NAVAL AIR TRAINING COMMAND

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FLIGHT TRAINING INSTRUCTION

PRIMARY SNFO CONTACT T-6A

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1. CNATRA P-868 (02-11) PAT, "T-6 Flight Training Instruction, Primary SNFO Contact T-6A" is issued for information, standardization of instruction and guidance of all flight instructors and student aviators within the Naval Air Training Command.

2. This publication shall be used as an explanatory aid to the T-6A Primary SNFO Flight Curriculum. It will be the authority for the execution of all flight procedures and maneuvers therein contained.

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

4. CNATRA P-868 (04-03) PAT, is hereby cancelled and superseded.

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FOR

PRIMARY SNFO CONTACT

T-6A

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CHAPTER ONE
INTRODUCTION TO FLIGHT TRAINING

100. INTRODUCTION

This Flight Training Instruction (FTI) is a Naval Air Training Command directive in which the Chief of Naval Air Training (CNATRA) publishes information and instructions relative to all Instructors and Student Naval Flight Officers (SNFOs) operating T-6A aircraft in the Primary Phase of SNFO training. It is very important that the factual material contained herein be thoroughly studied and retained.

The Contact FTI should in no way be your sole source for study and preparation. Rather, this instruction provides a focal point and reference manual for other sources of information, outlining and amplifying flight procedures where necessary. Every effort has been made to remain in accordance with current fleet procedures and techniques whenever possible and to provide references to the NATOPS Flight Manual. It is important to note that the emergency procedures shown are to aid in the topic discussion. For all emergencies, the NATOPS is the final authority.

During the contact stage of T-6 training, SNFOs receive "stick time" in a pilot-like syllabus in order to create and build the following skills:

1. **Situational awareness (SA)**: The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future. In simpler terms, SA is the accurate perception of what's going on with you, the aircraft, and the environment around you; now and in the future. When perception matches reality, you are situationally aware. SA is essential in recognizing unsafe conditions and taking appropriate action to prevent mishaps.

2. **Visual scan**: Visual scan encompasses two components. The first is the ability to recognize deviations from the base airspeed, altitude and heading with reference to flight instruments and the horizon. The second component is the ability to recognize and avoid potential traffic conflicts.

3. **Procedural recall and execution:** The T-6A contact stage will provide your initial training in procedural recall and execution while operating in a dynamic environment. Throughout one's aviation career, understanding and application of flight procedures, both normal and emergency, is an essential component of flight safety.

You will accomplish a series of maneuvers from this manual including takeoffs, transitions, stalls, spins, landing pattern work, and finally, aerobatics. These maneuvers will be graded in accordance with the course training standards. Preparation is key to enjoying your initial military flight experience and getting the most of out it.

101. HISTORICAL BACKGROUND

Naval Aviation training has come a long way since 1910 when Lieutenant T. G. Ellyson was ordered to flight instruction to become the first Naval Aviator. Soon thereafter the U.S. Navy purchased its first aircraft, the Curtis Triad, at a cost of $5,500. Since then, naval aviation technology has progressed at a rapid rate. The fleet aircraft of today's Navy are tremendously complex and demanding machines capable of astonishing performance. Advancements in aviation technology are only part of a much bigger picture. Even the most modern aircraft will most certainly fail to accomplish its mission if its crew is poorly trained or incompetent. Therefore, a thorough and comprehensive training program is essential to mission accomplishment.

Early aviation pioneers suffered through many accidents which became unwanted, yet commonplace occurrences. A good landing was one from which you could walk away! Today, the safety record of Naval Aviation is the best it has ever been. Accidents or mishaps are rare yet do occur. Our universal goal is a zero mishap rate, especially in the training environment. Therefore, SAFETY is one of our primary concerns during all phases of training.

102. THE FLIGHT INSTRUCTOR

Your flight instructor is an experienced aviator, trained to provide you with a sound foundation in the operation of the aircraft. Instructors undergo a training course similar to the student NFO. This course familiarizes them with the SNFO curriculum and techniques for effective presentation.

Standardization is key to effective instruction, as it provides a logical, effective, and consistent foundation on which to present any maneuver. This in turn ensures all students can be judged on the same basis, each having been exposed to the same material and afforded an equal opportunity to demonstrate abilities. Although no two instructors will be identical in their techniques, the goal is to provide standardized training to the greatest extent possible.

In order to teach you to fly the T-6A properly, your instructor must critique your performance. Your instructor's feedback and suggestions are intended to improve your understanding and technique. All criticism by the instructor should be constructive in character, with the intent to develop a newly qualified NFO ready for service.

103. CREW RESOURCE MANAGEMENT (CRM)

Human error is the single leading cause factor for Class A mishaps in modern naval aviation. Human error can often be manifested through poor aircrew coordination. Crew Resource Management (CRM) describes the process of coordinated action among crew members which enables them to interact effectively while performing mission tasks. The following section discusses conditions that threaten and conditions that aid effective aircrew coordination.

Conditions that threaten aircrew coordination:

Sandbag Syndrome: The Sandbag Syndrome is based on a comforting premise that one or more crewmembers have the situation under control and are looking out for your best interest. It can be experienced by any crew member, resulting in that person being "along for the ride." In a multi-person crew aircraft, the safe and effective completion of the mission depends upon the professional performance of every crewmember. Never assume your pilot will take care of you.

Excessive Professional Courtesy: In general, we are hesitant to call attention to deficient performance in others, particularly if they are senior to us. Thus, even when one crewmember does point out performance which is outside established parameters, it is typically done with very little emphasis. Instead of stating "Sir/Ma'am, you're a little fast," or "a little low," use assertive specifics such as "I show our airspeed 15 knots fast" or "I show our altitude 225 feet low."

Strength of an idea/channelized attention: Strength of an idea can be defined as an unconscious attempt to make available evidence fit a preconceived situation. Once a person or group of people gets a certain idea in their head(s), it is difficult or impossible for them to alter the idea no matter how much conflicting information is received. Avoid channelized attention or a closed-minded attitude which might allow a serious threat to the mission without any awareness on the part of the crew. In a highly stressful situation, it is even more important we do not focus our attention or become channelized on only one area.

Sudden Loss Of Judgment (SLOJ): SLOJ is a condition in which an individual's decision-making abilities become impaired. Even the most capable and experienced crews are susceptible to this condition. It is generally precipitated by a real or perceived pressure to perform or by workload or stress-related issues.

Halo Effect: The halo effect comes into play when the aircrew is impressed by the vast experience of a senior person. They tend not to speak up about problems they see, even though they may have more experience on that type of aircraft or particular mission. Sometimes the senior person involved is aware of this effect and even attempts to use it to his/her advantage.

Hidden Agenda: Sometimes a crewmember may make suggestions or decisions based on information or desires the rest of the crew are not aware of, such as a strong desire to make it back to base due to important plans for the evening. We need to communicate all motives involved honestly so decisions can be made rationally and are based on the facts rather than on wishful thinking. Additionally, there may be instances where a crewmember fails to share certain information about his/her intentions regarding the completion of a particular maneuver, task, or mission in order to prevent objections and confrontation from other crewmembers.

Concepts that aid aircrew coordination:

Two- Challenge Rule: The two-challenge rule provides for automatic assumption of duties from any crewmember who fails to respond to two consecutive challenges. This overcomes our natural tendency to believe the pilot flying must know what he/she is doing, even as he/she departs from established parameters.

Most Conservative Response Rule: Occasionally there is a disagreement in the cockpit which cannot be resolved due to lack of information. It is best to agree in advance to take the most conservative action in these situations until additional information is available.

Assertive Statement: The assertive statement is a non-threatening method by which a crewmember can directly communicate concerns about a situation with which he/she is uncomfortable. An example of an assertive statement is “time out”, or “knock it off”, or “this is stupid”. After getting the attention of the other crew member(s), you should state your concern and then offer a solution.

Training Time Out (TTO)

A TTO may be called in any training situation whenever a student or instructor expresses concern for personal safety or a need for clarification of procedures or requirements exists. . . ."

The intent of TTO is to give students and instructors the means to stop a flight if they are not "communicating" or if either party feels they are in an unsafe position. It will not be used to terminate a flight just because you are having a bad day or do not know your procedures. Nevertheless, do not be hesitant to use TTO if you feel the flight conditions warrant it.

Positive transfer of control of the aircraft

A most important flying safety requirement is a clear, positive understanding at all times of who has control of the aircraft. You must understand the procedures involved in transferring control of an aircraft.

The instructor will tell you over the intercommunications system (ICS), “I have the controls.” When your instructor says, “I have the controls,” you acknowledge by stating over the ICS, “You have the controls.” You then take your hands and feet off the controls. Your instructor will then confirm control by saying, “I have the controls.” Conversely, but in the same manner, when your instructor wants you to fly, he/she will say, “You have the controls,” whereupon you will take control and acknowledge over the ICS, “I have the controls.” The instructor will then complete the exchange with another, “You have the controls.” Understand that unless you and the instructor complete the 3-way exchange of controls, no exchange of control was made. For example, your instructor may coach or aid your flare during a landing. You may feel a presence on the control stick, but you are still flying and should continue to do so. Never be in doubt as to who is flying; if you are not absolutely sure, safety dictates you speak up and ask!

Radio/ICS Communications

Proper radio communication is extremely important to safety. Your communication will be inside the aircraft with your instructor over the Intercom System (ICS), and also outside of the aircraft with controlling agencies like ground, tower, and departure/arrival control. You must read and learn the contact radio procedures in the Voice Communications FTI prior to your first flight.

