Standard Aircraft Characteristics

B-62

SNARK
NORTHROP

ONE J57-P-1

PILOTLESS AIRCRAFT

PRATT & WHITNEY
**POWER PLANT**

- No. & Model: (1) J57-P-1
- Mfr: Pratt & Whitney
- Engine Spec No.: A-1632-A
- Type: Axial
- Length: 163.6"
- Diameter: 41.9"
- Weight (dry): 4200 lb

**BOOSTER**

- No. & Model: (2) X-226-A3 Solid Roc
- Mfr: Allegheny Ballistics Lab
- Thrust (max): 130,000 lb ea
- Duration (sec): 4

**ENGINE RATINGS**

- S, L, Static: LB - RPM - MIN
  - Max: 9500 - 5950/9950 - 5
  - Mil: 9500 - 9500/9950 - 30
  - Nor: 8250 - 5700/9720 - Cont
    - *Low Spool/High Spool

**MISSION AND DESCRIPTION**

- Navy Equivalent: None
- Mfr's Model: N-69E

The SNARK is a pilotless aircraft whose principal mission is the destruction of surface targets at ranges up to 5500 nautical miles from the launching point at speeds up to Mach 0.94 and altitudes above 50,000 feet. The slender fuselage houses the warhead, fuel, power plant, and guidance equipment. The wing utilizes low thickness ratio, a high degree of sweepback, and high aspect ratio. Leading edge extension of the outward wing section delays the tip stall. Rear tail surfaces consist of only a vertical fin. Longitudinal and lateral control is maintained by means of elevons. For extended range missions, external fuel tanks are carried on pylons mounted beneath the wings and dropped when empty. The pilotless aircraft is launched from a mobile short rail launching platform by means of booster rockets.

**DEVELOPMENT**

- Design Initiated (Automatic Celestial Navigation): Mar 46
- Design Initiated (XSSM-A-3): Jan 47
- First Flight (XSSM-A-3): Mar 51
- Completion of Research & Development (est): Jun 56
- Availability of Standard Article (est): Nov 56

**Remarks:**

The B-62 is similar to the later version of the XSSM-A-3A research aircraft (N-69E) except for slight modifications due to production tooling. The XSSM-A-3A is the XSSM-A-3 experimental aircraft redesigned to incorporate a higher thrust engine, an ACN Guidance System and a pre-production airframe configuration.

**DIMENSIONS**

- Wing
  - Span: 42.2"
  - Incidence: 0°
  - Dihedral: 0°
- Sweepback (at 36.82% chord): 45°
- Length: 67.2"
- Height: 14.7"

**GUIDANCE SYSTEMS**

- (a) INITIAL ... Doppler Radar
- (b) MID-COURSE
  - (primary): Automatic Celestial (auxiliary): Doppler Radar
- (c) TERMINAL ... Inertial

**TERMINAL ACCURACY**

- N9% within 1500 ft (including mid-course errors).

**CONTROL**

- System: N-80 Autopilot

**WEIGHTS**

- Loading: 17,054 lb
- Normal Launch: 48,147 lb
  - (w/o boosters): 58,583 lb
- Max Launch: 49,000 lb
  - (w/o boosters): 52,000 lb

**BOOSTERS**

- Empty: 2376 lb
- Loaded: 5218 lb

**FUEL**

- Location: No, Tanks
- Fuselage: 8...3158
- Wing Pylons: 2...600
- Total: 3758
- Grade: JP-4
- Specification: MIL-F-5624A
- OIL
- Fuselage: 1...12
- Grade: 1010
- Specification: MIL-D-6801

**WARHEAD**

- Design Weight: 6050 lb
- Gross Weight: 7000 lb
- FUZE
- Type: Undetermined
- Arming Method: Undetermined

**LAUNCHING**

- Mobile short rail platform
- Maximum launch acceleration: 5.5 g
- PREPARATION & LAUNCH TIME
- 31/2 hrs from the "Alert" condition
- UNATTENDED STORAGE TIME
- Storage time in the "standby" condition is unlimited. Standby pilotless aircraft are assembled on mobile launchers without booster rockets, fuel, warhead, or guidance tapes, and are stored under shelter with limited temperature control.
### Loading and Performance - Typical Mission

