Ranking of Space Missions

by our Washington Correspondent

FUTURE missions suggested by the seven disciplinary panels were ranked by the executive committee of the Space Science Board study (see preceding article) in three categories, base, intermediate and higher, corresponding to zero, 25 per cent and 50 per cent increments respectively in the size of the present budget of the Office of Space Science and Applications.

BASE LEVEL BUDGET

Planetary exploration Three Planetary Explorer missions to Venus should be launched, consisting of dual-entry probes in 1975, an orbiter for 1976–77, and another mission with either probes or an orbiter in 1978.

The base level budget does not allow a Grand Tour mission to Jupiter and the outer planets. Missions should concentrate on Jupiter, with spacecraft, possibly extended Pioneers, being launched to probe the planet's atmosphere, orbit it or "fly by, possibly towards one of the outer planets".

Lunar exploration Automated landers and rovers should be developed to continue where the Apollo programme leaves off.

Astronomy A series of high energy astronomical observatories (HEAO) with a payload of about 22,000 lb will take instruments above the atmosphere to explore cosmic rays and the gamma-ray and X-ray regions of the spectrum.

Small astronomical satellites (SAS) at a launch rate of one a year are intended to be simple, flexible satellites allowing exploitation of new developments in astronomy.

A doubling of support for rocket and balloon-based observations is "ranked with highest priorities in astronomy" since these are economical ways of studying the regions of the spectrum blocked out by the Earth's atmosphere.

An immediate start should be made on a large space telescope (LST) with a diffraction limited mirror of 1.5 m aperture.

Gravitational physics Priorities are for an earth-orbiting gyroscopic experiment now under development by Stanford University, and a sun-orbiting satellite designed by the European Space Research Organization (ESRO), for which NASA support will probably be requested.

Solar-terrestrial physics The interplanetary monitoring platform series (IMP) should be continued with a mother-daughter satellite system (IMP KK′) designed to study the interaction of the magnetosphere with the solar wind.

A solar-terrestrial probe should be launched into heliocentric orbit to monitor the undisturbed solar wind at a distance of some 10 million miles from Earth.

Priority should also be given to data analysis, funds for which should be doubled, and to solar-terrestrial physics, rockets and balloons, for which a 20 per cent increase in support is needed.

Earth observations Earth observatory satellites (EOS) will contribute to meteorology, Earth resources surveys, oceanography (sea state and surface temperature), hydrology and ecology.

Small applications technology satellites (SATS) are needed to permit rapid development of new approaches in meteorology and Earth resources work.

A dual satellite system whereby a low altitude, zero-drag satellite is tracked from a second in higher orbit would provide important data about gravity anomalies and mantle convection.

NASA should continue its support for Earth resources surveys from aircraft.

Life sciences On the assumption that manned flight continues, there should be stronger programmes of space medicine.

INTERMEDIATE LEVEL BUDGET

Astronomy Work on the 1.5 m aperture telescope should be accelerated, with the telescope ready for launch in the mid-1970's. Should there be a choice between the telescope and the Grand Tour, preference should be given to the telescope because of its higher scientific promise.

The L and M members of the orbiting solar observatory (OSO) series should be flown during the next high activity phase of the solar cycle.

Solar-terrestrial physics The F and G members of the atmospheric explorer (AE) series should be added to the already approved programme; AE, F and G are satellites with propulsion capability that can maintain low orbits despite atmospheric drag.

Priority is also given to a magnetosphere experiment which would extend the IMP KK′ concept by having four subsatellites in a tetrahedral configuration around the Earth.

Earth observations Development should proceed with an earth resources satellite (ERS), synchronous earth observation satellites (SEOS), and a drag-free Earth physics satellite capable of measuring sea surface heights to within 10 cm.

HIGHER LEVEL BUDGET

Planetary exploration A solar-electric mercury orbiter will follow up the exploration of the planet begun by the Venus-Mercury flyby already approved for 1973.

Priority is also given for the full Grand Tour concept, which calls for development of a thermoelectric outer planets spacecraft (TOPS) designed for longevity and operation far from Earth. Exploiting an unusual planetary alignment in the period 1975–80, TOPS spacecraft would use the gravitational field of Jupiter to swing on to the outer planets, two missions being dispatched to Saturn and Pluto (JSP) and two to Uranus and Neptune (JUN). Another TOPS craft would be swung back by Jupiter toward the Sun in a path taking it out of the ecliptic.

Lunar exploration A dual satellite orbital system should be developed to study the gravity anomalies and magnetic field of the Moon.

Astronomy The budget allows development of a solar observatory with one sec of arc pointing capability, and a kilometer-wave orbiting telescope (KWOT), consisting of a rhombic antenna surrounding an area some 10 km in diameter.

Other disciplines Also recommended in the higher level budget are four solar-terrestrial physics explorer satellites, each designed for a particular experiment, recoverable Earth resources satellites, and an improved biosatellite.

Table 1. Office of Space Science and Applications (OSSA) Budget Summary and Major Activities

	Funding (in millions of dollars)			
	FY 1970	FY 1971	FY 1972	Difference
Physics and Astronomy	113	116	110	− 6
Lunar and Planetary	151	145	312	+167
Space Applications	128	167	183	+ 16
Launch Vehicles/Bioscience	127	138	146	+ 8
Total	519	566	751	+185