FLIGHT MANUAL

North American Aviation

F-86E/F Sabre

Leading Edge Slat Version

AIRCRAFT MODEL for Microsoft FS9

Developed by: SECTIONF8

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For Flight Simulator Use Only

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Golden Apple Operations: Contributed several important F-86 Sabre instrument panel photographs (http://www.goldenappleoperations.org).
Francois A. Dumas: Furnished an exclusive "F-86 Sabre Beta Test Forum" section on his FSAddon website (http://forums.fsaddon.eu).

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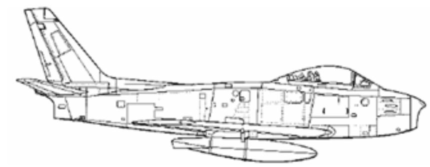

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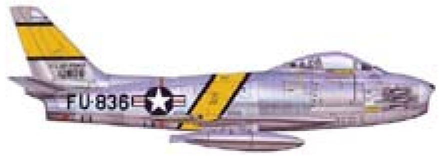


History of the North American F-86 "Sabre"

In 1945, North American Aviation, already famous for its P-51 Mustang and B-25 Billy Mitchell bomber, was put under contract by the US Army Air Force (USAAF) to produce a new jet fighter utilizing information derived from captured German data for the Messerschmitt Me 262. These innovative technologies were employed in transforming the straight-winged US Navy XFJ-1 into the XP-86 Sabre. It made its first flight on October 1, 1947 flown by North American chief test pilot George S. Welch who, in a high speed dive from 35,000 feet, broke the sound barrier 14 days before Chuck Yeager went supersonic in level flight flying the rocket powered Bell X-1. The first production F-86A-1 for the re-designated United States Air Force (USAF) flew on May 20, 1948. On September 15, 1948, an F-86A set a New World Speed Record of 670.97 mph.

Originally designed as a high-altitude day fighter, the F-86 Sabre would undergo a number of changes during its operational use, resulting in 20 different variants (including the US Navy FJ series known as the Fury). Some variants had major differences such as the F-86H fighter bomber and the F-86D all-weather interceptor. Thus, the “Sabre” was really a whole family of related aircraft. These variants represented many firsts in design and technology. Their original swept-wing configuration has since become a standard for jet aircraft and later models had a revolutionary but now commonplace “all flying” horizontal tail section that allowed the aircraft excellent maneuverability at high altitudes. Sabres also employed a hydraulic system for the movement of the flight controls to eliminate the excessive control stick forces necessary for a pilot to maneuver other types of aircraft at high speeds. The F-86D model was the first fighter jet to have an autopilot. Identifying features of the Sabre are its 4.78 aspect-ratio wing with a 35° sweepback and the air inlet located in front of the nose. Stream-wise airfoil-section thickness ratios varied from 9.5 percent at the root to 8.5 percent at the tip. Pitch-up was prevented on some models of the F-86E and F models with full-span leading-edge wing slats as on the Me 262. Deployment of the slats was automatically initiated at the correct angle of attack by aerodynamic loads acting at the leading edge of the wing. On later versions of the aircraft the slats were replaced by a sharp extended-chord cambered leading edge. Single-slotted high-lift flaps and outboard ailerons were incorporated in the trailing-edge portions of the wing. The ailerons were hydraulically actuated, as was the horizontal “all-flying” tail assembly on the F-86E. This meant the entire stabilizer could be rotated in conjunction with a linked elevator. With the horizontal all-flying tail greater control effectiveness is possible at high-subsonic and supersonic Mach numbers. Even later versions of the Sabre had an all-moving, slab-type horizontal all-flying tail, with no elevator. This arrangement has since become standard on all transonic/supersonic fighters.

The hydraulically actuated controls of the F-86E and F models were of the fully powered, irreversible type with an artificial control feel system to aid in eliminating such instabilities as aileron and rudder buzz. This permitted maximum deflection of the control surfaces without requiring excess physical effort on the part of the pilot. These controls differ from the hydraulically boosted controls used on the F-86A. In a boosted control system, the pilot is still directly linked to the aerodynamic control surfaces, but his strength is augmented by a hydraulic booster. Dive brakes were also mounted on either side of the fuselage behind the wing. Later versions of the Sabre, notably the F-86D, K and L models had an afterburner. Another identifying feature of the pre-afterburner versions of the F-86 was the fuselage nose-inlet installation. Inlet air was ducted under the cockpit and delivered to the turbojet engine located behind the pilot with an exhaust nozzle at the rear end of the fuselage. To minimize the depth of the fuselage in the cockpit area, the shape of the duct leading from the inlet to the engine was changed from a circular to an elliptical shape with the long axis in the horizontal plane. Environmental control in the cockpit consisted of air-conditioning, heating, and pressurization.

The thrust-to-weight ratio of the F-86 was about the same as that of the World War Two P-59A. Yet, as compared to it, the first Sabre showed a speed advantage of nearly 300 miles per hour at sea level! A smaller wing area, wing sweepback, and thinner airfoil sections, together with careful attention to aerodynamic design were responsible for the large difference in maximum speed between the two types. Improved engine function also played a role in the superior performance of the Sabre. Drag area was a little greater than for the F-80 by an amount that corresponds closely to the difference in wing area of the two aircraft. As would be expected, the zero-lift drag coefficients were about the same for both aircraft; however, comparison of values of the maximum lift-drag ratio showed the F-80 to have had the advantage by about 17 percent which was primarily due to the lower wing aspect ratio of the F-86.

The F-86 Sabre was best known for its combat role as an air superiority day fighter during the Korean War (1950-1953). First arriving at Kimpo airfield near Seoul, Korea on December 15, 1950, the Sabre saw extensive service not only as a fighter near the beginning of the war but also as a fighter-bomber during the latter stage of the war. Armament consisted of three .50-caliber M3 machine guns buried in each side of the fuselage near the nose. In three successive series (F-86A, E, and F) it challenged the (initial) tactical edge of Russian built Mikoyan/Gurevich MiG-15s over northwest Korea in an area known as "MiG Alley." The MiG pilots were good, being (for the most part) World War Two veteran Russian fliers; however, many of the Sabre pilots were also veterans of World War Two and their expertise showed. On December 17, 1950, Lt. Colonel Bruce H. Hinton scored the first MiG-15 kill by a Sabre pilot. On May 20, 1951 Captain James Jabara became the world’s first (Sabre) jet ace.

When the Korean War turned into a stalemate on the ground (July 1951-July 1953), USAF B-29s continued bombing targets in northwest Korea by day, but after MiGs shot down five in one week during October 1951, the big bombers began attacking only at night. “MiG Alley” remained a hot spot throughout the conflict. Day after day, Sabres swept into MiG Alley to meet MiGs based just outside the Korean border and across the Yalu river in the Chinese province of Manchuria. Although the United Nations had directed that the Manchurian airfields were "off limits" to USAF aircraft, some (aggressive) F-86A pilots occasionally ‘strayed’ into that sanctuary while in hot pursuit of prey.

In July 1951, the F-86E with leading edge slats entered the war, followed in June 1952 by the F-86F-10 also with slats. Next came the F-86F-30 with a change to wing design in which the leading edge slats were deleted in favor of a new solid leading edge and 6-inches more chord at the root near the fuselage and 3-inches more length at the wing tip were added - creating the famous "6-3" wing. A five inch high boundary layer "fence" was also added to the upper surface of the wing at 70% of the wingspan to direct air flow. These changes resulted in a lower drag coefficient and added seven miles per hour to the top speed. Maneuverability also improved at high altitude due to a delay in the onset of buffeting which enabled the Sabre to now turn inside a MiG. Top speed was 695 mph, climb rates increased 300 feet per minute and operating altitude increased in excess of 48,000 feet. Termed "viceless" by the men who flew it because it had to be forced into a spin and could recover simply by neutralizing the controls, the F-86F became the definitive Sabre. Flyaway cost was $211,111 (US) in 1952. Factored for inflation that would be $1,645,356 in 2008 … a real bargain for a front line jet fighter.

Even with its upgrades during the Korean War a F-86 Sabre pilot still had to be in visual contact with the enemy in order to attempt a shoot-down. Thus it was the last true 'dogfighter' in USAF inventory. It single-handedly turned the tide of the air war in Korea in favor of the USAF by shooting down 792 MiGs at a loss of 78 Sabre’s, a victory ratio of 10 to 1 and the highest ever achieved by a fighter in any sustained air campaign. Of the 40 USAF pilots to earn the designation title of 'ace' (five or more kills) 39 flew the Sabre, and by the end of the war (July 27, 1953) no fighter in the world could take on an F-86 without being at a disadvantage. In that regard it must be ranked, along with its illustrious WWII ancestor the P-51 Mustang, as one of the greatest fighter aircraft of all time.

After the Korean War, Warner Robins Air Logistics Center (WR-ALC) had logistics management responsibility for the guns, communications, fire control and bombing-navigational equipment installed on F-86 aircraft. From 1953 to 1958, under Project High Flight, more than 500 Sabre's were processed through the WR-ALC maintenance shops to prepare them for ferrying across the Atlantic to USAF bases in Europe or to other NATO allies.

Under license, production lines for F-86 Sabre day fighters were established in four foreign countries: Canada, Australia, Japan, and Italy. During the years 1947 through 1961, before production ended, a total of 8,745 were manufactured with five different engines making it the most produced jet fighter in history. Of the total, 6297 were built in the U. S. and 1815 in Canada. The last Sabre to be produced rolled off the Mitsubishi of Japan assembly line in 1961.

