Standard Missile Characteristics

SM-65F

ATLAS

General Dynamics - Astronautics

TWO BOOSTER ENGINES
LR89-NA-5

TWO VERNIER ENGINES
LR101-NA-7

ONE SUSTAINER ENGINE
LR105-NA-5

NAA-ROCKETDYNE

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**Mission and Description**

Navy Equivalent: None

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; (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 engines, 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 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 spacecraft 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 5000 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 boated.
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 13311 seconds, 763 nautical miles altitude.
5. Re-entry into atmosphere at 1184 seconds after launching.
6. Impact 6785 nautical miles, total time of flight 21552 seconds.