# Apprentice Training Pays Off

## WHEN APPLIED TO THE JET ENGINE INDUSTRY

***By J. W. TOMLINSON***

ALTHOUGH there are several worthwhile apprentice training schemes in Canada today, the Canadian jet engine industry, as compared to many other industries, seems to be least equipped for training its men of the future. This most important function of Canada's new industry must not be neglected. It should be considered the responsibility of the government and the industry to maintain adequate training facilities to meet all future requirements.

Very frequently these days, one reads of the vast number of engineers and technicians being trained in the U.S.S.R.; and even Britain, slowed down by her series of economic crises, sees fit to put aside $280,000,000 to meet this "world wide scientific revolution". The recently announced nation-wide conference to be held next September to discuss the supply and demand of professional engineers and technical personnel in Canada, seems to be a step in the right direction. The conference was announced by Crawford Gordon, Jr., president & general manager of A. V. Roe Canada Ltd., the sponsoring company.

**Technicians Too:** Although the emphasis seems to be on the shortage of engineers, it would be unsound business to ignore the need for increased numbers of technicians and craftsmen. It is useless to increase the number of engineers and then not have the trained technical personnel to support them.

No matter how carefully engineered is the design, or how efficient the production planning, the quality of any product is reflected in the skills of the people engaged throughout the industry. Even when the skills are of a minor nature, the standard of quality will be governed by the amount of training the individuals concerned have received. In the case of the aero engine industry, where quality is the essence of the product, the training of the design, development, and production personnel is of paramount importance.

Modern tooling has of course eliminated many of the pitfalls of manufacturing. This in itself tends to give the impression that aero engine manufacture is more or less an industry that can employ a large number of unskilled and semi-skilled people. Maybe a company can struggle through with this type of labor for a time if these employees are used judiciously, but for a high quality product, of a nature that will build up the reputation of the company and eventually make it a world leader, only a staff of apprentice trained personnel will do. To recruit individuals from other similar industries, in an "off the peg" manner is mostly a make-do proposition since this type of labor is usually accustomed to mass production methods used in the automotive industry or the rather unorthodox methods employed in the local repair garage.

### key man

THE APPRENTICE trained employee is the key man in times of national emergency. He is the kingpin who is surrounded by the unskilled in these times of necessity, watching over his charges and keeping them in line. Up to the present the aviation industry in Canada, particularly the jet engine branch, has been strongly supported by the influx of engineers and craftsmen from Britain, Europe, and the U.S. This has been a good thing for Canada while the inflow rate was high, but to expect this source of supply to meet Canada's future requirements would be industrial suicide. To keep the industry healthy, nothing short of a fully comprehensive range of apprentice training schemes must be established in Canada.

Proof of the pudding is to be found at Rolls-Royce Limited. Through the years Rolls-Royce has been a leader in aero engine design and manufacture. Since World War I this firm has been pulling winners out of the hat. Rolls-Royce claims no secret formula. "Just plain hard work and sound thinking," the company says, but we may add to this — plus an all important system of training, a system evolved over half a century of success. Way down deep in the heart of this vast organization, there lies the seed from which will grow the engines of the future, for the guided missiles, the space ships and other vehicles for interplanetary communication. The ground in which this seed is sown is this elaborate training system, from which flows a never-ending stream of engineers, scientists, chemists, technicians and craftsmen trained for every branch of the industry.

As an ex Rolls-Royce apprentice, the writer can vouch for the efficient way in which these training schemes are carried out and for those who are not so familiar with this topic, an outline of the six Rolls-Royce training schemes is given in the following paragraphs.

**Trade Apprenticeship:** This is the least academic course and it is designed to produce skilled craftsmen for all the different trades in the industry. The scheme is for boys who leave school at the age of fifteen.

The first year is a probationary period spent in the apprentice training school where the basic principles of workshop practice are taught. The boys are granted from one to two days off with pay each week to attend the local technical college, and they are also expected to attend evening classes. The next year is spent in the plant where specialized training is given. This is followed by four years in the plant where a planned training program is followed to ensure that the apprentice learns every branch of his trade.

**Technical Apprenticeship:** A step up the ladder is the scheme for training boys to be draughtsmen, technical assistants, technical writers, planners, service representatives, estimators, and similar technical occupations.

Applications are considered from boys between the ages of 16 and 17. Normally the period of training is five years, consisting of one year in the apprentice training school, two years general engineering practice in the plant, followed by two years specialized training in the department where the apprentice will ultimately be employed. As with the trade apprentice, time is allowed off with full pay for studying, which in this case is for the Higher National Certificate. If they obtain this certificate, they may, after a qualifying period, become members of the appropriate professional institution, the Institute of Production Engineers.

