F-5E TIGER II

USER MANUAL

Introduction

The F-5E Tiger II is an improved version of the original F-5 Freedom Fighter that entered service with the US Military in the early 1960s. It is a lightweight, supersonic fighter-bomber with great agility and load-carrying capability. Over 1400 examples of this type were built between 1972 and 1987, and the type has seen widespread service in the Air Forces of many nations, some of which still operate the type today. Additionally the US Navy still operates the type as an aggressor fighter at its Naval Fighter Weapons Schools.

Support

Should you experience difficulties or require extra information about the Virtavia F-5E Tiger II, please e-mail our technical support on tech.support@virtavia.com

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Package Contents

The Virtavia F-5E Tiger II package contains seven model variants to represent the various stores loadouts typcially carried by this aircraft :

Strike - 2 AIM-9 AAM, 4 Mk.83 free-fall bombs, Ventral Fuel Tank

Long Range - 2 AIM-9 AAM, 3 Fuel Tanks

Post Mission - Pylons fitted, No Stores

Paveways - 2 AIM-9 AAM, 2 Paveway GBU Guided Bombs, 2 Fuel Tanks

Aggressor - 2 AIM-9 AAM

Export - 2 AIM-9 AAM. 2 Fuel Tanks, Air Refueling Probe

Clean military variant

Exterior Model

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

Crew Access

The pilot's canopy can be open or closed using shift-E.

Crew figure

The crew figure can be toggled using Ctrl-W.

Tail Hook

Normally defined as Shift-Q but can be reassigned to 'T' if desired.

Auxiliary Engine Intake Flaps

These venetian-blind like openings each side of the rear fuselage open and close automatically according to engine speed.

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 lights 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 lights.

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

Alternative Viewpoints in FSX

There are several different ways of looking at the aircraft and the cockpit, select these alternative views by right-clicking in an empty area and picking the 'Aircraft' menu for external views and the 'Cockpit' menu for views inside the cabin. It is possible to zoom and pan as normal in these alternative views. Cycle though the available ones by pressing the A key.

External View Options

It is possible to pan and zoom as normal in all external views.

'Dirty' view, rear - perfect for viewing the flaps & gear all-out

Tail View - up and behind the Tiger II

Front, left side view

Nose View – head on

Front View - down low

Front View - up high

Interior View

Virtual Cockpit View

Moving Around the Cockpit

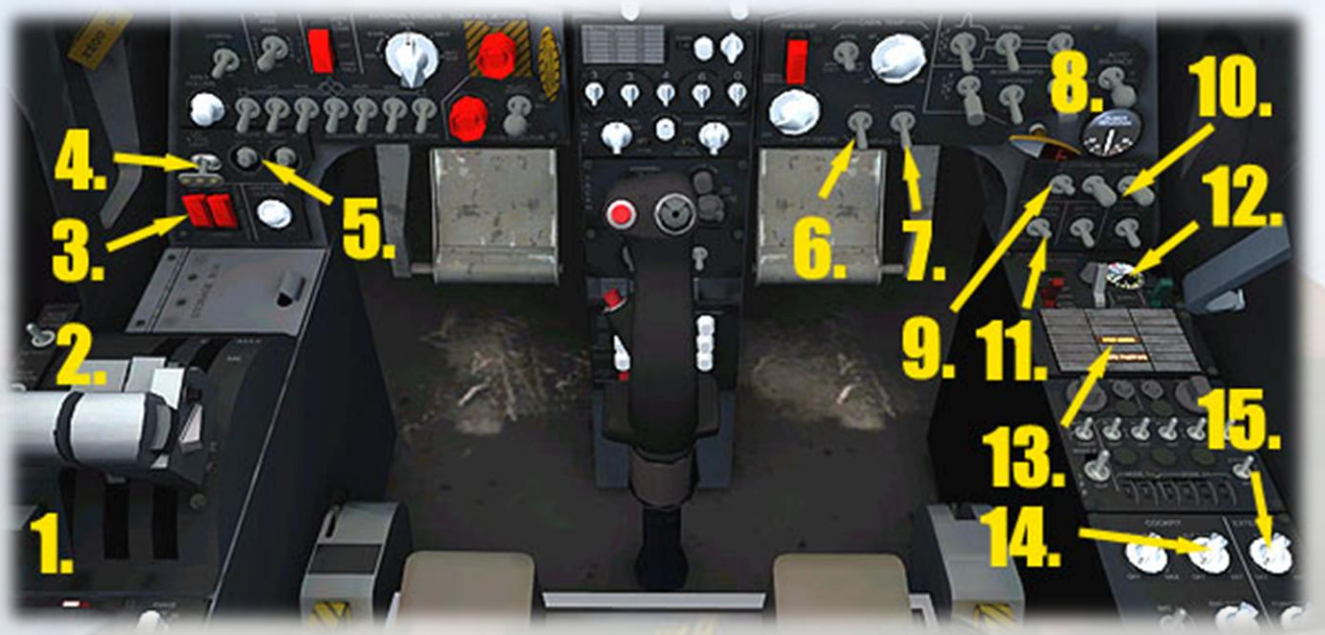
Shift-Enter and Shift-Backspace : moves up and down