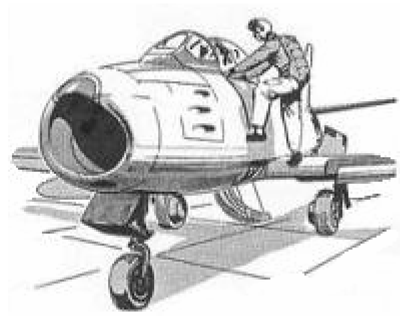
Ultimately surpassed in performance during the second half of the 1950's by the newer Century Series of Fighters, the F-86 Sabre has long been retired from the operational inventory of the USAF but as late as 1996 a number continued to be used for various military flight-test purposes or as US Army target drones. During its Foreign Service life, the Sabre was a part of the air forces for 24 different countries including Australia, Britain, Nationalist China, Pakistan, Republic of Korea, Spain and West Germany. As late as 1980, eight developing nations still had a number of Sabre's in their inventory. The last military active Sabre, an F-86F, was withdrawn from Bolivian service in 1993, fully forty-one years after it was built. At least one manufacturer, the Boeing Company, used an F-86 as a project chase plane into the early 1990's. Of all Sabre variants held by private owners and museums that are still flying today, the "F" model with leading edge slats survives in the greatest number.

Notice: It is important to read the complete flight manual

North American Aviation F-86E/F Sabre

Leading Edge Slat Version

Designed for Microsoft Flight Simulator 9



Technical specifications and performance data

Dimensions:

Wing Span: 37.12 feet
Length: 37.54 feet
Height: 14.79 feet

Weights:

Empty Weight: 10,830 lbs.
Take-off (clean): 14,860 lbs.
Take-off (2/120 gallon drop tanks): 16,625 lbs.
Take-off (2/200 gallon drop tanks): 17,800 lbs.

Fuel (JP-4 at 6.5 lb./gallon): Internal, sum total 435 gallons; 2,830 lbs.
With 2/120 gallon drop tanks, sum total 675 gallons; 4,355 lbs.
With 2/200 gallon drop tanks, sum total 835 gallons; 5,430 lbs.
Ammunition: 1,602 rounds .50 caliber; 480 lbs.

Basic mission take-off weight: Wing loading, 61.8 lbs./sq. feet at 17,800 lbs.
Combat weight: 14,860 lbs.

Performance:

Powerplant: General Electric J47-GE-27 axial-flow, turbine jet engine
Sea level static thrust: Maximum, 5,910 lbs. at 7,950 r.p.m. for 5 minutes. Military, 5,910 lbs. at 7,950 r.p.m. for 30 minutes. Normal, 5,200 lbs. at 7,370 r.p.m. continuous

Take-off run: Ground run at sea level 2,625 feet. Distance to clear 50 feet, 3,925 feet
Landing ground roll: 2,090 feet. Total distance from 50-foot height, 3,190 feet

Stall speed (power off): 128 mph (111 kts)

Ferry range with external tanks: 1,317 miles
Combat radius: 2/200 gal. drop tanks, 463 miles. Average cruise speed 513 mph (446 kts)
Combat radius: 2/1,000 lb. bombs, 315 miles. Average cruise speed 486 mph (422 kts)
Average mission time: Approximately 2.16 hours

Maximum Speed at sea level: 688 mph (598 kts)
Maximum Speed at 35,000 ft: 604 mph (525 kts)

Rate of Climb: 9,300 ft/min at sea level
Time to 20,000 ft: 5.2 minutes
Time to 30,000 ft: 8.3 minutes
Time to 40,000 ft: 16.0 minutes

Service Ceiling: 48,000 feet

Notable features of the F-86E/F

TRIM TAB CONTROL

To maintain desirable handling characteristics through-out the speed range of the F-86E/F, the ailerons and horizontal tail are actuated by an irreversible hydraulic control system that gives full pitch control at maximum speed. With this control system, trim tabs are not necessary on either ailerons or the horizontal tail. The hydraulic actuators at these surfaces do not transmit air loads to the pilot, so control stick feel is provided artificially by spring bungee connections and counterweights. Actuating the related trim control merely relocates the stick neutral (no-load) position so that stick forces are "zeroed" for any particular flight speed and altitude. To the pilot, this stick neutral (or no-load) position relocation is identical to reactions obtained from trim tab operation on a conventional control system. The rudder is conventionally operated by an electrically actuated trim tab to "zero" rudder feel forces for a particular airspeed or flight attitude.

CONTROLLABLE HORIZONTAL TAIL

The elevators and horizontal stabilizer are controlled and operated as one unit, known as the "controllable horizontal tail" or "all flying tail". The horizontal stabilizer is pivoted at its rear spar, so that the leading edge is moved up or down by normal control stick action. The elevator is connected to the stabilizer by mechanical linkage, and it moves in a definite relationship to stabilizer movement. Elevator travel is slightly greater than stabilizer travel and elevator movement is obtained at low speeds only by virtue of gearing between the stabilizer and elevator. This eliminates many undesirable effects of compressibility, such as loss of control effectiveness at high Mach numbers. It also affords more positive action and greater control effectiveness with less control surface movement than a conventional control system. Even later versions of the Sabre had an all moving, slab-type horizontal flying tail with no elevator

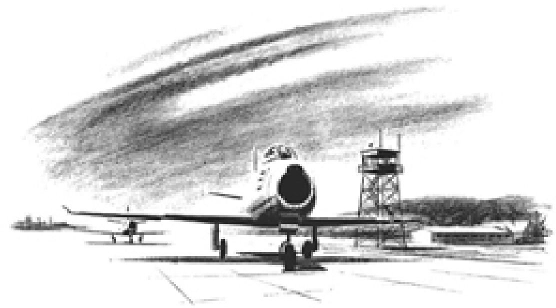
SPEED BRAKES

Any time that deceleration is desired, especially in high-speed turns or formation flying, speed brakes may be used without objectionable buffeting. Their use also enables a steeper dive approach on a target at a given airspeed. In a pull-out, recovery may be effected with minimum altitude loss by first opening the speed brakes and then pulling the maximum permissible G. Opening the speed brakes at high speed, without pulling on the stick at all, results in an automatic increase of about 2 G.

WING SLATS

The airplane is equipped with leading edge wing slats to prevent pitch-up by helping to reduce the stalling speeds in accelerated and un-accelerated flight. However, whether open or closed, they do not appreciably change the action of the airplane at the stall or during normal flight. The slats are unlike those on more modern aircraft in that they are fully automatic, and depending on the angle of attack, float to either the closed, partially open, or full open positions. A reduction in airspeed also automatically extends the slats and, conversely, an increase in airspeed causes the slats to retract. Up to Mach .65, an increase in G extends the slats, while a decrease in G retracts them. At higher speeds, the slats will not open regardless of G. The slats will remain closed while climbing and when in cruising flight.

Operating Instructions:



Starting engine

1. Parking brake – SET
2. All circuit breakers – SET
3. External Power Switch – ON
4. Throttle – OFF
5. Master Switch – ON
6. Battery Starter Switch – START … Momentarily, then move to BATTERY.
7. Throttle – OUTBOARD … Then advance slowly to IDLE

At 3% rpm, move throttle outboard to engage fuel booster pumps and to energize the ignition system. During ground starts above 4,000 feet, open throttle at 9% rpm.

Throttle – Adjust for 700°C exhaust temperature. After ignition occurs, allow exhaust temperature to stabilize; then slowly advance throttle to IDLE at a rate to maintain exhaust temperature between 700°C and 750°C.

Ground operation

No engine warm-up is necessary. As soon as the engine stabilizes at idling speed, and with normal gauge readings, the throttle may be slowly opened to full power. Idle rpm should be between 34% and 38% rpm, but will vary with altitude and outside air temperature. The idle rpm also depends somewhat on the manner in which the throttle was retarded, that is, whether it is eased back to IDLE or pulled back abruptly.

VERY IMPORTANT: The engine has poor acceleration characteristics between idle and 63% rpm.

Taxiing

The airplane has excellent ground handling characteristics. To obtain initial taxi roll, open throttle to approximately 70% rpm; then retard the throttle as needed. Avoid excessive or rapid jockeying of throttle during taxing. Once the airplane is rolling, it can be taxied at idling rpm on a hard surface.

Before take-off

Note: The ailerons and rudder take-off trim position should be neutral; the horizontal tail take-off trim position should be set for an airplane nose-up condition.

VERY IMPORTANT: The horizontal tail **Take-Off Trim Position Indicator Light** on the instrument panel will come on to indicate when the control stick has been properly trimmed to the correct neutral no-load trim position. You should trim until the amber light starts to **"glow"** on the instrument panel. This will take about 5 to 7 seconds. The light will go out when the respective trim switch is released.

Wing Flap Lever – Should always be **FULL DOWN** for take-off, with or without external load.
Canopy closed – Next roll into take-off position, heading airplane straight down the runway. With nose wheel centered, hold wheel brakes.

Take – off . . .

Normal take- off

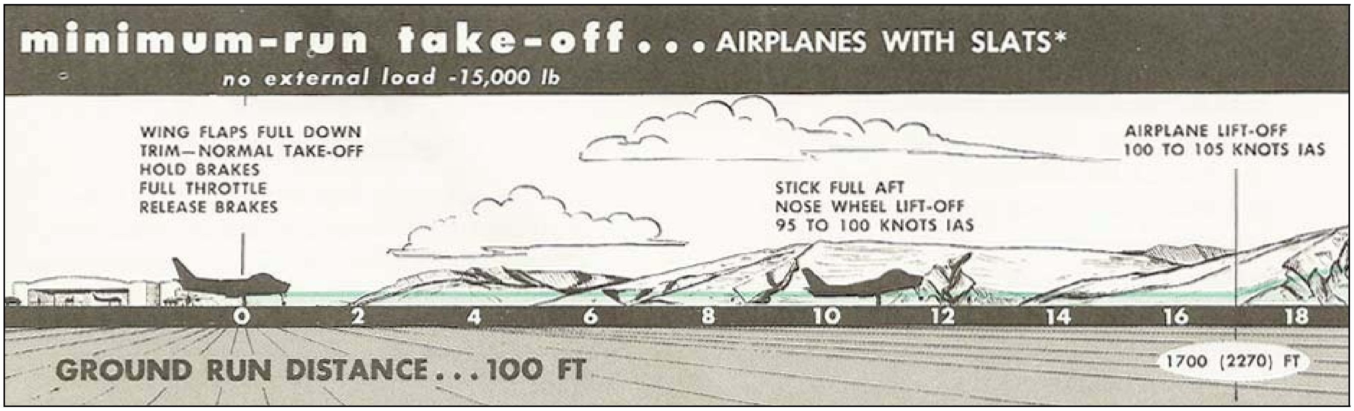
Push the throttle FULL OPEN, before releasing the brakes. During take-off roll, the airplane should be held in a near-level attitude before making a nose wheel only lift-off. In this attitude, the nose wheel should be held just slightly off the runway. Hold this attitude until the recommended airplane lift-off speed of 100 to 105 knots is attained.

