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GD

FZM-2612
14 May 1962

ADDITIONAL STUDIES OF B-58 MISSILE LAUNCH CAPABILITIES

USAF Declass/Release Instructions On File

(TITLE UNCLASSIFIED)

DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

COPY NO. 9
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GENERAL DYNAMICS | FORT WORTH

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INTRODUCTION

ORIGINAL PRESENTATION AND SUBSEQUENT DISCUSSIONS HAVE SHOWN STRONG INTEREST IN HIGHER PAYLOADS

- Multiple Passes
- Multiple Sensors
- Lower Development Risk

FULL INVESTIGATION OF INCREASED PAYLOAD, DEMANDS EXAMINATION OF SEVERAL DESIGN AREAS

- Airplane Payload Capability (FZM-2574)
- Missile Capability
- Missile/Aircraft Integration
  - Missile Size and Shape
  - Subsonic and Supersonic Launch

INVESTIGATION WAS IMPLEMENTED BY:

- Wind Tunnel Program for Effect of Missile Size and Shape
- Study of B-58 Engine Improvements for Increased Acceleration Capability
- Booster Design Studies for More Efficient Utilization of Available Weight and Size
- Studies of Improved Guidance/Control Systems

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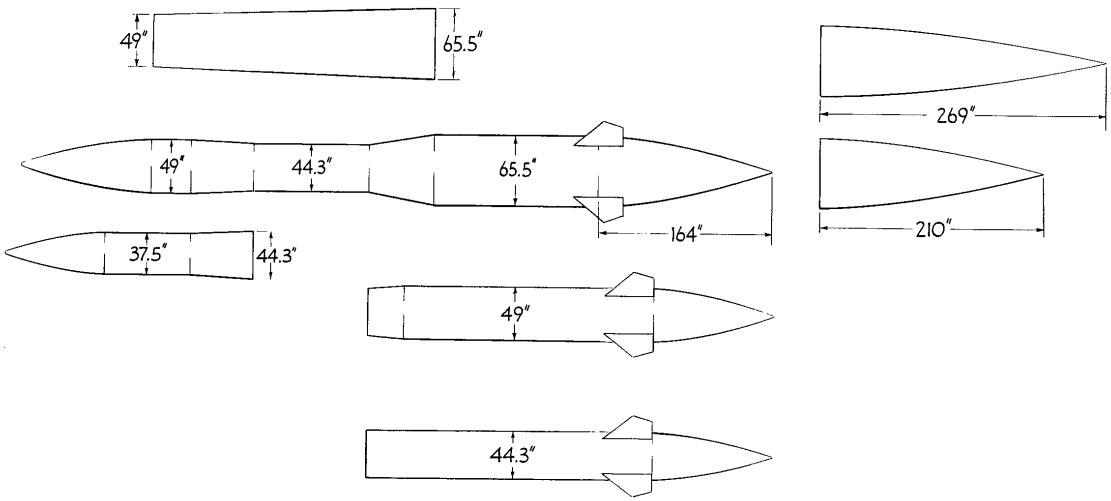
WIND TUNNEL PROGRAM (APRIL 1962)

OBJECTIVE: To determine the effect of motor diameter and missile shape on the total drag of the airplane with missile at Mach numbers from 0.9 to 2.0

MODELS: Existing 1/40 scale B-58A plus missile with variations in motor diameter, nose cone diameter, center section fairing and boattail fairing length