104. PHYSICAL/PSYCHOLOGICAL FACTORS

I'M SAFE CHECKLIST: Our situational awareness resources vary from day to day. Unfortunately, we don't have an external readout telling us or others when they are diminished. Therefore, it is important that we preflight ourselves daily. "I'M SAFE" (ILLNESS, MEDICATION, STRESS, ALCOHOL, FATIGUE, EATING) is a simple checklist to determine if we are ready and fit to fly.

One critical factor of success in this program is *mental attitude*. Mental attitude, as much as any other factor, determines the ease or difficulty with which the student progresses through the training syllabus. Under the heading of positive mental attitude come such elements as willingness to conform to military discipline, acceptance of curtailed personal freedom and leisure, and the ability to encounter occasional setbacks and still maintain enthusiasm and self-confidence.

The following is a paraphrased excerpt of a flight surgeon's discussion of the numerous physical and psychological factors affecting your training.

Physical ease and relaxation while flying make the difference between the pilot flying the plane and the plane flying the pilot. A proper sense of "feel" of the aircraft is essential. Just as a good horsemen must be sensitive to the movements of their mount, so must the aviators be sensitive to the movements of the aircraft. This cannot be achieved in any other way than by the proper relaxation of all the body muscles and light touch on the aircraft's controls. The ability to be relaxed in an aircraft involves an awareness of what your body and mind are doing. A natural reaction to the strange environment or unusual situation is the age-old aviator tendency to "pucker" in a tight situation. Be alert for involuntary tensing of the muscles and you will find that you will quickly develop that sought after "feel" and avoid the hard-to-break habit of mechanical flying. A most important aspect of developing this sense of "feel" is knowing what you are going to do at all times and be prepared for the next evolution in your flight training. This is nothing more than knowing your procedures. Remember the panic in your school days when you were handed the test and it suddenly dawned on you that you had not studied, or what you had studied was not on the test? The risks are magnified when the "test" is in the air. Don't let this happen to you.

Mental attitude is a very essential element in your relaxation in an aircraft. It affects your nervous system and, if allowed to continue in an unhealthy trend, can result in actual physical incapacitation. Therefore, its significance should be fully appreciated. As with physical handicaps, any mental distraction will detract from the full use of your required senses. A poor mental attitude will interfere with your ability to concentrate, learn, and apply your knowledge. In turn, a good or positive mental attitude will increase your learning capacity and make your flight training a pleasure rather than an unpleasant job. If for any reason you find yourself "flying more and enjoying it less," whether from some known cause or not, discuss it with your flight instructor or class advisor. Another aid to acquiring a positive mental attitude, after you have satisfied yourself it is not an outside problem affecting you mentally, is to find some healthy diversion to get your mind away from the subject of flying for a time.

Mental alertness on the NFO part has a direct bearing upon safety of flight as well as contributing significantly to the learning process. Remember, the training areas utilized by many aircraft are not very large. Being constantly on the alert while flying may save your life and one of your squadron mates. Mental laziness is the constant enemy of aircrew. As you progress through flight training, plan ahead and anticipate all possible contingencies that could affect the operation of your aircraft. This not only refers to the environment around you but the aircraft you are sitting in. Check your engine instruments from time to time to ensure all is well up front. In other words, train yourself to be alert to all facets of your flight rather than concentrating on the problem of the moment. You will find yourself surprised at the amount of information your eyes will transmit to your brain during a quick scan of your surroundings. Planning ahead enables you to take immediate and appropriate action should an emergency occur.

Confidence in your aircraft, your instructor, and most importantly in yourself, is another essential element of flying. The basic ingredient to acquiring confidence is knowledge and efficient analytical application of that knowledge. The risks beyond the control of the aircrew are minimal. Fire is an extremely rare occurrence. Engines are inherently reliable. In-flight collisions are rarities and completely avoidable if you stay alert. With the above points in mind, it is readily apparent the chance of an aviation accident caused by other than incompetence, disobedience, or poor judgment is remote. Remember, 70% of all fatal accidents are due to aircrew error alone. With all of this going for you, don't let human frailty or overconfidence develop, particularly while your experience is limited. Professional aircrews are never caught unprepared in an emergency situation. They know and understand emergency procedures cold. Humble confidence and perseverance will go a long way in striving for those Wings of Gold.

105. PROCEDURE TRAINERS

Procedure trainers have proven to be a valuable asset in helping students learn the physical attributes necessary to become a good NFO. Before you climb into the T-6A for the first time, you will have several opportunities to practice normal and emergency procedures in the procedure trainers. There are two types of procedure trainers available for your use: the static trainer and the Unit Training Devices (UTD). Both are located in the simulator building. You should utilize both trainers to the maximum extent possible. Practice will pay off with better grades, self-confidence, and professional performance.

You won't always have a formal training device at your disposal to prepare for your simulators and flights. "Chair flying" or "hangar flying" is an excellent way to prepare at home, preferably with a classmate. Strap your checklist on your knee, put on your gloves, grab a simulated control stick and mentally accomplish each segment of your imaginary flight. Visualize each procedural step of your planned maneuvers and verbalize your radio calls. “Chair flying” is a skill in itself and can reap major rewards in all phases of your training and throughout your career.

106. THE AIRCRAFT

The first aircraft you will fly in this program is the Hawker Beechcraft T-6A “Texan II.” It is a single-engine, two-place (tandem seat), pressurized, low wing training aircraft. Power is provided by a Pratt & Whitney PT6A-68 free-turbine turboprop engine with a Hartzell four-blade propeller, providing a flight envelope with altitudes to 31,000 feet. Each cockpit is equipped with an ejection seat. Reference your T-6A NATOPS Flight Manual for detailed aircraft information and operating procedures.

Figure 1-1 T-6A Texan II

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CHAPTER TWO
T-6 AERODYNAMICS

200. INTRODUCTION

This chapter discusses the controls with which you will operate the aircraft about the three axes of motion (Figure 2-1) and how to use them effectively. It also discusses aerodynamic effects from the T-6A engine and propeller.

201. PRIMARY FLIGHT CONTROLS

To maneuver an aircraft, you control its movement about its lateral, longitudinal, and vertical axes (Figure 2-1). This is accomplished by the use of the flight controls (elevators, ailerons, and rudder), which can be deflected from their neutral position into the flow of air as the aircraft moves forward. In flight, the controls have a natural live feel due to the force of the airflow around them.

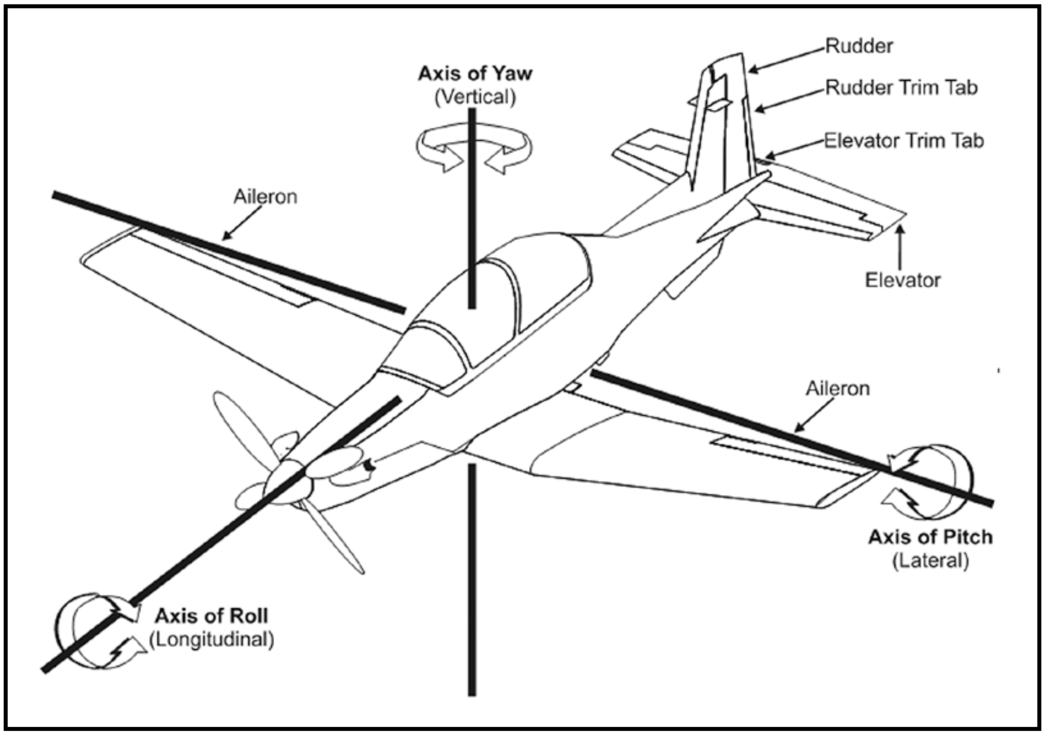

Figure 2-1 Lateral, Longitudinal, and Vertical Axes

Elevators

The elevators control the aircraft's movement about its lateral axis. They form the rear part of the horizontal stabilizer, and are connected to a control stick in the cockpit by means of cables and pulleys. Applying forward pressure on the stick causes the elevator surfaces to move downward. The flow of air striking the deflected elevator surfaces exerts an upward force, pushing the aircraft's tail upward and the nose downward. Conversely, exerting back pressure on the control causes the elevator surfaces to move up, exerting a downward force to push the tail downward and the nose upward.

