



The Beaver recently acquired by Aerial Agriculture Pty. Ltd. at work on the Hoxton Park, NSW, operation last month.

The Agricultural Beaver

An operational and flying assessment of Aerial Agriculture's de Havilland Beaver.

By KEITH ROBEY

WITH the current easing of dollar import restrictions on light aircraft and the recent DCA approval of an agricultural overload, the de Havilland Beaver is attracting much attention from Australian agricultural operators. Aerial Agriculture Pty. Ltd., of Bankstown, and Robbys Aircraft, of Parafield, have recently taken delivery of agricultural Beavers and the former company has stated that they are interested in acquiring a further two aircraft of this type.

The Beaver has been seen in Australia previously, but not until recent months as an agricultural aircraft. Four aircraft of this type have been operated in New Guinea by Qantas for a number of years and the Beaver has given outstanding service in the Antarctic, where two aircraft have been operated by the RAAF on behalf of the Australian National Antarctic Research Expedition, and a third Beaver for Antarctic work is now being prepared by de Havilland at Bankstown. Several Beavers have been in service in New Zealand on agricultural operations for quite some time and New Zealand operators speak highly of their performance.

The Beaver is a single engined all metal strut braced high wing monoplane, powered by a 450 HP Pratt & Whitney Wasp Junior engine, driving a 2-blade Hamilton Standard constant speed propeller. Wing span is 48 feet and normal all up weight 5100 lb. Agricultural operations, however, have now been authorised with an overload and the agricultural all up weight is 5490 lb.

The fuselage of the Beaver is constructed in three main sections, consisting of a front fuselage section extending back to the cockpit, the centre fuselage or cabin section which terminates at the aft cabin bulkhead and the rear fuselage. The front fuselage is a tubular steel structure which carries the four engine pick-up points, while the cabin section is specially braced and strengthened to carry the wings and undercarriage. The cabin floor is strengthened by three cross beams and designed to support heavy concentrated loads. Wide cabin doors measuring 39in. wide by 40in. high are located on both sides of the cabin section and greatly facilitate the loading of large bulky pieces of freight when the aircraft is in use as a freighter and the easy installation or removal of the hopper and associated equipment when employed in the agricultural role. In the standard Beaver three fuel tanks, two of 29-gal. capacity and one of 19-gal., are installed under the cabin floor. The centre 29-gal. tank is deleted in the agricultural Beaver, however, to make room for the hopper discharge chute. Filler caps are located on the side of the fuselage in a position that is readily accessible when refueling from drums or with primitive refueling equipment. This feature is of particular value to the agricultural operator, frequently

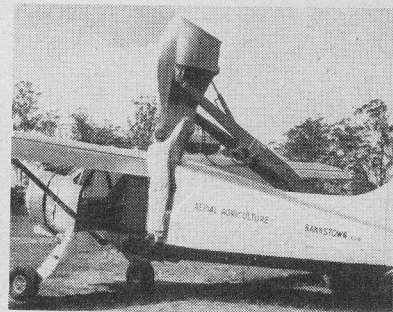
working away from established aerodromes and modern refueling facilities. The rear fuselage is of straight forward stressed skin monocoque construction.

The Beaver undercarriage is of the fixed tail wheel type. The cantilever single leg main undercarriage incorporates a rubber block shock absorber system and is equipped with Goodyear wheels and single disk hydraulically operated brakes. Undercarriage track is 10ft. 2in., the tail wheel is of the steerable type and also features a rubber compression shock absorber system.

The Beaver mainplane is an all metal 2-spar structure fabricated in two main sections with detachable wing tips. It is a medium aspect ratio untapered wing featuring a DH high lift section and the total area amounts to 250 sq. ft. The entire mainplane plus flaps and all control surfaces are metal skinned. Eighteen-gallon wing tip tanks are available as an optional extra and take the form of special wing tip sections incorporating an integral tank. Fuel lines for wing tip tanks are built into the standard wing and these tanks may be fitted at any time and only require connecting up to the existing plumbing. When fitted, fuel from the wing tip tanks flows by gravity into the main fuselage tanks. The slotted flaps and ailerons are interconnected and run the full length of the trailing edge of the wing. Neither flaps nor ailerons have any spars or ribs other than the pressed end ribs. They are jig built and derive their strength and rigidity from chordwise strengthening strakes applied inside the top surfaces and outside the bottom surfaces, where they are actually corrugations formed in the skin. Flap operation is hydraulic and the ailerons progressively droop up to 15 deg. as flap is lowered. The hydraulic pump for the flap system is hand operated and the reservoir is located in the cockpit under the pilot's seat and is readily accessible for checking.

