

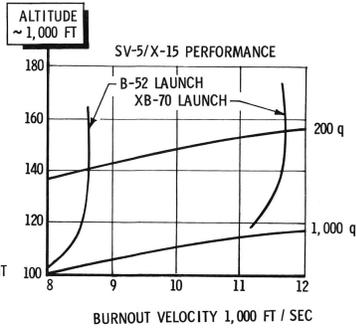
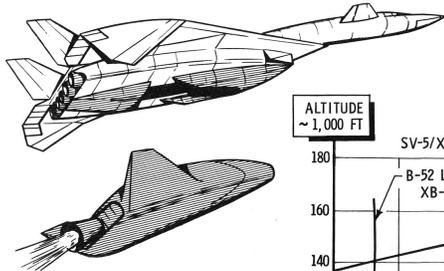
A Look Back...

NAA B-70 VALKYRIE VARIANTS

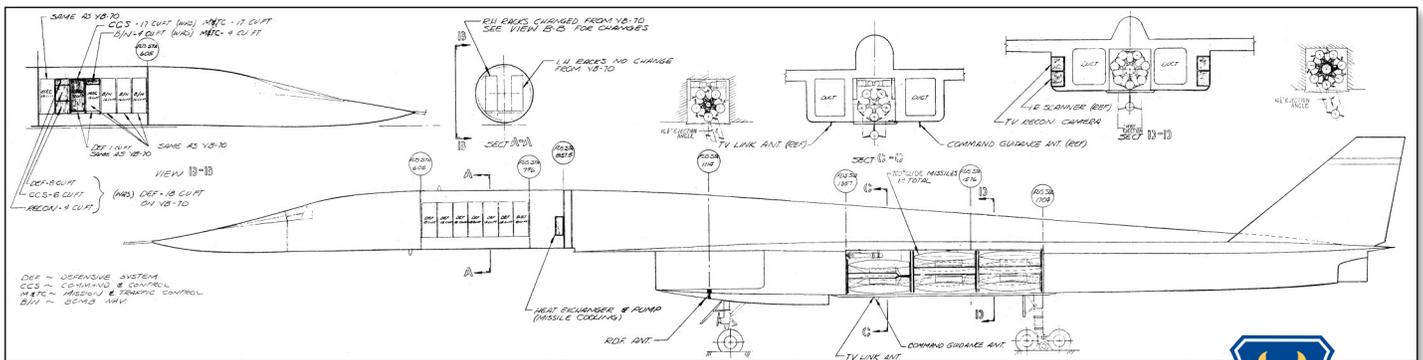
A Future That Never Was...



XB-70A LAUNCH VEHICLE FOR LIFTING BODY RESEARCH



- MACH 3 LAUNCH AT 70,000 FEET
- CAN LAUNCH 200,000 POUNDS
- TRAINED CREWS AND SUPPORT EQUIPMENT
- DATA COMPUTER CENTER



EDITED BY: TONY R. LANDIS
 WRITER/ARCHIVIST, HQ AFMC HISTORY OFFICE



B - 70 VALKYRIE VARIANTS: A FUTURE THAT NEVER WAS..

Like flying cars, human colonies on Mars and so many other futuristic ideas, the 1950's vision of the tomorrow was filled with grand ideas that are just now coming to fruition. As expected, aircraft engineers of the time had similar visions as they began taking their ideas from their minds, placing them on paper, then asking manufactures to bend steel and other exotic materials to create the planes of the future. Engineers hoped that one vehicle, one that they perceived as the last manned bomber, could change the future of aerial bombardment. Yet, politics, money, and technological advancements put an end to the B-70 Valkyrie, a Mach 3+, nuclear-capable super-bomber. Those varying factors killed the dream even before the first vehicle rolled out of the North American Aviation assembly plant.

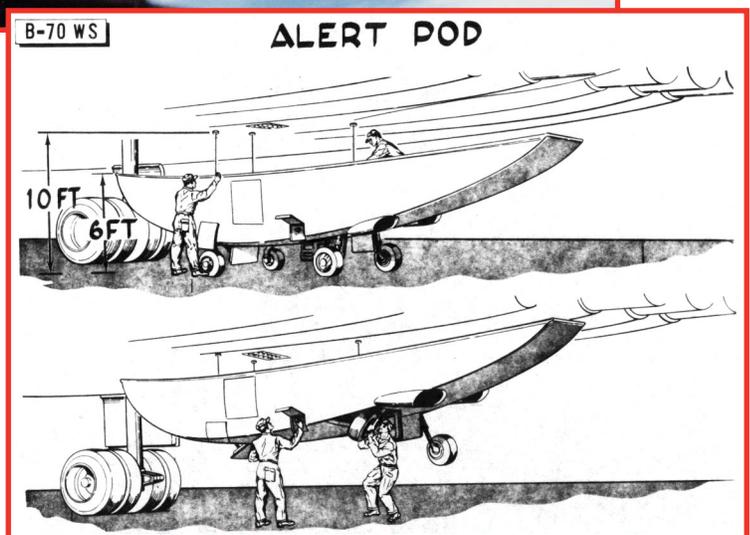
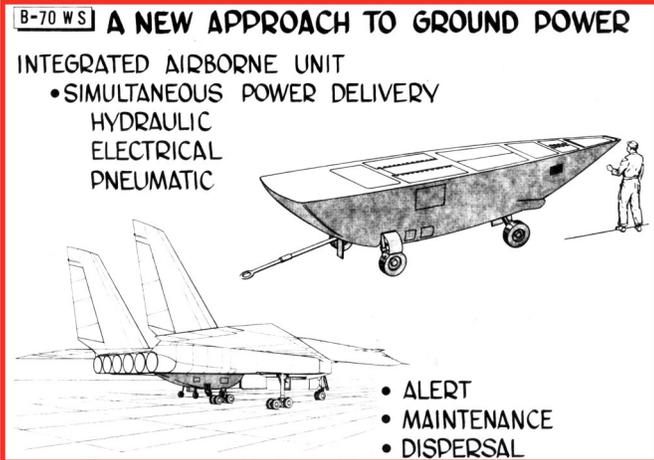
This document provides just a small glimpse into the minds of designers and engineers during the 1960's of what the future of aerospace just might entail. Though none of these proposals saw fruition, they quite possibly sparked the imaginations of future designers and engineers.

The story of North American Aviation's masterpiece is well documented. Published works such as 'The Manned Missile' by Ed Rees; 'North American XB-70' by Steve Pace; 'XB-70 Valkyrie: The Ride to Valhalla' by Jeannette Remak and Joe Ventolo, Jr; and 'Valkyrie: North American's Mach 3 Superbomber' by Dennis Jenkins cover the development of this vehicle in very good detail. Often overlooked is the potential that military and civilian designers had envisioned for this aircraft prior to cancellation.

Alternate concepts for the XB-70 ranged from cargo and personnel transport, supersonic tanker and reusable launch vehicle to name a few. Some topics have enjoyed brief coverage in previous publications, yet most of what you will find on the following pages came from the archives of the Air Force Materiel Command History Office, a research facility located at Wright-Patterson AFB. Our research revealed a variety of gems, many a simple mention or illustration in an obscure report while others came from archived materials supplied by the manufacturer. We hope you enjoy this glimpse into what could have been.



B-70 ALERT POD



Top: Chase pilot's view showing the bottom of XB-70 Air Vehicle (A/V) 2.

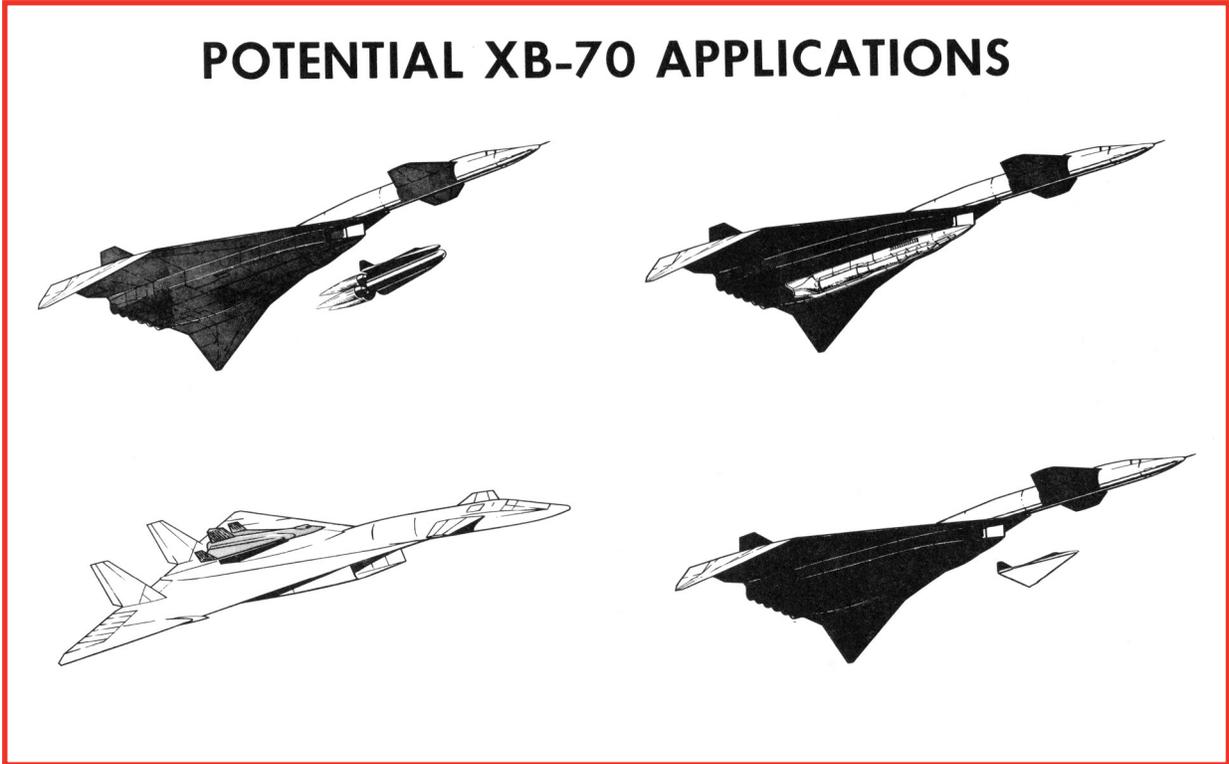
Middle Two: The Alert Pod could have been utilized as a stand alone support unit for the B-70 during operational deployments negating the need to send cargo planes full of aircraft ground equipment (AGE).

Bottom: The full-scale XB-70 mockup awaiting military inspection. A mockup of the Alert Pod can be seen behind the main gear in the background.