Ailerons

The ailerons control the aircraft's movement about its longitudinal axis (Figure 2-2). There are two ailerons, one at the trailing edge of each wing near the wingtips. They are movable surfaces hinged to the wing's rear spar and are linked together by cables so that when one aileron is deflected down, the opposite aileron moves up. The ailerons are statically mass balanced with weights installed on the leading edges of each aileron.

When one applies pressure to the left on the control stick, the right aileron surface deflects downward and the left aileron deflects upward. The force exerted by the airflow on the deflected surfaces raises the right wing and lowers the left wing. This happens because the downward deflection of the right aileron changes the wing camber and increases the AOA and lift on that wing. Simultaneously, the left aileron moves upward and changes the effective camber, resulting in a decreased AOA and less lift. Thus, decreased lift on the left wing and increased lift on the right causes the aircraft to bank to the left.

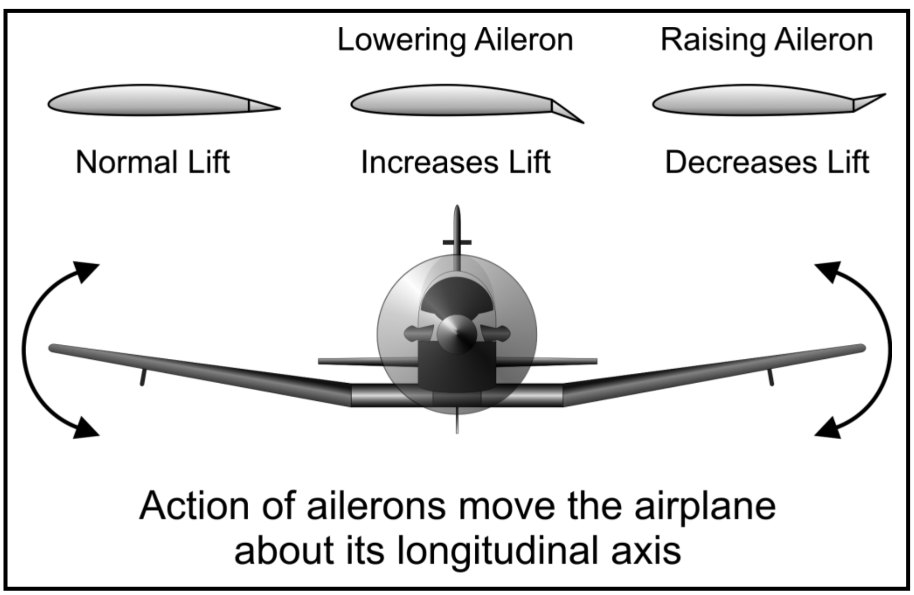

Figure 2-2 Aileron Control

Rudder

The rudder controls the aircraft's movement about its vertical axis. This motion is called yaw. Like the other primary control surfaces, the rudder is a movable surface hinged to a fixed surface. Left and right rudder pedals control rudder movement. Its action is much like that of the elevators, except the motion is side to side instead of up and down. When the rudder is deflected to one side, it protrudes into the airflow, causing a horizontal force to be exerted in the opposite direction (Figure 2-3). For example, left rudder deflection protrudes into the airflow on the left side of the tail, causing a horizontal force to be exerted on the tail to the right. Consequently, the tail of the aircraft moves right and the nose moves to the left.

When using the rudder pedals, pressure should be applied smoothly and evenly just like using the brakes of an automobile. When pressure is applied to one pedal, pressure on the other must be relaxed proportionally. For positioning, comfortably rest the balls of your feet against the lower portion of the rudder pedals while supporting the weight of your feet on the cockpit floor. The pedals should be adjusted so that full throw is available with a slight flex in the knee.

On the ground, the T-6A rudder pedals manipulate the nose wheel steering (if engaged), which is used to directionally control the aircraft while taxiing. Taxiing will be discussed in greater detail in Chapter Four, Ground Operations.

Adverse Yaw

Adverse yaw occurs when the upper wing in a turn is producing more lift, and therefore, more drag than the lower wing. This will cause the nose of the aircraft to initially pull in the opposite direction of the desired turn. An undesirable effect, adverse yaw is most apparent at low speeds and extreme control-surface deflections. At faster airspeeds, adverse yaw becomes less apparent and may be unnoticeable. When accomplishing slow flight, watch closely for the effects of adverse yaw in the turn. Coordinated use of the rudder with the ailerons in a turn will counteract the effects of adverse yaw.

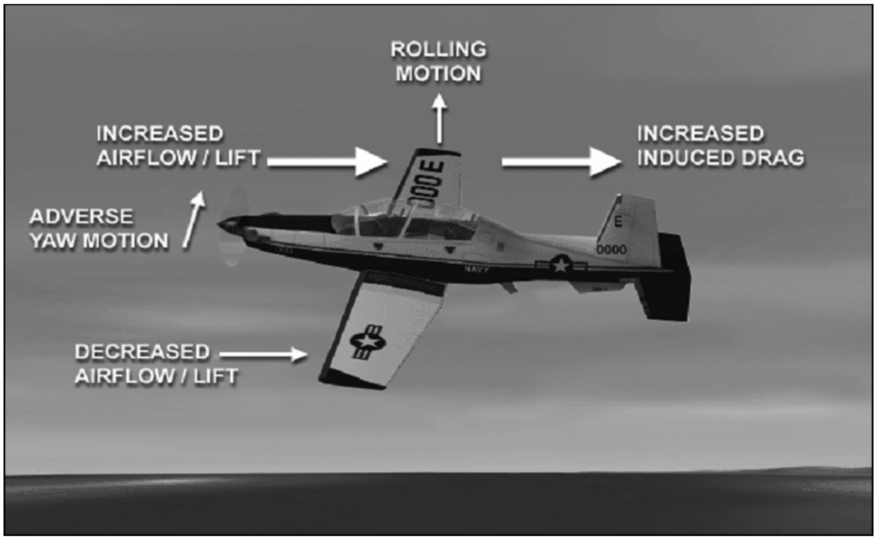

Figure 2-3 Adverse Yaw

Primary Flight Control Coordination

Coordinated use of all controls is important in any turn. Aileron deflection places the aircraft in the desired angle of bank (AOB), but simultaneous rudder application is required to counteract the resultant adverse yaw. Also, the AOA must be increased to compensate for loss of lift. This is done by adding back stick pressure. The steeper the turn, the more back elevator pressure is needed to maintain level flight.

The overlapping functions of the controls provide a safety factor in the control of the aircraft. It is possible to fly the aircraft without the use of one or more controls. For example, suppose the elevators failed to operate properly. It is possible to control the position of the nose by the use of power. As the power is increased, the nose will rise; as the power is decreased, the nose will drop.

It is also possible to bank the aircraft and turn it without the use of ailerons. Using only the rudder, the plane can be turned in any desired direction. This use of the rudder will cause the aircraft to yaw, or skid, in the direction the rudder is applied. During the yawing motion, the outside wing moves faster through the air than the inside wing. This increases the lift of the outside wing, causing it to rise, thus producing a bank in the direction the rudder is applied. A turn can also be accomplished by using only ailerons. In this instance, the aircraft will slip in the turn because of adverse yaw.

202. SECONDARY FLIGHT CONTROLS

The secondary flight controls include electrically actuated pitch/roll/yaw trim systems and a rudder trim aid device (TAD). The secondary flight controls are used for trimming and balancing the aircraft in flight in order to reduce the force required to actuate the primary flight control surfaces.

Trimming the aircraft is an essential skill for you to master and its importance is often overlooked by fledging aviators. When an aircraft's flight conditions (attitude, power, airspeed, loading and configuration) are changed, the required control pressures change. This in turn necessitates a trim adjustment in order to maintain proper attitude, bank, and airspeed control.

The general sequence for trimming the aircraft is: rudder, elevator, and then aileron. The rudder trim is usually first because a correction for yaw precipitates a change in the trim setting for pitch and roll. Consequently, not trimming the rudder first will generally cause you to go back and re-trim the elevator and aileron after trimming the rudder.

Rudder trim: An electromechanical actuator located in the vertical stabilizer drives an anti-servo trim tab on the trailing edge of the rudder to provide rudder trim. Reference the balance ball of the turn and slip indicator to help determine the proper direction of rudder and rudder trim pressure. For example, if the ball is out to the right, the nose is actually out to the left and you are in unbalanced flight. Smoothly apply right rudder pressure by "stepping on the ball" to regain balanced flight. Then smoothly apply right rudder trim until you relieve the rudder pressure you are holding. If you have trimmed properly, the ball should stay in the center and you should feel as if you are flying straight and level.

Elevator trim: Elevator trim is provided by an electromechanical actuator which drives a tab surface on the right side of the elevator. To trim the aircraft nose attitude, first move the stick to the attitude you desire in relation to your EADI and outside references. As the fore/aft stick force increases, maintain the desired nose attitude and apply elevator trim until the control pressure is relieved. Always use a light grip on the stick so as to "feel" the pressure. **"Finger-tip control" is the key to smooth flying.**

Aileron trim: The aileron trim is utilized much like the elevator trim but about the longitudinal, or roll, axis of the aircraft. Interestingly, unlike the other two trim systems that utilize trim tab surfaces on their trailing edges, aileron trim in the T-6A is accomplished by physical movement of the ailerons. Ground adjustable trim tabs are installed on the trailing edge of each aileron to allow maintenance personnel to adjust the "neutral" setting. Aileron trim is only necessary if, after the rudder is trimmed, the aircraft tends to roll to one side.