The agricultural Beaver is equipped with a stainless steel and light alloy cylindrical hopper of 35 cubic feet capacity. The hopper is installed in the passenger cabin immediately inside the large loading doors. Loading of the hopper is accomplished through a hatch in the cabin roof and the contents are discharged by gravity through a chute in the cabin floor. Fuel lines and electrical circuits in the vicinity of the discharge chute are enclosed for their protection in stainless steel circuits. The size of the aperture in the chute is controlled from the cockpit and up to 10 different settings may be selected in order to control the density of the coverage. The chute door is manually operated, controlled by a lever between the cockpit seats. An electrically operated jettison gate is operated by a button on the pilot's control wheel and enables the entire load to be jettisoned within five seconds.

Although Aerial Agriculture's Beaver, VH-AAI, is not so equipped, a conversion kit is available with the agricultural Beaver to convert the aircraft from a dry load applicator to a liquid sprayer in a remarkably short period of time. A synthetic rubber bag may be quickly installed in the hopper and spray booms, together with the associated liquid spray equipment including an emergency dump valve and a Simplex wind-driven pump, installed with a minimum of effort. De Havillands claim that the conversion from fertiliser to



Superphosphate handling at Hoxton Park with Aerial Agriculture's specially designed one-ton loader for the Beaver.

sprayer can be carried out by a team of two men working in the field in approximately 30 minutes.

The standard Beaver is fitted with a throw-over type control wheel, but dual wheels are available at extra cost and VH-AAI is equipped with full dual control with the exception of brakes, which are toe operated on the pilot's side. Throttle, pitch and mixture controls are mounted on top of a control console in an unusually high position, with engine instruments centrally mounted below. Only basic flight instruments are fitted in the agricultural Beaver and these are installed on the left hand side of the main instrument panel in front of the pilot. Flap indicator, master switch, magneto switches, starter and fuel tank selector controls are also located on this side of the panel. The right hand side of the instrument panel is available for a variety of radio installations, but as radio is not normally fitted to the agricultural version of the Beaver, this panel is blanked off in VH-AAI except for the main electrical switch-board. Other controls found at the base of the control console include fuel and oil emergency shut-off cocks, wobble pump and carburettor hot air control.

Through the courtesy of Aerial Agriculture Pty. Ltd. I was able to fly the agricultural Beaver on two separate occasions. My first flight was from Bankstown with the aircraft lightly loaded and a few days later I was able to fly the Beaver again with a full agricultural load on actual topdressing operations. On both occasions I flew with Aerial Agriculture chief pilot Cliff Coote.

Lightly loaded I found the Beaver performed like a high performance sporting aircraft and with a full load its performance, although rather more sedate, was still most impressive. Starting up procedure follows normal Pratt & Whitney Junior Wasp practice. The Junior Wasp starts easily and idles smoothly at about 800-900 revs. Mixture control should be placed in the auto rich position as soon as the engine fires and when the oil pressure rises to 50lb. the propeller control moved forward to the fully fine position.

The parking brake is controlled by a knob at the side of the control console and is applied by pulling the knob out whilst the toe brakes are depressed; the parking brake is released in the customary manner for this type of system by depressing both toe brake pedals. The steerable tail wheel is effective and taxiing the Beaver presents no problems. The view from the cockpit while taxiing is fair, the large radial engine obstructing the forward visibility only slightly. The undercarriage rides well and the braking system is most effective.

Pre-takeoff cockpit check calls for elevator trim set as required by loading, rudder trim neutral, mixture control auto rich, pitch fully fine, flaps in the takeoff position (35 deg.) and carburettor heat cold. So far as sideways and upwards visibility is concerned, the Beaver suffers from the usual high wing monoplane trouble and standing across wind on a busy aerodrome one has that uncomfortable feeling of not being quite sure of what traffic is on short final. Turning first 45 deg. to the left to check for landing traffic and then to the right into wind I received a green from the control van and began to takeoff.

