System Description of the Nanchang CJ-6 Pneumatic System
And Troubleshooting Tips V 1.0

By Craig Payne - ©2017

This article is intended only as a supplement to the CJ Maintenance Manuals, intended to better understand the overall system and how to apply troubleshooting logic to such problems when they occur.

The air system on the CJ controls and operates many of the same systems that many Western designed aircraft use electric-hydraulic operation. The CJ-6 systems include:

Engine Starting circuit
Wheel Braking circuit
Flap Actuation up/down circuits
Gear Retraction and Extension circuits
Emergency air charging circuit
Emergency operation of brakes, flap and gear extension
External air fill circuit
Engine-driven air recharge circuit

Systems Overview: Air pressure from either the external fill point, or system air from the Main air bottle is routed through the Air-Water filter to a Tee on the right (starboard) firewall. The check valve on the upper side of the Tee charges the Emergency bottle, while the lower side of the Tee is routed to the QDF-1 Air Solenoid Valve, the Main Air Pressure Gauge, and the rear cockpit Landing Gear valve. When the Main Air Valve is open, the Main Air Bottle is connected. **See diagrams**.

A check valve separates the Flap actuation circuit off of the Main circuit. The other side of the same Tee that isolates the Flap system is controlled by a check valve that allows air from either of the two emergency air valves. There is a Front Emergency air valve as well as a valve in the Rear Cockpit. Emergency and Main bottle recharging is continuous as long as the engine-driven Air Compressor is operating, or air is being supplied externally.

Air for the Braking Circuit is supplied from the Flap Circuit, through a water Deposit Filter, the QS-1 Reduction Valve, the aft Brake Pressure Relief Valve on the Rear Stick, and the QS-2 Brake Differential Metering Valve, controlled by Rudder Bar position. The QS-2 valve routes reduced pressure air to the Brake Bladders on each Main Gear.

Gear retraction and extension is driven off the Main circuit, routed through the Tee below the Main Air valve to the Rear Cockpit Gear valve. Placing the Rear Gear handle in the Neutral position enables operation of the gear from the Front. This interconnectivity operation is mimicked by the Flap circuit as well.

Engine starting is initiated by the opening of the QDF-1 Start Solenoid, which is activated by the Start Switch. The valve then routes the air to the engine-mounted Air Differential “spider” which supplies starting air to each cylinder, via a mini-check valve near each front spark plug. The spider is timed for about 7^0 to 10^0 After Top Dead Center (ADTC) on the power stroke. Since the start switch also activates the Starting Coil when pushed; spark is delivered to each cylinder about 25^0 ATDC from the trailing Magneto Rotor.

System Components:

Air Lines are 6mm O.D. aluminum, assembled with a sleeve, B-nut and 37^0 flare at each connection. Replacement consists of using ¼" 5052 line, drilling the metric B-nut with a 5/16" bit to insert a AN819-4D Coupling Sleeve and flaring the end to 37^0.

TEE's are metric equivalents to the AN824 Flared Tube Tee. Metric variations of "AN" hardware connect the system. All the Tees share the LD5 P/N.

Check Valves are one-way devices that prevent back flow and are used to isolate circuits. These valves require periodic maintenance to remove the effects of moisture in the system air, vibration and wear. CJ-6's are equipped with 6 check valves on the firewall, paired on each end of 3 Tees to separate air circuits. There are 3 Diverter Check Valves, one at each landing gear Uplock Release, to admit air from the Emergency system and 3 Diverter Check Valve Tees on each gear actuator on the Extension side to enable Emergency extension. Diverter Valves off of the Rear Flap valve are on the Retract and Extend lines. These are 1-way valves acting as check valves but can operate from two different sources. In total, there are 14 Check and Diverter Valves. **See Pics**.

Air Valves: The Main Air, manually operated valve, connects the Main Air Bottle to the system. Two other manual valves are arranged in parallel to connect the Emergency Air bottle to the Emergency system. All three Manual Valves share the same QSF-6A P/N. **See Pic**

PL-17 Deposit Filters, or "snot valves" collect moisture from the compressed air and contain it until manually released. One is mounted on the firewall, and another under the cockpit floor, accessed by the hinged panel underneath. **See Pic**

Air Pressure Regulator: P/N H2-5502-00 is a Tee with check valves feeding air in on either side. A regulator body on the bottom of the Tee can be turned to set a spring-operated valve, held in position by a stop nut. Air routed into this regulator from the Engine-Recharge circuit is wet and moist, requiring dis-assembly during every condition inspection. **See Pic**

Water Filter: The water filter does the important job of further removing moisture from the compressed air coming from the pressure regulating "pop-off" valve. Over the course of manufacture, two different filters were used; the short and the long. The original units were made of aluminum and will corrode in humid climates and should be replaced with a stainless-steel after-market unit.

Landing Gear Actuators have air ports on both the Extension and Retraction ends. The Emergency Diverter Valves are also ported to the Extension ends of each unit. **See Diagrams**

QDF-1 Solenoid Start Valve: This valve sides on the far-right (starboard) side of the firewall and when activated by the **Start Button**, releases high pressure air into the Air Distribution Spider, which an engine accessory. This Solenoid start valve must be maintained for rust build-up due to the steel lower end of the unit. This valve features a manual lever, which when depressed, opens the valve. I have rigged a wire pull system so that I can move the lever from the cockpit. Yaks use the same valve but also feature a foot switch to cause the engine to turn. **See Pic**

Uplock Releases were not fitted to all CJ's. The earliest CJ-6 with a 260HP engine was fitted without uplocks. Only air pressure kept them retracted. The CJ-6A was fitted with uplocks, allowing the gear handle to unload to the neutral position in flight. It is mechanical action that locks the gear in the up position, but is the Uplock Release's job to pneumatically release the gear, starting the Extension cycle. A simple piston is activated to push on the mechanical lock.

QSF-2A Landing Gear Valves (LGV) are fitted in the Front and Rear cockpits, with the rear unit configured as the Master valve, and the Front, the Slave valve. Placing the rear cockpit LGV in the Neutral position allows Front cockpit control of the Landing Gear.

Double Action Valves control flap position, either deployed or retracted. The Rear cockpit valve controls the Front Flap valve in the same manner as the LGV's are configured. **See diagram.**

Flap Diverter Valves are fed from the rear **Double Action Valve** which should be set in the center, or Neutral position to allow Flap control from the front cockpit. The **Flap Actuator**, fed by the Diverter Valves operate the Flap. When the aircraft is parked and air pressure bleeds down, a Bungee Cord in the Flap well keeps the Flap in the UP position. **Note:** The connecting nipples on the Flap Valves are all Male whereas the Emergency Diverter Valves feature a Female fitting in the center. Internally, they are identical.

QS-1 Pressure Reduction Valve: Brake pressure must be reduced to protect the **Brake Bladders** in each brake drum from over-pressure. The QS-1 is opened is opened by handles on the control sticks and the **QS-2 Brake Differential Metering Valve** metering is selected by rudder bar position: Right, Left or both Together within 15°. A **Brake Pressure Relief Valve** is mounted on top of the Rear Stick to allow an instructor to override a student's control of the brakes by venting brake air. I put a cotter pin through the actuating button so that a passenger cannot interfere with my brake control.

Flow Restrictors may be added to Landing Gear Extension circuits to dampen the sudden forceful deployment of the landing gear. These restrictors are merely small cones with .040" to .050" holes inserted between the air line sleeve and flare fitting on the Extension side of the Gear Actuators. **See Pics**

The Main Air Bottle is the larger bottle, located mid-ship on the starboard side. The smaller **Emergency**, spherical shaped air bottle, is mounted on the left (port) side. Both bottles are fitted with service drain plugs on the bottom which may be accessed from small hinged doors underneath each bottle.

Pressure Gauges: Most CJ's are equipped with a Main Pressure Gauge and two Emergency Gauges. These gauges are calibrated in Atmospheres. One standard atmosphere equals 14.7 PSI in sea level conditions. 50 atmospheres equal 735 PSI. Over a period of time, these gauges can accumulate a coating of aluminum scale and reduce their accuracy. A simple cleaning at the gauge pressure port corrects that. **See Pic**

External Air Service Port: The CJ features a ground service port that feeds directly to the firewall-mounted Fill Check Valve. For U.S. operation, drill and tap the old port cover and install a "Schrader" type 1/8" high pressure valve for use with a standard gooseneck that most shops use for Nitrogen strut service. Replacement of the rubber seal is both cheap and easy, keeping external air from escaping due re-filling.

