THE GEORGETOWN GYROPLANE

Avian's 2/180 Progresses

FOLLOWING the crash at Avro last February, a group of aeronautical engineers who had been working together on a little-known Avro rotating wing project, decided to start something on their own. Their new and completely independent venture into aircraft design and fabrication resembled the Avro project only insofar as it was a rotating wing aircraft. This Avro project had been initiated three years ago by Peter R. Payne and, because of its commercial promise, was Avro-financed for 18 months prior to Black Friday.

Peter Payne, along with nearly all the key figures of this engineering team, elected to remain in Canada and to continue this project as a privately financed venture. There are five engineers, and a similar number working as part-time consultants, forming the nucleus of Avian Industries Ltd. Payne is president of the company.

Permanent Quarters: A few months ago the young company moved into a small but modern cement-block constructed plant on the outskirts of Georgetown, Ont. The company has some 20 employees drawing full-time pay. At the present time, most of these are engaged in the busy production and assembly shop which takes up the entire back half of the building. Focus of attention here is the maroon-painted cigar-shaped fuselage of the first prototype Avian 2/180. (2 for passengers, 180 for engine horsepower.)

At time of writing, the 2/180 prototype was without the one-piece bubble-type canopy which is being fabricated by English Plastics Ltd., of Brampton. Even without the canopy however, the smoothly contoured lines of the small craft are pleasing to the eye.

Design Philosophy: This unique aircraft is the result of a design philosophy that should be spelled out in some detail to make possible better understanding of what Avian has tried to achieve in the 2/180.

The designers explain that though the autogyro (to which family the 2/180 belongs) was comparatively well developed before World War II, it was supplanted by the helicopter because of the latter's ability to hover. Says Avian:

"It seems to be a general rule that performance is the first criterion in evaluating a new concept and that only later are the equally important aspects of safety, operational costs and environmental suitability considered. The helicopter was no exception to this rule and it is only in the last few years that we have been asking ourselves whether hovering capability is sufficiently valuable to merit the very great premium paid for it in first and operating costs.

"For civilian operation it seems clear that hovering capability is not worth the money paid for it, since few civilian helicopters utilize it under normal conditions. What is required apparently is the ability to take off and land without a run over the ground.

"In the important area of Army aviation, aircraft, such as the Cessna L-19 Bird Dog, perform a valuable function which has not yet been taken over by helicopters. If an aircraft can be produced with the operational performance features of an L-19, but with the ability to land and take off vertically and if its initial and maintenance costs were comparable, then it would obviously constitute a major improvement in that no airstrip preparation

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would be required for its operation.

"Starting from these premises, the Avian 2/180 was evolved . . ."

The Details

THE BASIC fuselage structure of the Avian 2/180 is comprised of a vertical steel tube as the rotor pylon, and a horizontal steel tube for the forward fuselage. Everything, (seats, controls, the fiberglass fuselage shell itself) it attached to this hollow steel beam. The tapered spring steel rods which are the undercarriage legs are fastened in fuselage sockets by a single bolt.

This type of undercart is strongly suggestive of the spring-steel undercarriage used on the Cessna lightplane line. The designers of the Avian 2/180 point out that a crash landing will often result in nothing more serious than bent undercarriage legs which can be easily replaced. The nosewheel is castored and ground handling is achieved with the use of Goodyear differential brakes.

Conventional aircraft type stick and rudder pedal controls are used and control is exercised by the same movements which are familiar to all fixed wing pilots.

Plus One: Although the first prototype is fitted with two seats only, the second and subsequent models will be fitted with a bench-type backseat to carry not one but two passengers. Commenting on this change, Avian President Payne said:

"When we realized just how wide a 37-inch cockpit width can be, we decided that we had room for two passengers." Then he added thoughtfully: "Perhaps we should change the name now to '3/180' ".

