Standard Missile Characteristics

SM-65F

ATLAS

General Dynamics - Astronautics

TWO BOOSTER ENGINES
LR99-NA-5
TWO VERNIER ENGINES
LR101-NA-7
ONE SUSTAINER ENGINE
LR105-NA-5
NAA-ROCKETDyne

BY AUTHORITY OF
THE SECRETARY
OF THE AIR FORCE

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Mission and Description

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-65F is: (1) Provide proficiency training for operating personnel; (2) Establish confidence in the reliability and performance of the weapon system; and (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-63F is a one-and-one-half stage spacecraft; vernier engines are ignited 2.5 seconds after liftoff. The aft section is jettisoned at the end of the first stage of powered flight; however no jettisoning of the sustainer and vernier engines remain in operation during the second stage. At the end of the second stage, the sustainer engine shuts down and 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 90% 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 at 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
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.
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.
5. Re-entry into appreciable atmosphere 2484 seconds after launching.
6. Impact 6786 nautical miles, total time of flight 2552 seconds.
Performance Data
(TYPICAL MISSION)

POWERED FLIGHT

BALLISTIC TRAJECTORY

RE-ENTRY PHASE

RANGE

ALTITUDE

VELOCITY

FLIGHT PATH ANGLE

MACH NO.

ACCELERATION

RANGE - N. MILES X 10^2

ALTITUDE - FT X 10^5

VELOCITY - FT/SEC X 10^3

FLIGHT PATH ANGLE - DEGREES

MACH NUMBER

ACCELERATION - g's (12)

TIME - SECONDS

0 50 100 150 200 250 300 350

0 50 100 150 200 250 300 350

0 10 20 30 40 50 60 70

0 10 20 30 40 50

0 2 4 6 8 10

0 1 2 3 4 5 6 7

SM-65F