B-70 RECOVERABLE BOOSTER

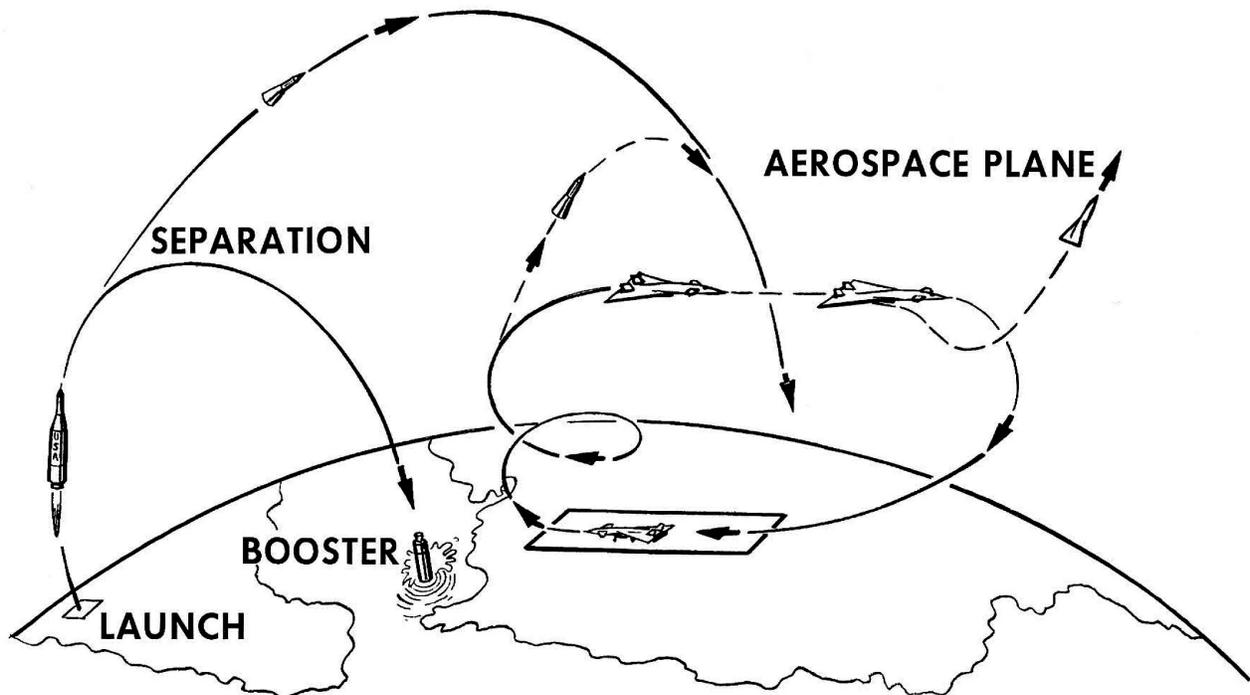
POTENTIAL XB-70 APPLICATIONS



Top and Bottom: The proposal to use the B-70 as a Recoverable Launch Booster received the most attention from military and civilian contractor engineers. Instead of utilizing expensive, disposable booster rockets with small capsules, having the Mach 3 Valkyrie launch an orbital spaceplane or hypersonic test vehicle would allow the entire system to be used again.

RECOVERABLE BOOSTER SYSTEM

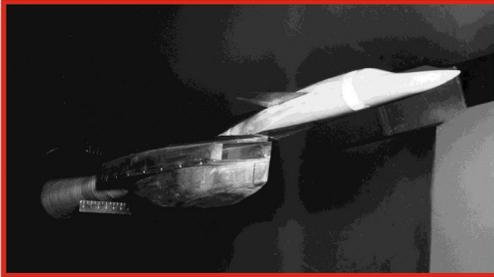
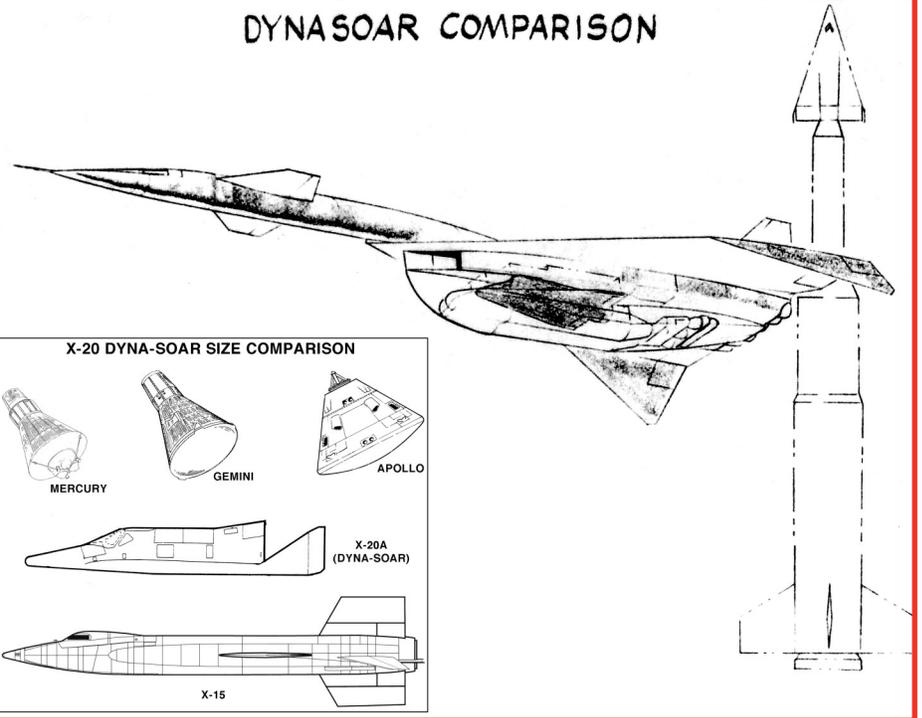
ORBITAL TRAJECTORY



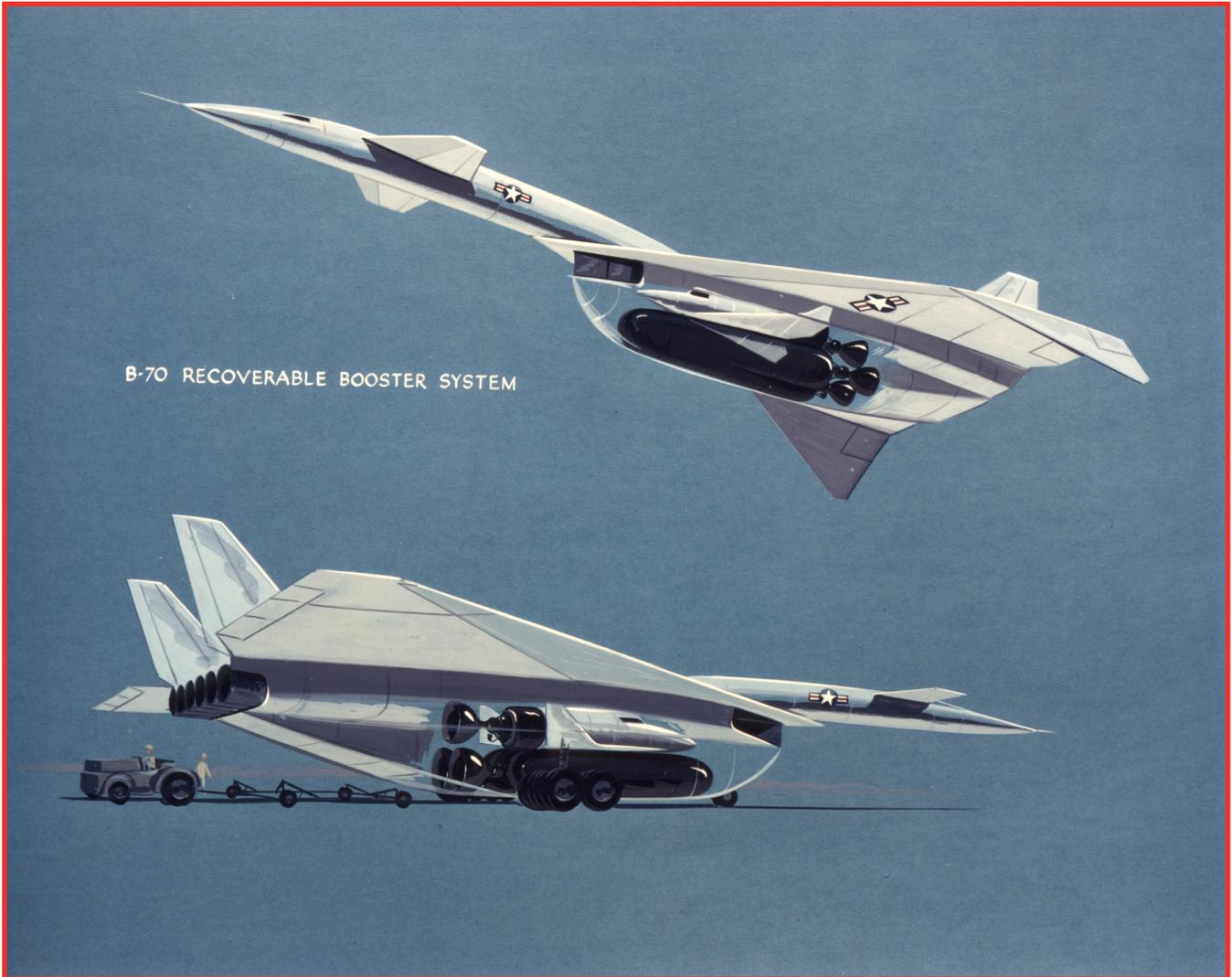
B-70 VALKYRIE VARIANTS: A FUTURE THAT NEVER WAS..

All: Surprisingly, the relatively small X-20 Dyna-Soar could be carried internally in the B-70 with only the additional boosters requiring a large belly fairing. This concept was appealing enough to make wind tunnel testing a requirement before it could proceed. With the cancellation of the Dyna-Soar program, the Air Force stopped all research.

