A handy guide to the cockpit, its controls and how to fly your new Ford Trimotor!

GETTING TO KNOW YOUR FORD TRI MOTOR.

Microsoft Flight Simulator

KNOW THE TRI-MOTOR

The developers have made every effort to simulate the various systems and flight procedures of the Ford TriMotor with as much accuracy as possible. Starting old, and in this case vintage radial engines is a tricky business requiring discipline and several hands.

Remember, you will be flying a vintage aeroplane built in 1927. The Ford was built by a car manufacturer, so it is not unusual to find automotive technology and building technique built into the design. In fact, the control columns are topped by standard Ford Model T steering wheels and the braking system is just like a car's. All the major systems like oil, fuel and mechanical linkages are based on automotive practice.

Speeds are not exactly electrifying but this aeroplane is still a handful unless you are careful - especially around stalling speeds.

Powered by three radial engines with inertial starters, there are clearly-defined procedures which MUST be followed to start and operate the motors correctly. You will also find the braking system interesting, to say the least, requiring some practice to master.

DIMENSIONS

WingSpan..74 feet
Length..49 feet
Height (at rest)...................11 feet 9 inches

WEIGHT

Empty:..6,500 lbs
Gross... 10,130 lbs

POWERPLANTS

3 X Wright J-6-9 Whirlwind 9-cylinder, air-cooled radial piston engines developing 300hp each.

PERFORMANCE

Maximum speed.......................132 m.p.h.
Cruise speed......................110-115 m.p.h.
Stall speed................................ 57 m.p.h.
Range... 560 miles
Service Ceiling...........................16,000 ft.
Rate of Climb.....................920ft/per min.

Other figures of interest:

Crew (inc. Steward.......................3
Passengers............................ up to 9

GENERAL LAYOUT AND FEATURES OF THE TRI-MOTOR

THE COCKPIT

The Tri-Motor has a simple cockpit, befitting of a vintage aeroplane. It does have one or two advanced (for the day) features and several quirky ones.

Let's start with the panel(s).

The default or Standard panel is based on examples of 4AT-Es with one or two additions to make life a little easier for the crew. An RMI and VOR/ADF gauges are added and operate in conjunction with a basic radio set mounted on the right cockpit wall. NOTE: with this old-school panel you will NOT find a baro-pressure scale and/or adjustment knob.

There is a knob/button to the left of the Chronometer (17) which you can use to switch out the Standard panel to an "Alternate" or " Modern" panel .

THE STANDARD PANEL.

1. Altimeter
2. Airspeed Indicator
3. Tachometer
4. Fuel tanks contents
5. Vertical Speed
6. Turn and Bank Indicator
7. Chronometer
8. Volts/Amps meter + 8a. Switch
9. VOR (Nav1) and ADF Indicators
10. R.M.I with Glideslope Indicator
11. Center Engine Gauges
12. Inertial Starter Solenoid Switches
13. Master Battery Switch
14. Generator Switch
15. Lighting Switch Panel
16. Lighting Rheostats
17. Toggle Switch for Alternate panel

The "Alternate" panel repositions instruments to allow for the inclusion of a Sperry Gyro-Pilot. The Sperry will be covered later in this manual. The "Modern" Panel consists of a GNS530, GNS430, KP140 Autopilot and a Transponder.

With this combination, together with the modern "Cessna-style" instrumentation fitted to this panel, you have everythig you need for today's style of IFR navigation. There's even a fully functional HSI.

THE ALTERNATE PANEL.

18. Sperry Gyro-Pilot

RADIOS (Old school)

19. NAV 1
20. COMS 1
21. ADF

THE MODERN PANEL.

22. GNS 530
23. GNS 430
24. Transponder
25. AP140

ELECTRICAL SYSTEM

You will find all the systems, including the electrical circuit, are very simple and follow standard automotive practice. Remember, Ford was used to manufacturing motor-cars so it was only natural that they would transfer that knowlege and method to an aeroplane.

The Tri-Motor is fitted with a basic 12 volt, 13 or 19-plate battery. This is kept charged when the aircraft is operating, by an engine-driven generator. The generator output in Amps can be monitored by using the joint Amps/Volts meter **(8)** on the panel.

The Battery condition is monitored by selecting the Volts reading using the special toggle switch. **(8a)**

The Battery is brought on line by using the Master Battery Switch **(13)** and the Generator has its own toggle switch **(14)**.