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<td>VI</td>
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</tr>
<tr>
<td>LAUNCHING WEIGHT (excluding boosters) (lb)</td>
<td>48,147</td>
<td>48,147</td>
<td>48,147</td>
<td>43,719</td>
<td>48,147</td>
<td>48,147</td>
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<tr>
<td>Fuel at 6.3 lb/gal (grade JP-4) (lb)</td>
<td>24,425</td>
<td>24,425</td>
<td>24,425</td>
<td>20,525</td>
<td>20,525</td>
<td>24,425</td>
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<tr>
<td>Warhead weight (lb)</td>
<td>6050</td>
<td>6050</td>
<td>6050</td>
<td>6050</td>
<td>6050</td>
<td>6050</td>
</tr>
<tr>
<td>Wing loading (excluding boosters) (lb/sq ft)</td>
<td>151.4</td>
<td>151.4</td>
<td>151.4</td>
<td>119.2</td>
<td>151.4</td>
<td>151.4</td>
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<tr>
<td>Minimum flight speed at SL (kn)</td>
<td>265</td>
<td>265</td>
<td>265</td>
<td>265</td>
<td>265</td>
<td>265</td>
</tr>
<tr>
<td>Launch altitude (ft)</td>
<td>SL</td>
<td>SL</td>
<td>SL</td>
<td>SL</td>
<td>SL</td>
<td>SL</td>
</tr>
<tr>
<td>Boost thrust and duration (lb/sec/ft)</td>
<td>260,000</td>
<td>6.0</td>
<td>260,000</td>
<td>6.0</td>
<td>260,000</td>
<td>6.0</td>
</tr>
<tr>
<td>Rate of climb at SL (fpm)</td>
<td>2940</td>
<td>2940</td>
<td>2940</td>
<td>2940</td>
<td>2940</td>
<td>2940</td>
</tr>
<tr>
<td>Time to initial cruise alt (min/ft)</td>
<td>33.5</td>
<td>33.5</td>
<td>33.5</td>
<td>33.5</td>
<td>33.5</td>
<td>33.5</td>
</tr>
<tr>
<td>Service ceiling (100 fps) (ft)</td>
<td>39,500</td>
<td>39,500</td>
<td>39,500</td>
<td>41,100</td>
<td>39,500</td>
<td>39,500</td>
</tr>
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</table>

BOMBERDMENT RANGE (n mi) | 5500 | 5460 | 5350 | 750 | 3710 | 4830 | 5060 |
Average cruising speed (kn) | 518 | 518 | 518 | 518 | 518 | 518 | 518 |
Final cruising altitude (ft) | 44,350 | 42,900 | 41,100 | 36,500 | 42,350 | 44,200 | 42,900 |
Total mission time (hr) | 10.7 | 10.6 | 10.4 | 1.5 | 7.2 | 9.4 | 9.7 |

COMBAT ZONE (n mi) | 500 | 1000 | 2000 | 500 | 500 | 500 | 500 |
Initial combat altitude (ft) | 50,250 | 48,800 | 48,000 | 43,100 | 44,800 | 48,000 | 48,500 |
Altitude over target (ft) | 51,500 | 51,500 | 51,500 | 51,300 | 46,200 | 49,600 | 49,600 |
Speed over target area (kts) | 524 | 524 | 524 | 524 | 524 | 524 | 524 |
Weight over target (lb) | 25,279 | 23,279 | 23,279 | 24,094 | 27,707 | 23,279 | 25,179 |

TERMINAL DIVE TRAJECTORY (n mi) | 4.32 | 4.32 | 4.32 | 4.35 | 4.30 | 4.25 | 4.34 |
Speed at impact (kn) | 690 | 690 | 690 | 705 | 724 | 689 | 705 |
Time to SL (sec) | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
Terminal dive fuel (lb) | 85 | 85 | 85 | 85 | 85 | 85 | 85 |

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**NOTES**
- 1. Military power.
- 3. Includes 2 min launch and acceleration time.
- 4. M. Rank with 23 kn headwind.
- 5. CST Mach number.
- 6. ECM equipment in place of external fuel.
- 7. Performance basis:
  - (a) Data source: Estimated data based on wind tunnel tests.
  - (b) Performance is based on powers shown on page 3.
FORMULA: BASIC RANGE MISSION I

Launch, drop boosters, climb on course to the tropopause (35,332 ft) at military power, cruise out at 0.90 Mach number until all external fuel is used, drop external tanks, continue cruise at 35,332 ft until gross weight decreases to the value where 35,332 ft coincides with optimum cruise altitude, then continue cruise at optimum altitude until the combat zone is reached. The combat zone distance is adjusted so that the bombardment range is 5000 nautical miles. Within the combat zone, operation is continuously at military power and consists of a climb to military power service ceiling (100 fpm rate of climb), a 0.91 Mach number cruise at service ceiling until all but terminal dive fuel has been consumed and the terminal dive trajectory to the target. Range free allowances include 2 minutes at military power for launch and 85 pounds of fuel for terminal dive. Zero mean effective wind is assumed. However, a considerable wind variation can be tolerated without seriously affecting range (see page 7).

