow a ballistic flight path to the point of impact. Approximately 80% of the flight is above the appreciable atmosphere where the space craft traverses an unpowered free-fall ballistic trajectory. The apogee of this trajectory varies with the individual flight, but is nominally 763 n miles. A velocity of approximately 24,409 ft/sec is attained as the re-entry vehicle enters the atmosphere.

## DEVELOPMENT

Initial Design Complete, SM-65F . . . . . December 1960  
 Static Test, Start of, SM-65F . . . . . April 1961  
 First Flight (Test Vehicle) SM-65F . . . . . August 1961  
 Delivery of First Operational Missile to Operational Site . . . . . 1961

## GUIDANCE

An All Inertial Guidance System is employed during the powered portion of the flight. The All Inertial Guidance System provides corrections for the proper trajectory to the autopilot during a portion of the powered flight

### CONTROL

The autopilot controls the flow to the hydraulic actuators. The actuators position the appropriate rocket engine thrust chamber to eliminate deviations from the flight path.

### ACCURACY

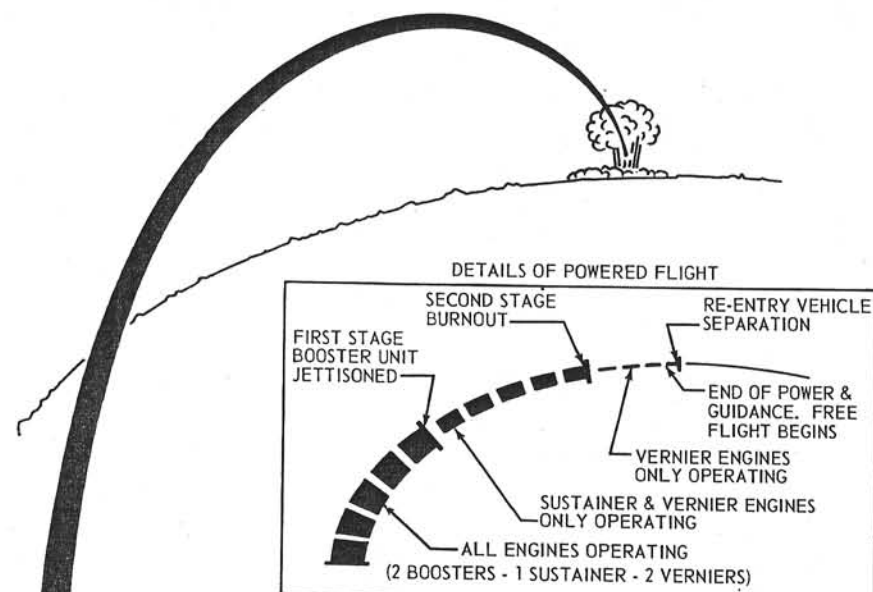
Maximum attainable accuracy of the All Inertial Guidance System is estimated to be 2 nautical miles Circular Error Probability, based on a 5500 mile range.

## LAUNCHING

The spacecraft is stored in an underground silo and is prelaunch checked in a vertical position. When command to launch is given, servicing and countdown will start and the missile is elevated to the launch position; the spacecraft is ready to launch at completion of countdown.

## RE-ENTRY VEHICLE

The re-entry vehicle will house the warhead, arming and fuzing system. Re-entry orientation is aerodynamic. The operational re-entry vehicles have pre-launch monitoring instrumentation of an adapter. The re-entry vehicle separates from the mid section shortly after termination of powered flight.



## Typical Mission

All engines except vernier, are started on the ground. Vernier engines are ignited approximately 2.5 seconds after lift-off. When sufficient thrust is reached, the spacecraft rises vertically. A preset programmer initially controls the attitude of the spacecraft throughout a portion of powered flight by positioning the gimbaled engines.

An All Inertial Guidance System provides corrections to the Autopilot for control during a portion of powered flight.

