NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNAT RA P-763 (Rev. 10-12)**

FLIGHT TRAINING INSTRUCTION

OUT-OF-CONTROL FLIGHT T-6A/B

2012

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL AIR TRAINING
250 LEXINGTON BLVD SUITE 102
CORPUS CHRISTI TX 78419-5041

CNATRA P-763
N716
24 Oct 12

CNATRA P-763 (Rev. 10-12)

Subj: FLIGHT TRAINING INSTRUCTION, OUT-OF-CONTROL FLIGHT, T-6A/B

1. CNATRA P-763 (Rev. 10-12) PAT, "Flight Training Instruction, OUT-OF-CONTROL FLIGHT" is issued for information, standardization of instruction, and guidance for all flight instructors within the Naval Air Training Command.

2. This publication shall be used as an explanatory aid to the T6A/B Instructor Under Training (IUT) curriculums and shall be the authority for the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via CNATRA TCR form 1550/19 per CNATRAINST 1550.6E.

4. CNATRA P-763 (New 10-9) PAT and CNATRA P-874 (New 03-08) are hereby cancelled and superseded.

C. HOLLINGSWORTH
Chief of Staff

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FLIGHT TRAINING INSTRUCTION

FOR

OUT-OF-CONTROL FLIGHT

T-6A/B

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:
Original...0…15 Dec 09 (this will be the date issued)
Revision…1…24 Oct 12
Change Transmittal…1…18 Nov 13

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 52 CONSISTING OF THE FOLLOWING:

Page No.	Change No.	Page No.	Change No.
COVER	0	2-2 – 2-19	0
LETTER	0	2-20 (blank)	0
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x (blank)	0		
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1-16 (blank)	0		
2-1	1		

INTERIM CHANGE SUMMARY

The following Changes have been previously incorporated in this manual:

CHANGE NUMBER	REMARKS/PURPOSE
1	Changes made per transmittal letter (18 Nov 13)

The following Interim Changes have been incorporated in this Change/Revision:

INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

SAFETY/HAZARD AWARENESS NOTICE

This course does not require any special safety precautions other than those normally found on the flightline.

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FOREWORD

Terminal Objective:

Upon completion of this course of instruction, the Instructor Under Training (IUT) will be able to perform the Out-of-Control Recoveries and Spins described in this Flight Training Instruction.

Standards:

Conditions and standards are defined in CNATRAINST 1542.154 (series) and CNATRAINST 1542.165 (series).

Instructional Procedures:

1. This is a flight training course and will be conducted in the aircraft.

2. The IUT will demonstrate knowledge of the material presented through successful completion of the flight maneuvers.

Instructional References:

1. T-6A/B NATOPS Flight Manual

2. Local Standard Operating Procedures (SOP) Instruction

3. Aerodynamics for Naval Aviators (NAVAIR 00-80T-80)

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CHAPTER ONE
INTRODUCTIONS AND SPINS

100. INTRODUCTION

This Flight Training Instruction (FTI) has been written to provide aerodynamic background information, to amplify procedures for recovery from inadvertent Out-of-Control Flight (OCF) encountered in the T-6A/B TEXAN II, and to establish procedures for intentional OCF training. It is designed to provide the IUT with the fundamental knowledge needed to recognize, prevent, and recover from aerodynamic loss of control of the aircraft.

Departure from controlled flight is practiced to familiarize the IUT with those realms of flight, which may be encountered as a result of control misapplication by an inexperienced Student Naval Aviator (SNA), Student Naval Flight Officer (NFO), or IUT. The intent is to expose the IUT to disorienting flight regimes and reinforce the essential need for prompt and correct flight conditions analysis. For example, am I spinning? Have I already departed controlled flight or am I just in an unusual attitude? Once you have analyzed the flight condition, you must be prepared to affect the proper recovery procedures.

Figure 1-1 OCF Procedures

Flight at high Angle of Attack (AOA) is an inherent part of stall, spin, and aerobatic training. The pilot's confidence necessary to operate in these regimes effectively is key to his/her ability to analyze and recover easily from the possible out-of-control condition associated with high-AOA maneuvering.

It is important to realize the AOA the pilot sees just prior to departure will vary significantly depending upon what kind of maneuver he/she is performing (i.e., the amount of yaw rate the pilot is experiencing). The higher the yaw rate or sideslip, the lower the indicated AOA at departure. The T-6A/B has proven its capability to enter and recover very easily from both Post-Stall Gyrations (PSGs) and spins. The T-6A/B NATOPS Flight Manual is the only source of officially recognized OCF and spin recovery procedures; therefore, this FTI is designed to amplify and supplement the NATOPS Flight Manual.

101. THE ERECT SPIN

The motion of an airplane in a spin can involve many complex aerodynamic and inertial forces and moments; however, there are certain fundamental relationships regarding spins with which all aviators should be familiar. Two primary factors must be present for an airplane to spin:

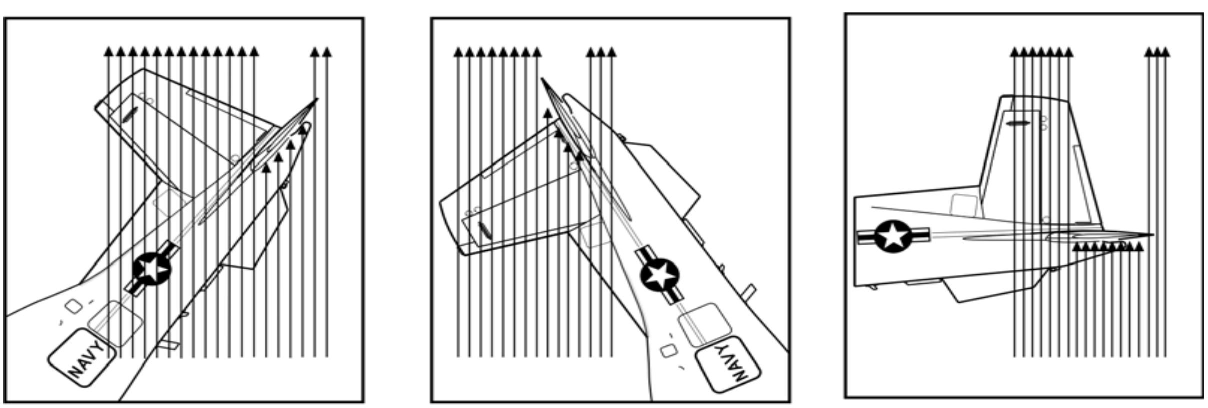
1. Stalled AOA.

2. Yaw (rotation about the vertical axis).

In the case of spins, we are concerned with the aerodynamic characteristics which take place at an AOA above stall.

This discussion concerns the spin characteristics of aircraft with moderate to high aspect ratio wings, moderate wing loading, and with little or no sweepback (T-6A/B).

In most airplanes, particularly light trainers, the rudder is the principal control for recovery from a spin; therefore, the configuration of the vertical stabilizer and rudder, as well as the placement of the horizontal control surfaces, has a very important effect on spin recovery. Figure 1-2 illustrates the T-6A/B rudder and horizontal stabilizer in various airflow conditions.



(Airflow Partially Blocked) (No Airflow Blockage) (Complete Airflow Blockage)

Figure 1-2 Rudder and Horizontal Stabilizer

You can see in Figure 1-2, the swept vertical fin is very nearly blanked out by the horizontal stabilizer and there is little, if any, effective rudder to stop rotation. For this reason, if you should enter an inverted spin in an aircraft with a conventional cruciform tail shown in Figure 1-3, you will probably recover quicker than from an erect spin because of greater rudder effectiveness and undisturbed airflow over the vertical fin and rudder. Conversely, in a T-tail design (Figure 1-3), the vertical stabilizer and rudder are more effective in an erect spin.

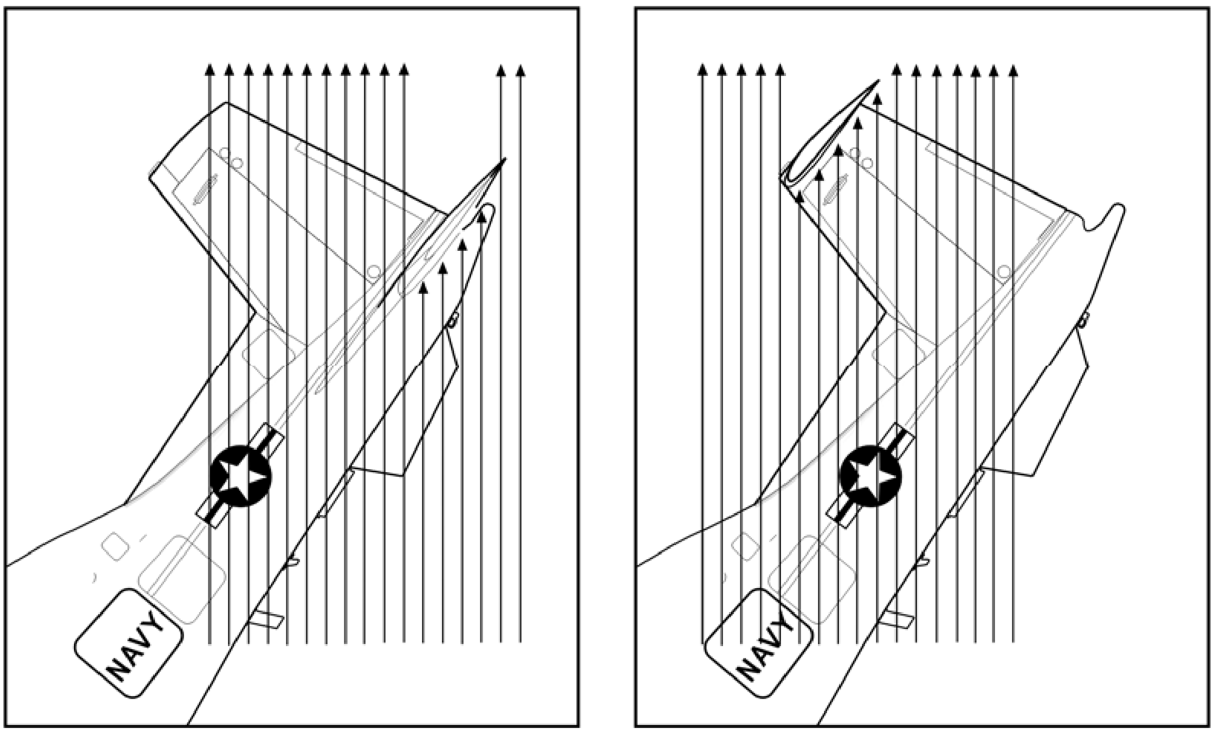


Figure 1-3 Tail Design

On the T-6A/B, a dorsal fin is designed to provide more vertical tail area for directional stability during large sideslip angles. Ventral fins and strakes are also on the tail to improve directional stability and enhance spin characteristics and recovery. They aid in damping oscillations in pitch, surges in rotation, and help to prevent the tail from going to excessively high vertical angles. All these devices are depicted in Figure 1-4.

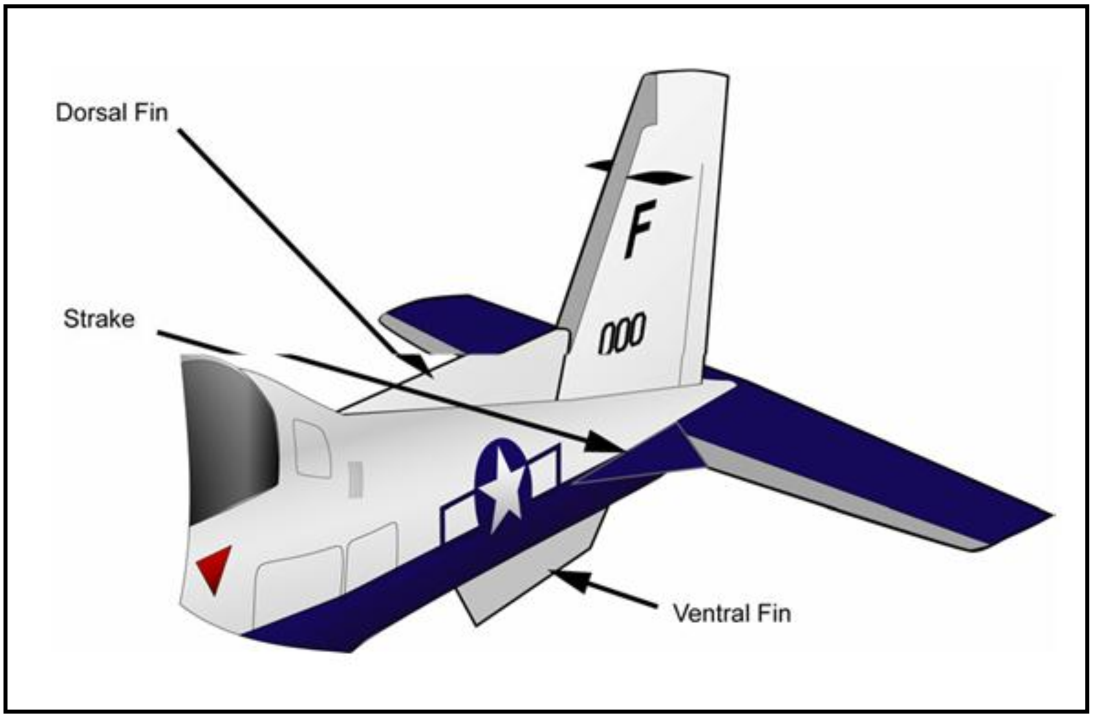


Figure 1-4 Dorsal and Ventral Fins

A number of other factors also influence the spin. Forward center of gravity (CG) aids in spin recovery, while aft CG tends to flatten the spin, resulting in less control effectiveness for recovery. In other words, the further aft the CG, the flatter (less nose-down) the spin. Figures 1-5 and 1-6 show airflow over the fin and rudder in the two CG locations.