**Engineering Apprentices:** The engineering apprenticeship scheme is for boys between the ages of 16 and 18 who are to become professional engineers. The period of training is five years, and the entry standard of education, based on a comparative Canadian level, would be about grade 13. The first year is spent in the apprentice training school where, as with the other schemes, the basic principles of workshop practice are taught. The next three years are planned for the apprentice to work several months in each of the many departments that make up a modern plant. The last year is for specialization, where the apprentice works in the department to which he is best suited through aptitude and other considerations.

The engineering apprentice is expected to study for and obtain a BSc degree (London External) during his apprenticeship. To help him in this he is allowed two days a week off with full pay to attend the local technical college. He is also expected to attend evening classes.

**Laboratory Apprentices:** The scheme is for selected boys between the ages of 16 and 18 and of the same educational standard as those of the engineering scheme. For the first year the same basic training is given. A similar two years training in the shops follows, with a bias towards laboratory work. Finally, two years are spent in the research laboratories, specializing in the particular branch of engineering science that the apprentice will ultimately follow — electronics, chemistry, X-ray, spectroscopy, etc.

**University and Graduate Apprenticeship:** This is a flexible scheme, designed to provide practical training for univer-

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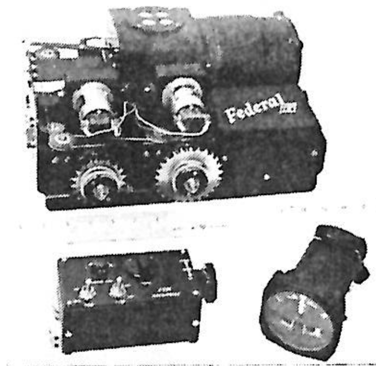
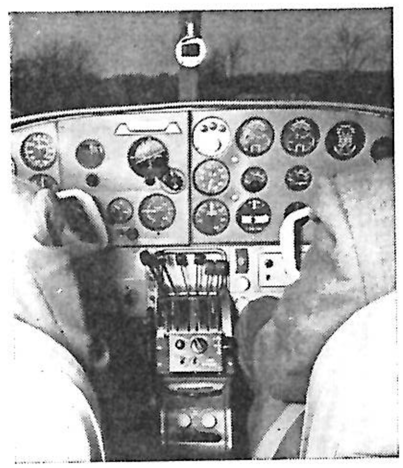



# Federal's New Autopilot



A new light-weight autopilot, designed for use in light or medium-weight private and business aircraft, has been introduced to the Canadian market through Standard Telephones & Cables Mfg. Co., Montreal. The new unit — a product of Federal Telephone & Radio Co. — weighs less than 25 pounds installed and is available in two models, costing $1,995 and $2,325 respectively, in the United States.

The autopilot, which does not employ electronic tubes, is said to reduce the problem of in-flight performance failure substantially. Its tubeless operation eliminates warm-up time and optimum performance is immediately available at the flick of a switch.

In introducing the unit, Standard Telephones & Cables pointed out that previously available equipment has become increasingly complex, featuring increased use of tubes and associated electronic circuitry, and has become prohibitively expensive.

The answer to this problem was found to be in a reversal of conventional electronic design trends. The result is an autopilot that offers major technical advantages as well as low cost. The new autopilot is expected to be especially valuable to week-end or semi-skilled pilots.

The equipment has been designated the "FTR Autopilot System" and is available in two models — F-200 and F-300. The F-200 model weighs 17 pounds uninstalled, and is a 2-axis unit for single-engine aircraft which have co-ordinated ailerons and rudder. The F-300 model weighs 19 pounds, uninstalled, and is a 3-axis model for twin-engine aircraft or for single-engine aircraft with uncoordinated ailerons and rudder.

The Autopilot consists of a gyro assembly, a control unit, and a turn-bank indicator. This system permits the aircraft to be kept in straight and level flight or to make climbs, glides or turns, with positive control at all times. The system is also capable of being adapted to accept control signals from a radio coupler, controlling both radio range and ILS systems, and operates on either a 12 or 24 volt input.

The gyro-servo assembly is ordinarily installed in the fuselage aft of the baggage compartment and is connected to the control unit which is mounted on the control pedestal or on the instrument panel in much the same manner as radio control units. The control unit consists of a manual "turn" control, a manual "pitch" control, and two on-off "roll" and "pitch" switches. The turn-bank indicator fits conventionally on the instrument panel where it is used as the autopilot sensing unit and as a standard visual flight instrument.