## Special Features

1. Vertical Silo Storage.
2. Electronic Equipment mounted in pods. Propellant lines externally located.
3. No hold-down. Free launch.
4. Gimbaled engines for positioning in pitch, yaw and roll correction.
5. Flight path under radar monitor. (R&D and training missiles only)
6. All Inertial Guidance.
7. Short countdown

## Performance Data

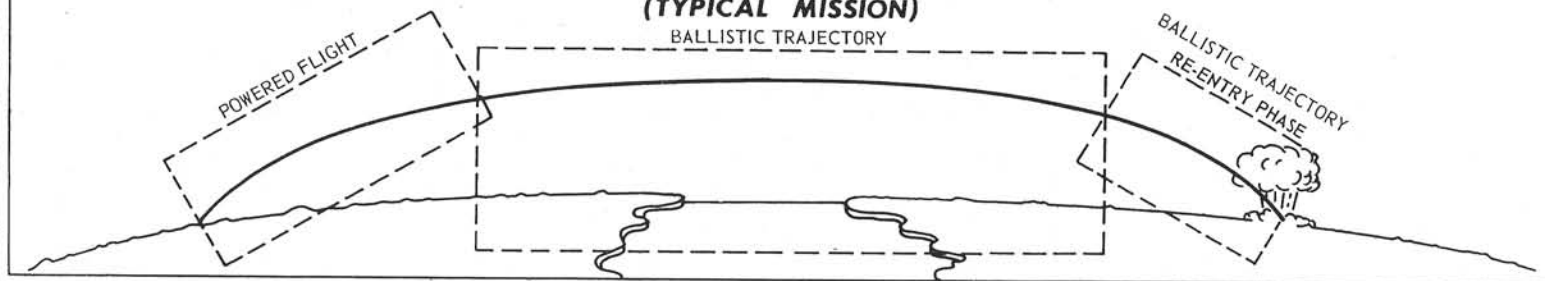
1. Free launch concept lift-off begins when the thrust-to-weight ratio exceeds one.
2. Jettison of first stage booster unit 127.8 seconds after launching.
3. Final power cut-off (vernier engines) and end of guidance as determined by range and azimuth of target with a maximum allowable of 349 seconds.
4. Apogee 1331 seconds, 763 nautical miles altitude.
5. Re-entry into appreciable atmosphere 2484 seconds after launching.
6. Impact 6788 nautical miles, total time of flight 2552 seconds.