On the Lighting sub-panel **(15)** you will find switches for the Navigation/Wing and Tail lights, Landing Lights and Cabin lighting.

There are four button style panel lamps to illuminate the instruments and two cockpit torch-style lights on the back bulkhead wall which provide general cabin lighting.As the Tri-Motor carries its outboard engine gauges in the nacelle struts there are lights for these, turned on with the panel lights.

FUEL SYSTEM

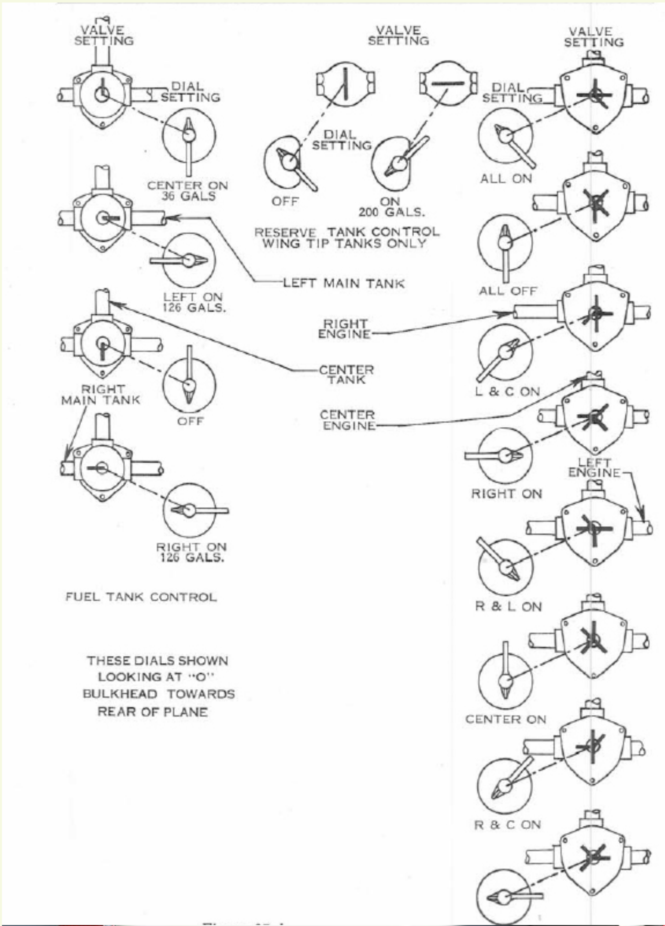
Your Tri-Motor is equipped with three tanks. Two are outboard of the cabin inside the wings. The third is centered above the cabin roof inside the wing cavity.

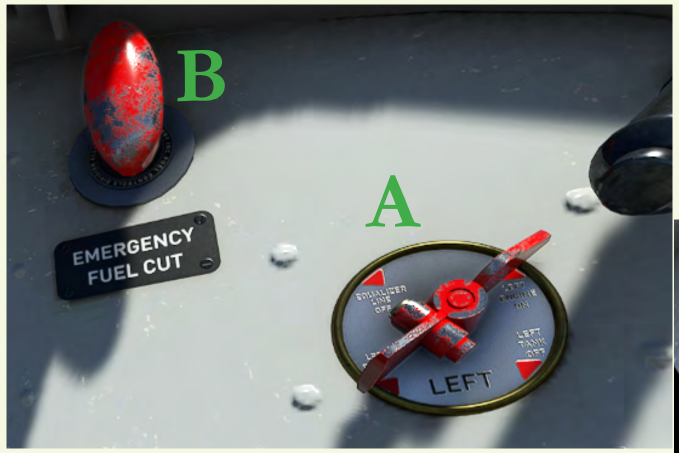
The system is designed so that any or all of the tanks serve any of the three engines, in any combination. The Center tank is called a RESERVE tank and is designed under normal conditions to feed into the other two tanks.

Fuel valves for each engine and the Reserve Tank are mounted on the bulkhead wall behind the pilots. Here on the left side is also mounted an Emergency Fuel cutoff. **(B)**

The RESERVE **(D)** tank valve has a simple ON/OFF position. The LEFT **(A)** and RIGHT **(C)** tanks have four positions: OFF, ENGINE ON, ENGINE OFF and EQUALIZER (Cross-feed).