Full throttle is not normally used for takeoff, recommended technique being to open up the throttle to 36.5in. of boost and, without raising the tail, allow the aircraft to fly itself off the ground in the tail down attitude at 55-65 MPH. What little tendency there is to swing is to the left, but this is easily held with a slight pressure on the rudder. Lightly loaded the Beaver accelerates rapidly and becomes airborne after a very short run. The initial climb is very steep and is made at an indicated airspeed of 65 MPH; at a safe height power is reduced to 30in. and 2000 revs. and the speed allowed to slowly increase to 80 MPH, after which the flap is retracted to the climb setting of 15 deg. — a marked nose

down change of trim is experienced as flap is retracted. Although best angle of climb speed is 80 MPH, the best rate of climb is achieved at 95 MPH.

Levelling out at 3000 feet I found that the Beaver cruised in this lightly loaded condition at an IAS of 115K using 28in. x 1900 revs. and indicated 120K on high cruise power 30in. x 2000 revs. No outside air temperature gauge was fitted and it was not possible, therefore, to calculate accurate true airspeeds. Fuel consumption at cruising power settings averages 15-17 gal. hr.

The Beaver is a very pleasant and stable aircraft to handle, properly trimmed, it will fly hands and feet off indefinitely, aileron control is light and effective and while elevators and rudder are slightly heavier, a nice balance of control has been achieved. Noise and vibration levels at cruising power are reasonable for a utility aircraft of this type and visibility in flight fair, except for above and behind.

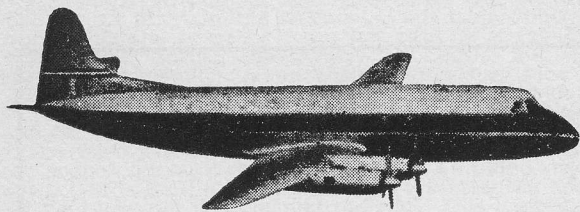
The slow flying characteristics of the Beaver are very good and with the engine throttled well back and takeoff flap extended I found that level flight could be maintained quite comfortably at 45K; aileron control at this speed was quite satisfactory and medium turns can be carried out with adequate control. Engine off and flaps up the Beaver stalled at an indicated airspeed of 45K and with takeoff flap extended and power set at about 14in. the speed washed off to 30K before the stall occurred. There is little warning judder, but on each occasion the stall resulted in nothing more than a gently dropped wing as the nose fell away. Aileron control is effective to and at the point of stall, normal recovery action resulting in full control being regained with a minimum loss of height. An electric stall warning device is available as optional equipment, but is not fitted to the standard agricultural Beaver.

Returning to the aerodrome to try some circuits and landings I found that the Beaver is an extremely docile and easy aircraft to handle in the circuit. Down wind check consists of ensuring that fuel is on the correct tank and sufficient, mixture control in auto rich and carburettor heat off. The maximum speed for lowering the flap is 91K and speed should be reduced on the base leg and flap extended to the takeoff position. The approach should then be continued at 70K and after turning final the pitch control moved up into fully fine and landing flap lowered as required. Speed may then be washed off to 60K over the fence. Full flap is not normally used except for a short landing. The drooping action of the ailerons as flap is lowered does not unduly affect the aileron control. With landing flap extended and just a little power, the Beaver descends at a very comfortable angle and the field of vision on the approach is good. The actual roundout and landing present no difficulties and the change of attitude is not so great as one might expect. The Beaver appears to be a forgiving aircraft and there is no tendency to skip back into the air again. Once on the ground the aircraft is content to keep rolling straight ahead and there is practically no tendency to swing.

Time permitted me three or four more circuits, enabling me to sample a short takeoff, followed by a steep climb using maximum continuous power, 33.5in. x 2200 revs. and a precautionary approach and short landing with full flap at 55K. Quite a steep rate of descent can be obtained with full flap and the power well back and with practice the Beaver can be landed in an extremely short distance. Harsh application of brake may safely be made after touch down, provided the wheel is kept hard back.