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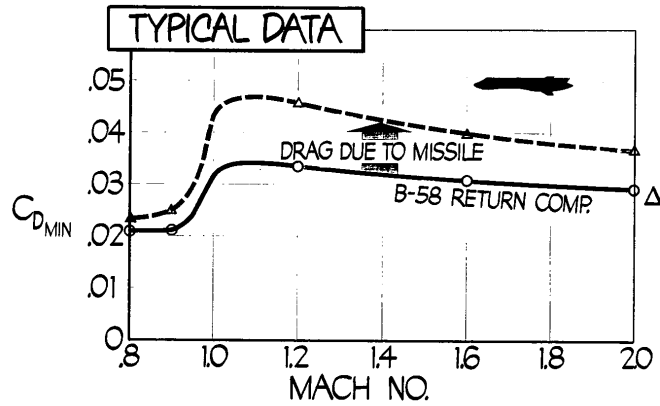
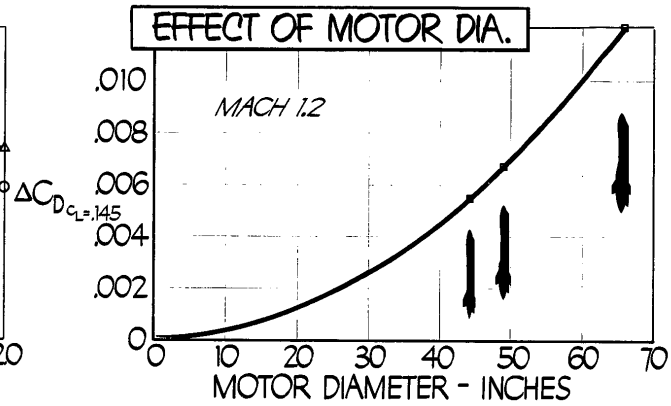
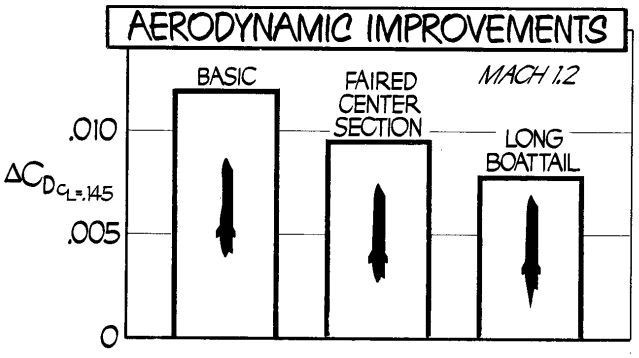
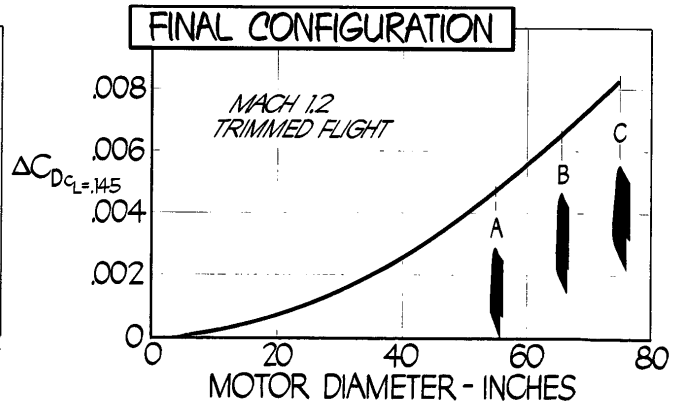
WIND TUNNEL RESULTS