Nose wheel lift-off and airplane lift-off Indicated Air Speed (IAS) with flaps full down are as follows:

Gross Weight	Nose Wheel Lift-Off	Airplane Lift-Off
15,000 lb	100 knots IAS	105 knots IAS
18,000 lb	110 knots IAS	115 knots IAS
20,000 lb	115 knots IAS	125 knots IAS

WARNING: Do not assume a nose-high attitude before the recommended take-off speed. Any attempt to take off at lower than recommended speeds can bring about a stall condition. This could be disastrous because of the resultant excessively long take-off run. If a ground stall does occur, as indicated by failure of the airplane to lift off, the nose must be lowered to a three-point attitude to eliminate the stalled condition of the wings.

Minimum-Run Take-Off ... For Airplanes with Slats



Cross-wind take-off

In addition to the procedures used in a normal take-off, be prepared to counteract airplane drift at lift-off by lowering upwind wing or crabbing into the wind. Also, increase nose wheel lift-off speed approximately 10 to 15 knots IAS by holding nose wheel down a little longer during ground run.

After take-off climb

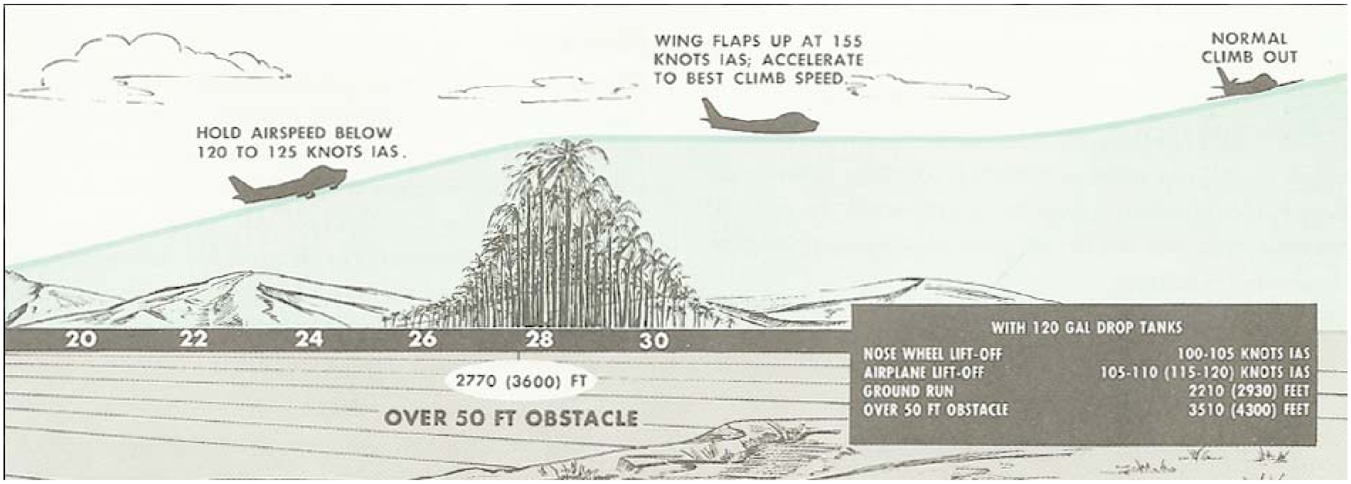
When airplane is definitely airborne:

1. During initial take-off climb with full tanks hold airspeed above 125 knots IAS.

2. **CAUTION: Landing gear should be completely "UP" before reaching 185 knots IAS**. Check gear position indicators. Failure to raise landing gear while **"under"** 185 knots IAS can result in actual hydraulic failure in the model.

3. **CAUTION: Wing flaps should be in the "FULL UP" position at 160 knots IAS**. Rapid acceleration will prevent any tendency for the airplane to sink. If flaps are raised below 160 knots IAS, a change in pitch will be necessary to prevent sinking.

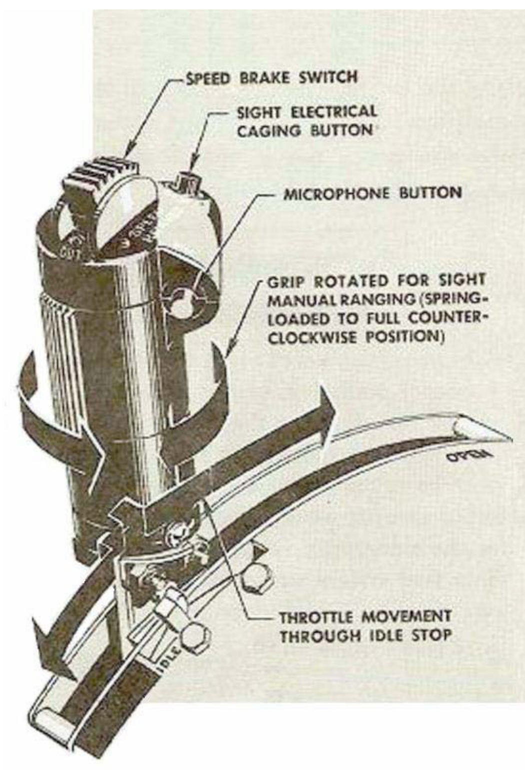
After Take-Off – Climb



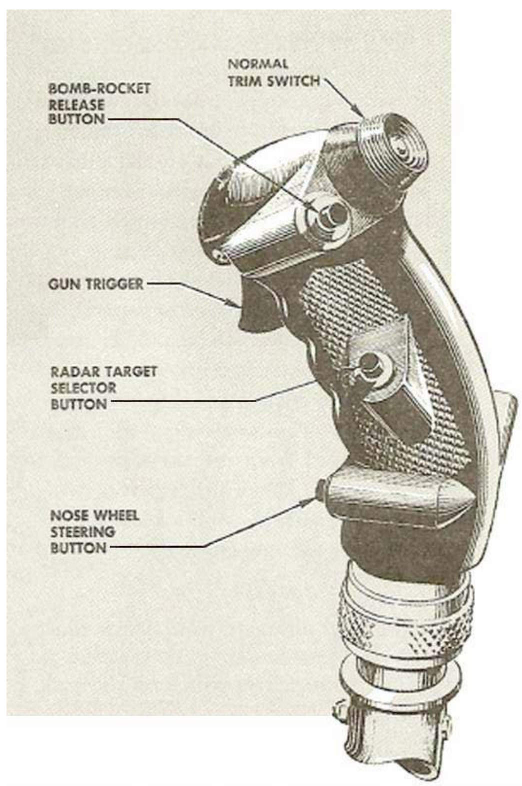
Climb

Normal climb speeds after acceleration from take-off climb should be approximately 430 knots IAS at sea level with no external load. Airspeed should decrease approximately 50 knots IAS for every 10,000 foot increase of altitude.

CAUTION: During extended climbs to high altitudes wherein an extreme nose-high altitude is maintained, level off for at least one minute between 18,000 and 20,000 feet, to permit adequate scavenging of engine oil. If the airplane is not leveled off, severe engine surging may occur because of inadequate engine oil supply for main fuel regulator control