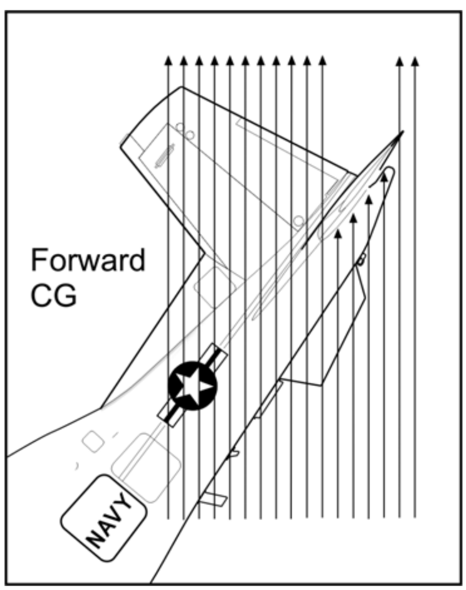


Figure 1-5 Forward CG

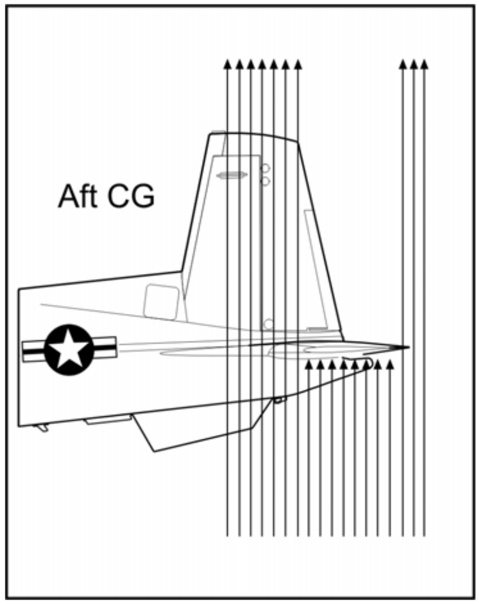


Figure 1-6 Aft CG

Mass distribution is a term which describes the construction technique in which the mass of an airplane is distributed between the fuselage and wings. Assuming aircraft are "flattened" into the xy plane, the maximum moment of inertia invariably occurs around the yaw, or the z-axis. Depending on the aircraft's mass distribution, 1x is either greater or less than 1y as shown in Figure 1-7. Wing-loaded aircraft tend to spin more nose-down (T-6A/B), while fuselage-loaded aircraft tend to spin flatter (F-14).

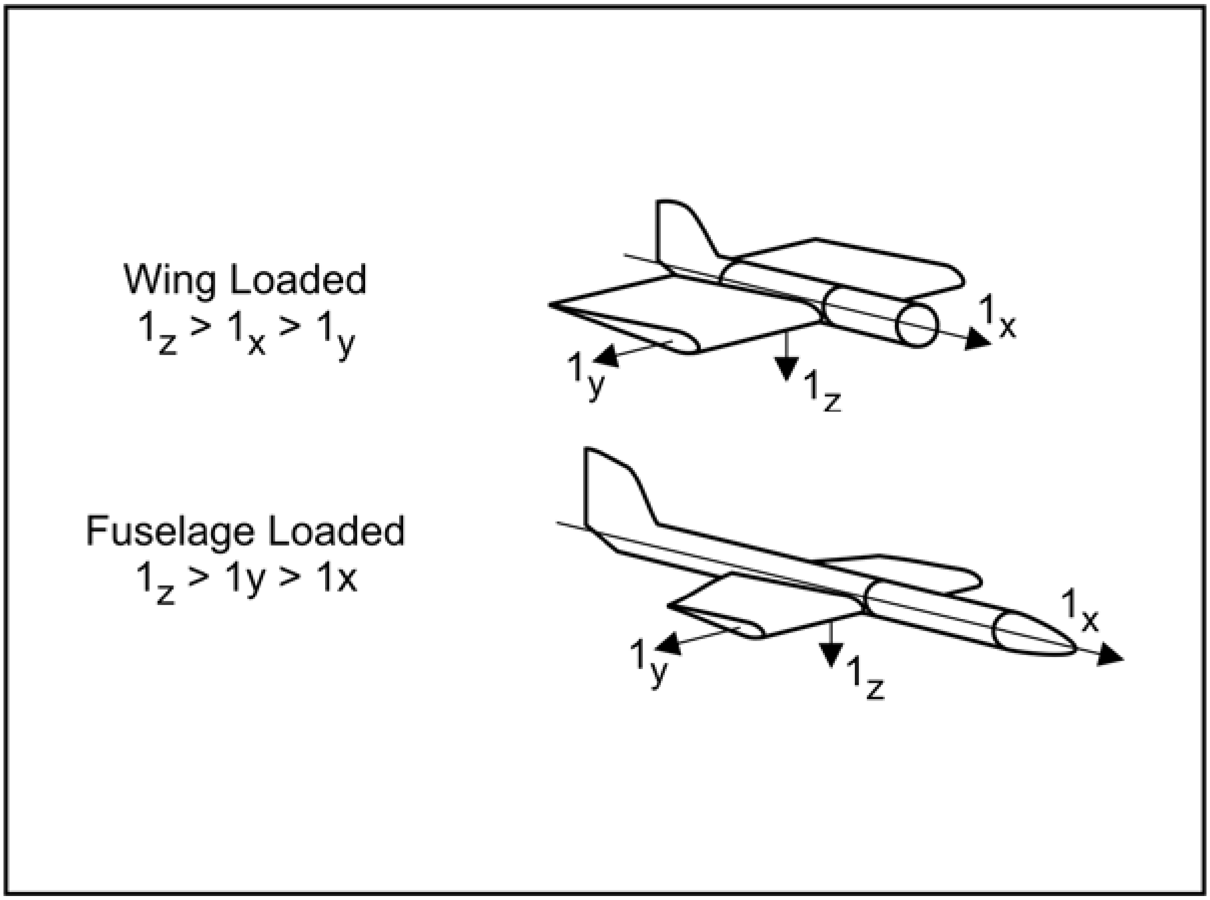


Figure 1-7 Mass Distribution

A stall departure usually begins with a yaw, then can involve a pitch up, nose slice, pitch-roll coupling, or some other type of Post-Stall Gyration (PSG), which results in an out-of-control situation. To recover successfully, the pilot must assess the disorienting situation immediately and apply NATOPS Flight Manual Inadvertent Departure from Controlled Flight Recovery Procedures (also referred to as “OCF Recovery Procedures” in this FTI).

In a flat spin, the horizontal tail may be stalled and ineffective because of the high AOA on the horizontal stabilizer and elevators. The vertical fin and rudder may also be blanked out with the rudder ineffective because of a lack of airflow (Figure 1-8). Since a flat spin is primarily a yawing motion, there will be a high sideslip angle with the possibility of a stalled vertical tail as well, and conversely, an ineffective rudder. If the wing, horizontal stabilizer and vertical tail are all stalled in a flat spin, there is very little you can do with the flight controls to recover because they are all ineffective. Fortunately, there is no tendency for the T-6A/B to spin flat, so you should never encounter this problem.

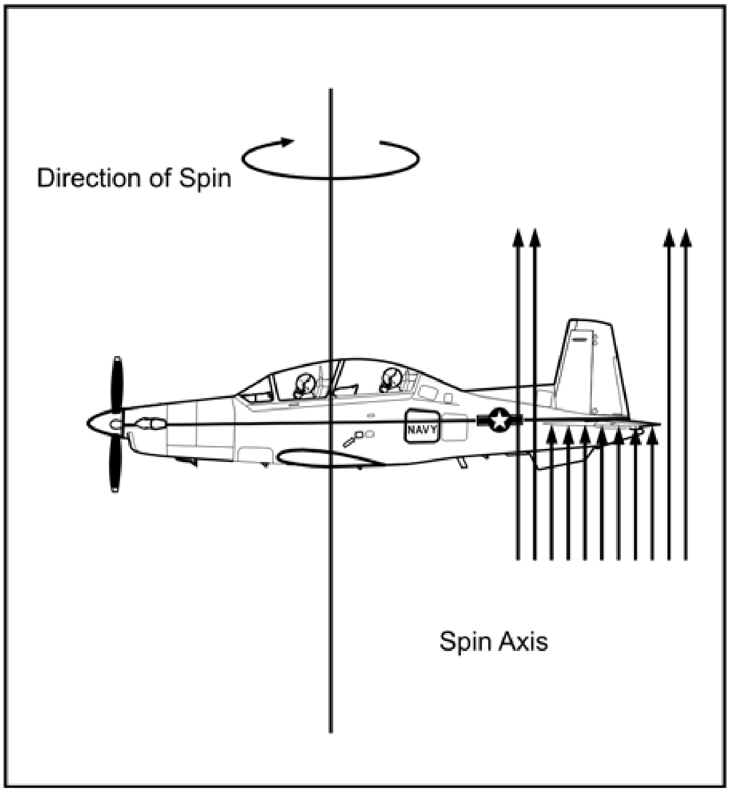
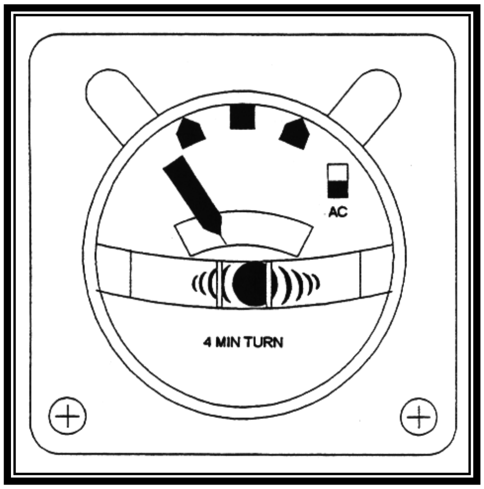


Figure 1-8 Flat Spin

Outside visual references cannot be relied upon to determine whether or not you are in a spin! You must interpret the message the cockpit instruments are sending. In a steady-state erect spin, airspeed will stabilize at 120-135 KIAS, AOA will be at 18+ units, and the turn needle will be fully deflected in the direction of spin. The altimeter and VSI will show a rapid rate of descent, with the altimeter possibly lagging behind the actual altitude. The balance ball gives no useful indication of spin direction.

The turn needle is the only reliable indicator of spin direction.

Figure 1-9a/b shows the needle pegged in the direction of rotation for the T-6A/B in an erect spin.



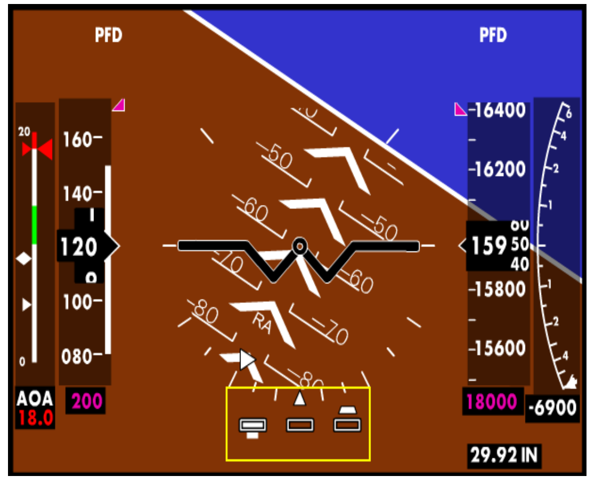


Figure 1-9a T-6A Turn Needle **Figure 1-9b T-6B Turn Needle**

Generally speaking, ailerons are not very effective in light aircraft at stalled AOA and should not be used for entry or recovery. In fact, application of ailerons creates a yawing motion in the opposite direction, known as adverse yaw. At spin initiation, a cross-control situation enhances spin entry. Conversely, deflection of ailerons into the spin reduces the autorotation rolling moment by reducing the AOA on the "inside" wing and can produce the adverse yaw necessary to aid rudder yawing moments to affect recovery.

