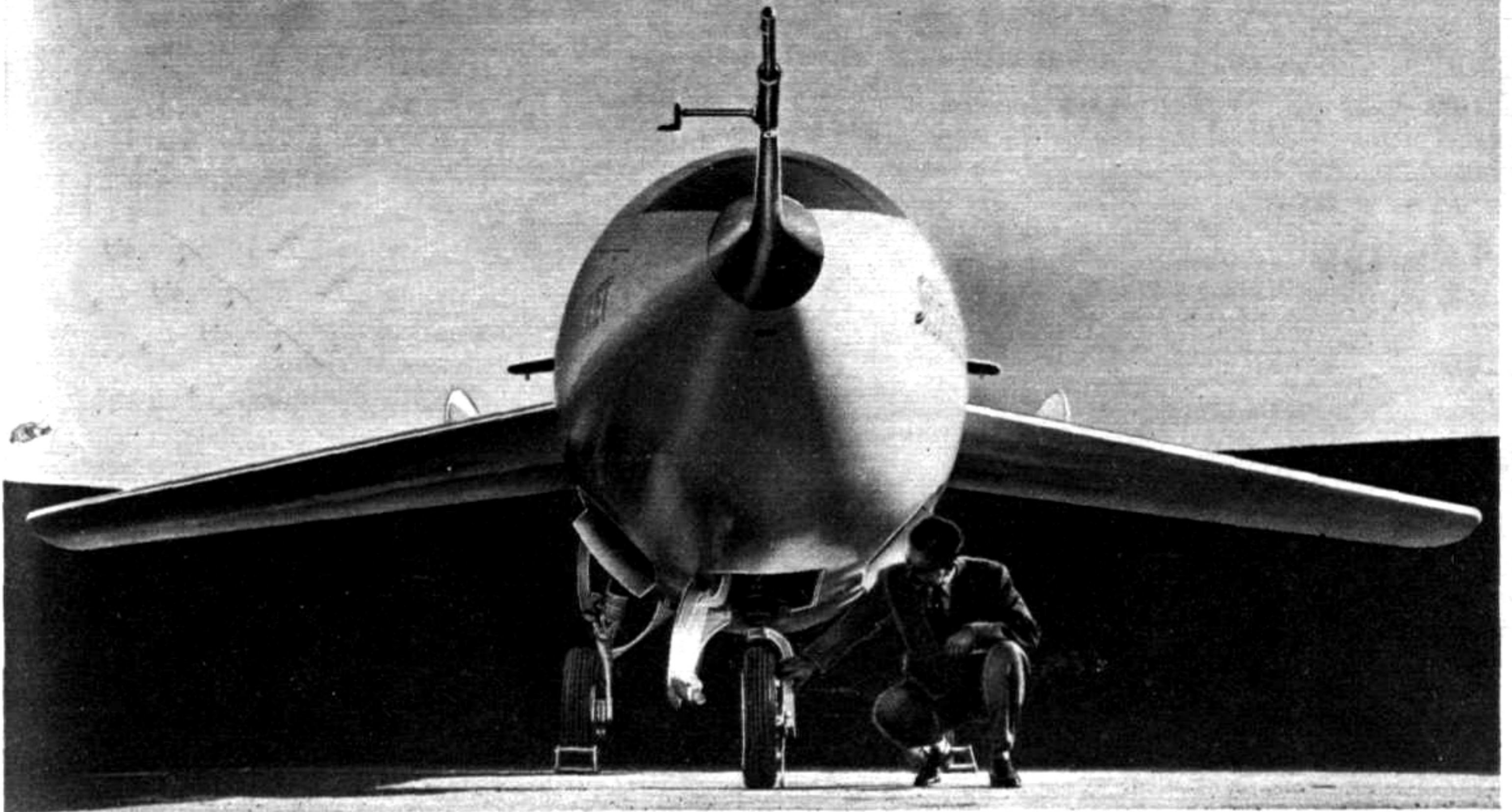


# SKYROCKET



## Turbo-Jet and Liquid-Rocket Power In Douglas Trans-Sonic Research Aircraft

**S**OON after the Douglas Aircraft Company started construction of the Skystreak, or D-558, high-speed research aircraft (now holder of the world's air speed record at 650.6 m.p.h.) the advantages to be derived in the trans-sonic speed range from swept-back wings began to be realised. The original contract was therefore extended to include the investigation of wings of this form and, since full realisation of the advantages of sweep-back could not be obtained using even the largest turbo-jet available in America, it was found necessary to build an aircraft having a supplementary rocket power plant. The new project was given the U.S. Navy designation D-558-2 and in the Douglas El Segundo factory, where it was developed in co-operation with the N.A.C.A. and U.S. Navy, it became known as the Skyrocket.