FORMULA: MISSIONS II AND III

Missions II and III are identical to the Basic Mission except that the combat zone is 1000 and 2000 nautical miles from the target, respectively.

FORMULA: MISSION IV

Mission IV is included to show the short range capabilities of the missile. Launch is made with full internal fuel but without external fuel or tanks. The mission, in other respects, is similar to the Basic Mission except that during the entire mission, climb, cruise and operation within the combat zone, fuel is dumped at the rate of 10,000 lb/hr, and the reserve on board at the start of the terminal dive trajectory is 1500 lb (the maximum allowable value due to terminal dive load limitations).

FORMULA: MISSION V

Mission V is similar to the Basic Mission except that the external fuel is replaced by an equal weight and volume of electronic countermeasure equipment, and the external tanks which house this equipment are carried during the entire cruise. The external tanks are dropped just prior to entering the terminal dive.

FORMULA: MISSION VI

Mission VI is presented to show the range capability of the missile under adverse wind conditions. A 23-knot headwind is assumed and a Mach 0.94 cruise is established to counteract the headwind and maintain almost the same distance-time relationship as would prevail for zero wind conditions. The mission is similar to the Basic Mission except that, due to the requirement for 0.94 Mach number cruise, the initial cruise altitude is 35,300 ft and the military power combat zone cruise is at the highest altitude permitting a 0.94 Mach number rather than service ceiling. The speeds quoted for this mission are ground speeds with a 25-knot headwind (see page 7 for trackkeeper details).

FORMULA: MISSION VII

Mission VII is similar to the Basic Mission except that the warhead weight is increased from 6050 lb to 7000 lb necessitating the use of 950 lb of ballast in the aft portion of the fuselage. In addition, because the launch weight is limited to 49,000 lb, 1047 lb of fuel must be removed, reducing the fuel weight to 23,378 lb.
GUIDANCE AND CONTROL

LAUNCHING POINT

The pilotless aircraft is ground launched from a mobile short rail platform at an attitude of 15° to the horizon. Launching speed is approximately 300 knots. The two rocket boosters used to assist launching are automatically ejected from the pilotless aircraft after rocket burn-out. Self contained radar under predetermined control is used until operation altitude of 35,332 ft is reached. If doppler radar becomes temporarily inoperative, the navigator maintains airspeeds and headings at the values that existed during radar control. When operational altitude is reached, the pilotless aircraft is approximately 250 miles downrange from launching point.

MID-COURSE FLIGHT

This phase is primarily a celestial navigation phase and will last from the time two stars are acquired by the navigator until the approach to the target area is reached. During this phase, instantaneous direction is specified in terms of the static vertical or gravity vector. This direction is established by star tracking telescopes and angle generators which lay off prespecified time-varying star altitude and star azimuth angles. The difference between the specified direction of the static vertical and the dynamic vertical observed onboard the pilotless aircraft is measured by accelerometers. This difference is fed to the guidance system computer which computes velocity and determines the necessary guidance correction to establish and maintain the prespecified course. An oscillation period of 84 minutes caused by unknown trajectory errors and mid-course system errors is damped out to the airborne primary reference frame by doppler radar. If cloud cover obscures navigational stars both the doppler radar and the inertial system are used for guidance. If the radar becomes inoperative during this same period the inertial system is used. At the end of the cruise the pilotless aircraft is at 44,350 ft at which point a programmed climb is made to initial combat altitude (50,250 ft) and a military power cruise under mid-course guidance system control is made over the combat zone. During the mid-course phase, the prespecified time-distance relationship is inserted into the trackkeeper by means of the magnetic guidance tape. The tape is prepared using the predicted effective wind values over the course. The guidance system is operable if the pilotless aircraft stays within 600 nautical miles of the prespecified point at any instant. This on course tolerance of 600 nautical miles not only allows for a variation of the effective wind from the meteorological predictions used in preparing the tape but also allows a tolerance of plus or minus 30 minutes on the launch time. In addition, the pilotless aircraft speed is varied if the deviation from the prespecified time-distance relationship exceeds certain preset values to keep the pilotless aircraft within the trackkeeper tolerance.

TERMINAL PHASE

When the pilotless aircraft is approximately four miles from target, the engine is cut, a speed brake is released, and programmed dive into target is indicated at -0.5 load factor. The guidance control for the terminal dive consists merely of determining the pushover point and the preset load factor. No directional guidance is used.