

of adapting the design to meet possible future requirements are now being studied by the company.

The ESRO-2 satellite is designed to measure the energy levels and spectral distribution of solar and cosmic radiation. It carries seven experiments sponsored by research groups at Imperial College, London; Leeds University; University College, London; Utrecht University; and the Centre d'Etudes Nucleaires, Saclay, France. The launch time has been chosen so that the satellite will operate for a full year in space during the period of maximum solar activity.

An elliptical orbit has been chosen with perigee of 350km and apogee of 1,100km. The orbital inclination is 98.22° retrograde, at which inclination the satellite will be continuously in sunlight.

Certain experiments need to sample alternatively radiation from the Sun and background radiation from space. This requirement is met by providing a spinning satellite with spin axis perpendicular to the Sun line and the experiments viewing radially, perpendicular to the spin axis.

A viewing accuracy of $\pm 10^\circ$ is required and an attitude control system is therefore needed to maintain the spacecraft spin axis perpendicular to the Sun line to within this tolerance. The attitude control system employs a "magnetorquer" (an electromagnetic coil which interacts with the Earth's magnetic field) and a Sun-sensor.

Some of the experiments also require that the sensors traverse the solar disc at a specific rate, and a spin-rate control system is therefore used. The satellite can be spun-up from the minimum to the maximum spin rate, i.e. 15-40 r.p.m., three times during its lifetime. Dry nitrogen gas is discharged through an expansion nozzle on ground command.

To reduce the initial rate of rotation after injection into orbit (when the Scout fourth stage, and the spacecraft, are spinning at 170 r.p.m.), a "yo-yo" or bolas type of de-spin system is carried. A ball-and-tube type of mutation damper is also employed, to minimise the coning angle which can be caused by various perturbations in flight.

TD SATELLITE BIDS

Four groups have submitted revised proposals for the European Space Research Organisation's Thor-Delta satellites TD-1 and TD-2. They are:—

European Satellite Team Elliott-Automation, Compagnie Française Thomson Houston, Fokker, ASEA (Sweden) and FIAR (Italy) with General Electric (USA) as consultant.

MESH Matra (France), ERNO (West Germany), Saab (Sweden) and Hawker Siddeley Dynamics.

BAC consortium BAC Guided Weapons Division, Bölkow (West Germany), Nord Aviation (France), ETCA (Belgium), Fiat (Italy) and other firms, with Hughes Aircraft Co (USA) as consultant.

Sud consortium Sud Aviation, Bell Telephone, LMT (France), CASA (Spain) and Standard Radio & Telephone AB (Sweden).

The four bids are now being evaluated by ESRO and a contract decision is expected by the end of this month. It is hoped to launch TD-2 in the first half of 1970, with TD-1 following 9-12 months later.

This Philco design for an automated space laboratory intended for scientific studies on Mars bears a superficial resemblance to the Soviet Union's Luna 13 spacecraft (photograph, page 65). It is one of several types of device under development in the USA in connection with the Voyager programme of unmanned planetary exploration, and is designed to conduct photographic, soil-sampling and other scientific studies

HEOS-A Integration Integration of the first prototype of the European Space Research Organisation's HEOS-A spacecraft was scheduled to begin at the beginning of this month. The first prototype of the communication equipment for the satellite is expected to be ready for acceptance tests in February.

Over 300 Scientific Experiments were launched by NASA's Wallops Station, Virginia, during 1966. Most of these involved sounding rockets fired from Wallops Island but the total also included sounding rockets fired in expeditions abroad and a USAF radiation-detection satellite launched by a Scout vehicle.

Over 400 Scientists and engineers applied to be trained as scientist-astronauts during the US National Aeronautics and Space Administration's most recent recruiting campaign, which ended on January 8. Medical scientists, engineers and physicists predominate, and almost half of the applications have come from universities. Initial selection will be by the US National Academy of Sciences.

NASA/Industry Post Mr B. L. Dorman, vice-president of Aerojet General Corporation, has been appointed Assistant Administrator for Industry Affairs at the US National Aeronautics and Space Administration. He succeeds Mr William Rieke, who resigned to return to Lockheed Missiles and Space Company. Mr Dorman will be responsible for maintaining effective relations between NASA and industry and will direct NASA's activities in procurement, labour relations, reliability and quality assurance and construction.

Second Coralie Second test firing of the French Coralie rocket stage (intended as second stage of ELDO's Europa 1 launch vehicle) was made from Hammaguir on December 18. Designated G2, the flight was described as "totally successful." As with G1, the vehicle in the second firing comprised the so-called Cora configuration—Coralie with fins, dummy German stage, and Italian nosecone and dummy satellite—representing the upper stages of the Europa vehicle. Two further Cora flight tests are scheduled from the Landes Test Centre.

US/Japanese Tests Ten American and ten Japanese meteorological sounding rockets are to be launched from Wallops Island in a joint programme beginning in March by agreement between NASA, the Japanese Science and Technology Agency and the Japanese Meteorological Agency. The Japanese vehicle is the MT-135, capable of launching a 6.6lb payload to 200,000ft; the American rockets will be Arcas or boosted-Dart vehicles. Objective is to compare payloads and operational characteristics of the rockets as well as to obtain wind and temperature data in the stratosphere.

