Flight Manual

L-1249A Turboprop Super Constellation
R7V-2 / YC-121F

Version 2.0
for FS2004

Introduction:

This package is a simulation of the Lockheed L-1249A turboprop-powered version of the Super Constellation for use in Microsoft Flight Simulator 2004 (FS9). It is based on the original model by Manfred Jahn and now incorporates a Virtual Cockpit (VC) and a completely new flight model based on real-life performance data.

Handling notes are based on USAF checklists, but some procedures have been modified to allow a better use within FS9. Specifically, the workflow has been changed from a 3-person parallel workflow to one better fitted for the sequential one of a single FS user. Some other issues cannot be simulated correctly in FS and, of course, we might have been plain wrong in some cases, in spite of every effort from our side.

The main difference between the L-1249 Turboprop Constellation and the 1049 series are the engines. Please note that only the differences between both types are described here. If you need information about systems available on both types, please refer to the L-1049 documentation. A checklist and a comprehensive set of performance charts and tables is included in the reference section of this document.

The cockpit and flight engineer's (FE) panel are generally similar to the piston-powered Constellation series, the FE panel actually slightly simpler. Operating the L-1249A shows the considerable differences between the different powerplant types. The actual operation of the P&W T34 engines is much simpler as well – a less complex startup procedure, only one set of power levers, no need to control mixture etc. - but there is a considerable lag between setting a power change and the response of the engine. If you are accustomed to the quick response of a piston engine, be warned!

This manual covers the layout of the instrument panels, a description of technical systems and a guide to operate the aircraft through the various phases of the flight.

To install the L-1249A, please closely follow the instructions in the readme file. If you want to install repaints, please note that the texture mapping of the aircraft has been changed. Fuselage textures from the L-1049H series will work, while those for the original L-1249A will not.

Historical background:

By the end of the 1940's it had become clear that piston aero engines were reaching the limits of their development. Turboprop engines, however, opened up new possibilities. In fact, the Vickers Viscount had already made its first flight on 16 July 1948 and would become a very successful airliner.

Lockheed began drafting first plans of a turboprop-powered version of the Super Constellation in June 1950, and design began in earnest in November 1951, when it received an order from the US Navy for 2 aircraft.

In 1952, 2 L-1049B/R7V aircraft on order by the Navy were set aside from the production line and completed as turboprops, designated R7V-2. These aircraft were powered by 4 Pratt & Whitney YT-34-P12A turboprop engines with a 13-stage axial flow compressor and a 3-stage turbine, producing 5,500 hp and driving broad-chord 3-blade propellers. Externally, the aircraft also had new nacelles and clipped wingtips that reduced span to 117'7" (38.84 m). Internally, the aircraft were strengthened to allow a MTOW of 150,000 lbs and MLW of 113,000 lbs. An extra tank was installed in the rear cargo hold and later, tip tanks were fitted as well. Further changes were made to the panels and various other systems as well, but generally, changes were kept to a minimum.

In 1953, the US Air Force ordered 2 more L-1249A as YF-121F, which had slightly more powerful YT-34-P-6 of 6,000 hp. These aircraft were evaluated by the Test Squadron of the 1700th Air Transport Group at Kelly Air Force Base, Texas, alongside the YC-97J Stratofreighter and the YC-124B Globemaster II, which were also powered by the T34 engine.

The 1249A were able to carry 106 passengers or 36,000 lbs of freight. The turboprops gave them power to spare and they were able to climb to cruise altitude quickly without time-consuming step climbing, and able to cruise at an efficient altitude and descend fast again without the complex limitations of piston driven engines in that phase of flight. During evaluation, they were the fastest propeller-driven transport in the world, setting several speed records in 1956 and 1957, culminating in a flight from Long Beach, CA to Andrews Air Force Base, MD, covering 2033 nm in 4:43 hours with an average speed of 431 kts.

A civilian version of the aircraft was also proposed and from that point on, all 1049 received modifications to allow conversion to turboprop engines. These changes were reflected by the change from L-1049C to L-1049E designation, and an aircraft converted to turpoprops would have been designated L-1249B. However, no piston-engined aircraft were eventually converted to turboprops.

Further plans included a passenger version with a new, stretched wing and possibly a fuselage stretch. This version grew to a point where Lockheed started building tools and jigs for the wing.

But it appears there were problems. First of all, the engines were prohibitively expensive, at 200,000$ each, while the rest of the aircraft would cost less than 2 million. While the costs of each unit would eventually reduce to about half the value, airlines eventually showed no interest in turboprop-powered Constellations. On top of that, there was a disagreement over operating weights of a stretched aircraft – while Lockheed wanted to raise MTOW to 190,000 lbs, Pratt & Whitney feared that such high operating weights would impair engine reliability and eventually result in damage to the company's reputation. The T-34 also turned out to have relatively little potential for further improvement and in the end, development of the T-34 turboprop engine was stopped altogether. It was only used by one aircraft type that entered series production, the C-133 Cargomaster transport. However, the wing design for the turboprop airliner was eventually used for the L-1649A Starliner.

Neither was the Constellation ideal for such powerful engines. The corresponding L-1049B (R7V-1) transport aircraft were limited to Mach 0.6 (compared to 0.56 for the comparable piston-engined aircraft in civilian service) and while it appears that the turboprop versions cruised at higher mach numbers during evaluation, we have found no evidence that the aircraft received any structural strengthening for such high speeds. Unfortunately, we have no data on how long the aircraft structure would last under these conditions.

The USN ended evaluation early, and the USAF planes did not reach a high number of flight hours, either. However, Lockheed did not give up on turboprops. One Allison 501/T56 was evaluated on the L-49 prototype in the no. 4 engine position, then one L-1249 was re-engined with T-56 in an arrangement that would be the base of the L-188 Electra. This aircraft was nicknamed 'Elation', a contraction of both aircraft names. The experiences made were also used for C-130 turboprop transport. Both aircraft had newly designed fuselage, wings and tail section and both types are still in operation today.

Parallel to turboprops, true jets wee in development as well. Boeing in particular had experience with large jets, dating back to the B-47 of 1947. The 367-80 made its first flight in 1954, before developing into the 707. When the 707 entered service in late 1958, it changed airline travel forever. Much faster than anyone anticipated, airlines were replacing piston-engines propliners by jets.

Neither did large turboprops airliners play the role anticipated by many. The L-188 Electra initially had problems with the powerplant, even though these were eventually corrected, and the Bristol Britannia was also delayed considerably. By then, the market for large passenger airliners was firmly a market for jets.

Many surplus propliners were scrapped, but there still was a market for air cargo. Since the L-1249 had cargo doors, the fuselages of the L-1249A were used to convert three passenger Super Constellations an one Constellation to freighters, as shown below in the individual aircraft histories.

While it was not an success itself, the turboprop-powered Super Constellation therefore was a valuable experiment with a new type of powerplant.

Individual aircraft histories:

Cn 4131: Delivered to USN Dec. 1953 and accepted 10 Sep. 1954, registration 131630. In storage 20 Dec. 1956, total time 109 hrs. Struck off 17 Apr. 1959 and cannibalized for spares. Probably in 1961, the complete rear fuselage section carrying the cargo door was used to convert a L-749 (cn 2619) to a cargo aircraft. That aircraft, originally delivered in 1949 to Air India, was then sold to Aerolineas Carreras in 1964 and was impounded for smuggling at Montevideo in 1971. The aircraft remained there until scrapped in 1982.

Cn 1432: Delivered to USN Jan. 1954 and accepted in Nov. 1954 as 131631. Total time of 120 hrs when transferred to Rohr Aircraft of San Diego and fitted with Allison 501 D-13 engines and Lockheed Electra-type nacelles, receiving the nickname 'Elation'. First flight in new configuration Jul. 1957, retired 30 Jul. 1949 (882 hrs). From mid-1960, the fuselage was used to rebuild a TWA Lockheed L-1049G (cn 4648), that had received substantial damage to the forward fuselage when the overpressure valves were wired shut during an overpressure test. It also received additional round windows. The resulting hybrid aircraft retained the serial number of the piston-engined aircraft and was used by various operators until withdrawn from use in 1970 and scrapped in 1979.

Cn 4161: Delivered to USAF 4 Mar. 1955 and accepted 31 Mar. 1955 as 53-8157. In service with USAF until stored 17 Feb. 1959. Record flights 11 Feb. 1956 Edwards AB, CA to Kelly AB, Tx, 1200 nm in 2:45 hrs. non-stop, 56 Kely AB, Tx to Andrews AB, MD, 1445 nm in 2:53 hrs. non-stop and Los Angeles, CA, to San Antonio, TX Oct 1956 1260 nm in 2:55 hrs. non-stop. Sold to Flying Tiger Line in 1963 and fuselage used in construction of a 1049H aircraft, using the engines, wings, center and tail section of a L-1049G (cn 4674, which remained the serial number of the resulting aircraft). Used as all-cargo aircraft only with Flying Tigers until 1966. Subsequently various owners, converted to aerial spray plane by Aviation Specialties in 1973 and crashed the same year.

Cn 4162: Accepted by USAF 30 Mar. 1955 as 53-8168. In service with USAF until stored 17 Feb. 1959. Sold to Flying Tiger Line in 1963 and fuselage used in construction of a 1049H along with parts of a L-1049G (cn 4636, retaining the serial number of the hybrid aircraft). First flight as 1049H Oct. 1963, later converted to bulk fuel oil carrier and sold to Interior Airways in 1966, but back to Flying Tiger 1966. 1969 sold to North Slope Supply Co. and crashed on final approach at Barrow AK 5 May 1970.