In a recent paper, Mr. E. H. Heinemann, chief engineer of the Douglas Aircraft Company, recalled that the need for a trans-sonic research aircraft was apparent as early as summer, 1945 and it was, in fact, on VJ-Day during a conference that studies of such a project were requested. The conference, incidentally, was continued at the El Segundo plant during the three-day VJ holiday.

### Conventional Co-ordinates

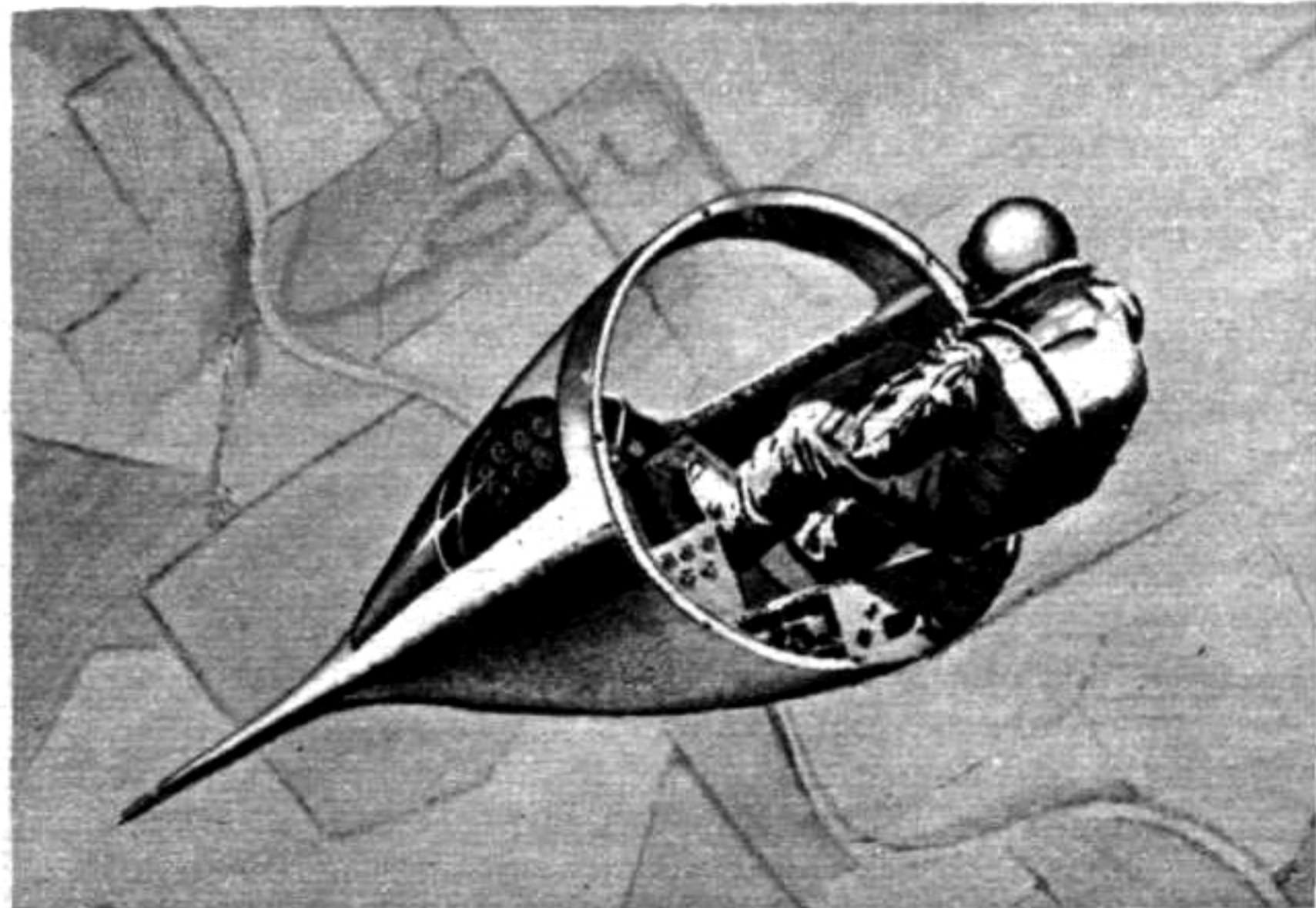
Though the wing and tail surfaces of the Skyrocket are swept-back, the aerofoil sections are of conventional subsonic type, i.e., they have rounded leading edges and contours and are not of the pointed subsonic type. This is because the Skyrocket has been built to determine the limits of this type of the subsonic aerofoil which, of course, permits retention of relatively normal low-speed characteristics.