Hoses: Flexible hoses are used for the Brakes and another for the Flap. These are metric and vendors like Doug Sapp stock them. Treat the life span of these hoses the same as on any other aircraft. They do deteriorate from ozone and flexing.

Pneumatic Circuits

After analysis of the system diagram, years of experience tracing lines and skinned knuckles, I have arbitrarily broken the overall system down into "circuits" for the purpose of understanding and troubleshooting. Please note that my breakdown ***may not*** correspond to what numerous experts routinely state on internet blogs.

External air fill circuit:

Filling the CJ air bottle begins by attaching the air bottle to the fill port and opening the Main Air Valve. Air

travels to the External Charging Check Valve (my description) on the firewall. Back flow is prevented by this valve. The air then goes through a Tee to the Pressure Regulator (Pop-off) and then to the Air-Water filter.

A line then runs from the output end of the filter, under the Oil Tank and to the Check Valve Tee on the right (starboard) side of the firewall. The upper Check Valve allows air into the Emergency System, is routed to each Emergency Pressure Gauge and Valve as well as filling the Emergency Bottle. It is this Firewall mounted Check Valve that holds the air in the Emergency System until one of the Emergency Air Valves is opened by pilot action.

Engine-driven air recharge circuits
Compressed Air is routed from the engine Air Compressor to the firewall mounted Deposit Filter. Since the air is heated by the action of compression, the steel line to the Deposit Filter is looped into a coil that serves to cool the air and allow collection of moisture in the Deposit Filter.

From the Deposit Filter, an aluminum line runs to the other Check Valve opposite the External Fill Check Valve and is Pressure Regulated. From there, air follows the same path as an External Fill.

Main air charging circuit
Starting from the Tee that feeds the Emergency Check Valve, Air also flows out the Lower Check Valve, feeding both the Main Charging Circuit and the QDF-1 Air Solenoid Valve. From the output side of this Check Valve air is fed to the System Pressure Gauge, the Main Air QSF-6A manual valve and the Rear Landing Gear Valve. ***The Main Air Bottle can only be filled when the Main Air Valve is opened while the Emergency Bottle is always filled through the upper right-side firewall check valve.***

Emergency operation of brakes and gear extension circuit
When either Emergency Valve is opened, Front or Rear, the Emergency Check (diverter) Valves on the landing gear are pressurized as well as the Uplock Releases, all through the firewall-mounted Check Valve, opposite the Flap Circuit Check Valve, the Flap Circuit and Brake Circuit is pressurized. **See Diagram**

If the Main Circuit is pressurized as well, the Emergency System may not be as effective as it could be when the Main pressure is much lower. For this reason, the Main System air pressure should be allowed to deplete. The pilot should wait until joining the landing pattern before opening the Emergency System. If the situation requires an immediate landing, squeeze the brake handle several times and cycle the flap.

Engine Starting Circuit
With sufficient air pressure at the bottom of the QDF-1 Start Valve, the pilot presses the Start button. If the battery has a sufficient charge, the solenoid on the upper part of the QDF-1 valve will open the valve with a loud “pop”. At the same time, spark from the Start Coil is generated by current flowing from that Start switch and pulsed sparking is sent to the Left Magneto trailing rotor finger, passing sparks to each cylinder.

Air from the QDF-1 Valve flows out the hose going to the air distributor mounted on the engine. The air distributor times feeds each cylinder air at about 7° to 10° ATDC. At the cylinder, a small one-way check valve admits air, pushing the piston down. Failed starts can result with low air pressure and a weak battery. Pilots often attribute the problem to other causes. **See diagrams and pics**.

Flap Actuation up/down Circuits
The flap circuit has a firewall mounted Check Valve, fed by the Main Air Circuit. On the other end of the same Tee, another Check Valve admits air from the Emergency System when one of the Emergency Valves is opened. Flap air is routed to each of the Flap Valves, front and rear. For normal operation of the Flap from the front, the Rear Flap Handle must be in the Center position. Flap Diverter Valves in the aft cockpit, Extend and Retract the

Flap. A Tee on the Flap Circuit runs to the rear Deposit Bottle and then to the Brake Circuit.

Main Gear Retraction and Extension circuits
Similar to the Flap System in operation, the Gear Circuit uses Main Air which is fed to the Rear Flap Valve first. When the Rear Gear lever is in the neutral position, the Front Gear Valve has control. The Rear Valve is the Master, and the front, a slave unit. **See Diagram**.

The Emergency Circuit functions only with the Extension side of the Gear Actuators and Uplock release. Emergency Check Valves are located on the Extension side. Flap is deployed as normal with the Emergency Air ON, but in order to deploy the gear down, the Emergency air pressure on the Diverter Valves must be greater than the Main Air pressure by enough differential to open the Diverter Valves.

Wheel Braking Circuit
Air for the Brake Circuit is supplied via the Flap Circuit. When Emergency Air is selected, a Check Valve on the firewall, opposite the Flap Check Valve, feeds Emergency air to both Flap and Brakes.

A Tee off of the Flap Circuit routes Brake air to a Deposit Bottle, located under the cabin floor. Next is the QS-1 Pressure Reduction Valve that drops air pressure down by a factor of about 10 times. Cables from each brake handle on the front and rear sticks will open this valve when squeezed, and send braking air to the Rear Stick Brake Pressure Relief Valve, placed there for an instructor to release pressure to the brakes, venting to the atmosphere. My aft stick button is locked with a cotter pin through a hole I drilled in it.

A rod from the aft rudder bar connects to a lever on the QS-2 Brake Differential Metering Valve. The QS-2 Valve sends air to both right and left sides when either front or rear rudder bars are centered 15° or less. If the rudder bar is pushed to one side, then the QS-2 Valve routes air to that side via hoses that run along each Main Gear leg. The hoses are attached to rubber Bladders that expand outward, pushing the brake pads against each Brake Drum. Rebuild kits are available for the QS valves.