System description:

Pilots Panel:

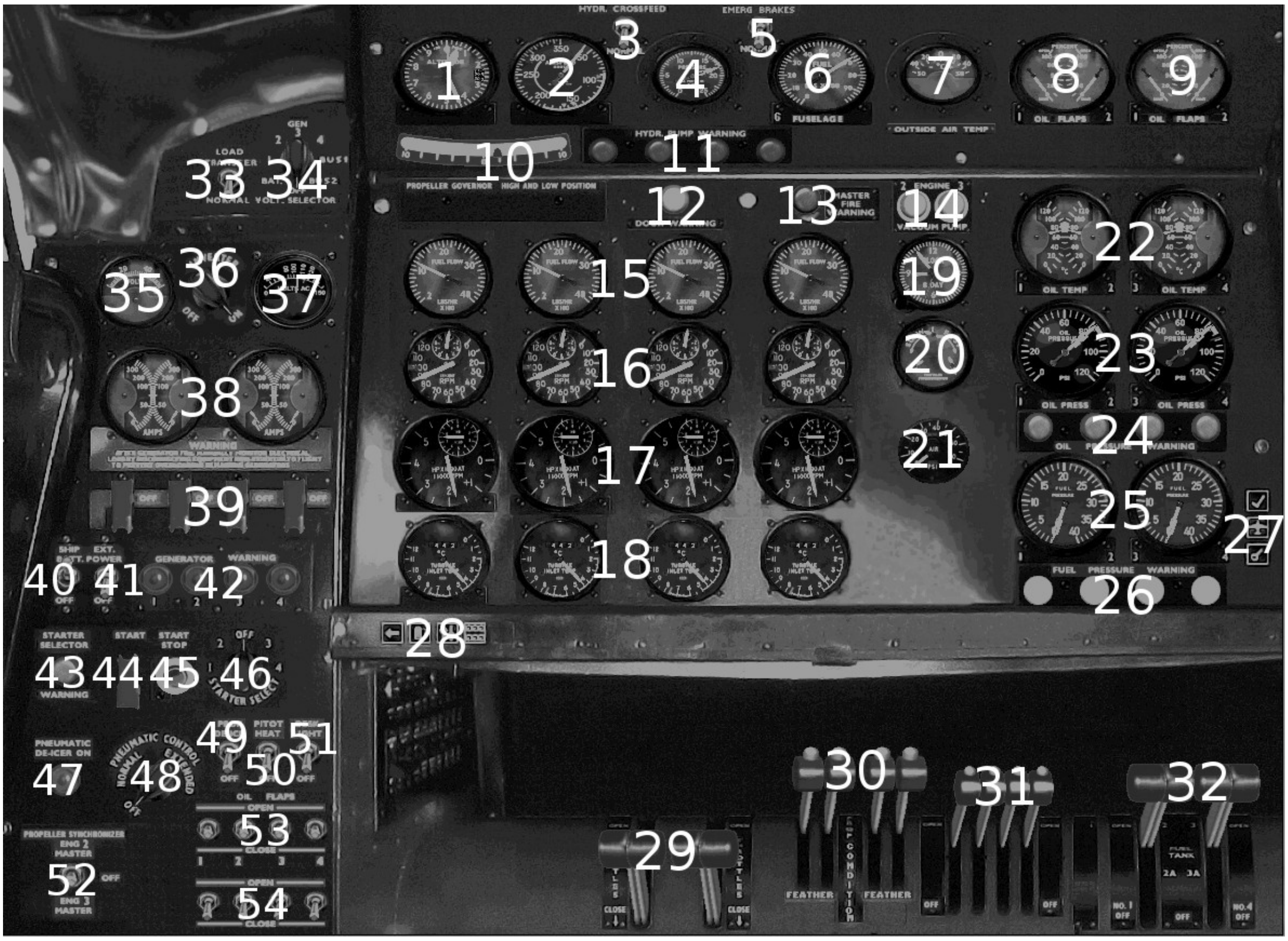
Changes from 1049G/H panel:

1. OMI (replaces RMI)
2. RMI (replaces VOR1)
3. VOR2 (replaces OBI-Selector)
4. DME, VOR-Selector
5. Engine Torque (dual, x2)
6. Engine RPM (x4)
7. Turbine discharge overtemperature warning light (x 4)

Otherwise, the panel is identical to the piston-engined Constellations. These gauge changes also apply to the VC. Apart from that, a minor change of the reverse light location has been made.

FE Panel:

The FE panel has more changes compared to the piston-engined version.



1. Altitude
2. IAS
3. Hydraulic crossfeed switch
4. Hydraulic pressure
5. Emergency brakes switch
6. Fuselage tank gauge
7. OAT
8. Oil cooler flap position port
9. Oil cooler flap position stbd
10. Inclinometer
11. Hydraulic pump warning lights
12. Door warning light
13. Master fire warning light
14. Vacuum pump warning light
15. Engine fuel flow (x4)
16. Engine RPM (x4)
17. sHP (x4)
18. EGT (x4)
19. Clock
20. Synchroscope
21. Bleed air pressure
22. Oil temperature (x2)
23. Oil pressure (x2)
24. Oil pressure warning light (x4)
25. Fuel pressure (x2)
26. Fuel pressure warning light (x4)
27. Icon block I
28. Icon block II
29. Throttles
30. Prop condition levers
31. Fuel shut-off levers
32. Fuel tank levers
33. Transfer switch
34. Voltage selector
35. Main bus voltage
36. Electric main switch
37. Avionics bus voltage
38. Generator ampere-meter (x2)
39. Generator switches (x4)
40. Battery switch
41. External power switch
42. Generator warning lights (x4)
43. Starter selector warning light
44. Starter switch (covered)
45. Start/Stop switch
46. Starter engine selector
47. Deicer warning light
48. Deicer selector switch
49. Prop deicer switch
50. Pitot heat switch
51. Panel light
52. Synchronizer switch
53. Oil cooler flap switches (x4)
54. Bleed air switches (x4)

Engines: P&W T-34-P-6

The engine P&W T34-P-6 is a single shaft, multistage, axial-flow, single compressor gas turbine driving a variable pitch propeller and giving residual thrust by the exhaust gases. The engine is capable of developing a static maximum power of 6000 ESHP.

It has a 13-stages axial flow compressor (pressure rise ratio of 6.7:1) with a 3-stage turbine.

Official ratings for this version are below:

STATIC SEA LEVEL RATINGS (YT-34-P-6)

	SHP	Thrust (lb)	Torque (ft-lb)	Torque (psi)	Turb RPM	Prop RPM	RPM (%)	ESHP
T.O	5510	1250	28941	39,4	11000	1000	100,0%	6010
MIL.	5250	1250	27576	37,6	11000	1000	100,0%	5750
NORMAL	4450	1125	23917	32,6	10750	977	97,7%	4900
Flighlidle					10060	900	90,0%	
Ground Idle					7800	709	70,9%	

Engine power control:

Engine power is controlled by a single lever, the throttle, which coordinates fuel flow with propeller governor setting (propeller RPM). There is no way to control engine or propeller RPM directly and the Propeller Master Control is removed from the cockpit.

Cockpit instrumentation is changed little from the basic 1049 layout. The main instrument gauges are now 2 dual engine torque gauges and 4 engine RPM gauges, which are the main power references in flight.

Reverse thrust is available by a mouse click on reverse lights or by pressing the "F2" key. In VC, reverse power can be controlled by the reverse levers attached to throttle levers. To cancel reverse power, you can press the "F1" key, click again on reverse lights or advance throttle in the positive range.

The throttle quadrant has three basic positions: Ground Idle, Flight Idle and Take Off. The Flight Idle power is adjusted to give zero thrust at 85 KIAS.

In real life, there was a detent in the Flight Idle position to avoid going below this position in flight. In FS9 there is no possibility to simulate the Flight Idle detent, so the throttle idle position yields Flight Idle when airborne and Ground Idle on ground. On ground, the throttle range from 0% to 6% is equivalent to the range from Ground Idle to Flight Idle in the real airplane.

Pressurized air from an external cart is required to start up the first engine, the remaining engines can be started from engine bleed air via the air manifold. The connection for the pressurized air is in the starboard wing root. To achieve secondary hydraulic system pressure for the brakes and avoid injury to personnel disconnecting the starter cart, engine start sequence is changed to 4-3-2-1.

Engine Power instruments:

The usual pilot's instrument to set power in turboprops is the torquemeter. Unlike today's standard lb-ft or percentage of rated max torque, the instruments are calibrated to show indicate torque as torque pressure (psi). In this engine the conversion is Torque (lb-ft) = Torque pressure (psi) * 734. Dual needle torquemeters are in the pilot's center panel.

Another power indication, not used today, was the Shaft Horsepower Indicator gauge. It also measures torque at the turbine shaft. It is calibrated in SHP at 100% RPM. So, the instrument GISHP (Gage Indicated Shaft Horsepower) reading is showing actual power delivered to the propeller only if turbine is turning at 11,000 rpm (100% RPM). For other turbine speeds, to get real horsepower you must correct for RPM in the following way: SHP = GISHP * RPM(%) / 100. The GISHP instruments are located in the FE panel.

Propellers:

The engines are equipped with full-feathering, reversible pitch propellers, incorporating synchronized or constant speed governor control. The normal RPM range is from 91% to 100%. In Ground Idle, RPM is 73-75%.

The governor controls the engine RPM according to throttle position, in the range from 91% to 100% RPM.

Propeller Synchronizer: Provision for synchronisation the four propellers through a limited band (2%) of RPM is provided for by an electronic controller. Either engine #2 or engine #3 may be selected as master engine. A two positions synchronizer switch is located in the FE panel, placarded ENG 2, OFF and ENG 3.

Synchronizer is only operative with propeller condition levers in the RUN position.