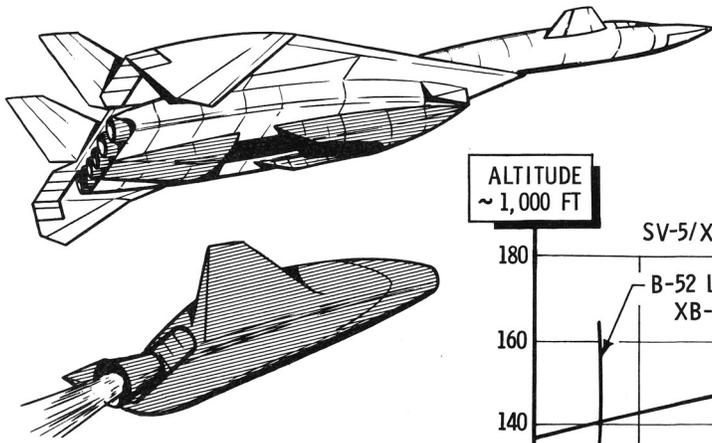
DYNASOAR COMPARISON



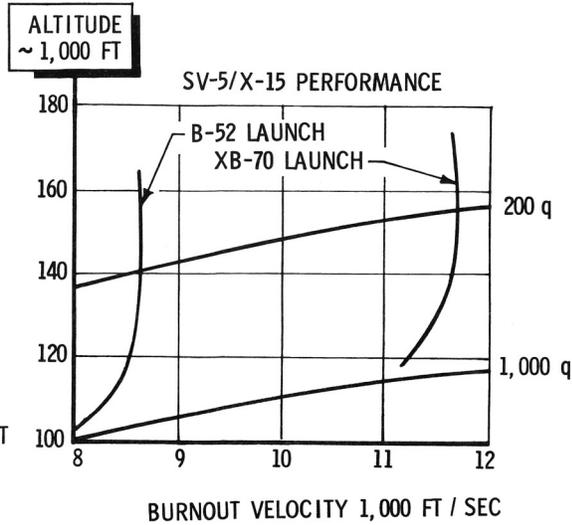
B-70 RECOVERABLE BOOSTER SYSTEM



XB-70A LAUNCH VEHICLE FOR LIFTING BODY RESEARCH



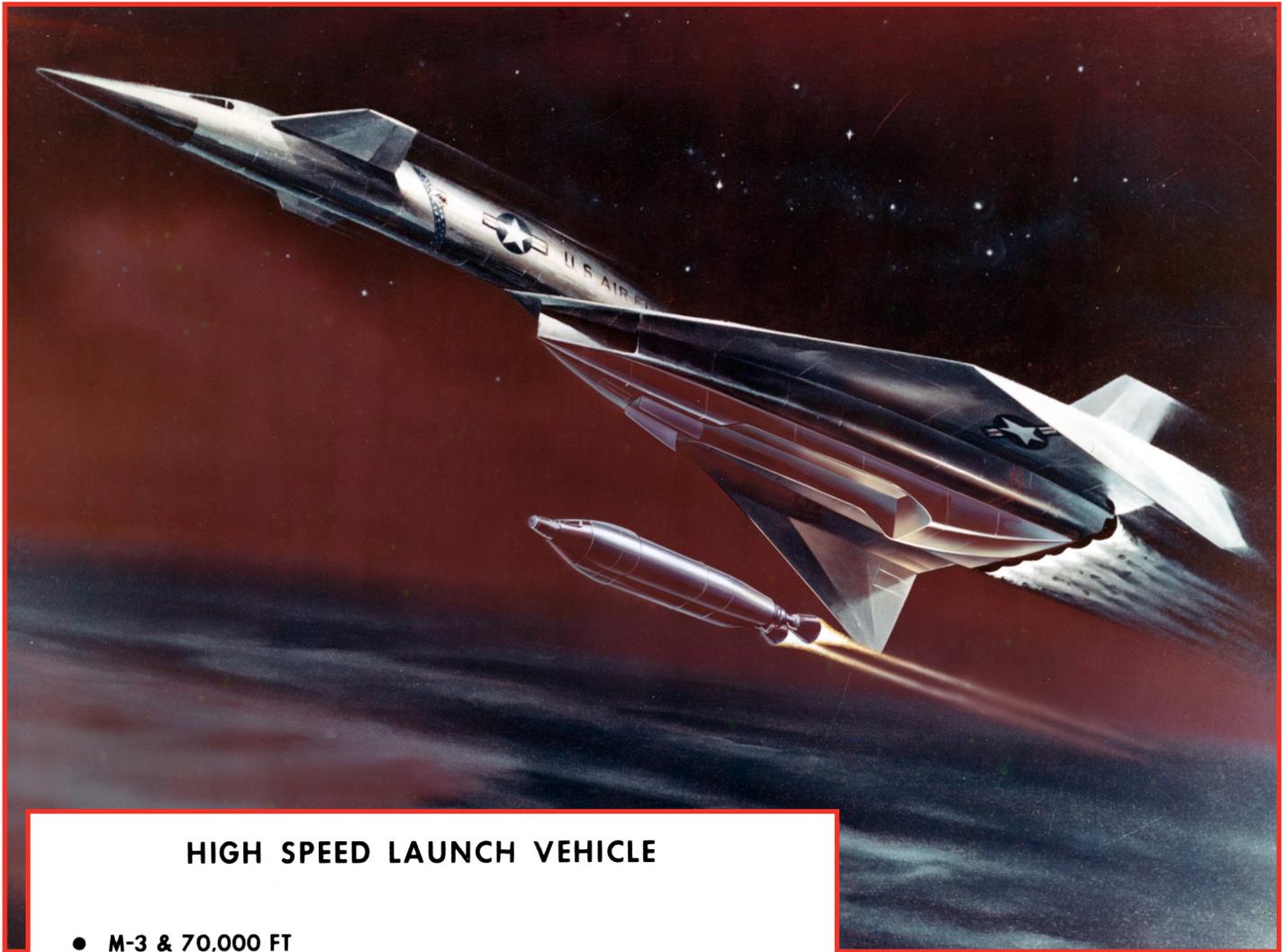
- MACH 3 LAUNCH AT 70,000 FEET
- CAN LAUNCH 200,000 POUNDS
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- DATA COMPUTER CENTER



Left: Some vehicle types, such as the Martin SV-5 lifting body suborbital test vehicle, required only forward and aft fairings instead of a full enclosure.

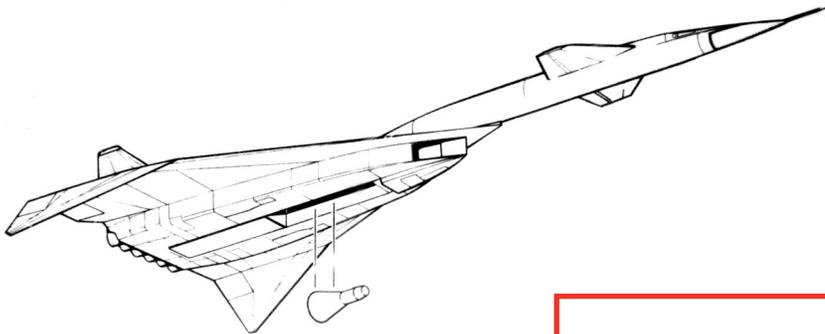
Below: Lockheed built the RM-81 Agena originally for the WS-117L reconnaissance satellite program. After WS-117L split into three separate programs, the Agena became an upper stage booster and satellite carrier. Launching the Agena from a recoverable booster such as a B-70 would save significant cost over the large, disposable rockets of the era.





HIGH SPEED LAUNCH VEHICLE

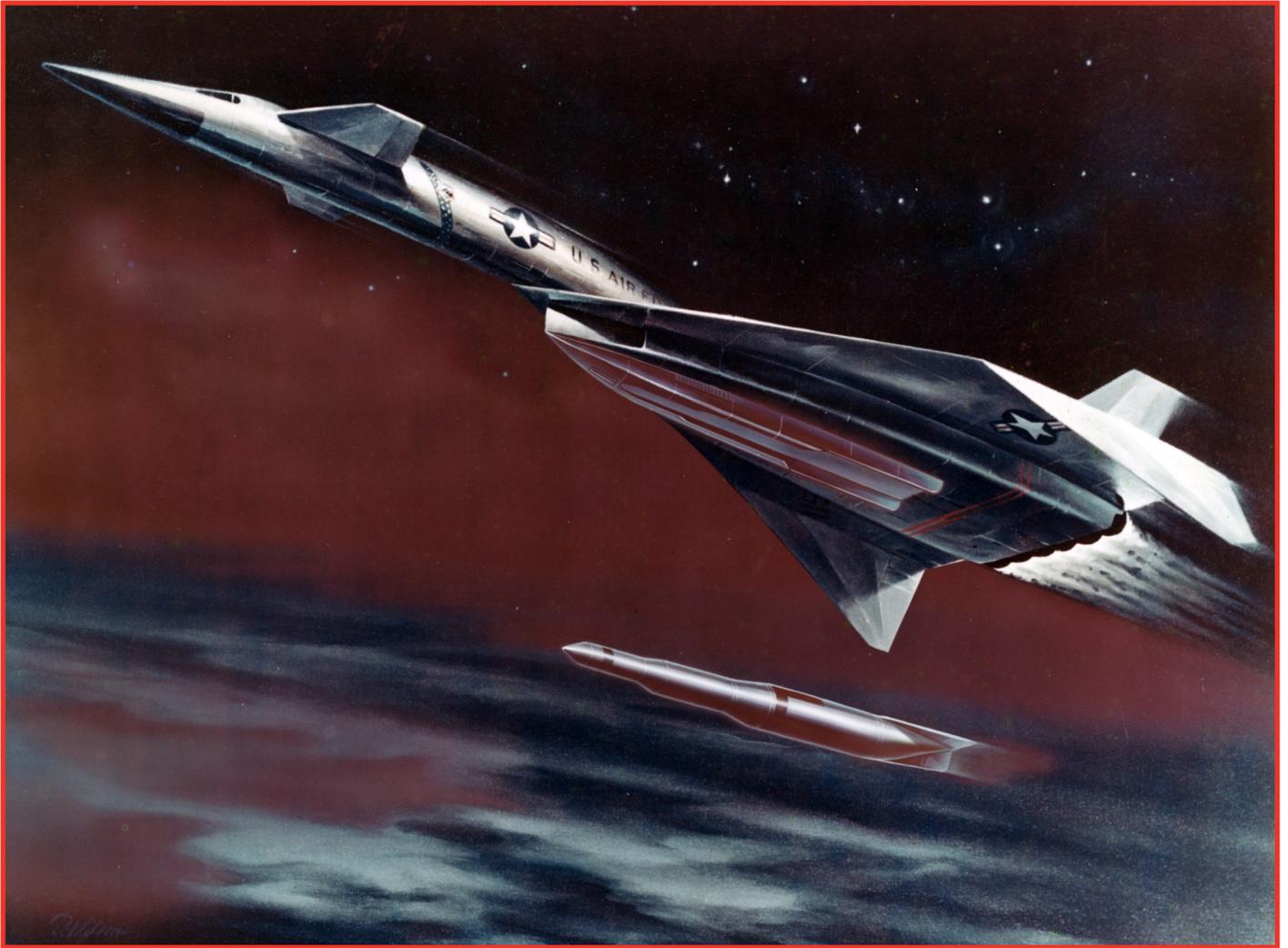
- M-3 & 70,000 FT



All: Some fanciful proposals went so far as to propose launching NASA's Gemini manned missions from the Valkyrie mothership. It appears engineers were desperate to come up with a mission for the aircraft and if a space-bound vehicle was small enough to be carried in this fashion, then a report was created to launch it from the B-70.