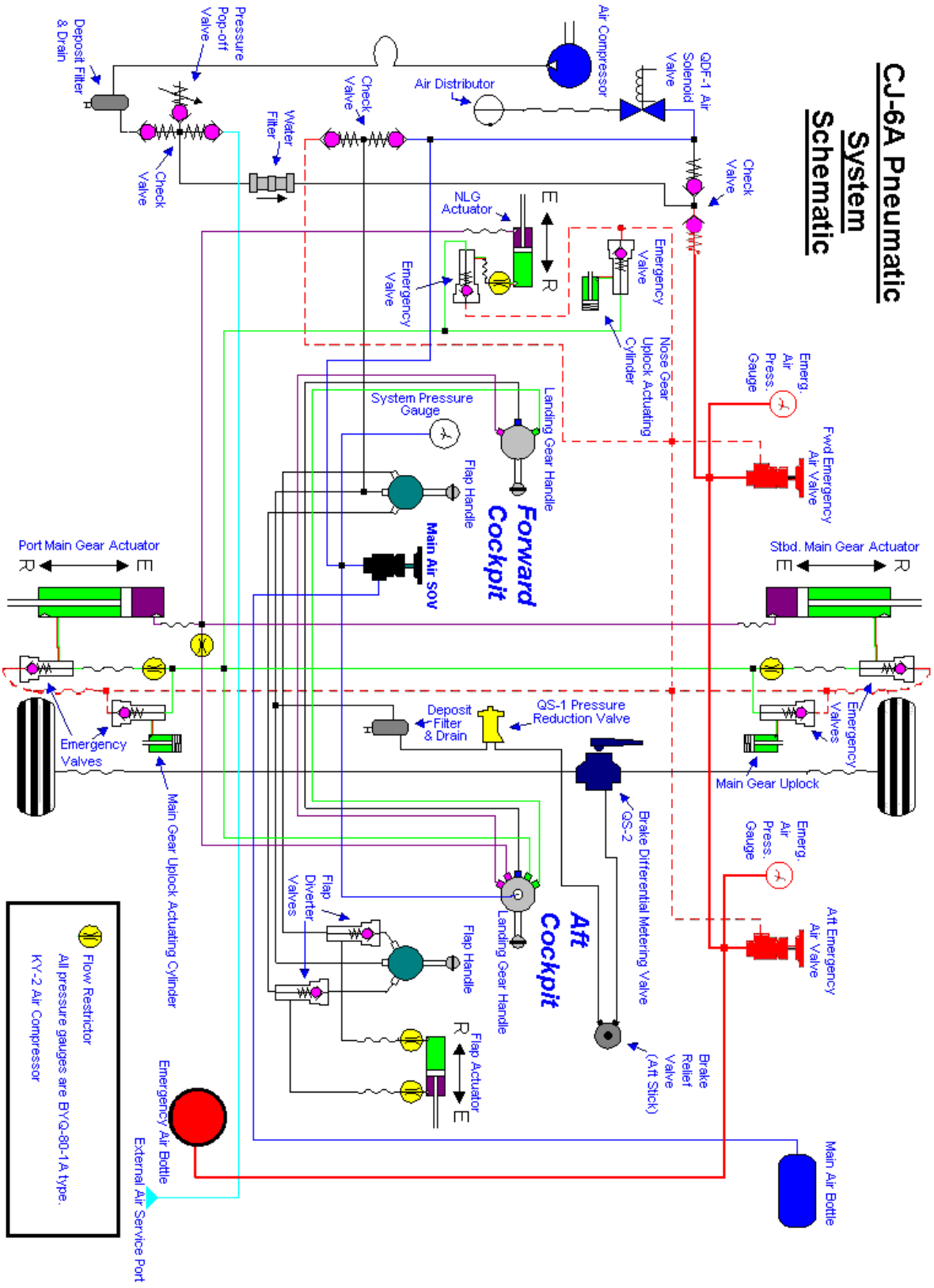
Troubleshooting Tips

Recognition of a Problem: Many times, we won't realize something is not right until it is broke. Take a disciplined approach to troubleshooting. For leaks, note the starting pressure readings on both and Main and Emergency gauges. Both circuits will charge to the same pressure, at least initially. Note beginning pressures and the time it takes to bleed down. So, with the engine started, the Emergency gauge reads 40 atmospheres while the Main gauge is at 30 after starting and drops to 25 after a few minutes. This says that the Emergency system is fine but the Main is leaking or the compressor isn't making air.

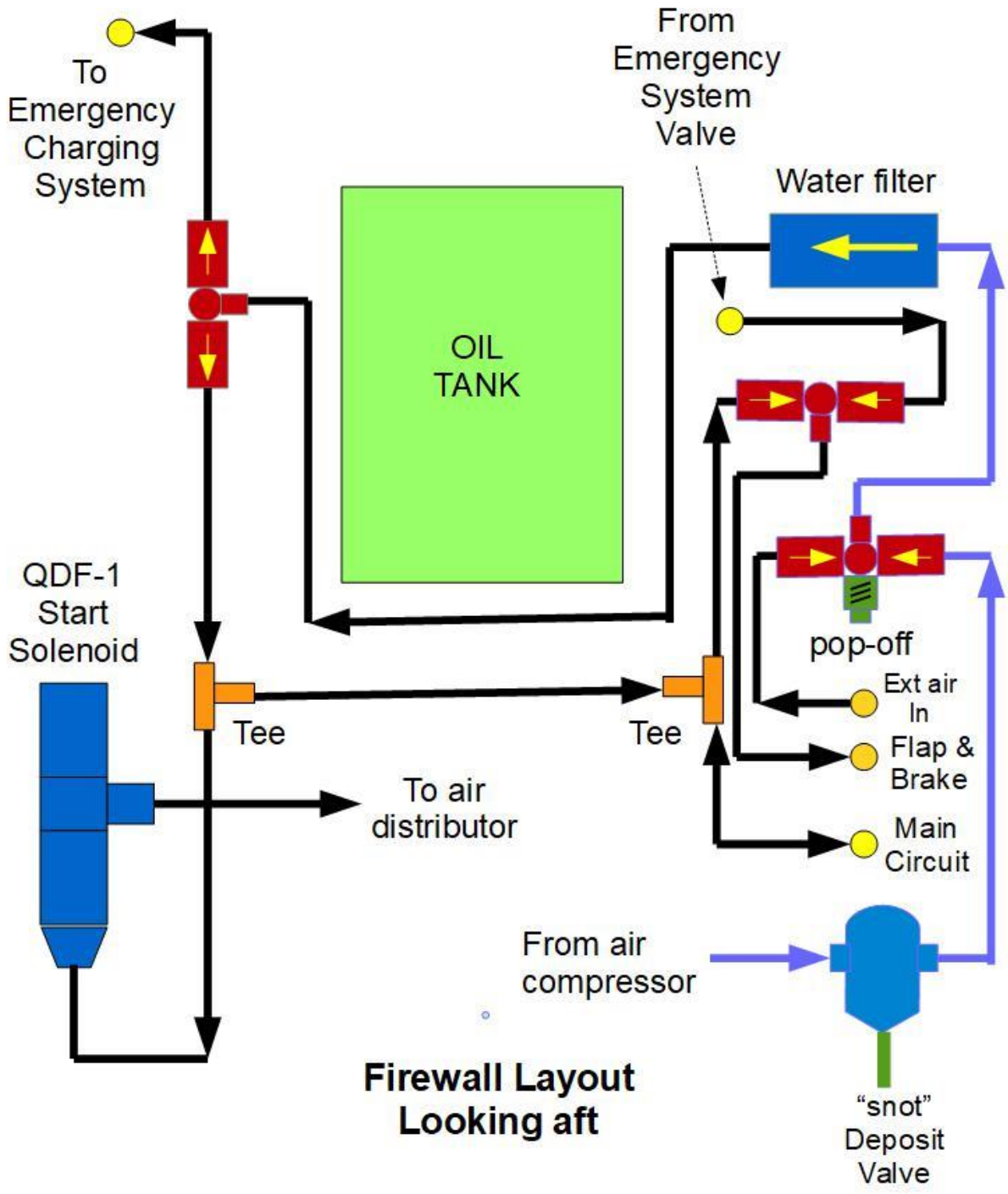
Testing with Engine Running:

- Was there a loud “hiss” of air from the start valve when the Main Air Valve was opened, and then a “Pop” as air pressure fills the system? If so, the start valve may be plugged with rust and the springs may be rusting or weak.
- Does the Main pressure stabilize when using no brakes? If so, suspect a leak in the brake circuit.
- Neutralize the front flap valve, does the pressure stabilize? If yes, then look at the flap circuit.
- Neutralize (careful not to select the up position) the Gear lever, does this help?