Propeller condition levers: Four propeller condition levers are located in FE panel. The levers have three positions: FEATHER, UNFEATHER, and RUN.

A Negative Torque Control (NTC) is installed in each engine to automatically provide an increased pitch (decrease RPM) whenever a condition of negative torque (propeller driving the turbine) exists. When a negative torque is detected, the pitch is increased to reduce RPM to about 60%. The system is armed when airspeed is below 270 KTAS.

If engine power is restored prior to feathering, normal propeller operation is restored automatically.

Note: Do not use your keyboard or controller for fuel mixture/shut off or prop pitch adjustment (except for prop reverse - see landing section).

Fuel System:

For increased fuel capacity, the aircraft has an extra fuel tank installed in the fuselage aft of the center fuel tank, taking up some space of the rear fuselage cargo bay (similar to the 10-tank-system of the EC-121D). It holds 1000 gall / 6000 lbs, 998 gall of which are usable. In real life, fuel from tank 6 is ducted to tanks 1 and 4. Since the present FS system does not allow more tanks, half of the capacity is added to tanks 1 and 4. Otherwise, the fuel system is identical to the 1049G/H 9 tank system. The fuel dump system is unchanged from the 1049G – in real life, fuel from tank 6 could be pumped into tanks 1 and 4 for dumping, while fuel from tank 5 is undumpable.

NOTE: The L-1249A was used both with and without tip tanks (2B/3B). This FS flight model is configured for the use with tip tanks to simplify installation in FS, but visual models with and without tip tanks are provided. To simulate use without tip tanks, simply set their content to zero using the fuel/payload manu.

Take-off tanks are 1,2,3 and 4, minimum fuel is 400 gallons in each for take-off. During flight, first empty the fuselage tanks, then run the inboard engines on the tip tanks and tanks 2/3 afterwards, while the outboard engines use tanks 1 and 4. Landing tanks arew 1, 2A, 3A and 4.

Fuel pumps: Electric auxiliary fuel pumps are installed in each tank, supplying fuel to main fuel manifold. To avoid cavitations in engine driven main fuel pumps, the auxiliary pumps of tanks in use should be switched on as long as the engine runs. Four low fuel pressure warning lights are installed in FE panel, illuminating if there is not enough pressure to feed the engine fuel pumps safely.

Fuel Shut-Off Levers: Four fuel shut-off levers are located in FE panel. The levers have two positions: OFF and OPEN.

Hydraulic System:

Four hydraulic pumps, one driven by each engine, provide hydraulic power up to 1700 psi for the units operated by hydraulic pressure. There are two hydraulic circuits. The primary system is connected to hydraulic pumps of engines 1 and 2, and the secondary system is connected to pumps of engines 3 and 4. A hydraulic pressure gauge shows the pressure of both systems and four low hydraulic pressure warning lights allow checking the correct operation of each pump.

The primary system powers flight control surfaces, while the secondary system powers flaps, gears and brakes. If a hydraulic pump fails, a check valve automatically isolates the failed pump and the remaining pump of the same side supplies the pressure to the corresponding system. An electrically operated crossover valve can connect both circuits, if both pumps fail on the same side, feeding both systems with the remaining operating pumps. The switch for this valve is located on the upper part of the FE panel, next to the hydraulic pressure gauge. A single engine supplies enough pressure to supply a hydraulic circuit. However, if the secondary systems fails and pressure from the primary system is used via the crossover valve to operate gear and flaps, operation time may be slower.

Unlike in real life, FS will not simulate the loss of control surface boost. But with the starboard engines shut down, you will not be able to extend flaps or gear unless you operate the crossover switch. Neither will the brakes operate without pressure in the secondary circuit.

The 'Emergency Brake' allows the use of brakes without a pressurized hydraulic system, using pressure in the hydraulic accumulators. It has enough stored pressure to allow a few braking actions by either the normal or the parking brake. The switch for the Emergency Brake is located on the upper part of the FE panel, next to the hydraulic pressure gauge and opposite to the crossover switch. In the event of a landing with all hydraulic pressure lost, you must select the emergency brakes circuit before landing to have enough pressure from hydraulic accumulators to stop the plane. The Emergency Brake circuit will be engaged before engine shutdown to park the aircraft and is released again once the engines have been started and hydraulic pressure is up.

Electrical System:

The electric system is supplied by four DC generators, a 24 volts battery system and an inverter for AC instruments. An Auxiliary Power Unit (APU) is not simulated here. A connection to an external power supply is available when on ground, with parking brakes set.

The master switch connects the batteries to the circuits, and the external source switch connects the external power source.

There are two electrical buses, BUS 1 and BUS 2. When master battery switch is ON and load transfer switch is in NORMAL position (see tool tips), bus 1 is fed by generator 1, generator 2 and battery, and BUS 2 is fed by generator 3, generator 4 and battery. If the load transfer switch is in TRANSFER position, batteries and all generators feed both buses. Use this position if both generators of one side fail.

When external power is connected, both buses are supplied and batteries are recharged, if battery switch is ON. Each generator can be connected or disconnected by the corresponding switch. You can check the amperage supplied by each generator by the corresponding ammeter. Do not overload the remaining generators, if one or several generators fail. DC voltage from different DC power sources and buses can be checked by the DC voltmeter. There is a DC voltmeter selector switch to select the corresponding sources, with the following positions: OFF, BATTERY, GENERATOR 1, GENERATOR 2, GENERATOR 3, GENERATOR 4, BUS 1 and BUS 2.

The inverter is transforming DC current in AC current, and is supplied by batteries, external power source or DC generators. There is a switch to connect or disconnect it. You can check AC voltage by the corresponding voltmeter.

The original L-1249A had an APU to supply electrical power. In the similarly equipped C-121C, this avoided the need for a starter cart. However, the APU does not supply pressurized air for starting the turboprop engines, so a starter cart of a different kind is necessary anyway. Therefore, an APU is not simulated here.

Miscellaneous:

Flight instruments: The Bendix Omni Magnetic Indicator (OMI) works in much the same way as any VOR/ILS indicator. The required VOR radial or ILS course is set using the knob lower left and the aircraft is steered so as to center the course and glide slope needles. Flags are displayed when there is no VOR/LOC or GS signal. The small central rotating needle shows the aircraft's magnetic heading in relation to the selected course. This is useful when intercepting the selected radial or localiser and also shows the degree of "crabbing" in crosswinds. The indicator light top right is a marker light, blue for an ILS outer marker, amber for the middle marker and green for the inner marker. The aircraft will intercept and hold the selected course when the AP rotary knob is set to Range/LOC/GS. It will operate only from the NAV1 frequency.

Status gauge: Changes have also been made to the Status Gauge and you will see that several features not relevant to turbine aircraft have been removed or replaced with performance data. In particular in the upper right area you will see headings of Max, EGT and TP which are respectively the category of operation, the maximum permitted exhaust gas (turbine discharge), and corresponding torque setting for any particular altitude and speed. Against "Mil" (military) are the settings for maximum possible power, not normally used as there is a greater risk of engine failure or at least poor economy and short time between overhaul (time limit of 30 minutes). Against "Norm" are the settings for normal operations and finally against "T.O." are the take off settings (time limit of 5 minutes). Don't be too concerned if the "TP" value in the Status panel does not always seem to correspond with the torque setting values in the performance charts. It should only be accurate once the aircraft is actually at the altitude and the EAS speed shown in the charts and plus or minus 5 % is acceptable.

Because of the way FS9 is dealing with the ambient temperature variable, in non ISA conditions, some readings are incorrect if the simulation is “paused”, mainly EGT, Max TP and Max EGT. So be sure that simulation is running before reading data from status gauge.

Operation of the L-1249A:

Starting engines:
Firstly some essential steps that apply to all of the start options below, otherwise the start procedure will not work.

A. Set the emergency brakes using the switch at the top of the FE panel, to supply hydraulic pressure to parking brakes from the emergency circuit (no pressure in normal circuits with engines shutdown).
B. Select ground power to ensure a supply of air to the starters and check the bleed air manifold pressure from the gauge on the FE panel.
C. Open the fuel panel, switch on the fuel pumps for tanks 1-2-3-4, and check the rise in the fuel pressure gauges.
D. Set the propeller condition levers to the forward RUN position.
E. Unlike piston engines, the throttles should be fully closed.

Then you have three options,
Option 1: For a quick and easy but unrealistic start, place all four fuel shut off levers to OPEN, then click the key icon on the right of the FE panel. The engines will start 1-2-3-4. You can also quickly close the FE panel and watch the start in spot view.

Option 2: The FS9 conventional Ctrl+E procedure is also available but offers no advantage over the key icon. This is because in this model the four fuel shut off levers have to be in the OFF position when pressing Ctrl+E then individually opened immediately each propeller starts to turn. Therefore the FE panel needs to be kept open.

Option 3: Now for a completely realistic start procedure in the correct order 4-3-2-1.
1. Turn the starter select to number 4,
2. open the number 4 fuel lever,
3. open the start switch, click the start switch once then release it.

Note that the starter switch should not be held down as with the piston engine versions. The start switch tooltip will tell you if you have forgotten to set fuel pumps or fuel levers. You will hear the turbine spool up then the RPM gauge bursts into life followed by the turbine discharge temperature. Watch that temperature limits are not exceeded.

Once engine 4 is up and running and stable per the checklist, you can use bleed air from that engine to start the remaining engines. So,

4. switch on generator number 4,
5. close the external power (this allows ground personnel to disconnect the cart without risk of injury from the props on engines 3 or 2),
6. increase engine 4 RPM to approx 92%,
7. open the number 4 bleed air switch on the bottom left of the FE panel.