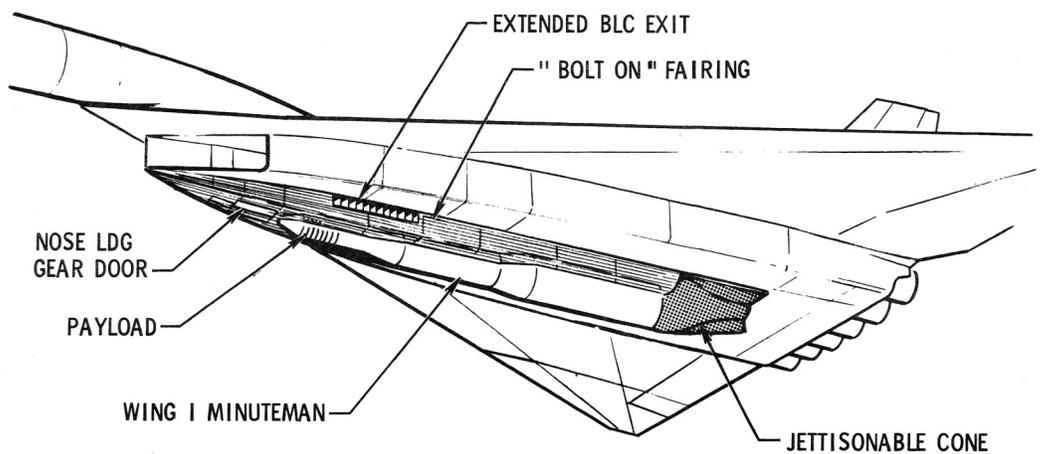
B-70 RBSS

- ALL WEATHER
- REDUCED COST
- OPERATIONAL FLEXIBILITY
- ORBIT PLANE SELECTION/MATCHING



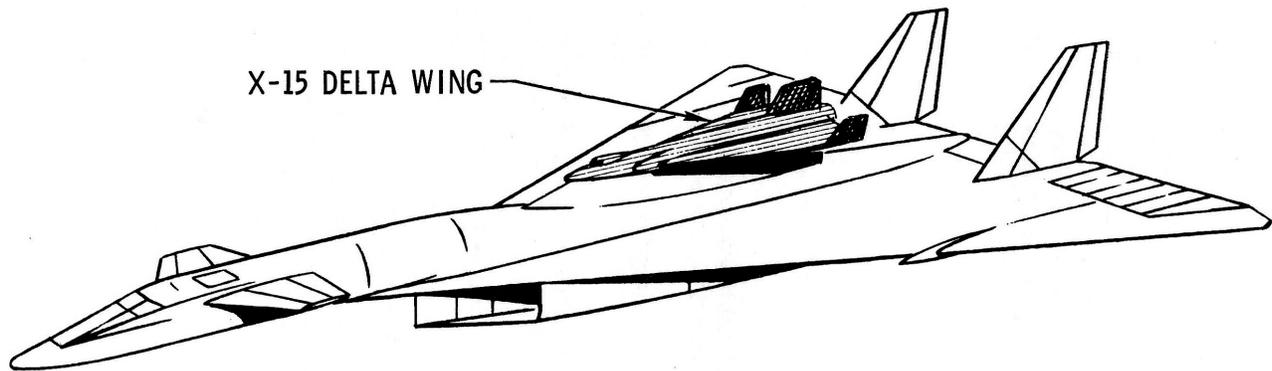
All: In addition to hardened launch silo's equipped with the LGM-30 Minuteman II ICBM, having a fleet of mobile missiles standing airborne alert on a Mach 3 carrier aircraft would have struck fear into anyone thinking of attacking the United States or its Allies.

XB-70-MINUTEMAN MATING



- 2000 POUND PAYLOAD INTO LOW EARTH ORBIT
- 1300 N MI REMOTE LAUNCH POINT, 2600 N MI RANGE
- UNLIMITED LAUNCH AZIMUTH CAPABILITY

XB-70 UPWARD LAUNCH TECHNOLOGY RESEARCH



- UPWARD SEPARATION RESEARCH FOR AEROSPACE PLANE/
REUSABLE LAUNCH SYSTEMS
 - POWERED AND UNPOWERED AERODYNAMIC SEPARATION
 - FLIGHT CONTROL SYSTEM EVALUATION
 - PULL UP MANEUVERS
- INITIAL FLIGHTS WITH PROVEN VEHICLES
 - XB-70 AND X-15 OR X-15 DELTA WING
 - XB-70 AND LARGER UPPER STAGE
- M = 3 LAUNCH AT 70 - 80,000 FEET

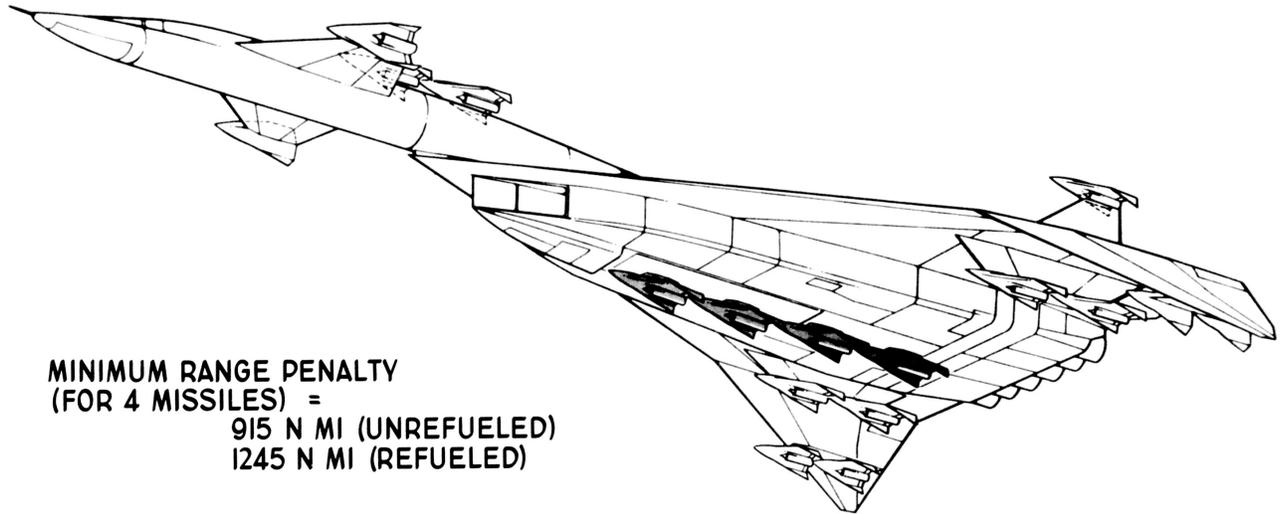


All: The very successful X-15 program produced a follow-on proposal for a delta-winged variant capable of even higher speeds and altitudes. In order to maximize the potential of this new vehicle, launching from the Mach-3 Valkyrie appeared to be a perfect match. The cancellation of both vehicles ended this concept quickly.

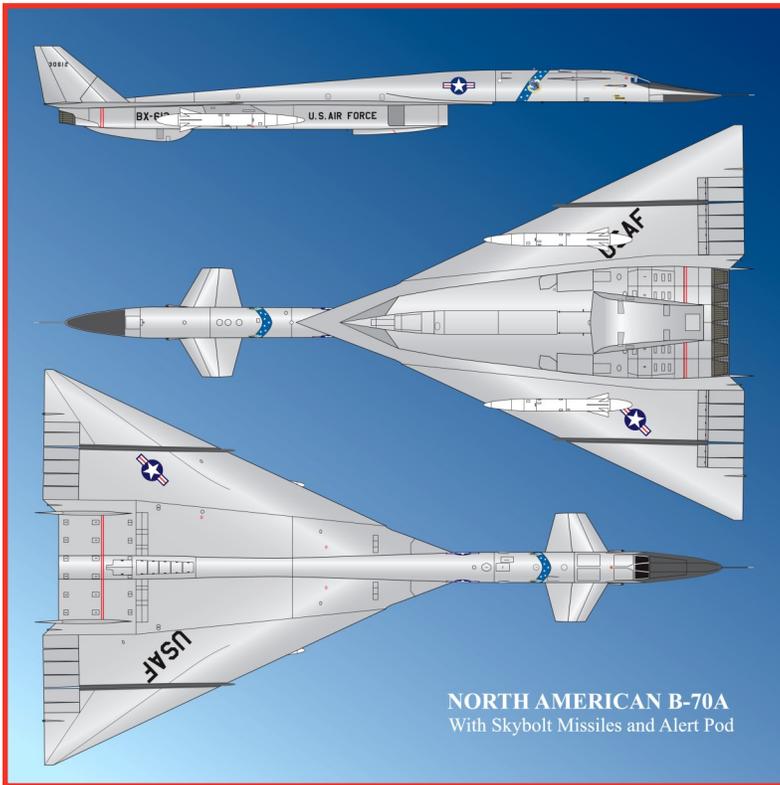
Inset: Fictional logo for the M-70 Valkyrie Mothership program.



EXTERNAL CARRIAGE STUDY

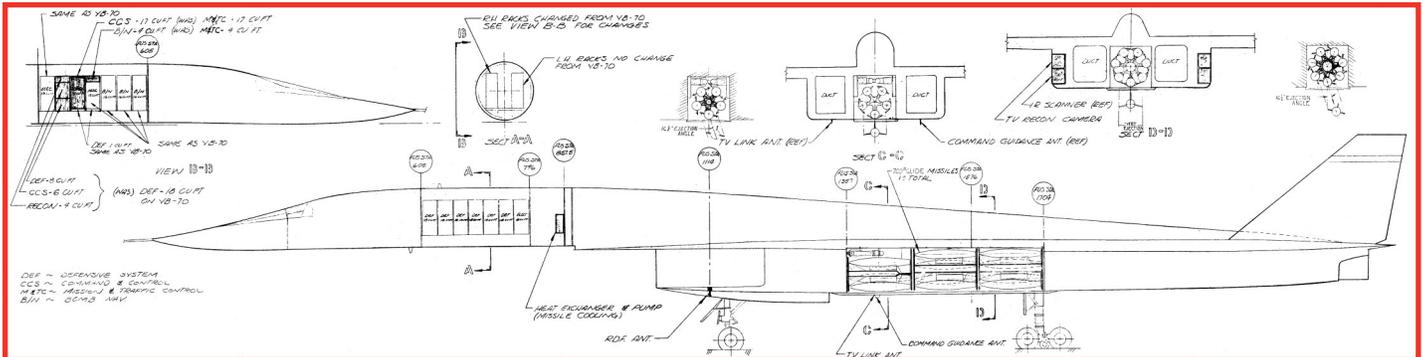
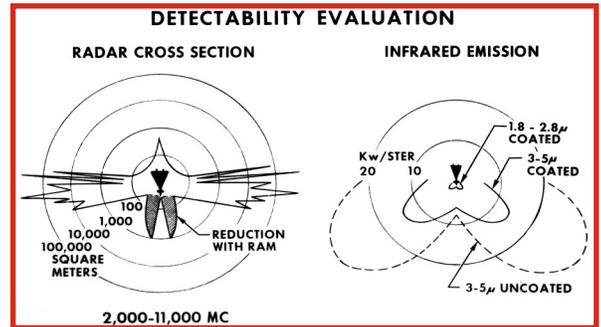


MINIMUM RANGE PENALTY
(FOR 4 MISSILES) =
915 N MI (UNREFUELED)
1245 N MI (REFUELED)



Top: The General Purpose Missile (G.P.M.) concept proposed using a common shape with different warheads adapted for different targets similar to today's smart weapons. Carrying no less than 14 of these, this B-70 concept is ready for anything.