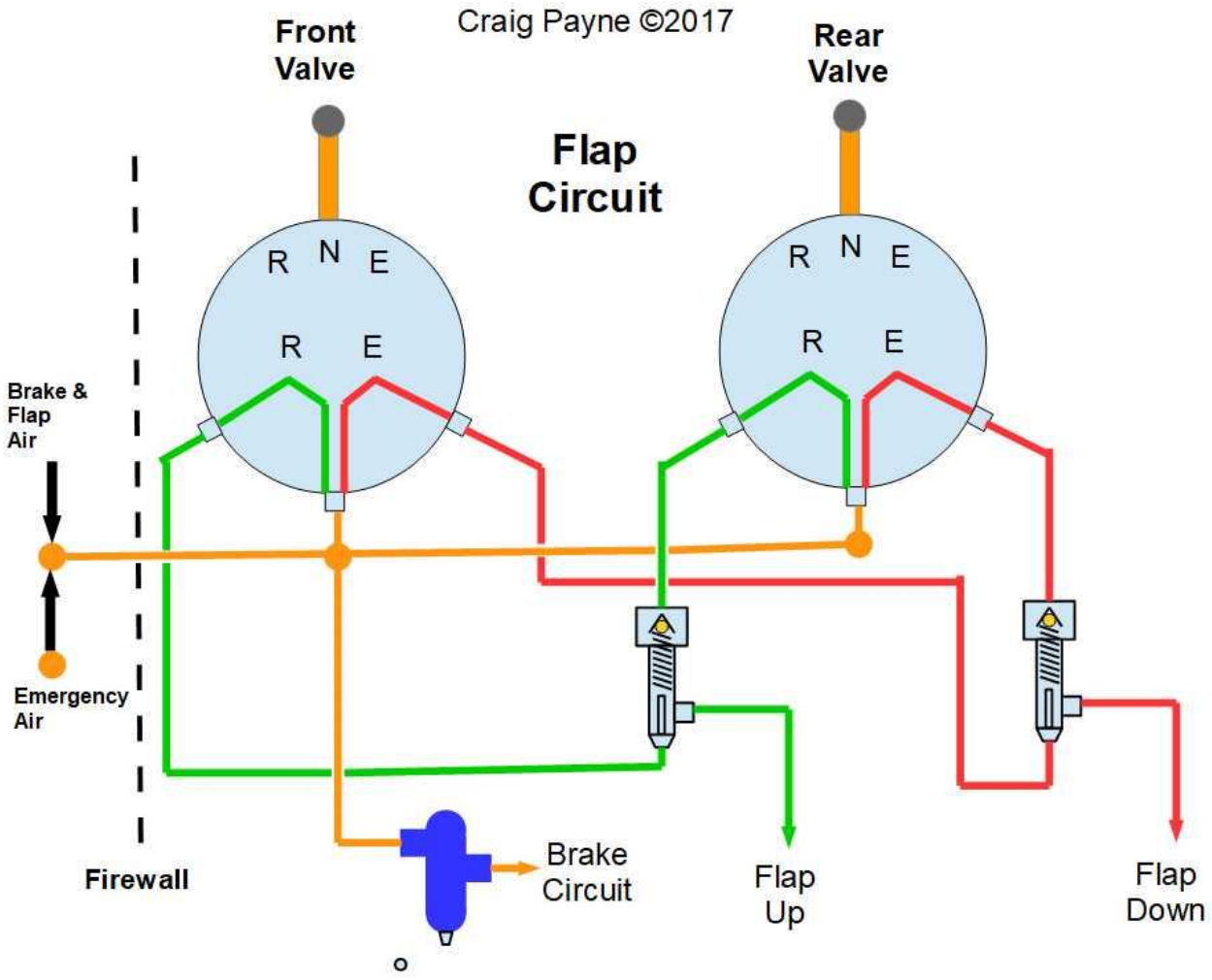
Static Testing, Engine Off: Leave the Main Air Valve **CLOSED**, and pressurize only to 300-400 PSI, and then turning OFF the external tank to save expensive air while troubleshooting circuits. Use the circuit blocking tools (see pic) to isolate the circuits and paths described above. If the output of the Air Compressor is suspect, run the Balloon test by placing a balloon over the output of the firewall mounted “snot bottle”, and pulling the front spark plugs. After a couple dozen quick flips of the prop, the balloon should at least stand out straight.



(public domain document)

