PERCIVAL P. 56

The two types of Percival P. 56 basic trainer: The external differences between the Cheetah-powered Mk 1 and the Leonides-powered Mk 2 (in foreground) lie chiefly in the cowling lines.

Design Analysis of the New Basic Trainer Adopted for the Royal Air Force

IN these days of mechanical and physical complexity, when virtually everything embraced in the aviation field is a badge of progress to mark man's technical advance, the production of a mere training aircraft would seem to be a matter of no great difficulty. To some extent, of course, this is so, but before an aircraft can be produced it is essential that some clear idea should exist as to the precise functions it will be called upon to fulfil. The flying training policy of the Royal Air Force has, naturally enough, been subjected to periodic modification during the past few years; and the Percival Prentice can be regarded as a transition between the light-aircraft category of the *ab initio* trainer as exemplified for so long by the Tiger Moth, and the higher-powered, heavier and more advanced type of basic trainer, such as the P. 56.

Percival Aircraft, Ltd., foresaw that an advance over the Prentice would naturally come into its own eventually, and they set about producing a design study for such a type. To this extent the company's prescience must be recognized, for when the Air Ministry issued the specification for a new basic trainer, it might almost have been framed with the design study in mind. Over 30 designs to the specification were submitted by various manufacturers, and from these, two companies—one of them Percivals—were selected to build prototypes to their individual designs. Thereafter, the prototypes competed with each other in an extensive series of comparative trials, as a result of which the P. 56 was chosen, and the decision taken to put the aircraft into quantity production as the standard basic trainer for the Royal Air Force.

It is apposite here to dilate briefly on the *raison d'être* of the new basic trainer as a type. Fundamentally, it is clearly a reflection of the advances which have been made in operational aircraft during the past decade, the gap between the traditional *ab initio* trainer and the operational types having grown steadily wider. Advanced training aircraft today have features and performance which, a few years ago, would have been found only in a first-line fighter and, therefore, the present-day *ab initio* trainer of necessity must move farther up the scale in order that transition from it to the advanced trainer does not present too much of a chasm for the leaping powers of the pupil pilot.

The comprehensively equipped basic trainer—of which the Percival Prentice may be regarded as the forerunner—can, with its radio aids, give the pupil many more useful flying hours in all weathers than could the time-honoured elementary types which, since 1947, it has replaced. As a result, the number of hours required on the advanced trainer types have been reduced. In this context, whereas the maximum number of useful hours on the original *ab initio* type was found to be about 60, leaving some 140 hours for the advanced trainer stage, the Prentice has changed this ratio to 100 hours in each stage. Extending the example, it is only to be expected that the new P. 56, with its additional power and consequent much-improved performance will, as the successor to the Prentice, take over an even greater share of the training syllabus. Advanced trainers—which are by no means cheap to operate—will then need to be used only for a relatively short conversion stage to accustom the pupil to high-performance aircraft and to the use of weapons.

Two versions of the P. 56 exist, the Mk 1, which is powered by a 420 h.p. Armstrong Siddeley Cheetah 18, and the Mk 2, with a 550 h.p. Alvis Leonides 25. Beyond these differences of power installation, the aircraft are structurally entirely similar, although, as is only to be expected in view of the increase of power available, the Mk 2 has considerably the better performance. It is possible that the first production batch of aircraft will be Cheetah-powered; but because the Mk 2 version will be the standard aircraft delivered to Flying Training Command, it is with this model of the P. 56 that we shall concern ourselves in this analysis.

The power installation is of interest on two main counts, (a) engine cowling, and (b) engine mounting. In order to conform with the classic Stoutian exhortation to "simplicate and add more lightness," the Leonides cowling is of ducted type, the outlet orifices at the port and starboard trailing flanks of the cowling being fixed, so that the pupil pilot is relieved from operating such complexities as variable outlet shutters, or gills, and, of course, the constructors need not provide them. If the tropical trials of the aircraft prove that the cylinder-head temperatures can be kept down to acceptable limits, it will say a great deal for the design quality both of the engine and the cowling system.

The engine mounting arrangement adopted is the result of a decision recently taken by the Service that a reversion to the practice of changing the bare engine should become the standard procedure in place of changing the power-plant as a whole, the latter practice having been found to be uneconomical. To this end, the engine is carried on a tubular-steel triangulated truss-mounting with four attachment points at the firewall, connection between engine and mounting being made through nine dynafocal-type pick-ups between the crankcase and the engine mounting ring. The top-centre and the side apices of the mounting triangulations are fashioned as truncated-cone/socket fittings, which are drawn up with through-bolts. The two bottom tubes of the