THE ANGLO-AMERICAN CONFERENCE...

arranged to give full expansion at a pressure ratio of 2.3 and no significant difference had been noted.

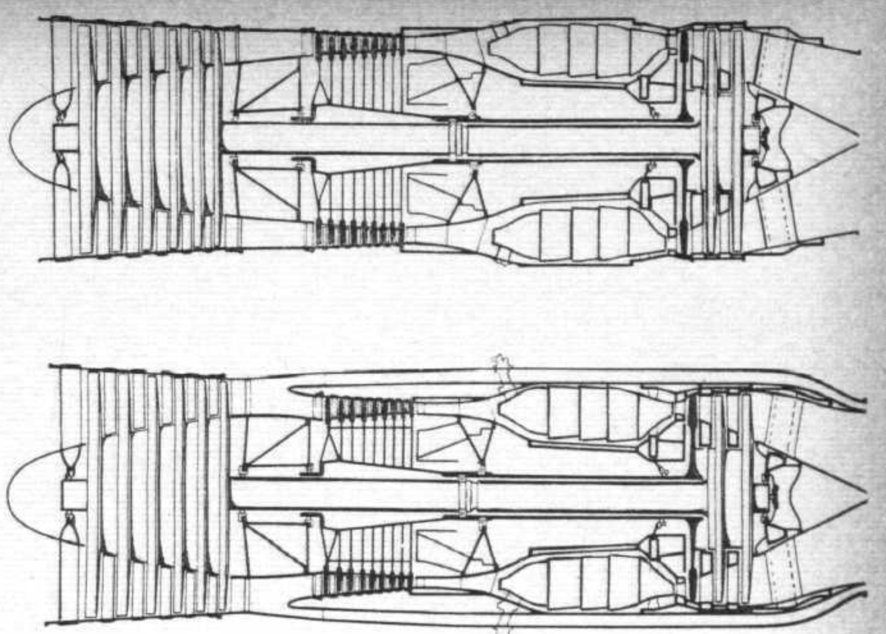
It was agreed that any large, long-range aircraft must be noisy—but a specially treated Conway could be made quieter than a piston engine. Rolls-Royce had not yet achieved reductions of 18 db but they had got perhaps 15. Aerodynamic noise was certainly very important.

Mr. E. S. Allwright (Vickers-Armstrongs): The turboprop seemed to make a good-neighbour's aircraft. Present jet noise was excessive and reduction was looked for even in engines 50 per cent more powerful.

His company had investigated the pressure-intensity close to the jet-pipe; on the Valiant—powered by "five-figure thrust" Avons—conical, finger, corrugated (6 to 60 corrugations) and convergent-divergent nozzles had been examined, taking readings chiefly about eight feet behind the nozzle and two feet (about one nozzle diameter) to one side. The results had agreed closely although the convergent-divergent nozzle showed definite advantages and gave the lowest measured intensity. A broader Valiant programme had shown reading of 150 db at 90ft and 135 db at 150ft behind and at 40 deg to the longitudinal axis.

A photograph was shown of a mobile silencer developed for the Valiant, manœuvred by a tractor which followed a white guiding line and brought the twin intakes of the silencer up to within about one foot of the bomber's nozzles (two units being needed for ground running of all four engines together). The silencer was a large mild-steel duct containing perforated steel splitters enclosing slag wool. The results had shown a reduction from 150 to 110 db and no adverse intake noise had been traced.

Mr. Greatrex, replying, pointed out that there was nothing about the turboprop which made it inherently quiet.



These two sectional elevations, illustrating the essential differences in the layout of turbojets of the plain (top) and by-pass types, were among the illustrations accompanying Mr. Lombard's paper.

DISCUSSION OF MR. LOMBARD'S PAPER

THE following discussion took place after Mr. A. A. Lombard (chief designer, aero engine division, Rolls-Royce) had read his paper entitled *Low-consumption Turbine Engines*, an abstract of which was published in our issue of June 24th.

Mr. L. Fischer (G.E.C.) spoke of the design of engines which had good supersonic performance and also performed well during the take-off and subsonic cruise regimes. In general, designers were going to higher pressure-ratios and temperatures. In supersonic flight the high velocity paid off in specific fuel consumption with increase in turbine-inlet temperature; less afterburning would therefore be used in future, the reheat section being operated nearly dry, with an almost 2:1 gain in s.f.c. In general, aircraft manufacturers wanted engine designers to err on the side of low s.f.c. rather than low weight, because something could be done about high weight.

Mr. N. R. Quinn (chief aerodynamicist, Bristol engine division) referred to a report by Illingworth (R.A.E.)—which, it was averred, few could fully comprehend—in which were discussed eleven factors governing s.f.c. and specific weight. The "fully-variable" third formula by Lombard, in which wing loading and take-off thrust were increased, was questioned. In the B.E.25 it was cruising thrust which was increased, resulting in higher and faster flight. At present, caution should be shown in increasing pressure ratio, on account of handling problems; he would not like values higher than about 12:1. Mr. Lombard had given the by-pass engine about five per cent better range than the simple jet, and also must "better" noise. Pearson's formula was cited to suggest that, in fact, what was meant was better range or better noise-level.

