F-89 Scorpion

USER MANUAL

Introduction

The classic Cold War design of the F-89 Scorpion was the product of a 1945 USAAF specification for a night fighter. The aircraft was to have a crew of two with an offensive armament of six 20mm cannon. The prototype was first flown on August 16, 1948 by test pilot Fred C. Bretcher. The first major production model was the F-89D, which swapped the cannon for a phalanx of 104 missiles. The final version was the F-89J, which carried two Genie nuclear-tipped missiles along with four Falcon air-to-air missiles tipped with high explosives. Both the D and J versions used highly advanced Hughes fire control systems coupled with radar and computers. Although the Scorpion appears quaint and dated now, these were highly advanced aircraft for their time. The Howard Hughes movie Jet Pilot starring John Wayne and Janet Leigh prominently features the F-89 as a 'supporting actor.'

Support

Should you experience difficulties or require extra information about the Virtavia F-89 Scorpion, please e-mail our technical support on tech.support@virtavia.com

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Package Contents

The F-89 package contains three variants:

F-89B – no underwing stores, 6 nose cannon

F-89D – wingtip rocket pods, underwing aux. fuel tanks

F-89J – wingtip fuel tanks, 2 x AIR-2 Genie, AIM-4 Falcon

Exterior Model

The exterior model has all the usual animations such as ailerons, elevators and flaps. There are some additional animations on the model:

Crew Access

The sliding canopy can be open or closed using shift-E.

Landing Light

The nose-mounted landing light swings down when the landing light is switched on by the switch or the ctrl-e key press. The taxi light shares the same lamp so comes on at the same time. This can be switched off if desired using the switch in the cockpit.

Exterior Lighting

Pressing the L key will turn on all lights. You may however wish to turn them on using the appropriate switches in the cockpit, as the L key also turns the on navigation, landing light and flood lighting in the cockpit, which should ideally be switched separately.

Shift-L will toggle the nav lights and the cockpit lights.

Crtl-L will toggle the landing and taxi lights.

Please refer to the cockpit section of this manual for information regarding light switch location.

Scorpion Reference

Specifications (nominal, F-89B/C)

Crew: 2
Length: 53 ft 10 in (16.4 m)
Wingspan: 60 ft 5 in (18.4 m)
Height: 17 ft 6 in (5.3 m)
Wing area: 606 ft² (56.3 m²)
Empty weight: 24,200 lb (11,000 kg)
Loaded weight: 33,693 lb (15,308 kg)
Max takeoff weight: 37,619 lb (17,091 kg)
Powerplant: 2× Allison J35-A-21C afterburning turbojets
- Dry thrust: 5,100 lbf (22.7 kN) each
- Thrust with afterburner:6,900 lbf (30.7 kN) each

Performance

* Maximum speed: 636 mph (553 knots, 1,020 km/h) @ 10,600 feet
* Range: 1,367 mi (1,188 nm, 2,200 km)
* Service ceiling: 49,200 ft (15,000 m)
* Rate of climb: 12,600 ft/min (61.5 m/s)
* Wing loading: 69.7 lb/ft² (340.4 kg/m²)
* Thrust/weight: 0.35

Armament (F-89D)

* 104× 70 mm (2.75 in) "Mighty Mouse" folding-fin aerial rockets
* 16× 127 mm (5 in) aerial rockets on underwing racks or
* Bombs: 3,200 lb (1,500 kg)

Armament (F-89J)

* (2) Douglas MB-1 Genie nuclear-tipped unguided air-to-air rocket.
* (4) Falcon HE air-to-air missiles