A Westinghouse 24C (J-34) turbo-jet is provided for take-off, normal flying and landing, the rocket motors being intended solely for high-speed test flying. Mr.

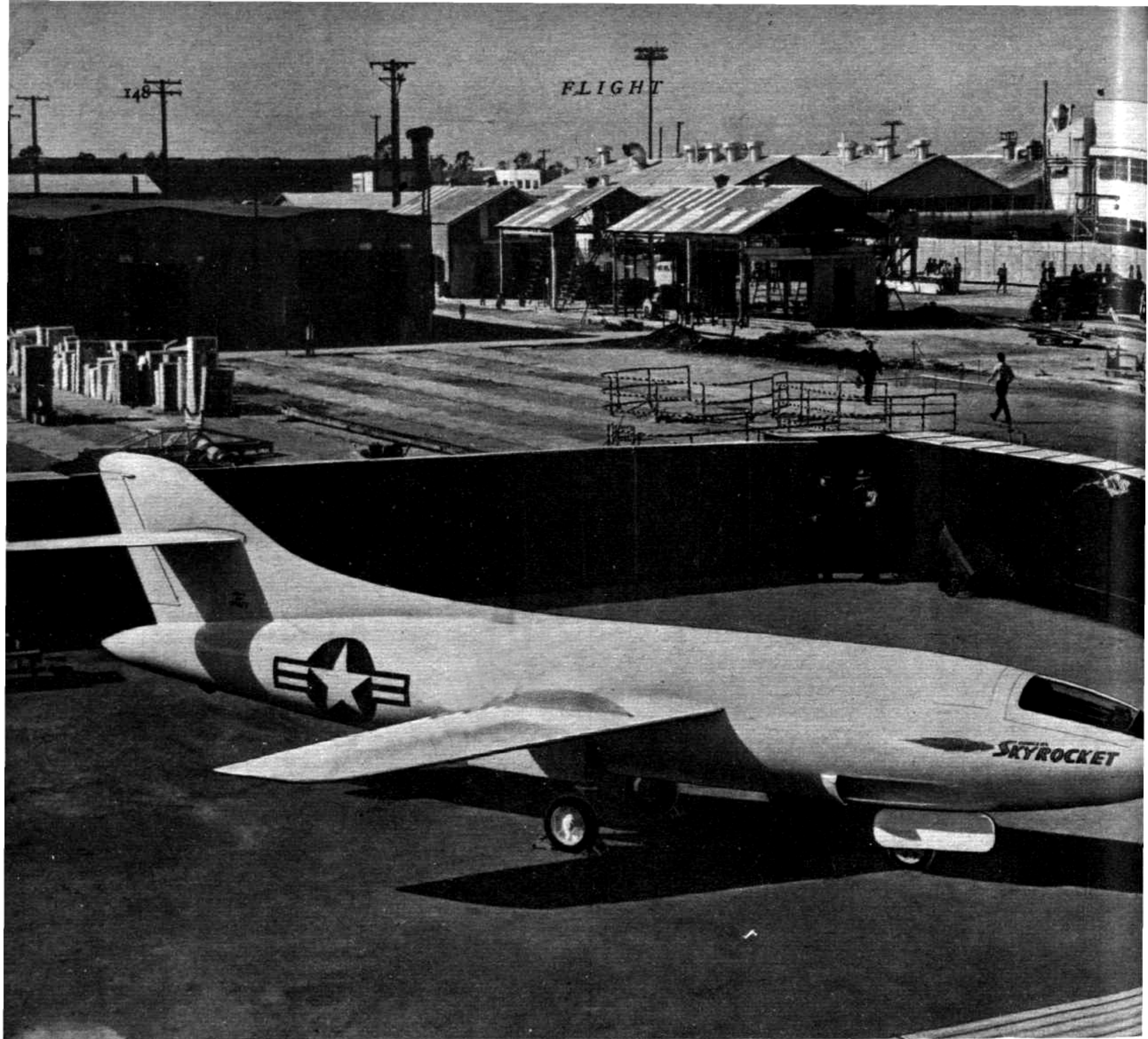
Heinemann states that considerable thought was given to the omission of the turbo-jet and to the use of a "mother ship" to carry the Skyrocket to a high launching altitude. It was, however, considered preferable, in order to develop low-speed flying qualities, to retain the turbo-jet, even though this meant a slightly lower maximum speed. The rocket motors have been built by Reaction Motors Inc.