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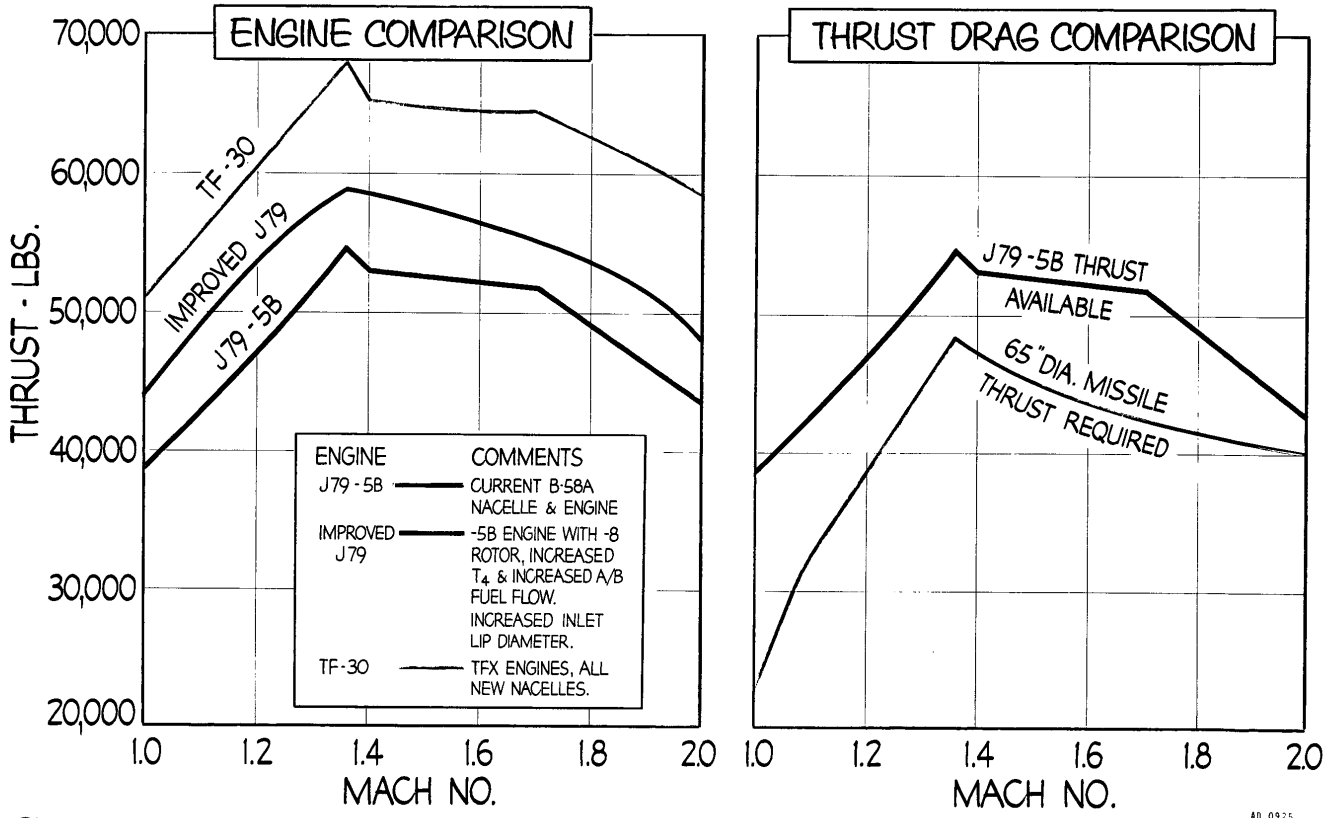
B-58 POWERPLANT STUDY

STANDARD DAY



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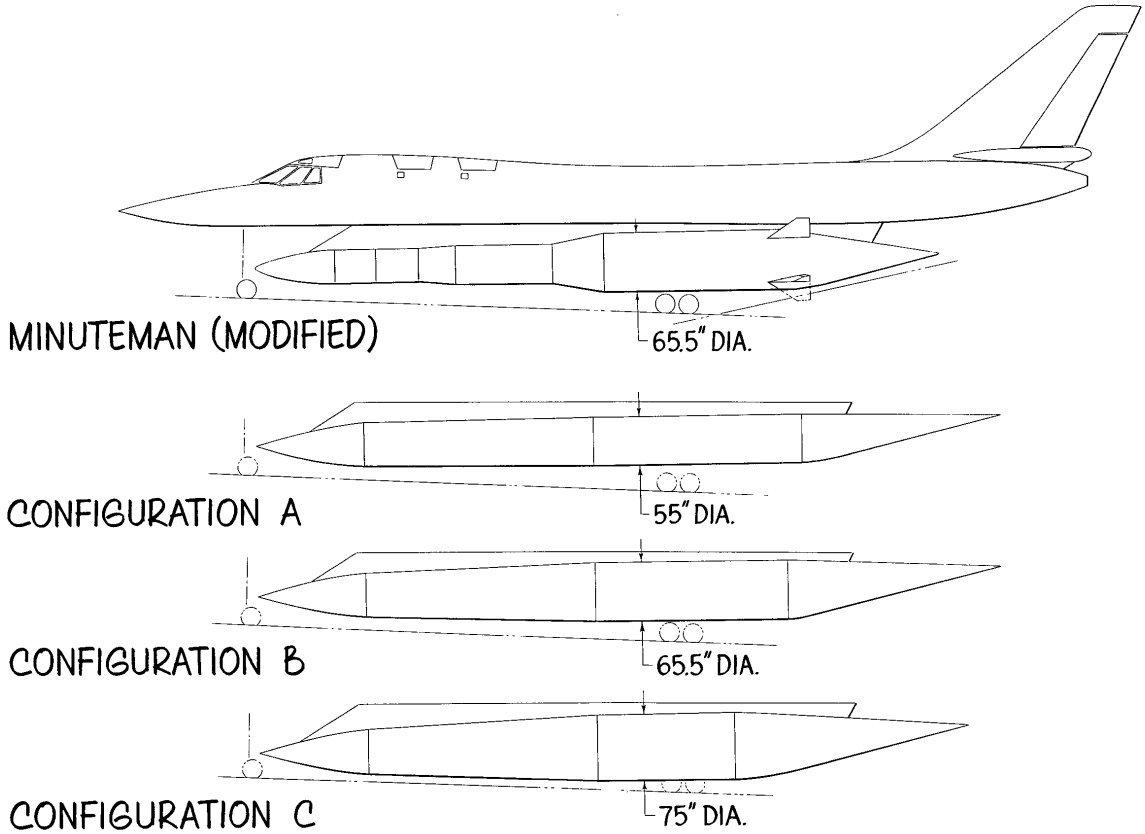
BOOSTER SPACE ENVELOPE