My experience with the Beaver fully loaded came a few days later on a topdressing operation carried out by

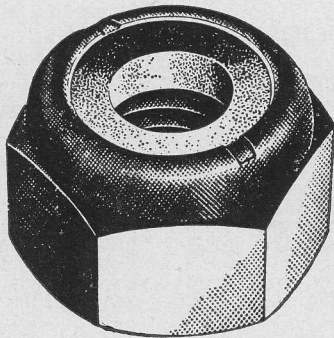
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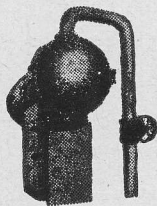
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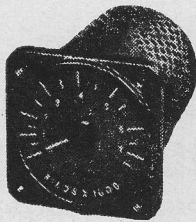
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The Agricultural Beaver

continued from page 62

Aerial Agriculture from the old wartime airstrip at Hoxton Park near Sydney. The area to be dusted on this particular occasion was less than a mile away from the airstrip and the superphosphate was being loaded into the aircraft from a bulk dump by a one-ton loader especially designed to work with the Beaver. This loader has been constructed on a 3-ton truck chassis, it is hydraulically operated and features dual driving controls enabling the operator to face the rear during the actual loading operation. Carrying 19 cwt. per trip the Beaver was averaging about four minutes from takeoff to landing and the loading operation appeared to take about one minute. Watching the operation from the ground while waiting my turn to fly I was impressed with the ease at which the Beaver appeared to be handling the heavy load. With little assistance from the wind takeoff distance did not appear to be any more than 250 yards and once the aircraft was off the ground it climbed away in quite an impressive manner. When operating with the agricultural overload — an AUW of 5490 lb. — the Beaver has been listed by DCA in Group 3 of AGA/4 requiring at sea level a runway length of 2000 feet. At its normal AUW 5100 lb. the Beaver is considered as being in Group 4 and it is permissible to operate off a 1500ft. runway. From observation, both these figures appear to be most conservative.

Flying the Beaver with Cliff Coote in the right hand seat again to make sure that I did the correct thing with the load of Super and a suitably reduced load in the hopper to allow for the weight of the additional crew member, I found the Beaver's performance when operating with the agricultural overload most impressive. Acceleration on takeoff was, of course, slower than when I flew the aircraft previously, but still very satisfactory. Flap is retracted to the climb setting soon after takeoff and with the power set at 33.5 in. x 2200 revs the climb is carried out at 70K and rate of climb appeared to be in the vicinity of 500 ft./min. Levelling out at 500 feet the rest of the flap is retracted and power reduced to 30 in. x 2000 revs; the aircraft is still very manoeuvrable and I found that quite steep turns could be carried out comparatively close to the ground without any feeling of apprehension. The actual topdressing run was being carried out over fairly undulating country at an average height of 100 feet above the terrain. Swathe width at this height was about 25 yards. I personally had difficulty at first in picking up the markers for each run, but this was in no way due to lack of visibility, but purely to my inexperience on this type of operation. The run is made at 110K and approximately 27 in. of boost appeared to be the correct power setting to obtain this speed. A slight nose down change of trim is experienced as the load is dropped, but is insufficient to cause concern and the aircraft is still quite comfortable to fly until a hand becomes available to retrim.

With the hopper empty at the end of the run a turn is immediately made to get round and into position to begin an approach back onto the strip. Flap is lowered progressively as required and the approach made at 70K, washing speed off to 60K over the fence; a short landing enables the aircraft to turn off the strip and park in a convenient position alongside the loader. The pilot opens the hatch above the hopper by pulling a spring loaded handle in the cockpit roof and carries out his cockpit check in preparation for the next takeoff. As the load is deposited in the hopper the Beaver settles appreciably and when the loader's assistant gives the all clear the pilot closes the hatch and taxis back onto the strip and starts the next takeoff. After three or four runs I began to appreciate just how hard the topdressing pilot works and how he is constantly exercising his judgment in a way that he is seldom called upon to do on other types of flying operations. Pilot fatigue is a most serious problem to the agricultural operator and aircraft design can go a long way towards helping to solve this problem. The Beaver, with its docile handling characteristics, should prove most satisfactory in this respect.

There seems little doubt that the agricultural Beaver will uphold in its specialist field the high reputation that it has already earned in the many roles it has so far undertaken. Where the volume of work is sufficient to keep it gainfully employed it should prove a most satisfactory addition to the fleet of any Australian agricultural operator. Australian price of the standard agricultural Beaver, fitted for the application of dry materials only, is £24,150 fly away Bankstown. The additional equipment in the form of a conversion kit to convert the standard duster to liquid spraying is available at a cost of £1300, and an alternative liquid spray installation incorporating a 200-gal. metal tank and full span spray booms is quoted at an additional £1500.

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