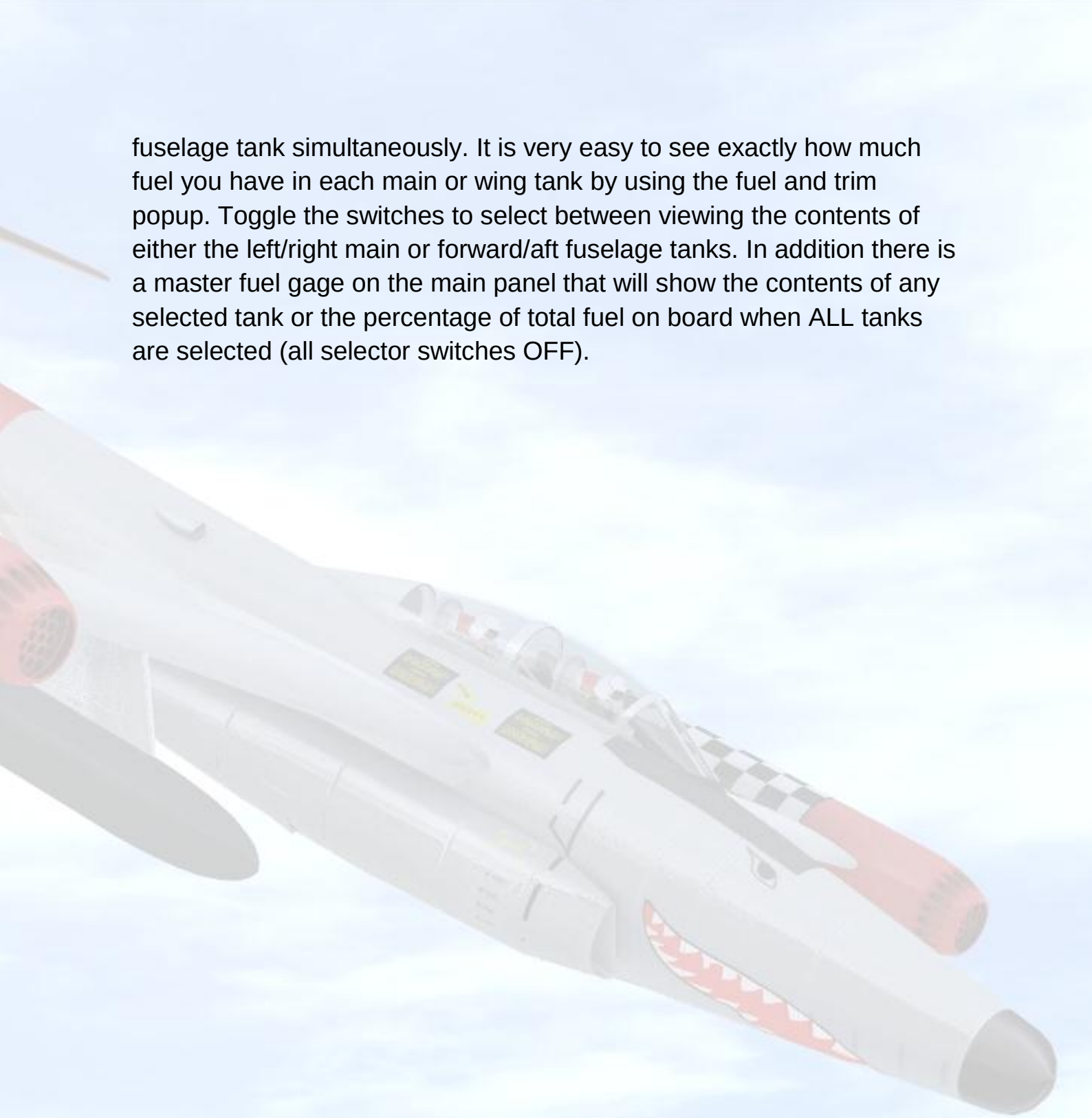
Aircraft Limitations and Speeds

* Stall speed, clean: 124 KIAS at 35,000 lbs
* Stall speed, landing: 99 KIAS at 35,000 lbs
* Max gear extension: 205 KIAS
* Max flap extension: 195 KIAS
* Maximum speed: 425 KIAS below 20,000 feet
* Maximum Mach: 0.9
* Maximum G: +5.67/-2.0 (tip tanks empty)

