MCDONNELL

ASSET

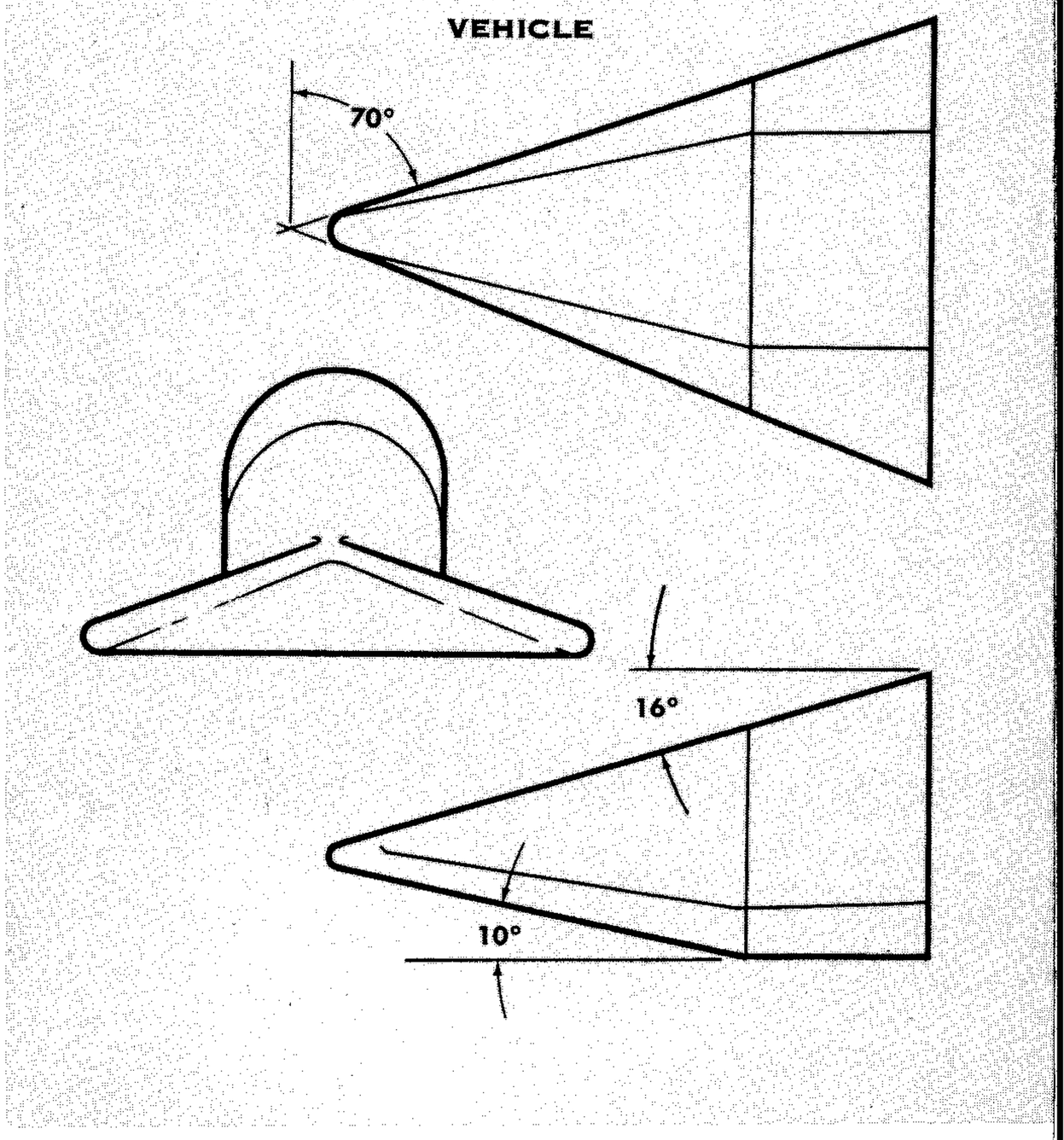
INTRODUCTION

The ASSET Program of applied research in the glide re-entry regime is a timely, economical method of obtaining data to accelerate the development of a maneuverable re-entry capability. Conducted by McDonnell under the sponsorship of the Aeronautical Systems Division of the Air Force Systems Command, ASSET will be the first vehicle to operate in the critical regions of glide re-entry flight.

