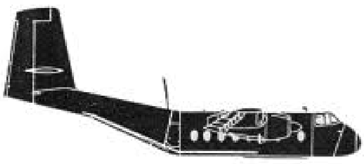
The following text is expanded from an article I wrote for a small aviation magazine in 2017 and includes photos I have taken. To the aviation enthusiast/pilot I hope it gives an interesting insight in to what it was like to operate the Caribou from a piloting perspective. This can also be referred to as a supplement to my recently published photobook (previous page).



I joined the RAAF as a pilot in 2002 and flew the Caribou between 2005 and 2009. During my 12 years in the RAAF I also captained the CT4, PC9, Hawk Jet and the C130J Hercules including flying on overseas operational deployments. The Caribou would however remain my favourite type due to the hands on flying it involved. Without an autopilot or weather radar, you were always kept busy going from A to B. Another advantage of flying an unpressurised aircraft was the ability to fly at low level along some tropical beach with a window open and an arm hanging out imitating superman! I hope the following gives some idea of what it was like to operate the mighty "Bou" or "Gravel Truck" as we affectionately called it.

A typical Caribou crew consisted of a Captain, Co-pilot and Flight Engineer, who doubled as the Loadmaster and Aircraft Technician. Every Flight Engineer had to have previous experience as a technician on the aircraft. Longer trips would usually involve taking additional "techos" for the ever-likely breakdowns that would occur! The Flight Engineer would stand between the elevated pilot seats for take-off and landing and sit in the cargo area for the majority of flight.

Excellent visibility is available to both pilots, and the engine controls are located in the overhead console similar to a Twin Otter. Left to right are the Throttles, Props and Mixtures (which have 3 detents, Auto Rich, Auto Lean and Idle Cut-Off). Further aft in the roof console are the Ignition/Magneto Switches and Carb Heat controls. Flying around with your hands hanging from the throttles sounds strange but is more comfortable and intuitive than one may think. Mounting the engine controls on the overhead console requires less complex rigging in a high wing aircraft for cables to go to the engines and it frees up space between the pilots, which in the case of the Caribou is utilised for a slide out "radio boat" (console). This console houses the communication radios (2 VHF, 1 HF & 1 UHF) and navigation receivers (ILS, VOR, TACAN, NDB & DME). A basic Trimble GPS was also fitted in the 90's. To the Left of the Captain's leg on the sidewall is a vertically mounted hydraulic nose wheel steering tiller/wheel which is used for taxiing and steering on take-off and landing until the rudder becomes effective above 40 knots.

Engine start switches are located in front of the Captain's left knee and there are 3 toggle switches arranged vertically labelled START, VIB and PRIME. The Caribou has the advantage of having a starter motor that is designed to slip if any resistance is incurred in the event of a hydraulic lock so there is no need to pull the blades through by hand prior to engine start. The right engine is started first by pushing the start toggle switch to the right and after turning through 15 blades (or 6 on a warm engine) the Captain calls "contact". At this point the VIB and Prime switches are also pushed right and the co-pilot moves the ignition switch to BOTH. After the engine achieves approximately 600 RPM the Starter and VIB switches are released and 1000 RPM is maintained using the primer only. Once all parameters and no fire lights are illuminated the co-pilot moves the Mixture to Auto Rich and the primer can be released. Sounds easy hey? Not so easy on a hot engine! A couple minutes later hopefully both the Pratt and Whitney R2000s will be purring away happily with the temperatures in the green ready for engine run ups.

Brakes are checked when taxiing out and the propeller reverse is checked for correct operation (unusual to be fitted on a piston aircraft). This is accomplished by pushing the throttles up in to the roof and then pulling backwards. Two blue lights annunciate on the instrument panel to confirm that the propellers have moved in to reverse pitch.

Run ups are fairly conventional but like any radial engine all movements with the throttles should be made as smoothly as possible. Props are checked and cycled at 1900 RPM and the ignition check is carried out at static manifold pressure (roughly 30" at sea level). Because the propellers are not governing at this power it is not only a check of the magnetos but also general engine health. The RPM should be within 50 RPM of that placarded (around 2200 RPM), obtained from initial test flight data.

After engine run ups the before take-off checklist calls for flaps to be set anywhere from 0 to 25 deg. The flap lever is also located in the overhead console behind the engine controls. An indicator instrument panel indicates actual flap position. A minimum length STOL take-off uses 25 deg flap with a rotate speed of 63 knots at a MTOW of 28500 lbs. The aircraft can get airborne well below 60 knots but 63 knots is used as it coincides with the minimum VMCA speed. The take-off roll only takes around 8 seconds so this is one phase of flight that one needs to be thoroughly prepared for.