Fuel and Payloads

Use the Fuel and Payloads options to set up weight and fuel loading. Each aircraft has two fuselage tanks and a left and right main wing tank as well as left and right tip tanks. Depending on the variant, the plane may also be fitted with left and right drop tanks. These can be selected individually by using switches in the cockpit (see below). The default fuel feed schedule with all switches set to OFF is ALL tanks which will drain the drop tanks first (if present) followed by the tip tanks and aft fuselage tank simultaneously and then right and left main tanks and forward

fuselage tank simultaneously. It is very easy to see exactly how much fuel you have in each main or wing tank by using the fuel and trim popup. Toggle the switches to select between viewing the contents of either the left/right main or forward/aft fuselage tanks. In addition there is a master fuel gage on the main panel that will show the contents of any selected tank or the percentage of total fuel on board when ALL tanks are selected (all selector switches OFF).



Panel

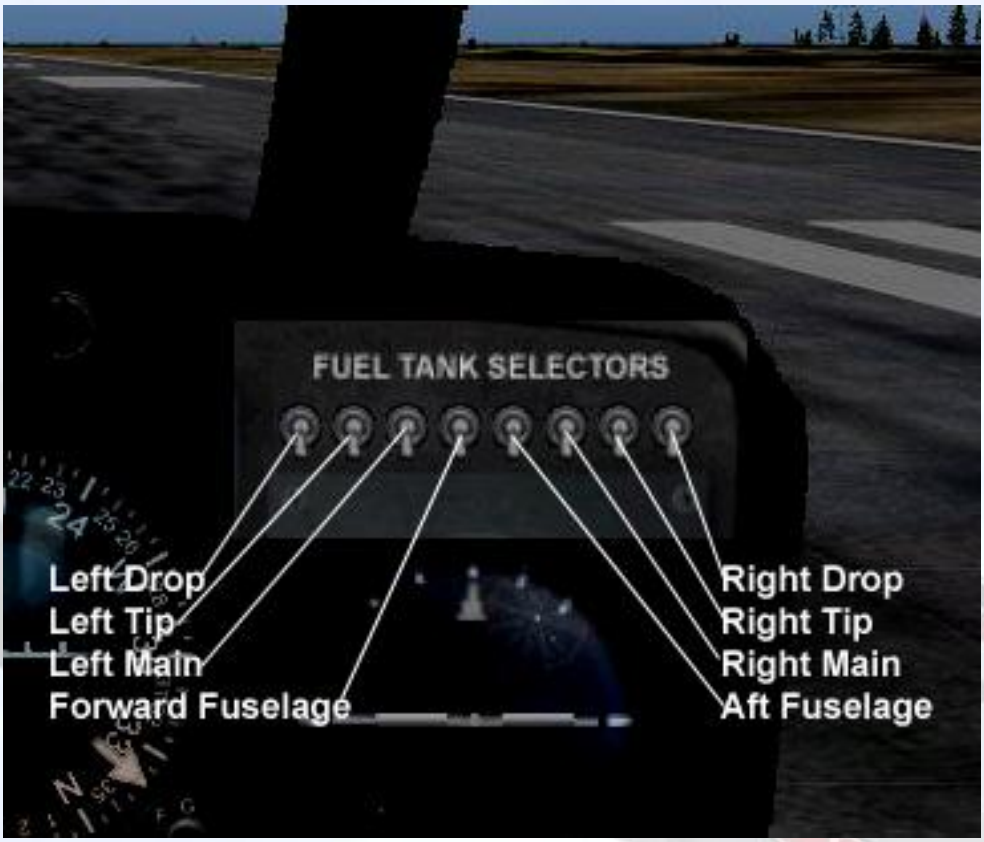
Landing Lights Switches (left main panel)

Virtual Cockpit (differs slightly from 2D panel)

