Background to the New Comet 4A

A 92-seat, 530 m.p.h. Comet

ON page 138 we record the news of the Capital Airlines order for four Comet 4s and ten Comet 4As and comment is made in a leading article. Here we provide the background to this historic announcement, and give first details of the new medium-range jet transport.

IN a leader on May 11 we remarked how entertaining it would be to listen in at the keyhole of almost any medium-haul airline's boardroom door. We imagined the bewildered chairman trying to make the right choice from among the nine medium-range jet and turboprop airliners—American and European—now on the market, and we remarked upon the great opportunities for the British manufacturers. With the long-haul jet market conceded to the DC-8 and 707, it seemed opportune for them to burst down the door with their medium-range airliners and to sell as they had never sold before. We know now that D.H. were already kicking at the door harder than we thought.

The present story really began about six months ago when, on the U.S. West Coast, Convair and Douglas began to try out airline-reaction to two newly drafted medium-jet projects, respectively the Skylark (since named Golden Arrow) and the DC-9. Boeing had a project also.

What started as a light flirtation quickly developed into ardent courtship. The suitors found the airlines most susceptible to the argument that the public, having once tasted jet travel on long-haul routes in the sixties, would demand it on regional routes also. But the airlines found the courtship of the turboprop suitors equally hard to resist.

The choice, if one dare so over-simplify, lay between glamour on one hand and running costs on the other. In the U.S., four airlines had already succumbed to the charms of the turboprop Electra, and competing domestic operators began to wonder whether, by having jets, they might not be going one better. It would mean waiting two years longer: Electra delivery-date was 1958 compared with 1960 for the Golden Arrow and 1961 for the DC-9. But on June 20 the market broke; T.W.A. and Delta decided to buy 40 Golden Arrows between them, for delivery starting in 1960.

Then, earlier this week, Capital put the jet among the pigeons by ordering four Comet 4s and ten Comet 4As for 1958 and 1959 delivery. It was a satisfying moment for de Havilland.

Events in the U.S. had been followed closely at Hatfield. Even before Capital first showed an interest last April, the immense new opportunities for the Comet were clearly seen. Here was a jet airliner that, given the orders, could beat the field by about two years on delivery-date, and which, unlike its paperware competitors, had seven years' hard and continuous flying experience behind it. In Mk 4 form, it was almost ready-made for the medium-jet market.

Almost ready-made—but, for Capital, not quite. The 505 m.p.h. cruising speed of the Comet 4 was some way below the 575 m.p.h. of its projected American competitors, and furthermore it was designed to the hitherto accepted jet formula of cruising at 40,000ft to get the maximum number of miles out of every pound of fuel. The Comet 4, as ordered by B.O.A.C., is in fact a medium-sized long-hauler, capable of carrying 16,400 lb payloads over 3,000-mile stages. As such it has a wide application on all but a few of the world's major trunk routes for those operators who do not need aircraft of DC-8 or 707 size—size which is a function of the geographical fact that the North Atlantic is 3,000 miles across, and swept by strong west winds. But the Comet 4's requirement to fly high did not make it an ideal aeroplane—from the point of view of economy and block speed—for short and medium stages, by which are broadly meant routes of from 500 miles to 1,500 miles. It was this fact that inspired de Havilland to develop the Comet 4A to meet Capital's specifications.

The problem was to make the Comet 4 go faster lower down. Extra speed was sought that would offer block times within a few minutes of those offered by the later Golden Arrow and DC-9. How far could the Comet 4's 240 kt indicated airspeed limit, dictated by structural considerations, be raised? Cruising at higher indicated speeds at lower altitudes required re-examination of the wing, rear fuselage and tail stress-cases under the higher gust loads; wing bending-moments were accordingly reduced by a 7ft clipping of span (from 115ft to 108ft), coupled with structural stiffening of the rear fuselage and tail. The net result was that the aeroplane was made structurally adequate for 320 kt indicated—an increase of no less than 80 kt. The altitude at which the 320 kt curve intersects the curve of Mach 0.74 is 23,500ft, equivalent to a true airspeed in standard conditions of about 530 m.p.h., or 545 m.p.h. in I.S.A. plus 20 deg C. This is equivalent to a true Mach number of 0.75. As illustrated in Fig. 1, 23,500ft is obviously the height, therefore, for the fastest block time, which on a 1,200-mile stage including 15 min terminal time is of the order of 470 m.p.h.

Although 23,500ft is the height where the Comet 4A's Mach and indicated speed operating limits intersect, and the height for maximum block speed, the aeroplane can of course be operated like

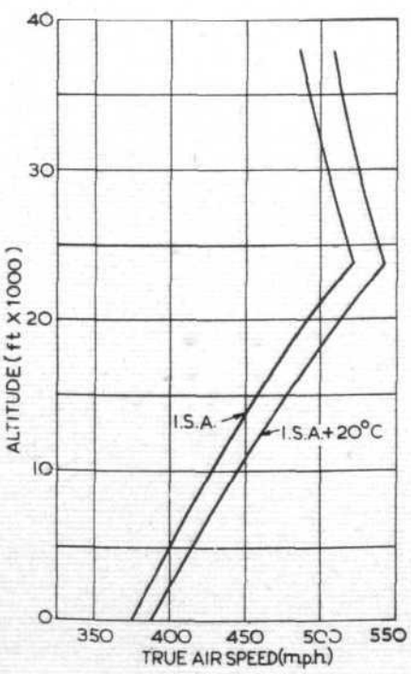

Fig 1. Normal operating limit true air speed versus altitude. The placarded speed limits for the Comet 4A are 320 kt indicated and Mach 0.74; the graph (left) is a plotting of the true air speed implied by these limits. It will be seen that the altitude for the highest block speed is 23,500ft.

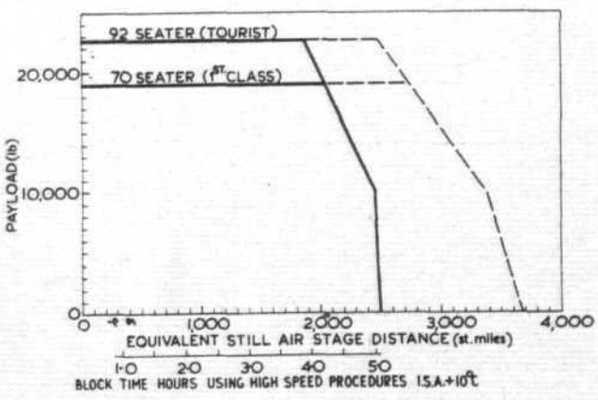

Fig. 2 (right). Payload versus stage-length, still air. The full lines apply to high-speed procedures, i.e., cruising at 320 kt at 23,500ft. The dotted lines apply to long-range procedures, cruising at M=0.74 and 1.2 times the speed for minimum drag. Block time includes 15 min terminal time. Full fuel reserves are included.