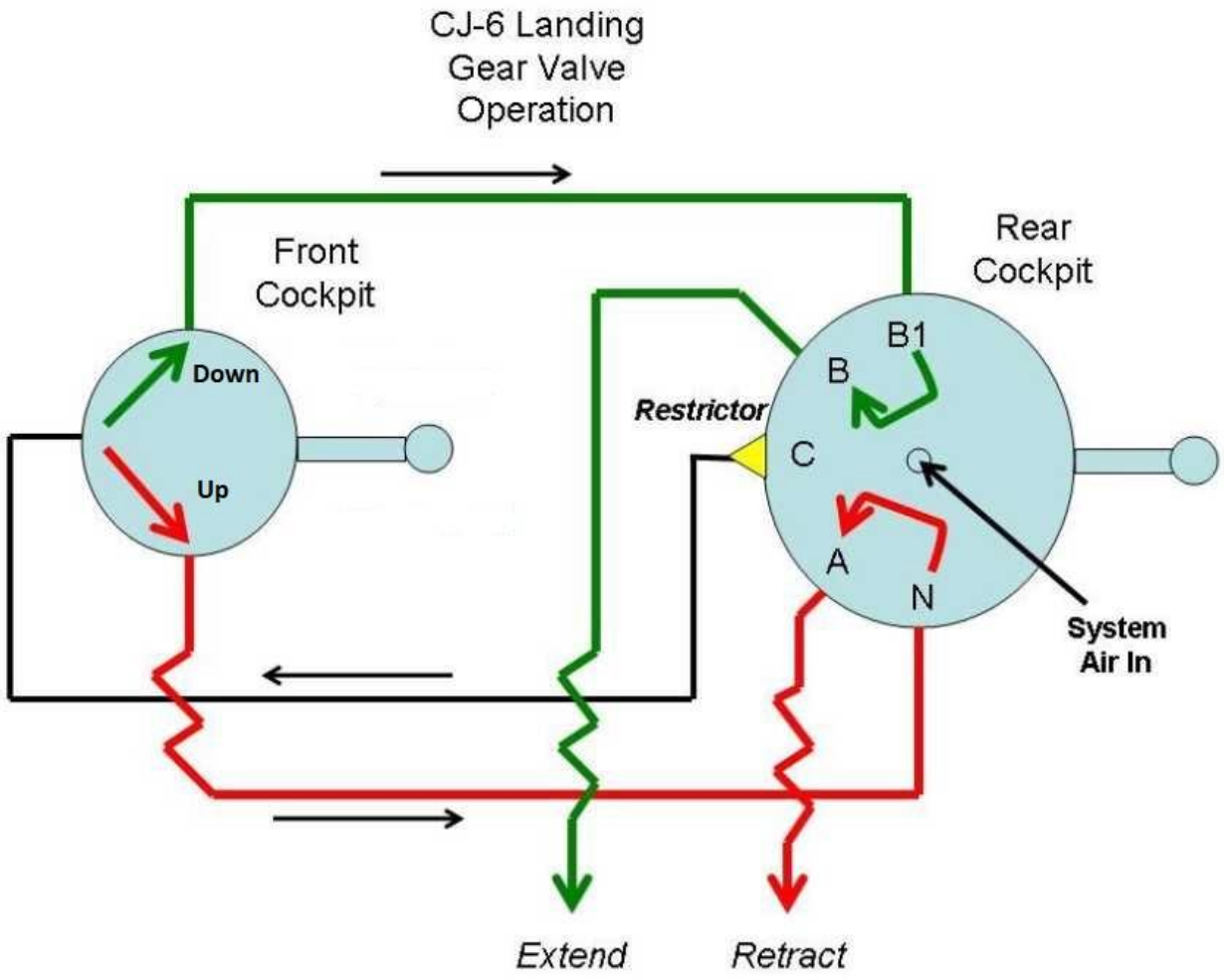


Firewall Layout
Looking aft



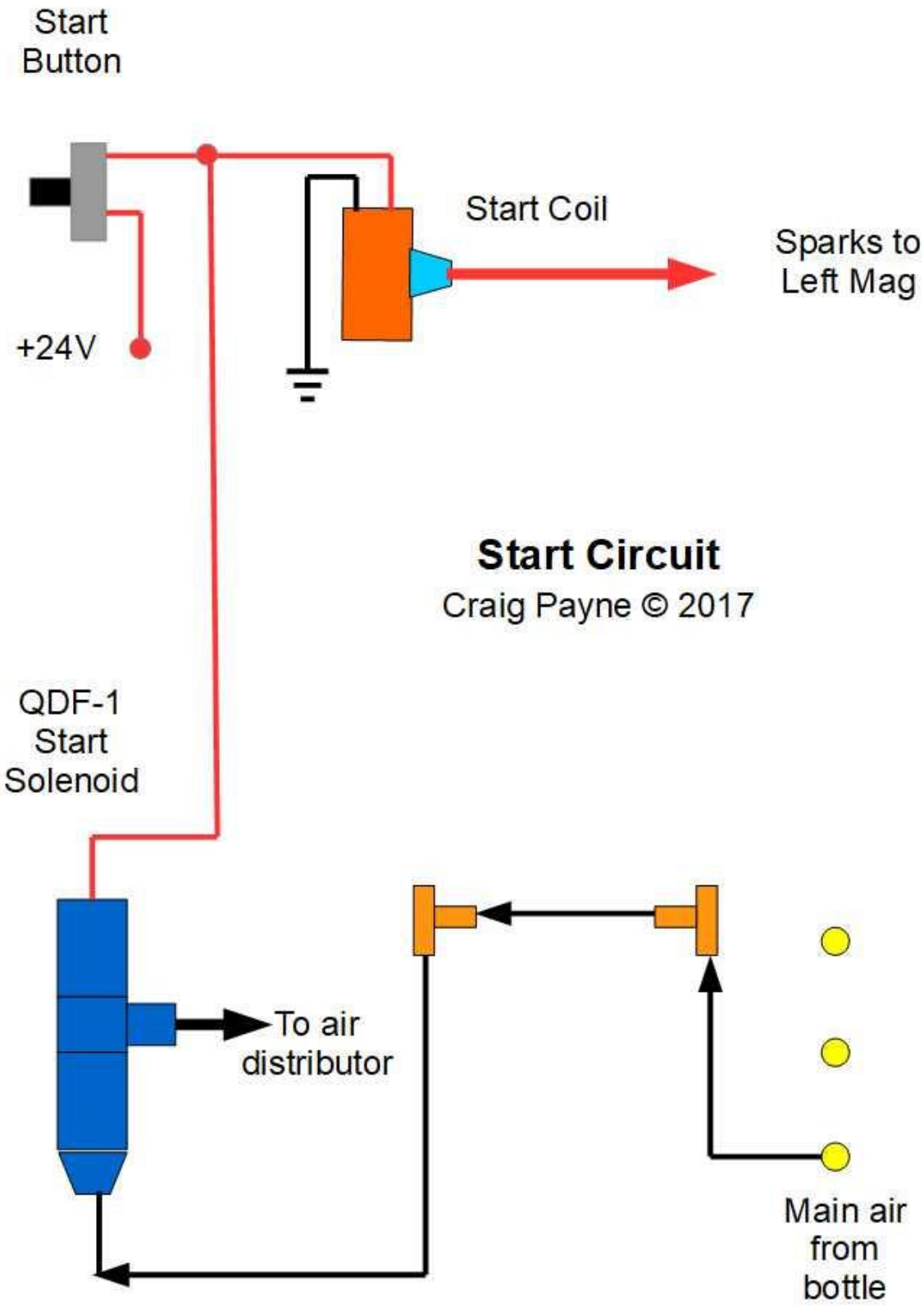
Looking at the Flap circuit, the Rear Valve must be in the Neutral position to allow the Front Valve to function. I safety-wire mine to Neutral but then keep wire cutters in the "ration box" so a ***Qualified*** back seater could use them in an emergency.

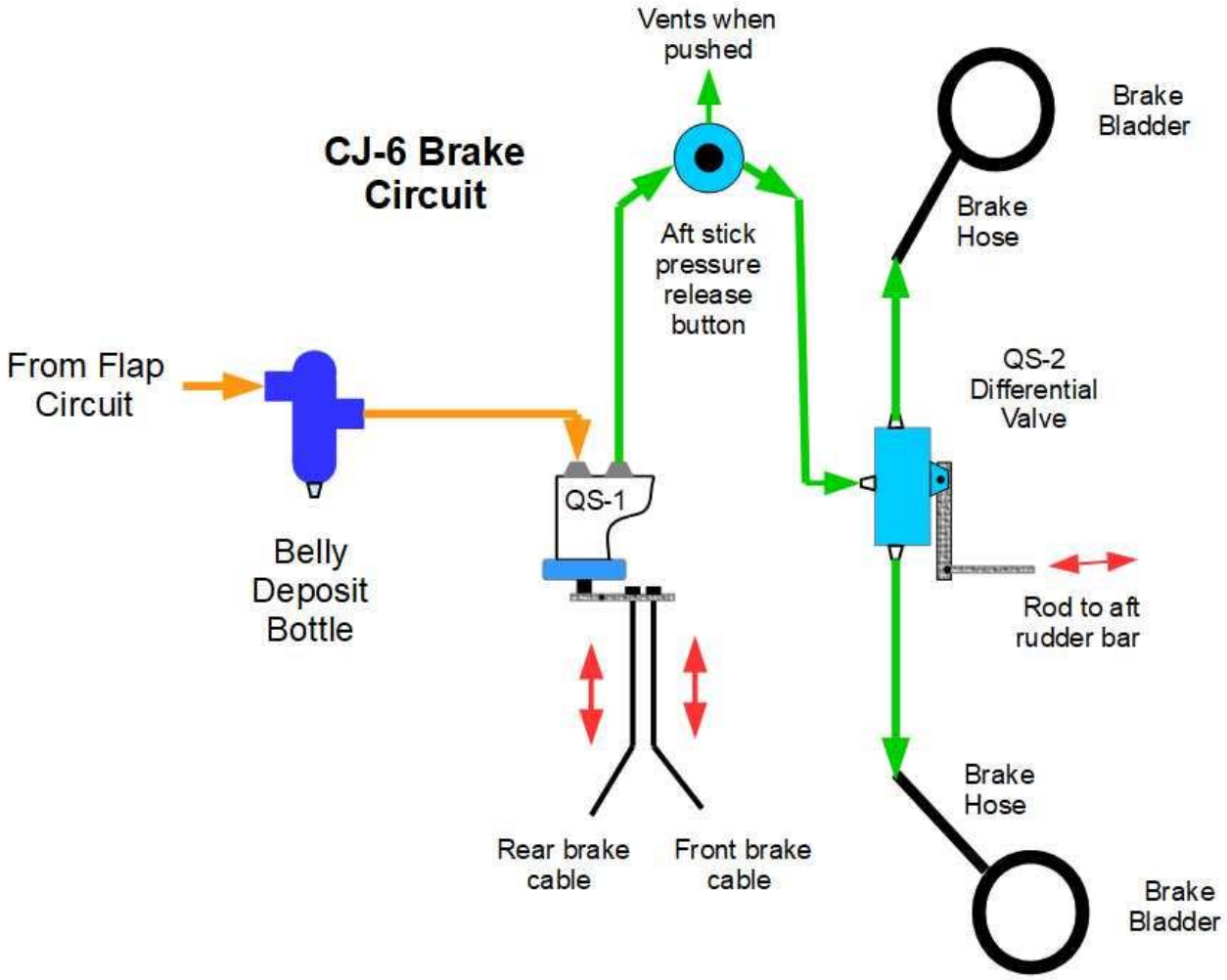
Emergency Air is routed from a check valve on the firewall and is NOT supplied directly by Diverter Valves on the Actuators like the Landing Gear Circuit. The Flap Diverter Valves differ from Gear Diverter Valves only by the Male Gender of the output nipple. P/N is H2-5510-00 but internal parts are identical to the H2-5522-00 Gear Diverter Valve.

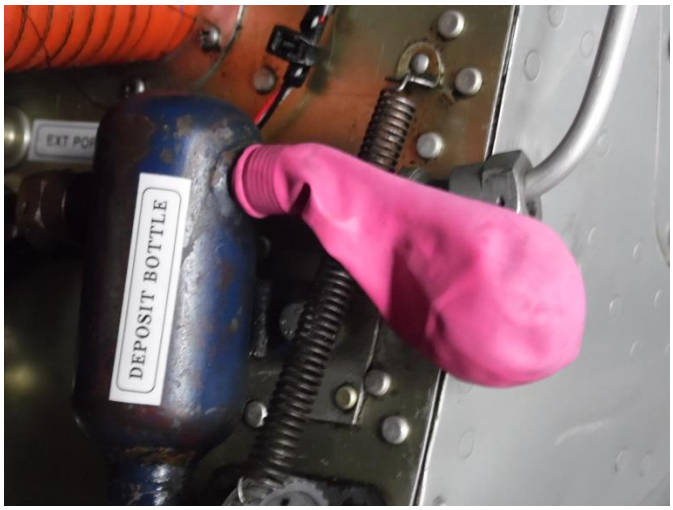


In normal and solo operation, the Rear Gear Handle is parked in the Neutral position, allowing operation from the front cockpit. In military training, the instructor in the back was able to override the student's control of the gear handle from the rear. I safety wire the rear handle in Neutral. Investigation of a mid-nineties double fatality in a CJ-6 found that the passenger had deployed the landing gear as well as the magneto switch to "0". While this was not the sole accident cause, it was listed as a contributing factor.