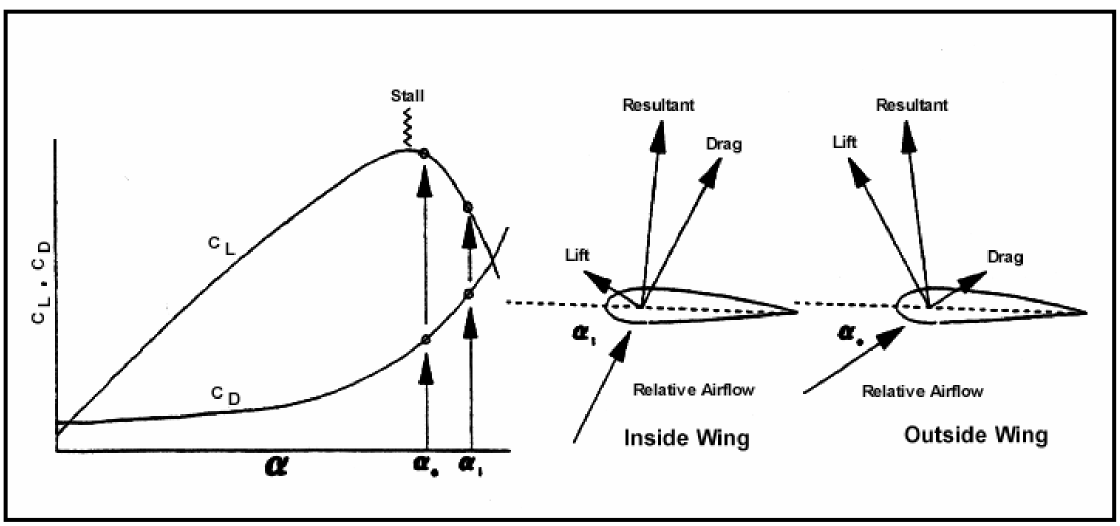


Figure 1-10 Cause of Autorotation

Figure 1-10 diagrams the forces which occur during the spin that cause the aircraft to autorotate. As the AOA increases in normal flight, both lift and drag increase; but as the aircraft stalls, lift drops sharply while drag continues to rise. During the initiation of the spin, as rudder is applied at the stall in the direction of desired spin, the yawing motion increases the speed of the outside wing. The increase in local airflow shallows the relative airflow vector, which in turn creates a reduction of AOA, an increase in lift and reduction of drag. These forces result in a rolling motion in the direction of initial yaw input. The inside wing experiences a corresponding reduction in airspeed and lift, an increase in AOA and drag, which adds to the rolling motion.

Although the outside wing is still in a stalled condition, it is less stalled than the inside wing (Figure 1-10). Because of the greater lift on the outside wing, the aircraft will roll in the direction of rudder deflection and will generally go slightly inverted or make a barrel roll type maneuver during the spin entry. As you can see in Figure 1-10, the inside or down-going wing has a greater AOA, less lift, and more drag than the outside wing. Figure 1-11 shows how the slightly greater and more forward tilt of the resultant lift-drag vector of the outside wing drives that wing forward and up in a self-sustaining rolling and yawing motion known as autorotation. Therefore, the T-6A/B spin is described as a nose-low autorotation.

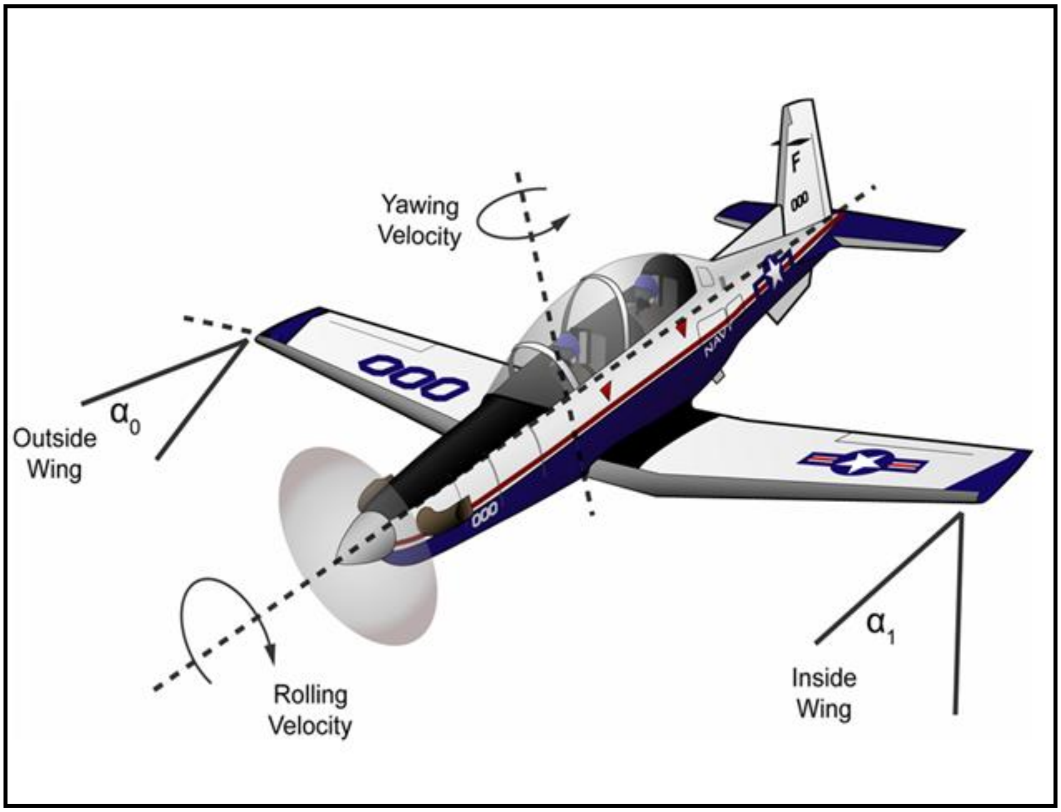


Figure 1-11 Self-Sustaining Autorotations

After about three turns, the rate of rotation stabilizes, and because of high drag at the higher AOA, the rate of descent stabilizes to about 400-500 feet per turn. The aircraft is now in a steady-state spin. The primary method for recovery from any OCF condition is to perform the critical action steps of NATOPS Flight Manual Inadvertent Departure from Controlled Flight. If however, it is determined that the aircraft is in a ***steady-state spin***, the pilot should execute anti-spin recovery procedures as follows:

1. Gear, flaps, and speedbrakes - Retracted.

2. PCL - Idle.

3. Rudder - Full OPPOSITE to turn needle deflection.

4. Control Stick - Forward of neutral with ailerons neutral (erect spin).

5. Smoothly recover to level flight after spin rotation stops using unusual attitude recovery.

WARNINGS

1. Application of spin recovery controls when not in a steady-state spin (as verified by AOA, airspeed and turn needle) MAY further aggravate the OCF condition.

2. Aggressive or "Popping" forward elevator can result in engine damage. A "smooth" forward movement of the stick is best.

If recovery from an erect spin does not occur within one and one-half turns after applying anti-spin recovery inputs, verify cockpit indications of AOA, airspeed, and turn needle for a steady-state spin and visually confirm proper spin recovery controls are applied.

WARNING

Application of power when not actually in a steady-state spin will result in a rapid increase in rate of descent and airspeed.

102. INVERTED SPINS

Inverted spins are an interesting and spectacular realm of flight; a realm with which most pilots are unfamiliar. Aerodynamically, the inverted spin is quite similar to the erect spin, since the conditions that are required to enter an inverted spin are:

1. A stall at negative AOA.

2. Yaw.

An inverted stall is more difficult to enter than an erect stall, although it can be done either deliberately or inadvertently. In some aircraft, elevator authority is insufficient to induce the negative load factor required to stall in level, inverted flight; however, inverted stalls can be achieved in nose-high, slow airspeed, inverted flight. For example, the T-6A/B can enter an inverted stall from entering a loop at slow airspeed.

Naval Air Test Center (NATC) evaluations of the T-6A/B spin characteristics revealed that while recovery from an inverted spin was easily accomplished, the spin itself proved to be very disorienting to the pilot. For this reason, intentional inverted spins in the T-6A/B are prohibited.

Disorientation experienced by the pilot during an inverted spin is primarily because the yaw and roll occur in opposite directions. Pilots are more sensitive to motion about the longitudinal axis than the vertical axis, and are consequently more likely to interpret an inverted spin in the direction of roll rather than the direction of yaw. Regardless of whether the aircraft is spinning erect or inverted, the turn needle will always deflect fully in the direction of spin and is the only reliable indication of spin direction.

In the T-6B, steady-state inverted spins are characteristically flatter than erect spins with the nose of the aircraft approximately 30° below the horizon.

Typical indications of an inverted, steady-state spin include:

1. Airspeed approximately 40 KIAS.

2. AOA pegged at zero (the AOA indicator does not display negative values).

3. Turn needle fully deflected in direction of spin.

The pilot will experience a load factor of -1.5 Gs. In a standard inverted spin, the average spin rate is approximately 120° per second and the aircraft will lose roughly 450 feet per turn, descending at approximately 9,000 feet per minute.

Perform the first four steps of NATOPS Flight Manual Inadvertent Departure from Controlled Flight Procedures to verify aircraft is truly in an inverted spin. If so, the quickest recovery is accomplished in the following manner:

1. Gear, flaps, and speedbrakes - Retracted.

2. PCL - Idle.

3. Rudder - Full OPPOSITE to turn needle deflection.

4. Control stick - Aft of neutral with aileron neutral (up to full aft stick may be used).

5. Smoothly recover to level flight after spin rotation stops using unusual attitude recovery.

The stick will “float” near the full forward position, so you will have to apply a pull force of about 30 lbs. to place the stick in the neutral position. The aircraft will recover to a steep, inverted, nose-down unusual attitude. As stated earlier, although they are not encountered frequently, inverted spins can be extremely disorienting!

103. OUT-OF-CONTROL RECOGNITION

Loss of control of an aircraft can be a confusing and disorienting experience. Sound familiar? A rapid analysis of the specific phase of OCF is essential for executing a prompt recovery. Visual and "seat of the pants" cues are not sufficient to differentiate among the departure, Post-Stall Gyrations (PSGs), incipient spin, or steady-state spin phases.

Even the seemingly obvious determination of whether or not the aircraft is in an erect or inverted attitude may not always be possible through sensory cues. In an erect spin, the airplane may spin in a relatively nose-low attitude with a high rate of roll, or it may spin in a flat attitude with a high yaw, but very little roll rate. In a steady-state spin, the flight path is vertical (i.e., straight down). The axis of the spin or the center of the spin rotation is also straight down.

In a steep, nose-down attitude, the axis of rotation lies forward; in extreme cases, the axis may be forward of the entire aircraft. As the nose rises to a flatter attitude, the axis of rotation moves aft. If it moves behind the cockpit, and if at the same time a high yaw rate is present, the pilot will experience high transverse (eyeballs-out) G forces. The pilot may interpret these transverse G forces as negative Gs. This phenomenon is illustrated in Figure 1-12.

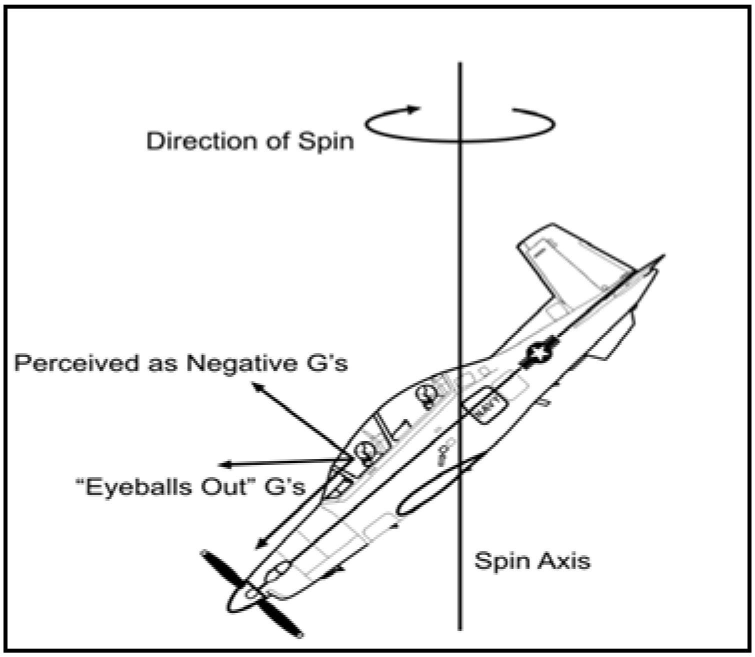


Figure 1-12 G Forces

The problem is further compounded when roll, pitch, and yaw oscillations cause variations in the direction and magnitude of G forces and literally tumble the pilot about the cockpit.