8. Repeat the start procedure steps 1-3 for number 3.
9. When number 3 is running, turn the hydraulic crossover switch to EMERGENCY, check that the hydraulic pressure gauge is showing a rise in the primary circuit then switch back to NORMAL.

10. Now repeat steps 1-3 for engines 2 and 1,
11. switch on all generators, and finally
12. ensure the start and pre-taxi checklists have been completed.

Failed Start

If for any reason, like the wrong procedure or excessive temperature, you wish to interrupt a start for that engine then you will see a button labeled START-STOP next to the start switch. Press this once, noting STOP on the tooltip, and close the fuel shut off lever. Hold the start switch down for 20 to 30 seconds to clean the engine from any remaining fuel, then press the START-STOP switch again once, noting OFF on the tooltip. Wait at least a minute before recommencing the start procedure.

Prop Sync Check

Before take off it is possible to check the propeller synchroniser system. Open all throttles to 92% RPM. Select propeller number 2 as master using the switch bottom left on the FE panel. Increase engine 2 to 96% RPM and check that the other engines increase by not more than 2-3 %. Repeat using engine 3 as master.

Taxiing

With these powerful engines, 6% throttle (the ground idle limit) is enough to get the aircraft moving even at MTOW. Once on the move 4 or 5% will suffice.
Be aware of not engaging reverses with parking brakes on; you are going to have a tail strike. If you are using reverses to go backwards, you must always stop the airplane using positive power, never with brakes.

Take-off and climb:

In piston-engined Constellations, the power available is limiting performance and the aircraft struggles to gain airspeed and altitude, particularly in the initial phases of the flight. This is totally different here. Power is easily available, but, as mentioned above, setting exact power is tricky.

Actual power settings for take-off and climb depend on density altitude. This would be calculated by the crew before take-off. For this simulation, we need to use the status gauge to do the calculation for us. Open the status gauge (right click on checklist simicon). Power settings are found on the right side of the second paragraph, next to the tank settings. Note Torque Pressure (TP) settings for Take off (T. O.) and Normal Rated Power (Normal). Military power is not normally used, but offers a power setting above Normal Rated Power with a time limit of 30 minutes, while take-off power is limited to 5 minutes.

Take-off power is achieved at a throttle setting of about 90%. However, to spool up, the engine take at at least about 5 seconds and quickly adding power will cause excessive heat buildup in the engine. It is therefore important to add power only slowly, some 10 seconds from idle to take-off power. Do not allow turbine discharge temperature to rise above 585°C (and the panel warning lights to light up) for more than 10 seconds. The temperature can also be read from the status gauge or the FE panel.

In the real aircraft, apparently the procedure was to apply full throttle before releasing the brakes but possibly in real life and certainly in FS9 the brakes will not hold anything like full power.

Once airborne, the aircraft will climb easily even with a high load. Retract gear and set Normal Rated Power (NRP) when it is up and locked. Accelerate to 190 kts, check for NRP again (NRP TP is affected by RAM pressure, check status gauge), and maintain this speed during climb. Again, this is much simpler than piston-engined aircraft with their careful choreography of METO and climb power settings along with blower switches. And again, setting NRP of 97.7% RPM is a bit tricky – set throttles to 75% and adjust as necessary. You can climb straight to cruise level at about any weight.

Cruise and Descent:

Charts for normal high speed cruise and long range cruise performance and settings are shown below.

The power setting for high speed cruise is the same 97.7% RPM as for the climb. When reaching cruise altitude, the aircraft will accelerate and ram effect will increase the engines efficiency. The aircraft's performance has been adjusted to take ram effect into account, but unfortunately, FS9 does not simulate ram effect. Therefore, you will have to slightly adjust the throttles from time to time to maintain Torque Pressure as calculated by the status gauge while the aircraft accelerates to cruise speed. During cruise, Torque Pressure is the value to watch rather than RPM.

For other power settings, you should check the required cruise torque setting for your actual weight and altitude from the charts and set that torque if different. Once the aircraft has accelerated to the appropriate cruise EAS the TP value should be the same as your engine gauge readings.

Cruise speed is limited to 353 kias and M0.60. The airspeed indicator is fitted with a mach needle to help you avoid these limits. As mentioned above, these limits are somewhat higher than in the comparable piston-engined aircraft, but while the 1049 series will only be able to reach critical mach numbers when cruising just below critical altitude at low weight, there is a very much real possibility that the 1249A will reach critical Mach numbers in flight, suffer structural failure and crash. You have been warned!

Turbine engines are more economical at altitude and inefficient at partial power. If you reach critical speeds, you should first consider climbing to a higher cruise altitude before reducing power. 30,000 ft is the ceiling for the 1249A.

Here you have a set of typical level flight performances, extracted from the official USAF Manual, as general guidelines for cruise settings.

YC-121F: Level Flight typical performances

Altitude (ft)	W (lb)	TP (psi)	GaSP	KCAS	KTAS	FF (pph/eng)
10.000	140.000	32,2	4500	310	355	2750
10.000	140.000	18,5	2580	236	270	1830
10.000	140.000	15,4	2140	198	230	1620
10.000	80.000	32,2	4500	320	368	2750
10.000	130.000	13,0	1825	187		1530
20.000	130.000	26,4	3690	269	360	2100
25.000	130.000	22,2	3100	240	351	1820
20.000	130.000	18,5	2580	236		1755

In the L-1249A, the rate of descent is higher than in piston engined aircraft, so the top of descent time is reached later. If you wish to start descent at cruise speed then plan for descent at 1,000 feet per minute and if you descend at around 1,500 fpm you can easily avoid exceeding Vno retarding throttles and be at the initial approach fix at the correct speed. Alternatively, if you allow the aircraft to slow before top of descent, then 2,000 fpm is possible but you must be careful not to exceed Vne and allow enough level time to slow down.

You can use close to flight idle for the descent, no cylinder head temperature problems here, but keep above 5 psi torque. Remember that these huge propellers yield a lot of drag when windmilling, so avoid in flight torque below 3-4 psi. Once level at the IAF altitude, the aircraft will slow quickly to initial take off flap speed, 190 kts.

If you are required to hold then the recommended holding speeds are shown in the chart below.

Approach and Landing:

Remember the challenging MLW limit of 125,000 lb. At 190 kts or less (170 kts is desirable), set take off flaps and again the aircraft will very quickly slow at 5 psi torque. For a straight in or ILS approach, allow the aircraft to slow to 165 kts maximum before final descent, 150 kts is ideal, lowering gear and setting 80% flap just before glide path interception. Gear can be lowered earlier, 190 kts max if required. The approach and threshold speeds for various weights are shown in the charts below.

Select full flap at around 500' above ground or as required to reach the correct threshold speed. To avoid excessive sink rate some power should be maintained, say 15 to 20% throttle, until just before touchdown, when closing the throttles allows flight idle, 6% throttle. Ground idle is automatically enabled on touchdown

For a circling approach the maximum speeds should be 190 kts downwind and gear and take off flap selected, turning base leg at 165 kts and 80% flap selected, then turning final at 130 kts with full flap.

After touchdown, reverse power has a powerful braking effect. Reverse can be selected either from the indicator lights or key F2 and cancelled either by clicking the lights again, closing the throttles or using key F1.

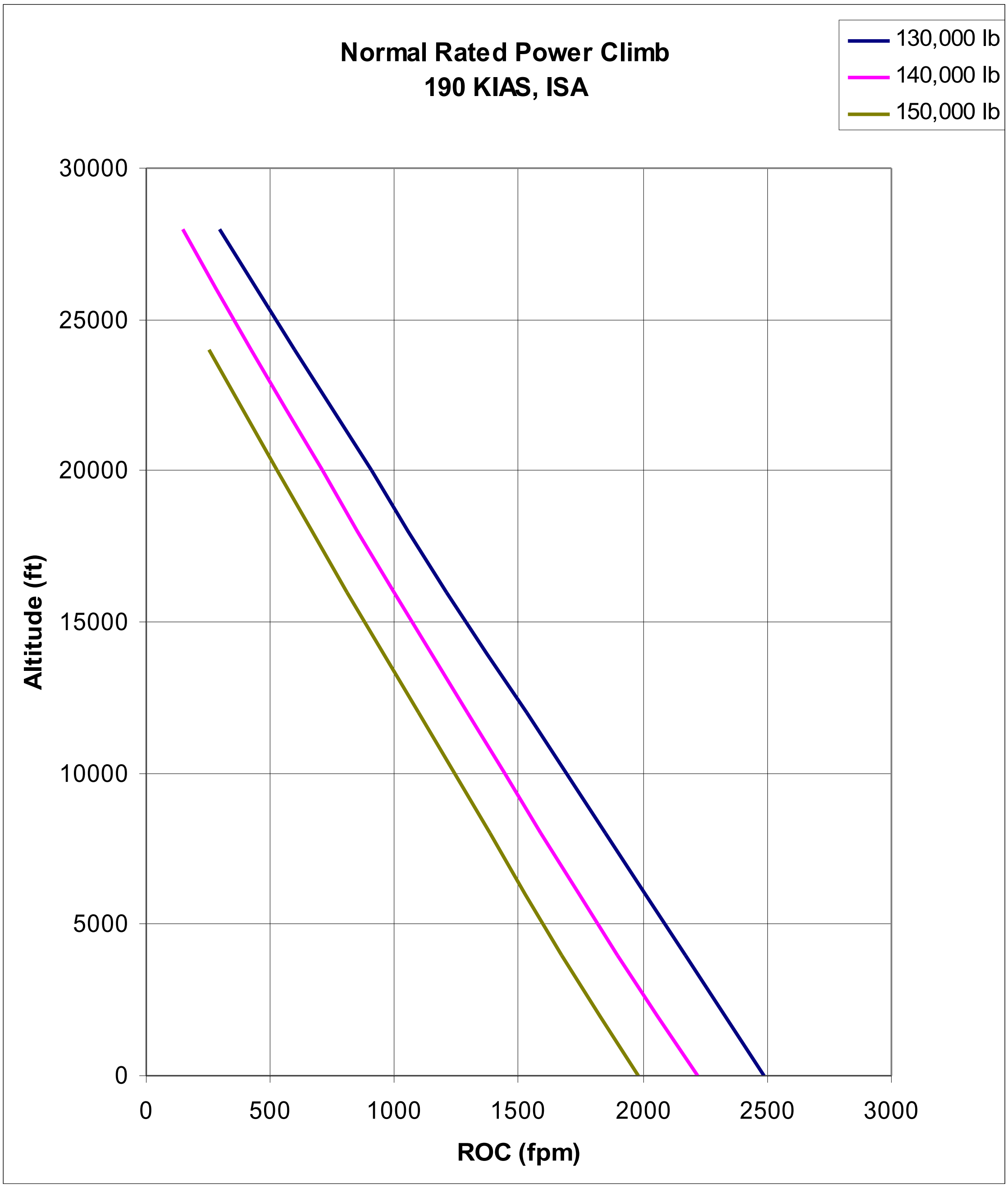
Once on the ground, ground idle is available and otherwise procedure is very similar to the other Connies.