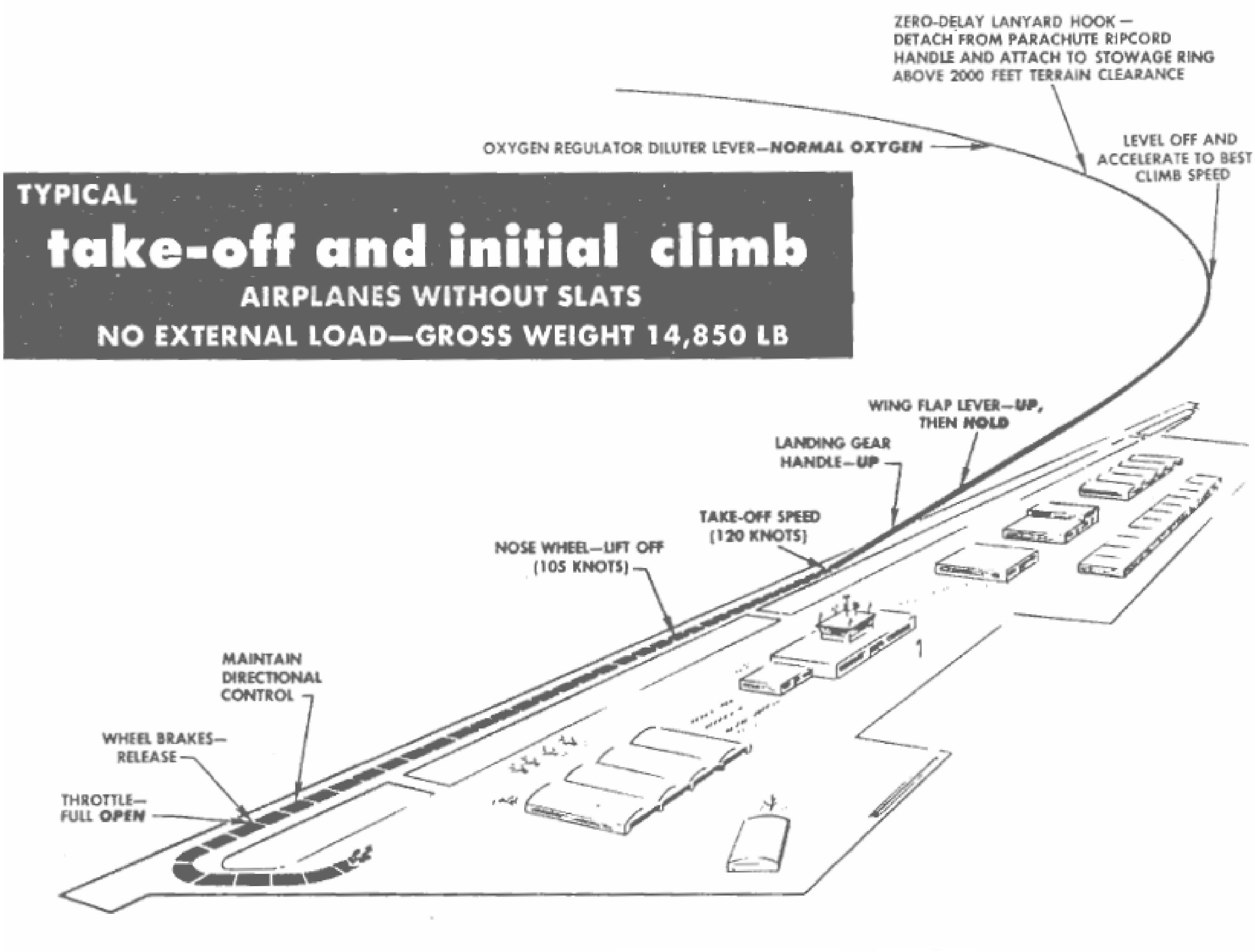


throttle grip



stick grip

Typical Take-Off and Initial Clim



Warning

The recommended nose wheel lift-off and take-off speeds for airplanes with slats are distinctly different from those for airplanes without slats, and you must learn them for each type of wing leading edge configuration.

Because of the lower speeds for airplanes with slats, the control stick must be pulled back farther to pull the nose wheel off the runway.

Do not assume a nose-high attitude before the recommended take-off speed. Any attempt to take off at lower than recommended speeds can bring about a stalled condition. This could be disastrous because of the resultant excessively long take-off run. If a ground stall does occur, as indicated by failure of the airplane to lift off and loss of acceleration, the nose must be lowered to a three-point attitude to eliminate the stalled condition of the wings.

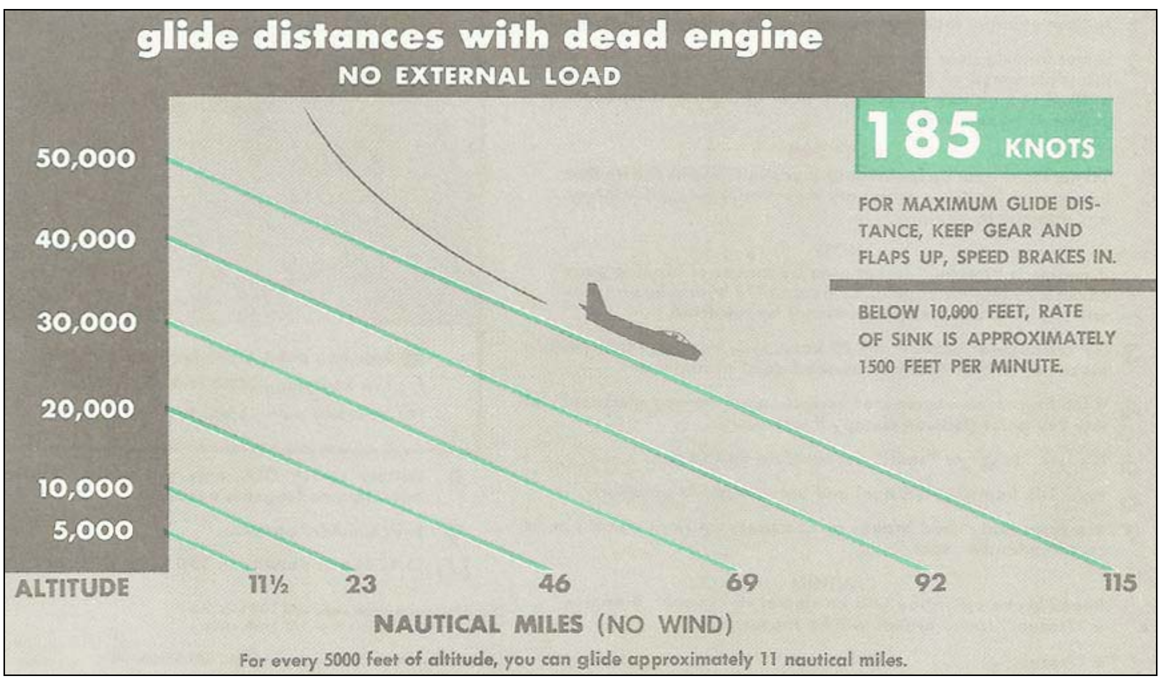
Normal cruise

Note: Average cruise speed with two 200 gallon drop tanks, 513 mph (446 kts.). With two 1,000 lb. bombs, 486 mph (422 kts.). Refer to charts for additional data.

Glide distances

Best glide speed is 185 knots (IAS). Glide distance with gear and flaps up, speed brakes in, approximately 11 nautical miles (no wind) per 5000 feet descent. Below 10,000 feet, rate of descent is approximately 1500 feet per minute.

Glide distances with dead engine



Landing decent

Since very little stall warning exists under landing pattern flight conditions, and G-loads imposed by an abrupt flare-out at touch-down may cause wing drop, with slat-equipped airplanes the landing pattern should be widened, and speed increased.

Final approach

Before landing

Properly followed, these instructions will produce the results needed for a safe landing:

Before landing, the emergency fuel switch should be OFF.

VERY IMPORTANT: The engine has poor acceleration characteristics between idle and 63% rpm. To ensure adequate engine acceleration in case of an emergency, rapid increases in thrust are possible only ABOVE 63% rpm.

It is desirable to use speed brakes to improve deceleration.

Very Important: The maximum airspeed for lowering the gear and flaps is 185 knots IAS. After the landing gear is lowered, drop full flaps as early in the traffic pattern as possible.

Downwind leg speed should be approximately 170 knots IAS.

Very Important: The engine has poor acceleration characteristics between idle and 63% rpm.

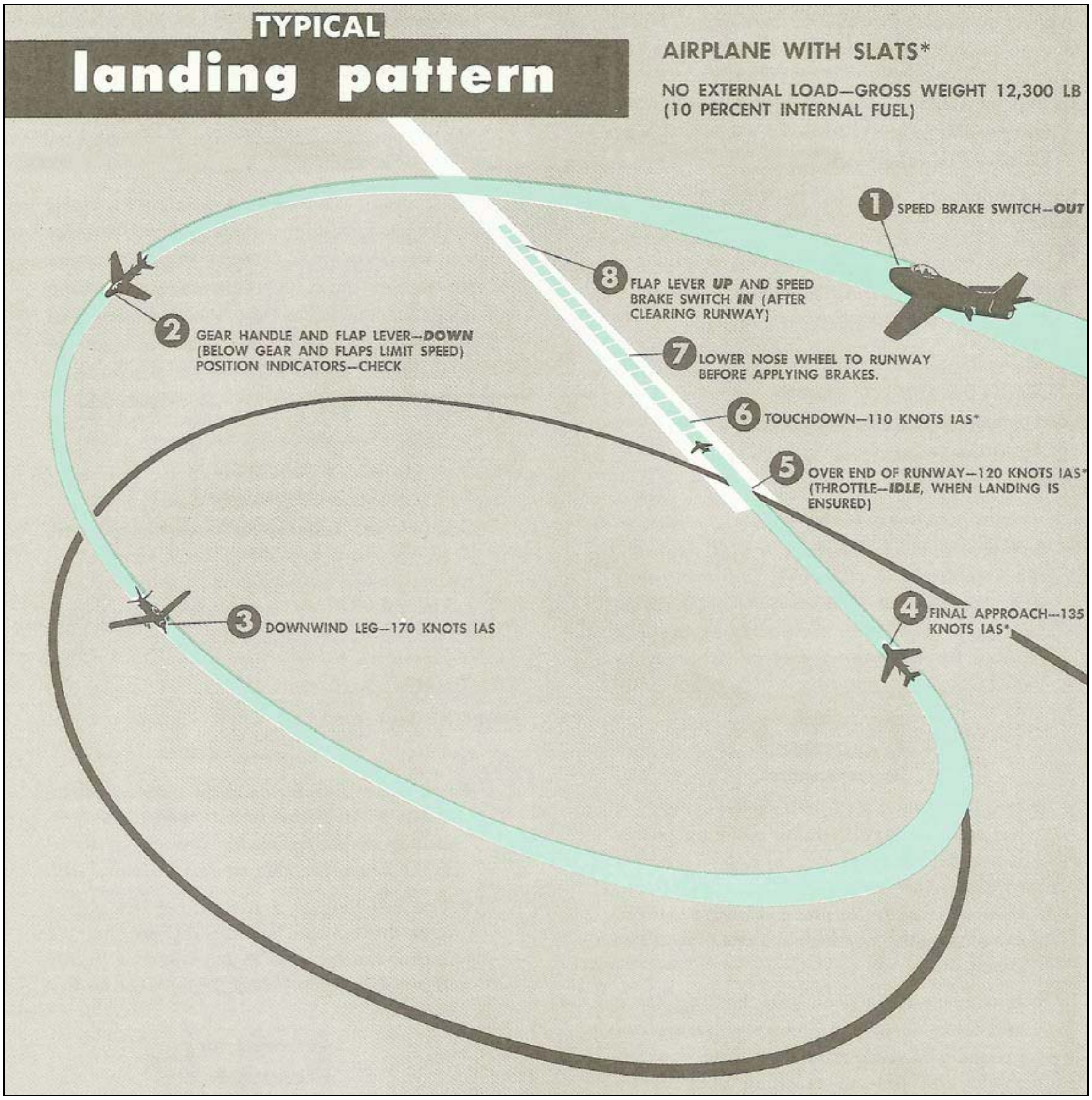
With speed brakes **DEPLOYED** use power as required on final approach to maintain a rate of descent less than 1500 feet per minute at recommended final approach speed of 135 knots IAS.