Ctrl-Shift-Enter and Ctrl-Shift-Backspace : moves side to side

Ctrl-Enter and Ctrl-Backspace : moves back and forwards

Virtual Cockpit Functions

Pilots Panel · lower



1) **Flaps Switch**.

2) **Engine Throttle Levers**.

3) **Master Fuel Shut Off Switches**.

4) **Landing Lights Switch**.

5) **Engine Starter Buttons**.

6) **Pitot Heater Switch**.

7) **De-Icing Switch**.

8) **Rudder Position Gauge**.

9) **Master Bettery Switch**.

10) **Generator Control Switches**.

11) **Avionics Control Switch**.

12) **Cabin Pressure Altitude Gauge**.

13) **Annunciator Lamps Panel**.

14) **Cockpit Lighting Switch**. Toggle 3 states by clicking left/right sides.

15) **Navigation Lights Switch**.

Pilots Panel · upper

1) **Landing Gear Lever & Warning Lamps**.

2) **Flaps Position Warning Indicator**.

3) **Tail Hook Switch**.

4) **Pitch Trim Indicator**. Mousable.

5) **Airspeed Indicator**.

6) **Altimeter**.

7) **Angle of Attack Indicator**.

8) **Angle of Attack Indexer and Warning Lamp Cluster**.

9) **Artificial Horizon**.

10) **Vertical Speed Indicator**.

11) **Horizontal Situation Indicator (HSI)**.

12) **Gun Sight Glass Display**. Switches are on 2D panel.

13) **Clock**.

14) **Master Caution Warning Lamp**.

15) **Fuel Shut Off Lamp / Switches**. Mousable (caution).

16) **Hydraulic Pressure Gauges**.

17) **G-Meter**.

18) **Standby Atrificial Horizon**.

19) **Radar Altimeter**.

20) **Standby 'Whiskey' Compass**.

21) **Engine RPM Indicators**.

22) **Engine EGT Indicators**.

23) **Nozzle Position Indicators**.

24) **Fuel Flow Indicators**.

25) **Oil Pressure Indicator**.

26) **Fuel Quantity Gauge**.

Two-D Panel Pop-Ups in VC

The following keystrokes will toggle the 2D pop-up panels associated with the accompanying 2D panel suite :

Shift-2 : Autopilot panel

Shift-3 : Electrics and Air Refuelling Controls

Shift-4 : Radios, Autopilot, De-Icing and Lighting panels

Shift-5 : Standard FSX GPS unit

Shift-6 : Air Refuelling Controls

Shift-7 : Warning Lamps Panel

Shift-8 : Warning Lamps Panel (alternate positioning)

Two-D Panel and Pop-Ups

The instruments are the same as in the virtual cockpit with the addition of mousable switches around the radar screen frame which toggle all the pop-up panels as well as ATC, Map, Checklist and GPS. There are also mousable switches on the gun sight unit.