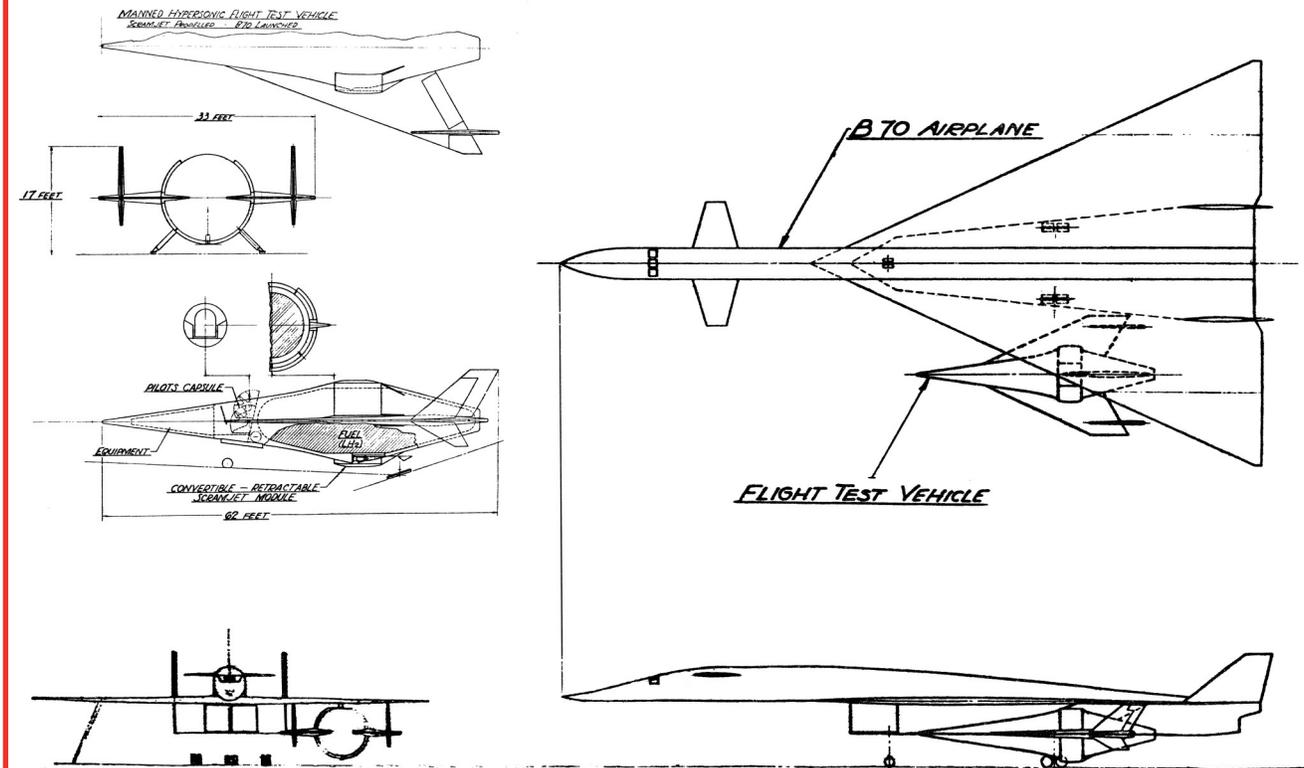
Left: Speculative artwork of an Alert Pod-equipped B-70 with GAM-87 Skybolt missiles. North American proposed using a special silver finish to reduce the infrared signature which the aircraft needed as shown below.



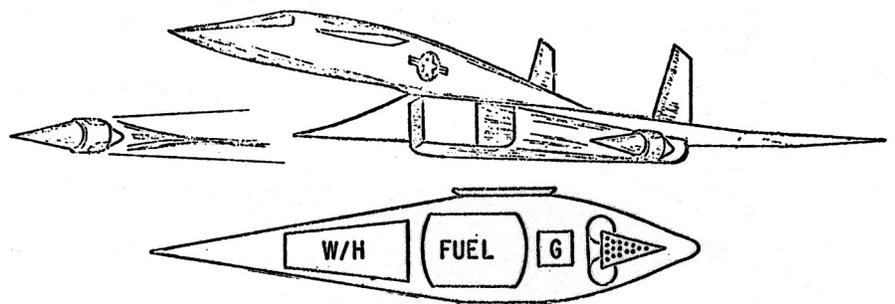
Above: Modifications required to convert the YB-70A into the reconnaissance/strike RSB-70A included swapping of avionics boxes, the addition of strike cameras and the installation of a rotary bomb rack which would not become standard on bomber aircraft for at least another decade.

B-70 VALKYRIE VARIANTS: A FUTURE THAT NEVER WAS..

MANNED HYPERSONIC FLIGHT TEST VEHICLE
ATTACHED ARRANGEMENT WITH B70 AIRPLANE



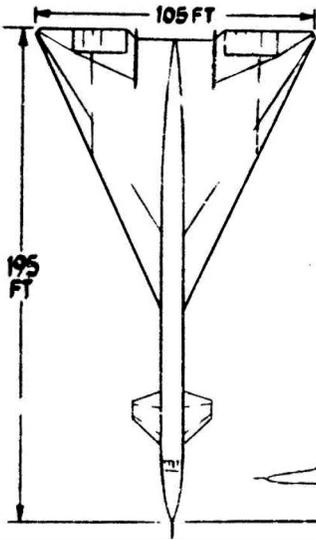
All: 1960's aerospace research centered around new technologies to go higher, faster and further than ever before. It was thought that *Scramjet* technology would be the breakthrough needed to achieve these goals, yet it would take another five decades to achieve this. From manned test vehicles such as Republic's manned hypersonic vehicle shown at top and center to nuclear missiles shown at right, *Scramjet* propulsion offered an attractive solution to many propulsion issues.



WEIGHT 915 lb. PAYLOAD 315 lb.
OVERALL LENGTH 16.8' DIAMETER 3.5'

B-70 TRANSPORT

Passenger and Cargo



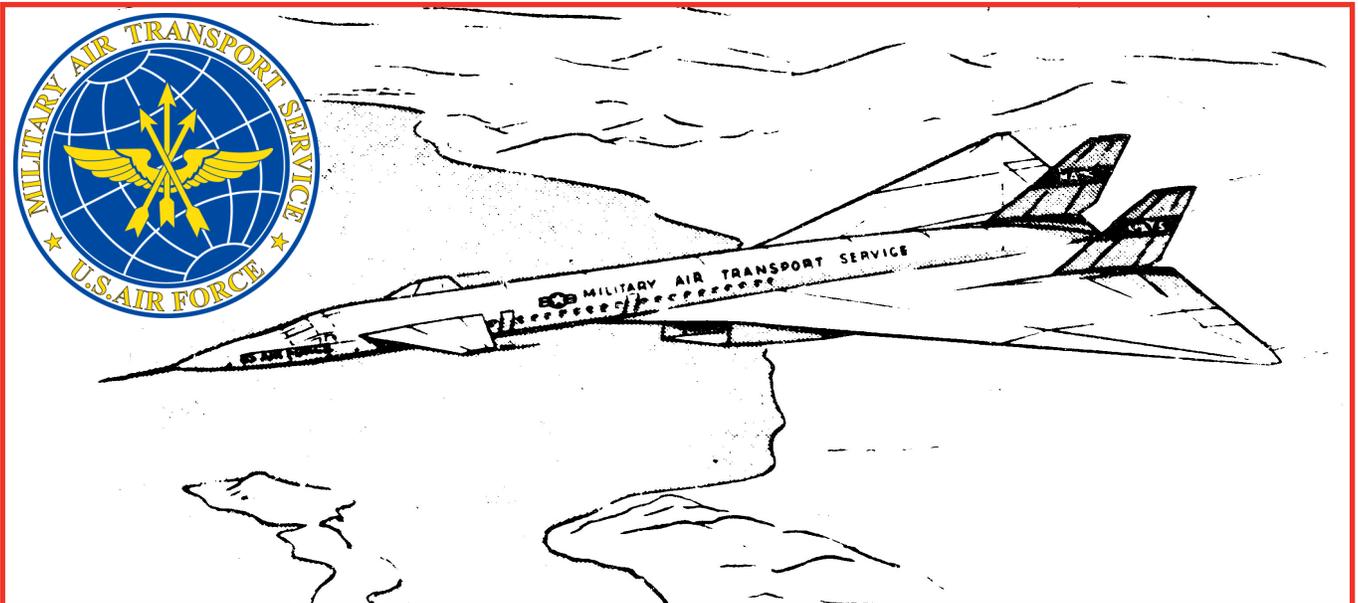
DESIGN BRIEF SUPERSONIC TRANSPORT

RANGE	2500 N.MI.	3500 N.MI.
T.O.G.W.	427,000 LB	490,000 LB
FUEL	194,000 LB	252,400 LB
CARGO	36,000 LB (15.0 LB/FT ³)	27,900 LB (16.8 LB/FT ³)
CRUISE	M3.0	M3.0
PASSENGERS	80	80

Left: Modifying a B-70 into a Supersonic Transport, a quick and logical solution to having an operation SST in the shortest amount of time.

Middle and Page 13 Bottom: North American was so convinced they could sell a transport version of their latest vehicle, they added temporary 'windows' to XB-70 A/V-1 during a maintenance layover in Palmdale, CA.

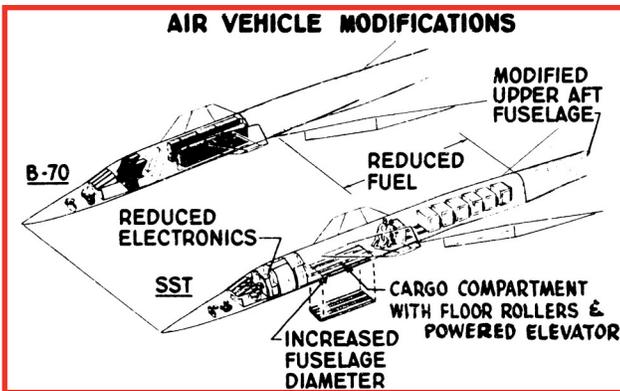
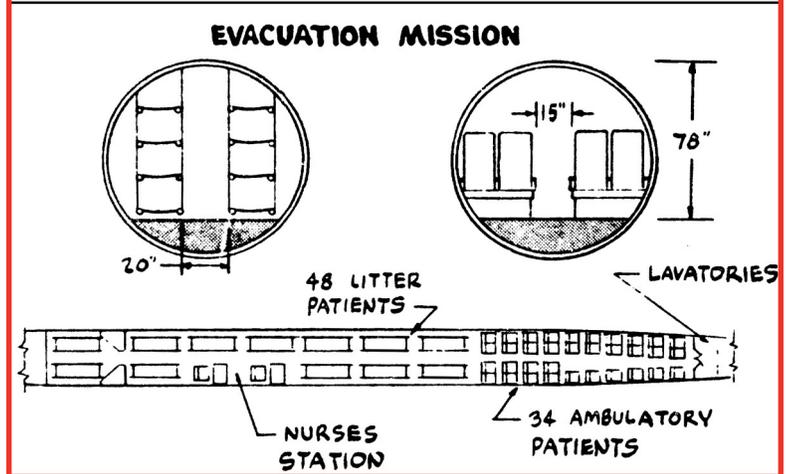
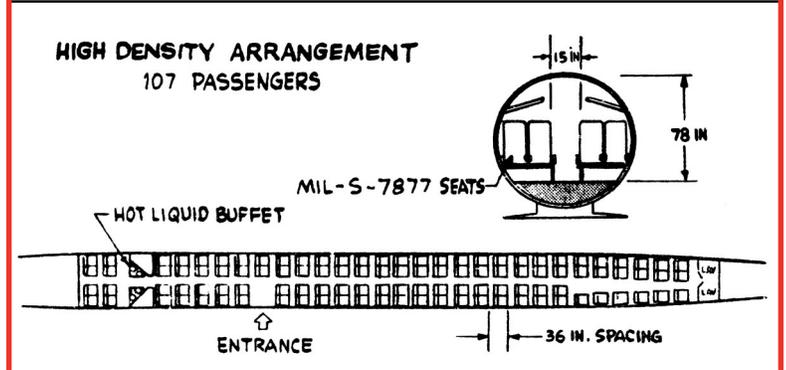
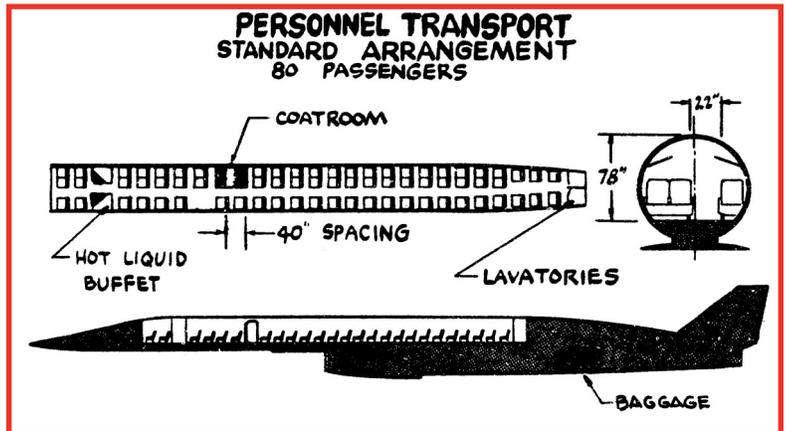
Bottom: One Air Force report on the subject included this art of a 'C-70' in the markings of the Military Air Transport Service.