Protect yourself from passengers! Keep a wire cutter handy in the aft cockpit and brief Qualified pilots about the storage location.


Start
Button
Start Coil
Sparks to
Left Mag
+24V
Start Circuit
Craig Payne © 2017
QDF-1
Start
Solenoid
To air
distributor
Main air
from
bottle

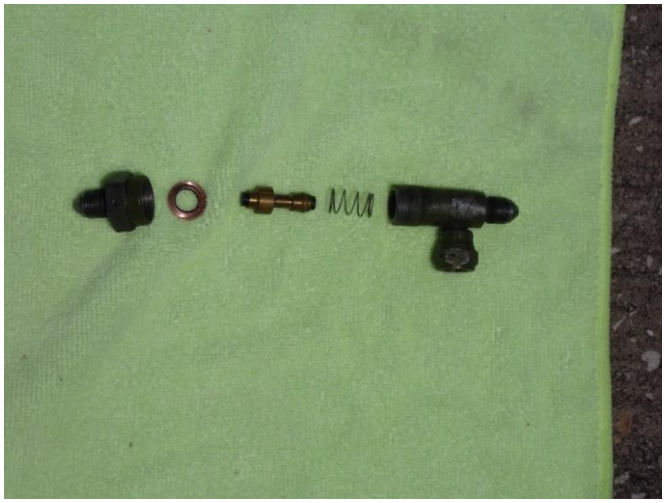




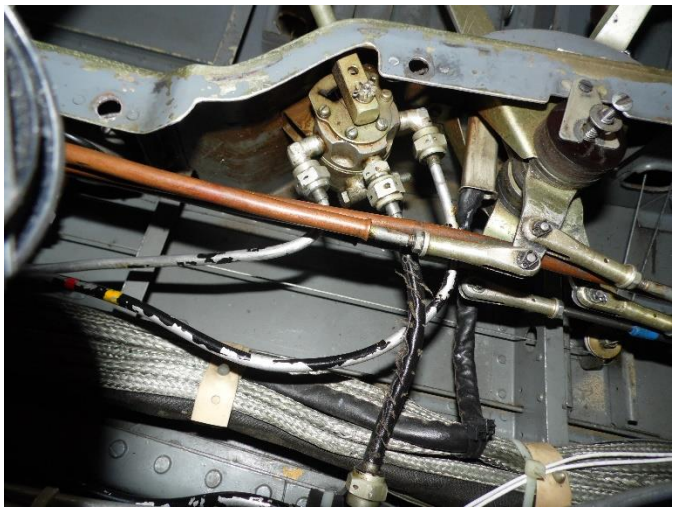
Balloon Test – see text for procedure

B-Nut has an un-drilled Restrictor inside

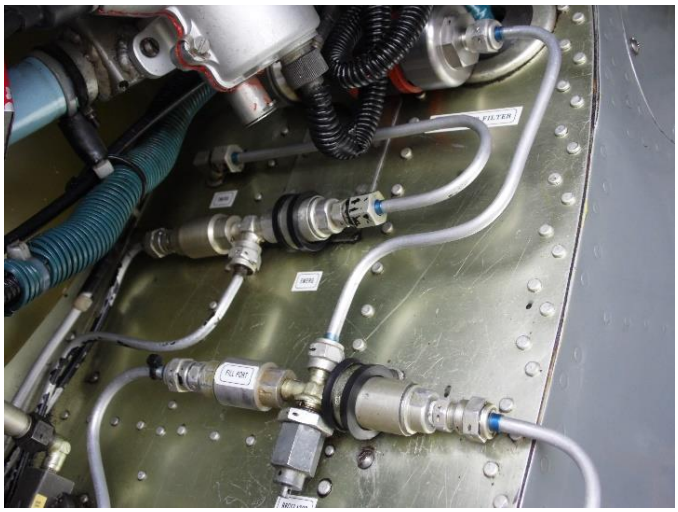
Drilled and Undrilled Restrictors



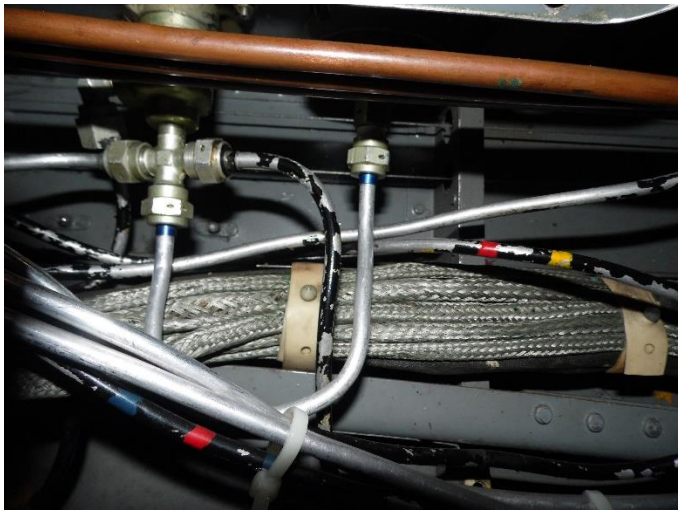
Gear Diverter Valve – Steel assembly that can crack due to years of movement with the actuator and hoses.



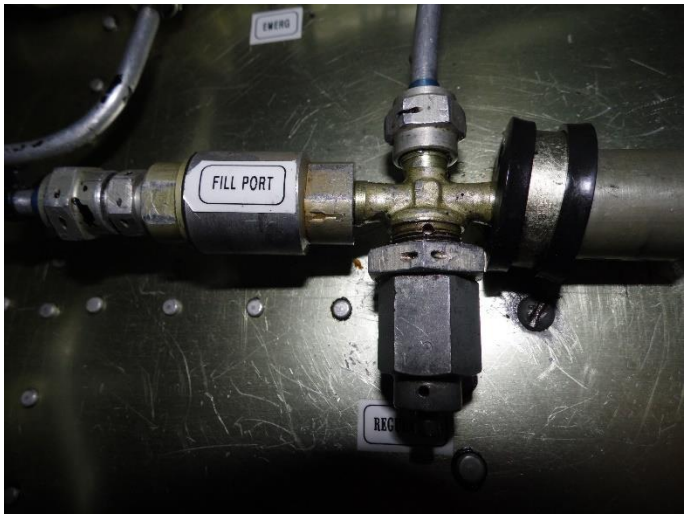
Front Flap Valve (Double-acting valve)



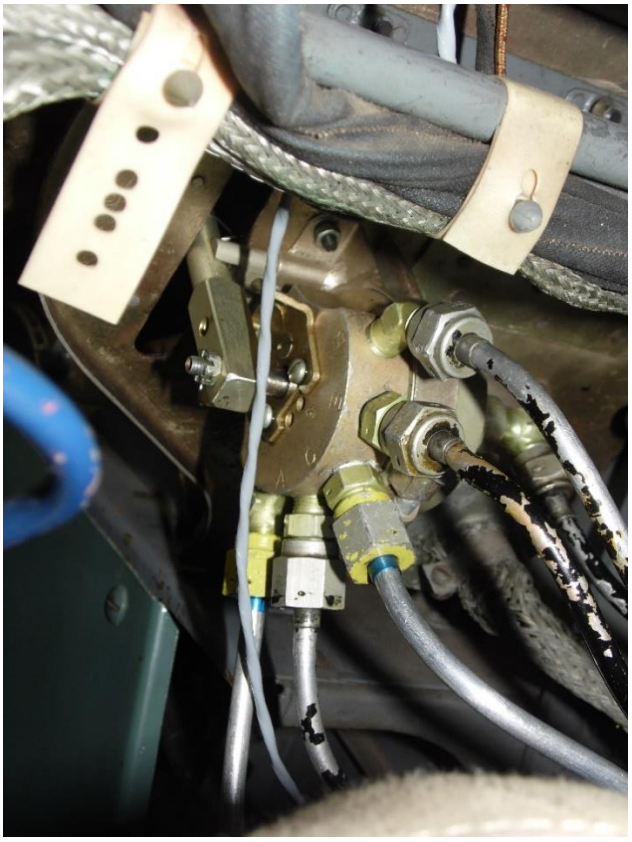
Left (port) Firewall Check Valves (4)