Credits:

Gauge and panel modifications by Volker Böhme, Luis Pallas, Bill Tyne and Stefan Werner
FDE changes by Luis Pallas
Model modifications and manual by Volker Böhme and Manfred Jahn
Original release version by Manfred Jahn
Supercharger, Fuel Dump and Engine Start system code by Doug Dawson, used with kind permission

YC-121F Performance Data (P&W T34-P-6 engines):

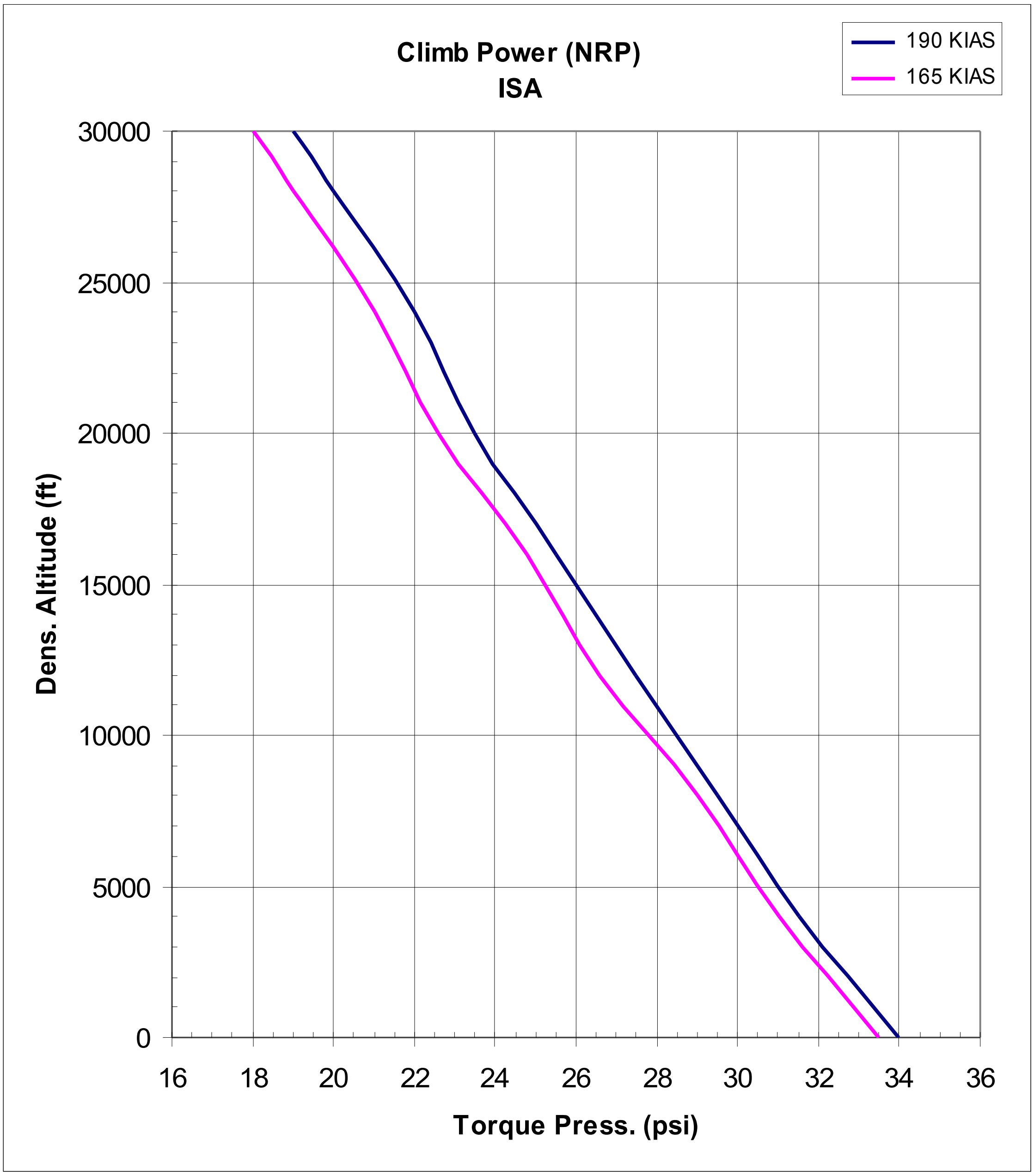
CLIMB:



CLIMB

Climb Normal power, 97.7% RPM		ISA 190 KIAS			ROC (fpm) Weight (lb)		
ISA Altitude	TP (psi) *	GaSP	SHP	FF (pph)	130,000 lb	140,000 lb	150,000 lb
0	33,3	4650	4543	3320	2490	2220	1980
4000	31,3	4370	4269	3000	2170	1895	1675
8000	29,3	4100	4006	2720	1850	1590	1385
12000	27,3	3820	3732	2460	1530	1295	1095
16000	25,6	3580	3498	2190	1210	1000	810
20000	23,6	3300	3224	1970	905	710	530
24000	21,8	3040	2970	1780	598	425	255
28000	19,8	2760	2697	1640	295	145	

(*) Including RAM pressure effect



MAX. CONTINUOUS POWER CRUISE

Normal Rated Power — 97,7% RPM — ISA

Weight (lb)	**100.000**						
Altitude (ft)	**0**	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi) *	36,6	35,1	32,2	29,0	26,4	22,2	20,0
GaSP	5110	4900	4500	4050	3690	3100	2790
SHP	4880	4680	4298	3868	3524	2961	2664
FF (pph)	3490	3100	2750	2400	2100	1815	1560
CAS (kt)	346	332	318	300	277	252	225
TAS (kt)	346	356	365	372	371	368	356
nm/100 lb	2,48	2,87	3,32	3,88	4,42	5,07	5,71
SFC	0,715	0,662	0,640	0,621	0,596	0,613	0,585

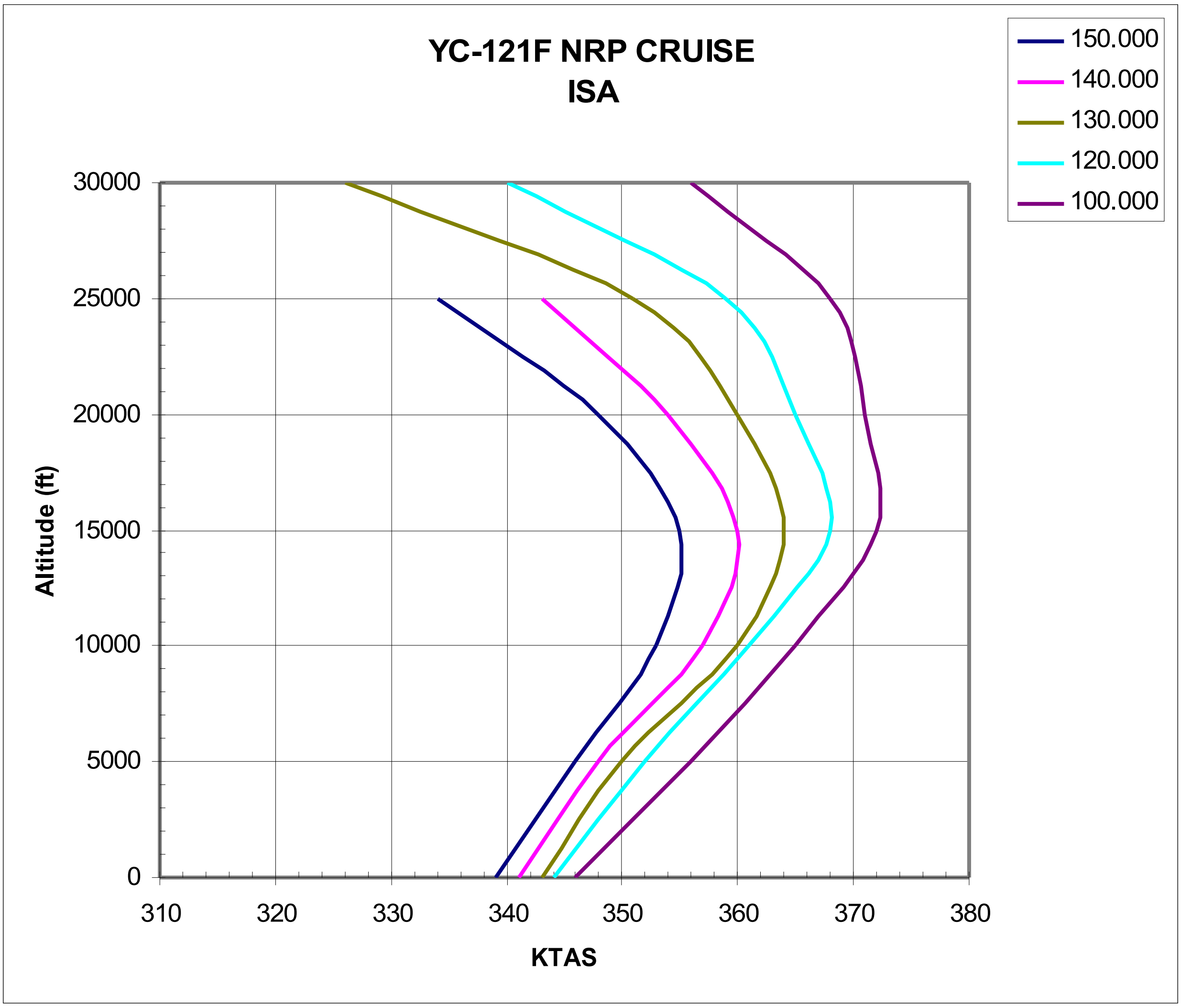
Weight (lb)	**120.000**						
Altitude (ft)	**0**	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi) *	36,6	35,1	32,2	29,0	26,4	22,2	20,0
GaSP	5110	4900	4500	4050	3690	3100	2790
SHP	4880	4680	4298	3868	3524	2961	2664
FF (pph)	3490	3100	2750	2400	2100	1820	1560
CAS (kt)	344	328	315	296	272	246	214
TAS (kt)	344	352	361	368	365	359	340
nm/100 lb	2,46	2,84	3,28	3,83	4,35	4,93	5,45
SFC	0,715	0,662	0,640	0,621	0,596	0,615	0,585