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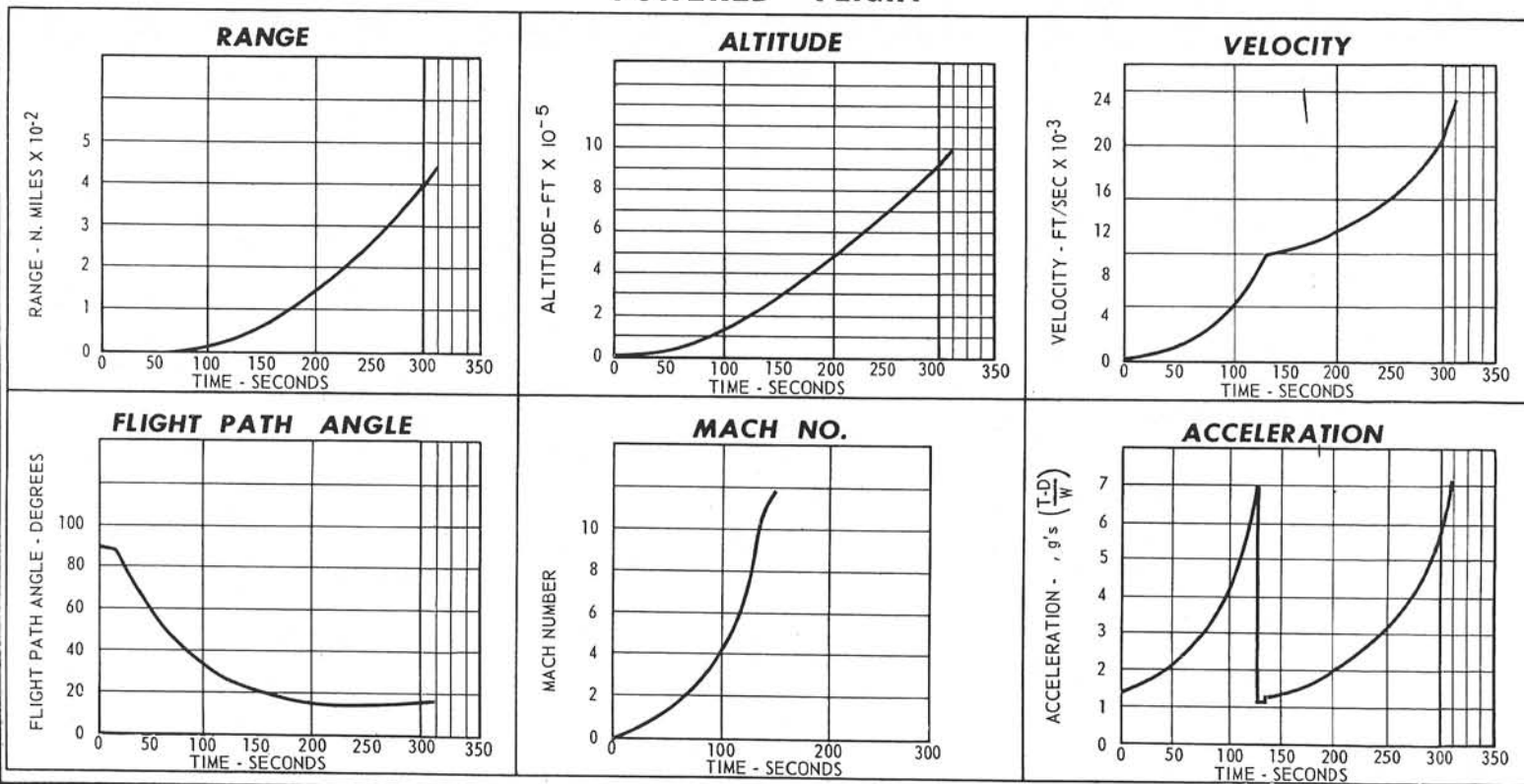
# Performance Data

(TYPICAL MISSION)

BALLISTIC TRAJECTORY



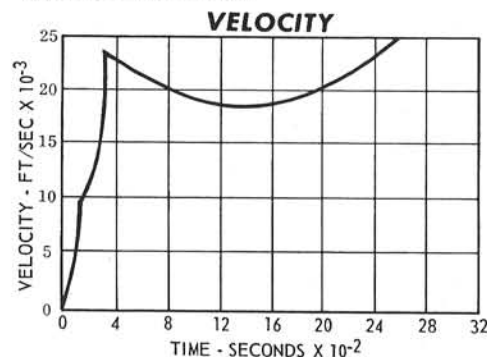
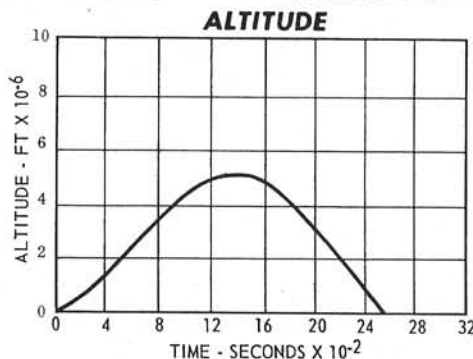
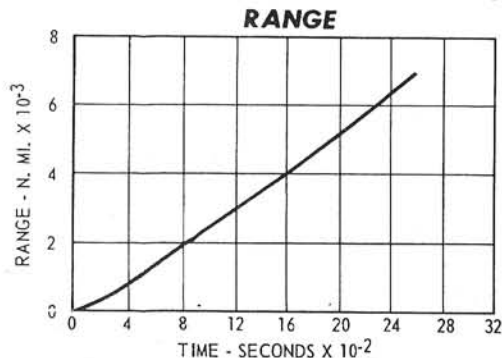
## POWERED FLIGHT





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# PERFORMANCE DATA - BALLISTIC TRAJECTORY



# PERFORMANCE DATA - BALLISTIC TRAJECTORY - RE-ENTRY PHASE