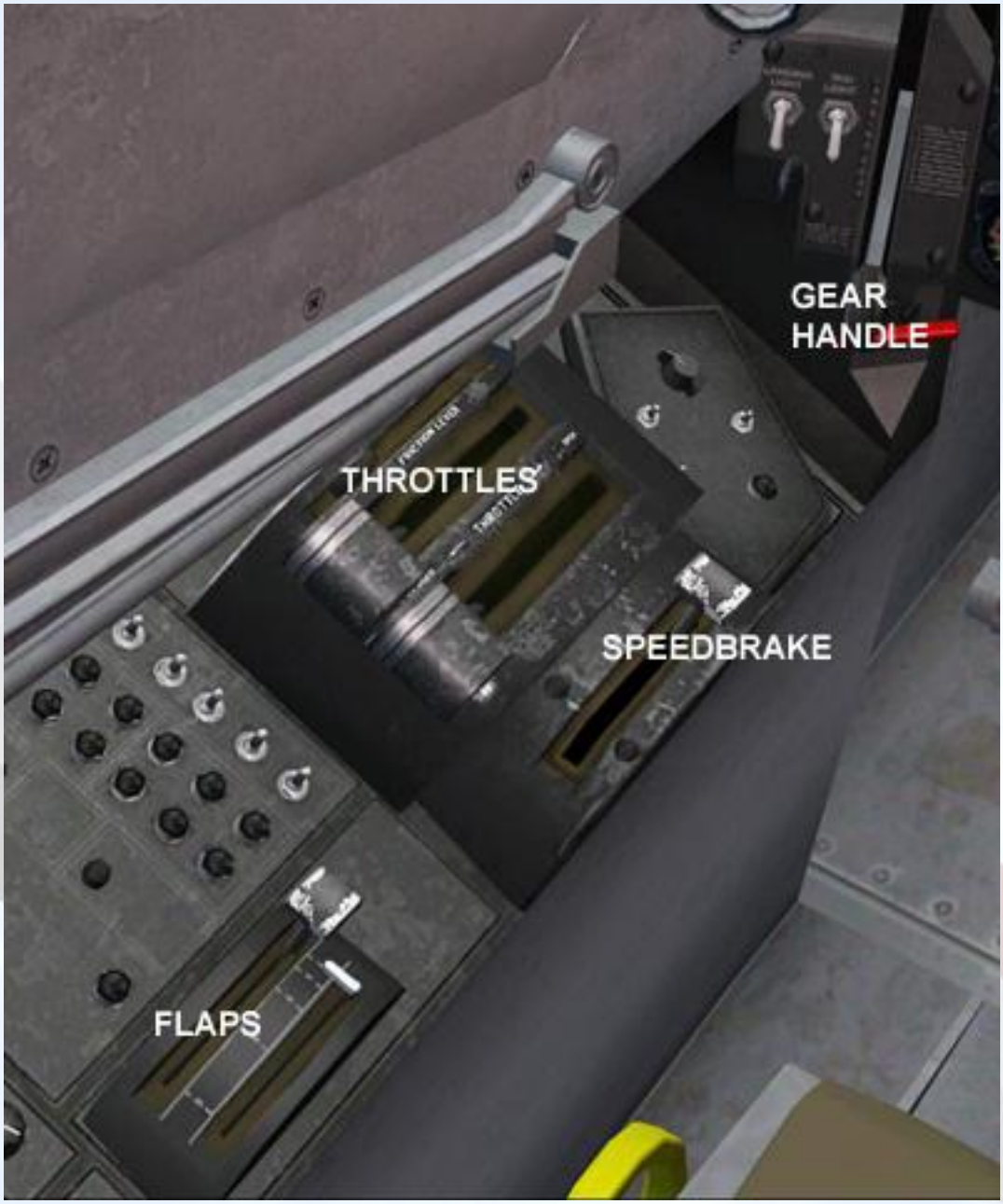
Pop-up Panels

Fuel System Control Panel

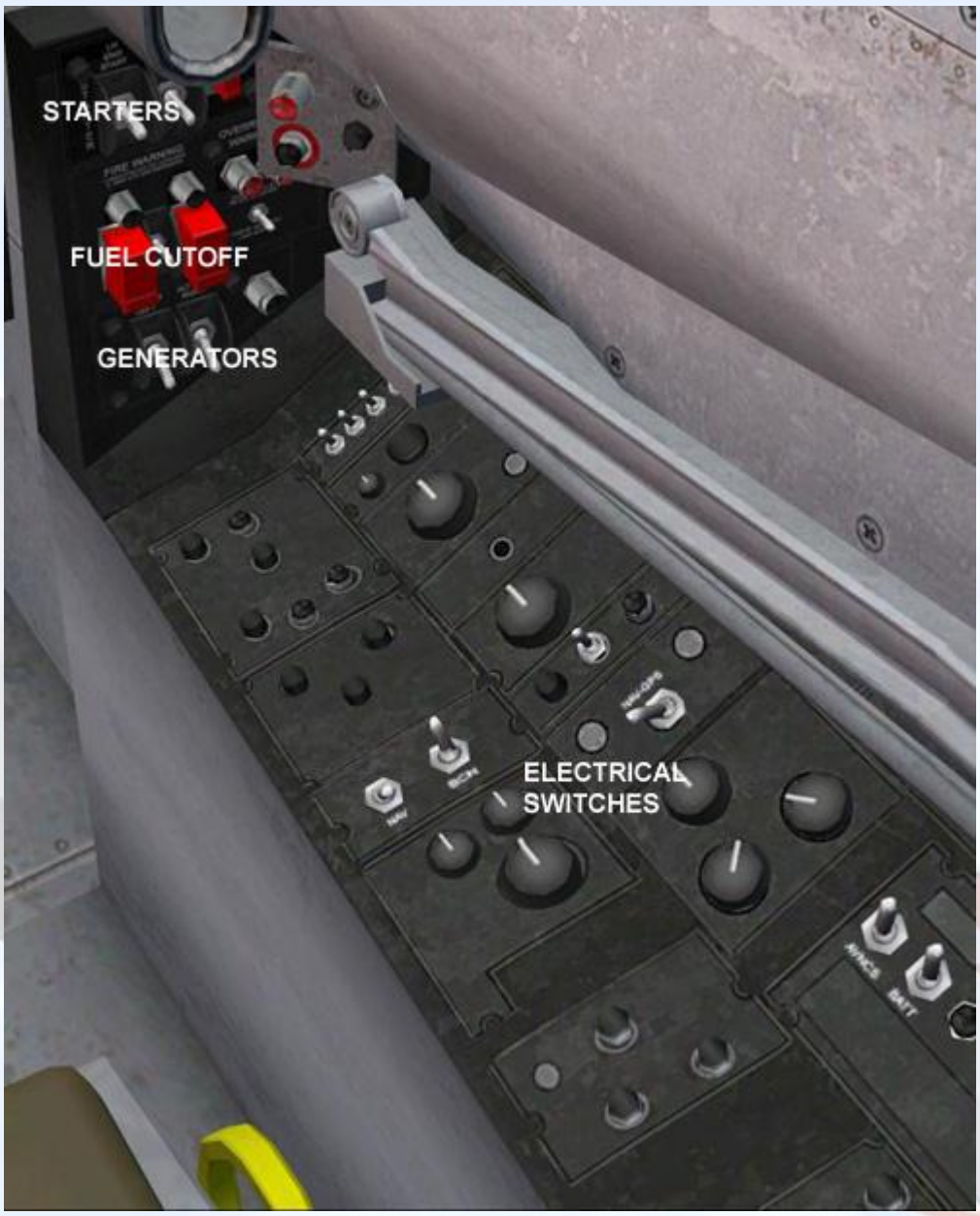
Turning ON any of the switches selects only that tank to feed both engines. It also will cause the main fuel gage to show the contents of that tank. Turning all switches OFF selects all tanks for automatic feed and will also cause the master fuel gage to show the total fuel in percent.