TAD: The Trim Aid Device (TAD) assists in trimming about the yaw axis of the aircraft. The inputs to the TAD include engine torque, altitude, airspeed, and pitch rate. Based on these inputs, the TAD sends a signal to the rudder trim actuator physically moving the trim tab surface to a computed position. Although the TAD is effective at approximating a valid rudder trim position, it by no means replaces the need to appropriately trim the rudder, especially during rapid accelerations and large power changes.

203. ENGINE AND PROPELLER FORCES

Propeller driven aircraft present flight characteristics that must be understood in order to effectively control the aircraft in all phases of flight. The following lists four propeller/engine performance factors that must be considered during T-6A operations.

Torque

Torque is a reactive force based on Newton's Third Law of Motion. As a force must be applied by the aircraft's engine to make the propeller rotate clockwise, Newton's Third Law tells us that a force of equal magnitude, but opposite direction, is also being produced. In the T-6, the aircraft tends to roll to the left as a result of torque when power is increased, and the aircraft tends to roll right when power is reduced.

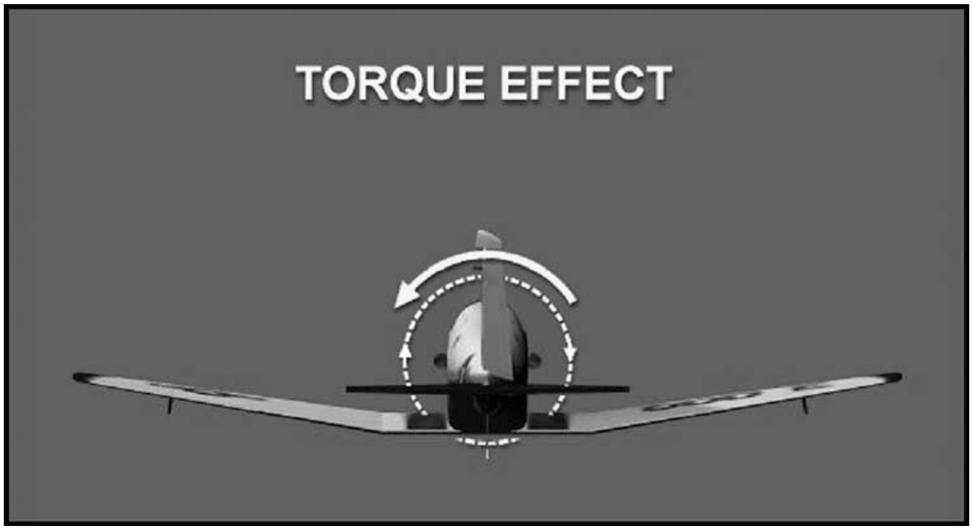

Figure 2-4 Torque Effect

P-Factor

P-factor is the yawing moment caused by one propeller blade creating more thrust than its opposing blade. For P-factor to be noticeable, the engine must be at high power setting, and the thrust axis must be displaced from the relative wind. If the free airstream relative wind is above the thrust line (in a power-on descent), the up-going blade on the left side creates more thrust since it has a higher angle of attack. This will cause the nose to yaw to the right. (Figure 2-5a) Corrective action is to apply left rudder.

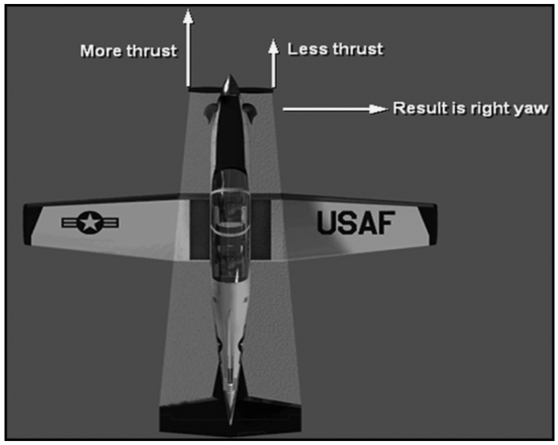

Figure 2-5a P-Factor

If the relative wind is below the thrust line, such as low-speed, high angle of attack flight, the down going blade on the right side will produce more thrust, yawing the nose to the left. The corrective action is to apply right rudder (Figure 2-5b).

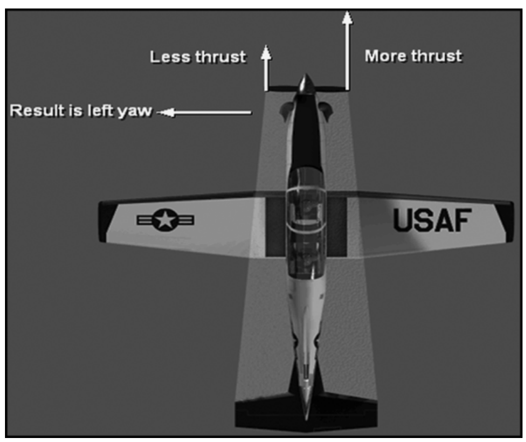

Figure 2-5b P-Factor

Slipstream Swirl

Slipstream swirl is a corkscrewing airflow that travels around the fuselage. This airflow strikes the vertical stabilizer, increasing its AOA. The increase in AOA of the vertical stabilizer pulls the tail to the right and yaws the nose to the left. This situation is more prevalent at high power settings and low airspeeds. To compensate, right rudder is required.

Figure 2-6 Slipstream Swirl

Gyroscopic Precession

Gyroscopic precession is one more force that affects a propeller driven airplane. When you apply a force to the edge of a spinning object `parallel to the rotational axis, a resultant force is created in the direction of the applied force, but 90° ahead in the direction of rotation. Pitching the nose of the T-6A up produces an applied force acting forward on the bottom of the propeller, and backwards on the top. The resultant force is 90° ahead in the direction of rotation, causing the nose to yaw right. Again, the T-6A helps compensate for gyroscopic precession effects with the TAD.

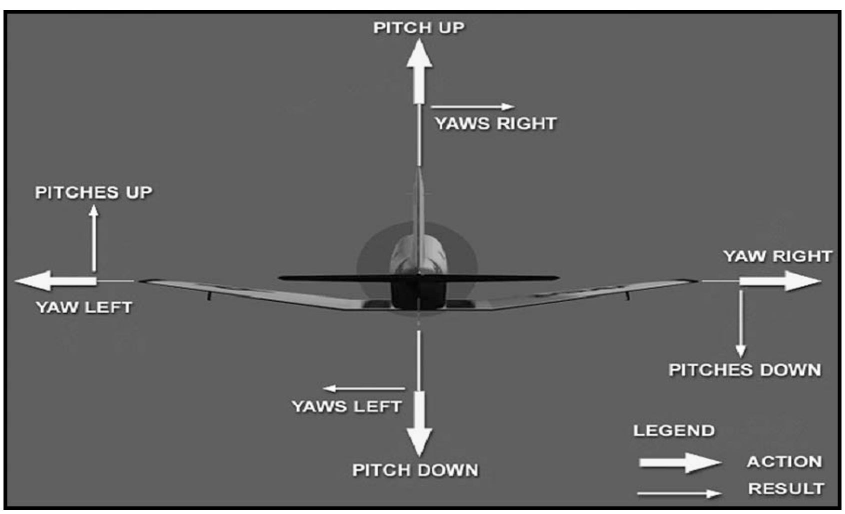

Figure 2-7 Gyroscopic Precession

204. TRIM REQUIREMENTS - RUDDER/ELEVATOR

Acceleration	LEFT/DOWN
Deceleration	RIGHT/UP
Power Addition	RIGHT/DOWN
Power Reduction	LEFT/UP

When one considers the aerodynamic effects of the engine, propeller, and primary and secondary flight controls, one can be better prepared to control the aircraft. The box above summarizes trim requirements for different situations. When airspeed is increased (with constant power), the nose will have a tendency to rise and the aircraft will yaw slightly to the right; consequently, we need to add left rudder and nose down trim. If power is unchanged and airspeed is reduced, we see from the box above that right rudder trim and up elevator trim is needed. If airspeed is constant and power is increased, then right rudder trim and down elevator trim is needed. If power is reduced with airspeed constant, then left rudder trim and up elevator trim are necessary.

Many flight maneuvers combine two of the “rules” simultaneously. For example, when initiating a 180 knot climb from normal cruise, you add power, raise the nose, and decelerate. In this case, right rudder trim is required for both the power addition and deceleration. However, the requirement conflicts on what to do with the elevator (power addition = nose down/deceleration = nose up). In this example, trim “nose up” because, generally speaking, airspeed will have a greater and more lasting effect on the elevator and rudder trim. Therefore, as a common trim rule, *“Airspeed trumps Power.”*

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CHAPTER THREE
FUNDAMENTAL CONCEPTS

300. INTRODUCTION

This chapter explains the fundamentals of flying maneuvers. As in any learning process, fundamentals must be mastered before the more advanced phases can be learned. The concepts in this chapter apply to every kind of sortie flown in the T-6, and many are universally applicable to flight in every type of military aircraft. Full understanding of these general concepts is developed through study and flying experience.

301. CONTROL AND PERFORMANCE CONCEPT

Aircraft performance is achieved by controlling the aircraft attitude with the control stick and power with the Power Control Lever (PCL).