There is another EMERGENCY FUEL CUTOFF **(E)** for the CENTER engine. This is positioned to the left of the Pilot's feet and is painted bright red. This will isolate the CENTER engine ONLY.





BRAKING SYSTEM

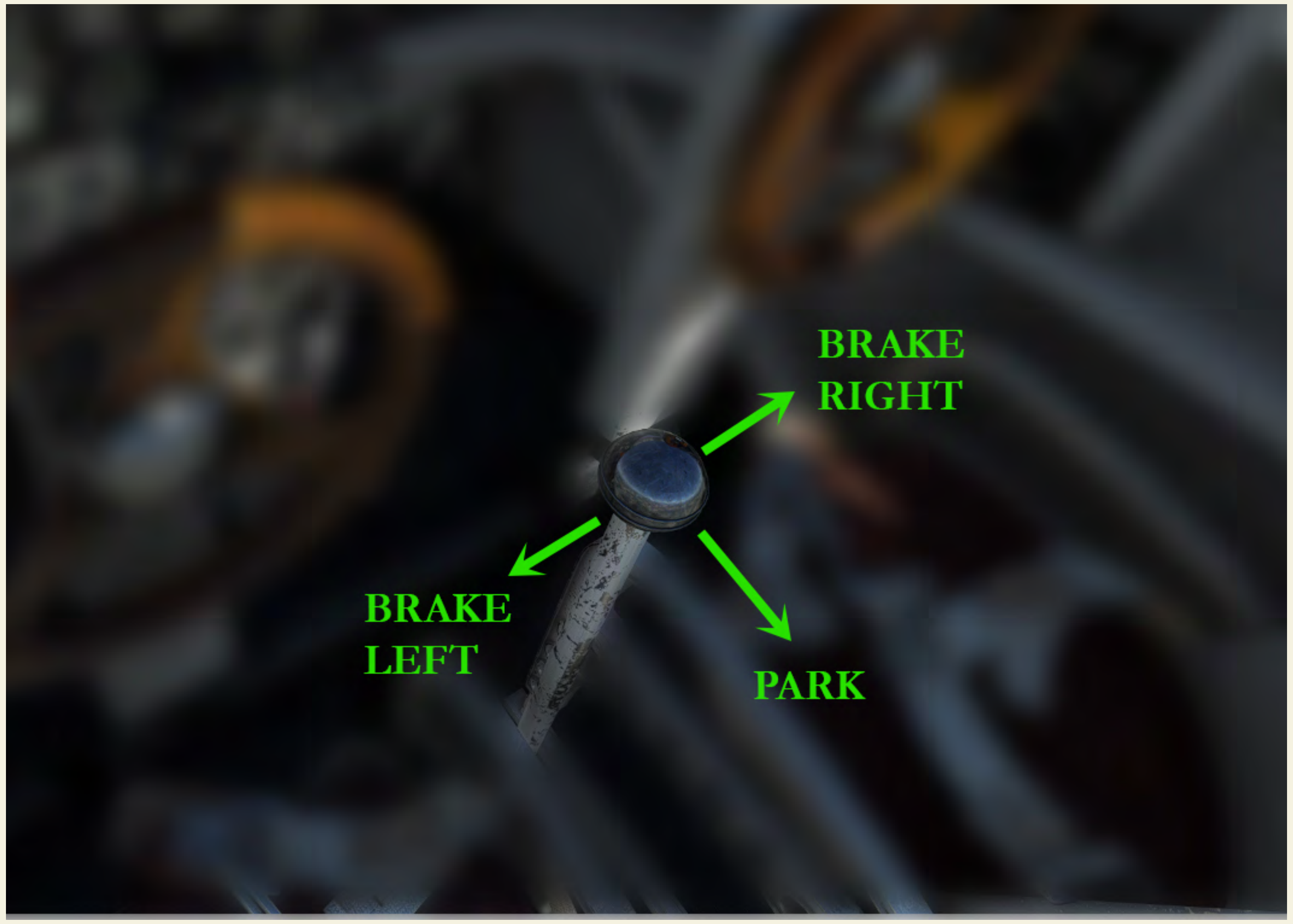
Just like a car, the Tri-Motor has a form of drum-brakes on the main wheels. These are operated hydraulically, using a tall lever in the center of the cockpit floor.

THERE ARE NO TOE-BRAKES!

The brakes are used in conjunction with the throttles and rudder to provide differential brake-turning when taxying. The technique is a bit awkward and takes some practice to get used to.