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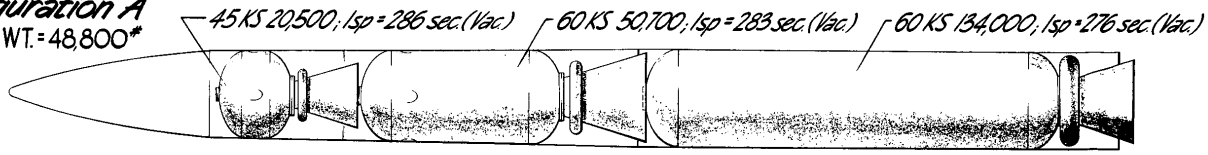
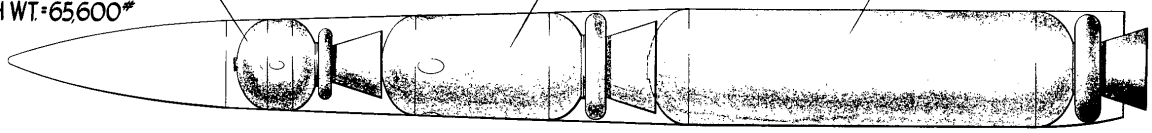
GD-UTC BOOSTER STUDY

Configuration A
LAUNCH WT. = 48,800#



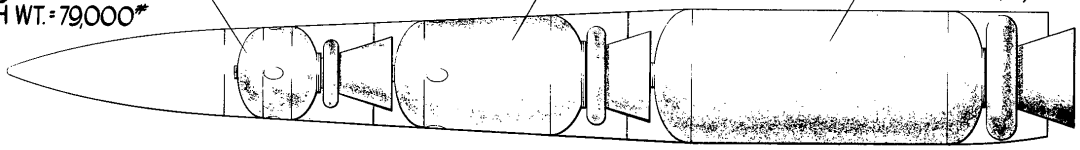
PROPELLANT WT.	3200#	10,630#	28,554#
TVC FLUID WT.	51#	169#	446#
STAGE WT.	3676#	12,091#	31,549#

