DESIGNED FOR MACH 8

# North American X-15A-2

*by John W. R. Taylor*

EVEN IN AN age in which astronauts, male and female, hurtle around the earth in 90 minutes in tin cans, it is still rather shattering when an aircraft manufacturer announces calmly that his latest product is designed to fly at Mach 8 at an altitude of 100,000 ft. It is a tribute to the reputation of North American and their X-15 that nobody doubts the ability of the latest version of this research aircraft to attain such a speed.

Yet this "latest version", designated X-15A-2, is no immaculate new aeroplane, but a veteran of many earlier test flights and the scarred survivor of at least three serious fires, a broken back and a subsequent accident so serious that it was not worthwhile repairing the aircraft in its original form.

The exciting story of the early flight trials of the X-15 has been told in *Always another Dawn**, the autobiography of test pilot Scott Crossfield. After a series of captive and unpowered flights in the first of the three X-15As, he made the first powered flight in the No. 2 aircraft, on 17th September 1959. At that time it was fitted with two 8,000-lb. s.t. four-barrel Reaction Motors LR11-RM-5 rocket engines, as the 57,000-lb. s.t. XLR99-RM-2, around which it had been designed, was not ready for flight. Despite this, the aircraft reached a speed of Mach 2.1 (1,350 m.p.h.) in a shallow climb to 52,341 ft. after release from its NB-52A mother-plane.

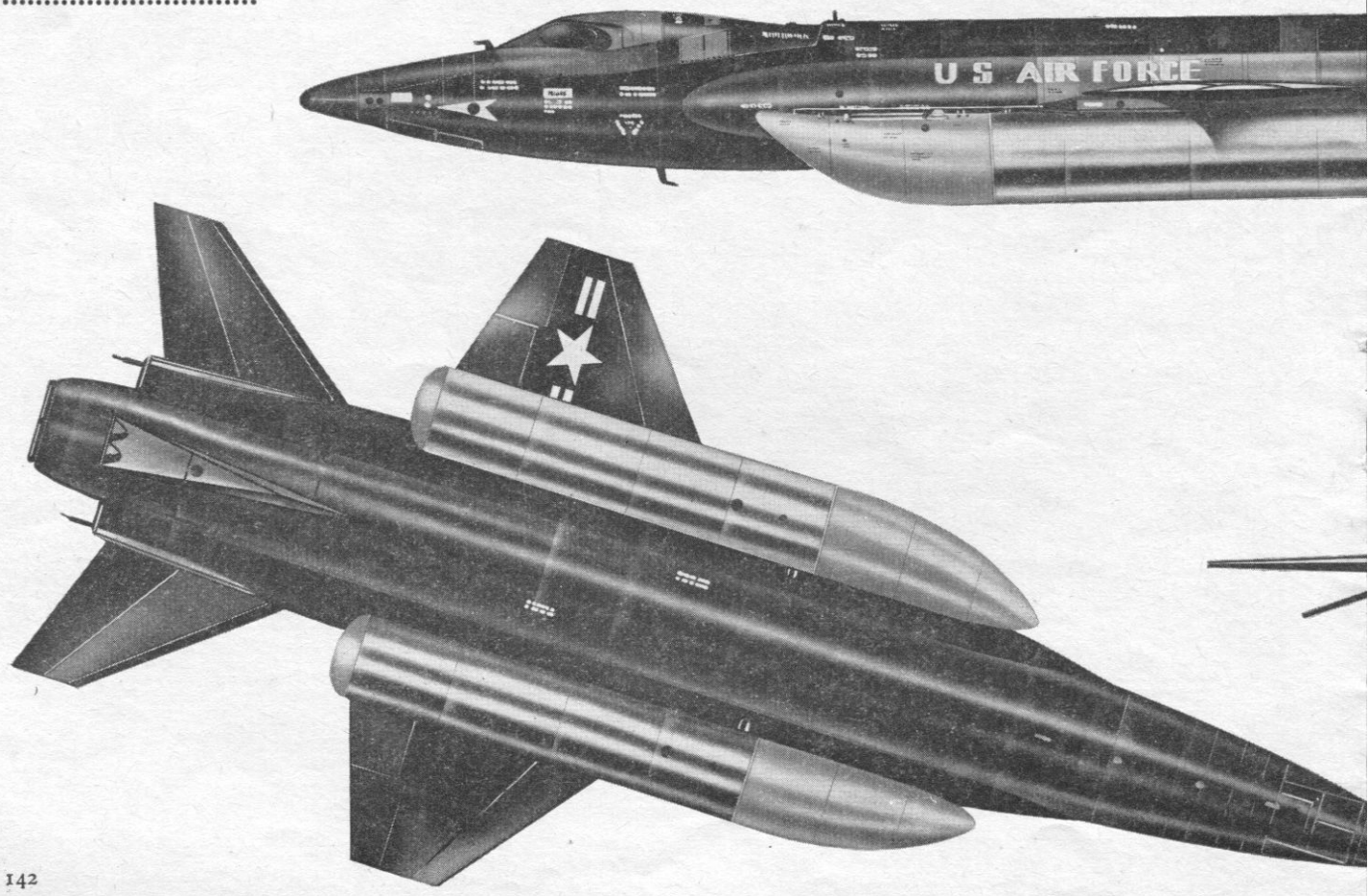
Nor was speed the X-15's only virtue. Crossfield wrote that "It was apparent almost instantly that we had built a beautiful aeroplane. Her nose held straight and firm without the yaw and pitch common to most high-performance planes. She eased through the speed of sound imperceptibly with little or none of the usual buffet-and-control disturbance. . . . I recalled the agony at Edwards many years before (1953) when we had worked for months, pushing, calculating, polishing, and who knows what else to achieve Mach 2 in the Skyrocket. Now with the X-15 we had reached this speed in three minutes on our first powered flight and I had to throttle back".