Since outside visual and sensory cues cannot be relied upon to determine the mode of flight, intuitive responses must be ignored. The only satisfactory means to analyze the situation and thereby recover from OCF properly is by referencing your flight instruments. While it is true the AOA, airspeed indicator, and turn needle are sufficient to provide all the information necessary for recognition and recovery, the altimeter can never be ignored because of the obvious safety factor. In fact, in accordance with the NATOPS Flight Manual, you should consider altitude first!

The AOA indicator primarily enables you to determine whether the flight mode is upright or inverted. The instrument will be pegged at 18+ units if upright, and 0 units if inverted. If the AOA indicator displays neither of the above indications, the aircraft is not in a steady-state spin.

Airspeed in a steady-state spin will either be stable or it will oscillate above and below a constant airspeed. Airspeed above or below the characteristic range (120-135 KIAS) indicates the aircraft is in some other flight mode. Steadily increasing airspeed above 135 KIAS indicates the aircraft will not reach a steady-state spin and could develop into a high-speed spiral.

The turn needle will be fully pegged in the direction of the spin, but it does not provide other information about the phase of flight. For example, the needle may also be fully pegged during PSGs or a high-speed spiral! The turn needle, therefore, can only be relied on to indicate the direction of rotation since the pilot may misinterpret visual cues during the extreme disorientation that often accompanies OCF.

You must reference the altimeter to determine how much "time" is available for recovery. Remember, 6,000’ AGL is the NATOPS recommended minimum altitude for uncontrolled ejection in the T-6A/B.

104. OUT-OF-CONTROL RECOVERY

The proper recovery procedure from a loss-of-control situation depends upon an accurate analysis of the condition. Erroneous analysis and subsequent improper control inputs have often resulted in the pilot worsening the situation and losing the aircraft. Figure 1-13 presents an overview of the typical OCF sequence.

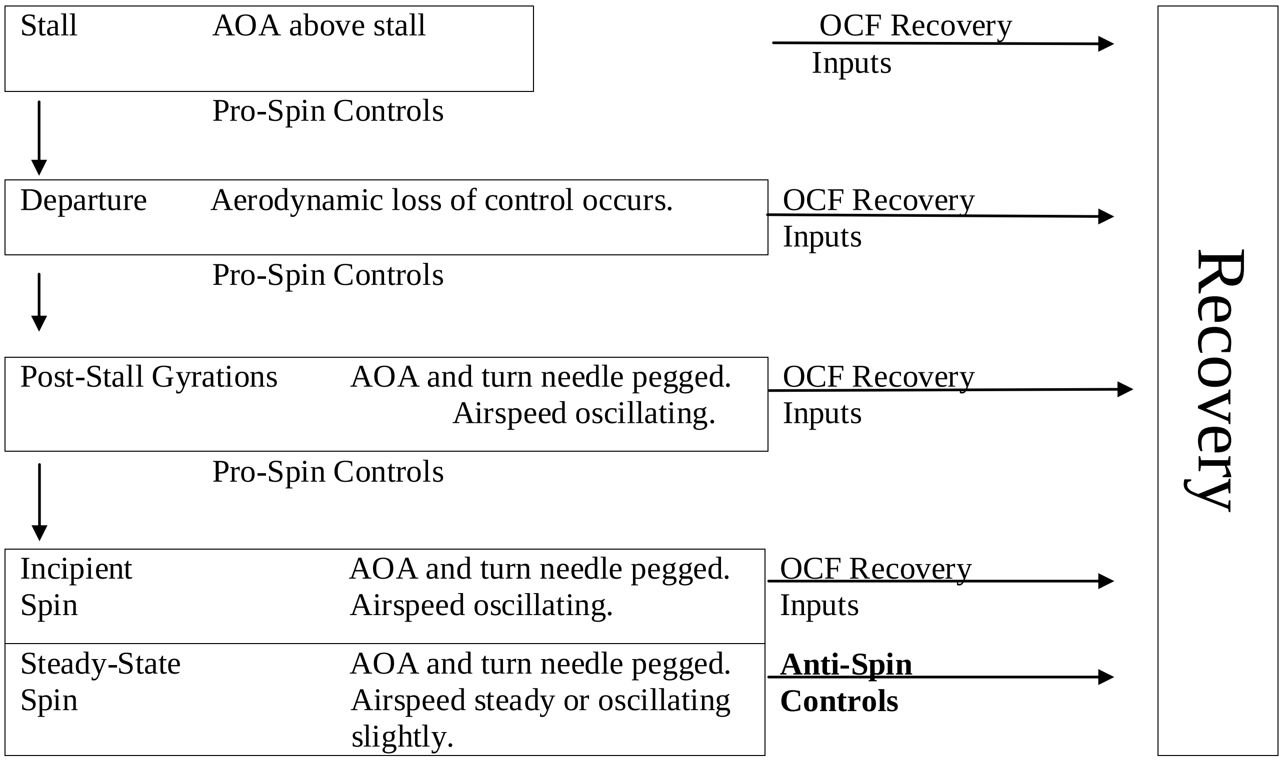


Figure 1-13 OCF Sequence

The recovery procedure from the Stall, Departure, PSG, or Incipient Spin phase is to ***FIRST, PCL - idle and SECOND, Controls – neutralize***. Any other control input will only aggravate the situation. Even slight deviations from neutral may prevent recovery.

Since you may be thrown about the cockpit under varying positive and negative Gs and since control forces will probably differ from those you normally experience, neutralizing the controls may not be a simple matter. In addition, your natural instinct upon losing control may be an attempt to counter a roll with aileron, which will only make matters worse.

Visually, come inside the cockpit and neutralize the controls.

105. PILOT FACTORS DURING OUT-OF-CONTROL FLIGHT

Now that OCF aerodynamics and some design problems have been discussed, there are several factors that affect a pilot's performance when the aircraft departs controlled flight that should be reviewed.

Time Distortion. Studies show the average pilot, under the stress of OCF, perceives time to be passing about five times faster than it really is. This misconception leads to reluctance on the pilot's part to maintain proper recovery control inputs long enough to be effective. Instead, the pilot feels the control inputs have been held long enough and recovery should have taken place; therefore, it must be necessary to *"**try something else,**"* thereby delaying or even preventing recovery. The only sure way to avoid problems brought about by time distortion is to analyze the problem accurately, know the aircraft's recovery procedures, maintain recovery inputs, and be patient. The altimeter will indicate when it is time to stop attempting recovery and eject from the aircraft.

G-Force Distortion. G-force distortion, or perceived "seat of the pants" cues can cause you to analyze a situation incorrectly and apply improper recovery inputs. Disregard perceived G forces! ***Look at the instruments! Believe them!***

Control Inputs. The pilot's natural tendency usually will be contrary to necessary and proper control application, primarily in the use of ailerons. For example, upon experiencing a wing drop or roll during departure, the pilot's instinct is to counter with ailerons, which induces adverse yaw, aggravates the departure, and can lead to a spin. The pilot should visually check the controls to ensure they are in the correct position for recovery.

Seat Restraint. OCF flight may cause the pilot to be thrown out of reach of the controls. Keeping lap belts as tight as possible will help prevent this problem; however, under heavy G loads, reaching the controls will take a definite effort, even if the pilot is strapped in tight.

106. CONCLUSION

Every pilot must be prepared to handle uncontrolled flight.

Know the aircraft. Study the NATOPS Flight Manual.

Know the procedures. Inadvertent Departure from Controlled Flight Recovery Procedures must become second nature.

Power to Idle. Failure to do this can delay the recovery.

Neutralize the controls. Upon losing control, simultaneously position controls to neutral until recovery or a steady-state spin has been positively confirmed.

Be patient. Hasty control applications can lead to trouble. Also, be patient with the control inputs you have applied (i.e., neutral) when an aircraft experiences OCF.

Check the altimeter. If sufficient altitude is not available, ***EJECT***. There is no reason to spend the rest of your life trying to recover the aircraft. Do not waste time when you have made your decision. If you have not recovered by 6,000' AGL and you have not ejected, you are extremely time-limited, since the aircraft will impact the ground in less than 45 seconds.

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CHAPTER TWO
UNUSUAL ATTITUDES AND OUT-OF-CONTROL FLIGHT

200. INTRODUCTION TO OUT-OF-CONTROL FLIGHT

Intentional OCF maneuvers are conducted to enhance pilot proficiency in OCF recovery. OCF training shall only be conducted on NATOPS training flights, NATOPS check flights, or as part of approved curriculum training flights authorized by unit Commanding Officers or higher authority. All intentional OCF maneuvers shall be done with a clearly defined horizon, clear of clouds. OCF maneuvers may be performed over an undercast cloud layer that does not exceed 4,500 ft AGL. Clearing turns and the Pre-Stalling, Spinning, and Aerobatic Checklists shall be accomplished prior to initiating any practice OCF maneuver. All maneuvers shall be recovered above 6,000' AGL.

CAUTION

Rapid airspeed buildups may occur during OCF recovery. Take care when performing maneuvers with the landing gear extended and the flaps down to avoid overspeeds.

201. OUT-OF-CONTROL FLIGHT

OCF is the seemingly random motion of the airplane about one or more axes and originates from a stalled condition when the inertial forces on the airplane exceed the aerodynamic control authority. OCF usually results from stalls in accelerated or out-of-balanced flight or from stalls where improper recovery control inputs are applied. OCF can be divided into three categories:

1. ***Post-Stall Gyrations (PSGs)*** are the random motions of the airplane about one or more axes immediately following a stall. A PSG can occur at normal flying speed (from an accelerated stall) or at slow speed following a normal stall. The PSG can be extended through continued application of post-stall controls or misapplication of stall recovery controls. At normal flying speeds, a PSG will dissipate kinetic energy so that the aircraft tends to slow to a potential incipient spin condition. At slow airspeeds, the post-stall condition is accompanied by flight controls that are ineffective compared to the inertial forces present. PSGs may be extremely violent and disorienting. The intuitive response of rapidly applying controls in all axes in an attempt to stop the PSG is generally ineffective or exacerbates the random motions. PSGs are aggravated by holding aft stick and rapid cycling of the rudder pedals. A pilot can usually identify a PSG by noting an uncommanded (and often rapid) aircraft motion about any axis, an immediate feeling of lost control authority, stalled or near-stalled AOA, random (usually transient) airspeed and random turn needle deflection.

2. ***Incipient Spin*** is the motion occurring between a PSG and a fully developed spin. Additionally, the reversal phase of a progressive spin is also an incipient spin. Any stall can progress to an incipient spin if steps are not taken to recover the aircraft at either the stall or PSG. An incipient spin is a spin-like motion in which the aerodynamic and inertial forces are not yet in balance, but where there is sustained, unsteady yaw rotation. As a result, an incipient spin is

characterized by oscillations in pitch, roll, and yaw attitudes and rates. In an incipient spin, the nose attitude will likely fluctuate from the horizon to the vertical (nose down), the yaw rate will increase toward the Steady-State value, and the wings will rock about a nearly level attitude. The incipient phase lasts approximately two turns. A pilot can usually identify an incipient spin by noting stalled AOA, airspeed accelerating or decelerating towards a Steady-State Spin value, and fully deflected turn needle. Visual indications are misleading and may lead to the false impression of a Steady-State Spin.

3. ***Steady-State Spin*** motion is considered to be OCF because control input in any one of the three axes does not affect an immediate response about that axis. To develop a Steady-State Spin in the T-6A/B requires maintaining pro-spin control inputs during the incipient spin phase. With such a dedicated effort required to develop a Steady-State Spin, one might conclude there is no danger of entering one inadvertently. Unfortunately, this is not the case. There are several documented instances (some resulting in mishaps) in which pilots have attempted to recover from OCF in its earliest stages and because they used improper procedure(s), forced the aircraft into a spin. To identify a Steady-State Spin properly, the pilot must depend on certain cockpit indications and avoid the natural instinct to rely on visual cues. For instance, hanging in the straps while the aircraft is upside down and spinning around does not equate to an inverted spin. Understanding of this extremely important point is somewhat obscured by the out-of-date notion that a "good" pilot can always depend on visual cues to determine what is happening to his aircraft. To identify a Steady-State Erect Spin, one must note 18+ units (pegged) AOA, a steadied airspeed of 120-135 KIAS, and a fully deflected turn needle. Indications of an inverted spin are 0 units AOA, airspeed 40 KIAS, and a fully deflected turn needle. Any indications other than these signify something other than a Steady-State Spin.