When landing is assured – move throttle to idle

When landing is assured move throttle to idle (fully closed). Touchdown should be made at a recommended speed of 120 knots IAS.

CAUTION: Flying a steeper than normal final approach or not maintaining a nose high pitch attitude when entering ground effect, can cause touchdown sink rate to exceed the design limit of the main landing gear struts.

Typical Landing Pattern



How to do a correct touchdown for the F-86E/F

Caution: Maintain a nose-high pitch attitude prior to touchdown but do not attempt a full-stall landing, because the angle of attack would be so high the aft section of the fuselage would drag.

Touchdown on the two main wheels and then lower the nose wheel to the runway before raising wing flaps. Next apply brakes. This procedure will actually improve braking action, since the load on the tires will be increased, thus increasing the frictional force between the tires and the runway.

Brake - As Required. Do not apply brakes before the nose wheel has touched down and your speed diminished sufficiently for effective braking.

Note: The full length of the runway should be used during the landing roll so that the brakes can be applied as little and as lightly as possible with bringing the airplane to a stop.

After rudder control loses effectiveness, use differential braking to maintain directional control.

TOUCHDOWN . . .

Cross-wind landing

Adequate control is available for landing in a direct cross-wind with a velocity of 25 knots.
On final approach, crab or drop wing to keep lined up with runway.

Caution: Approach and touchdown speed should be increased 5 knots for each 10 knots of direct cross wind.

If crabbing, align airplane with runway before touchdown; if using wing-down approach, lift wing before touchdown. At touchdown, lower nose wheel to runway as quickly and smoothly as possible.

Touch-and-go landing

Caution - VERY IMPORTANT: The F-86E/F jet engine has poor acceleration characteristics between idle and 63% rpm.

When a touch-and-go landing is to be made, perform a normal approach and landing. Next lower the nose wheel onto the runway as soon as possible after touchdown and simultaneously close speed brakes and advance throttle to Military Thrust.

If in a **go-around** try to fly level, do not allow excessive climb for a few seconds in order for the airplane and your mental condition to stabilized and catch up. If you are not descending, and not losing speed, you're in fine shape. Take your time; this is the point where most pilots get rushed and botch the whole process but there should be no hurry to climb since you will almost certainly need to push on the stick to hold level flight.

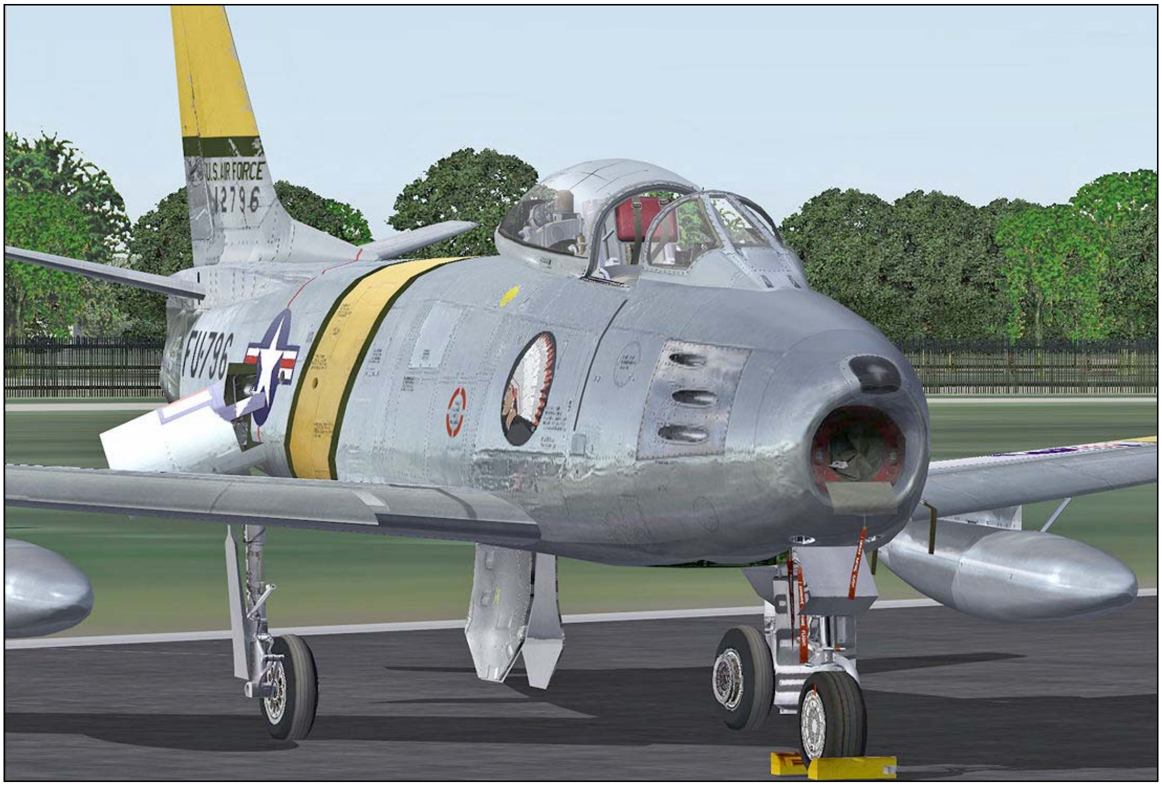
Braking

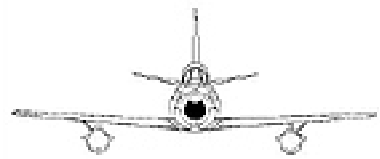
Brake as required. When landing do not apply brakes hard before the nose wheel has touched down and speed has diminished sufficiently for effective braking.

Important: The full length of the runway should be used during the landing roll so that the brakes can be applied as little and as lightly as possible when bringing the airplane to a stop.

Note: The use of speed brakes will help to shorten ground roll.

After rudder control loses effectiveness, use differential braking to maintain directional control.



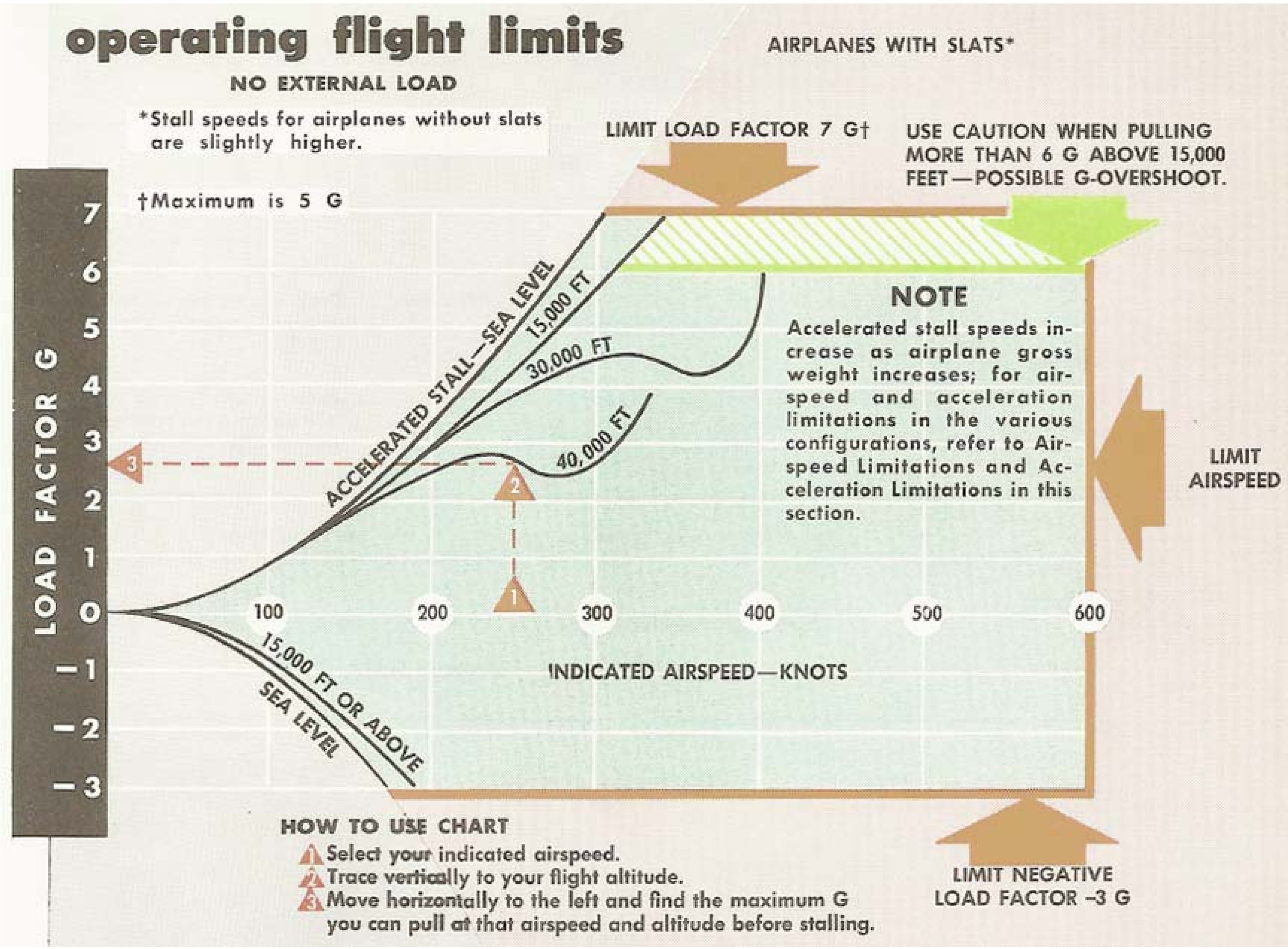


Flight Characteristics of the F-86E/F

Introduction:

The F-86E and F models are advanced versions of the Sabre. While retaining many of the same flight characteristics as the F-86A throughout its speed and altitude range, with the adoption of a full-power hydraulic flight control system and the use of a flying horizontal tail as the primary longitudinal control, handling qualities are noticeably improved…particularly at high Mach numbers. This type system also provides a more consistent, comfortable stick force feedback level over the entire speed range while the wing slats reduce stall speeds and improve lateral control at or near a stall.

