The Department of Defense Space Test Program

Capt Stewart Cobb
Space Test and Transportation Programs Office
HQ Space Systems Division, Los Angeles AFB, CA

Abstract

For over twenty-five years, the Department of Defense Space Test Program has provided spaceflights for DOD experiment payloads, using almost every kind of booster and satellite in service during that period. This paper discusses briefly the mission and history of STP. The diversity of STP projects is illustrated by descriptions of several current projects. Finally, STP's future plans are discussed.

The Department of Defense (DOD) Space Test Program (STP) provides spaceflight opportunities for DOD research experiments and agencies that are not authorized their own means of spaceflight. STP is a tri-service program under the executive management of the Air Force, and has been in existence for over twenty-five years.

In 1965, the Director of Defense Research and Engineering (DDR&E) authorized the establishment of the Space Experiment Support Program (SESP), which was to be tri-service in nature. The Air Force was designated the executive agency and a Program Office was established at Space Division. Originally chartered to support advanced development and engineering development payloads, SESP's scope was increased in 1968 to include basic research and exploratory development payloads. SESP became the Space Test Program in 1971, when the name was changed to reflect the expanded mission.

The first SESP mission, known as P67-1, was launched from Vandenberg AFB, CA, on 29 June 1967. A Thor/Burner II rocket carried two experiments, one Army and one Navy, into a 2100 nm orbit. Three Air Force experiments, collectively known as S67-3, were launched 7 August 1967 on the aft rack of an Agena spacecraft. These initial payloads space-qualified a prototype operational system and investigated space and earth environments.

Since its inception, STP has flown over 170 experiments on over 50 missions, including experiments sponsored by the Army, Navy, Air Force, DARPA, DNA, NASA, NSA, the Department of Energy, and other government agencies. Experiments have flown "piggyback" on operational spacecraft, on dedicated spacecraft buses, on the Space Shuttle, and even on a balloon.

The Experiment Process

STP is not authorized to seek out experiments; experiments must come to STP. Each experiment must be sponsored by an agency of the Department of Defense. The sponsor fills out a Space Test Program Flight Request, form DD-1721, and submits it to STP. Each spring, the experiment is presented to a prioritization board held by the sponsor's service. The individual services rank their experiments, and the process is then repeated at the tri-service level. STP uses the experiment rankings from the tri-service board to determine its priorities for the year.

STP's Mission Planning Division attempts to match experiment requirements with available rides. Some experiments can fly "piggyback" on existing spacecraft or on board NASA's Space Shuttle. These become *secondary payloads.* (The name reflects their requirements, not their importance.) The rest are *primary payloads,* requiring a special-purpose spacecraft and launch. STP attempts to combine compatible primary payloads onto one bus, to promote synergism and reduce costs.

The experiment's ride into space determines its interface requirements. Once the ride is chosen, the experimenter can construct and test the actual spaceflight hardware. STP manages and funds the integration of the experiments into the chosen bus, the launch, and the first year of experiment data collection.

Examples of Experiments

Many of STP's secondary payloads fly on NASA's space shuttle. The shuttle provides capabilities such as the Get-Away Special (GAS) cannister, the Hitchhiker program, and the middeck lockers inside the crew cabin. STP has used all of these capabilities, and has also provided experiments which met NASA's requirements for generic secondary payloads in the cargo bay. NASA liked several of these latter experiments, such as the Ascent Particle Monitor, so much that NASA now flies them as NASA experiments.

During the pre-Challenger era, STP had in place the Quick Response Shuttle Payloads program, which was able to fly simple middeck payloads in as little as a few months. After Challenger, the lead time grew longer. Nevertheless, a simple payload such as a GAS can be flown in 18 months or less if there's space on the Shuttle manifest.

Not all secondary payloads use the space shuttle. A typical "piggyback" is the Polar Ozone and Aerosol Measurement (POAM) experiment. This experiment stares at the sun through the earth's atmosphere during orbital sunrise and sunset, and measures the absorption of sunlight in various bands. It requires a stable spacecraft in sun-synchronous low earth orbit.

Mission Planning Division had a great deal of trouble finding an appropriate ride for this experiment. No US spacecraft going into polar orbit could accomodate POAM. STP eventually reached an agreement with CNES, the French national space agency, to place POAM on their SPOT-3 earth resources satellite. POAM is currently being integrated onto SPOT-3, and is scheduled for launch in March 1991.

A recent primary payload mission was Stacksat (P87-2), launched in April 1990. This mission involved four experiments built into three very similar spacecraft. The three satellites were stacked (hence the name) atop a solid rocket stage and launched on an Atlas booster. All three sapcecraft are currently healthy, and the experimenters are happy with their data.

The STEP-1 mission (P90-1) is the model for STP's future primary missions. STP determined that four experiments on its priority list were mutually compatible. None of the three could be flown as a secondary mission. After selecting these three experiments, STP held a competition for the contract to build the satellite bus and integrate the experiments. The bus is known as the Space Test Experiment Platform, or STEP.

STEP represents a significant break with STP tradition. STP intends to use the STEP bus design several times for several sets of primary experiments. This allows STP and its contractors to move down the learning curve, significantly reducing the cost of each mission. The STEP contract contains options for up to twelve missions. The proposal encouraged contractors to make their bus designs modular and generic, to facilitate reuse.

Unlike most contracts for military hardware, the STEP contract incorporates very few general military specifications (MIL-SPECs). Instead, the STEP proposal invited contractors to show how they could meet a few overall reliability specifications, in whatever manner they chose. The absence of MIL-SPECs cut the price of STEP nearly in half, without affecting the anticipated mission reliability at all. Most of the MIL-SPECs remaining in the STEP contract reflect safety requirements imposed by the launch sites, which STP cannot control.

An illustration of STEP's flexibility is provided by the TAOS experiment, which received a high ranking during its first appearance at the tri-service board last spring. STP determined that a slightly modified STEP bus could support this experiment, and added TAOS to the STEP contract. TAOS is scheduled for launch not long after the first STEP mission.

Future Plans

STP is currently baselined to receive one (Pegasus-class) Small Launch Vehicle (SLV) launch per year in FY92 and FY93, and two SLV's per year from FY84 to FY97. Most of these missions are expected to use the STEP bus, and STP has tentatively selected experiments for the first two or three missions. In addition, STP expects to launch one a group of experiments on an Atlas II Medium Launch Vehicle (MLV) booster in FY95. This mission is currently being defined.

STP's Shuttle secondary experiments continue to fly whenever the Shuttle flies. Within the next two years, STP plans to fly two GAS experiments, two Hitchhikers, and a large number of mid-deck locker payloads. For the STS-44 mission next year, STP is planning a demonstration of manned observation capabilities for the Military Man In Space program.

STP continues to search for ways to improve the response time and lower the cost of an experiment's access to space. STEP is one result of this search; the Quick Response Shuttle Payloads (QRSP) program is another.

Conclusion

The Space Test Program exists to fly DOD experiments in space. STP has a long record of success, stretching back some twenty-five years, and an equally bright future now in the planning stages. Innovative concepts such as STEP help STP to reduce the cost and improve the speed and reliablity of an experiment's access to space.