202. PROGRESSIVE SPIN

1. **Discussion.** This maneuver is introduced in order to familiarize the IUT with the OCF characteristics and disorienting effects associated with a progressive spin, which results from misapplication of spin recovery control inputs. Reversal of rudder direction during a steady-state spin while maintaining full back stick will result in a progressive spin. The progressive spin is characterized by an initial increase in nose-down pitch and spin rate, followed by a rapid reversal in spin direction. The number of turns which occur prior to spin direction reversal varies depending upon the initial spin direction and the location of the aircraft's center of gravity.

Spins to the left typically reverse after fewer rotations than spins initiated to the right, and tend to be the most intensely disorienting. Flight departure investigations revealed that reversals consistently occurred 1.5 to 2 turns after full opposite rudder was applied. Because of the increased potential for disorientation, it is once again important to emphasize that the turn needle is the only reliable indicator of spin direction.

The reversal phase also involves the motion which occurs between steady-state spins in the opposite direction and is similar to the incipient spin phase. The reversal phase continues for several turns following initial reversal of spin direction. Aircraft motions during this phase become oscillatory and airspeed may go as high as 175 KIAS.

Recoveries initiated during the reversal phase were evaluated to determine the optimum recovery procedure to be used in the event of intentional or inadvertent progressive spin entry. Both neutral control and NATOPS anti-spin control procedures were used to effect recoveries initiated up to 2.5 turns after the reversal of spin direction. Recovery using the NATOPS anti-spin procedure was slightly more rapid than the use of neutral controls but was also evaluated as having the potential for entry into a second progressive spin. In the event of inadvertent progressive spin entry, the neutral control procedure should be applied while assessing the aircraft's flight condition. In the event that recovery has not occurred within two turns, apply proper NATOPS anti-spin controls to affect a rapid recovery. Minimum entry altitude for a Progressive Spin maneuver is 19,000' AGL.

2. **Procedures.**

a. Perform the procedures for a normal, erect spin entry in either direction.

b. After stabilized steady-state erect spin indications are achieved, smoothly apply full rudder opposite the direction of turn needle deflection while continuing to hold full back stick.

c. Continue to hold these control inputs until the aircraft has reached the incipient spin phase in the opposite direction of the initial spin (no greater than 150 KIAS). Recover in accordance with the NATOPS Flight Manual Inadvertent Departure from Controlled Flight Procedures.

203. OUT-OF-CONTROL FLIGHT RECOVERY

Recovery from PSGs and incipient spins (including the reversal phase of the progressive spin) is accomplished through prompt, positive neutralization of flight controls in all axes. Patience and the maintenance of neutral controls are vital, since an immediate aircraft response to neutralizing may not be apparent to the pilot. In addition, cycling the controls or applying anti-spin controls prematurely can aggravate aircraft motions and prevent recovery. Wrestling with the aircraft in a PSG or incipient spin may delay or prevent recovery and increase altitude loss.

An important distinction must be made between stalls and OCF. OCF is preceded by a stall, but a stall is not necessarily OCF. A stall by itself is mild and is associated with the partial or apparent complete loss of control authority in one axis (almost exclusively the lateral axis as the nose drops). OCF includes a rapid uncommanded motion that accompanies or follows a stall as well as a more complete loss of control effectiveness. Stall recovery procedures are not appropriate for OCF and should be abandoned once it has been determined that the aircraft has departed controlled flight. For example, an Approach Turn Stall (ATS) that exhibits the normal characteristic of the nose-down pitch should be recovered using the stall recovery procedure. If, however, during the stall or recovery, the aircraft begins a rapid and uncommanded roll, the stall recovery should be abandoned and out-of-control recovery should be initiated (PCL - idle, neutral controls, etc.).

Just as important as the distinction between stalls and OCF is the distinction between steady-state spins and other categories of OCF. After neutralizing the flight controls, if cockpit instrument indications show a steady-state spin has developed, the appropriate anti-spin control inputs will ensure a more rapid recovery from the spin.

1. Recovery from OCF will be accomplished in the following manner:

    a. PCL - Idle.

    b. Controls - Neutral.

NOTE

> When positioning the controls to neutral, it is not uncommon to mistakenly position the elevator slightly aft of neutral. If the aircraft is not recovering as expected, slowly feed in forward stick until the neutral elevator position is reached and the aircraft recovers.

    c. Altitude - Check.

WARNING

> If recovery from OCF cannot be accomplished by 6,000’ AGL, ***“EJECT!”***

    d. Recover from unusual attitude.

2. If in a steady-state spin, the following procedures will ensure a quicker recovery:

    a. Gear, flaps, and speedbrakes - Retracted.

    b. PCL - Idle.

    c. Rudder - Full opposite to turn needle deflection.

    d. Control stick

        i. Erect Spin - Forward of neutral with ailerons neutral.

        ii. Inverted Spin - Aft of neutral with ailerons neutral (up to full aft stick may be used).

WARNING

Application of power when not actually in a steady-state spin will result in a rapid increase in rate of descent and airspeed.

e. Smoothly recover to level flight after spin rotation stops.

WARNING

Lower power settings reduce torque effect, restrict onset of rapid airspeed buildup, and enhance controllability; however, departures from controlled flight in close proximity to the ground may require rapid power addition upon out-of-control recovery.

Positively neutralize the controls

This step will require your right hand and both feet and will, in all probability, require a visual check to confirm the controls at the neutral position. It is possible that you will have to work against stick forces to neutralize. Experience has shown that neutralizing controls abruptly, but smoothly, is more effective than doing so slowly. Visual confirmation of neutral stick is vital, because the natural position to which your hand will fall is aft of neutral. Neutralizing the rudder assumes the ability to reach the pedals - not so easy if your harness is loose and you experience negative G forces.

Determine aircraft altitude

Scan the altimeter frequently, especially if the recovery is delayed. You should always be aware of the aircraft's altitude and know approximately what 6,000' AGL is on the barometric altimeter.

Determine AOA, airspeed, and check turn needle

The purpose of this step is to ensure that the aircraft is NOT in a steady-state spin. If the aircraft is in anything other than a steady-state spin, the correct recovery inputs have already been set (neutral), and all that is required is to wait until the aircraft regains controlled flight to begin the unusual attitude recovery. Only if all three instruments indicate a steady-state spin should any form of anti-spin input be applied. A steady-state spin can normally be ruled out after noting AOA and airspeed. Checking the turn needle is required primarily to determine the correct rudder to use if AOA and airspeed indicate a steady-state spin. Being upside down and rotating does not necessarily equate to an inverted spin. For example, the possible AOA values for a steady-state spin in the T-6A/B are 18+ units (pegged) or 0 units. Noting any other value immediately indicates the aircraft is ***not*** in a steady-state spin and applying anti-spin controls are inappropriate. The same applies for any airspeed value other than zero (40 KIAS) or stabilized between 120-135 KIAS. The steps of checking altitude, AOA, airspeed, and turn needle should take no more than one to two seconds (Figure 2-1).

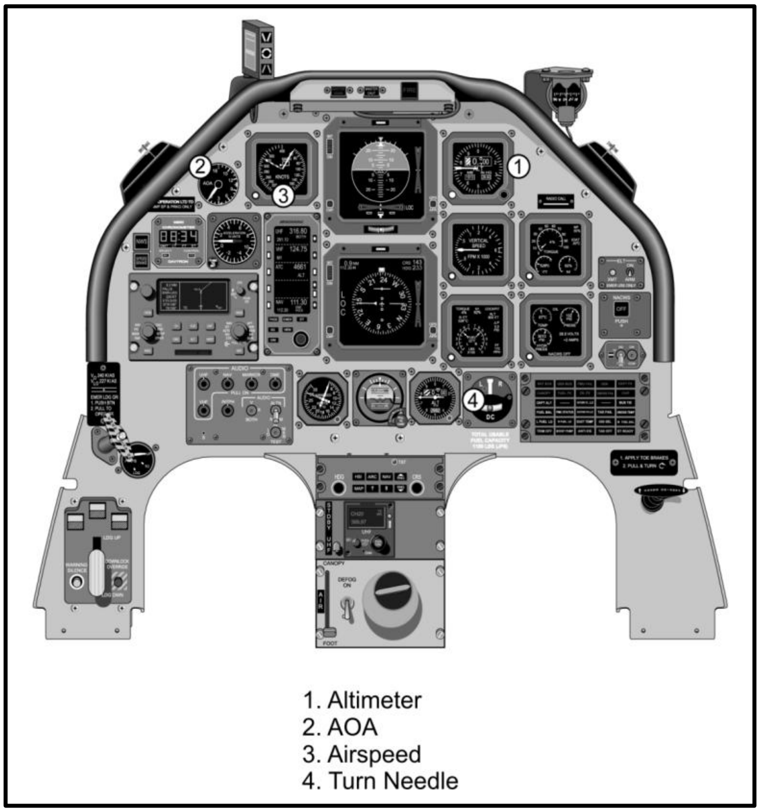
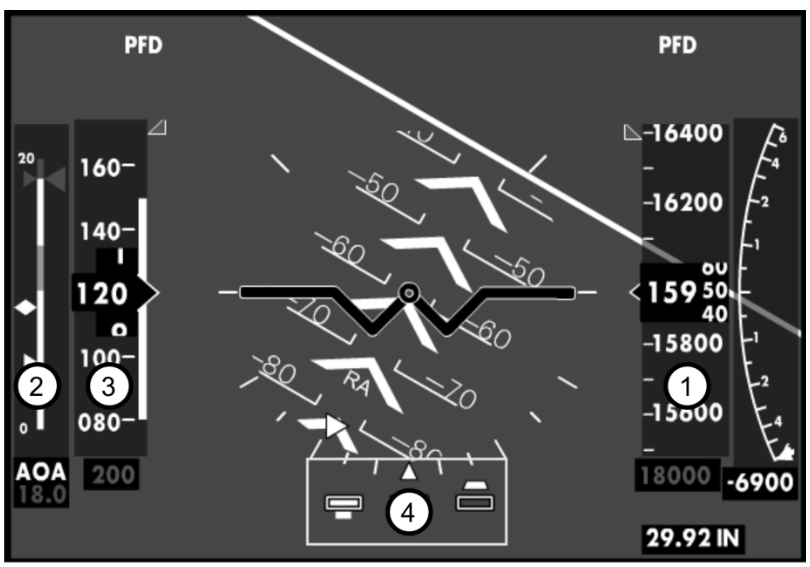


Figure 2-1a T-6A Scan Pattern



1. Altimeter
2. AOA
3. Airspeed
4. Turn Needle

Figure 2-1b T-6B Scan Pattern

If in a steady-state spin, execute the appropriate anti-spin recovery procedure.

Assuming a steady-state spin, the controls at this point will be neutral. In order to execute the appropriate spin recovery, use full rudder opposite the turn needle deflection and move the stick a bit more forward. Recovery may take up to two more full turns.

After the aircraft regains controlled flight, execute unusual attitude recovery as appropriate.

Barring any complications, the aircraft will return to controlled flight expeditiously. The unusual attitude that follows will in most cases be nose-low. While maintaining the nose-low attitude, check the position of the wings. If inverted, roll in the shortest direction to the upright position and then complete the recovery by leveling the wings and commencing a smooth pullout, not to exceed the aircraft G limits or 16 units AOA.

204. STALLS AND DEPARTURE

Stalls can be categorized as either normal or accelerated. A normal stall will occur when the aircraft is in an unaccelerated flight condition. The primary warnings of an approaching unaccelerated stall in the T-6A/B include: the stick shaker, decreasing airspeed, and increasing AOA. Other indications may include airframe buffet (although somewhat more subtle) and decreasing control effectiveness. An accelerated stall will occur in an accelerated flight condition (increased Gs), such as a pull-up or level turn maneuver. Accelerated stalls exhibit more severe characteristics than normal stalls. A "secondary stall" which may be experienced while recovering from a normal stall (such as those experienced periodically during the approach turn stall recovery), is actually an accelerated stall. Such a stall can be caused by the rapid addition of power, increasing the aircraft AOA, and inducing a stall at a higher than normal airspeed and G loading.

If it is not the pilot’s intention to stall the aircraft, and stall warning such as stick shaker or airframe buffet are experienced, then take immediate action to avoid the stall. Actions that reduce AOA, such as relaxing back stick pressure, smoothly advancing power, leveling the wings, and centering the ball (***RELAX, MAX, LEVEL, BALL***) are all appropriate. If such warnings are ignored, subsequent departure and PSGs are probable. Misapplication of stall recovery controls may result in a departure from controlled flight. Accomplish T-6A/B NATOPS Flight Manual stall recovery as follows:

1. Reduce AOA - This may require a reduction in back stick pressure, or moving stick progressively towards neutral, or moving stick forward of the trim position.