Obviously, extreme care had to be taken in the arrangement of the power plants and fuel systems to distribute fuel uniformly about the c.g. Exhaust outlets were also arranged to react through the c.g. in order to exert a minimum effect on trim. There is tankage for

*Below, the artist has visualised the nose section of the Skyrocket's fuselage, which, having been jettisoned in an emergency, nears the earth, with the pilot ejecting himself for the final parachute descent.*







## SKYROCKET...

250 U.S. gallons of petrol (*not* kerosene) for the turbo-jet.

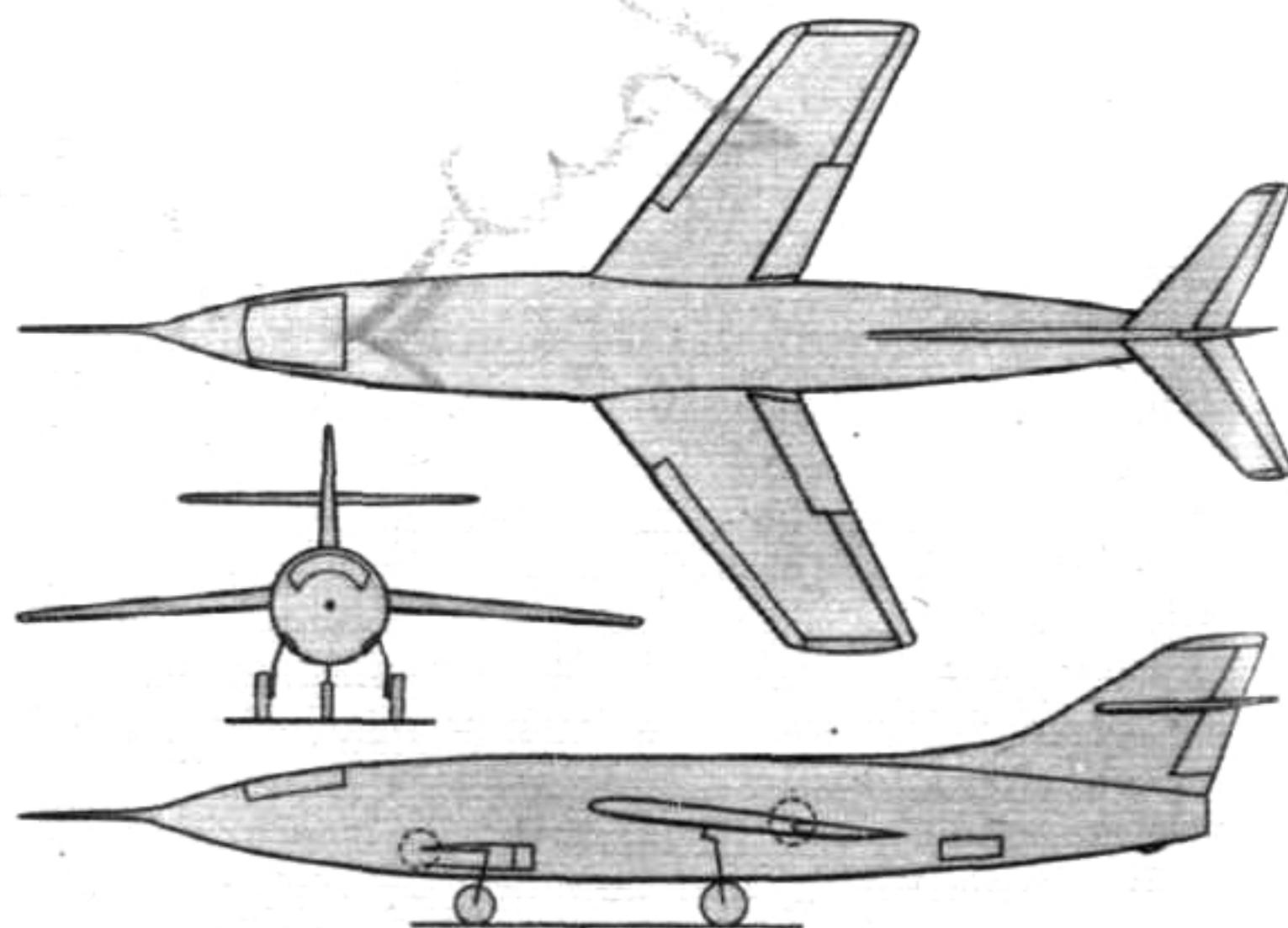
Structurally, the Skyrocket is quite similar to the Skystreak. Magnesium alloy has been used to good advantage for the greater portion of the fuselage skin, and the wing and tail surfaces are made largely of aluminium alloy. As an antidote to the poor low-speed lift characteristics of the swept-back wing, Handley Page automatic leading-edge slots are fitted.

The relatively large diameter of the fuselage—much greater than that of the Skystreak—results from the necessity of stowing fuel and undercarriage, the wing being of insufficient depth. Aerodynamic brakes are fitted on the rear section of the fuselage to give control of drag or speed. The complete nose of the fuselage, containing the pressurised, refrigerated and heated cockpit, is jettisonable as a means of high-speed exit. Details of the method of jettisoning and of the pilot's procedure are not available.

In addition to the normal flight instruments, there are three types of recording instruments. A photographic "flight recorder" will record on cinefilm the readings

### IN A WESTERN CORRAL

*With an armed guard for company, the Skyrocket is seen in its enclosure at the Douglas plant, screened from the eyes of passers-by. The three-view drawing below shows how astonishingly small the wing area appears in relation to the fuselage size, the machine having something of the appearance of a winged V-2.*