30" of MAP is set on the brakes and once released full power is advanced slowly to 50" giving 2700 RPM. Care has to be taken to limit throttle movement as the supercharged engines can be over-boosted at sea level beyond their 50" maximum. Noise levels are understandably high calling for a good quality helmet. Acceleration is brisk and nose wheel steering is used until the rudder becomes effective at around 40 knots. At this point the captain calls "my controls" and transfers their left hand from the nose wheel tiller to the control column. At rotation speed a reasonable amount of back pressure is used to achieve the climb attitude. Once airborne the captain selects the gear up using a lever just to the left of the throttles (funnily enough, once again on the overhead console!) and asks the co-pilot to select flaps 15. As the aircraft accelerates above 74 knots, flaps are selected up by the co-pilot. At 300 ft power is reduced to METO (42.5" and 2550 RPM) and at 500 ft CLIMB power is selected (35" and 2250 RPM) and the aircraft is settled in to the climb at 105 knots, achieving a leisurely 700-800 fpm depending on the aircraft weight. All throttle movements are made by the pilot flying and prop and mixture adjustments made by the pilot monitoring.

As altitude is gained the throttles need to continually be pushed further forward to achieve 35" as the single speed supercharger loses efficiency. Typical cruise altitude is 9000-10000 ft using a power setting from the flight manual that equates to 700 brake hp, usually around 31" and 1900 RPM. Below 750 hp, an auto lean mixture can be selected. This results in an indicated cruise speed of around 120 KIAS (Indicated Airspeed) or 140 KTAS (True Airspeed) using 600 lbs/hour of decomposed dinosaurs. This gives good endurance with a max fuel capacity of just over 4800 lbs but you are not going anywhere too fast. The good news is there is a spacious area down the back to lie down and a "relief tube" at the back of the aircraft for one to empty their bladder. This goes straight overboard via a drain pipe and Flight Engineers were known to use a dirty tactic of relieving their bladder when flying in formation directly in front of the following aircraft! The Flight Engineers always tried to stay one step ahead of the pilots and often succeeded!

All primary flight controls utilise cables and the flaps are powered by a single hydraulic jack. Elevator forces are quite light at all air speeds and a manual trim wheel is located on the right side of the Captains seat. I understand that electric trim was not considered for elevator in the event of a trim runaway. A rudder trim wheel is located behind the engine controls and an electric aileron trim provided on both pilots' yokes. Rudder forces again are quite light and remains very effective at low air speeds which enables such a low VMCA. Because of the high positioning of the rudder relative to the aircraft axis the flight manual warns that a rapid application of full rudder at low airspeed can result in an initial roll OPPOSITE to what one would normally expect. Aileron forces are very manageable up until 120 knots where above this speed they get quite heavy.

The Caribou is a very manoeuvrable aircraft, given its vast size. When flying into narrow valleys in Papua New Guinea a "precautionary" configuration of flap 15 could be used, which at around 80 knots enabled better visibility with a slightly nose down attitude and tighter turn radius to exit the valley if bad weather lay ahead. Large wing overs could also be flown which were not only fun but also an effective means of losing altitude after dispatching paratroopers from the rear ramp. Cargo packages ranging from light cardboard “heliboxes” to “A22” loads up to 2200 lb in weight could be airdropped from various altitudes. After being pushed off on temporary rollers attached to the floor, their parachutes would be pulled open with cables attached to the roof. LAPES (low altitude parachute extraction system), could deliver loads up to 4000 lbs flying at a height of 3-6 feet off the ground with the landing gear extended. A quick web search will find good videos on this. The tactic was developed by the U.S. for Vietnam where the aircraft could fly accurately in to a cleared area and accurately deliver the load extracted with a parachute. This meant the aircraft didn't have to expose itself to ground fire by stopping on landing. One of the risks of this was that the load could get stuck in the cargo bay with the parachute still attached and creating a huge amount of drag. Apparently full power and an airspeed of 74 knots would allow the aircraft to fly away but I am glad I never had to try out this theory!

Above: LAPES run at RAAF Richmond with the parachute about to extract the load.

Cruise descents are flown at a power of 28-30" and 1900 RPM giving 140 knots and a leisurely 500fpm rate of descent to minimise shock cooling and for passenger ear comfort in the unpressurised cabin. Under boosting a radial engine can be just as damaging as over boosting so we always planned to use at least 1" per 100 RPM for descents where possible (i.e. at 1900 RPM avoid using less than 19"). Re-join checklists cover some more important items such as selecting Auto Rich mixture.