Weight (lb)	**130.000**						
Altitude (ft)	**0**	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi) *	36,6	35,1	32,2	29,0	26,4	22,2	20,0
GaSP	5110	4900	4500	4050	3690	3100	2790
SHP	4880	4680	4298	3868	3524	2961	2664
FF (pph)	3490	3100	2750	2400	2100	1820	1560
CAS (kt)	343	327	313	293	269	240	205
TAS (kt)	343	350	360	364	360	351	326
nm/100 lb	2,46	2,82	3,27	3,79	4,29	4,82	5,22
SFC	0,715	0,662	0,640	0,621	0,596	0,615	0,585

Weight (lb)	**140.000**						
Altitude (ft)	**0**	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi) *	36,6	35,1	32,2	29,0	26,4	22,2	
GaSP	5110	4900	4500	4050	3690	3100	
SHP	4880	4680	4298	3868	3524	2961	
FF (pph)	3490	3100	2750	2400	2100	1820	
CAS (kt)	341	325	311	290	264	234	
TAS (kt)	341	348	357	360	354	343	
nm/100 lb	2,44	2,81	3,25	3,75	4,21	4,71	
SFC	0,715	0,662	0,640	0,621	0,596	0,615	

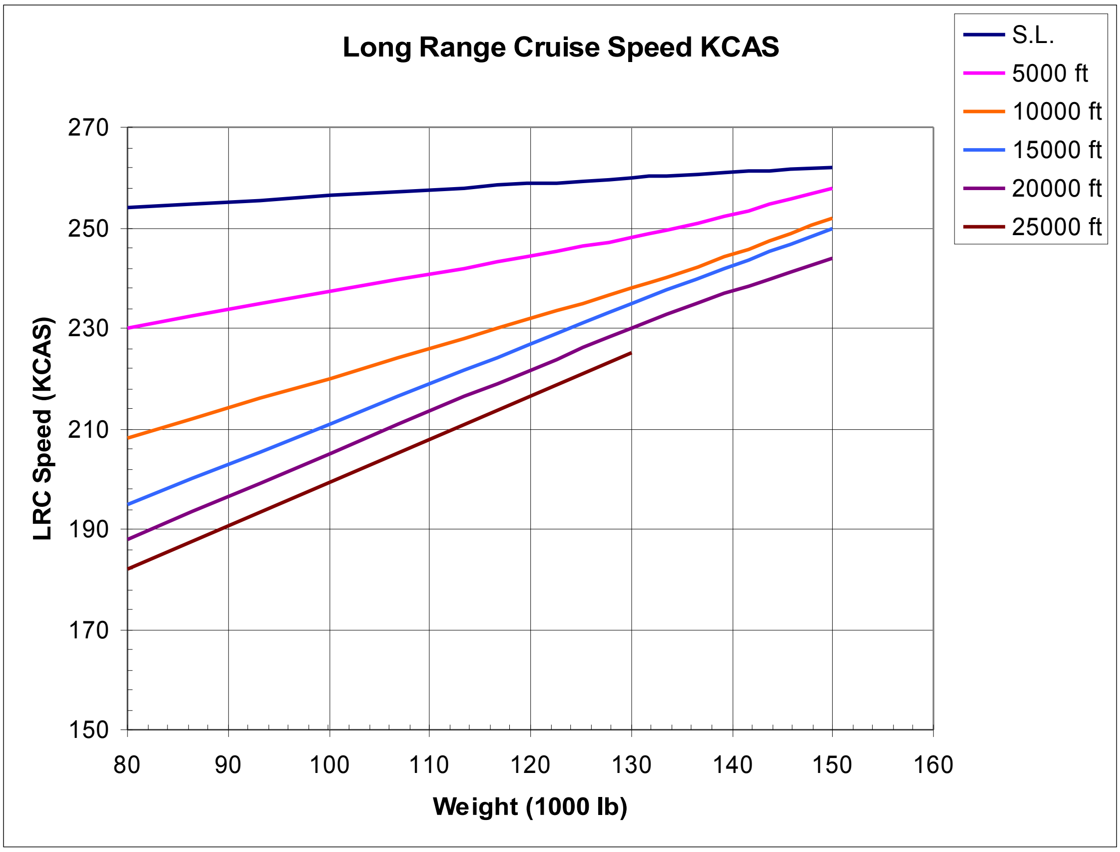
Weight (lb)	**150.000**						
Altitude (ft)	**0**	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi) *	36,6	35,1	32,2	29,0	26,4	22,2	
GaSP	5110	4900	4500	4050	3690	3100	
SHP	4880	4680	4298	3868	3524	2961	
FF (pph)	3490	3100	2750	2400	2100	1820	
CAS (kt)	339	323	308	286	259	228	
TAS (kt)	339	346	353	355	348	334	
nm/100 lb	2,43	2,79	3,21	3,70	4,14	4,59	
SFC	0,715	0,662	0,640	0,621	0,596	0,615	

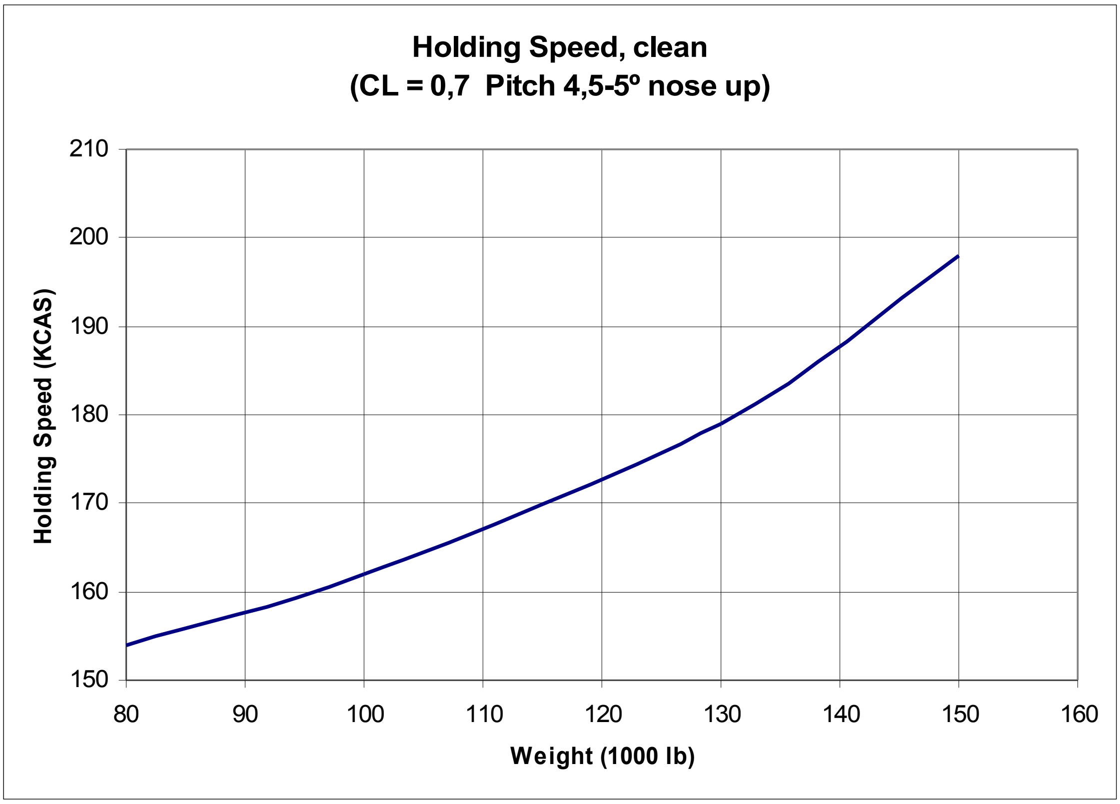
(*) Including RAM pressure effect


YC-121F NRP CRUISE
ISA
150.000
140.000
130.000
120.000
100.000
Altitude (ft)
30000
25000
20000
15000
10000
5000
0
310
320
330
340
350
360
370
380
KTAS