2. Advance PCL - smoothly, as required.

3. Use aileron and rudder, as required, to maintain wings level coordinated flight.

4. As flying speed is regained, smoothly increase back pressure on the control stick to stop altitude loss.

Stall departure is normally recognized by rapid yawing and a nose-down pitching movement, usually toward the direction of rudder input. The departure will be followed by PSGs if the controls are not neutralized promptly. Positively neutralizing the controls will cause the airplane to recover from the stall departure, but may result in an ensuing unusual attitude from which the pilot must ultimately recover.

205. POST-STALL GYRATIONS

If control inputs are held after the aircraft departs controlled flight, the aircraft will continue to oscillate randomly about any or all axes in increasingly nose-low attitudes, which may or may not develop into a spin. From a 1 G departure, these oscillations are comparatively mild with a roll in the direction of applied rudder. With ailerons applied opposite to rudder deflection, nose-low attitudes and faster roll rates will result.

PSGs resulting from accelerated departures are similar, except initial roll rates will be higher (assuming the same amount of rudder deflection). In either case, neutralizing the controls will affect rapid recovery, normally in a nose-low attitude. AOA and airspeed should be checked prior to starting pullout.

206. SPIRALS

The spiral is characterized by a nose-low attitude, high roll rates, and rapidly increasing airspeed. A spiral may easily be confused with a spin if the pilot relies solely on the interpretation of outside references and fails to accomplish a proper analysis of the cockpit flight instruments. Should the pilot misinterpret a spiral as a spin, it is highly unlikely that anti-spin control inputs will affect a successful recovery.

If performed to the left, the cockpit indications will initially look like those of a steady-state erect spin, with AOA pegged, airspeed moving into the 120-135 KIAS range, and turn needle fully deflected left. However, the aircraft is not stalled. This becomes apparent if the spiral is performed to the right, which makes the AOA hover near 15-16 units. Even when performed to the left, the airspeed will soon accelerate through the 120-135 KIAS range and positively indicate the aircraft is not in a spin. Airspeed will continue to accelerate with a rapid rate of rotation until the NATOPS Inadvertent Departure from Controlled Flight Procedures are performed. After rotation stops, the pilot will recover from a nose-low unusual attitude. Having the power reduced to idle will help slow the rate of airspeed increase. Excessive airspeed creates a strong tendency for the nose to pitch upward. This tendency is exaggerated when the aircraft is trimmed for a slower airspeed (i.e., 120 KIAS). It is critical to emphasize that the pilot must stop the roll and level the wings prior to allowing the nose to pitch upward. This will prevent a rolling pullout, which imposes additional stress on the airframe. Failure to prevent a rolling pullout could result in structural failure of the aircraft due to asymmetrical G loading. On pullout, ensure the wings are level by referencing the horizon and do not exceed 16 units AOA or maximum Gs (altitude permitting).

The key to a safe recovery from an inadvertent spiral lies in the expeditious recognition of the aircraft's actual flight condition. The pilot must be able to accomplish a proper analysis of the cockpit flight instruments and not rely solely on outside references.

207. T-6A/B ERECT SPIN CHARACTERISTICS

If pro-spin controls are maintained through the PSGs and incipient phase, a spin will develop. A spin is characterized by stable pitch attitudes, AOA, vertical velocity, airspeed, and yaw rates. Cockpit indications of an erect spin are: airspeed - stabilized between 120-135 KIAS, AOA - 18+ units, and turn needle - fully deflected in direction of spin. Other characteristics include approximately 60 degrees nose-down attitude and 400-500 feet per turn rate of descent.

208. DEFENSIVE POSITIONING

It is essential that new Primary Flight Instructors are introduced and become comfortable with OCF so they are able to recover the aircraft if/when a student puts them in that situation. Equally important is to teach instructors the preventative measures concept of "defensive positioning."

The following is a discussion of maneuvers that students commonly perform and sometimes perform incorrectly. This section is an amplification of common student errors found in the Contact FTI and is intended to provide the new instructor with additional knowledge on the subject.

Spin Defensive Positioning

The spin is a terrific confidence builder for a young aviator and is a relatively simple maneuver to perform, but if not entered correctly or if the student is slow to put in the proper inputs, you as the instructor may end up in a flight regime you did not intend to enter.

Recommendations

1. During strap-in, ensure the student cannot lock his/her knees.

2. As the student rolls out after completing the clearing turn, look at his head to see if he is looking out the opposite direction of the last 90º of the clearing turn. This may be an early indication they are going to spin the wrong way. You can either confirm the direction verbally or wait to see if they are leading rudder in the correct direction. If they are leading with the wrong rudder, confirm verbally. Look for the early signs.

3. As the instructor, you must constantly be vigilant for other traffic. Try to look around and clear your aircraft in both directions. At the stall, if the student puts in the wrong rudder, either let him continue if you have cleared the area and debrief it after you have recovered or recover immediately by taking the controls and performing OCF Procedures. What you do not want is confusion in the cockpit at the stall and subsequent cycling of the rudder pedals.

4. As the nose of the aircraft comes up, you as the instructor should now focus inside the cockpit. You should be ***shadowing*** the controls and begin scanning your instruments, looking for stalled AOA (altitude, AOA, airspeed, and turn needle). If you do not see the correct control inputs going in, go ahead and put them in, then debrief it later. Silence the horn.

5. The spin entry should be very methodical and deliberate; it should not be a slow "milked" entry with insufficient back stick to stall the AOA. If you see the proper control inputs are not put in, apply them in a timely manner to avoid a spiral or unusual attitude.

6. After you are in the spin (executing a fully developed steady-state spin), confirmed by stalled AOA and stable airspeed (120-135 KIAS), shadow the controls by blocking the aileron and rudder. Now we are looking for a correct recovery. Make sure as you are shadowing the controls, you do not block the rudder as the student is trying to put in the correct inputs.

7. Upon spin recovery, the student may leave the recovery rudder in too long; emphasize the controls go to neutral once rotation stops.

8. Be prepared to take the controls by 12,500’ MSL.

Approach Turn Stall (ATS) Defensive Positioning

The ATS is a relatively benign maneuver and as an instructor, you will do many of them; however, due to this maneuver’s normally benign nature, it can catch you by surprise. You may end up in an OCF scenario you did not intend to be in if the student does something unexpected.

The purpose of this instruction is not to reiterate what is already covered in the Contact FTI, but to prepare the instructor for the unexpected. With that said, this excerpt from the Contact FTI bears reiteration with regard to the ATS.

NOTE

> Stalls should be practiced to the maximum extent to build confidence and proficiency. In all cases, however, ***departure from controlled flight shall be avoided***. Instructional time should be used to practice successful recovery procedures rather than test the student’s ability to recover from uncontrolled flight.

As an instructor, you will have the opportunity to recover from the "botched" ATS under an approved OCF syllabus; however, the student is being taught the procedure to recover from an ATS that may save their life should this occur in the landing pattern. We are not teaching them to recover this maneuver from OCF.

Recommendations

1. During the descent after the clearing turn, check the student’s trim. This can be done by either having the student show their hands or by scanning the trim indicators. This helps the

student learn the correct trim inputs for the pattern. It will affect your departure from controlled flight if they are incorrectly trimmed and enter a secondary stall.

2. As the student enters the stall, you should shadow them on the controls. It is not uncommon for the student to raise the nose after beginning the recovery and enter a secondary stall. If this occurs at the point when the power is spooling up, you could depart to the left due to torque effect. You can solve this early by verbally telling them to relax some back stick.

3. It is also not uncommon for the student to use the left rudder when recovering from an approach turn stall to the left. Point out that the student may enter left rudder incorrectly on recovery from an approach turn stall to the right. Additionally, in either case, left rudder is always incorrect to counter the torque. You can prevent this by shadowing the controls with your right foot over, not on, the right rudder pedal; you can prevent the student's inadvertent left rudder input with an artificial stop. Lastly, note that it does not require full rudder to abruptly depart the aircraft when the engine spools up. With full rudder input at a stalled or near-stalled condition, you need to be concerned about an approach turn spin, with the gear and flaps down.

Slip Defensive Positioning

The slip is a terrific way to lose excessive altitude while maintaining airspeed and ground track; however, with a misapplied rudder or inattention to airspeed, the student could depart or stall the aircraft.

Recommendations

1. Pre-brief the student to say "***Wing down, top rudder***" as they are lowering the wing to enter the slip. You should shadow them on the controls as they enter.

2. Ensure the rudder (slip) is taken out before the student tries to change directions and lower the other wing and swap rudders. The rudder should be taken out smoothly and entered smoothly. If the student is not taking out the rudder before making turns, they may inadvertently enter a skid. Again, shadow the controls.

3. If a student is changing rudders and changing the wing in a rapid or rough manner, they could depart the aircraft due to a rapid increase in yaw rate. Due to the out-of-balanced flight condition, the stall speed will be higher. In either case, shadow the controls.

Emergency Landing Pattern (ELP) Defensive Positioning

With regard to the ELP, the previous slip defensive positioning applies. In addition, here are other ELP considerations.

Recommendations

When simulating a power loss emergency, once you say, "***Simulated***" and pull the power towards Idle, the student still has the controls (stick and PCL), but you are the only one who will move the PCL to a SIMULATED feather condition (4-6% torque). Leave your hand near the PCL.

Landing Pattern Defensive Positioning

Landing Pattern errors are contained in the Contact FTI. As an instructor it is important to maintain a vigilant scan and Situational Awareness (SA) while in high-traffic environments, where your attention will be divided between trying to teach a young aviator how to land, and at the same time, keeping an eye on interval. Do not trust the student in the front to do this. It is important to note that students will have bad landings. Your task as an instructor is to know the difference between a bad landing and an unsafe landing; the first is part of the learning curve, the latter should be waved off.

Typical errors include:

1. Not trimming throughout pattern.

2. Ballooning.

3. Porpoise landing.

4. Stall prior to touch down.

5. Overshoot/Undershoot final.

6. Low/High.

7. Slow/Fast.

8. Poor crosswind correction/landing with a drift or in a crab.

9. Late/Early transition at the 180 position.

10. Turning without interval.

11. Missed calls/using incorrect radio (VHF/UHF).

12. Wing rising after touchdown.

13. High/Late/Rapid Flare.

14. Floating/landing long.

Recommendations

1. Shadow the student on the controls. Do not ride the controls; they need an opportunity to make mistakes and learn to correct them on their own.

2. Do not overload the student to the point where they are task saturated on every pass and lose SA; this may help keep them from doing something unexpected.

By teaching defensive positioning methods, we can expect our instructors to be able to prevent situations from developing beyond their capability. Defensive positioning training will improve our reaction time by allowing us to "feel" an improper input and act correctly or not allow the improper input to be accomplished at all if that is the suitable thing to do. It is just as important to recognize an unsafe situation developing and prevent it from happening, as it is to properly assess an OCF regime and recover from it correctly. A good example of defensive positioning occurs during an ATS (especially to the left) when the student's tendency is to apply left rudder vice the correct input of right rudder. By placing your right foot over, not specifically on, the right rudder pedal, you can prevent the Student's inadvertent input with an artificial stop, preventing the dreaded approach turn spin. Other examples include "guarding" the rudder pedals during forced landings, working to prevent a slip from becoming a skid, or keeping your hand behind the stick during takeoffs and landings to prevent over-rotation, over-flare, or push-over after ballooning.

Defensive positioning must be an integral part of the Instructor Training Syllabus to be instilled effectively in all of our flight instructors prior to "hitting the pits."

209. ADDITIONAL FLIGHT MANEUVERS

1. **Spiral Demo**

   a. **Description.** This maneuver is demonstrated by the OCF instructor pilot to familiarize the IUT with the cockpit indications and flight characteristics of a spiral in the T-6A/B.

   b. **General.** During the maneuver, the OCF Instructor Pilot (IP) will execute normal spin entry procedures up to the point of stall. Immediately after the stall, full rudder and full back stick shall be applied. As the aircraft enters the PSGs, the rudder will be applied (between full to slightly short of full rudder) in the direction of turn. Full aileron will be applied in the direction of the spiral with stick slightly forward of neutral. The aircraft will do a "Barrel Roll" type entry and initially "feel" like a spin. Altitude, AOA, airspeed and turn needle are scanned to differentiate between a spin and a spiral and are called out by the IUT. Airspeed will continue to build unless OCF recovery procedures are initiated. The OCF IP should maintain pro-spiral control inputs until the airspeed approaches 140 KIAS (no greater than 150 KIAS) to allow the IUT ample opportunity to recognize the aircraft is not in a steady-state spin. If the maneuver is performed to the left, the AOA will be fully pegged (if performed to the right, AOA will indicate approximately 15-16 units) and the turn needle pegged in the direction of rotation, resembling a steady-state-spin; however, the airspeed will accelerate rapidly through 120-135 KIAS. Minimum entry altitude for the Spiral Demo is 19,000’ AGL. OCF recovery will be initiated by 12,500’ AGL or 150 KIAS, whichever occurs first. Test pilots have found rates of descent associated with a spiral can be as high as 27,000 FPM. The aircraft will typically recover within one-quarter turn once OCF recovery inputs are initiated.

c. **Procedures:**

i. Perform procedures to enter a normal erect spin.

ii. As the nose of the aircraft begins to roll off in the direction of the spin, follow the nose of the aircraft with the stick, first to the left/right until the stick reaches your thigh, then forward to a position forward of neutral. At the same time, the rudder may be moved off the stop to a position slightly short of full, (or rudder pressure may be kept full).

iii. IUT shall report altitude, AOA, airspeed, and turn needle following spiral entry.

iv. OCF Instructor Pilot will maintain pro-spiral control inputs until airspeed approaches 140 KIAS, but no greater than 150 KIAS.

v. Initiate OCF Recovery Procedures upon IUT recognition of spiral or no later than airspeed reaching 150 KIAS, or 12,500’ AGL (whichever occurs first).

vi. Recover from ensuing unusual attitude.