POWER + ATTITUDE = PERFORMANCE

Control instruments. Attitude and power are indicated on two instruments: the electronic attitude director indicator (EADI), and the torque indicator, located on the primary engine data display (PEDD). During the contact stage, you will integrate visual references to complement EADI references.

Performance instruments. Changes in power and attitude cause a change in performance. In the T-6, performance is measured through instruments that include the altimeter, airspeed indicator, vertical speed indicator, electronic horizontal situation indicator (EHSI), turn and slip indicator, and angle of attack indicator.

Most early basic air work problems result from the inability to properly see and control the aircraft's attitude, and set the appropriate power setting. As the T-6A is inherently stable along the vertical and longitudinal axis, lateral control is the key to aircraft control. Figure 3-1 lists typical pitch and power setting for different phases of flight.

FAST CRUISE	240 KIAS / Clean Power as required (~80%)/ - 1° Nose Down
NORMAL CRUISE	200 KIAS / Clean Power as required (~54%) / 0° Nose Up
SLOW CRUISE	150 KIAS / Clean Power as required (~33%) / 3.5° Nose Up
NORMAL CLIMB	180 KIAS / Clean Max Power, 100% 8° Nose High
EN ROUTE DESCENT	200 KIAS / Clean Power 20%, Pitch 5° Nose Low

DOWNWIND CONFIGURATION, or NO-FLAP APPROACH CONFIGURATION	120 KIAS / Gear Down, Flaps Up Power as required (~31%) / 4° Nose High
TAKEOFF FLAP APPROACH CONFIGURATION	115 KIAS / Gear Down, Flaps TO Power as required (~34%) / 3° Nose High
LANDING FLAP APPROACH CONFIGURATION	110 KIAS / Gear Down, Flaps LDG Power as required (~50%) / 1° Nose High

Figure 3-1 Pitch and Power Settings

NOTE

Power settings are approximate and will vary with aircraft weight, altitude, etc.

302. COMPOSITE CROSS CHECK

Composite, or integrated cross-check is a two-step process of maintaining an attitude by aligning part of the aircraft with a landmark or feature in the environment and verifying that attitude by cross-checking performance instruments. The cockpit environment offers many references you can use to help you maintain proper attitude. Figure 3-2 provides visual cues you can use. Aligning the point labeled on the cockpit with the horizon puts the aircraft in the desired pitch.

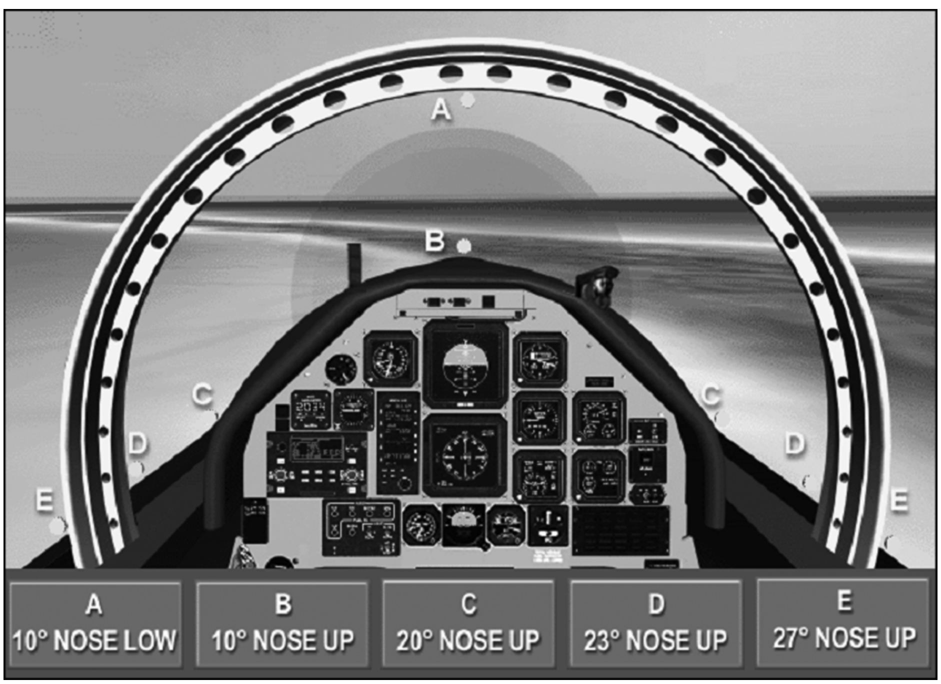

Figure 3-2 Cockpit References for pitch control

303. STRAIGHT AND LEVEL FLIGHT

Using the horizon as the primary reference, you will learn to accomplish one of the most basic of flight maneuvers, straight and level flight. Basic aircraft control is maintained by setting your attitude reference for what you think is level flight, and then cross-checking your performance instruments to ensure you are straight and level. Trimming off control pressures will dramatically aid your straight and level flight performance.

Pitch control for level flight requires selecting some point on the aircraft's windscreen as a reference point and keeping the point in a fixed position relative to the horizon. Periodically, check the attitude indicator, and crosscheck the VSI and altimeter to confirm you are not climbing or descending. In the T-6A the horizon should intercept the canopy approximately one-half of the way up the windscreen for normal cruise (Figure 3-3).

Figure 3-3 Visual and EADI Representations of Straight and Level Flight

Yaw and lateral control are accomplished by flying a constant heading with ailerons and coordinated rudder. To fly a constant heading, select one or more outside visual reference points far ahead of the aircraft such as fields, towns, lakes, distant clouds, etc. Keep the aircraft headed towards the reference point while realizing that a wind corrected heading (crab) may be needed. Roads and section lines on the ground also offer excellent references for flying a constant heading. Periodically crosscheck the EHSI to confirm the aircraft heading.

304. CORRECTING STRAIGHT AND LEVEL FLIGHT DEVIATIONS

There are several methods for correcting deviations from desired altitude and/or airspeed while attempting to maintain straight and level flight. Good coordinated use of the flight controls/trim and a diligent scan will help you correct deviations in the least amount of time.

Off airspeed/on altitude: If you note the altitude is correct, but the airspeed is slow or fast, a power adjustment is necessary since power controls airspeed in level flight. Remember, the power settings in this manual are approximate. With a power adjustment, a slight change in pitch may be required to maintain the level-flight attitude. As always, re-trim.

Off airspeed/off altitude: If you are fast and low or high and slow, it is probably bad pitch control. Stop the loss or gain by resetting level flight attitude and then correct the deviation by trading the excess altitude or airspeed to return to the desired altitude and airspeed. Re-trim.

On airspeed/off altitude: If you note you are 100 feet high, yet the airspeed is correct, correct to altitude by reducing power slightly and allowing the nose attitude to lower just slightly so the aircraft will descend back to the desired altitude. Once returned to altitude, reset normal cruise power setting and re-trim.

305. BASIC TRANSITIONS

Basic transitions are used to initiate and/or level off from a climb or descent. The four basic transitions are: climb-to-cruise, cruise-to-climb, cruise-to-descent, and descent-to-cruise. Use the Power-Attitude-Trim (PAT) principle to make all transitions: Because trim is so vital to this section, now would be a good time to review the Trim Requirements discussion in Chapter 2.

Climb-to-Cruise Transition:

1. 200 feet prior to level-off altitude, begin lowering nose toward the level flight attitude.

2. Trim for acceleration.

3. Five knots prior to desired cruise airspeed:

   Power – smoothly reduce to normal cruise, 54% (fast cruise, 80%).

   Attitude – set level flight picture

   Trim as necessary to remove all pressures from the flight controls and check the balance ball centered (coordinated flight).

Cruise-to-Climb Transition:

1. **P**ower - smoothly advance power to max.

2. **A**ttitude - raise the nose to 12-15º nose high (nose attitude slightly above the 180-knot climbing attitude shown in Figure 5-4).

3. **T**rim as required and commence clearing turns as appropriate.

NOTE

When not under positive radar control, use clearing turns for all climbs and descents greater than 1000 feet. A recommended procedure for clearing turns is to use 15º angle of bank between reversal headings 30º either side of the base heading.

4. As airspeed decreases to 180 KIAS, lower nose slightly to the normal climbing attitude, 8º nose high (Figure 3-4).

5. Re-trim and check balance ball centered.

Figure 3-4 8° Nose High

Cruise-to-Descent Transition:

1. **P**ower – smoothly reduce to 20%.

2. **A**ttitude – lower nose to the en route descent nose attitude ~5º Nose Low. (Figure 3-4)

3. **T**rim for power reduction and commence clearing turns as appropriate.

4. Re-trim as necessary to remove all pressures from the flight controls and check the balance ball centered.

Figure 3-5 5° Nose Low

Descent-to-Cruise Transition:

1. Passing 100 feet prior to level-off altitude, simultaneously:

Power – advance to normal cruise ~54% (fast cruise, 80%).

Attitude – raise the nose to level flight picture.

Trim for power addition.

2. Re-trim as necessary to remove all pressures from the flight controls and check the balance ball centered.

306. TURNS

The turn is the most complex of basic flight maneuvers. During the execution of a turn, coordinated use of all three flight controls is required. Figure 3-6 illustrates composite references for turns in the T-6.