With the advent of the space age, this country's initial effort was directed towards the development of methods to achieve orbital flight. The introduction of manned systems has naturally caused a parallel effort to develop re-entry technology. For example, missions such as ferrying astronauts, refueling in space, and maintenance of permanent space stations must be carried out periodically. These missions which require reusable vehicles and a highly maneuverable landing capability have opened the door to manned maneuverable re-entry. The capability for maneuver that is inherent in the glide or lifting-body concept of re-entry, provides for mission flexibility that is desirable in the design of these advanced systems.

The achievement of successful designs requires unique structural design concepts as well as rigidly controlled manufacturing techniques. Since the knowledge available in this field today is rudimentary, prime consideration must be given to obtaining better definition of the environment involved, and to correlating the ground test data with actual flight data. Basic research programs and ballistic re-entry programs will not completely satisfy these needs because of the complex extrapolations required. Ground test data is inadequate since no existing facility can provide a complete simulation of the parameters involved.

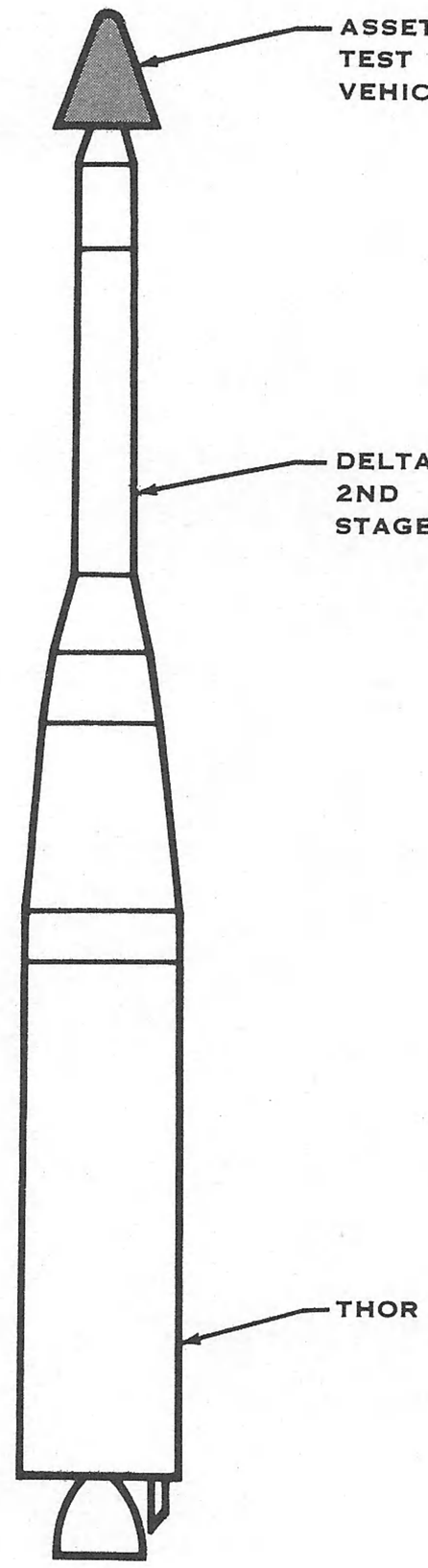
There is therefore a need for, and a lack of data necessary for implementation of the design of advanced space vehicles with a maneuverable re-entry capability. ASSET is designed as a major step towards solving this problem. Through applied research with tailored programming, ASSET provides much useful data, efficiently with regard to time and costs, and represents an interim step between the small study type program and the complex major weapon system programs.



