

WARNING

When using auto fuels, the fuel delivery system must be designed to prevent fuel vaporization.

To check pressure, insert a 'T' piece between the mechanical pump & carburettor. Test boost pump with engine off, then mechanical fuel pump with engine on, then combine with electrical boost pump as well, before first flight.

- A method for performing a fuel flow test is available from Jabiru if required. In brief, the fuel line is disconnected from the carburettor, fuel is pumped into a calibrated container and the rate at which the fuel is pumped (or drained, for gravity-fed systems without a pump) is calculated.
- Most regulations require that the fuel system (including pumps) supplying the engine be capable of delivering 1.25 to 1.5 times the maximum flow rate required for the engine. For a Jabiru 3300 engine this equates to approximately 44 to 53 Litres per hour (see Section 1.5.3). The electric boost pump used on Jabiru Aircraft generally manages a flow rate of approximately 60 litres per hour.
- The Bing carburettor has a Balance tube (also known as a "sense tube") which connects the carburettor to the air box. The tube runs from a nipple on the carburettor to the airspace in the air box on the "clean" side of the air filter. This tube is part of a system of ports which "tells" the carburettor how hard the engine is working and controls how the carburettor varies the fuel / air mixture delivered to the engine. Tuning issues and poor running will result if this tube is blocked or connected to the wrong spot. Figure 30 shows the tube installation. Note that the balance tube must not be connected to the air box in a location where the air is moving fast – rapid flows produces pressure changes and boundary layer effects which mean the balance tube gives the carburettor "bad" information, which can cause poor mixture control and running issues.
- A drip deflector to deflect overflowing fuel from the exhaust system is supplied as standard equipment on the engine.
- Because idle adjustments cannot accurately be made on the dynamometer (where every engine is run before delivery), some adjustment of the 7mm idle set screw may be required. A hot idle of around 900RPM is desirable.
- Fitting an earth strap from carby to crankcase is recommended to eliminate possible radio interference.