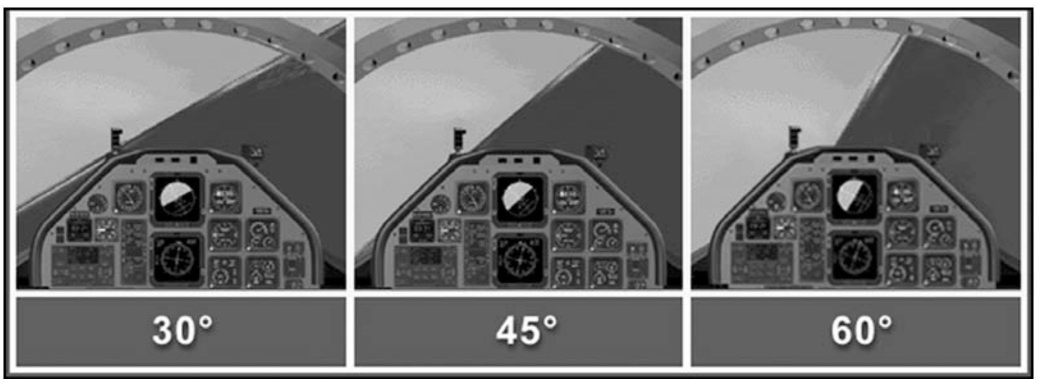

Figure 3-6 Composite references for turns

To begin a turn, simultaneously apply pressure to the ailerons and rudder. The ailerons will roll the aircraft, and the rudder maintains coordinated flight and negates the effect of adverse yaw. When you reach the desired bank angle, neutralize the aileron and rudder inputs.

As you are rolling in, increase back pressure on the stick to maintain level flight. This is required because the lift produced must now equal the weight of the aircraft and the centrifugal force caused by the turn. The amount of back pressure depends on the bank angle. In shallow bank (30° or less), little back pressure is required. At higher bank angles, more will be necessary.

The One Third Rule

In order to come out of a turn on a specific heading, you must lead the roll-out. The amount required to lead the heading will depend on the rate of turn and the rate you level the wings. A good rule of thumb is to start the roll-out one-third the number of degrees of bank. For example, if in a 30º AOB, the roll-out would be started 10º prior to the desired heading on the EHSI.

Remember to use rudder in the direction of the roll-out (opposite the turn) as you roll wings level to counter adverse yaw. You will apply the one third rule during some contact maneuvers.

307. SLIP

A slip is uncoordinated flight occurring when the aircraft slides sideways toward the center of the turn. It is caused by an insufficient amount of rudder in relation to the amount of aileron and the AOB used. If you roll into a turn without using coordinated rudder and aileron, or if you hold rudder against the turn after it has been established, the aircraft slides sideways toward its center of turn. A slip is generally not a dangerous maneuver. The slip is an acceptable method to safely dissipate excess energy under certain conditions. The flight paths for a coordinated turn and a slipping turn are depicted in Figure 3-7. Notice the position of the balance ball.

308. SKID

A skid is uncoordinated flight occurring when the aircraft slides sideways away from the center of a turn. If excessive pro-turn rudder pressure is maintained after the turn is established, a skid will result. In other words, if you try to force the aircraft to turn faster without increasing AOB, the aircraft skids sideways away from its radius of turn. A skid may also occur when you are flying in a level flight attitude if the nose of the aircraft is permitted to move sideways along the horizon with wings level. This condition occurs when excessive rudder pressure is applied or the aircraft is improperly trimmed.

A skidded turn can develop into a dangerous situation when in close proximity to the ground. In a skid, the wing on the inside of a turn is moving slower than the outside wing. Since the slower wing develops less lift during a skid, this compounds the reduction in lift occurring on the inside wing of a normal turn. If allowed to progress, the skid develops into a rapid and disorienting stall of one wing and will result in out-of-control flight. The flight paths for a coordinated turn and a skidded turn are depicted in Figure 3-7. Notice the position of the balance ball.

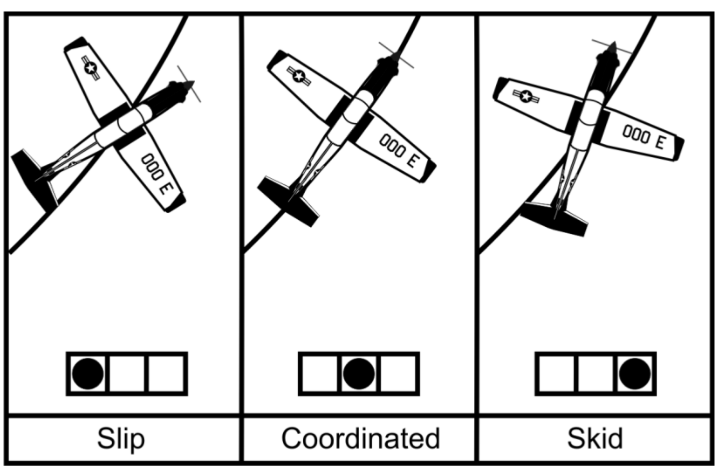

Figure 3-7 Coordinated vs. Uncoordinated Turns

309. SEE AND AVOID DOCTRINE

A sharp lookout for other aircraft must be maintained at all times to avoid the possibility of collision, especially in the training environment. This doctrine is your best defense against a midair collision. For visual flight, your scan should be directed outside the cockpit at least 80% of the time.

Each crewmember is responsible for collision avoidance regardless of rank, experience, or cockpit position. This applies whether operating under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR). The three primary tools for clearing in the T-6 are eyes, radios, and the Naval Aircraft Collision Warning System (NACWS) or Traffic Advisory System (TAS). Air traffic control (ATC) shares aircraft separation responsibility with the pilot and provides separation between IFR and participating VFR aircraft operating in controlled airspace.

A recent AOPA (Aircraft Owners and Pilot Association) Air Safety Foundation study of midair collisions revealed that 49 percent occurred in the traffic pattern or on approach to or departure from an airport. Of the other 51 percent, about half occurred during en route climb, cruise, or descent, and the rest resulted from formation flights or other hazardous activities. Eighty percent of the midair collisions that occurred during "normal" flight activities happened within ten miles of an airport, and 78 percent of the midair collisions that occurred around the traffic pattern happened at non-towered airports.

Our eyes are the best defense against mid-air collisions, but they have some limitations. Our eyes, and consequently vision, are vulnerable to many things including dust, fatigue, emotion, germs, fallen eyelashes, age, optical illusions, and residual alcoholic content. Hazy days with no distinct horizon present a problem for visual scanning. If there is little or nothing to focus on, we do not focus at all. We experience something known as empty-field myopia; we stare but see nothing, even opposing traffic.

We need motion or contrast to attract our eyes’ attention. An aircraft on a collision course will appear to be motionless. It will remain in a seemingly stationary position, without appearing to move or grow in size for a relatively long time and then suddenly bloom into a huge mass filling the canopy. This is known as the “blossom” effect.

310. SCAN PATTERN

What can we do to overcome the vulnerabilities of the eye? The most important thing is to develop a thorough, effective, and comfortable visual scan. In normal flight, the threat of a midair collision is greatly diminished by scanning an area 60 to 90 degrees to the left and right of center and 10° up and down. This, however, doesn’t mean the rest of the area should be ignored.

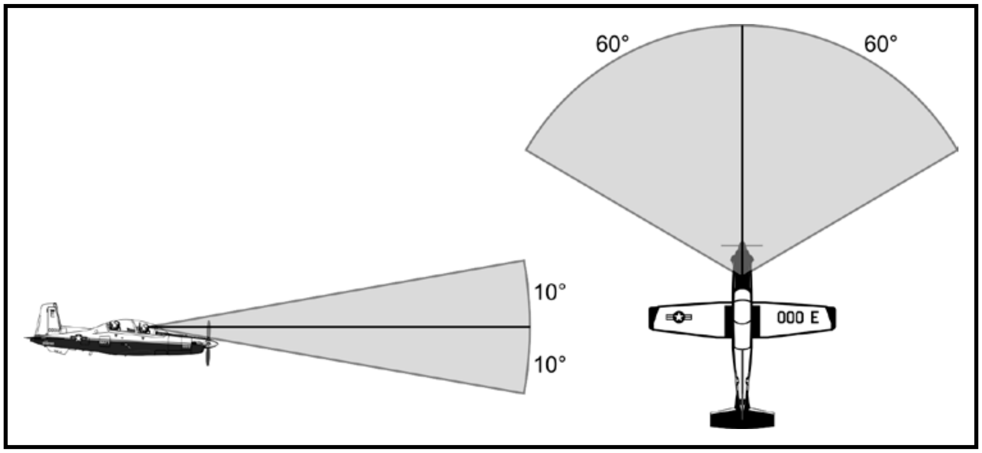

Figure 3-8 Visual Scan Area of Focus

Scanning is training your eyeballs to systematically move and process data inside and outside the cockpit. It is obvious you must look outside the aircraft to see where you are going, interpret where the aircraft is in reference to the horizon, and clear for other air traffic. Conversely, you must look inside at the instrument panel to check for proper power settings, flight instrument readings, and for any signs of aircraft malfunction. A scan pattern is a means, or procedure, by which you observe everything you need to see by starting at one point, moving visually about the aircraft, checking applicable items systematically, and completing the pattern at the starting point. A scan pattern may be started anywhere, but it must be complete and continuous. The proper division-of-attention techniques you learn in training will lay the foundation for the mandatory alertness of the NFO.

Initially, your scan pattern, or crosscheck, may feel uncomfortable and forced. However, continue to assertively move your eyes along the chosen scan pattern. As your proficiency increases, you will scan primarily from habit, adjusting your scanning rate and sequence to the demands of the situation. The entire scan pattern should take little time and no one item should fix your attention at the exclusion of another. Your training success will vary directly with your ability to develop and maintain a proficient, accurate, and expeditious scan pattern.