When taxying, to turn left, one increases right throttle a little, applies a small amount of left rudder and pulls the big lever over to the left (pilot) side. This brakes the left wheel and the aircraft will turn, pivoting on that wheel. An all castoring tailwheel assists in getting the tail round.

PARKING BRAKE is applied by clicking the lever shaft. As said, the system takes a bit of getting used to but once learned, is simple enough to operate providing you have three hands! Of course, standard keystroke/binding will also apply brakes as normal. It's just that this is far more fun!



SKIS AND FLOATS EXTEND THE OPTIONS!

Although this is the 1920s, the Trimotor's designers already recognised the need for an aero-plane to go where few others could. As a wheeled land-plane, the Trimotor already had an enviable reputaion for its ruggedness and high load-carry-ing capacity.

So to extend the versatility of the aeoplane, special ski-shod landing gear was developed for operations in the snow and ice.

Trimotors were subsequently used on Arctic and Antarctic Expeditions and in remote, mountainous regions.

Fresh-water lake and seaborne operations were made possible by equipping the Timotor with floats. Both of these versions are included in this simulation package and we recommend some challenging expeditions to test the limits of this dependable, rugged explorer!

GETTING STARTED

As already noted, the Tri-Motor is fitted with three Wright J6 type radial engines. These engines have inertial staters and require a specific routine to start them. Of course, you can always use Ctrl/E but where is the challenge in that? If you follow the following procedure closely, you will quickly learn the correct starting procedure and it will become second nature.

STARTING THE ENGINES

Having turned on the Battery and selected your fuel tanks you must now PRIME the engines. This is very important, especially when starting from cold. To the left of the instrument panel is the PRIMER CONTROL. This consists of a lockable priming lever and a yellow ENGINE SELECTOR.

To prime an engine first select it by turning the selector lever to point to the required engine. Usually you would be starting the left engine first, so let's do that now.

With the left engine selected, click to the right of the primer knob and it will rotate to UNLOCK. Now push in the primer 4 STROKES. Click again on the left of the knob to lock it and return to the yellow selector to cover the knob. This prevents any further unintended priming.

The actual engine start requires a number of steps. switch ON the MASTER IGNITION. This switch will stay on for the entire flight. On the floor in front of the pedestal are three starter buttons. These resemble the old-style starters you'd find in a car. That's because that is exactly what they are!

Up on the left sub-panel you will find the inertial Solenoid switches for each engine.

On the front of the pedestal you will have the three magneto switches, one per engine. Their posi-tions are LEFT,RIGHT,BOTH.

Below these switches are three red levers. These are the MIXTURE controls for each engine.

On the top of the pedestal are mounted the three throttles with round black knobs.

Correct starting uses a combination of all of these items, as follows:

1) OPEN THROTTLE SLIGHTLY
2) MOVE MIXTURE LEVER UP TO FULL RICH
3) PUSH STARTER DOWN
and WAIT 10 SECONDS
4) SWITCH ON LEFT SOLENOID
5) SWITCH MAGNETO TO BOTH.

Between steps 4 and 5, you should see the propeller start to turn over, gathering speed. This is the starter meshing with the propeller gear when the solenoid is activated. When the magneto switches are turned on to BOTH, the engine will fire and begin to run.

TUNING THE RADIOS

The cockpit of the original Ford Tri-Motor was delivered without radios. Airborne radio and radio navigation was in its infancy with few options to choose from. Most equipment was ex-WW1 and not at all suitable for the long ranges that the new 'airlines" were going to need.

We recognise that most simulator pilots are used to operating communications and navigation radios as part of their simulation experience. So, we have installed some "period"-looking equipment that works as standard NAV1, COM1 and ADF receivers. For NAV and COM radios, you tune using the big crank handle for MhZ frequency and the smaller knob in the centre of the crank for KhZ frequency changes.

There's a toggle switch provided to swap frequencies from Standby to Active and vice versa.

The ADF receiver has four large cranks to tune the whole and decimal figures and achieve the desired frequency.

Once tuned correctly, the VOR/ADF and RMI gauges on the panel will indicate.

LIGHTING

Your new Tri-Motor comes complete with an array of cockpit lighting, Navigation Lights and Landing Lamps. You can vary the lighting intensity in the cockpit using the rheostats (18) on the main panel. Landing Lamps are positioned in the leading edge of each wing. The switches for these are on the right sub-panel.