Configuration B
LAUNCH WT. = 65,600#



PROPELLANT WT.	4100#	14,420#	38,580#
TVC FLUID WT.	63#	221#	590#
STAGE WT.	4682#	16,284#	42,644#

Configuration C
LAUNCH WT. = 79,000#



PROPELLANT WT.	4620#	18,800#	45,500#
TVC FLUID WT.	73#	290#	690#
STAGE WT.	5248#	21,033#	50,259#

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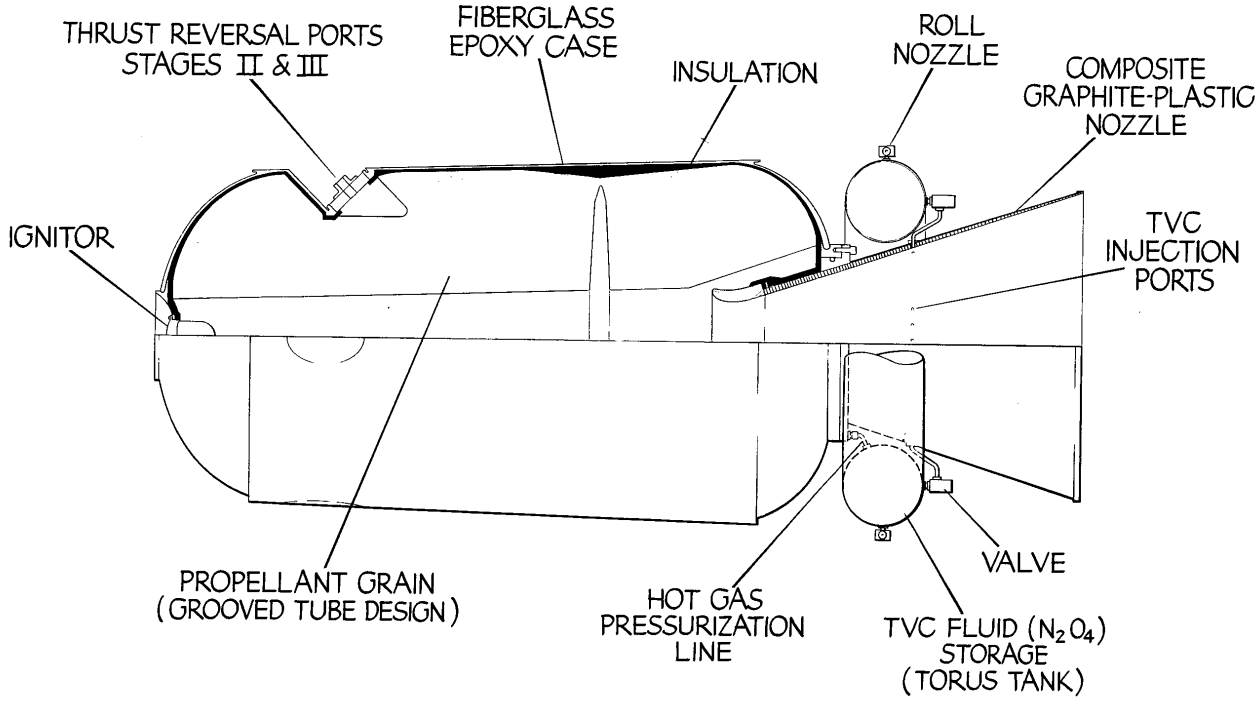
TYPICAL UTC MOTOR DESIGN