The circuit is joined at 1000 ft with approximately 26" and 2250 RPM and on downwind the landing gear is extended below its limit speed of 120 knots followed by flap 15 selected below 105 knots. The clock is started abeam the landing threshold and the base turn commenced 30 secs later in nil wind. Power around base is 15-17 inches and setting an attitude to achieve 80-85 knots and 15-20 deg angle of bank. Rolling on to finals for a STOL landing should occur at 500-600 ft AGL on a slope considered much steeper than what most aircraft would fly. Flaps 30 are selected below 85 knots and requires lots of forward pressure to counteract the balloon and a very nose low attitude initially results. Finals checks are then carried out, selecting props full fine (full increase in RAAF speak) and the speed is allowed to slow to maintain a threshold speed of 66 knots at typical weights.

Flap 40 (full flap) was rarely used for landing as it only reduces the approach speed by a couple of knots and makes the aileron forces much heavier. This is due to fact the ailerons also droop with flap extension. Aileron authority on finals at such a slow speed is quite poor and requires quite large manipulations of the controls in turbulent conditions leading to the expression of the pilots looking like they are "wrestling a gorilla". With so much extra drag from the flaps, large power changes are required to fix airspeed errors quickly. A few knots too fast over the fence on a 350 metre strip in a 12 tonne aeroplane can spoil your day quite quickly! Another side effect of the blown wing is that large power increases also result in a lot more lift so one has to be ready to lower the nose as power is increased otherwise you can also end up quite steep on profile. Being fast over the fence also results in the aircraft flying nose low and potentially hitting the nose wheel first. If you nail the speed correctly the flare is commenced at approximately 30 ft (judged visually) and the big Pratts pulled back to idle achieving full back elevator just as the stick shaker comes on with both mains kissing the hard stuff gently- very satisfying when you get it right! Once the nose wheel is on the runway both throttles are pushed up into the roof to engage reverse pitch confirming with the 2 blue lights mentioned earlier. The captain then verbalises "two blues, your controls". The co-pilot now has control of the yoke and the captain transitions their hand to the nose wheel steering tiller, and pulls back on the throttles to increase the RPM with reverse pitch. At 30 knots reverse thrust is cancelled to avoid ingesting too much debris. All this happens pretty quickly and you also need to remember to use the brakes as well to achieve minimum stopping distance.

Parking and shut down is conventional observing a maximum cylinder head temperature of 180 deg prior to moving the mixtures to Idle Cut-Off.

Single engine performance in the Bou was adequate but not startling. I shut down a few engines as precautionary measures and on test flights but luckily never had any failures at critical moments. Because there was no simulator all practice was carried out in the aircraft using “zero thrust” of 15" and 1500 RPM. The large rudder provided ample control in the event of a failure (providing you were above VMCA) and full power on the live engine would return about 300 fpm rate of climb at MTOW and sea level. Like any radial engine however it did not like to be run at high power for long periods and sometimes even after 5 mins the oil temp on the good engine would be reaching the maximum limit during training requiring it to be throttled back. I would not have liked to have had to rely on one engine for 30 mins at METO climbing out of a valley in PNG on a hot day! Conducting STOL approaches required a committal height of 400 ft single engine to allow for the height loss in the event of cleaning up for a go around.

Above: Tep Tep airfield, PNG. 6969ft above sea level and 10% slope. Not for the faint hearted!

To fly one of the last radial-engined aircraft in military service was a real adventure and leaves me with some great memories. The biggest highlight for me was conducting

Humanitarian Relief missions in Papua New Guinea, flying in to some airstrips as high as 7000 ft above sea level with density altitudes approaching 10000 ft. Other strips were only 350 metres long and often with a 12% slope and perched precariously on the edge of a ridge line. In October 2011 I was lucky enough to Captain the first Caribou (A4-210) that HARS acquired on its flight from Oakey to Wollongong. When I lived in Sydney I flew regularly with HARS, including conducting displays at the 2013 and 2015 Avalon Air Shows, but sadly I no longer live in the region to fly with them.

Above: Avalon Airshow 2013. HARS took both Caribou A4-210 & A4-234 from their Albion Park base.
This was the first time the Caribou appeared at Avalon since 2009 when it was still in RAAF service.

The Caribou is an incredibly unique aircraft which is adored by those that flew and worked on her. I genuinely hope this iconic aircraft continues to fly with HARS for many years to come and that others out there get the same satisfaction that I do of hearing the roar of the mighty gravel truck at full power, even if we do joke about it being one of the only aircraft that can have a bird strike from behind!

Fly safe out there,

Chris Jaensch

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