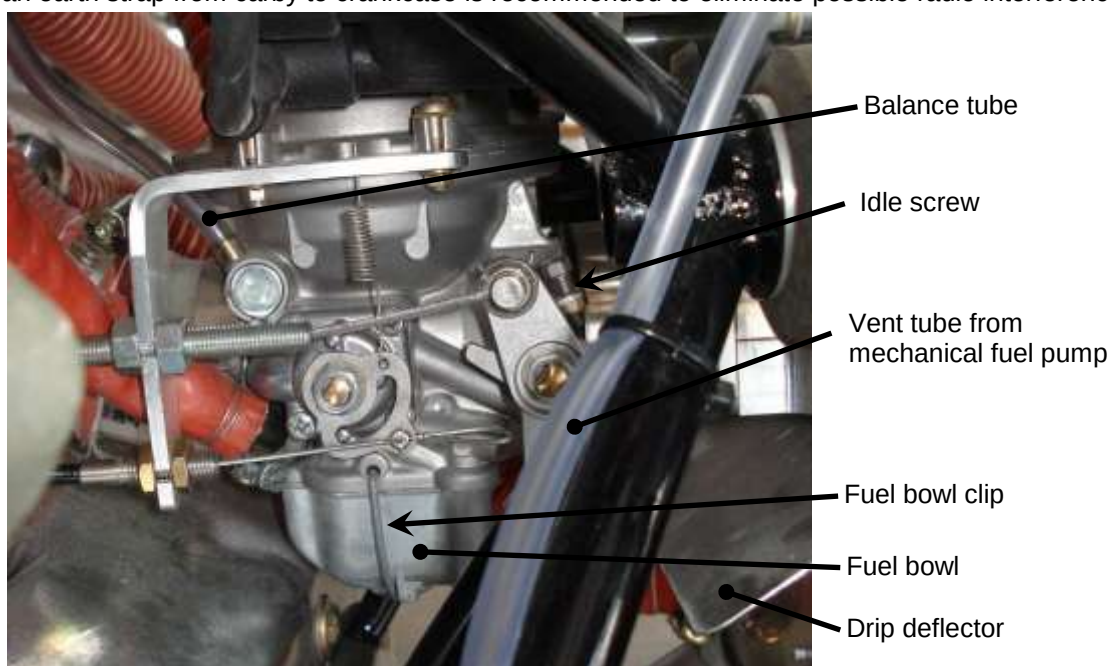


Figure 29. Carburettor Installation

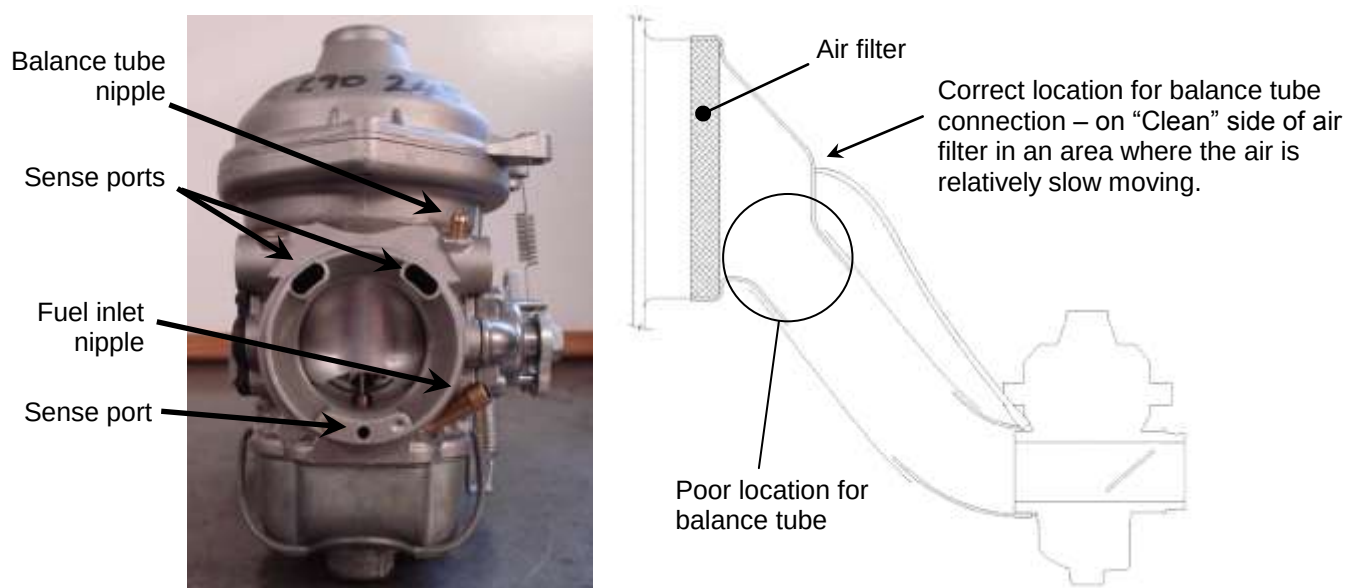


Figure 30. Carburettor Intake & Balance Tube Detail

5.5.1 Carburettor Operation

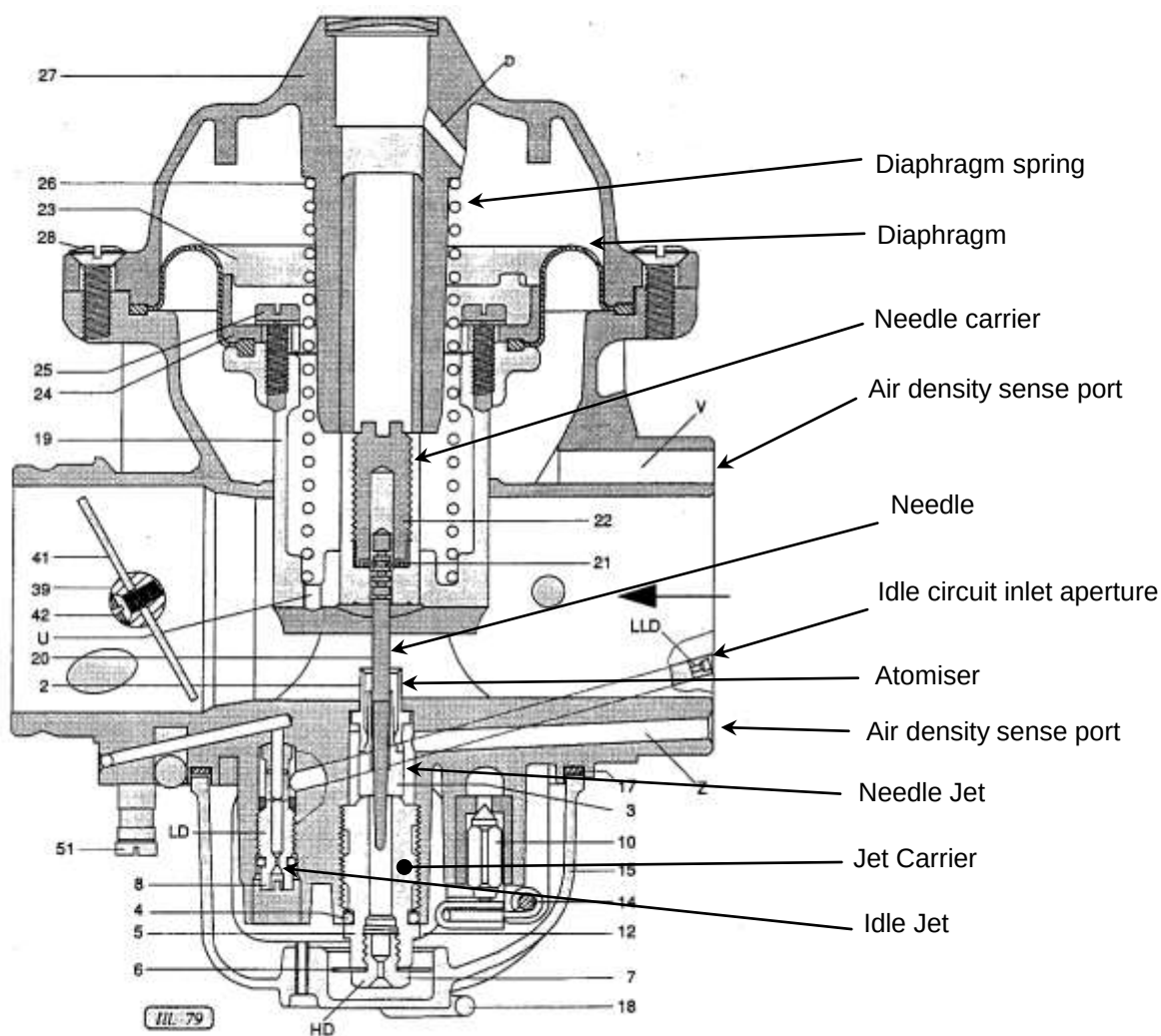


Figure 31. Carburettor Schematic

- The Bing altitude compensating carburettor uses bowl float level and two main air circuits – the idle and the needle/main – to control the mixture. Both circuits use jets to meter the rate at which fuel is allowed to flow. The jets are small brass parts with precisely controlled openings (both the size of the opening and the shape surrounding the opening affect fuel flow rate) which can be changed to adjust engine mixture.
- The main and idle jets have simple fixed apertures, while the effective size of the needle jet aperture varies, depending on the diameter of the needle. Figure 32 below shows three different throttle settings in the needle jet and the corresponding difference in aperture. On the left is a low power setting, where the needle jet is nearly completely blocked by the needle. The middle throttle setting corresponds approximately to a high cruise power setting. The gap between the needle and the sides of the jet is much larger. The final setting corresponds approximately to wide open throttle. The needle jet is now effectively not there, and the amount of fuel flowing is controlled by the main jet (located upstream of the needle jet in this circuit).
- The shape of the taper of the needle controls the mixture at a given throttle setting. The needle used in Jabiru engines been optimized for use with a propeller, which puts a very non-linear load on the engine; to double the RPM of a propeller a lot more than double the power has to be applied.
- To achieve a good mixture with the type of load applied by a propeller, the Jabiru needle uses two-stage taper and a straight tip. The more gradual taper at the upper end of the needle gives a leaner mixture in low-power cruise settings and at lower RPM where the propeller is using relatively little power. The sharper taper at the lower end ramps up rapidly to a much richer mixture at higher power settings. The straight tip of the needle is used when the throttle is wide open and the engine's mixture is being controlled by the main jet. This rich mixture at full power protects the engine from detonation.
- The transition from lean, cruise mixtures to richer full-power mixture will occur at around 2800 – 3000 rpm on 4 and 6 cylinder engines, when fitted with an appropriate propeller. For most efficient operation, the transition must be above cruise rpm. The transition can clearly be seen by changes in the EGT.