Operating Flight Limits



Indicated airspeed at Altitude for given Mach numbers

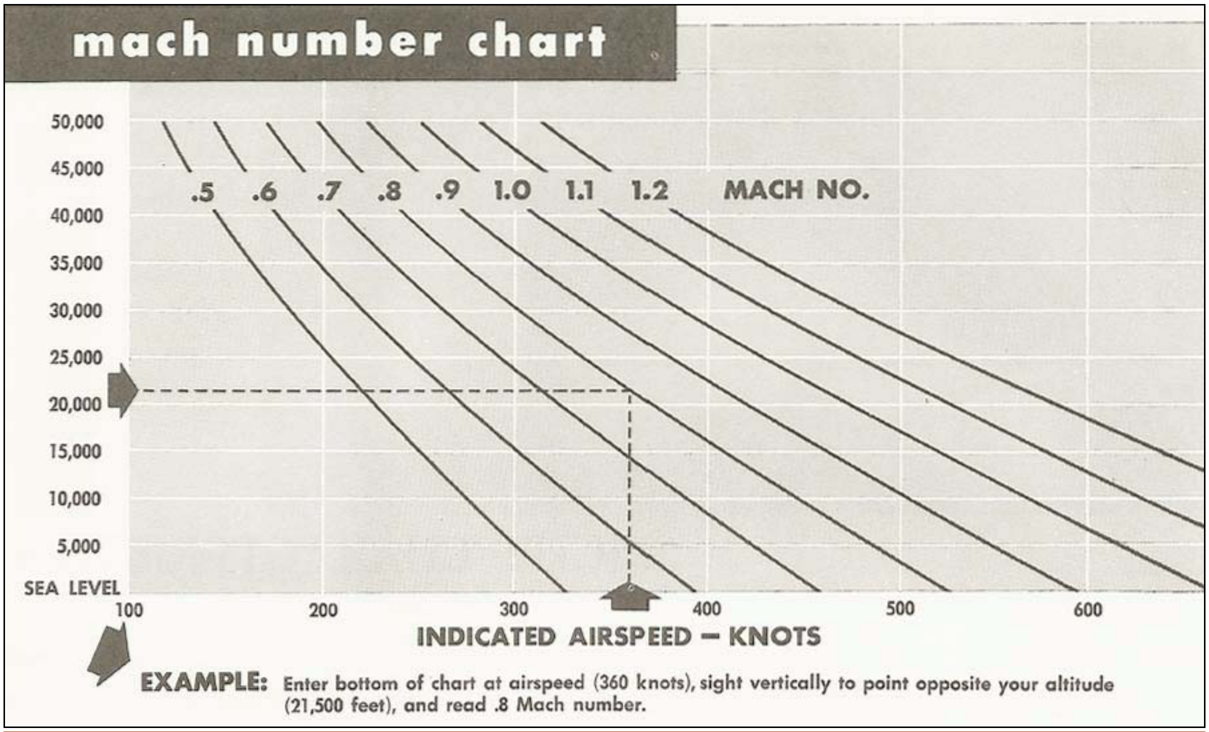
Note: A specific handling characteristic will occur at the same Mach number at all altitudes; however, the higher the altitude the lower the indicated airspeed will be for a given Mach number due to the lower pressure forces that air exerts against a surface at higher altitudes.

In order to relate a flight characteristic to an indicated airspeed, it would be necessary to know the different airspeed for every altitude at which that characteristic occurred. However, if a flight characteristic is related to Mach number, you will notice that this flight characteristic occurs at the same Mach number at any altitude and varies only in intensity, depending upon the altitude at which you are flying. The lower the altitude, the higher the indicated airspeed must be for a given Mach number. The higher indicated airspeed is a result of the greater forces that air exerts at lower altitudes. Consequently, you will notice that although a specific handling characteristic occurs at the same Mach number at all altitudes, the effect on the airplane and on control is more pronounced, and possibly even dangerous, at low altitudes. In addition to being very useful in high-speed and maneuvering flight, the Machmeter provides an excellent means of obtaining maximum range.

Maximum range is obtained by flying at higher altitudes while holding a constant Mach number and constant throttle settings.

Constant Mach number while cruising is economical. As fuel is consumed and gross weight is reduced, you will climb slightly as long as you fly at the same Mach number and throttle setting. This means that at a constant Mach number, the airplane will automatically seek the optimum cruising altitude for the particular gross weight as fuel is used, and maximum range will result. To obtain maximum range using the airspeed indicator, you would have to know a different airspeed for every slight change in gross weight. Since the airplane is designed specifically for high-speed, high-altitude operation, you should be very familiar with the Machmeter and know how to use it in order to obtain maximum performance from the airplane. The Mach number chart on the next page illustrates the variation of indicated airspeed with altitude for given Mach numbers.

Mach Number Chart

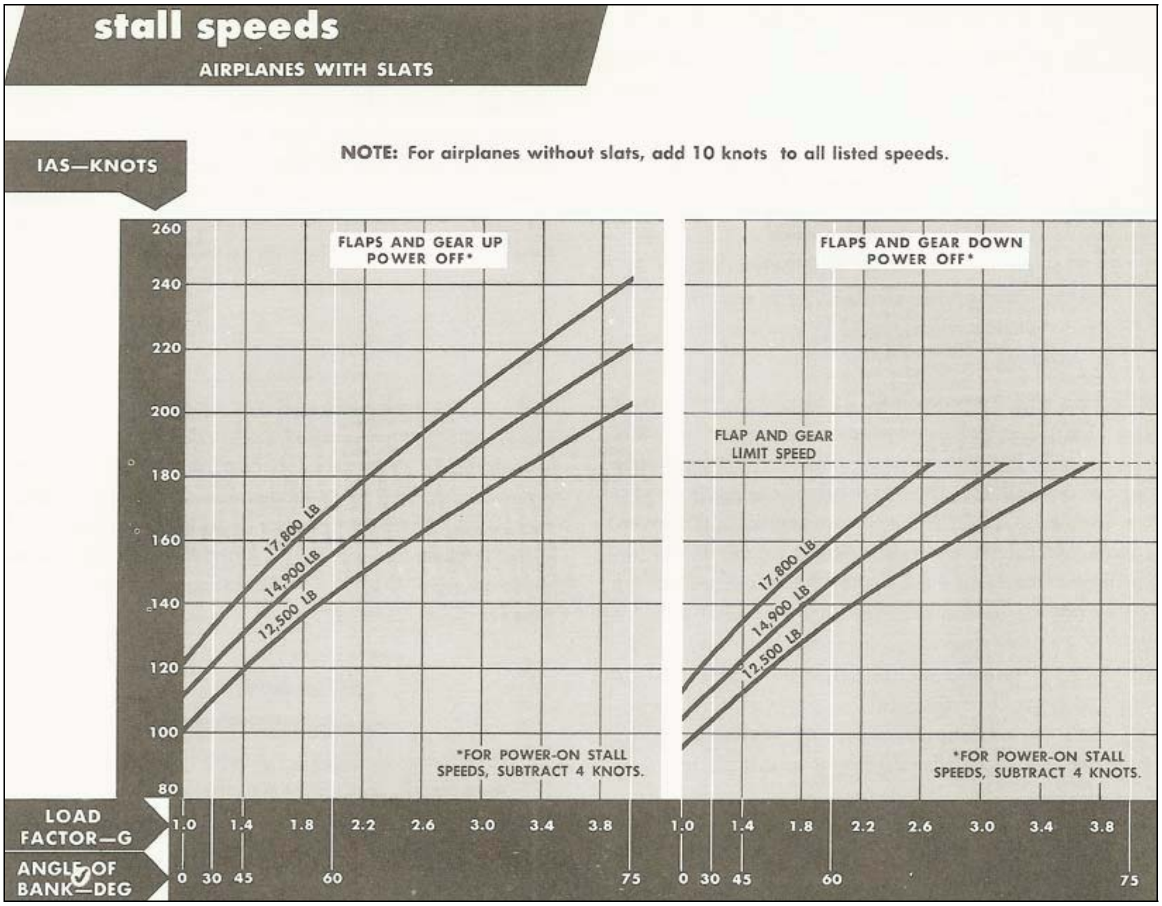


Stalls

Stall characteristics of the airplane are typical for a fighter-type airplane. The swept wing has no unusual effect on the stall other than the higher angle of attack at the stalling point. On airplanes with slats, there is no severe rolling or yawing tendency, and positive aileron control is obtainable up to the stall and during recovery. The stalls are preceded by rudder and general airplane buffet which begins well in advance of the actual stall.

Note: The wing slats will become fully open 20 to 25 knots above the stall.

Stall Speeds – Airplanes with Slats



ACCELERATED STALLS.

An accelerated stall (sometimes referred to as a "high-speed stall") is primarily a stall that occurs while pulling more than 1G. It is the result of pulling into a tight turn and rapidly increasing G through the buffet region to the stall point.

NOTE: Be alert for the buffet warning that precedes the stall.

LOW-SPEED ACCELERATED STALLS.

Low-speed accelerated stalls are usually preceded by a mild airplane buffet. Be constantly alert to detect the onset of a stall because the mild buffet that constitutes a stall warning may escape your attention. Once a pending stall is recognized, reduce back pressure on the stick immediately and use power to avoid excessive loss of altitude near the ground.