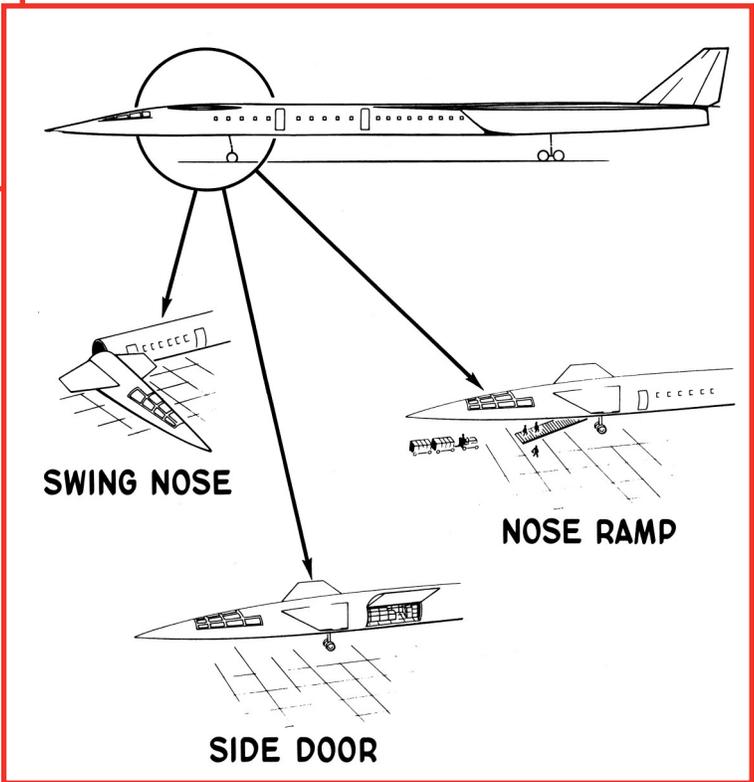
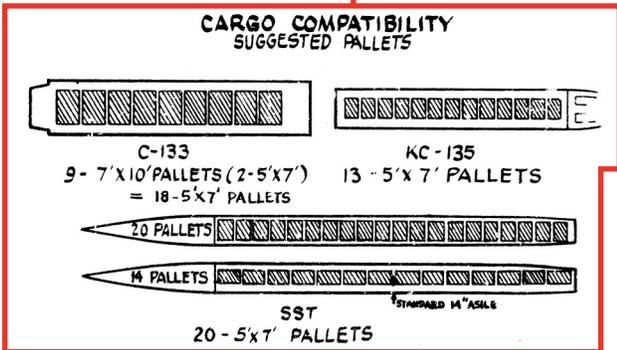
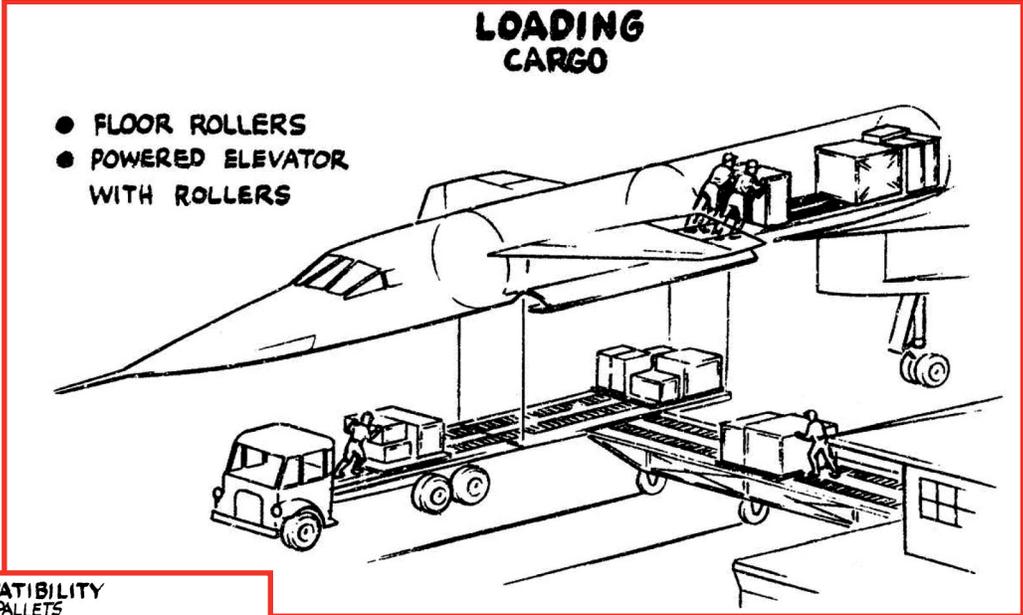


B-70 VALKYRIE VARIANTS: A FUTURE THAT NEVER WAS..

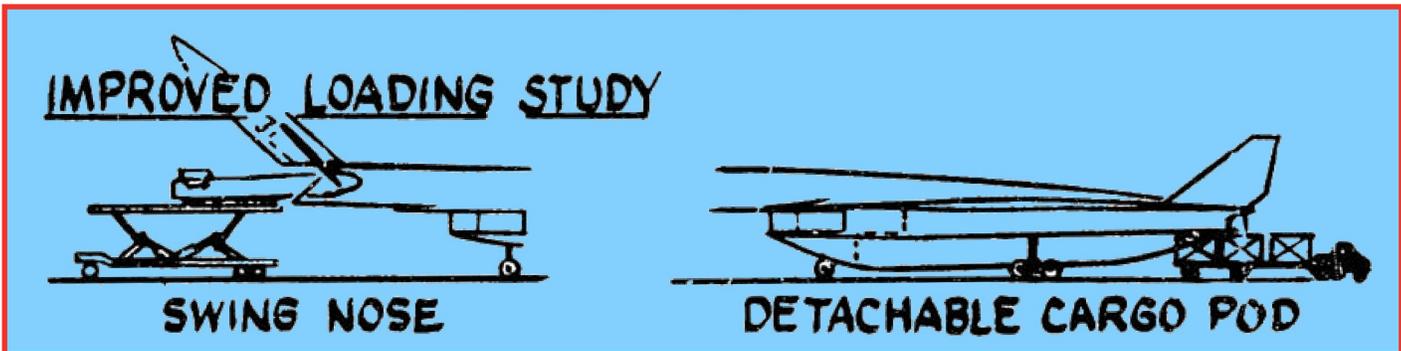
Right: Standard seating arrangements in the new transport could accommodate 80 passengers seated in an offset arrangement while the high density offering added an additional 27 seats in somewhat cramped quarters. During medical emergencies, the *Valkyrie* transport could be configured to include a nurses station along with patient litters for forty eight wounded personnel.

Below: Modifications to create the transport aircraft included a modified upper aft fuselage, the widening of the main cargo area, a lower cargo door and the addition of seats at the cost of a reduced fuel load.





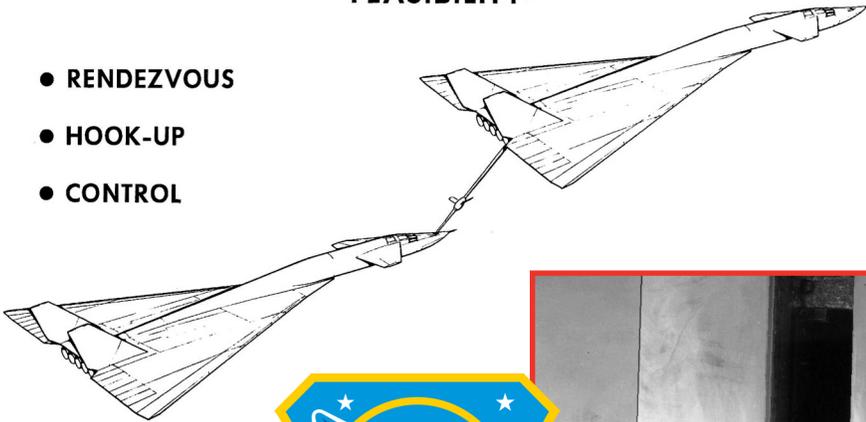
All: In an attempt to sell a pure cargo variant, engineers truly embellished their findings by attempting to show that the cargo capacity of their supersonic transport was equal to, or better than, larger transports such as the C-133 or KC-135. Loading of cargo through a swinging nose similar to a Lockheed C-5 or Super Guppy, or the use of access doors in the bottom and sides were just some of the problems to be overcome. The use of a detachable pod appeared to be the most logical solution.



