D.H. Gipsy Major I

Now 1,500-hour Overhaul Period

The maximum permissible running time of the de Havilland Gipsy Major I engine between complete overhauls has been extended by the Director of Engine Development from 1,260 hours (already claimed to be longer than any other engine) to 1,500 hours. This quite exceptional figure represents about double the overhaul period for the average aero engine, and that despite the fact that the Gipsy Major operates under conditions that aviation can impose on a power unit, the conditions of the elementary flying schools which involve endless repetitions of taking off, climbing on full power, gliding, taxying and cooling down, this embodying a great deal of handling by inexperienced pupils. Thousands of these engines are in service and almost all the scores of thousands of pilots of the British Empire and Commonwealth have learned to fly behind the Gipsy Major. Its faithful dependability has meant much to the building up of their confidence in the air.

The first Gipsy engine was designed in 1937 (the prototype establishing a world speed record for its class) and entered service having an overhaul period of 450 hours with an output of 100 horse-power. Later increases in these figures are shown in Table I.

As early as 1938 a Gipsy engine completed 600 flying hours under seal, without top overhaul, but in view of its steadily increasing power no extension was then made to its overhaul life. With the entry of the Gipsy Major into service, in 1932, however, it was decided to eliminate the top overhaul period of 150 hours and to run the full 450 hours with no attention to the engines other than routine checks. At first this caused aircraft operators some misgivings, but the step was soon proved to be justified and in 1933 world history was made by an increase of overhaul life to 750 hours. Since then the life between overhauls has in stages been increased by 100 per cent. Even the latest approval does not call for intermediate top overhauls, but in the Royal Air Force a schedule of inspections is laid down and if operating conditions have been such as to make one necessary it is undertaken.

After a complete overhaul an engine is restored literally to new condition, and is ready for a further full flying period. Many engines are now doing their third or fourth tours of duty, making a total time of up to 5,000 hours flying. The number of engines returned before they have completed their full period is small and it was mainly the very high average overhaul life shown by the 1933 figures (about 1,200 hours, excluding those which have crashed) which led to an investigation into the advisability of an increase to 1,500 hours flying time. Six engines in service at various Royal Air Force stations, picked at random from the records, were allowed to run on in service for a period of 1,500 hours under normal operating conditions. They were then sent to de Havillands and were stripped under inspection supervision.

The following is a typical case history:

The engine servicing time expired at 1,499 hours running time and the following major parts were found to require replacement, these being in addition to standard replacements such as joint gaskets, rubber connections, washers and split pins: 2 main bearings (due to modification, not wear); 2 connecting rods; 8 compression and 4 scraper rings; 8 valve guides; 8 rocker pads; 1 oil pump relief valve; 1 induction manifold elbow; 1 flame trap valve; 1 valve tappet. A number of control bushes, levers, etc., which do not receive positive lubrication, were also replaced.

As a further check of particular severity, one engine was completely re-assembled, using parts worn beyond maximum permissible limits, and submitted to 300 hours testing under type-test conditions which are so severe as to be equivalent to 1,000 hours of normal flying. No troubles were experienced and the engine completed its test in a most satisfactory way, the full throttle output being 111.5 h.p. at 2,100 r.p.m. and the oil consumption 3.2 pt./hr., as compared with 122 h.p. and 2pt./hr. for a new engine. Thus in the equivalent of 3,500 hours there is a drop of only 10.5 horse-power and an increase of 1.2 pt./hr. oil consumption compared with a new engine, both of which figures could be considerably improved by fitting a new set of piston rings.

The engine was then again stripped and examination showed that all parts had stood up to test extremely well, there being no sign of incipient failure anywhere. The de Havilland Engine Company, however, state that they wish to make it quite clear that this information is not intended to encourage or permit the building of engines to a lower standard than that laid down, and that this test was only undertaken to prove their belief that the established overhaul life, although in excess of any other engine, is in fact conservative.

Besides the Gipsy Major four-cylinder engine there are also in service a large number of de Havilland Gipsy Six engines (or Gipsy Queen) of the type originated in 1933. In those days a maximum power rating of 200 h.p. and an overhaul period of 500 hours was given to the Gipsy Six I, but as shown in the figures of Table II the life was progressively increased. The main difference between the Six I and Six II is that provision for a controllable-pitch airscrew is made on the latter and it is modified to use leaded fuel.

During the war the de Havilland production of six-cylinder engines has been concentrated on the Gipsy Queen variants for the Royal Air Force for installation in both communication and training aircraft. For this work reliability and ease maintenance are essential, and as a result of the very large number of engines completing their overhaul life the South African Government have agreed to an extension for the Queen III to 1,000 hours.

In order to meet the post-war needs of both civil and military aircraft design a new series of Gipsy Majors and Queens incorporating superchargers and reduction gear airscrew drives has been developed. Full particulars of these will be released in the very near future.