Left Console, Virtual Cockpit



Right Console, Virtual Cockpit



Flight Computer

The F-89 had a unique predecessor to today's "Flight Director". It was called a "Flight Computer" and allowed a similar combination of gage functions to be incorporated into a single unit. We have recreated a facsimile of the Flight Computer which works in a similar way to the original.

In the default mode it works as a compass and course selector. The white bars will operate as localizer and glide scope indicators. The knob at the right is a mode selector. It can be used to activate the Flight Director (F) and the GPS navigation mode (G) which is nothing more than a NAV-GPS switch. Depending on the mode, the bars change their function to Flight Director or GPS. In GPS mode the horizontal bar indicates the altitude of the next waypoint (if such are available), the vertical bar indicates the distance until crossing the track to the next waypoint.

IFR

This aircraft is fully IFR-capable and has dual NAV and COMM radios, a DME, a dual-need RMI, a full-function autopilot, and a combination VOR/ILS gage. NAV1 drives the VOR/ILS. The thin inner needle of the dual RMI will point to any VOR station selected on either NAV radio, and this is selected using the toggle switch on the DME found on the radio stack. The wide, outer needle of the RMI is driven by the ADF. To fly to a VOR station or to fly an ILS approach in this aircraft you must use NAV1 to drive the VOR/ILS.

ILS

Fly your ILS at 230 KIAS and intercept the glideslope at 4,000 feet AGL and 15 miles out. Get set up early enough for the autopilot to correct for trim and drag issues when you extend the flaps and gear. The plane will track the glideslope perfectly if the procedure is followed.

Autopilot

The autopilot is a fully-featured unit and has been thoroughly tested. When setting altitude hold, establish the plane in level flight before engaging the autopilot to avoid slow "porpoising" moments. These will eventually damp out but they can be eliminated altogether by establishing level flight at the desired altitude before engaging the unit. Course and heading hold as well as IAS and Mach hold, wing leveling, altitude hold, vertical speed hold, approach, and backcourse hold can all be selected and adjusted on this unit.

Afterburner

The afterburner function on this plane has been very carefully designed to model that of the real aircraft. Older, early afterburning engines were quite poor at modulating the thrust while in afterburner and thus the fuel consumption is very poor, especially at low speeds. The afterburner will not light off until the engine is at 100 percent RPM. On the runway with the brakes on, you will be able to observe the light off at exactly 98 percent. The plane will lurch forward visibly, the afterburner annunciator light will go on, and in the spot view you will see the flames emit from the burner can. Under static conditions such as takeoff, the afterburner adds a fixed amount of additional thrust which is not scalable. However as the aircraft reaches normal operational speeds and can ingest massive amounts of air, the afterburning range becomes scalable. The afterburners will operate from 98-101% RPM and will kick in when the throttle handle is slightly more than halfway advanced (50% of the throttle's range, not to be confused with the percent of engine RPM). About half the throttle range is the afterburning schedule, meaning that 100 percent RPM is obtained at about 50% of the throttle movement, and the remainder of the movement is the afterburning range from 98-101 percent. The engine RPM remains more or less constant during the

afterburning range, with the additional power derived from the combustion of the fuel in the burner can.

Trim Characteristics

The aircraft will exhibit neutral trim on rotation with takeoff flaps. After takeoff when the flaps and gear are retracted, the nose will want to rise because the downward pitch moment created by the gear and flaps has now been removed. The nose will continue to pitch up mildly with increasing airspeed but this can very easily be trimmed out. At just below 0.8 Mach, the aircraft is almost in perfectly neutral trim and this is the best speed for climbing and subsonic cruise. However just beyond 0.80 Mach, the aircraft will begin to pitch nose down and an increasing amount of nose up trim will be needed to maintain level flight, peaking at Mach 1.0.