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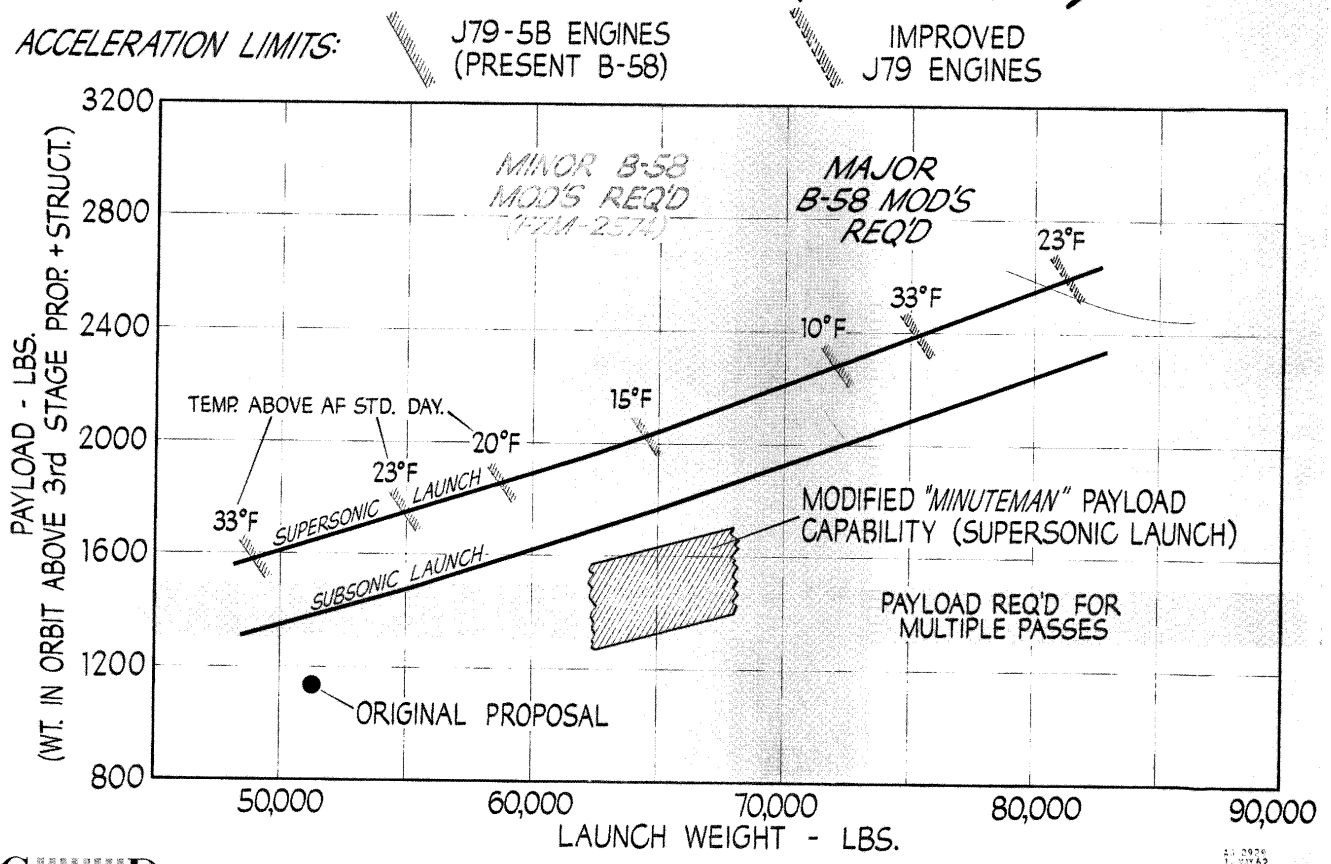
PAYLOAD CAPABILITIES (AT 100 N.MI.)



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CONCLUSIONS

LAUNCH VEHICLE SHOULD BE DESIGNED FOR LARGEST BOOSTER PHYSICALLY COMPATIBLE WITH B-58.

PAYLOADS IN EXCESS OF 2000 LBS. MAY BE ACHIEVED WITH:

- Present B-58 (Mods. ≤ $200,000), Supersonic Launch
- Present Solid Propellant Technology
- Guaranteed Capability (Subsonic Launch) ~ 1800 lbs.

TO ACHIEVE MAXIMUM CAPABILITY REQUIRES CAREFULL BOOSTER/AC INTEGRATION

- Optimization of Both Booster and Aircraft Performance
- Full Utilization of Available Booster Volume

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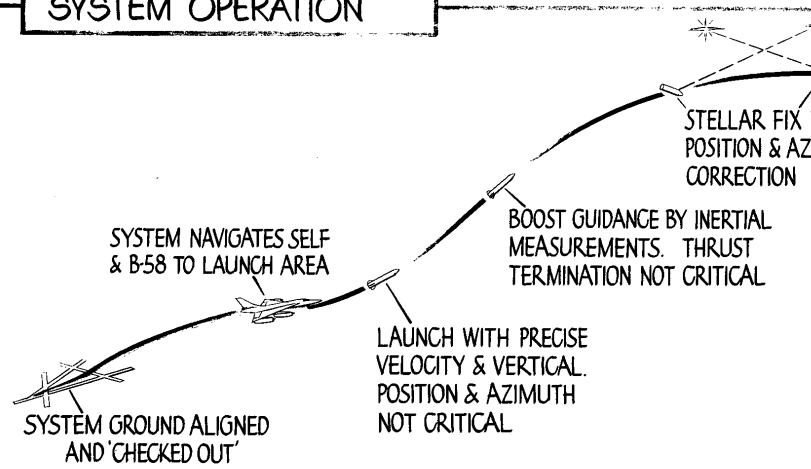
INTEGRATED GUIDANCE & CONTROL SYSTEM