Main Air Valve and Pressure Gauge



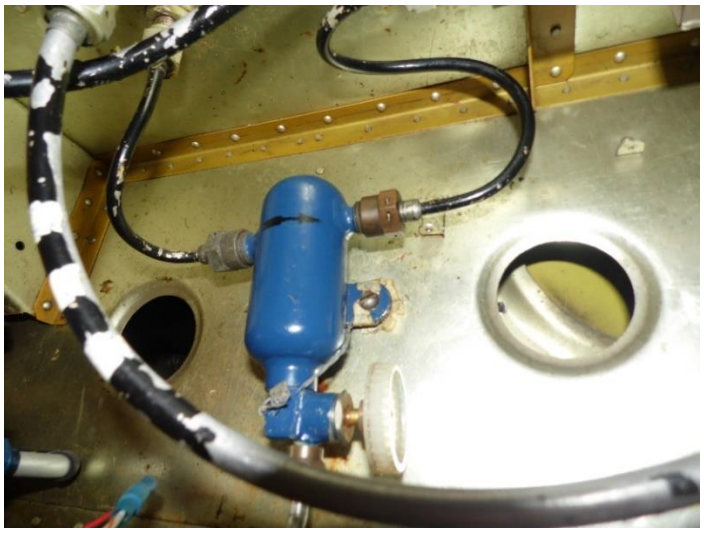
Air Pressure Regulator Valve



Rear Gear Valve - QSF-2A.
The front gear valve shares the same P/N but only uses 3 ports

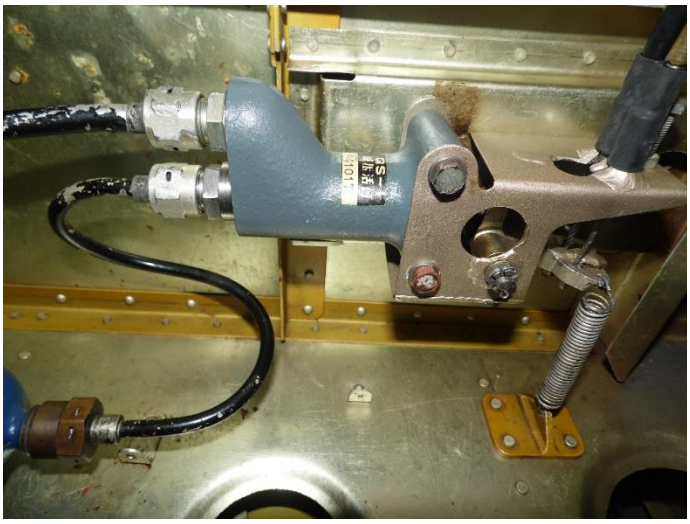
Right (starboard) Firewall Check Valves (2)

Main Gear Actuator (diverter valve in Red)

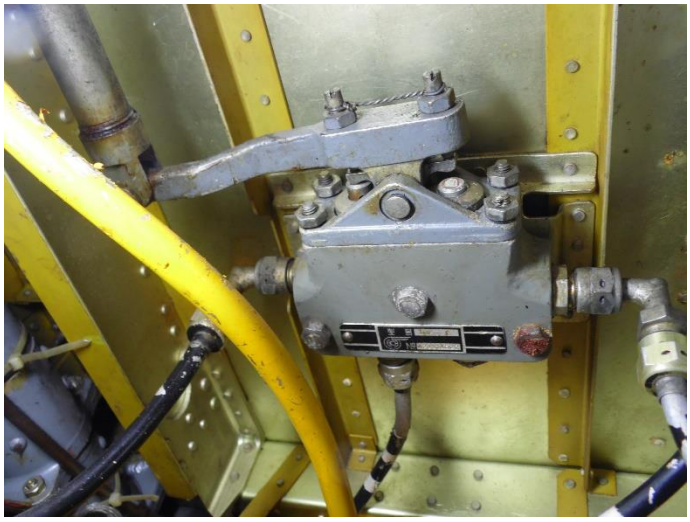


Deposit Bottle in belly – open at end of flying day

Movement of the Main Gear Actuator up and down, causes flexing of the air hoses as well as the Diverter Valve which can develop small stress cracks over years of use. Small leaks can be checked with an Ultrasonic leak detector since sound generated by these leaks is in the 40,000 Hertz range, well above what our ears can detect. See picture of my inexpensive unit below.



QS-1 Pressure Reducer
Doug Sapp has seal replacement kits for servicing



QS-2 Brake Differential Valve
Shaft on left connects to rear rudder bar. Valve Positions are Right, Left or Both.

Flap Diverter Valves in Aft Cockpit

Flap Actuator in Aft Bay

Rebuild kits or exchange for overhauled parts are available for most pneumatic devices. Devices such as the QDF-1 Start Valve may be interchanged with the equivalent Yak-52 part. Mr. Doug Sapp has expanded his catalog to include these services. Having the Airframe Part Overhaul Manual is also useful.

QDF-1 spread out next to service kit

QDF-1 Start Solenoid and Valve

QSF-2A Air Valve – (1) main and (2) emergency

Air Valve opened – cone does NOT turn but pushes down into seat. Check for rust & scale if leaking or fails to pass enough air. New, aftermarket Stainless Steel cone shafts are available. Re-plating the cone with chrome also reconditions.

Check Valve and insides

Check Valve – A one-way air flow device. The spring can rust, "goop" accumulates and the rubber seal wears out. The flat sealing ring sealing the two halves may be OEM lead or aftermarket Flat O-ring. "Leaking" check valves are not as common as gummed up with oil and water mixture. There are (6) of these on the firewall, configured in pairs, attached to TEE's. They act to separate and define the different circuits described above. On the Left firewall, two pairs feed into a single TEE's, feeding circuits but on the Right firewall, the pair *Separates* two circuits.

Restrictors – Small aluminum cones that are drilled to restrict the rate of flow, but not pressure. I use #57 to #55 bits (.043" - .052") but even a larger .060" hole will still slow down the sudden transfer of air into gear actuators.

Problem Causers

It is moisture and oil mist that corrodes and/or gums up the system. Moisture from the air that does not get removed by the deposit bottles and air-water filter. Oil mist is ingested from the air compressor, through the intake filter. Allowing to remain in components over time results in "goop" and corrosion.

- Hose flexing and exposure to ozone in the air affects the brake, gear and flap hoses. The extension hoses on each main gear actuator move with the cylinder. The result is cracking before the other non-moving hoses require replacement.
- Gummed up and corroded Check Valves; especially the Pressure Regulator and rightmost Check Valve.
- Rust in the QDF-1 Start Valve from moisture in the lower housing gets into the moving portion.
- Cracked air lines under the B-nuts from over-tightening and work hardening. The lines to the water filter probably get taken on and off most often.
- Gear and Flap valves also suffer from corrosion and "goop". I use small amounts of WD-40 although powerfully worded posts on internet blogs warn dire consequences if used. But none of those folks take care of my airplane.
- Scale, from aluminum corrosion at small openings such as the Air Valves and Pressure Gauges. The presence of scale is the result of a build-up over long periods of time, rather than annual to annual.
- Corrosion, leading to pin holes in the Air bottles from lack of routine maintenance.
- Gear Actuators have seals that wear against the metal cylinder. Dirt (fine grit) and "goop" will accelerate wear. I service the air-water filter at regular intervals and add small amounts of WD-40 to the cylinder during annual inspection. External rust-through is also possible when airframes sit for years.

Common Maladies that Cause Grief

While not dangerous to flight, not getting the engine started can ruin your day, weekend or vacation. The pneumatic system is integral to starting unless the aircraft has been fitted with an M-14 with electric starter.

In many instances, the left magneto, spark plugs or even air starter timing is suspect when the prop turns over slowly and sticks in one position. Often is not just one issue but a combination of problems that result in this condition. When the prop "sticks", it usually stops on the compression stroke, due to the resistance to turning. The usual response is to get out, turn the prop a few times and maybe it starts because the prop had a bit more momentum before compressing one of the cylinders.