Mr. Lombard, replying, agreed with Mr. Fischer's observations, but pointed out that the original lecture was confined to non-afterburning engines. With increase in flight velocity, optimum temperatures went up, owing to rise in compressor delivery temperature; on the other hand, the case of 550 m.p.h. cruise in the stratosphere implied a low flame-temperature. Suggesting that the aircraft designer could tolerate weight rather than poor s.f.c. implied volume-limitation; this could be true of fighters, but the original paper had concerned itself with transports. If big metallurgical advances were likely to take place with time, then the design should be biased in favour of better s.f.c.

The formula questioned by Mr. Quinn was not intrinsically based upon take-off thrust; this parameter had merely come out in the mathematical reduction. Certainly pressure-ratios above 12:1 might today involve handling problems, but the factor to be noted was that increase of pressures and temperatures in the turboprop indicated "jam tomorrow."

Regarding the by-pass engine, if by virtue only of its lower jet velocity it achieved higher propulsive efficiency it would also be quieter; noise was a function roughly of the ninth power of jet velocity.

Mr. G. R. Edwards (managing director, Vickers-Armstrongs aircraft division) stressed the importance of Mr. Lombard's plot of turboprop efficiency with increasing pressure and temperature [reproduced in *Flight* of June 24th]; improvements in efficiency added up with the turboprop and they did not when the prop was taken off. He said this while fully aware that he was as much involved with turbojets as other speakers; and he commented on the fact that, although by-pass engines lent themselves readily to being podded, he had "toothpasted" four into a wing. Certainly jet transports would be built and they would fly faster than turboprop aircraft, but he believed that, for the great mass of the travelling public, the high-efficiency propeller-turbine was here to stay. He asked Mr. Lombard whether he believed in high pressure two-spool engines and referred to the early Rolls-Royce Clyde.

Mr. Lombard emphasized that he had described the pod as "God's gift to the by-pass engine" and not as a gift to the by-pass aircraft. There was no doubt in his opinion about high pressure-ratios, and he expressed regret at cancellation of a paper (which was to have been given by a G.E.C. engineer) on variable-stator engines. One could only match compressors when off-design by varying shaft speeds, and the only engine better than a two-spool might be a three-spool. With fixed stator blading there was but a small range of r.p.m. over which one could match the varions parameters. A large airscrew was needed to achieve high propulsive efficiency; this implied a high tip-speed but, as helical Mach number was of paramount importance to cabin noise level, cruising had to be done at low r.p.m. A wide range of operating speeds could be achieved only on a two-shaft engine. A low tip-velocity was also advantageous in that it brought the airscrew operation nearer to its point of peak efficiency.

A CRANFIELD OCCASION

LAST week we announced the appointment of the new Principal of the College of Aeronautics, Cranfield—Professor A. J. Murphy, M.Sc., F.I.M.—and it is now possible to publish a portrait. Prof. Murphy, who is Professor of Industrial Metallurgy at Birmingham University, takes up his appointment on October 1st.

The appointment was publicly announced at the College's eighth annual presentation of diplomas, held on July 1st. At this ceremony, the chairman of the Board of Governors, Sir Frederick Handley Page, welcomed the Minister of Supply (who was to present the diplomas) and said in his opening address that the work of the College had continued to expand during the past year. Mr. B. W. A. Dickson, Acting Principal, reported that 79 students had completed the two-year course, 68 of whom were to receive diplomas. During the year Prof. J. A. J. Bennett and Prof. G. A. Whitfield had begun duties as heads of the departments of Aerodynamics and Aircraft Electrical Engineering respectively. A new short course in flight-test techniques, Mr. Dickson announced, was to be held in September of this year, open to University graduates and undergraduates.

Professor A. J. Murphy.

In his speech following the award of diplomas and prizes, Mr. Reginald Maudling, M.P., Minister of Supply, said that the shortage of highly skilled men in aircraft development work was a most serious bottleneck at present. In the continued development of aeronautical science, he suggested, this country was ensuring future prosperity as well as building up her defences. A vote of thanks to the Minister was proposed by Sir Harold Roxbee Cox, who is vice-chairman of the College's Board of Governors.

The same evening, a most enjoyable presentation ball again showed that the undoubted abilities of Cranfield students are not confined to the science of aeronautics alone.

We hope to publish, in an early issue, the names of students who received diplomas and prizes. The theses which were the subject of the majority of the awards totalled over 60, and covered wide fields within the five main subjects of aerodynamics, design, aircraft economics and production, electrical engineering, and propulsion.