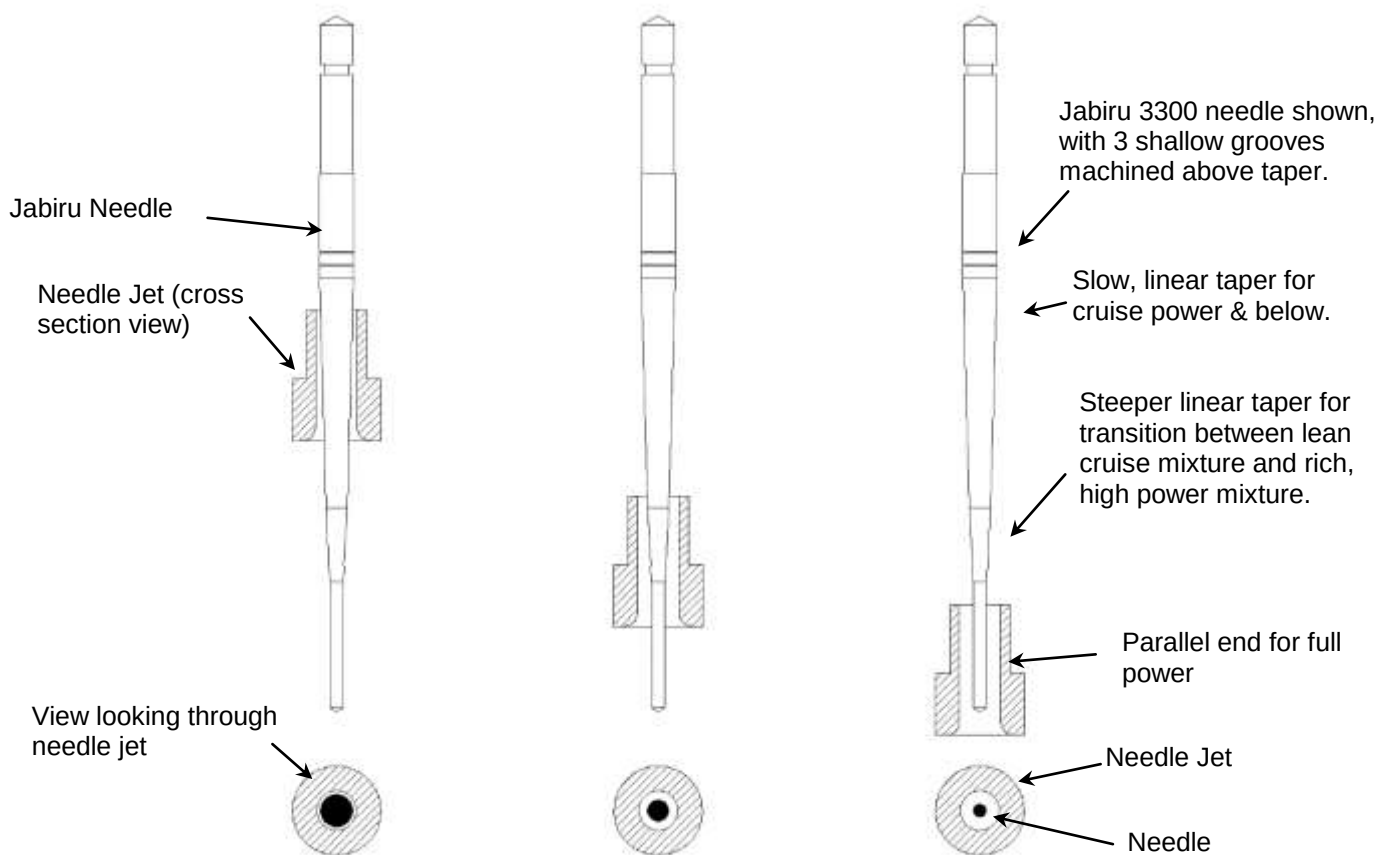


Figure 32. Needle Jet (Jabiru Needle)

- Because of the way the carburettor uses the sense ports and balance tube to regulate the mixture it is sensitive to the way the intake air moves, and to the conditions of the intake system.
- Section 6 below contains information on setting up the induction system.

**5.5.2 Carburettor Tuning**

- The mixture supplied to the engine by the carburettor is affected by a large number of variables, including:
 - i. Ambient temperature
 - ii. Propeller size (coarse or fine) and loading
 - iii. Whether the engine is cowled or open (by affecting the temperature of the induction pipes and carburettor)
 - iv. The airframe type
 - v. The intake system
- Because of these factors, we recommend that whenever a new engine installation is being developed that the engine be fitted with EGT probes and the tuning checked.
- Jabiru Aircraft or our local representative can provide assistance during this phase.

5.6 Fuel Lines

- Fuel lines are nominally 6mm bore.
- All hoses forward of the firewall require fire resistant sheathing (visible as an orange covering on the fuel lines in Figure 28 above). Note that wherever possible the sheathing should be extended past the hose clamp. The ends of the sheath must be held in place using safety wire to prevent the sheathing moving and exposing the fuel line.
- Fuel lines between moving sections such as between engine and firewall should be flexible. SAE standard automotive rubber hoses are adequate, provided they are protected with fire resistance sheathing.
- In many countries (including Australia) standard airworthiness requirements state that all flexible hoses must be changed every two years, though if there are visible signs of degradation (such as cracking or hardening) the hose should be changed immediately.