The images below shows the full range of possibilities available when using the 2D panel :


VC POPUP TOGGLES
RIGHT POPUP TOGGLE
LEFT POPUP TOGGLE
AP UNIT TOGGLE
REFUEL PANEL POPUP


WARNING PANEL ID
LEFT GENERATOR
CANOPY OPEN
RIGHT GENERATOR
LEFT OIL PRESSURE
PARKING BRAKE
RIGHT OIL PRESSURE
EXT TANKS WING
EXT TANKS CENTER
LEFT FUEL LOW
PITOT HEATER
RIGHT FUEL LOW
LEFT ENG ANTI-ICE
RIGHT ENG ANTI-ICE
ALTITUDE HOLD
AUTO PILOT ON
HEADING HOLD
MACH HOLD
YAW DAMPER
COURSE HOLD
WARNING WHEN LIT
ENGAGED WHEN LIT
CLICK TO TEST
PANEL TOGGLE CLICKSPOTS
AUTOPILOT MODES SECTION
GLARESHIELD DISPLAY
DH - SELECTED RALT DECISION HEIGHT
ALT - SELECTED AP ALTITUDE
SMOKE - DISPLAY SMOKE ON WHEN LIT
DH
DRAG CHUTE
dig. MACHMETER
WARNING LIGHTS PANEL
LEFT SIDE COMPRESSED
TOGGLE
RIGHT SIDE WARNING LIGHTS
PANEL TOGGLE


LEFT CONSOLE POPUP
STARTERS & ELECTRICAL PANEL
GENERATORS
LEFT
RIGHT
ENGINE STARTERS
CUTOFF FUEL
EMERGENCY SWITCHES/LIGHTS
LEFT
RIGHT
LEFT CONSOLE TOGGLE
FUEL DUMPING SWITCH - INOP. IN FS9
REFUEL SWITCH . ADDS 25% KEROSENE PER CLICK


DISPLAY SMOKE OP.
AVOID USING THE "L" KEY TO SWITCH ON THE LIGHTS FOR IT WILL ALSO TRIGGER THE WHITE DISPLAY SMOKE.
IF YOU DO PRESS THE "L" KEY FOR LIGHTING, PRESS THE DISPLAY SMOKE SWITCH RIGHT AFTER TO STOP THE DISPLAY SMOKE TO ENGAGE
RIGHT CONSOLE POPUP
AP - RADIOS - LIGHT SWITCHES
DISPLAY SMOKE SWITCH
RIGHT POPUP TOGGLES


AP OPERATION
AP MASTER SWITCH DOESN'T NEED TO BE ENGAGED PRIOR TO ENGAGING ANY SELECTED MODE
ENGAGING ANY SELECTED MODE WILL AUTOMATICALLY ENGAGE THE AP MASTER SWITCH
DISENGAGING THE AP MASTER SWITCH WILL DISENGAGE ALL SELECTED MODES EXCEPT MACH HOLD
AUTOTHROTTLE SWITCH MUST BE SET "ON" PRIOR TO ENGAGING MACH HOLD ACQUIRE MODE
ENGAGING THE MACH HOLD SWITCH WILL NOT ENGAGE THE AP MASTER SWITCH
ALTITUDE, HEADING AND MACH HOLD MODES ARE ACQUIRING MODES, SELECTION CANNOT BE PRESET PRIOR TO ENGAGING
AUTO PILOT COMPRESSED PANEL AND AP OPERATION
ILS READINGS FOR IFR APPROACHES WILL BE DISPLAYED ON BOTH THE HSI AND ILS RADAR DISPLAYS.
IT WILL ONLY BE DISPLAYED ON THE ILS RADAR IF GPS MODE IS SELECTED
ALT
AP SELECTED ALTITUDE DISPLAY LGHTS 700ft BELOW SEL. ALT. LIGHTS 150ft ABOVE SEL. ALT.
J-3047
AP KIAS SELECTOR
NAV/GPS SWITCH - LOC MODE
AUTOTHROTTLE SWITCH
HDG SEL.
CRS SEL.
ILS RADAR SWITCH
AP PANEL POPUP TOGGLE
GENERAL LIGHT WARNINGS AND COMPRESSED WARNING LEFT POPUP
MULTI WARNING PAD
CANOPY UNSAFE
TOTAL FUEL LESS THAN 12%
WHEELS UP ABOVE 230 KIAS
AFTERBURNER ON
AoA INDEXER
MASTER CAUTION LIGHT ON
STALL & OVERSPEED
RPM LOW, ENG 1 &/OR 2
CRITICAL OIL PRESSURE
FLASHES - FUEL LESS THAN 10%
STEADY - FUEL LESS 8%
DISPLAY SMOKE ON
AIRBRAKES DEPLOYED
DISPLAY SMOKE SWITCH
DME 2
MASTER CAUTION WARNING LIGHT
TOGGLE WARN POPUP