B-70 Miscellaneous

SUPERSONIC REFUELING -FEASIBILITY-

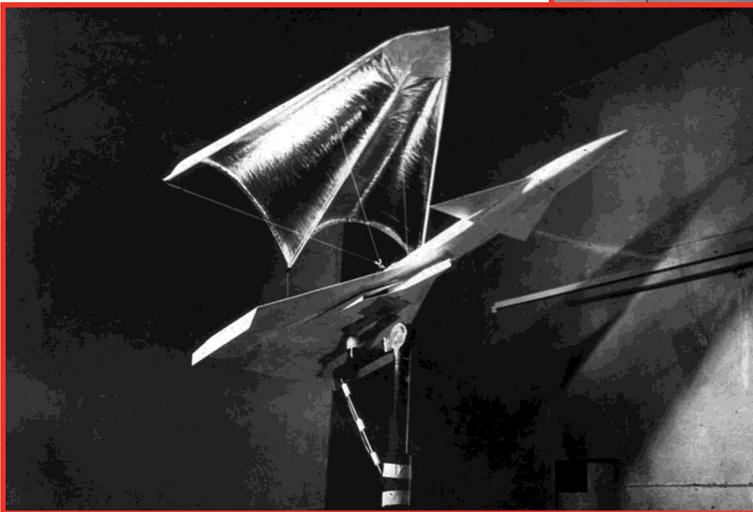
- RENDEZVOUS
- HOOK-UP
- CONTROL



Left and Below: Having a supersonic tanker could alleviate the need for high-speed fighters and bombers to slow down during in-flight refueling, though having two aircraft in such close proximity at speeds above the speed of sound created issues dealing with the shock waves from each aircraft.

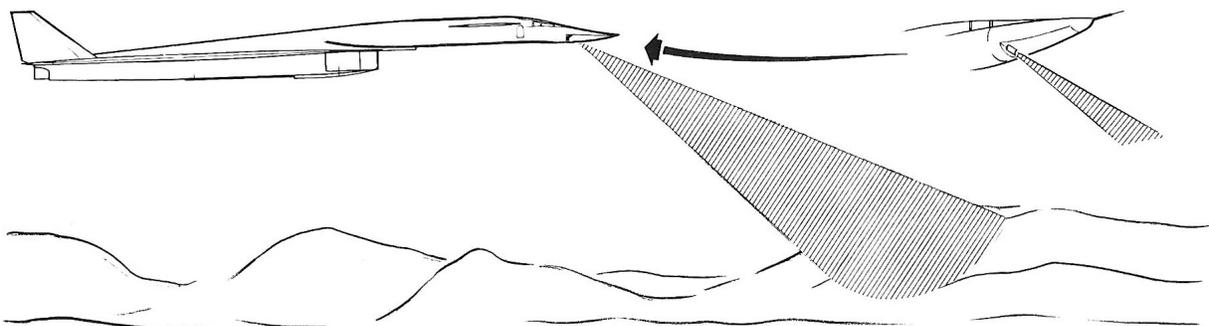


Left: A number of proposals submitted in the 1960's called for the use of a retractable Parasail to give aircraft a Short Take-off and Landing capability. The XB-70 and the F-100 Super Saber are just two of the aircraft proposed to receive this modification.



Below: As surface-to-air missile capabilities of hostile countries improved, the high and fast mission of the bomber fleet became obsolete. Low-level terrain-following missions had become the new standard.

TERRAIN AVOIDANCE



B-70 AMERICAN SST RESEARCH TESTBED

Right and Below: Creating a Supersonic Transport (SST) became a high priority for many countries including the United States. Utilizing the XB-70 as a testbed for the technologies required for such an effort made the US a frontrunner in the development of an operational SST.



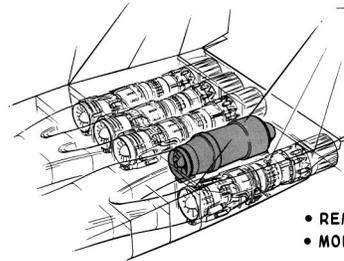
SuperSonic Transport



SuperSonic Transport

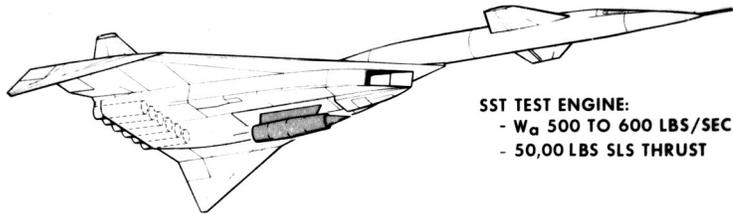
B-70 MODIFICATION SST FAN ENGINE TEST BED

- TEST POD WITH CONICAL INLET
- PARTIALLY RETRACTS FOR TAKE-OFF AND LANDING



- REMOVE TWO J93 ENGINES
- MODIFY AIR INDUCTION SYSTEM

SST ENGINE FLIGHT TESTING



- SST TEST ENGINE:**
- W_a 500 TO 600 LBS/SEC
 - 50,00 LBS SLS THRUST

PURPOSE:

- DOCUMENT PERFORMANCE IN VEHICLE ENVIRONMENT
- DEFINE & SOLVE OPERATING PROBLEMS
- DEMONSTRATE RELIABILITY & ENDURANCE
- PROVE STRUCTURAL INTEGRITY WITH FLIGHT LOADINGS
- PERFORM IN-FLIGHT SST ENGINE QUALIFICATION
- DUPLICATE SST MISSION PROFILES
- DEMONSTRATE SUPERSONIC AIRSTART CAPABILITY

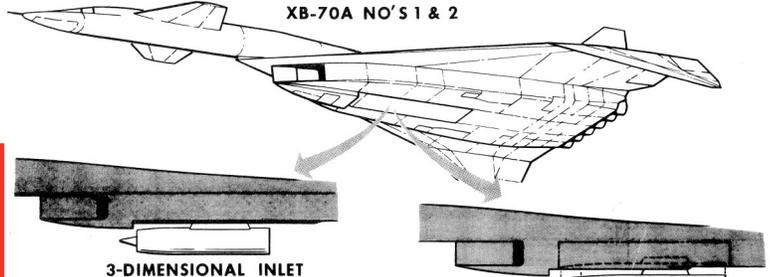
PROGRAM:

- 100 HOURS FLIGHT TIME

Below and Bottom: When the United States abandoned the effort to create an SST, engineers altered their plans to the use of an XB-70 as a propulsion testbed for all types of engine and inlet designs.

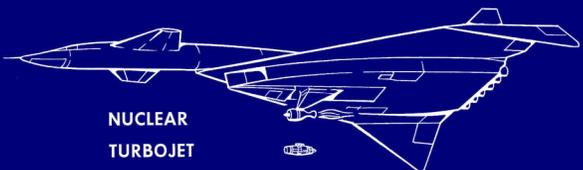
ENGINE TEST BED WEAPONS BAY INSTALLATION

XB-70A NO'S 1 & 2



- PROGRAM -100 FLIGHT HOURS
- PURPOSE:
 - DEMONSTRATE ENGINE-INLET COMPATABILITY
 - FLIGHT TEST ENGINE IN OPERATING ENVIRONMENT
 - DEMONSTRATE SUPERSONIC AIR START CAPABILITY
 - DEFINE AND SOLVE OPERATING PROBLEMS, i.e. ANGLE OF ATTACK, ETC
- ENGINE SIZE PERMISSABLE - 550-600 LBS/SEC. AIRFLOW.

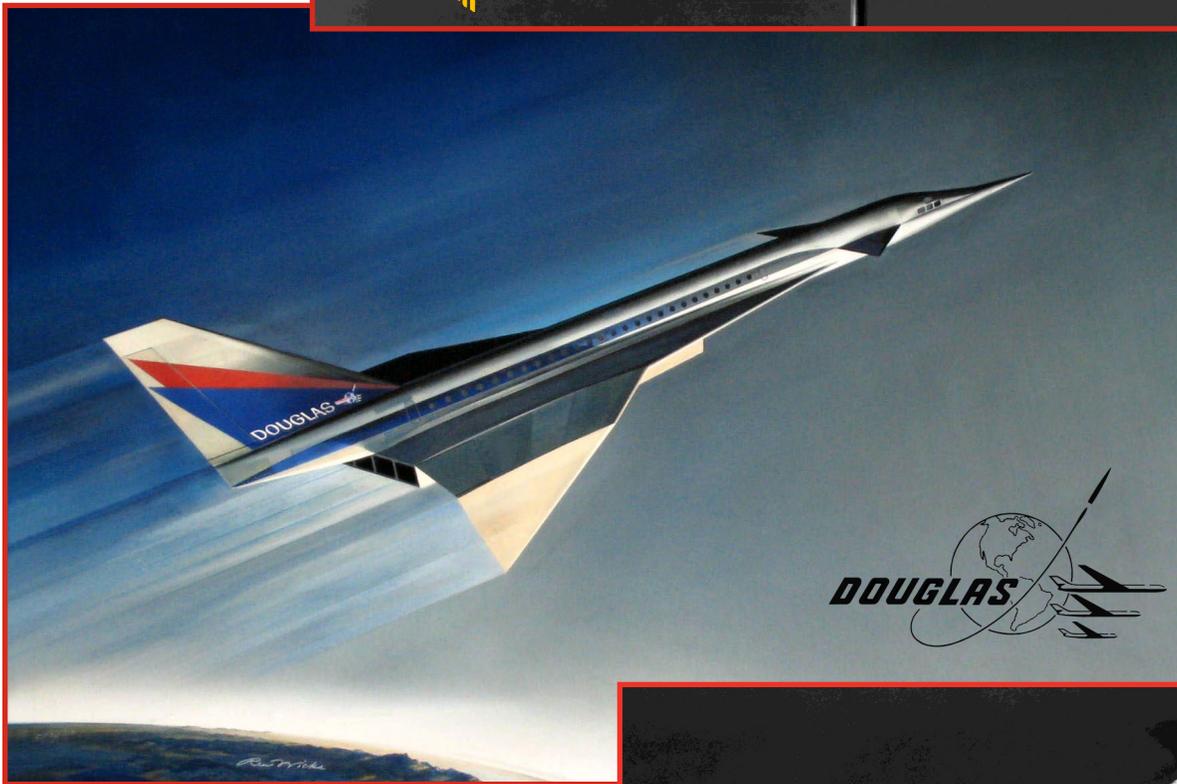
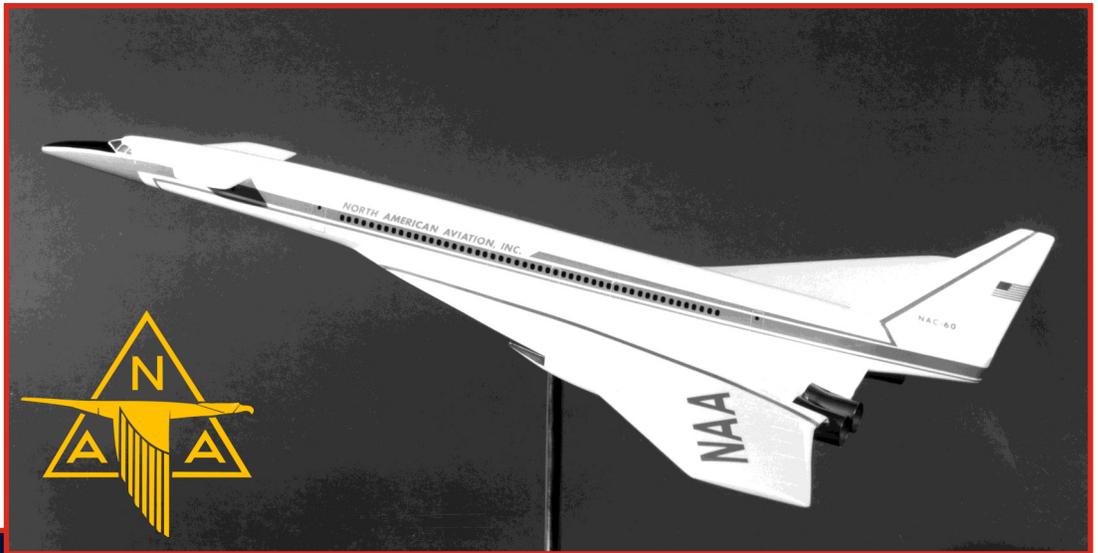
PROPULSION TESTING AND INFLIGHT SPACE SIMULATION



