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[redacted] has carried more than 450 individual scientific experiments.

has the highest ratio of successful space operations of any large scale program

since 1st launch, Feb 59, and 1st recovery, Aug 60, has successfully launched more space vehicles than all other US programs combined and more than twice as many as all ~~xxxx~~ Soviet shots.

as of 18 March: 76 launches, 80 percent successfully reached orbit, 73 percent of recoverable vehicles recovered.

is the basic program in which were developed some of the most vital ~~xxxxxxxxxxxx~~ space vehicles and space boosters in the US inventory. Development includes Agena A, B, D; Thor booster, TAT.

Agena D space truck concept, standardized space vehicle capable of a larger variety of specialized tasks than any~~xxx~~ other ever used in space work

results applied to <u>every</u> US space program since 1959.

Basic vehicle for principle lunar and interplanetary probes (Agena)

booster successes in 94 percent of attempted launches--best record in the world

booster has become the equal in reliability of any ~~xxx~~ airborne system in the USAF inventory

took only 10 months for TAT from contract to successful use

the first recovery of a functional object from space, in August 1960, marked the first time the US had beaten the USSR in <u>any</u> space achievement

responsible for more improvements in the state of the art of space technology than any other program

~~principlex~~
principal buttress of US prestiege in first years of space age ~~xxxxxxxx~~ heaviest weights, most efficient functioning, most difficult assignments of any space system at that time. Except for weight~~x~~, ~~x~~ still valid.

resulted in development of first <u>total space system</u>--integrated booster, upper stage vehicle, on-orbit system, ~~xxx~~ data abstraction and command/control system, recovery system

[redacted] directorate responsible for more noteworthy space achievement, over a longer period, and with a higher degree of success than any other civil or military organization in the free world.

Inconceivably complex operation thoroughly standardized, almost routine. Boost, coast, second-stage burn, and orbit injection must be accurate to microseconds and seconds of arc, although involving such tasks as gimballing orbit stage engine, rolling vehicle by gas jets, cutting off thrust through velocity meter inputs, complete end-over-end reorientation of vehicle, horizon scanner establishment of attitude.

Recovery (which is about as complex as complex as halting a bullet in mid flight and commanding it to return to the cartridge case) involves interlocked mechanical, electronic, and chemical reactions to uncouple, spin-up, use retro-rockets, de-spin, and separate thrust cone from re-entry capsule.

Agena D developed for [redacted] in period of precisely one year, an achievement matched by no other vehicle development of comparable magnitude. Attitude control, by pre-set or ground-dispatched command, must be accurate to within average tolerance of one degree along all three axes. Attitude control system development one of the most significant aspects of the program.

Refined vehicle capable of injecting scientific instrumentation into orbit with injection error of less than one-half degree. (Techniques thus developed have been applied to every subsequent US space program.)

Original objectives were somewhat limited: (1) develop a reliable satellite vehicle (Agena) and capability to place it in orbit with Thor; (2) develop reliable orbit ejection and orbital recovery system; (3) develop a satellite control organization; (4) develop sqtellite control procedures; (5) conduct scientific experiments in near earch orbit. Nevertheless, constituted as difficult an assignment as any other in space program. Total success--not something all programs can say—within two years of inception.

Accuracy in time and orbit position can now be computed to an accuracy of .005 percent (sic!). On 67th flight, position-time error was less than 5 seconds after 28 hours on orbit.

Data from [redacted] flights is basis for computing on-orbit and decay times for all low and medium orbits. Now able to compute effects of durinal, seasonal, and altitude variations with remarkable precision, well in advance of need.

Unpredicted differences between internal and free space pressures and temperatures detected by highly sophisticated [redacted] instruments, permitting establishment of precise criteria for simulating orbital conditions in environmental test chambers and permitting accurate results from such experiments in test chambers. Overcame need for hundreds of orbital tests.

[redacted]

A 6-flight horizon sensor program permitted functional tests of four different systems in a real-time orbital environment. Results permitted elimination of limitations in control of satellite attitude--a real breakthrough in space technology.

Experiments in [redacted] vehicle resulted in establishment of basic standards for measuring the plume of rocket engines and albedo refelcted from the earth. Economical and rapid in [redacted] vehicles; could not have been completed so rapidly or effectively except in orbit; could not have been done in orbit without [redacted]

Proved validity of thermal electric generator comcepts in space, providing first useful option to solar radiation cells.

[redacted]

Conducted experiments proving the feasibility of de-activating and later re-energizing attitude stabilization system.

Carried tracking lights which, in conjunction with use of Baker-Nunn cameras, permitted first photographs and tracking of lights on a satellite.

Experisment proved intercept capability of Nike-Zeus by providing a simulated target, miss-distance indicator, and Lunberg lens radar augmentation device. Inexpensive way of proving feasibility of continuing more expensive Nike-Zeus tests.

In summation, [redacted] has developed from an attempt to obtain basic informatinn about the space environment to a mature, sophisticated system which has carried through work of enormous value to the establishment of a USAF space capability. We may well look back on [redacted] a few years hence, as we now look at the X-series of aircraft which provided the basic information that permitted the development of operationally effective supersonic fighters and bombers. The parallel is very close.