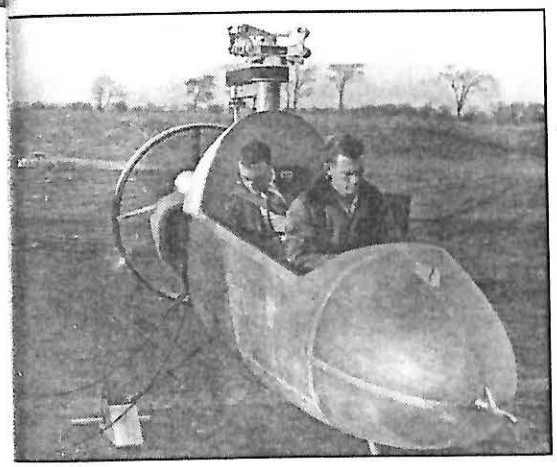
Immediately aft of the rear seat is the baggage compartment (90 lbs. capacity), and the 26 Imp. gallon fuel cell.

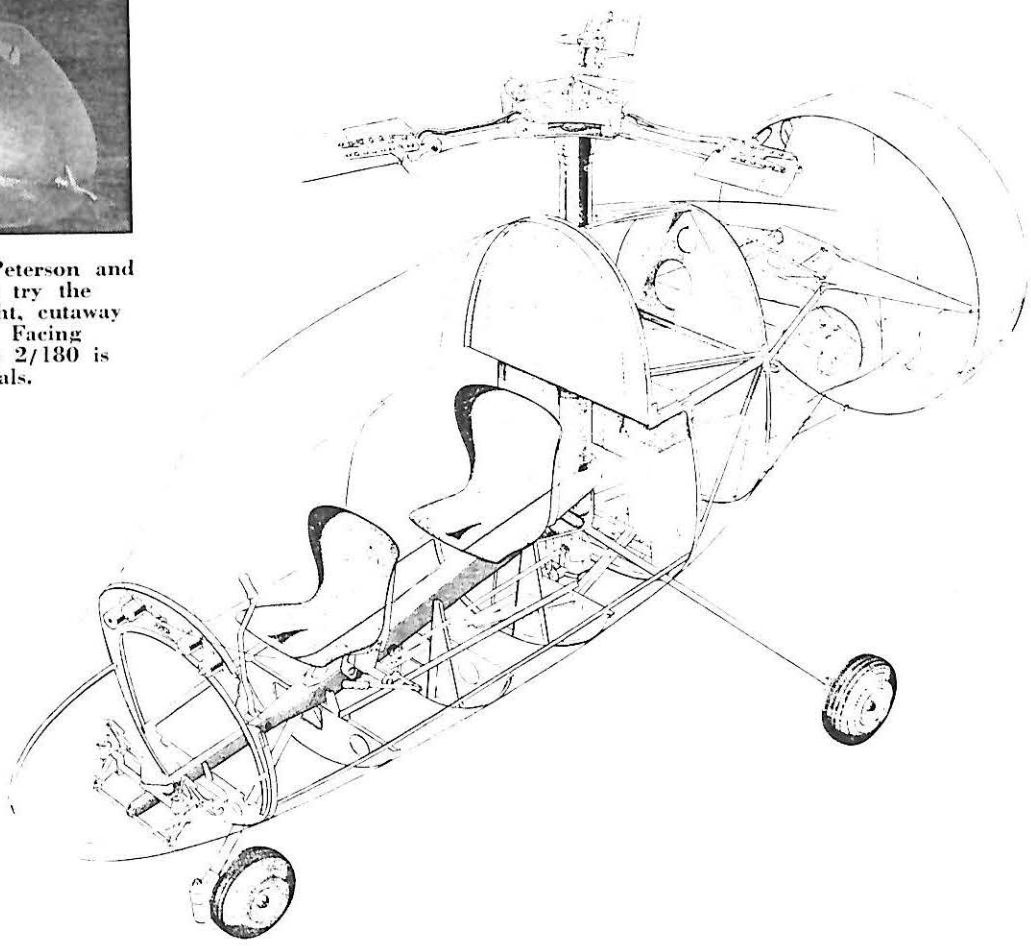
Propulsion is by means of ducted fan instead of the more conventional type of propeller. The ducted fan comprises a short (a bare 4 ft. diameter) wooden fixed pitch propeller enclosed by a fibreglass shroud. This unusual fan has flat paddle blades and is reminiscent of the test clubs used in engine test houses.