- | | | |
|--------------|--|----------------------------------------------------------------|
| NUCLEAR | | IN FLIGHT, ENVIRONMENTAL
TESTING OF EXPERIMENTAL
ENGINES |
| TURBOJET | | |
| RAMJET | | |
| PULSE JET | | |
| ROCKET | | |
| SOLAR ENGINE | | |
| IONIC ENGINE | | • SPEEDS UP TO MACH 3
• ALTITUDES UP TO 70,000 FT |

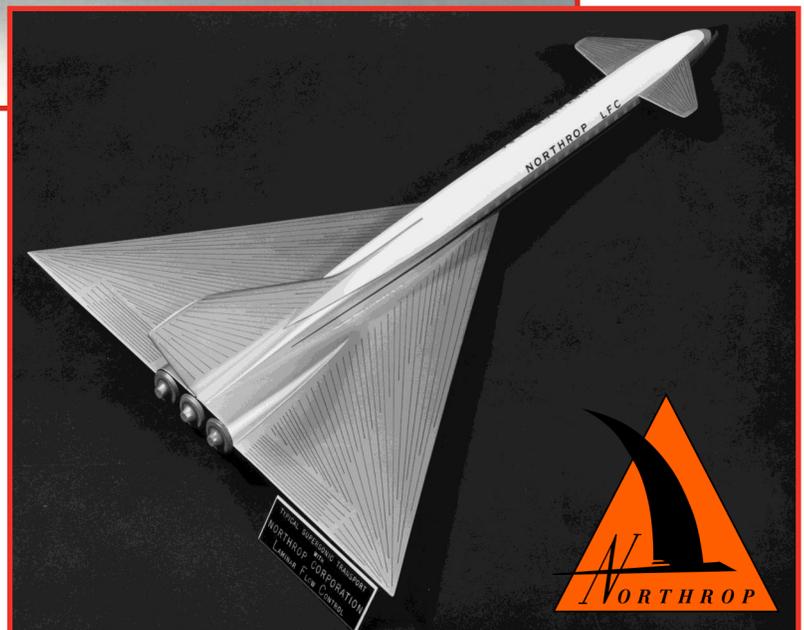
B-70 OTHER DESIGNS

Right: The basic shape of the B-70 lead North American and other manufacturers to adopt similar characteristics for their proposed high-speed vehicles. North American Aviation's true SST design bore a striking resemblance to the B-70 Valkyrie.

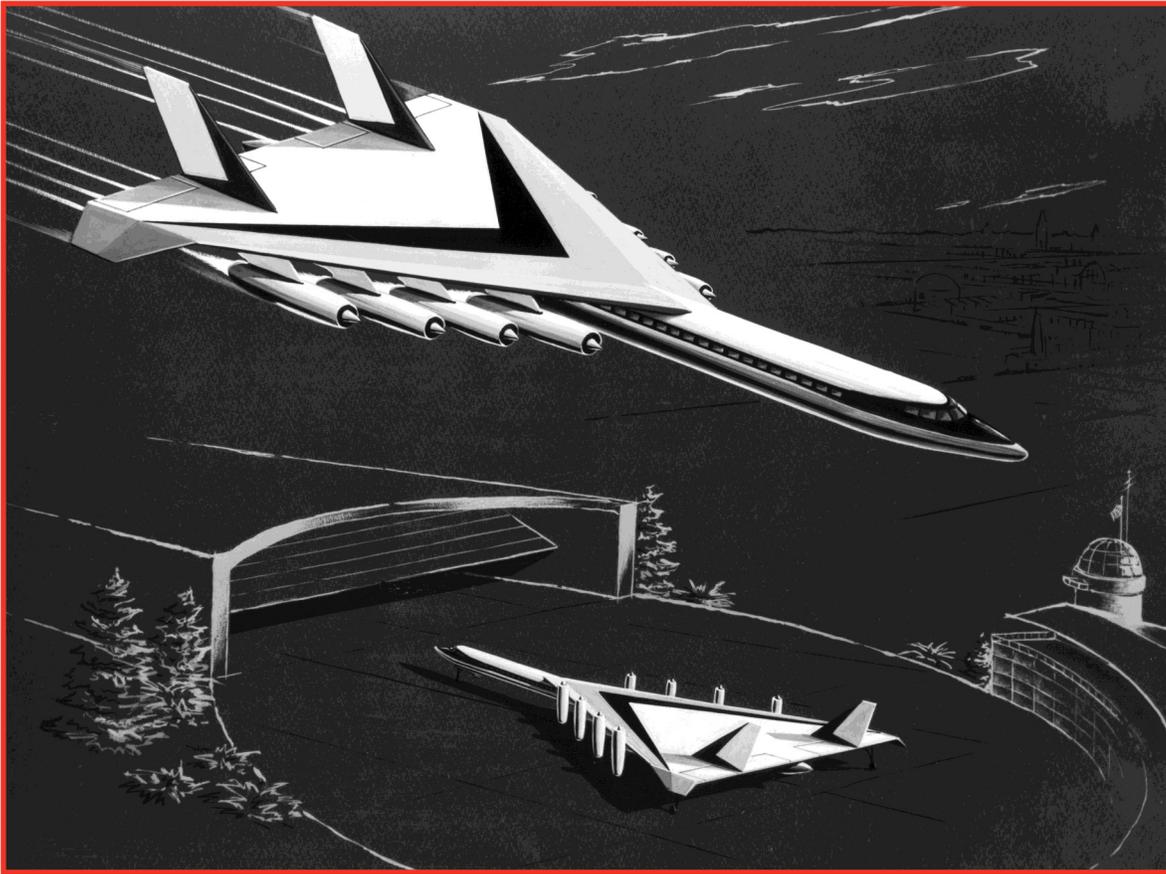


Above: North American's Valkyrie had obvious influence on Douglas Aircraft Corporation engineers when they created their SST design known internally as Model 2229.

Right: Northrop designed their SST to utilize the innovative Laminar Flow Control (LFC) technique on the wing and tail surfaces. Northrop believed the application of LFC would reduce the weight of the vehicle by approximately 60,000 pounds.

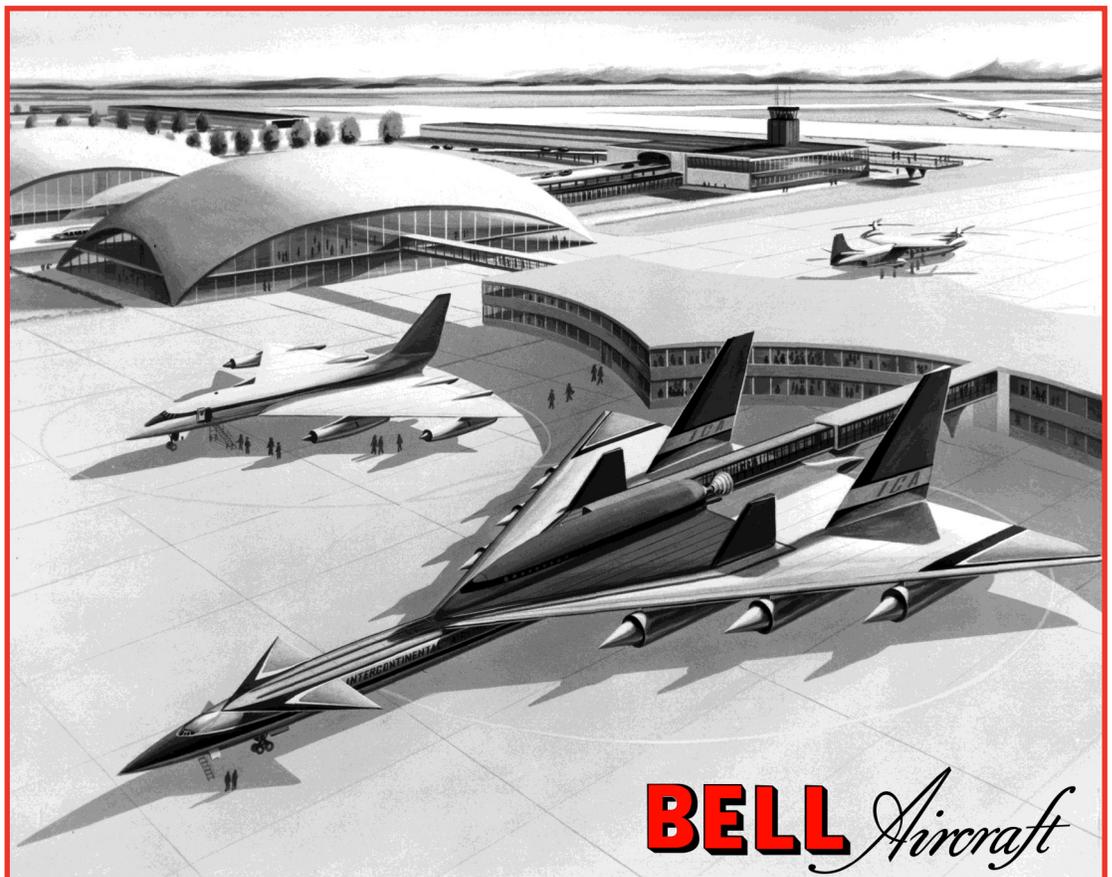


B-70 VALKYRIE VARIANTS: A FUTURE THAT NEVER WAS..



Above: Bell Aircraft Corporation, Buffalo, New York created some of the most outlandish proposals based off of the *Valkyrie's* basic design. The eight-engine, Vertical Take-Off and Landing (VTOL) passenger transport among the most creative.

Right: Another Bell Aircraft proposal used the lower portion of the vehicle combo as mother-ship to launch the hypersonic, passenger-carrying, rocket on top for reaching overseas destinations in just over an hour.





Above: One of the earliest design proposals to come out of the B-70 program is this October 1959 concept for a Recoverable Booster Support System (RBSS). Whether manned or unmanned, passenger or cargo carrier, launch vehicle or nuclear bomber, the B-70 Valkyrie design inspired the imagination of engineers and designers across all of the aerospace industry during the 1960's.



Above: The basic design of the B-70 continues to inspire engineers to this day. This 2018 proposal for an unmanned hypersonic design from Boeing's Phantom Works shows its lineage to the *Valkyrie*. With no official designation, the media have attached such nicknames as 'Son of Blackbird' and 'Valkyrie II'. (Boeing)



AFMC History & Heritage Program

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E-mail: HQAFMC.HO@us.af.mil