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SHUTTLE OPERATIONS

The key to America's future activities in space is development of a re-usable Earth-to-orbit transport system. Popularly known as the space shuttle, largely for its logistics applications, this re-usable vehicle will far exceed in its operational versatility and flexibility any existing rocket system.

Up to now, we have been designing and building a variety of rocket boosters for manned and unmanned space missions. They have remained, however, essentially the same type: ballistic missiles, with all the inflexible operational characteristics of such vehicles. The re-usable shuttle breaks this design mold of the past. A major objective of the shuttle program is to increase the nation's capabilities for flight in the strategic new medium, space, and to multiply man's use of it for scientific exploration and Earth applications and observations.

The shuttle is designed to serve the nation's requirements for manned and unmanned space flight quickly, on a routine basis, and with a flexibility of operations not possible with today's rocket technology. As now visualized, 52 per cent of the payloads to be carried by the shuttle will be for scientific and applications technology missions to increase our knowledge of Earth and its environmental conditions, and to help unlock the secrets of the solar system and universe beyond. Another 22 per cent will be for Department of Defense missions.

An important factor in the shuttle design is its growth potential. Technologically, the shuttle -- now designed for near-Earth operations -- has a growth potential permitting more extensive and sustained lunar exploration, for example, although NASA is not planning such a development at this time. But, because technological growth is inherent in its design, the nation's options for much more sophisticated manned and unmanned space exploration are preserved.

Thus it may be appreciated that the space shuttle represents, in a very important aspect, an increased operational capability in a design which is at the beginning, not the end, of a line of potential space flight vehicles. It is the "Wright Brothers' Kitty Hawk Aeroplane" of the space age, a forecast of man's future ability to fly in and use space to a degree far greater than even the considerable accomplishments we expect from the prototype.

Today's space missions are one-shot operations. Nothing can be re-used, either the booster, the spacecraft, or the instrument-equipment payloads. Once they leave the launch pad, the spacecraft and payload are committed: there is no bringing them back if a malfunction occurs. In the event somthing goes wrong, the whole multi-million dollar mission is lost or degraded, and often years of work by the project scientists are wasted. Nor is it possible to retrieve the spacecraft to refit them with new experiment payloads and re-use the vehicles. The vehicles and their inactive payloads remain in orbit, sometimes for years, and burn up on re-entry into the atmosphere.

The space shuttle, however, changes this operational scenario. It will transport unmanned spacecraft and their payloads into the precise orbits required for particular missions. Interplanetary spacecraft would be placed in Earth orbit and then, using their own rocket propulsion, continue on their selected missions without having been subjected to the hazards of launch to Earth orbit. The space shuttle's crew checks out the spacecraft and payloads, places them in the desired orbit, and stands by until assured all systems are functioning properly. Satellites that have completed their missions, or which have ceased functioning, can be retrieved and brought back to Earth. These shuttle tasks can be done, not once, but repeatedly.

While astronauts and payload specialists will operate the shuttle, other, non-astronaut personnel can be carried as passengers to perform -- in shirt-sleeve freedom -- experiments in laboratory modules installed in the shuttle's large cargo bay. Duration of shuttle missions will range from a few hours to a week or more, according to requirements. A crew of four astronauts plus a complement of as many as six scientists or engineers can be carried in the orbiter laboratory module to conduct experiments.

Launching conditions will be acceptable for passengers in normal health, and the vehicle will land like a jetliner at its selected base. This feature should encourage participation by foreign, as well as American, scientists and engineers who may wish to conduct experiments in laboratory modules contributed by their respective governments.

The space shuttle offers a reduction in launch operations costs by an order of magnitude even with the prototype design. In addition, because of the much more benign launching conditions, savings in the design, fabrication and testing costs of payloads and their associated spacecraft will be realized. More off-the-shelf hardware items can be used in the design and construction of instruments and equipment, redundancy can be reduced or eliminated, reliability standards can be less stringent, and a great deal of the meticulous, expensive testing procedures can be relaxed somewhat. Indeed, it is in this area of design, fabrication and test that an important part of the savings to be realized from the shuttle will occur. In addition, it is quite likely, as it becomes cheaper to produce shuttle-launched spacecraft and their payloads, that many more uses for this versatile vehicle will be discovered.

NASA's shuttle technology is thus offering an entirely new approach to space operations. It combines the advantages of human judgment, skill, observation and ability to take corrective actions, with an even great degree of economy in manned and unmanned space operations than can be realized today. It will accomplish this through use of a common launch system.

Beginning with simple satellites and probes to search out the secrets of an unknown environment, we have progressed to ever more sophisticated automated and manned vehicles, each having a separate launch system. With the shuttle, all but the very small Scout-launched payloads will be carried aloft by a single launch system. Our present inventory of ten different active rocket boosters can be reduced to one, the Scout, in addition to the shuttle booster-orbiter system.