NOTE

Recovery airspeeds will be in excess of 200 KIAS with recovery initiated at 150 KIAS.

CAUTION

Failure to initiate recovery by 150 KIAS will result in rapid airspeed buildup and high rates of descent. The possibility of asymmetrical G loading during the pullout exists due to the extremely disorienting effects felt during a spiral recovery.

2. **Approach Turn Stall**

a. **Description.** Stall the aircraft while simulating a landing approach and recover safely with minimum loss of altitude.

b. **General.** The maneuver will be flown and recovered by the IUT. Enter with sufficient altitude to ensure recovery by 6,000’ AGL.

c. **Procedures:**

i. Establish the aircraft in the downwind configuration (gear down, 120 KIAS).

ii. Perform the Pre-Stalling, Spinning, and Aerobatic Checks and clearing turn.

iii. Roll out and stabilize the aircraft at 120 KIAS, level flight (simulating downwind leg).

iv. Simulate the transition near the abeam position IAW Contact FTI procedures. Power should be approximately 15% torque, flaps set to takeoff (TO), airspeed 115 KIAS, trimmed in a descending 30° AOB turn to simulate the approach turn to final. Report over the ICS, "Gear down, flaps TO, speedbrake retracted, Before Landing Checklist complete."

v. Once stabilized at 115 KIAS in the simulated approach turn, raise the nose to 5-10 degrees nose high, then reduce power to idle. Adjust ailerons to maintain AOB between 30-45 degrees, and increase back stick pressure to hold the pitch attitude.

vi. At the stall (or first indication of stall [stick shaker or buffet] as directed by the OCF Instructor), recover IAW the Contact FTI or NATOPS Flight Manual (as appropriate) with minimal loss of altitude.

3. **Aft Stick Stall**

a. **Description.** Stall the aircraft in a power-off clean configuration. At the point of stall, hold full aft stick and aileron as required to maintain level flight.

b. **General.** The aft stick stall demonstrates the potential for the aircraft to maintain a level flight attitude while holding a full stall. Maneuver will be flown at a minimum of 13,500' AGL.

c. **Procedures:**

i. Perform the Pre-Stalling, Spinning, and Aerobatic Checks and clearing turn (13,500' AGL minimum).

ii. Set wings level and reduce the power to idle or 4-6% torque. Use elevator pressure to maintain altitude, stop trimming at 150 KIAS.

iii. Allow the aircraft to develop into a full stall.

iv. Do not allow the nose to fall at the point of stall; maintain full aft stick and neutral rudder through the stall, and use aileron as required to maintain wings level. Note the pegged AOA and excessive descent rate.

v. Recover by decreasing AOA and adding power.

OCF ENTRY MANEUVERS

The following is a list of maneuvers that the OCF IP may give to the IUT in an effort to build confidence and demonstrate the flight characteristics of the T-6A/B. All maneuvers shall be performed at a minimum of 13,500' AGL and shall be planned to be completed by 10,000' MSL. All aircrew shall ensure that the PCL is at IDLE at the time of departure.

1. **Aileron Swap – OCF Entry**

   a. **Description.** This entry into OCF flight is a good introduction to both OCF recovery and to the consequences of misapplied controls during a low-altitude slip. Departure will generally be gentle.

   b. **General.** The Aileron Swap may be done either to the left or the right. One possible scenario includes clean glide to High Key with improper slip inputs. The IUT should note the altitude loss and importance of maintaining good defensive positioning during any slip maneuver.

   c. **Procedures:**

      i. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and clearing turn.

      ii. Establish the aircraft in a right/left hand descending 125 KIAS turn (4-6% torque, gear and flaps up, 30 degrees AOB).

      iii. Smoothly apply back stick pressure and reduce the power to idle. At the onset of stick shaker, smoothly bank the aircraft in the opposite direction.

      iv. After the aircraft departs, recover in accordance with OCF Recovery Procedures.

2. **Rudder Swap – OCF Entry**

   a. **Description.** This maneuver demonstrates the aircraft's tendency to depart controlled flight when the rudder is cycled/swapped at slow to moderate airspeeds.

   b. **General.** Although there are many possible scenarios, we will demonstrate this maneuver in the clean configuration, simulating a glide to intercept the ELP. In this scenario, incorrect rudder application (skid) is made in an attempted slip to High Key. Once recognized, opposite rudder is smoothly applied and the aircraft departs in the direction of rudder application. The IUT then takes the controls and recovers the aircraft using OCF Recovery Procedures.

   c. **Procedures:**

      i. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and clearing turn.

ii. Establish the aircraft in a 125 KIAS glide, 4-6% torque, gear and flaps up.

iii. In the glide, add wing down and incorrect rudder (bottom) to enter a skid. Use aileron to maintain 30 degrees AOB. Verbalize error, then simultaneously raise the nose, move PCL to idle, and smoothly apply opposite rudder until the aircraft departs controlled flight (recommend departing below 120 KIAS).

iv. Recover in accordance with OCF Recovery Procedures.

3. **ATS – OCF Entry**

a. **Description**. This maneuver demonstrates the consequences of an improper application of controls when recovering from an approach turn stall.

b. **General**. A botched approach turn stall can quickly develop into an OCF scenario.

c. **Procedures:**

i. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and clearing turn.

ii. Setup an ATS in a clean configuration. As the aircraft reaches full stall, reduce PCL to idle and add full pro-turn bottom rudder.

iii. Recover in accordance with OCF Recovery Procedures.

4. **Improper Slip (Skid) – OCF Entry**

a. **Description**. This maneuver demonstrates the consequences of an improper slip.

b. **General.** All pilots need to be aware of the negative effects of an improper slip.

c. **Procedures**:

i. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and clearing turn.

ii. In the clean configuration, slow to 125 KIAS and set torque 4-6%.

iii. Begin a 30 degree AOB turn to the left/right, reduce the PCL to idle.

iv. Add pro-turn (bottom) rudder.

v. Recover in accordance with OCF Recovery Procedures.

5. **Spin – OCF Entry**

a. **Description.** This maneuver demonstrates a recovery from a spin prior to steady-state spin indications.

b. **General.** It is not uncommon for a pilot to have to recover from a spin earlier than planned. Any number of things may necessitate an early recovery, such as a Master Caution/Warning light, TCAS hit, etc.

c. **Procedures:**

i. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and clearing turn.

ii. The IUT enters a spin in accordance with FTI procedures.

iii. After the aircraft departs, but prior to development of a steady-state spin, the OCF IP simulates an emergency by activating the Lamp Test switch.

iv. The IUT recovers in accordance with OCF Recovery Procedures.

6. **Aft Stick Stall – OCF Entry**

a. **Description.** This maneuver demonstrates the effect of rudder input on an aircraft that is stalled.

b. **General.** All pilots should be aware of the effects of yaw inputs on a stalled aircraft. The maneuver is setup by a standard aft stick stall, with the introduction of rudder to depart the aircraft.

c. **Procedures:**

i. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and clearing turn.

ii. Setup an aft stick stall, note descent rate, AOA and ability to maintain level flight.

iii. Reduce the PCL to idle (if not already there).

iv. Smoothly add full rudder left/right.

v. Recover in accordance with OCF Recovery Procedures.

210. CONCLUSION

The procedures outlined in this FTI have been gleaned from the experiences and misfortunes of others. Training methods listed herein have been thoroughly tested through years of flight experience with the T-6A/B aircraft and have proven their ability to expand the skill envelope of each new IUT. Every T-6A/B IUT is encouraged to read and live by the procedures outlined in the NATOPS Flight Manual and this FTI. A solid understanding of the above maneuvers will provide instructors with the ability to limit their exposure to the "near tragic" situations that students may inadvertently put them in.

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APPENDIX A
GLOSSARY

A

AOA: The instantaneous angle between a reference line on the airplane (usually the wing chord line) and the relative wind (Figure A-1).

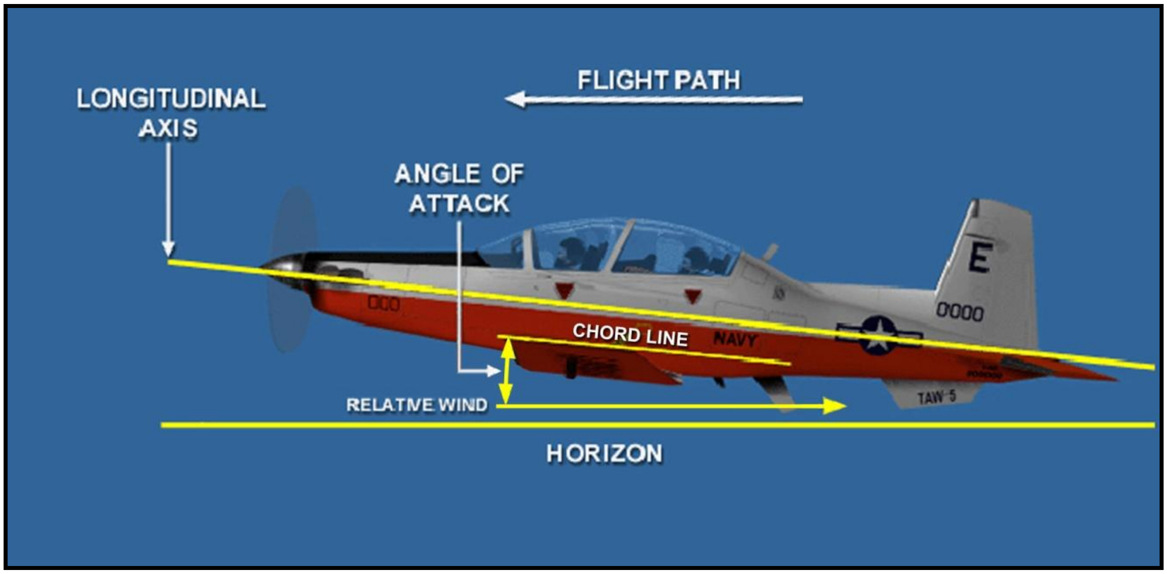

Figure A-1 AOA

AERODYNAMIC COUPLING: An aerodynamic characteristic affecting dynamic stability which results when a disturbance about one axis causes a disturbance about another axis (i.e., a combination of yawing and rolling motion resulting from rudder deflection).

B

BODY AXIS SYSTEM: The system by which the axis of flight or aircraft movement are determined (Figure A-2).

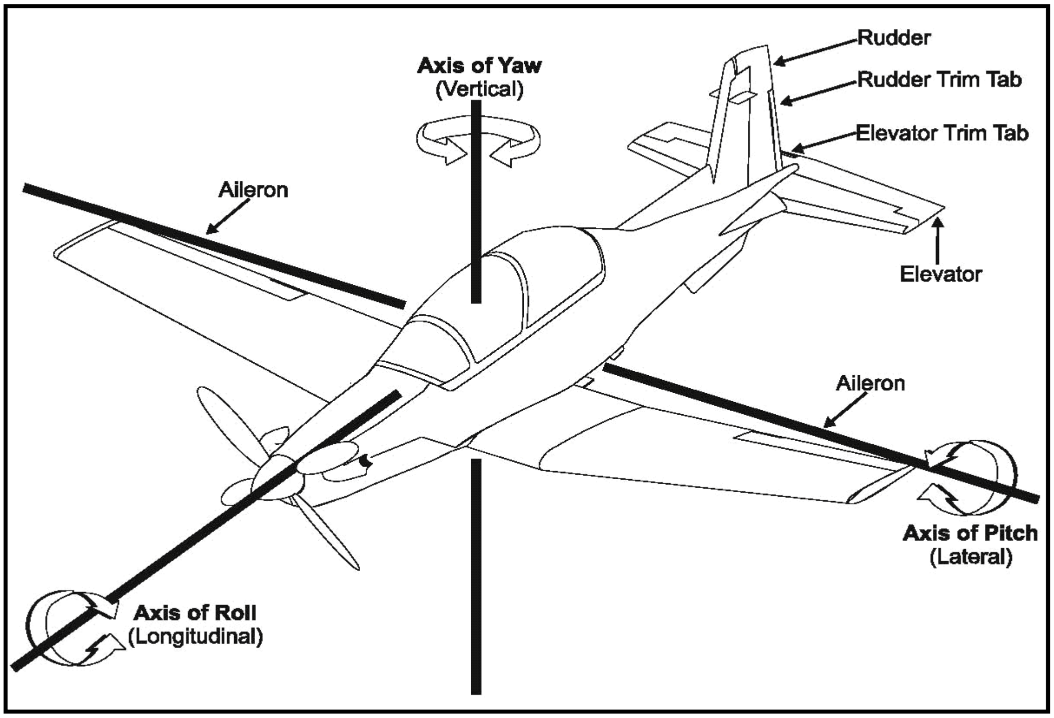

Figure A-2 Body Axis System

D

DEPARTURE: The phase of flight during which the airplane goes from controlled to uncontrolled flight (Figure A-3).