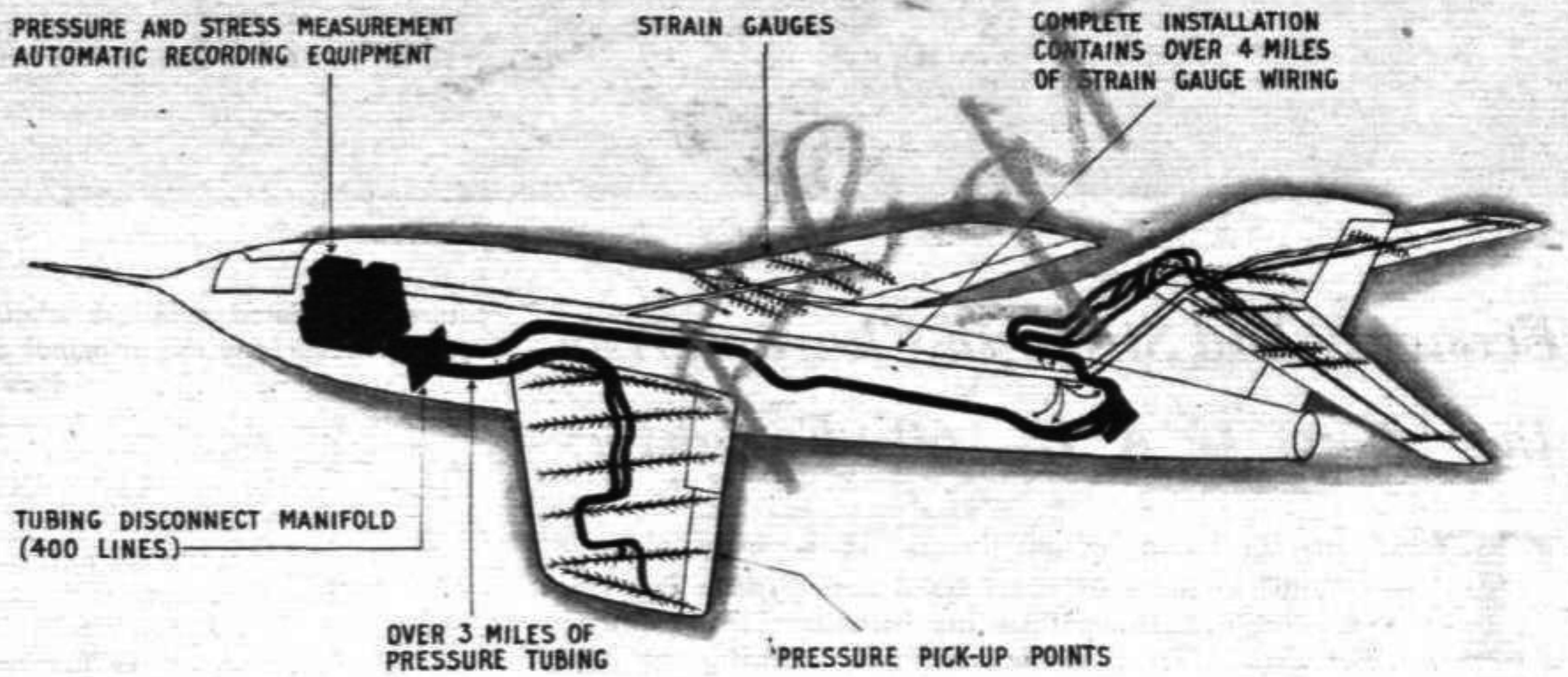


of a battery of flight instruments. This system will be used during the first flights when the functioning of the controls is studied. A pressure-measuring system consisting of an automatically recording manometer will measure air pressure at 400 points on the wing and tail surfaces, and control forces and structural stresses will be measured by 904 electric strain gauges, and automatically recorded by an oscillograph.

A typical test run during the research flights will be to take off, using the turbo-jet only, climb to about 25,000ft, start the rocket motors, make a high-speed run of about two minutes duration, and return to base (Muroc Dry Lake) with the turbo-jet. The whole operation will take only about half an hour, during which time 1½ tons of rocket fuel will be burnt.

Mr. Heinemann gives an interesting note concerning colour. The Skyrocket, like the Skystreak, was originally to have been painted red—the standard colour for identifying American experimental aircraft. At the request of the N.A.C.A., however, the colour was changed to white which is more readily visible. This may well, however, lead to confusion because of its similarity to the light shade of grey used on Army jet fighters.

At the time of writing, the Skyrocket has not flown, but tests of the Skystreak continue at Muroc, where further experiments with the Bell XS-1 are also in hand. Unlike the two Douglas machines, which are sponsored by the U.S. Navy, the Bell is an Army project. There is still no confirmation of the rumour suggesting that this type has exceeded the speed of sound.



The Skystreak instrumentation diagram above shows the stress-measuring strain gauges and pressure-measuring orifices. Below is a chart to show the speed and height range in which aerodynamic conditions are known, the range now being investigated by the Skystreak and other aircraft, and that to be investigated by the Skyrocket.