LONG RANGE CRUISE ISA

Weight (lb)	**100.000**					
Altitude (ft)	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi)	15,4	14,3	14,3	14,3	14,3	14,3
GaSP	2150	2000	2000	2000	2000	2000
SHP	2053	1910	1910	1910	1910	1910
FF (pph)	1900	1670	1600	1530	1360	1310
CAS (kt)	238	222	213	209	201	196
TAS (kt)	257	257	267	283	295	312
nm/100 lb	3,38	3,85	4,16	4,62	5,42	5,95
SFC	0,925	0,874	0,838	0,801	0,712	0,686
Weight (lb)	**120.000**					
Altitude (ft)	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi)	17,8	17,8	17,8	17,8	17,8	17,8
GaSP	2480	2480	2480	2480	2480	2480
SHP	2368	2368	2368	2368	2368	2368
FF (pph)	2080	1900	1780	1640	1580	1560
CAS (kt)	245	237	230	220	214	210
TAS (kt)	264	275	288	298	314	334
nm/100 lb	3,18	3,61	4,04	4,54	4,97	5,35
SFC	0,878	0,802	0,752	0,692	0,667	0,659
Weight (lb)	**140.000**					
Altitude (ft)	**5000**	**10000**	**15000**	**20000**	**25000**	**30000**
TP (psi)	20,2	21,0	21,8	22,2	22,5	
GaSP	2825	2940	3050	3100	3140	
SHP	2698	2808	2913	2961	2999	
FF (pph)	2200	2090	1975	1900	1840	
CAS (kt)	256	254	241	238	233	
TAS (kt)	276	294	302	322	342	
nm/100 lb	3,14	3,52	3,82	4,24	4,65	
SFC	0,815	0,744	0,678	0,642	0,614	


Long Range Cruise Speed KCAS
S.L.
5000 ft
10000 ft
15000 ft
20000 ft
25000 ft
LRC Speed (KCAS)
270
250
230
210
190
170
150
80
90
100
110
120
130
140
150
160
Weight (1000 lb)


Holding Speed, clean
(CL = 0,7 Pitch 4,5-5º nose up)
Holding Speed (KCAS)
210
200
190
180
170
160
150
80
90
100
110
120
130
140
150
160
Weight (1000 lb)

When holding at low weights, it is recommended not to reduce power below 30% of Normal Rated Power (about 10 psi TP at S.L.), allowing speed at low altitudes to be higher that indicated in the graph above for weights below 110,000 lb.

V-Speeds

Take-Off

YC-121F **T.O. Weight (lb)**	KCAS **Vso 60%**	**V1**	**Vlo = Vr**	**V50ft = V2**
80.000	85		112	112
100.000	95		112	115
120.000	103		112	126
130.000	107		118	130
150.000	115		125	140

Vmca = 112 KCAS

Landing Speeds

Landing Weight (lb)	KCAS **Vapp**	**Flaps 100%** **Vthr**	**Vtdn**
80.000	115	96	80
100.000	123	108	90
110.000	129	114	94
120.000	135	120	98
130.000	139	124	102

YC-121F
Stall speeds (CAS)

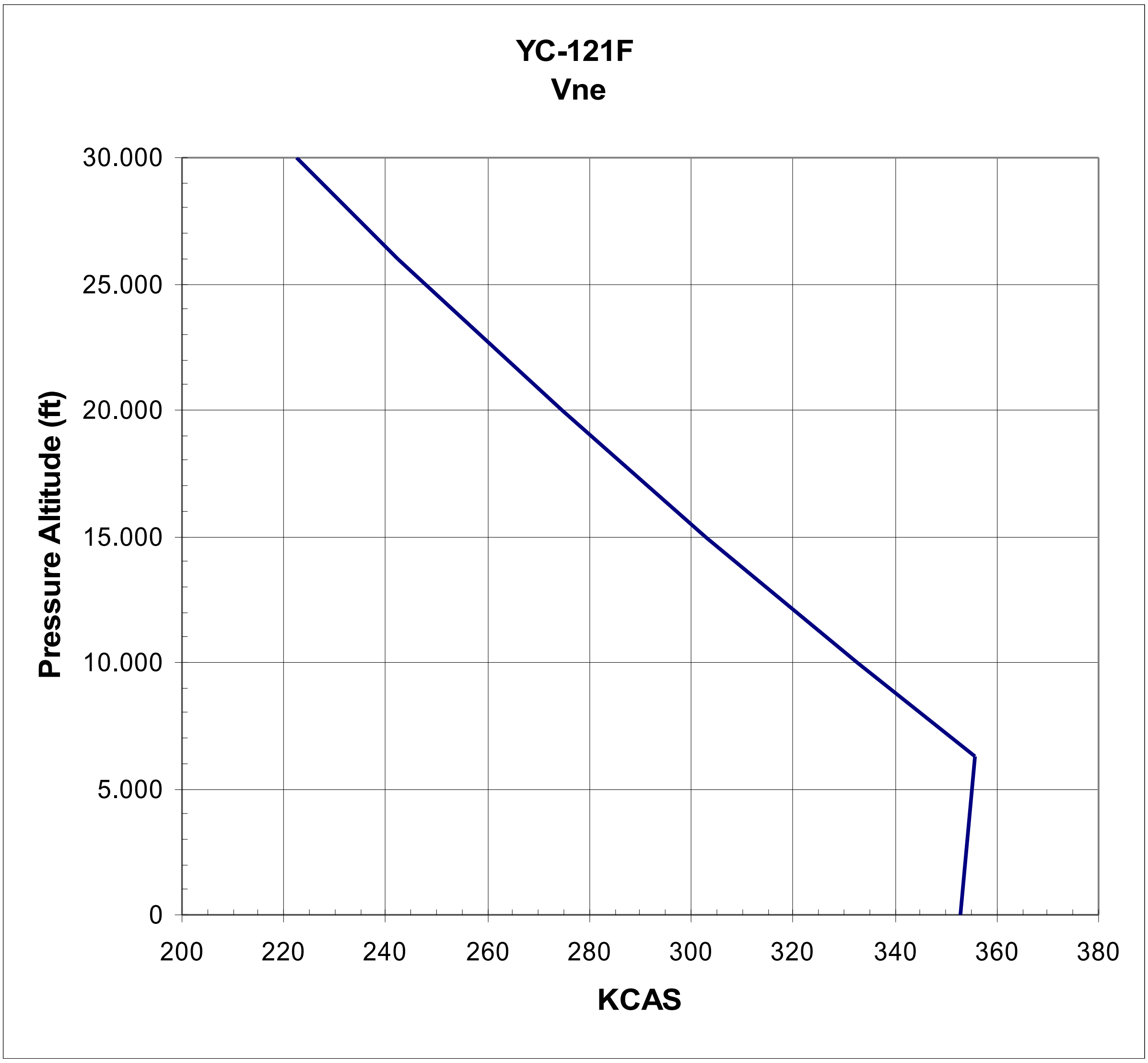
Weight (lb)	**Clean**	**60% flap**	**100% flap**
80.000	94	85	74
90.000	100	90	79
100.000	105	95	83
113.000	111	100	89
120.000	114	103	92
130.000	119	107	95
140.000	124	111	99
150.000	128	115	104

AIRSPEED POSITION ERROR CORRECTION:

Take Off 60% flap	-3 kt
Cruise (100-260kt)	-2 kt
Cruise (300-360kt)	-3 kt
Land 100%	-3 kt

CAS = IAS + Correction

LIMITATIONS	**YC-121F**
Speed Limitations	**IAS**
Vno normal operation (kt)	
Vne never exceed (kt)	353
Va maneuvering (kt)	180-210
Mach number never exceed	0,60
Flaps extended	
Take off position	190
Approach position	165
Landing Position	150
Gear extended	190
Landing Lights extended	175
Vmca (kt)	112
Max angle of bank (º)	45
Weight limits	
MTOW (lb)	150.000
MLW (lb)	125.000
MZFW (lb)	106.000
CoG limits (% of MAC)	
Forward	21
Aft	32
Max acceleration (smooth air)	2,5g
Max acceleration (turbulence)	1,6g
Engine limits:	
Max RAM Torque Pressure:	46,5 psi
Max EGT starting:	760ºC
Max EGT Idle:	430ºC
Max EGT Accelaration	585ºC
Max time for Take Off power:	5 min.
Max time for Military power:	30 min.
Max oil temperature (º)	85
Oil Pressure: Max	85-90 psi
Min Ground Idle	80 psi
Max Fuel dumping speed (kt)	190


YC-121F
Vne
Pressure Altitude (ft)
30.000
25.000
20.000
15.000
10.000
5.000
0
200
220
240
260
280
300
320
340
360
380
KCAS

Vne profile

CHECKLIST

NORMAL PROCEDURES

BEFORE STARTING ENGINES:

PILOTS PANEL

Landing gear lever:	DOWN
Brakes hydraulic circuit selector:	EMERGENCY
Parking brake:	SET
Pitot heater	OFF
De-icer boots cycle selector	OFF
Autopilot switches	OFF
Position, panel and taxi lights	CHECK

FE PANEL

Battery switch	ON
External power switch	ON (engages both electrical and bleed air services)
Fuel dump valves levers	CLOSED
Emergency shut-off levers	OPEN
Battery voltage	CHECK
Inverter switch	CHECK
Generator switches	OFF
De-icer and anti-icer switches	OFF
Fuel crossfeed levers and tank 5	OFF
Engine starter selector switch	OFF
Throttles	GROUND IDLE
Propeller levers	RUN Condition
Fuel shut-off levers	OFF
Fuel tank selector levers 1,2,3,4	ON
Fuel boost pump switch 1,2,3,4	ON
Fuel pressure	CHECK
Propeller synchronizer switch	OFF
Oil cooler flaps switches	OPEN
Engine air bleed valve switches	CLOSE
Fuel quantity	CHECK
Gross weight	CHECK
Bleed air pressure form cart	CHECK

STARTING ENGINES

FE PANEL

The normal starting sequence is 4,3,2,1.