GUNSIGHT
STALL WARNING DOT
OVERSPEED WARNING DOT
4G WARNING DOT
WARNING MODES
NORMAL SIGHT VIEW
SIGHT SWITCH & LIGHTING 4 POSITIONS
J-3047
DRAG CHUTE
ARREST HOOK
FLAPS

REFERENCE INFORMATION

Virtavia F-5E Tiger II Procedures

Engine Start:

1. Ensure battery and avionics switches are ON.
2. Flip both left and right fuel cutoff switches to the ON position.
3. Press engine #1 starter switch (left engine)
4. At 10% RPM move the left throttle from the OFF to IDLE position.
5. Observe engine auto-ignition at approximately 22% RPM, signified by spike in EGT.
6. Monitor engine parameters, ensuring EGT does not rise above 845°C, and allow 30-45 seconds for engine to stabilize at ground idle (approximately 57% RPM).
7. Repeat steps for engine #2.
   NOTE: For simplified procedure, Ctrl+E for auto-engine start.

Taxi Checklist (All weights):

1. Verify that both engines are running within normal parameters.
2. Lower flaps to FULL position (Flap position 4).
3. Slowly increase throttle on both engines until 61% RPM indicated.
4. Taxi at or below 61% RPM.
5. For left or right turns, avoid using differential braking. Perform the turn using nose wheel steering at the lowest reasonable speed (at or below 10kts GS).

Takeoff at normal loaded weight of 14,600lbs, TOCG 15.8 (Clean configuration, cannon ammo included):

1. Ensure sufficient fuel for the mission.
2. Set pitch trim to 2.5° aircraft nose-up.
3. Set flaps to FULL (Flap position 4).
4. Slowly apply full power (press F4 to ensure throttle is fully-forward).
5. Begin to rotate the nose (aft stick) at 145 KIAS.
6. Un-stick will occur at approximately 155 KIAS and will occur rapidly.
7. Depress wheel brakes once airborne to stop wheels.
8. Retract landing gear.
9. Raise flaps to Maneuver setting 2 (Flap position 3) at 200 KIAS, reduce trim to maintain a constant pitch.

10. Raise flaps to Maneuver setting 1 (Flap position 2) at 250 KIAS, reduce trim to maintain a constant pitch.
11. Raise flaps completely (Flap position 0) at 300 KIAS, continue to climb checklist.

Takeoff at high gross weight of 20,000lbs, TOCG 12.7 (Wing stores attached, cannon ammo included):

1. Ensure sufficient fuel for the mission.
2. Set pitch trim to 3.0° aircraft nose-up.
3. Set flaps to FULL (Flap position 4).
4. Slowly apply full power (press F4 to ensure throttle is fully-forward).
5. Begin to rotate the nose (aft stick) at 175 KIAS.
6. Un-stick will occur at approximately 185 KIAS and will occur rapidly.
7. Depress wheel brakes once airborne to stop wheels.
8. Retract landing gear.
9. Raise flaps to Maneuver setting 2 (Flap position 3) at 225 KIAS, reduce trim to maintain a constant pitch.
10. Raise flaps to Maneuver setting 1 (Flap position 2) at 250 KIAS, reduce trim to maintain a constant pitch.
11. Raise flaps completely (Flap position 0) at 325 KIAS, continue to climb checklist.

Climb (Clean configuration):

1. Climbing at max afterburner is authorized (Press F4 to ensure max thrust).
2. Maintain a moderate pitch angle until reaching 400 KIAS for economy climb.
3. Maintain 400 KIAS using pitch until reaching Mach 0.90, then use pitch to maintain Mach 0.90.

Climb (External stores carried):

1. Climbing at max afterburner is authorized (Press F4 to ensure max thrust).
2. Maintain a moderate pitch angle until reaching 425 KIAS for economy climb.
3. Maintain 425 KIAS using pitch until reaching Mach 0.90, then use pitch to maintain Mach 0.90.