Ducted Fan Advantages: The adoption of the ducted fan for propulsion is responsible in large part for making it possible to keep the 2/180 down to such compact dimensions. Avian explains that since the duct allows the propeller (fan) diameter to be reduced and since the overall height of the aircraft is defined by adequate ground and rotor clearance, this much reduced propeller diameter enables the rotor to be placed nearer the ground.

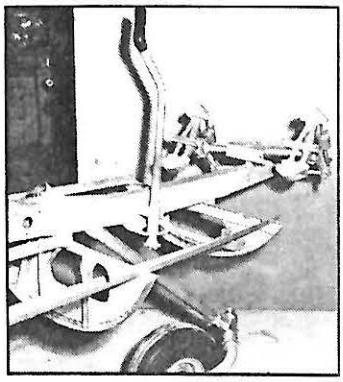
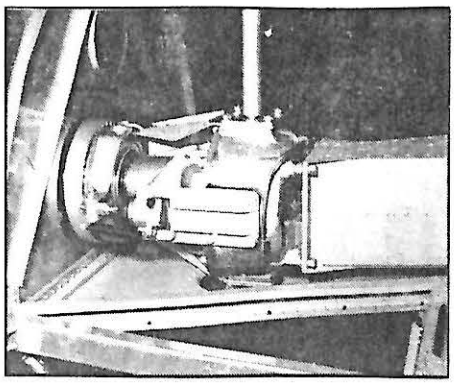
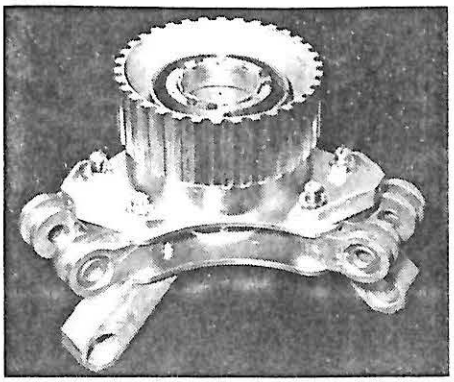
The fan duct also performs the functions of a fin and tailplane and enables the rudder or yaw vane to be mounted immediately behind the propeller where it is most effective.

When used in connection with a ducted fan, a fixed pitch propeller does not entail a performance sacrifice, as is usually the case in a conventional propeller installation. Thus the extra cost of a variable pitch propeller is avoided without any loss of performance. Other advantages of the ducted fan in this case are that propeller noise is reduced





Above, Test Pilot Ron Peterson and Avian Pres. Peter Payne try the 2/180 on for size. Right, cutaway showing general layout. Facing page, the still canopyless 2/180 is shown during taxying trials.

Photographic close-ups show structural and component details. Left, front fuselage structure showing conventional stick and rudder bar; centre, the gearbox and clutch assembly; right, 2/180B rotor hub (shown inverted).

because the small diameter means lower tip speed (and the noise is also further attenuated by the duct); the duct itself constitutes a valuable safety device in preventing the unwary from walking into the propeller disc.

Power is supplied by a 180 bhp Lycoming mounted at the extreme rear of the fuselage.

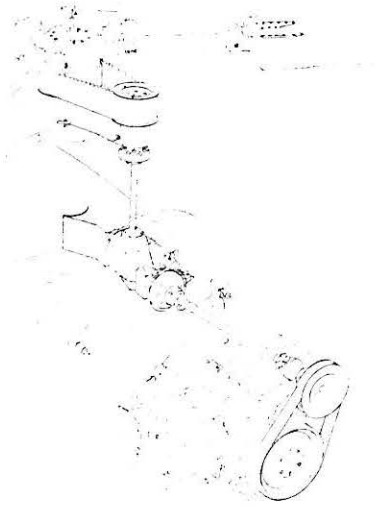
On the first prototype Avian 2/180, a mechanical drive from the engine to the rotor has been incorporated for certification purposes. The drive bleeds off some 35 hp and was installed to permit ground testing and C of A trials which can be done without leaving the ground.