Engine Start

Use Ctrl-E (autostart) to start the aircraft, or use the popup ECU or virtual cockpit features to start the aircraft.

1. Set parking brake.
2. Set throttle to IDLE.
3. Turn OFF Generator, Avionics and Deice switches.
4. Turn on Master Battery switch.
5. Ensure fuel supply is on (advance mixture control fully or press Ctrl-Shift-F4).
6. Turn on Engine 1 fuel cutoff switch.
7. Turn on Engine 1 fuel pump.
8. Start Engine 1 using the engine start switch (hold down in FS9)
9. Monitor oil pressure and temperature.
10. Repeat for remaining engine.

Takeoff (normal fuel)

1. Make sure fuel is adequate.
2. Set elevator trim neutral.
3. Set flaps to half down.
4. Hold brakes.
5. Apply full throttle - afterburners will light automatically when RPM reaches scheduled value.
6. Keep the nosewheel on the ground until reaching 123 KIAS for a weight of 35,000 lbs. (adjust with aircraft weight).
7. Rotate smoothly at about 130 KIAS.
8. Don't "yank" the plane off the runway, ease back and let the wings get a bite of the air.

After Takeoff and Climbing

1. Retract landing gear and flaps once a positive rate of climb is established.
2. Make your initial climb at a shallow angle until 200 KIAS is reached.
3. Nose will rise when gear and flaps are retracted so be prepared to trim.
4. Climb at 400 KIAS and maximum afterburner power for a tactical climb.
5. Climb at 0.78 Mach above 10,000 feet after reaching that speed.

Acrobatics

The Scorpion is not intended to be an advanced aerobatic aircraft. Aerobatics are prohibited below 12,000 feet AGL. Airframe loads can be excessive, especially with any fuel in the tip tanks, so symmetrical maneuvering and a prudent hand on the stick is mandatory for this plane in most configurations. The Scorpion is endowed with good overall

handling manners and few vices. The stall is not vicious and recovery is straight forward provided you have sufficient altitude.

Cruising

As with any jet of this era, the Scorpion is most economical when flown at subsonic speeds at or below military power (no afterburner) and higher altitudes. However, the aircraft is fuel-thirsty whenever it's in afterburner. Keep an eye on the fuel totalizer if you plan on using the afterburner a lot. The sea level figures are given to show just how high the fuel consumption is at maximum speed. This cruise figure is for the clean F-89B and matches the aircraft flight manual. Fuel consumption will go up as high as 4150 pph for the same airspeed with the D/J models and with aircraft weight.

Altitude	Airspeed	Fuel Consumption	Nautical miles/1000 lbs	Pilot's IAS	Ground Speed, knots
35,000 feet	0.75 Mach	3450 pounds/hour	122	251	422

Note: Optimal Cruise

Normal Descent

1. Retard throttles to idle.
2. Lower landing gear observing speed restrictions.
3. Use speed brakes as necessary.

Landing (30,000 lbs. nominal)

1. Approach the field at about 250 KIAS at 80 percent RPM.
2. Lower gear (below 205 KIAS).
3. Set wing flaps to takeoff position (50 percent, 8 seconds to extend).
4. Adjust trim as airspeed is reduced and flaps extend.
5. Check instruments.

6. Turn to final at 160-170 KIAS.
7. Wing flaps lever to DOWN on final when runway is made (8 seconds to extend).
8. Maintain at least 80 percent RPM and use speedbrakes to control speed.
9. When landing is assured, retard throttles and adjust speedbrakes as needed.
10. Touch down at 110-128 KIAS depending on aircraft weight.
11. Open speed brakes fully.
12. Set nose down at 106-123 KIAS depending on aircraft weight.
13. Brake as necessary after front main gear touches down.