Cruise:

1. Once at desired altitude, slowly bring the aircraft level and trim as best as possible before enabling the autopilot.
   NOTE: If using autopilot vertical speed hold, manually reduce the vertical speed as you approach the desired altitude to assist the autopilot altitude capture mode. Use 2000ft below desired altitude as the anticipation altitude for leveling out.
2. The use of cruise flaps (Flap position 1) at speeds below Mach 0.97 will improve cruise performance by reducing the pitch and angle-of-attack of the wing, and subsequently induced drag.
3. The use of cruise flaps above Mach 0.97 will impact the top speed of the aircraft.

Fuel burn estimates:

Altitude	Airspeed	Mach number	Fuel Burn
100 ft	750 KIAS	1.01	1678 lbs / 100 NM
36,000 ft	450 KIAS	0.96	452 lbs / 100 NM
36,000 ft	500 KIAS	1.60	862 lb / 100 NM

= Optimum Cruise

Descent:

1. The F-5E is capable of descent rates exceeding -50,000ft/min so long as the pilot adheres to the airframe/external stores speed restrictions.
2. For a fast descent, reduce thrust to idle and descend at a pitch of -45° whilst being mindful of the airspeed limitations.
3. Speed brakes can be applied to slow the descent. The speed brakes do not affect lift, only drag.

Approach and landing, 11,000lbs (Clean configuration):

1. Slow the aircraft to 300 KIAS or the recommended pattern speed.
2. Set flaps to Maneuver (Flap position 2) at 250 KIAS.
3. Lower the landing gear at or below 250 KIAS.
4. Set flaps to Maneuver (Flap position 3) at 200 KIAS.
5. Set flaps to FULL (Flap position 4) at 175 KIAS.
6. At landing weight of 11,000lbs final approach speed should be approximately 140 KIAS.
7. At 10ft AGL, retard the throttles.

8. At landing weight of 11,000lbs touchdown speed should be approximately 135 KIAS.
9. The F-5E does not exhibit a significant ground effect, so flair of several degrees is required.
10. Hold steady aft pressure on the stick after the main wheels contact and allow the nose wheel to fall slowly onto the runway surface (-3°/sec max)
    NOTE: If sufficient runway length exists, aerodynamic braking (IE holding the nose off the ground as long as possible and using the fuselage to create excess drag) is authorized.
    NOTE: If using aerodynamic braking, DO NOT apply the wheel brakes until the nose wheel is in firm contact with the runway surface.

Approach and landing, 13,000lbs
(External stores attached configuration):

1. Slow the aircraft to 300 KIAS or the recommended pattern speed.
2. Set flaps to Maneuver (Flap position 2) at 250 KIAS.
3. Lower the landing gear at or below 250 KIAS.
4. Set flaps to Maneuver (Flap position 3) at 200 KIAS.
5. Set flaps to FULL (Flap position 4) at 175 KIAS.
6. At landing weight of 13,000lbs final approach speed should be approximately 155 KIAS.
7. At 10ft AGL, retard the throttles.
8. At landing weight of 13,000lbs touchdown speed should be approximately 145 KIAS.
9. The F-5E does not exhibit a significant ground effect, so flair of several degrees is required.

1. Hold steady aft pressure on the stick after the main wheels contact and allow the nose wheel to fall slowly onto the runway surface (-3°/sec max)
   NOTE: If sufficient runway length exists, aerodynamic braking (IE holding the nose off the ground as long as possible and using the fuselage to create excess drag) is authorized.
   NOTE: If using aerodynamic braking, DO NOT apply the wheel brakes until the nose wheel is in firm contact with the runway surface.

Virtavia F-5E Tiger II Reference

The F-5E Tiger II is an improved version of the original F-5 Freedom Fighter that entered service with the US Military in the early 1960s. It is a lightweight, supersonic fighter-bomber with great agility and load-carrying capability. Over 1400 examples of this type were built between 1972 and 1987, and the type has seen widespread service in the Air Forces of many nations, some of which still operate the type today. Additionally the US Navy still operates the type as an aggressor fighter at its Naval Fighter Weapons Schools.