The rotor itself is considerably different from conventional light helicopters. The normal helicopter problems of first harmonic flight vibration and ground resonance are avoided by not using drag hinges on the rotor head, and by insuring that the fundamental in-plane natural frequency of their blade is well above the maximum rotor speed. This has resulted in a relatively heavy blade, with a high in-plane stiffness. At present, blade structure is all steel, with fibreglass skins, stabilized by hardwood forward of the main spar, and by balsa in the trailing edge section.

No Tracking: The use of a steel structure, plus the fact that the blade angle of attack is determined almost entirely by the tab control angle, leads Avian engineers to believe that rotor blade tracking will be unnecessary in service. The tabs, located at the extremities of the blades, are responsible for very light stick forces. That this is so is due to the fact that instead of moving a 60 lb. blade, the pilot is required to control only a 1 lb. tab assembly and associated linkages.

Through the steel mainspar of the blade is piped the 3000 psi compressed air to the tip nozzles which gives the Avian 2/180 its "jump" take-off capability. (the "jump" will be about 200 ft.) A fibreglass compressed air bottle stored in the aircraft provides up to two minutes of continuous power to the tip nozzles for either take-off or landing. A small, highly efficient air compressor will recharge the bottle within 30 minutes. As an option, and at some additional expense, a compressor capable of recharging the bottle in 15 minutes is available.

It should be explained here that the normal Avian 2/180 take-off will be made after a short run. A safe take-off speed for the new autogyro is expected to be around 40 mph, and will be achieved with a run of little more than 100 feet. Taxi trials already conducted by Avian at the Kitchener-Waterloo Airport have shown that the 2/180



Mechanical drive used on prototype (2/180B) for certification purposes is added to basic 2/180 system. Added components are ones shown in heavy lines in the drawing above.

accelerates faster than a late-model V-8 car.

Full Stop: In flight, the 2/180's forward speed range will extend from 25/30 mph (slowest possible speed without losing altitude) to 180 mph top speed. Normal landings will be made at an average approach speed of between 20 and 25 mph. On round-out, the 2/180 may be brought to a full stop just prior to touching down. This feat, in all likelihood, will require a bit of practice. In any event, the landing roll of the Avian 2/180 will be remarkably short.

These figures would indicate that the uniquely designed Avian autogyro will be highly suited for parking lot operation, something that fixed wing conventional aircraft have never been able to accomplish. In dimensions, the 2/180 compares more than favorably with the smallest of light planes. It is 7.9 feet high, 14.6 feet long and has a rotor diameter of 26 feet. Empty weight is 1000 lbs.; all-up weight 1720 lbs.

The Avian 2/180 boasts a maximum rate of climb of 1500 fpm. It has a normal still-air range of 480 miles, on a total capacity of 26 Imp. gallons of gasoline.

Although this aircraft is in existence only in the prototype form, the workmanship apparent in Avian's CF-LKF-X is impressive. No lash-up effort here. Avian Industries has produced an exceedingly well-built model, boasting an obviously professional degree of finish which makes it difficult to be pessimistic about the Avian 2/180's chances.

Test flying of the 2/180 is being done by Ron Peterson, an ex-RCAF helicopter pilot.

Number Two: The company expects

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vale, Lancs., for meteorological flights. Vickers-Armstrong's Mk. 5, AB 910, is unusual in that it is probably the only British civilian aircraft which is allowed to fly without displaying its registration letters: G-AISU.

Few people realize the number of Spitfires that still exist in Britain. I have uncovered more than 65, and expect confirmation of at least another twenty, so it is by no means "extinct".

G. A. ROWE.

Stittsville, Ont.

AVIAN 2/180

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to have the second prototype out in January, 1960. This one will have no mechanical rotor drive attached and is to be used as a demonstrator model. It is hoped that DoT certification trials will be completed by late April or early May. It would seem likely that it will get its C of A under the rotorcraft classification, though there is some doubt about this at the present, as the C of A requirements were originally written with helicopters in mind.

Avian Industries has no intentions of relying on a government contract for its future existence. This would, in Peter Payne's view, be completely unrealistic.

Instead, the young company hopes to break into the lightplane market with a $10,000 product which can out-perform anything in that field. With its landing and take-off advantages, plus its wide speed range and 2.98c per seat mile operation, the Avian 2/180 may carve a deep niche in the light aircraft market both here and abroad.