STATISTICS

Length	68.7 In.
Span	58.9 In.
Wing Area	14 Sq. Ft.
Radii	
Nose Tip	3 In.
Wing Leading Edge	2 In.
Weight	
Aerothermodynamic Structural	1100 Lbs.
Aerothermoelastic	1200 Lbs.
Materials	
Refractory Metals	Titanium
Refractory Ceramics	Aluminum
Super Alloys	Beryllium

Four Aerothermodynamic Structural Vehicles are designed to investigate various structural concepts and to obtain free-flight data on materials, coatings, surface temperatures, and pressure distributions. Two Aerothermoelastic Vehicles are designed primarily to obtain data on thermal effects on structural response and aeroelastic instabilities.



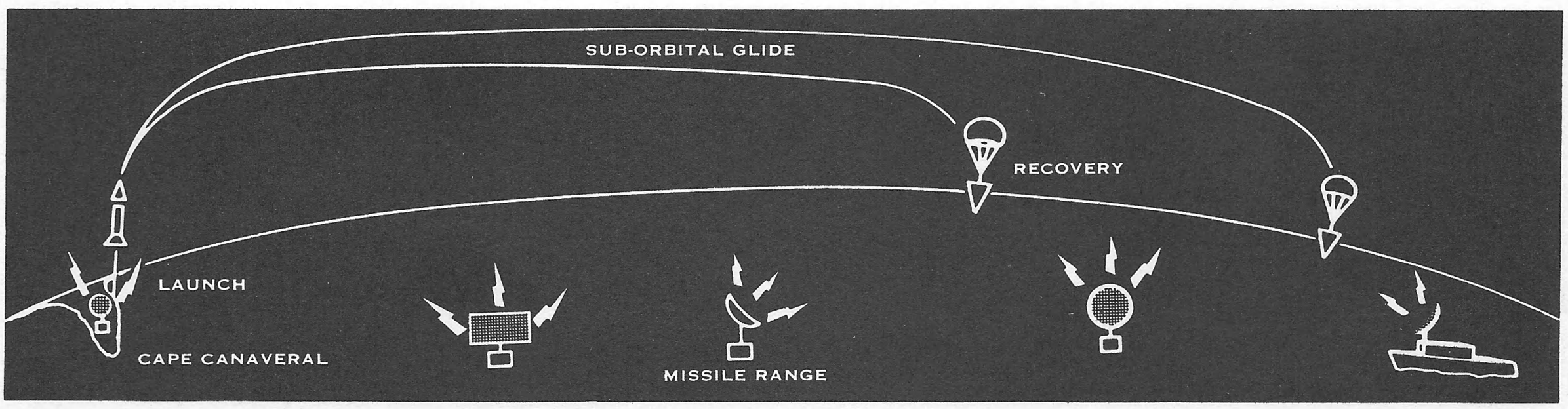
BOOSTER

The booster system employed in the ASSET Program is the Douglas THOR system. This booster capability is being utilized by the Air Force for the purpose of supporting military space and weapon system development and is noted for being the work horse of the space age.

	Aerothermodynamic Structural Vehicle	Aerothermoelastic Vehicle
Configuration	THOR-DELTA-ASSET	THOR-ASSET
Length	88 Feet	68 Feet
Launch Weight	113,231 Pounds	109,041 Pounds

PERFORMANCE

Both types of ASSET vehicles use a Minneapolis-Honeywell guidance system. Pitch attitude is established by the location of the center of gravity in each vehicle, with pitch damping provided by reaction jets. Reaction jets are also provided for roll and yaw attitude control systems. The vehicles have no movable surfaces for control purposes.



	Aerothermodynamic Structural Vehicle	Aerothermoelastic Vehicle
Start of Glide Altitude	195,000 - 230,000 Ft.	165,000 Ft.
Velocity	Mach 18	Mach 12
Range	2000 N. M.	1000 N. M.
Endurance	17 Min.	10 Min.