DOOR AND SERVICES

There are two switch controls mounted on the left side of the pedestal. The top one will open the passenger door on the right rear of the fuselage and the lower on will open the luggage doors in the wings and place a smart freight truck with luggage.

FLYING THE TRI-MOTOR

OK, we have the engines running, we've tuned our radios and buttoned up the aircraft. It's time to go.

Checklists for each stage of a flight are vital for safe, correct operation of any aeroplane and the Tri-Motor is no different. A full set of checklists is provided at the end of this manual and, of course, as a kneeboard document in the simulator.

We will, however, just run through the basics now to get this iconic aeroplane up where it belongs-in the air.

TAXIING

You don't need three engines to taxi, but you can use them if you wish. Usually one would just use the center engine for maneuvering on the ground, using differential braking to turn. So as you move out toward the runway, practice using the brake lever to turn the aircraft. Once at the runway and straight-ened up, apply the lever as a handbrake and idle your engine.

FINAL CHECKS

There are a couple of things you need to do before commiting to a takeoff. The first is a mag-check. This is where you check the magnetos for correct function advance the selected engine throttle to give around 1500 rpm. Then, switch the magneto for that engine from BOTH to LEFT. Watch the Tachometer and you should see a fall in RPM of around 75 -100, no more. As soon as possible return the Magneto to BOTH. Check the other engines in simialr fashion.

Now, check all radios, engine instruments, lights and so on for correct function and call ground services for takeoff clearance.

TAKEOFF

Move the throttles as one, smoothly for-ward and as you do release the brake lever. As the aeroplane begins to move forward, ease the throttles to full power. The Tri-Motor is a big "tail-dragger" meaning it has two main wheels and smaller tail wheel which castors freely left and right. This can make for tricky takeoffs, especially in cross-winds. So, make sure you concentrate and use your rudder and throttles to keep her straight as she accelerates.

The tail will lift very quickly (at around 25 - 30 mph!) so get ready to catch it and keep her level for a short time before lifting off at 65 -80 mph. A gentle pull back on the control wheel will see her airborne.

CLIMB AND CRUISE

It is good practise to keep your aircraft in level flight and let the airspeed rise before you go into a climb. Your climb speed should be around 110 -115 mph at which speed she'll climb at a rate of 900 feet per minute. Always enter the climb at a higher speed and let it fall back a little.

SPERRY GYRO-PILOT

It should be remembered that this unit is not designed as a navigation aid and was never meant to be one. When you are flying long distances you can keep your airplane in straight and level flight by means of the Automatic Pilot. It detects flight deviations the instant they occur and corrects them immediately and with precision. Use this pilot only in ordinary weather conditions and never in extremely turbulent air.

NOTE: The servo controls (speed valves) are INOP in this simulation.

First time engaged-Configure the aircraft for a stabilized flight, correctly trimmed and wings leveled. Select the appropriate prop RPMS. Ensure that there is enough vacuum pressure, and the Attitude gauge is free (uncaged). Select the heading bug position. If the new heading is to the left of current, rotate rudder knob **(2)** counterclockwise until heading bug scale **(1)** value coincides with the center white mark. Rotate **(2)** clockwise if new heading is to the right

Select the desired bank (max 30 deg) by ro-tating the aileron knob **(3)** same direction to where the rudder knob **(2)** was rotated – counterclockwise for left bank and clockwise for right bank. Check that position of bank bug **(5)** coincides with desired bank to reach.

Turn gyropilot ON by pushing power button **(9)**. Check that green light is ON to confirm the unit is active.

Aircraft will start turning towards the selected heading due to the gyropilot inputs to rudder and aile-rons. Once reaching that heading, it will be maintained by keeping the wings leveled.

If a climb or descent is desired, slowly rotate the elevator knob **(4)** clockwise to pitch up (climb) and counterclockwise to pitch down (descend) until the VS gauge shows the rate expected.

1. Index & Gyro cards 2. Heading Adjust 3. Bank Adjust 4. Pitch Adjust 5. Bank indicator 6. Pitch Reference (bug) 7.Pitch indicator 8. Suction Gauge 9. ON/OFF 10. Cage Knob 11. Illumination

The pitch bug **(6)** will move up/down accordingly. Once close to reach the reference altitude, start repositioning the pitch bug up/down so to maintain zero VS at that level (bear in mind the gyropilot will not capture the selected altitude).