HIGH-SPEED ACCELERATED STALLS.

An impending high-speed stall is preceded by a distinct warning in the form of airplane buffet. As the stall is approached, you will notice a considerable increase in the buffet. On airplanes with slatted extended leading edge wings the buffet will decrease noticeable as the slats begin to open.

Whenever pulling G be alert for any signs of general airplane buffet and be prepared to relax stick back pressure. If necessary, apply forward stick pressure to avoid the stall. It is also advantageous to apply power if available to avoid the approaching stall.

PRACTICE STALLS.

The normal altitude loss during and recovery is 1000 feet. However, because of the every-present possibility of entering a spin during these maneuvers, stalls should only be practiced at a minimum altitude of 10,000 feet.

STALL RECOVERY.

Stall recovery is made in the normal manner by applying forward stick and increasing power.

Spins

WARNING: Practice spins should always be started at a minimum altitude of 30,000 feet.

NORMAL SPINS.

Spin characteristics of the airplane are normal. With proper recovery technique and enough altitude recovery can be made by simply neutralizing the controls, although it may take an extra turn to recover in this manner. As the airplane enters a spin, the nose drops down through the horizon to a nearly vertical attitude, reaching a dive angle of 50 to 75 degrees about halfway through the first turn of the spin. During the first half of this turn, the airplane begins its spin rotation gradually but as the nose drops steeply, the rotation rate increases to a point where the pilot senses the airplane suddenly whipping down to almost a vertical attitude. On the average, 8 seconds will be required to complete the first turn, with a loss in altitude of 500 to 600 feet.

Normal spin recovery is characteristic of the airplane. Spin recovery technique for the airplane is similar to that for conventional airplanes. To recover from a spin, regardless of the configuration, proceed as follows:

1. Retard throttle to IDLE upon spin entry, to prevent excessive loss of altitude.

2. Apply full opposite rudder and follow immediately by neutralizing the stick. Do not hold the stick *back* during recovery, as this may cause a spin in the opposite direction as the turn is stopped.

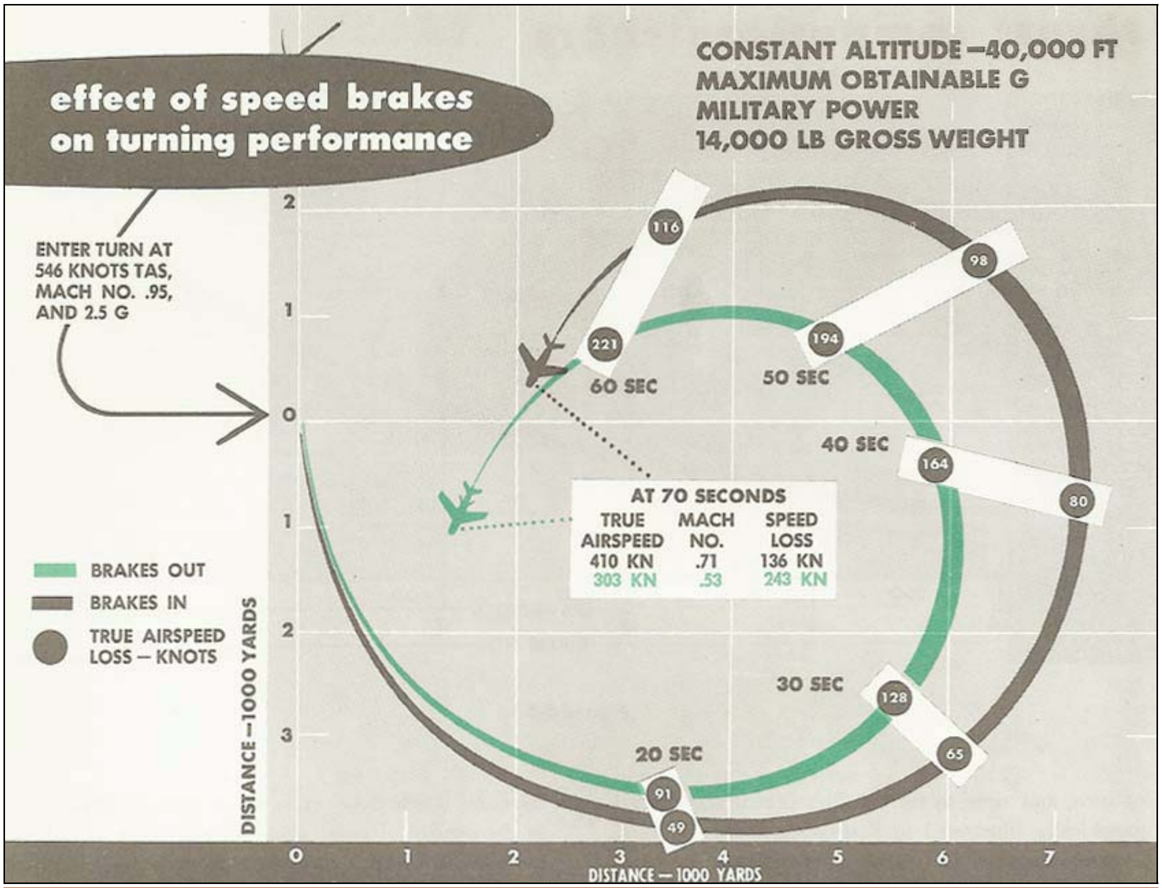
Hold ailerons neutral during all spin recoveries, since recovery may be prolonged by improper use of ailerons.

After spin is stopped, neutralize rudder and regain flying speed before opening speed brakes or starting pull-out.

Speed brakes – Please read

Any time deceleration is desired, especially in high-speed turns or formation flying, speed brakes may be used without objectionable buffeting or uncontrollable changes in trim. An additional advantage of the speed brakes; i.e., their use enables a steeper approach on a target at a given airspeed. In a pull-out, recovery may be affected with minimum altitude loss by first opening the speed brakes and then pulling the maximum permissible G. Opening the speed brakes at high speed, without pulling on the stick at all, results in an automatic increase of about 2G.

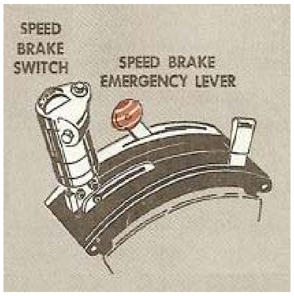
Effect of Speed Brakes on Turning Performance



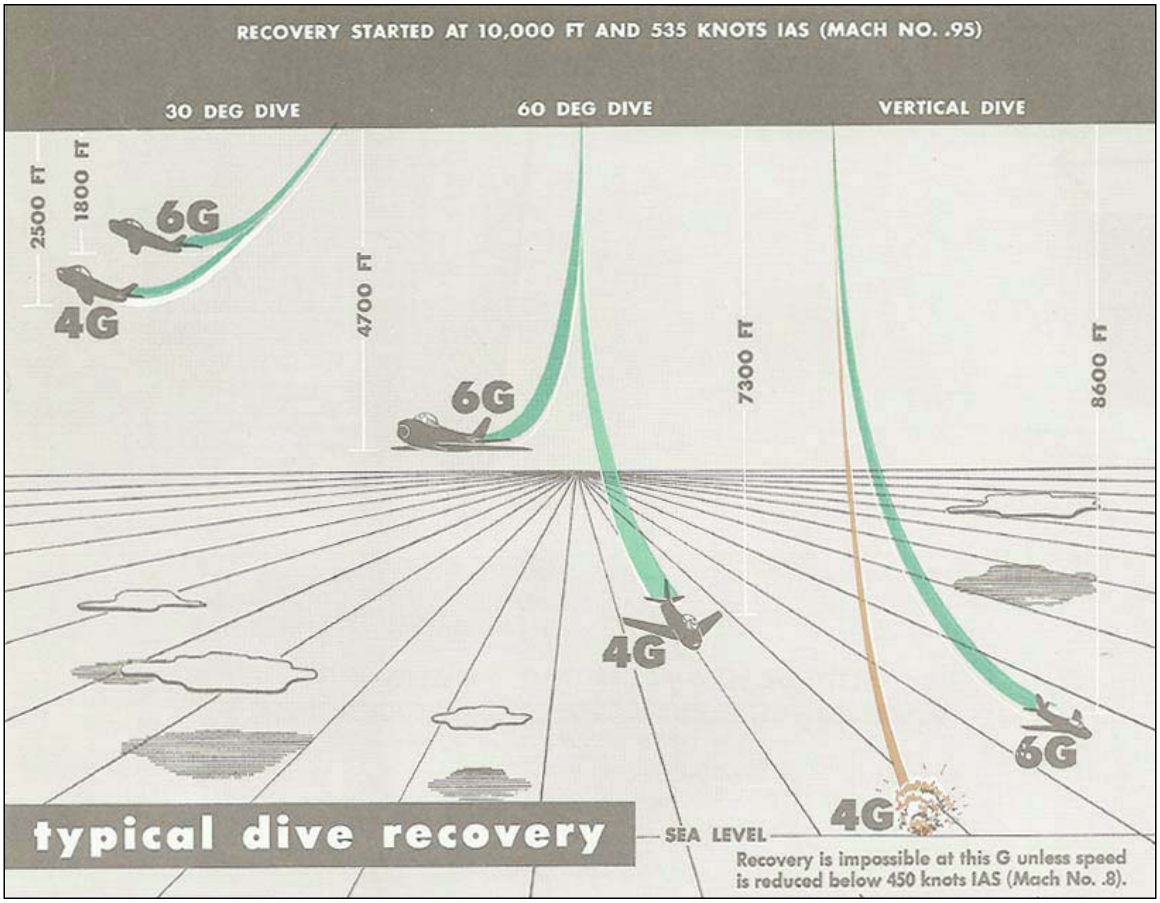
Dive recovery

Because of airplane trim changes which occur during pull-ups at high Mach numbers, the following procedure is recommended for recovering from high Mach number dives or maneuvers:

1. Open the speed brakes. Do not pull back on the stick rapidly until after speed brakes are open and the nose-up pitch due
2. Pull stick back as necessary to affect the desired pull-up.