Throttle	GROUND IDLE
Engine air bleed valve switches	CLOSED
Engine starter selector switch	SET TO no. 4
Fuel shut off lever no. 4	ON
Starter button	ON
Turbine dischar. Temp. in 15-30 sec	CHECK FOR RISE
Turbine dischar. Temp. indicator	NOT OVER 760ºC
Engine RPM	stabilized to ground idle (72-75%)
At ground idle, turbine temperat.	430ºC
Oil pressure	80-90 psi

If start is satisfactory:

External power	OFF

Run engine to 92%. When at operating temperature,

Engine air bleed valve	OPEN to start other engines

Repeat start sequence for engine no. 3

When engines 3 and 4 running:	Hydraulic system crossover CHECK
Hydraulic crossover switch	to EMER then to NORMAL
	Check pressure rise in primary hydraulic circuit

Repeat start sequence for engines no. 2 and no. 1

After all engines are started:

Engine starter selector switch	OFF
Generator switches	CHECK ON

The following procedure is to be used in case of an unsatisfactory start:

Start Stop	STOP
Fuel shut off lever	OFF

Before a re-start clear the engines with the following procedure:

Engine not rotating

External power	ON if first engine
Emergency fuel shut-off lever	ON
Fuel boost pump switch	ON
Fuel shut-off lever	OFF
Starter switch	ON for 20-30 seconds
Start stop	STOP
Fuel boost pump switch	OFF

Wait for at least 1 minute before attempting a new start.

ENGINE GROUND OPERATION

PILOTS PANEL

Flight instruments	SET and CHECKED
Vacuum	CHECKED
Altimeter	SET

FE PANEL

External power	OFF
Battery switch	ON
Engine instruments	CHECKED
Hydraulic pressure	primary and secondary CHECKED

BEFORE TAXIING

PILOTS PANEL

Wing flaps lever	TAKE OFF
Wing flap shut-off test switch	TEST

FE PANEL

De-icer boots (if ice condition)	CHECKED
Brakes hydraulic circuit selector	NORMAL
Hydraulic pressures	CHECK NORMAL

TAXIING
Use power from ground idle to flight idle range to taxi (0% to 6% throttle).

ENGINE RUN-UP
FE PANEL

Propeller synchronizer	CHECK as follows:

Set all engines to 92% RPM
Select no. 2 engine as master
Increase power on no. 2 to 96% RPM and note
than in the other engines RPM increases, but no more than 2-3%

BEFORE TAKE OFF
PILOTS PANEL

Gyros	SET and UNCAGED
Trim tabs	SET +2.7

Note: In 2D panel you can click on pitch trim T.O. hotspot to set TO pitch trim

Wing flap lever	TAKE OFF
Pitot heat switches	ON
Check flight controls	FREE FULL MOVEMENT

FE PANEL

Run up	COMPLETED
Propeller levers	RUN
Temperature and pressure	NORMAL
Auxiliary fuel pump switches	TAKE OFF TANKS 1, 2, 3, 4 ON
Oil cooler flap switches	SET

TAKE OFF
PILOTS PANEL
Set take-off power to calculated Torque Pressuere slowly (about 10 sec.)

	Throttle about 91%
Check RPM	100%

When power, temperatures and pressures stabilize, release brakes.

FE PANEL

Engine gauges	MONITOR
Turbine discharge temperature	Not to exceed 585ºC for more than 10 sec.

If temperature above of 585ºC are experienced, a slower throttle movement should be used.

AFTER TAKE-OFF
PILOTS PANEL

Landing gear lever	UP
Accelerate to 150 kts	
Above all obstructions	
NORMAL RATED POWER	Torque Pressure for Normal Rated Power (about 75% Throttle)
Check RPM	about 97.7% RPM
Torque Pressure	below max. calculated value
Wing flap lever	UP when landing gear is fully retracted.
Accelerate to 190 kts	

CLIMB

PILOTS PANEL

Landing gear lever	NEUTRAL
Landing lights switches	OFF
Airspeed	190 kts, adjust pitch to maintain
NORMAL RATED POWER	Adjust throttle for calculated Torque Pressure

Adjust throttle as aircraft accelerates to maintain Torque Pressuere
Throttle about 77%, no need for adjustments with altitude if IAS is maintained.

Check RPM	about 97.7%

FE PANEL

Oil cooler flap switches	As required [normal oil temperature 70-85 ºC]
Pressures and temperatures	NORMAL

CRUISE

HIGH SPEED CRUISE

RPM	97.7% RPM
Torque Pressure	As calculated by Status gauge, then adjust throttle as aircraft accelerates (up to 82-83% throttle at Max Cruise speed)

or

Refer to cruise charts in Reference Notes for alternate power settings

Cruise speed	below 353 kias and M0.60

Climb if critical airspeed is reached and altitude below 30,000 ft

FE PANEL

Oil cooler flap switches	As required [normal oil temperature 70-85 ºC]
Pressures and temperatures	NORMAL
Tanks	Change as required

DESCENT

Plan 1000 fpm descent rate
Power from flight idle to TO as required
Avoid torque pressures below 5 psi

Oil cooler flap switches	As required [normal oil temperature 70-85 ºC]

Plan to allow aircraft to slow down once approach altitude is reached

BEFORE LANDING

PILOTS PANEL

Decelerate below 190 kts

Wing flaps lever	TAKE-OFF
Altimeter	SET

FE PANEL

Fuel tank selector levers	1, 2A, 3A, 4 - ON
Fuel boost pump switches	1, 2A, 3A, 4 - ON
Fuel tank selector lever 5	CLOSED
Fuel crossfeed levers	CLOSED
Pressures and temperatures	NORMAL
De-icer boots	OFF
Brakes	CHECK ON NORMAL
Hydraulic pressure	CHECK Secondary system

TRAFFIC PATTERN and LANDING

When on downwind leg, 190 kt max.

Landing gear	DOWN and LOCKED
130 – 140 kts	
Wing flap lever	TAKE-OFF
1500 ft AGL	
Turn to base leg	
Begin Descent	
165 kts maximum	
Wing flaps set to APPROACH when required	
Final approach	
130 kts maximum	
Wing flaps set to LANDING when required (150 kt max.)	
Over threshold at 115 kts	
Throttles	GROUND IDLE as soon as gear contacts ground
Reverse throttle	As required

GO-AROUND

PILOTS PANEL

Throttles	As required
Wing flap lever	TAKE-OFF
Landing gear lever	UP
Power	Request NORMAL RATED after gear is up

FE PANEL

Oil cooler flap switches	As required

AFTER LANDING

PILOTS PANEL

Wing flap lever	UP

FE PANEL

Oil cooler flap switches	OPEN
Pitot heat	OFF

ENGINE SHUT DOWN

PILOTS PANEL

Parking brakes	SET
All unnecessary switches	OFF

FE PANEL

Brakes hydraulic circuit selector:	EMERGENCY
Throttle	GROUND IDLE
Propeller levers	RUN
Fuel shut-off lever	OFF
Fuel boost pump switches	OFF
Fuel tank selector levers	OFF
Inverter switch	OFF
Generator switches	ON
Battery switch	ON
All unnecessary switches	OFF

EMERGENCY PROCEDURES

Engine failure in flight:

Identify the failed engine.	
Throttle	CLOSED
Fuel shut off lever	OFF
Propeller condition lever:	FEATHER
Fuel tank to engine valve:	CLOSE.
Boost fuel pump to engine:	OFF
Generator Switch	OFF
Oil Cooler Flap	FAIRED
Engine Air Bleed Valve	CLOSED

Engine Air Start:

Emergency shut off lever	ALL ON
Throttle	FILGHT IDLE
Propeller condition lever:	UNFEATHER.
Fuel shut off lever	OFF
Fuel tank to engine valve:	CHECK OPEN
Boost fuel pump	ON
Fuel pressure gauge	NORMAL (21 to 30 psi)
Propeller condition lever:	RUN.
Bleed air pressure	CHECK
Engine starter selector switch	SET TO ENGINE
Engine Fuel shut off lever	ON
Starter button	ON

Check for rise oil pressure and exhaust gas temperature.

Propeller Condition lever:	RUN (check)
Throttle as required.	
Engine starter selector switch	OFF
Generator switch	ON
Bleed Air Switches	AS REQUIRED
Oil cooler flap switches	As required

Fuel Dumping:

Wing Flaps lever	UP
Landing Gear Lever	UP
Airspeed	BELOW 190 kts (recomm. 155-165 kts)
Fuel Dump Valve Levers	AS REQUIRED

Hydraulic Power System Failure:

Failure on Primary System: Hydraulic pumps on engines 1 and 2 inoperative
Flight control boosters are lost; pressure to primary system can be obtained by moving the hydraulic system crossover switch to the EMERGENCY position.

Failure on Secondary system: Hydraulic pumps on engines 3 and 4 inoperative
Gear, flaps and brakes operation is lost; pressure to secondary system can be obtained by moving the hydraulic system crossover switch to the EMERGENCY position.

Failure of both Primary and Secondary Systems:
In this case it is necessary to power the brakes with the emergency brake system, putting the brakes selector to the EMERGENCY BRAKES position.