PLANT SAFETY

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day and what the safety man did about it, the following examples are typical of the day-to-day functions of the safety-conscious employee.

In an office area, a safety man advised the supervisor that the cords of his calculating machine were a tripping hazard and that the machine should be moved closer to the outlet. In the shop a guard which had been removed yesterday from a band-saw "for just this one job" was replaced when the supervisor brought it to the attention of the foreman. In another area a three-prong plug which had been filed at some time to fit the outlet better — and incidentally make electrocution a definite possibility — was replaced and thrown out. A bottle of compressed gas, standing unsupported, was moved into an area where it could be chained to a stand. In another department a representative from the Safety Department and a foreman talked with a man who had sustained three minor injuries during a three month period and was suspected of being "accident prone."

These incidents all took place today, and not one of them hit the headlines . . . they weren't expected to. But routine actions such as these have resulted in awards from the National Safety Council for recording in one period, two million man-hours without an accident.

Which would indicate that if you work at Canadair you're safer there than you are in your own home.

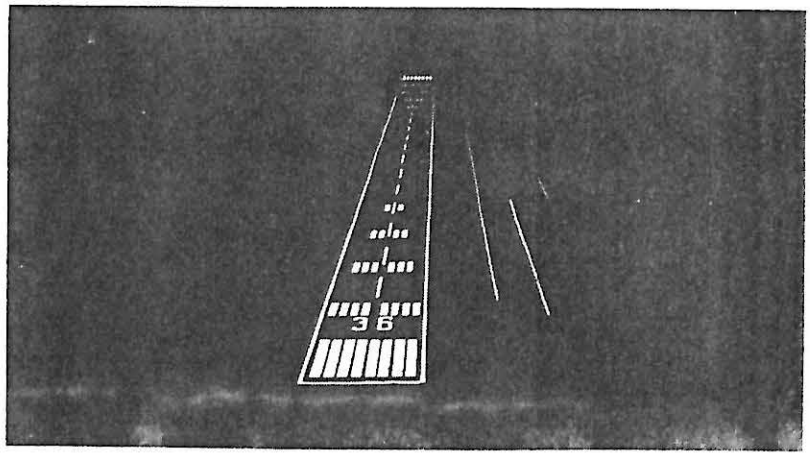
A FINE SIGHT

The first Canadian test application of a product designed to aid a pilot's depth perception and provide all-weather visual guidance between approach lighting and final touchdown, is being carried out at RCAF Station Trenton, Ont.

Developed as a result of a need expressed by both civilian and military pilots, the light-reflective marking material is tiny particles of granite treated with highly reflective materials and mixed with a binder. It is applied with conventional runway striping equipment.

Trade-named Scotchrok reflective aggregate, the particles stand on edge in the heavy binder, providing a mirror-like intensity reflection of the aircraft's landing lights that is 100 times brighter than white paint. Heavy concentrations of water standing on the runway fail to dim the brilliance appreciably.

USAF tests south of the border indicate the aggregate retains 70% reflectiveness at 10 months.



RCAF FUEL HANDLING

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lie on the ground and tend to flow to low contours, forming pockets, hence the danger may extend to some considerable distance from the fuel.

First Aid Fire Fighting Methods: All personnel in the RCAF who handle aircraft fuels must be familiar with the proper operation and use of fire fighting equipment. Fires are classified into three principal groups according to the combustible material burning. Different types of extinguishers are designed to combat effectively and safely each type of fire.

Static Electricity: To most of us who are not trained in electrical phenomena, static electricity is the mystery hazard that has to be dealt with in the handling of petroleum products. Electrical charges can be generated and stored in practically any material. Static means "at rest". It is when an electric charge is not at rest that its effects become apparent, and is probably the most surprising source of ignition when it occurs.

I have dealt in detail with the proper handling of aircraft fuel within the RCAF, but the proper handling of other aircraft fluids such as oils, lubricants, hydraulic fluid, oxygen, alcohol, hydrogen peroxide, etc., present no less a problem. It has been proven beyond doubt that the techniques and procedures of the four agencies in the RCAF which have looked after the proper handling of aircraft fuel must