The maximum command control is 30° right or left with a pitch control of 10° up or down. The specifications call for a yaw correction average of 5° per minute.

Timmins Aviation Ltd., Montreal, has recently been appointed as distributor for the unit.

Photo at upper L shows complete Federal Autopilot system with gyro-servo assembly at top, control panel at lower left, and turn & bank indicator at lower right. Photo at upper R shows installation of gyro-servo unit in fuselage. Lower photo shows control panel installed on aircraft control pedestal.

the students are expected to return to of the earth, the work of IAM will continue as long as man with his irreplaceable brain is required to go along.

## APPRENTICE TRAINING

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sity students. One year basic training can be taken before entering the university. During the summer vacation the students are expected to return to the plant for further practical training, for which they receive pay. After graduation, they receive a further year's specialized training in aero dynamics, vibration, research laboratory, or whatever applied science they are following.

**Commercial Apprenticeship:** The commercial apprentice is selected from boys up to the age of 17. The period of training is five years and the educational standard on acceptance is similar to that of the engineering apprentice. Although this is a commercial training, the first year is spent in the training school learning the fundamentals of workshop practice. The remaining four years consist of a carefully planned course through the company's commercial departments—costing, production control, accounts, stock control, buying, etc., finishing with a specialization period in the chosen department.

**Conclusion:** This brief outline of the Rolls-Royce apprenticeship schemes will give some idea of the complexity of the training required to produce engineers, technicians and craftsmen of a rating that will be needed to meet the future with confidence. There is no time to be lost in getting down to this problem. In the interests of the country and the industry, there will be many who will hope that the results of the September conference will be the beginning of a new era in Canadian engineering training.

## MOONEY 20

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brought the airspeed back to 65 mph over the hedge, and after a short float the Mark 20 touched down, nose high, in the first 100 feet of runway. Ground run without flaps is noticeably longer.

**Wind on the Side:** At Frank Ogden's suggestion we obtained permission from the Tower to do a crosswind take-off, circuit and landing using runway 24. The wind as we lined up was from the left at 60 degrees, blowing at 25 mph.

During the initial part of the take-off run, the steerable nose wheel comfortably copes with the slight tendency to weathercock into the wind. As the nose wheel leaves the runway, the airspeed is sufficiently high for a small angular displacement of rudder to hold any swing tendency.

Turning onto the approach to runway 24 with full flap, we "crabbed" down to the runway threshold, kicking off drift just before the main wheels touched. By coincidence this was the smoothest of the three landings that we had done.

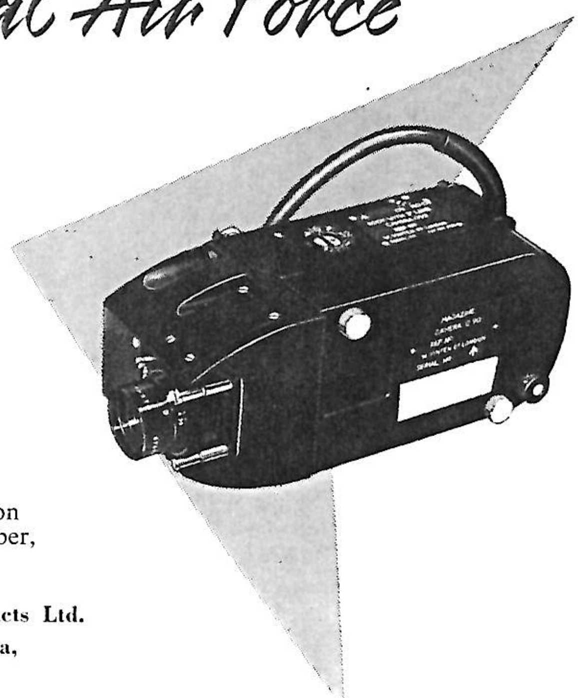
In a cross wind the Mark 20 is as straightforward to take-off and land as in a headwind.

After a pleasant hour of evening flying, we returned the Mooney Mark 20 to roost in the hangar.

**Pleasant Impression:** Overall impressions of this aircraft are pleasant. At a modest price Mooney Aircraft Inc. (Canadian price, delivered, $13,-950) have furnished a compact, four-place aircraft that will travel 900 miles


*Chosen by the Royal Air Force*

Vinten



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