The amount of time spent scanning outside the cockpit in relationship to inside depends on cockpit workload and traffic density. You cannot afford to gaze at any one item for any length of time or the pattern will be broken. Scan each position, initiate corrections if needed, and then cross check.

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CHAPTER FOUR
GROUND PROCEDURES

400. INTRODUCTION

This chapter discusses the basic procedures and techniques essential for safe operation of aircraft on the ground prior to and after flight. This includes the major points of ensuring the aircraft is in airworthy condition, starting and stopping the engine, and taxiing the aircraft to and from the line area and runway.

Figure 4-1 T-6A Taxiing

In the line area, SAFETY IS PARAMOUNT. Aircraft are constantly taxiing in and out, and fuel trucks and people are often moving about. Constant vigilance must be exercised at all times while performing ground operations. The propeller is the most dangerous part of the aircraft for pedestrians, and under certain light conditions, it is difficult to see a revolving propeller. As a result, the files of aviation safety offices contain many cases reading: “Victim walked into a rotating propeller.”

401. NAVAL AVIATION LOGISTICS COMMAND MAINTENANCE INFORMATION SYSTEM

The Naval Aviation Logistics Command Maintenance Information System (NALCOMIS) is the standard Navy-wide aviation maintenance system. It is a fully integrated, computerized system that allows input, tracking, and monitoring in real time. Aircrews use an electronic Maintenance Action Form (MAF) to document aircraft discrepancies in NALCOMIS. Aircraft data is then integrated from NALCOMIS into the Aircraft Discrepancy Book (ADB). The ADB is primarily used for pre-flight operations by aircrew to check the aircraft's maintenance status.

All discrepancies are assigned either an UP or DOWN status. A discrepancy assigned an UP status does not impair the safety-of-flight or mission capability of the aircraft. An airplane may be flown with outstanding (not yet corrected) UP write-ups or gripes, with no danger to the crew. An example of an UP gripe would be "paint peeling off leading edge of starboard wing just forward of primary pitot tube." Notice the specific details used in this example. Detailed discrepancy reports foster a closer working relationship between aircrew and maintenance and save both time and money.

A discrepancy assigned a DOWN status immediately "downs" the aircraft until it is fixed. You must be able to interpret an outstanding MAF and determine whether the aircraft is safe for flight. Besides any uncorrected write-ups, discrepancies recorded over the past ten flights should be reviewed as a minimum.

402. CHECKLISTS

It is mandatory to use checklists to inspect, start, and ensure aircraft systems are operating properly. There are no excuses for lack of checklist discipline. Checklists ensure the standardization of all operating procedures pertaining to the aircraft and provide a logical, safe, and precise sequence to follow. Positively confirm completion of all checklists regardless of how they are accomplished (for example, memory aid, mnemonic, approved unit-developed checklist [UDC] or flight crew checklist). The checklists will be conducted in the challenge-action-response format. This means you report the challenge, accomplish the required action, and state the appropriate response.

403. CONTACT 1001

Contact 1001 is ground training you receive from a qualified instructor to help prepare you for your first flight in the T-6A. This is your first opportunity to present yourself well-prepared, motivated, and ready for training.

You are required to wear/bring to the brief all of your flight gear. This includes the following items:

- Flight suit
- Flight boots
- Flight gloves
- Helmet/O_2 mask
- Harness
- G-Suit
- Dog tags
- Ejection-seat compatible kneeboard
- NATOPS pocket checklist
- In-flight Guide

You may not have all of these items and some may be planned issues. Come to the brief with as many of the items as you have been previously issued. Your instructor will show you where the additional items can be obtained prior to your flights. If by the end of C1001, you still have questions about flight gear, ask your instructor. Do not show up to C4001 unequipped!

You should be ready to discuss all the items listed under C1001 in the Multi-Service Navigator Training System (MNTS) curriculum guide with the instructor. A major objective of the event is the preflight inspection. Study well the T-6A ground inspections and Navy-approved hand signals in the NATOPS Flight Manual.

404. FLIGHT BRIEFING

Prior to each flight you will be scheduled for a brief with your instructor, which usually lasts from 60 to 90 minutes, depending on the requirements. During the brief, the instructor will explain the conduct of the flight. The instructor will expect you to know the procedures for all the maneuvers to be flown per the MNTS guide. You must also be prepared with a thorough knowledge of all the discussion items. Additionally, the instructor may ask general questions from any subject area pertaining to T-6A systems, operating limitations, etc.

With respect to contact flight maneuvers, to “know” is to “memorize” each action of the procedure. Nothing less is acceptable. For emergency procedures, only boldfaced items are required to be committed to memory, although you must have a thorough understanding of the remaining non-boldfaced steps and the systems involved. **You cannot prepare for your contact flights solely with this manual.** You must reference the NATOPS Flight Manual, JPATS courseware, Voice Communications FTI, and other publications for Emergency Procedures (EPs), systems, radio procedures, and general information. You are highly encouraged to ask questions during the brief. Do not fly with unanswered questions.

405. EJECTION SEAT SAFETY

“Respect the Seat.” Think of this motto every time you get in and out of a T-6A or any other ejection seat airplane. Ejection seat and canopy fracturing system (CFS) safety is absolutely paramount during ground operations. If unintentionally or improperly fired, results could easily be fatal. Take extra care to ensure you and those around you never compromise ejection seat safety.

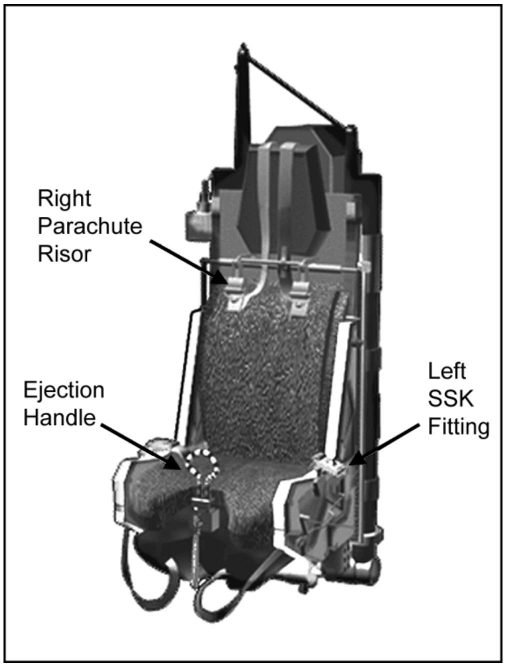

Figure 4-2 The Martin-Baker Ejection Seat

Upon initially opening the canopy, ensure all safety pins (ejection seat and CFS) are installed per the NATOPS checklist, and verbally confirm with your instructor. **Never enter or exit the airplane without the ejection seat safety pins installed.** With the pin(s) removed, always be conscious of the ejection handle. Do not rest your hands on the ejection handle and never allow any equipment, such as kneeboards, checklists, and approach plates to interfere with it. Remember, “Respect the Seat.”

406. STRAPPING IN TO THE SEAT

Upon completion of the preflight inspection, your instructor will show you how to enter the cockpit. The T-6A is not a particularly simple aircraft to strap into and it is easy to forget one or more buckles or straps. Be patient, but precise; there is no fast way to do it. Reference Figure 4-3.

Ensure the harness buckles are fastened and all G-suit zippers are secure before entering. A good technique is to start at your feet and work up. Fasten your leg garters, the seat survival kit (SSK) V-rings, your lap belt, and then plug in your G-suit. Attach the main oxygen hose and emergency O_2 hose to your CRU-60/P (before putting on the helmet) and then reach back, grab, and fasten the parachute risers to the harness frost fittings. You should now be ready to don the helmet and lower the visor. Attach the oxygen mask hose to the CRU-60 and plug into one of the two available ICS cords. Consult the NATOPS Flight Manual for notes, cautions, and warnings during strap in sequence.

Each time you fly, your seat position should be the same. The electronic seat adjustment switch is located on the left console behind the PCL. When sitting straight in the seat, line up the front edge of the instrument glare shield with the upper part of the instrument panel so the top of the EADI is just visible. Adjust rudder pedals so you can get full forward throw of either pedal with the corresponding brake fully depressed without locking your knee.

NOTE

Take extra care to ensure no straps or buckles are entangled with any of the side panel switches or components before actuating the electronic seat adjustment to prevent inadvertent (and potentially very costly) damage to the ejection seat and/or cockpit side consoles.