With gyropilot engaged

To start a new turn, just rotate the rudder knob **(2)** as needed to reposition the heading bug scale **(1)**. The gyropilot will command the rudder for a shallow turn (coordination ball uncentered). If the new heading is close to the current, rudder input should be enough. For large heading changes, it will be necessary to add a bit of bank to speed up the turn (centered ball), then rotate the aileron knob **(3)** to position bank bug **(5)** as explained in previous paragraph. When the new heading is reached bank bug will auto reset to 0.

For climbs or descents use the same procedures described above.

Caging the Attitude gauge with the attitude caging knob **(10)** makes the gyropilot command an immediate wing leveled position, ignoring the heading and bank bugs (that are not auto reset). Uncaging the Attitude will make the gyropilot continue with the turn as it was commanded before.

Gyropilot Performance

Within turns, use bank bug with caution. Best results are obtained with bank angles between 10-15 degrees. When using max or close (20-30 deg), they should be manually reduced as current heading approximates to bug position, to avoid overshooting the target (there might be oscillations during the capture process).

When using rudder input only, the gyropilot will command a turn towards the smallest trackangle. However, when using the bank bug, direction of turn will depend on side of bank selected (left/right). An opposite bank bug will command an extended, uncoordinated turn, that might be useful in certain circumstances (for example, making a 360 degrees change).

Checklists

NOTE: These checklists are for simulation purposes ONLY. In no way are they intended for real-world aviation use.

WEIGHT AND BALANCE

It is important to make sure that the configuration of the airplane selected, matches the fuel/payload data listed in the simulator drop-down menu. The simulation will react to any changes in the data that you make or enter.

Once you have established your intended flight and have fuel and payload data available, enter these values in the boxes provided. Adjust the payload fore and aft to achieve a good CoG balance as indicated in the FUEL drop-down of the sim. Doing this will decrease the amount of time required to trim the aircraft for level and balanced flight.

BEFORE STARTING ENGINES

Controls..................FREE

Doors............CLOSED AND LOCKED

Park-brake.........ON

Fuel.......................CHECK GAUGES

Mixtures................FULL RICH

Fuel Tanks.............SET

Master Battery Switch............ON

Generators............OFF

STARTING ENGINES

Per engine

Primer...................SELECT ENGINE

Primer...................UNLOCK

Primer...................4 PUMPS

Primer...................LOCKED

Master Ignition...............ON

Starter.........................DOWN

WAIT 10 SECONDS

Solenoid Switch................ON

Magnetos.........................BOTH

REPEAT PROCEDURE FOR OTHER ENGINES

Generators............ON

ENGINE RUN-UP

Parking Brake.........ON

Mixtures...........FULL RICH

Oil Pressures.........CHECK GAUGES

Oil Temperatures....CHECK GAUGES

Engine(s)................1,500 RPM

Magnetos........Check(100RPM drop)

Engine(s)................IDLE RPM

BEFORE TAXIING

Radios............ ON and tuned

Altimeters..............Set

Clock.....................Set

Gyros...................Set and un-caged

Flight Controls........Free

Parking Brake ....OFF

TAKEOFF

Brakes....................RELEASED

Throttles.............Advance Gradually

Horizontal........... TRIMMED

Engines.................MAX RPM

Climb Speed..........70 - 80 MPH

Mixtures........lean above 5,000 ft.

Power reductions.....as advised

CRUISE

Engines.............CRUISE POWER

Gyro-pilot...............AS REQUIRED

AutoPilot (GNS Suite) AS REQUIRED

Power adjustments.....as advised

LANDING

Automatic Pilot........OFF

Altimeters...............Set

Approach Speed..........68-75 MPH

Mixtures............FULL RICH

Instruments........CHECKED

Radios .....APPROACH FREQUENCIES

Landing Speed..........55 - 65 mph

Touchdown Speed........45 MPH

AFTER LANDING

Park-brake..........ON

Mixture................CUT

Fuel selctors.........OFF

Magnetos.............OFF

Master Ignition................OFF

Radios.............   OFF

Master Battery Switch.............OFF

Passenger Door Switch.........OPEN

Luggage Doors Switch..........OPEN

Before closing your flight, ensure that the aeroplane is set up the way you want it, next time you fly and then save your flight. This way when you next load your aircraft it will be in the state you left it.