OBJECTIVES

ASSET is not a weapon system prototype. It is a program with the basic purpose of obtaining data which is necessary to understand the glide re-entry environment, and which will be useful in the development of future vehicles that will operate in this environment. By using optimized vehicle design of minimum size, ASSET conducts multiple experiments under true conditions of temperature, density and velocity to obtain data in the following areas:

Structures	Applications of exotic materials Oxidation protection Structural integrity
Aerodynamics	Pressure distribution Free flight stability Control characteristics
Aerothermodynamics	Heat flux distribution Flow investigation Radiation characteristics
Aerothermoelasticity	Flutter investigation Oscillatory pressure measurements Structural Vibration

RESULTS

The program will produce data which will:

- Provide for refinement of prediction techniques
- Evaluate advanced structural concepts
- Measure performance of high temperature materials
- Provide for correlation and validity of ground test data
- Explore tracking, telemetry and communications systems
- Provide actual aeromechanic flight data
- Evaluate and establish problem priorities

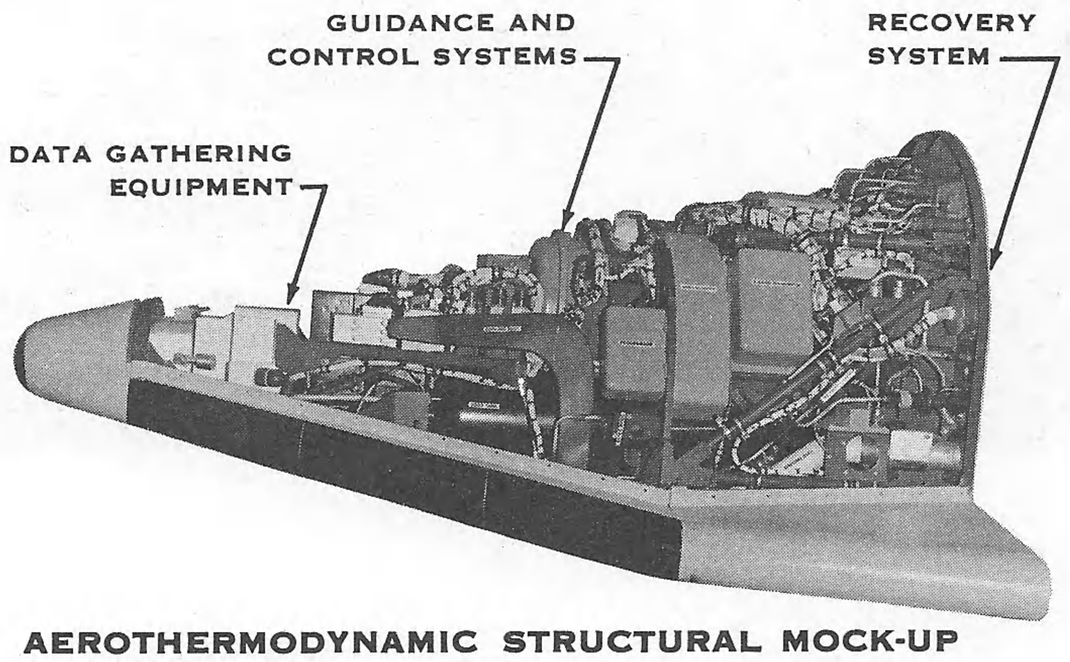
SUMMARY

By providing these data, ASSET will help accelerate the development of new aerospace systems and will aid in the establishment of future research requirements and system concepts. It is a necessary and major step in the achievement of safe, piloted, precision re-entry vehicles for on-land recovery.

ASSET is a flight laboratory for economically obtaining steady-state data from the glide re-entry enrivonment. This program will obtain specific information which is necessary for the development of advanced systems employing the lifting body concept, and which is not provided by ground testing or ballistic re-entry programs.

The follow-on potential of this program can also be of value. The fact of the existence of a workable booster-vehicle combination lends itself to utilization as a test bed for extension of tests in the field of aeromechanics, and for additional research on systems for communications, propulsion, observation and navigation.

The ASSET concept of High Yield—Short Time—Low Cost programming is an essential step in the acceleration of our progress into military space.



AEROTHERMODYNAMIC STRUCTURAL MOCK-UP

Aerothermodynamic / Elastic Structural Systems Environmental Tests