What's really happening could be the result of one or more factors. Let's begin by following the start sequence:

- Preflight per checklist completed
- Prime for start
- Get out of the airplane and pull prime through to check for hydraulic lock
- Open (then close) intake drains to remove excess gasoline
- Strap in and configure cockpit for start
- Switches on, check battery voltage***…this may be your first indication of a problem if low***
- Open Main Air Valve and check pressure ***…also could be a problem if low***
- Mags and start switch per check list- procedure varies with magnetos and engine type
- CLEAR PROP!
- Press Start Switch
    - Battery voltage flows to BOTH QDF-1 Start Solenoid and Start Coil
    - Prop turns and engine starts to fire, add a shot of Primer if needed
    - Mags full on to "1 + 2"
    - Warm up engine

OK, let's say it didn't go that way. First, switch off Magnetos and close the air valve to preserve what is still there.

Question time:

- Has the airplane been starting normally up to now? Think about that, was anything amiss?
- Did the battery voltage look normal? Perhaps it did but if the airplane has been sitting for a week, perhaps it's not. Let's test:
    - Try a start again but without opening the air valve. We want to hear the Spark Generator buzzing, let's say that sounded OK
- Open the Main Air valve again and try to start again, you should hear a solid "Pop" and maybe another shot of prime.

So, the prop "stuck" but the pressure looked OK on the gauge. Next step, switches off, chock and find another CJ or Yak pilot to stand in front of the right wing-root and manually depress the Start Valve lever when attempt a restart. Signal him when you press the start switch.

If the result is still no start, get a battery charger, or swap out the battery with another airplane, refill the air. If the result is the same, it's time to find a hangar. After opening the cowl, look at the firewall behind the QDF-1 Start Valve. Can you see brown rust stains? If so, pull the valve, disassemble and clean.

Real Life Examples

We all know that *stuff* happens, especially at the most inopportune moments, such as being away from home. Maintenance and preparation can reduce those days but **recognition** that something is going wrong cannot be ignored.

It is not always just one thing, other problems can occur when more than one component is “broke”. Troubleshooters must break down each symptom into probable causes.

Case 1: “Maverick” has arrived at SUN ‘n FUN and shuts the Main Air valve, noting that the pressure bled down to 25 atmospheres. No worries Mate, Mav has a SCUBA bottle in the back. After startup for the air show, the pressure is dropping and then stabilizing at about 12 atm. On the long taxi-out in the Conga Line, Mav sees that pressure is actually dropping lower and returns to parking.

Short Story: three weeks later after catching a ride home, Mav returns and finds a “goopy” check valve in the Charging Circuit is losing air, but it took his SCUBA bottle and another to find that out. Even after fixing that leak, air pressure diminished during the taxi. Consensus was that a downstream leak in the braking circuit was losing air and that air pressure would build up in flight. This was the case and Mav went home safely but it took a few more weekends to locate the cracked brake hose.

Case 2: “Ace” worked on his airplane before the fly-in but during recovery from a formation flight, the nose gear would not lock down. After 20 minutes of violent maneuvers, the problem remained and Ace set it down nice and smooth with Mags off, next to his chase wingman and the nose settled on the runway. He did such a great job that only two prop blades, a flap and lower cowl repair were required.

During post-mortem of the “incident” (not an accident), Ace realized he had cracked a Main Circuit line when he over-torqueing a B-nut in the main circuit. Had “Ace” followed check list procedures first and then used the Emergency system before using up his all of the air, a non-eventful landing may have resulted. Each Gear Actuator has Ball Locks that hold position when fully extended.

Case 3: “Speedy” notices that his Main pressure gauge seems “flakey” but since the Emergency gauges seem to be good, Speedy ignores the problem. When it came time to leave, the engine would not start because there did not seem to be any air pressure. After an embarrassing tow to a hangar, the problem was presumed to be that air was not charging the bottle. A week later after hours of work in Florida summer, Speedy pulled the Main Air Valve and Gauge. What he found was that corrosion scale blocked flow to and from the Main Bottle and Gauge also. A few minutes later and all was good.

Note white/gray scale deposits at line ends

A Powerful Tool – I wish I had one years ago.

Finding a leak can be problematic. My first suggestion is to determine which circuit is leaking and proceed from there. Early into my ownership, I used my ears to listen for audible leaks. Works for loud leaks if you can get to the location before the system air is exhausted. Quiet places are best but hard to find at busy airports.

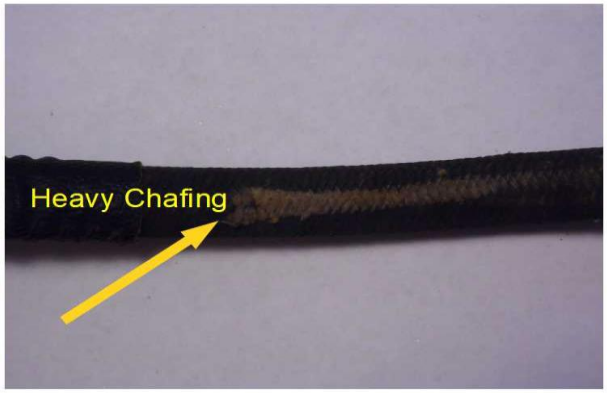
Spraying soapy water into fittings also can be useful but sometimes the leak is not in a visible location or hard to get to. Many slow leaks can be detected this way.

And then there is the Ultrasonic leak "sniffer". It works by "hearing" high pitched leaking air in the 40,000 Hertz range. Most instruments have adjustable sensitivity, which is useful at lower pressures for pin pointing small leaks. Prices range from $50 and up. They work very well but better than that, they can quickly check several locations before all the air runs out. I am amazed by what my cheap $50 "ear" can find.

Warning:
Since manufacture, these aircraft have been serviced and modified, both in China and in the West after importation. Undocumented changes may have been made. The smallest, yet meaningful, is the removal of Flow Restrictors from Gear and Flap fittings. It is placement of these little cones that prevent forceful and violent extension of both landing gear and flap. I have placed these devices to slowly deploy and retract, saving wear from shock and vibration.

Miscellaneous Stuff

Don't ignore the hoses. The main gear hoses are subject to movement from gear swings, weather, FOD and dirt coming off whatever you are landing or taxiing over. Keep clear from chafe and look for cracks. There is a problem, it's hard to detect hose cracks. The quickest way I know of is to check hoses right after flying when system pressure is still present on the gauges. Use the Ultrasonic "sniffer" and run it over the hoses in the wells.



Brake Bladder – Heavy rubber pushes against thin metal clips and the brake blocks.

External Fill Port Mod

The center of the tab was milled and a 1/8" high-pressure Schrader valve was inserted into the tapped hole. The Schrader will work with or without the actual valve. Without the valve, pressure is contained by the External Fill Check Valve on the firewall. Leaving in the needle valve limits the amount of loss when the fill hose is removed.

Reference Publications the CJ-6 Owner or Mechanic should have

Most are available in .pdf format

- CHUJIAO – 6 Airplane - Technical Specifications for Service and Maintenance
- PT-6 Trainer Maintenance Manual Vol I - Aircraft and Engine
- PT-6 Trainer Maintenance Manual Vol II – Instrument and Electrical Equipment
- CJ-6 Trainer – Illustrated Parts Catalog
  - Vol 1 – Structure, Landing Gear, Control System, and Pneumatic System
  - Vol 2 – Powerplant and Special Equipment
  - Vol 3 – Standard parts, Tools and Ground Equipment Delivered with Aircraft
  - Vol 4 – HS–6A Engine
  - Vol 5 – Electrical Equipment, Instrument and Radio Equipment
- Type 6 Primary Trainer – Pilot's Flight Manual
- PT-6 Trainer Aircraft – Overhaul Manual (Airframe Accessories) See Doug Sapp

Other Publications for Vendenyev M-14P engine conversions

- M-14P Maintenance Manual – Jan. 1989
- M-14P Parts Catalog

Misc. published materials are available in the Red Star Pilot's Association archived copies of the Red Alert.

Pressure Conversions

Atm	Pounds per square inch (PSI)	Kilograms per square meter (kg/cm^2)
1	14.7	1.033
10	147	10.33
20	294	20.66
30	441	30.99
40	588	41.32
50	735	51.65
60	882	61.98