OLD WORLD

MARS

Arrival of Russians

by our Soviet Correspondent

THE safe arrival of the Soviet Mars-2 probe in an 18 h areocentric orbit on November 27, 1971, followed on December 2 by the soft landing of an instrument capsule from Mars-3, has led to self-congratulation in the Soviet press that the guidance and orientation problems which led to the failure of Mars-1 (launched November 1, 1962), and presumably Zond-2 (launched October 30, 1964), have been overcome.

Part of this success seems attributable to the use of on-board guidance systems—the orbital injection of Mars-2 was carried out without ground control, by means of an automatic device which aligned on the Sun and a star (probably Canopus). Another important factor (judging from the amount of press coverage it has obtained), the difficulty of keeping the solar batteries aligned with the Sun while simultaneously keeping the transmitting and receiving aerials pointing at Earth, has at last been resolved. (Academician A. A. Blagonravov, speaking at the Sixth Annual Meeting of the International Council of Scientific Unions' Committee on Space Research, explained that contact with Mars-1 had been lost when "a defect in the probe's orientation system resulted in a violation of the directionality of the probe's antenna to Earth".)

Less, however, has been made public about the intended experiments to be undertaken by the two probes. The TASS reports at the time of launching indicated merely that they were "to investigate the planet Mars and the neighbouring region of space and to investigate the characteristics of the solar plasma, cosmic rays and the radiation picture during the flight from Earth to Mars"

The results from the in-flight investigations are now being processed and compared with the data obtained from Cosmos satellites, Lunokhod-1 and Luna-19. Special attention has been paid to the study of the Earth's magnetic tail, and it seems (*Pravda*, December 4, 1971) that a special attempt has been made to repeat the experiments of Pioneer-7, Pioneer-8 and Mariner-4. The two Mars probes passed through the "tail region" at a distance of 20 million km (3,000 Earth radii), a distance at which Mariner-4 failed to locate traces of the geomagnetic tail. The Mars-3 readings, however, showed that for about 36 hours the distribution of charged particles with respect to velocity differed considerably from that characteristic of the solar wind—the "most probable explanation" being that at this time the probe was passing through a region of mixing of the solar wind and geomagnetic tail, and that, therefore, the tail is still observable at this distance.

Mars-3 is also carrying the French Stereo-1 experiment, designed by Drs Steinberg and Carubos of the Meudon Observatory to study the directivity of the radiation from solar bursts. This device, mounted in the solar battery unit to ensure constant solar orientation, continuously monitors the solar radiation in the metre waveband, but, by comparing each reading with the preceding one and eliminating those which show no change, it transmits data only when actually sensing a burst. By comparing these readings with those taken at Nancy and at the Moscow Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation, it is hoped to be able to map the "directivity diagram" of the bursts recorded.

The investigations to be carried out in areocentric orbit are, so far, less explicit. In a *Pravda* interview (December 3, 1971) Dr M. Ya. Marov hints, however, at a programme largely based on study of the "radiative capacity" of the planet, over a wide range, from the ultraviolet down to centimetre wavelengths. Thermal mapping of the planet is to be carried out, allowing the properties of the surface to be postulated. The chemical composition of the atmosphere is to be investigated by infrared and ultraviolet, special attention being paid to any indications of traces of nitrogen and water vapour. Important questions behind the Mars programme are: What gas predominates in the upper atmosphere of Mars? What ions are in its ionosphere? Why has Mars no magnetic screen and what are the differences in the interaction of Mars and Earth with the solar plasma? Dr Marov does not, however, indicate to what extent these questions will be answered by the two current probes.

The current Mars probes, with a mass of 4,650 kg, are more than five times heavier than the ill-fated Mars-1. One would expect, therefore, a considerable increase in the experimental capacity. Yet, in the case of Mars-2, which it now seems likely is intended for orbital survey (the hammer and sickle capsule deposited on the surface shortly after orbital injection apparently was meant merely as a symbolic gesture in case of the failure of Mars-3), with the experiments being very similar to those intended for Mars-1.

Clearly as much equipment for orbital work as possible has been placed aboard Mars-2, leaving any extras, such as Stereo-1 and of course the landing capsule, to be carried by Mars-3. Although the telemetry signals from Mars-2 and the remaining orbital section of Mars-3, as monitored by Jodrell Bank, are similar but for a greater signal strength from Mars-3 (it has not so far proved possible to monitor signals from the surface), the probes do not seem to back up each other but are complementary. This is perhaps regrettable, especially in view of the reported failure of the cameras aboard the landing capsule, but it may not only be due to a tendency of the Soviet space programme planners to avoid duplication; the question may, ultimately, be one of weight.

It has been stressed several times in the Soviet press that the new on-board computer and guidance system makes great use of micro-miniaturization, and the very emphasis on this fact, plus the apparently similar or diminished experimental capacity of Mars-2 in comparison to Mars-1, does suggest that a relatively large proportion of the weight increase of the current probe has been expended in bringing them into orbit, leaving too little available for the duplication of even the most important experiments.

PHARMACEUTICAL INDUSTRY

Beecham to Win?

IF the Glaxo shareholders agree to the recently announced bid of £290 million by Beecham for their company and if the matter is not referred to the Monopolies Commission, it seems likely that the new year will see the creation of a pharmaceutical concern which will dominate the British market and rank about tenth or eleventh in the world. But what are the factors that determine whether Glaxo is ripe for a takeover?

Certainly the announcement last month that Glaxo had suffered its first drop in profits for more than ten years is an indication that all is not well. But in the pharmaceutical industry, where the failure rate among new compounds is astonishingly high, success is often as much a matter of luck as of expenditure on research and development. And the sixteen year protection given by patents is nowadays effectively reduced to twelve years or so because of the extensive toxicological and clinical tests that are required before new drugs can be marketed.

Glaxo and Beecham are in many ways quite similar—their sales are £173 million and £182 million a year respectively and they each spend about £5 million a year on research and development. Most of the Beecham research is done at laboratories at Brockham Park, Surrey, where 25 per cent of the staff of 400 are graduates.

It was in these laboratories that the first semi-synthetic penicillins, which have formed the backbone of Beecham's ethical drug sales, were developed in