Specifications:

Single-seat, lightweight supersonic fighter-bomber	
Empty weight:	9,558 lbs
Typical TO weight:	15,500 lbs
Max TO weight:	24,664 lbs
Fuel capacity:	677 US Gal internal
Drop tanks:	150 or 275 US Gal. each
Initial climb rate:	34,000 ft/min
Service ceiling:	51,800 ft

Aircraft Limitations:

Stall speed, clean:	108 KIAS
Max gear extension:	250 KIAS
Max gear retraction:	250 KIAS
Max IAS	750 KIAS (600 KIAS with external stores)
Max speed at S/L:	Mach 1.01 (Mach 0.85 with external stores)
Max speed, 36,000 ft:	Mach 1.6 (Mach 1.2 with external stores)
Maximum G:	+7 / -3

Notes on configuration and load-out:

All applicable load stations are included in the configuration file. In the event the user wishes to use a model with particular load-out, they will need to add weight to the particular load station. The recommended and researched weights for each load station are as follows:

Station_load.0	Pilot	200.00 lbs (Flexible)
Station_load.1	Center drop	229.00 lbs

	tank	
Station_load.2	Left drop tank	148.00 lbs
Station_load.3	Right drop tank	148.00 lbs
Station_load.4	2x Mk83 bombs	2000.00 lbs
Station_load.5	2x AIM-9	344.00 lbs
Station_load.6	560 rds 20mm	394.00 lbs

In the fuel load-out editor the drop tanks are listed as following:

External 1:	Left drop tank (150 gallons)
External 2:	Right drop tank (150 gallons)
Center 3:	Centerline drop tank (275 gallons)

If you are using a model that does not have one of these fuel tanks, set the fuel level for the given tank to 0. You must do this as the fuel tank will always default to the maximum capacity of the tank.

Autopilot:
Though this aircraft is equipped with an auto flight system, it is designed to be flown by hand through the majority of the flight envelopment. The auto flight system however, is fully functional and more than capable of controlling pitch and roll. It is recommended that when attempting to use the auto flight to hold an altitude to level off as best as possible to avoid any pitch oscillations. When using the autopilot in vertical speed mode to capture an altitude, use 2,000ft below as the anticipation altitude to begin leveling off.

Trim Characteristics:
The aircraft will require only small trim adjustments throughout its flight envelope, with the exception of landing, where the gear and flaps cause a nose-down tendency. The aircraft is capable of trimming +/- 10° in either direction; though it is highly unlikely that this much trim would be required at any phase of flight.

General Notes on Handling:
The Northrop F-5E is a highly maneuverable fighter under certain conditions. Because of its small wing, the F-5E has high wing loading, which necessitates relatively high takeoff and landing speeds.

The F-5E should always been flown at a minimum of 300 KIAS or greater for any sort of hard maneuvering unless on approach. Hard maneuvering (tight turns, barrel rolls, stalls, spins, hard rudder reversals,

etc.) below 300 KIAS may result in a stall or weathervane instability because of the aircraft's high wing loading.

The F-5E features an all-moving tail-plane that gives it great pitch authority. As a result, however, the F-5E is easily capable of high-speed stalls if the pilot applies too much aft stick pressure. Stalls are generally mild if the pilot makes a deliberate effort to reduce the angle-of-attack upon stall onset. If the aircraft stalls in a turn or bank it is susceptible to dropping a wing or possibly entering spin, though either situation is recoverable given sufficient altitude and deliberate nose-down pitching action by the pilot. Unrecoverable spins are highly unlikely.

To aid in maneuverability and to make up for the small wing area, the F-5E is equipped with several flap settings for maneuvering and cruise:

- Flap Position 1 lowers the trailing edge flaps to 8°, or the CRUISE position. This setting is highly useful for high altitude cruising and will significantly lower the pitch of the aircraft and subsequently reduce induced drag. It will adversely affect maximum speed, however, and should not be used above Mach .97.
- Flap Position 2 lowers the slats to 12° and the trailing edge flaps to 8°, or the MANEUEVER position. This setting is a maneuvering flap setting to be used at speeds greater than 250 KIAS. It is useful for reducing angle-of-attack during tight maneuvering and can delay the onset of a stall. This setting should only be used in hard maneuvering and will adversely affect top speed. This flaps should be retracted by 550 KIAS to prevent ballooning of the aircraft at higher speeds.
- Flap Position 3 lowers the slats to 18° and the trailing edge flaps to 16°, or the second MANEUVER position. This setting is useful for maneuvering between 200-250 KIAS while flying in the pattern and on initial approach.
- Flap Position 4 is the FULL flap setting. It is used for takeoff and landing and should not be used for maneuvering above 200 KIAS because it may cause significantly ballooning of the aircraft at higher speeds.