Of course, it was not all as easy as this. There was a little matter of "gliding like a brick" when the nine tons of propellants had been consumed, followed by a touchdown at 200 m.p.h. on the twin steel skids and nosewheel. And, during the third powered flight (on 5th November!) there were fireworks when the rocket-engines exploded and set fire to the engine bay soon after the aircraft had been released from the NB-52A. With great courage, Crossfield stayed with it, but even his skill could not prevent the aircraft from breaking its back just aft of the cockpit as it landed.

This was not the first disaster. The first flight had been delayed by several weeks

* Hodder & Stoughton, 25s.

***Drawing by John W. Wood***



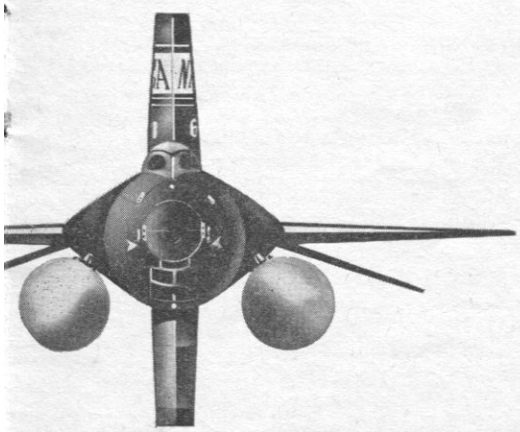
after a fuel fire had burned out the rear fuselage. A small fire had very nearly blown up both aircraft and pilot on the ground after the first flight. Now, after only two more tests, an even more extensive repair was necessary. While this was being done, the No. 1 aircraft made its first powered flight and was handed over to NASA.

Test flights with X-15 No. 2 were resumed in February 1960. Crossfield was not allowed to investigate maximum speed and altitude and had to be content with high-*g* loading, trying out the reaction-jet system for control in space, and dive pull-outs to prove the integrity of the structure, while other pilots hit the headlines with speeds of up to 2,196 m.p.h. and heights up to 136,500 ft. in No. 1.

He looked forward to the first tests of X-15 No. 3, which had been fitted with the "ultimate" XLR99 engine. On 8th June 1960, during the first ground run of this huge powerplant, the aircraft's entire load of propellants ignited in one shattering blast that flung the front part of the aircraft, with Crossfield inside, 20 ft. across the concrete at an acceleration of about 50*g*.

Five months later, on 15th November, he showed the real capabilities of the XLR99 by attaining Mach 3 in the re-


*The X-15A-2, a rebuild of the second X-15 (serial 56-6671), at North American's Los Angeles Division before being transferred to Edwards A.F.B.*

engined X-15 No. 2, with the engine held to its lowest power and the airbrakes extended. In March 1961, NASA test pilot Joe Walker took No. 2 up to 169,600 ft. to set a new unofficial height record. The unofficial speed record was shattered on almost every flight, reaching a staggering 3,603 m.p.h. by June 1961.

On 9th November 1962, X-15 No. 2 had what looked like being its final accident. With the other two machines going strongly, it seemed a waste of money to repair it yet again: but NASA and North American put forward a plan to rebuild it in a new form, for even more advanced research, and the result is the "new" X-15A-2. The design was finalised in January 1963, construction began on 13th May and the aircraft was delivered ahead of schedule on 24th February 1964.

The basic structure of titanium and stainless steel, with "armour skin" of Inconel X nickel alloy steel, remains unchanged; but even this could not withstand the temperatures of more than 2,400°F. likely to be encountered during future test flights. So the entire airframe is to be coated with Emerson Electric T-500 ablative material, like a missile nose-cone. Thickness of this material will vary from 0.7 in. at the wing and lower vertical leading-edges to 0.03 in. aft. It will burn away at about 530°F., keeping the temperature of the structure well below the 1,200°F. maximum for which it was designed.

A 29 in. extension of the centre fuselage provides accommodation for a liquid hydrogen fuel system for advanced ramjet engines which it is planned to attach under the rear fuselage, in place of the normal ventral fin. Other equipment bays will have advanced photographic and optical apparatus for "up-looking" and "down-looking" experiments at great heights.

All three units of the landing gear have been lengthened, the windscreen has been strengthened and the starboard wingtip is now removable to permit testing of new configurations and materials at hypersonic speeds.

More in evidence than any of these modifications is the introduction of two enormous external fuel tanks, each 22 ft. long and 37.75 in. in diameter. One contains an additional 1,041 U.S. gallons (6,006 lb.) of anhydrous ammonia, the other 757 U.S. gallons (7,494 lb.) of liquid oxygen, enabling the aircraft's XLR99 engine to run for more than 150 seconds in flight, instead of the usual 84 seconds. The fuel in these tanks will be used first, taking the X-15A-2 to a speed of 2,000 ft./sec. at 70,000 ft. The empty tanks will then be jettisoned and recovered by parachute, after which the internal fuel will be used to continue the aircraft's acceleration to the planned 8,000 ft./sec. (5,455 m.p.h.) in level flight at 100,000 ft.

Test flights are scheduled to start this summer and should be interesting to say the least!

---

## S.B.A.C.'s new name

THE SOCIETY OF British Aircraft Constructors has changed its name to the Society of British Aerospace Companies. This new title, while perpetuating the world-known initials S.B.A.C., is felt to be more truly representative in modern conditions of the scope of activity of the society's member companies. The society has 534 member companies in the U.K. and Commonwealth. U.K. membership comprises eighteen aircraft companies, three aero-engine manufacturers, four guided weapon companies and 389 equipment manufacturers; there are also ninety-eight materials members. There are eleven members in Canada, nine in Australia, one in India and one in Hong Kong.