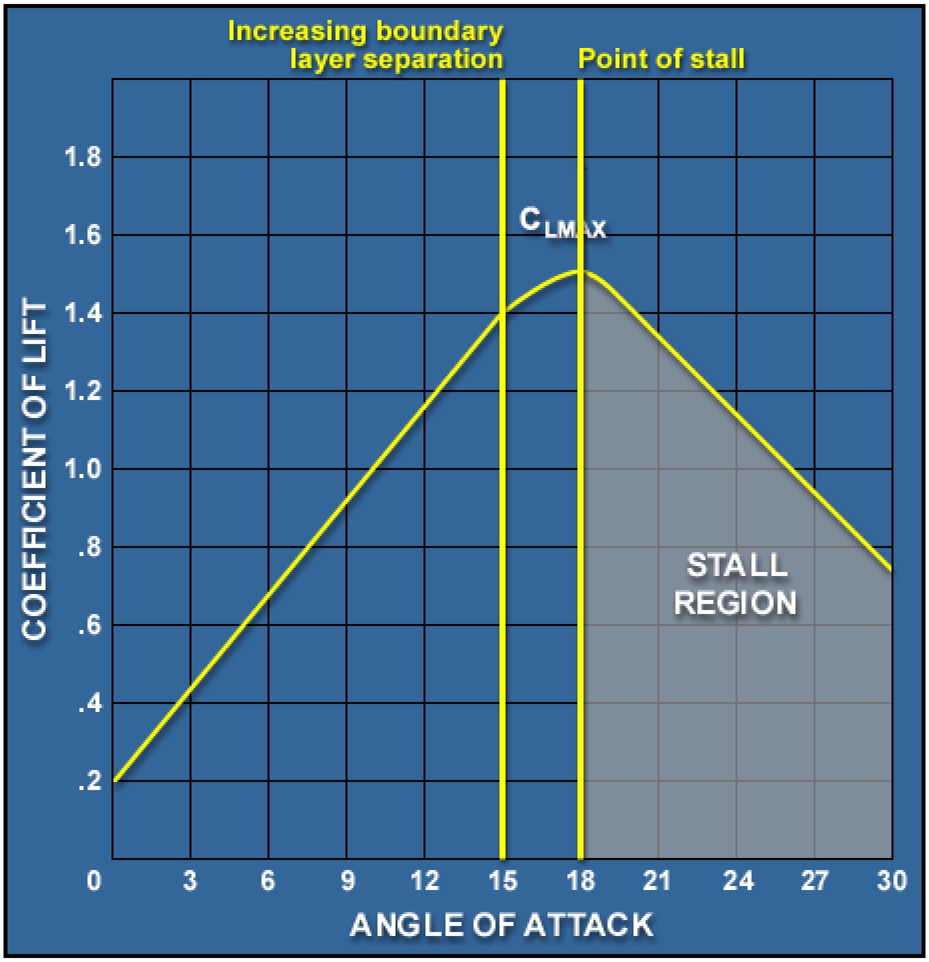

Figure A-3 Departure

M

MOMENT OF INERTIA (I): A measure of the resistance of a body to angular acceleration, for any given axis. 1x, 1y, and 1z are moments of inertia about respective body axes.

S

SIDESLIP ANGLE: Relationship between the displacement of the airplane centerline from the relative wind rather than from a reference axis (Figure A-4).

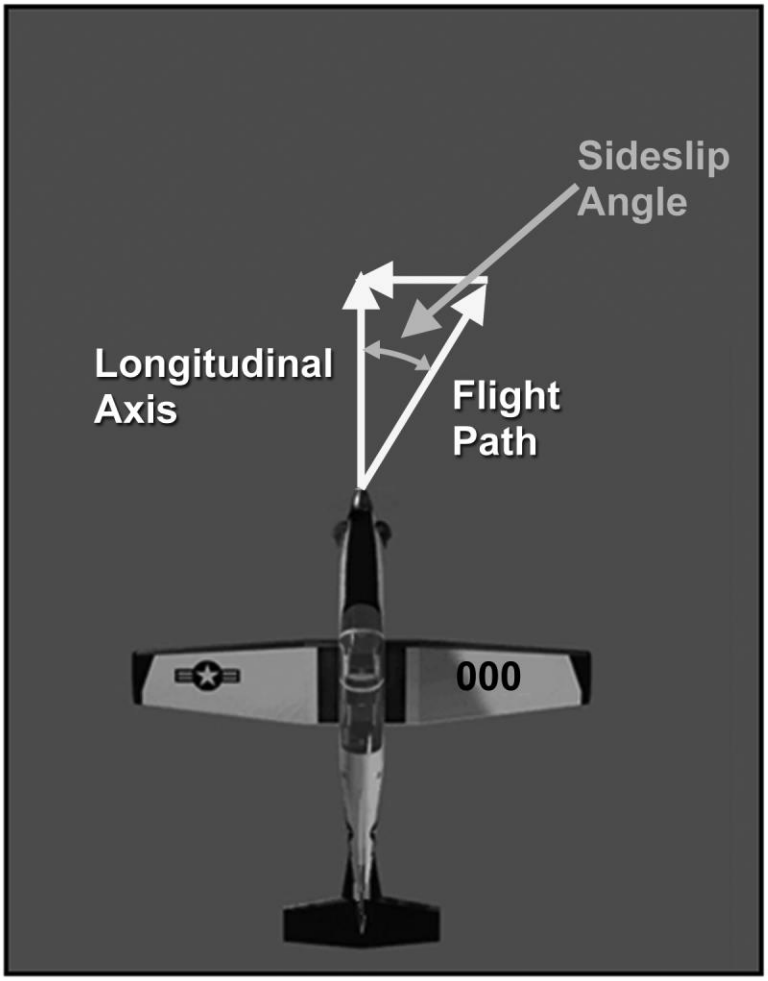

Figure A-4 Sideslip Angle

STALL: That AOA beyond which a further increase in AOA will not produce a corresponding increase in lift (this is not an all-inclusive definition).

STATIC DIRECTIONAL STABILITY: Essentially the weather cocking tendency of the airplane or the initial tendency of an airplane to return to steady-state flight after a disturbance about an axis. Directional Stability can be positive, neutral, or negative (Figure A-5).

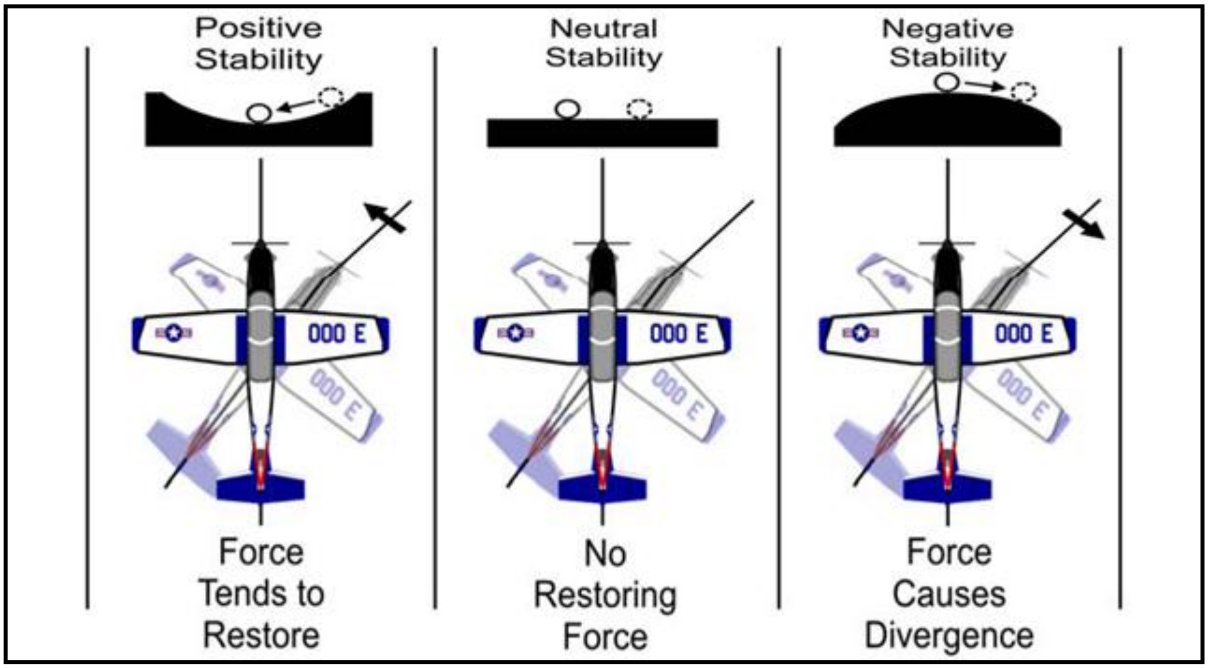

Figure A-5 Static Directional Stability

Y

YAW ANGLE: Relates to the displacement of the airplane centerline from some reference azimuth. This term is normally used in wind tunnel tests and is presented here only to eliminate or minimize the tendency to confuse it with angle of sideslip or yaw rate (Figure A-6).

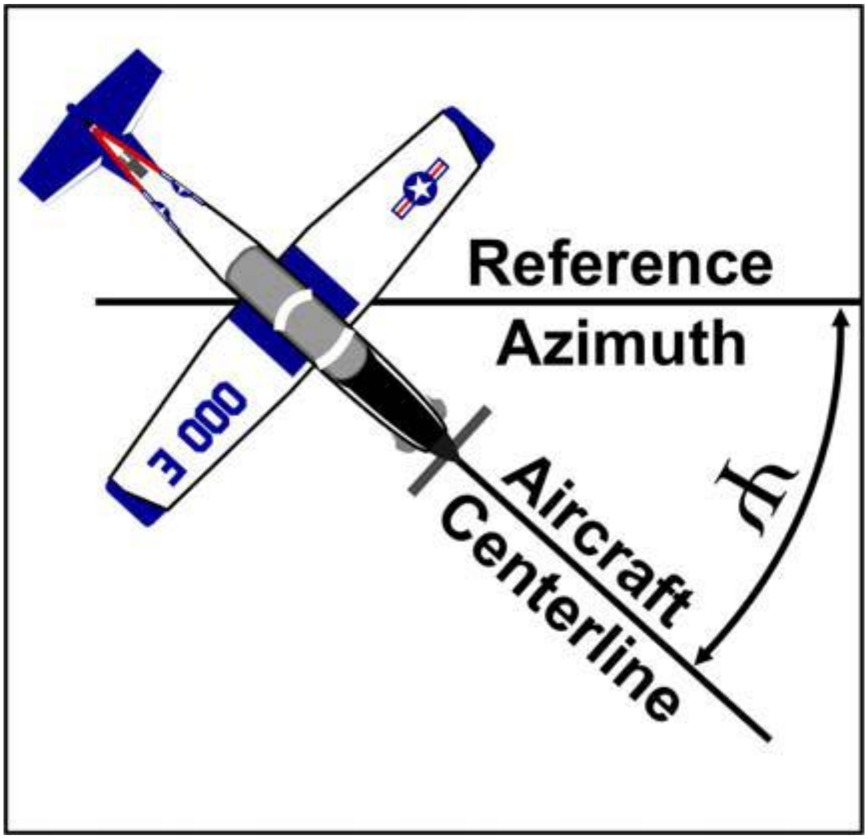

Figure A-6 Yaw Angle

YAW RATE: Rate of change of yaw angle or how fast the nose of the airplane is moving across the horizon (measured in degrees per second (deg/sec)).