LOCKHEED v. DOUGLAS

A Brief Comparative Analysis of America's New Long-range Liners

WE suggested in our issue of November 5th last that the next generation of long-range airliners would be dominated by the Bristol Britannia and the various developments of the Douglas DC-7. The great British turboprop liner is developing very satisfactorily, and it is not proposed to refer to it again here; but a new entrant has joined the race for global traffic, in the form of a Super-Super Constellation, the Lockheed L-1649. We now propose to draw a comparison between this remarkable design and its similarly powered competitor, the DC-7C or Seven Seas.

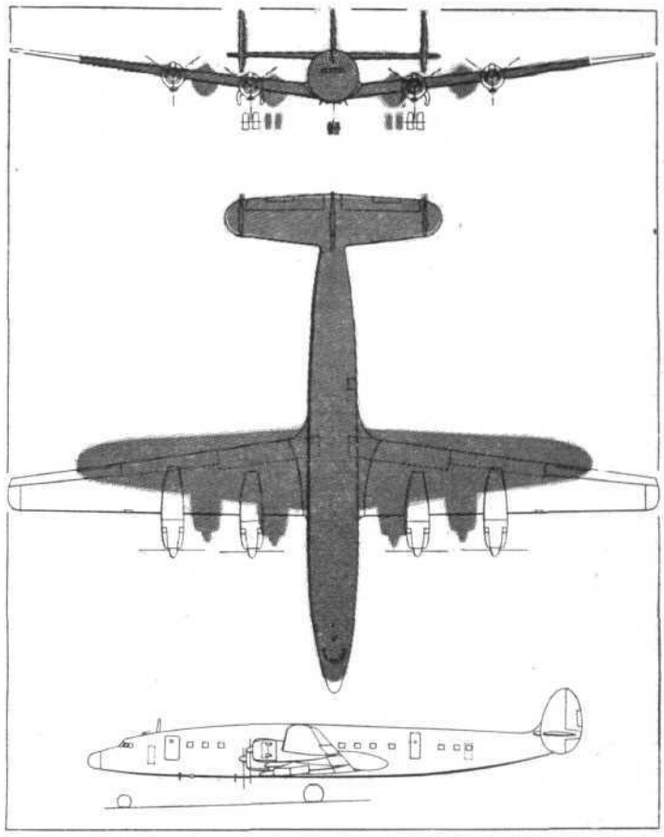
Incidentally, both types have been ordered in quantity, and so each can be considered as a definite type to be reckoned with. Again, both represent the policy of "stretching" of a basic design carried to what must be the ultimate degree. Both are powered by four Wright R-3350EA-2 Turbo-Compounds, giving 3,400 h.p. each up to 4,000ft and having a normal rated output of 2,800 b.h.p. to 4,300ft. Both L-1649 and DC-7C also have re-worked airframes, with a revised tail assembly of rather greater area, and —more important—a new wing of longer span. These new wings have higher aspect ratio, so induced drag figures are improved, and specific range likewise. The greater wing area is needed to counteract the increased take-off weight; and the latter results largely from the immense tankages which the two new transports can put into the extra space available inside the wing. Finally, most of the added span of both types has been inserted in the centre section, so that the inboard engines are further out and the interior noise level is better than before.

The new Lockheed, in particular, has a wholly new wing. The section is slimmer, the t/c ratio having been reduced from 18 to 15 per cent. The opportunity has also been taken to effect structural improvements, and integrally stiffened skin is now used from root to tip on both lower and upper surfaces (previously only the underside was so made). The chordwise spread of this integrally stiffened wing box is greater than before, so making space available for no less than 9,600 U.S. gallons. The tankage is entirely integral, all fuel lines being inside the tanks themselves. Other features of the 1649 are a new hydraulic system working at 3,000 lb/sq in, divided into two independent systems in parallel; a new and simplified twin-booster flying-control system; a wholly new flap system, with steel torque tubes driven by dual hydraulic motors and screwing the flaps out on steel tracks; complete re-arrangement of the interior (which is again "styled by Henry Dreyfuss") and heating of the lower freight holds to above 32 deg F at an outside air temperature of −20 deg F.

Lockheeds have now worked out the performance of the 1649A as accurately as they can at this stage, and they have compared it with the estimated figures for the DC-7C. Some of the results are given here, and we wish to stress that the figures are those assumed by Lockheed. The DC-7C performance does not, however, differ materially from that put out by Douglas, and so can be accepted as accurate. In any case, no aircraft manufacturer would deliberately falsify figures for a competitor's product; the airlines who are in the market for aircraft of this nature do their own calculations.

The outstanding characteristics of both the new transports are the following: extreme range, either with maximum or reduced payload; block speeds only slightly better than those achieved with current equipment; a range of cruising altitudes "in the weather"; competitive direct operating costs; and a relatively low maximum payload, either reckoned on space- or weight-limitation. These are, in fact, all the hall-marks of a highly stretched design. If Lockheed and Douglas had started from scratch, using turboprop power, there is no doubt that they could have overcome their present deficiency in cruising speed, cruising altitude and maximum payload.

Reference to the curves of payload/range and range/block speed indicate (say Lockheed) the following results. In standard (62-passenger) form, the DC-7C will carry a payload of 17,050 lb a distance (still-air, not an airline stage) of 4,010 statute miles. The 1649A will carry the same load a distance of 4,620 miles. The standard-configuration space payload of the DC-7C (17,550 lb) can be carried 3,580 miles at maximum cruising power. To increase the distance, it is necessary to adopt l-r cruise procedure



A three-view drawing of the Lockheed L-1649A with the shaded silhouette of the L-1049G Super Constellation in the plan view. Standard engine for both aircraft is the Wright Turbo-Compound.

BASIC COST ASSUMPTIONS ($1,000=£357)

	DC-7C	1649A
Basic price	$2,205,539	$2,295,000
C.F.E.	$40,000	$40,000
Galley	—	$15,000
Changes (based on experience)	$30,000	$30,000
Radar	$20,000	$20,000
Total	$2,295,539	$2,400,000
Cost per engine	$79,800	$79,800
Cost per airscrew	$13,700	$22,500
Cost of radio	$45,000	$45,000
Cost of airframe	$1,876,539	$1,945,800
	$1,976,339	$2,080,800
Weight empty	73,238 lb	85,752 lb
Engine weight	3,609 lb	3,609 lb
W.E., less engines	58,802 lb	71,316 lb
Gross weight	139,000 lb	156,000 lb

OPERATING WEIGHT DETERMINATION

	L-1649A 62 seats	L-1649A 87 seats	DC-7C 62 seats	DC-7C 87 seats
Basic empty weight	87,413	87,413	75,001	75,001
Interior correction	+1,058	0	0	−309
Empty weight	88,471	87,413	75,001	74,690
Operating equipment:				
Crew and baggage	1,786	1,786	1,786	1,786
Life rafts	529	661	529	661
Life vests	154	198	154	198
Emergency radio	33	33	33	33
Food, water, etc.	1,653	1,918	1,653	1,918
Consumable oil	1,741	1,741	1,741	1,741
Spares	88	88	88	88
Total equipment weight	6,041	6,495	6,041	6,495
Operating empty weight	94,569	93,908	81,042	81,185
Space payload	11,111	17,053	17,550	18,971*
Zero-fuel weight	105,680	110,961	98,592	100,156

* Limited by maximum landing weight.