(BASED ON SYS. UNDER DEVELOPMENT BY UNITED AIRCRAFT)

SYSTEM COMPONENTS

INERTIAL PLATFORM-HIGH PERFORMANCE INERTIAL COMPONENTS.
CELESTIAL ANGLE SENSOR, BODY MOUNTED, NO STAR TRACKING REQUIRED, WIDE ANGLE FIELD
HIGH SPEED DIGITAL COMPUTER. COMPACT, 1 MC CLOCK RATE, 4000 WORD, 30 BITS.
HYPERGOLIC VERNIER PROPULSION. COLD GAS ATTITUDE CONTROL.

SYSTEM OPERATION



● Multiple pass capability enhanced by virtue of "in-orbit" trajectory adjust and de-orbit-re-entry vernier correction.

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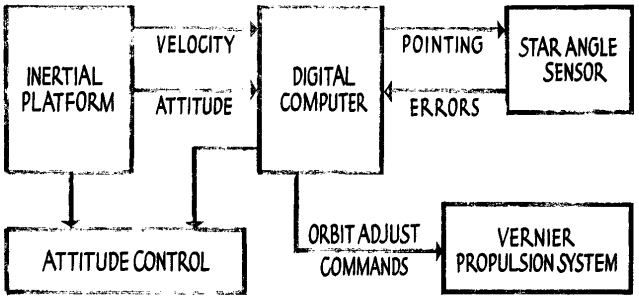
UNITED AIRCRAFT GUIDANCE & CONTROL SYSTEM

SYSTEM INTERFACE

- Platform provides velocity and attitude
- Star-angle sensor provides stellar fix for position and azimuth correction
- Attitude control and propulsion system Provide stabilization and trajectory adjustment



SYSTEM FEATURES

- AN INTEGRATED *HIGH QUALITY* GUIDANCE CONTROL AND VERNIER PROPULSION SYSTEM
- STELLAR MONITORING FOR *PRECISE* INJECTION AND DE-ORBIT GUIDANCE
  - Capability for accurate guidance without precise knowledge of position and azimuth
  - Requirement for accurate booster termination is relaxed
  - Capability for orbit adjust or orbit transfer
  - Capability for de-orbit and recovery guidance

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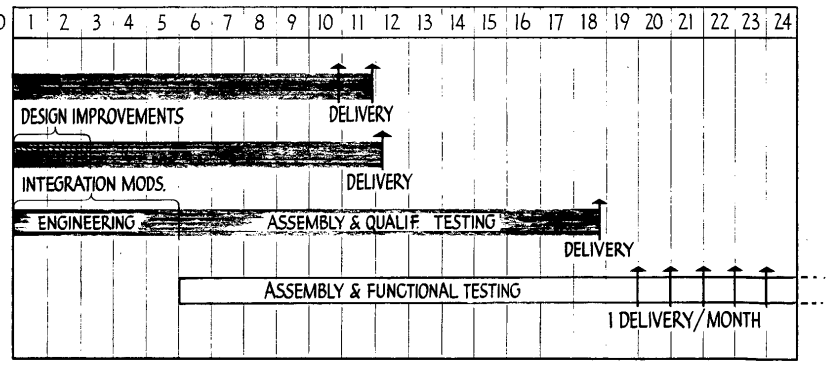
STATUS & SCHEDULE

UNITED AIRCRAFT G&C SYSTEM PROGRAM

STATUS

- INTEGRATED SYSTEM DESIGN IN FINAL STAGES
- STAR ANGLE SENSOR AND PLATFORM IN PERFORMANCE EVALUATION
- BREADBOARD COMPUTER UNDERGOING FUNCTIONAL TESTS
- IN PREPARATION FOR TOTAL SYSTEM, IN-ENVIRONMENT, REAL-TIME SIMULATION
- TOTAL SYSTEM SIMULATION WILL PROVIDE REALISTIC ENGINEERING SOLUTIONS THEREBY SPEEDING DEVELOPMENTAL PHASE

SCHEDULE



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