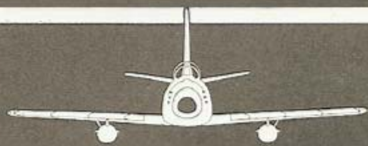
Typical Dive Recovery Starting at 10,000 Feet and 535 Knots IAS (Mach .95)



Airspeed and Acceleration Limitations Chart

airspeed and acceleration limitations

NOTE
Positive g-limits for rolling pull-outs are two thirds of limits shown.
Negative G-limit for rolling push-downs is —1.0 G.

CONFIGURATION	AIRSPEED LIMITATIONS	G-LIMITATIONS MAX POS	G-LIMITATIONS MAX NEG
 NO EXTERNAL LOAD	600 knots IAS or airspeed where wing roll is excessive.	7.0 (6.0 above 15,000 feet*)	-3.0
 TWO 200 GAL DROP TANKS	Above 15,000 feet—Unlimited except by wing roll. Below 15,000 feet—Mach .95 or 555 knots IAS, whichever is less. Avoid buffet regions. NO CONTINUOUS ROLLS	5.0	-2.0

Fuel Quantity Data Chart

fuel quantity data

POUNDS AND US GALLONS

NOTE: Multiply gallons by 6.5 to convert JP-4 fuel to pounds (Standard Day only).

TANK	NO.	USABLE FUEL IN LEVEL FLIGHT (EACH) POUNDS	USABLE FUEL IN LEVEL FLIGHT (EACH) GALLONS	FULLY SERVICED (EACH) POUNDS	FULLY SERVICED (EACH) GALLONS
FORWARD FUSELAGE TANK	1	1274	196	1306	201
AFT FUSELAGE TANK	1	682	105	689	106
OUTER WING TANKS	2	435	67	442	68
DROP TANKS*	2	1300	200	1306	201

- Total usable internal fuel, 2828 pounds or 435 gallons.
- Total usable fuel with 200-gallon drop tanks, 5427 pounds or 835 gallons.

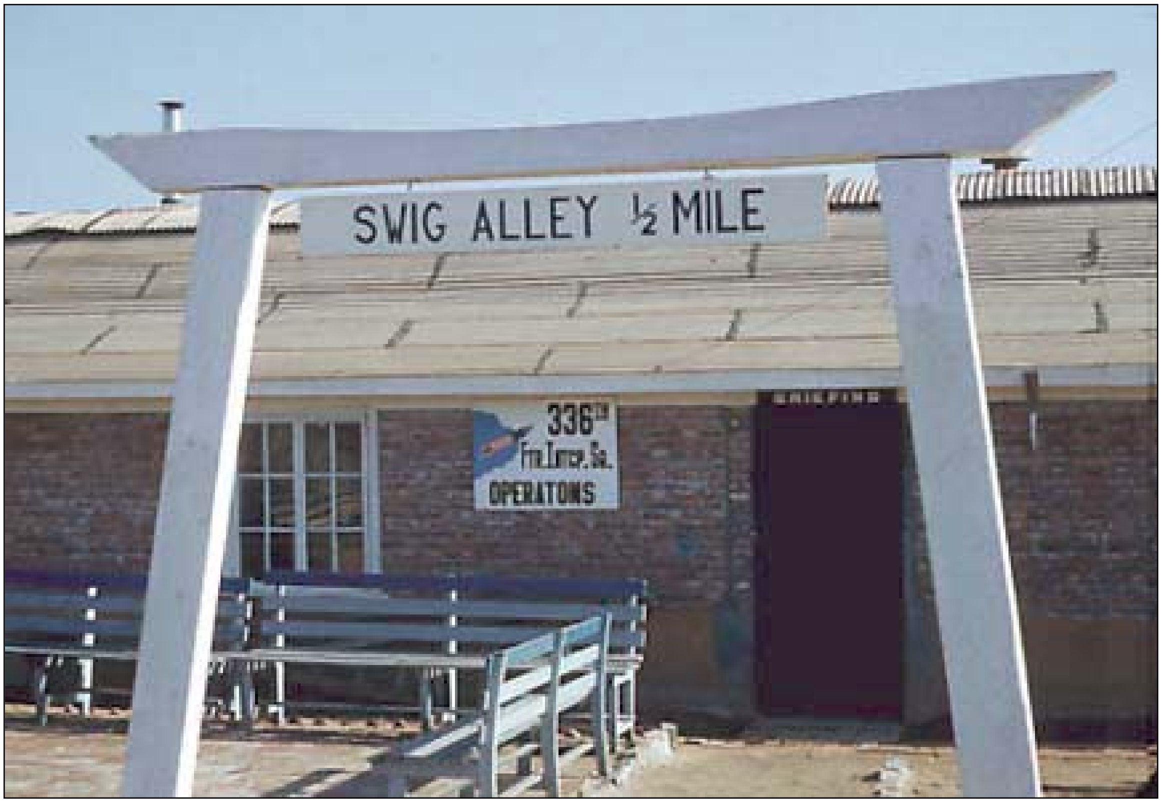
"Fun is what this F-86 Sabre is all about so climb aboard NOW! She's waiting… "

"And we hope you enjoy flying it as much as we did creating it"

"The Four Horseman of Fun"

SECTIONF8

Jan Visser, Hansjoerg Naegele, Robert Young, Clifford Presley

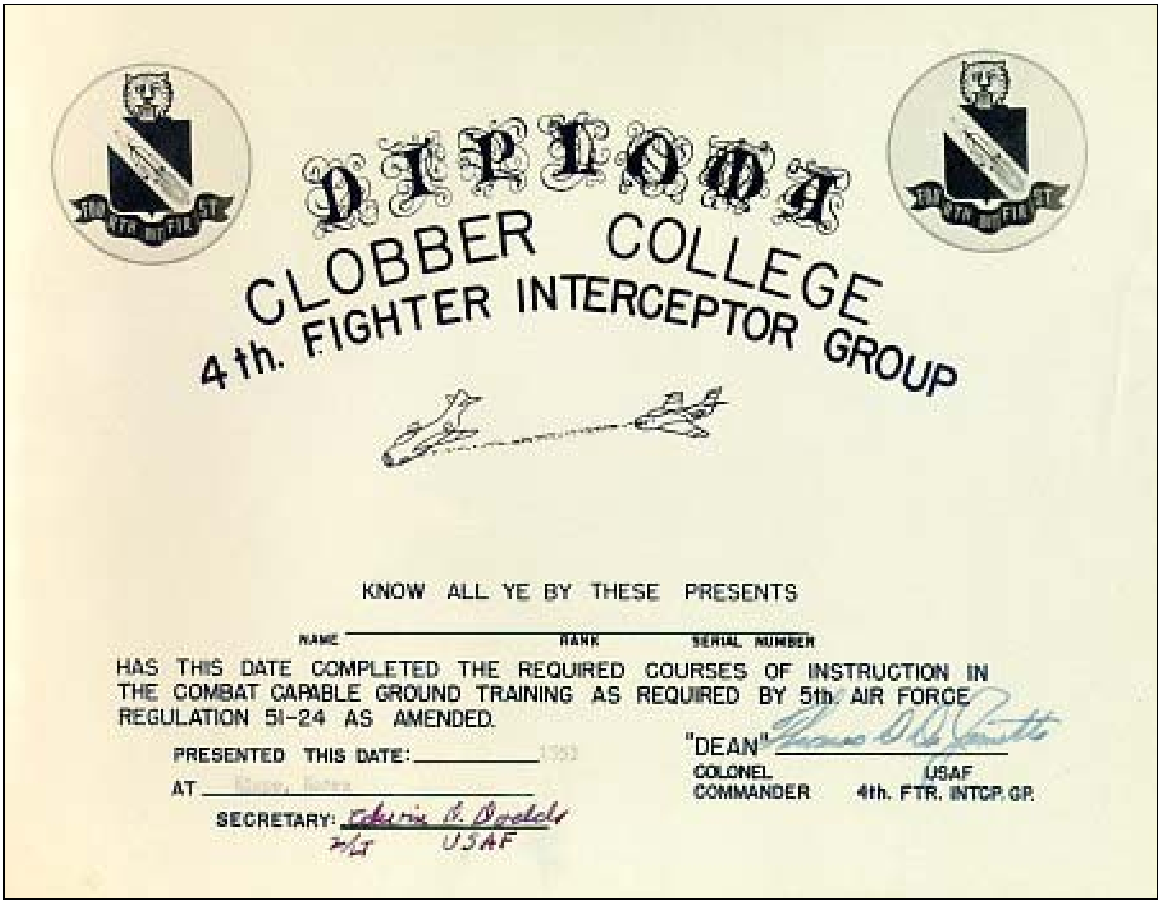



MACH BUSTER'S CLUB

THIS CERTIFIES THAT

IS A MEMBER IN GOOD STANDING AND HAS
EXCEEDED THE SPEED OF SOUND IN A
USAF F-86 SABRE JET

North American Aviation, Inc.
LOS ANGELES, DOWNEY, FRESNO, CALIFORNIA AND COLUMBUS, OHIO



DIPLOMA

CLOBBER COLLEGE

4th. FIGHTER INTERCEPTOR GROUP

KNOW ALL YE BY THESE PRESENTS

NAME ______ RANK ______ SERIAL NUMBER

HAS THIS DATE COMPLETED THE REQUIRED COURSES OF INSTRUCTION IN THE COMBAT CAPABLE GROUND TRAINING AS REQUIRED BY 5th. AIR FORCE REGULATION 51-24 AS AMENDED.

PRESENTED THIS DATE: ______

AT ______

SECRETARY: ______

USAF

"DEAN" ______

COLONEL USAF

COMMANDER 4th. FTR. INTCP. GP.