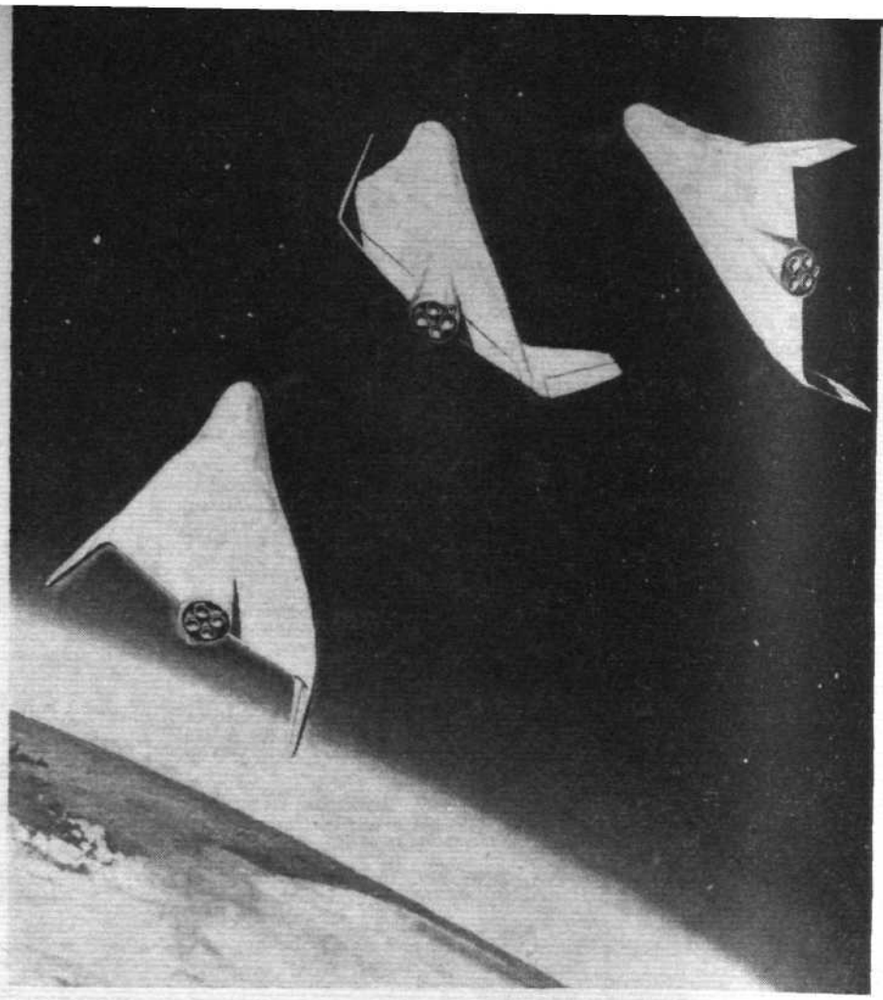
Spaceflight

SPACE TRANSPORTERS FOR EUROPE?



In the BAC space transporter project, the two booster units would separate from the main spacecraft after transferring fuel to it and prior to flying back to base under turbojet power

AN increase in Britain's annual national expenditure on space science and technology from £20 million to £35 million was urged by Viscount Caldecote, managing director (guided weapons) of British Aircraft Corporation, in a Royal Aeronautical Society lecture at Bristol on March 2. The occasion was the Barnwell Memorial Lecture organised by the Bristol Branch of the Society. An expanded national programme, Lord Caldecote suggested, would enable Britain to make a useful contribution to international programmes including communications satellites.

Entitled *Britain's Future in Space*, Lord Caldecote's lecture covered a number of the fundamental theoretical and practical factors of spaceflight, including a description of the UK-3 satellite which BAC is constructing; and also the proposed Black Arrow vehicle, recoverable launchers and the space transporter. These last three sections are here reproduced, together with Lord Caldecote's concluding remarks.

Black Arrow The UK-3 programme is an international one to which Great Britain is subscribing the satellite, the experiments and the check-out equipment. The Americans have undertaken the launching, subsequent tracking and data acquisition. Many of you in the audience tonight will feel that, but for years lost in indecision, we could have had a British launcher of the required capacity to meet the launch date for the UK-3. I refer of course to Black Arrow.

The first proposal for a launcher of about this size was put up as a design study in 1962, at which time the state of the art would have allowed a project of this capability to go straight ahead into development. It was not until two years later that the first decision was taken on a requirement for a launcher of this capability. Even now, although development work is proceeding, there has been no firm Government decision to go ahead with the manufacture of the launcher, and there is no possibility now of it being ready until 1968.

The Black Arrow as such was proposed in 1964 as a development of the highly successful Black Knight research rocket. When the then Minister of Aviation announced in September 1964 a proposal to develop this rocket as an all-British satellite launch vehicle there were good reasons to hope for an early decision to go ahead. Although I believe that limited funding has been made available to keep the development of the Black Arrow moving, a long-term decision to proceed is still awaited.

The Black Arrow would provide Great Britain with a satellite launch vehicle with the capability of putting a payload of 150lb to 220lb into circular orbit of about 350 miles altitude. This would have matched the UK-3 requirement admirably.

It is proposed as a three-stage launcher, the first and second stages being based on the Bristol Siddeley Gamma engine burning high-test hydrogen peroxide (HTP) and kerosene. The first stage would employ four swivelling pairs of combustion chambers and the second stage would use one pair of chambers mounted on gimbals for control. The spin-stabilised third stage would be propelled by a solid-propellant motor developed by the Rocket Propulsion Establishment.

Recoverable Launchers Certainly for some years to come, the now-conventional rocket launcher will remain the accepted means of putting bodies into orbit; certainly also the development of new fuels and new materials will lead to improved launchers of this type. Sooner or later, however, anyone engaging in large-scale space activities will have to develop some fundamentally more economic means of launching than using an expendable rocket. Although most of the weight of the launcher at take-off is the weight of the fuel, by far the most expensive part is the hardware, which includes guidance and control systems, all of which is thrown away each time a satellite is launched.

The Americans have given considerable thought to the retrieval of spent rockets by giving them aerodynamic characteristics so that they can be brought back to a recovery area through the Earth's atmosphere, surviving re-entry hazards by controlling their angle of re-entry and their subsequent