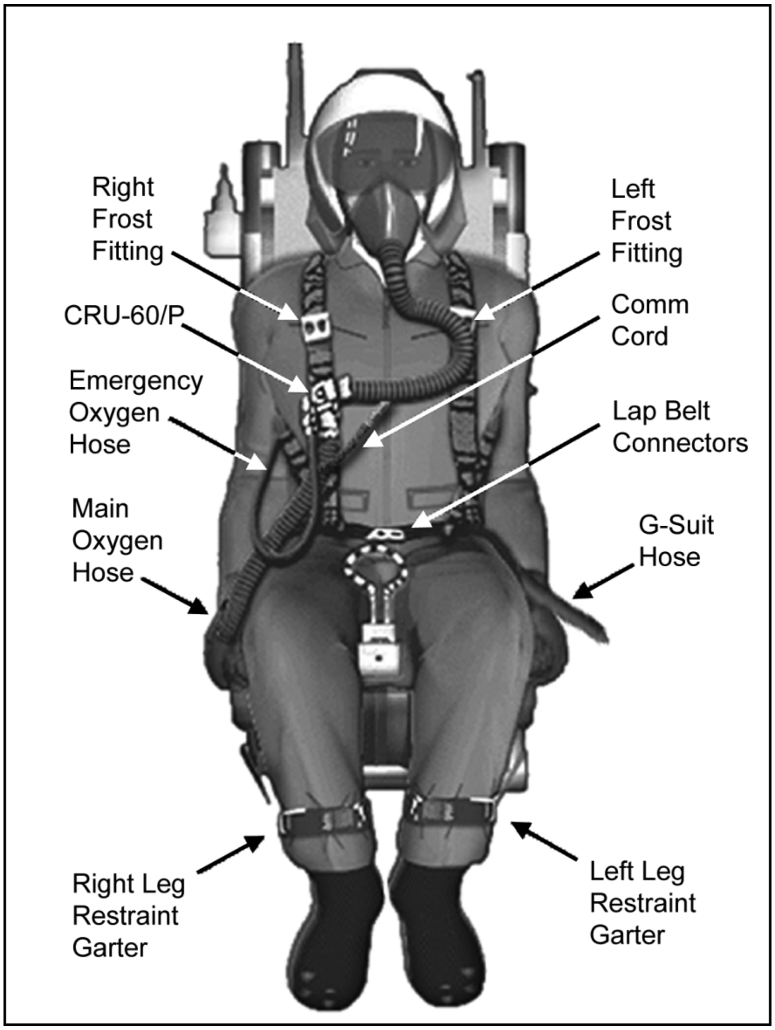

Figure 4-3 Strapping into the Seat

407. STARTING ENGINE

After completion of the INTERIOR INSPECTION COCKPIT Checklist, ensure the prop area is clear, a fire extinguisher is available, and the plane captain is ready for start. With the canopy closed and latched, check the green mechanical canopy lock indicator is visible (Figure 4-4) and the red CANOPY annunciator is extinguished. Initiate the ENGINE START Checklist, while being conscious of any hazard indications from the plane captain.

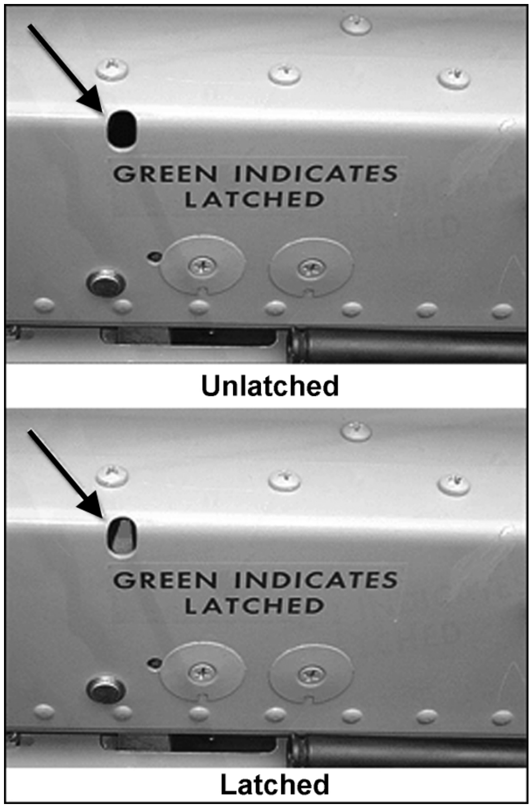

Figure 4-4 Canopy Lock Indicator

Monitor the engine start sequence. If the power management unit (PMU) detects a malfunction, such as a hot or hung start, it will automatically terminate the start sequence. However, you should always be prepared to manually abort a start if the PMU fails to do its job and an abort is warranted.

At the completion of the BEFORE TAXI CHECKLIST, you will perform a brake check prior to releasing the lineman. The instructor will call for the student to release the parking brake and normally check his brakes first. Then, the student will check his brakes. After the student brake check is complete, the student shall set the parking brake and report “parking brake set” over the ICS. Failure to properly set the aircraft parking brake may result in inadvertent aircraft movement.

408. TAXIING

Once the aircraft is running and all applicable checks are complete, it is time to taxi the aircraft from its starting point on the airfield to an active runway for takeoff. You should build the habit of always taxiing with the airfield diagram at your disposal (on your kneeboard, etc). Have a taxi plan and know exactly where you are going before leaving the chocks. This becomes even more important later in the program as you begin to conduct training off-station. Build good habits now. Once clear of the ramp area, complete the TAXI checklist.

Taxiways have a narrow yellow line painted down the middle. Taxi with the nose wheel on this line. This should ensure a safe taxi clearance from fixed objects, such as parked airplanes and buildings; however, the aircrew is solely responsible for obstruction clearance. At any time, if there is doubt about obstruction clearance, STOP! Most taxi accidents are easily prevented if someone makes the right decision to stop and re-evaluate the situation.

Taxiing in the T-6A uses power generated by the propeller. Once the aircraft is rolling, idle PCL setting provides sufficient thrust for taxi. Control speed with periodic brake applications. Directional control during taxi is accomplished by using the aircraft nose wheel steering (NWS) system, or by use of the rudder and/or differential braking. Keep your left hand on the PCL; keep your right hand on the control stick, facilitating ready access to the NWS button. Attempt to keep the ailerons deflected into the wind during taxi.

The NATOPS Flight Manual has warnings and cautions on the NWS and brake system that you must understand and be familiar with:

CAUTIONS

1. Minimum radius turns are possible through use of power, full rudder and differential braking. To preclude unnecessary wear to nosewheel steering and tire, disengage nose wheel steering prior to executing sharp turns with differential braking. To re-engage NWS, actuate the NWS switch prior to applying opposite rudder. Failure to do so may result in NWS not engaging.

2. If brake pressure appears to fade during application, or brakes are not responding as expected, fully release brakes then re-apply. Both crew members must fully release brakes for this to be effective.

WARNING

NWS is to be used at ramp speeds only. Engaging NWS at high taxi speeds can result in directional control problems due to increased sensitivity.

Figure 4-5 Nose Wheel Steering Button

409. PRIOR TO TAKEOFF

Before contacting tower for takeoff, ensure the following checklists are accomplished:

OVERSPEED GOVERNOR CHECK: The overspeed governor check will be conducted at designated run-up areas in compliance with local procedures. In the absence of a designated area, find a non-congested area and attempt to position the aircraft into the wind. Ensure the nose wheel is straight before adding power.

BEFORE TAKEOFF CHECKLIST: Initiate this checklist after the OVERSPEED GOVERNOR CHECKLIST while in the run-up area. Before you contact the tower, conduct a departure briefing for the appropriate takeoff runway.

LINEUP CHECKLIST: Initiate this once cleared onto or across an active runway. Use NWS to position the aircraft on the runway and center the nosewheel. Ensure it is turned off IAW the checklist.

410. TAXIING BACK TO THE RAMP

Begin the AFTER LANDING CHECKLIST: when clear of the active runway and at a normal taxi speed.

Taxi inbound to the ramp with the same vigilance you used in taxiing outbound. Many runways you operate on will have barriers or arresting cables installed at the approach and/or departure end. The T-6A has limited capability for taxiing over certain raised cables. A listing of the cables is found in Section V of the Flight Manual. If taxiing over cables is unavoidable, keep your speed as slow as possible and steer to avoid nose and main landing gear contact with the cable support donuts. You must plan to takeoff and land beyond any arresting cables.

ENGINE SHUTDOWN CHECKLIST: once the aircraft has reached the parking spot, complete the engine shutdown checklist. When shutting down the engine, verify the PCL is fully in the OFF position to preclude engine damage. Remember, after the battery switch is placed off, you will lose the ICS. A good technique is to open the canopy after the PCL is brought to OFF. Always challenge your instructor by saying “rail clear” over the ICS prior to opening the canopy.

NOTE

Always be cognizant of ground crew approaching the aircraft. Ensure PCL, speed brake, and flight controls are not moved until ground crew is clear of aircraft.

BEFORE LEAVING AIRCRAFT CHECKLIST: as with all checklists, reference the checklist to ensure completion. Check the exterior for signs of damage, such as from a bird strike, tail strike, etc. Confirm you have all of your flight items—no potential foreign object damage (FOD) left in airplane. Be safety conscious leaving the flight line.

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CHAPTER FIVE
FLIGHT PROCEDURES

500. INTRODUCTION

This chapter discusses the basic procedures and techniques that you will practice in the contact stage of training. In order to successfully accomplish these maneuvers, it is essential that you commit these procedures to memory prior to strapping into the aircraft. If you do not know the procedures on the ground, you will not be able to perform them in the air.

501. TAKEOFF

The takeoff requires a smooth transition from the ground roll to controlled flight. Although a relatively simple maneuver, the takeoff presents numerous potential hazards. High-speed aborts and low-altitude engine failures make the takeoff regime of flight unique in its safety challenges.

Takeoffs should always be made as nearly into the wind as practical. The airplane depends on airspeed in order to fly. A headwind provides some of that airspeed, even with the airplane motionless, by reason of wind flowing over the wings. The aircraft's groundspeed will be less with a headwind and greater with a tailwind. This results in a shorter ground roll. Therefore, less distance is required to develop the minimum lift necessary for takeoff and climb.

Although the takeoff and climb process is one continuous maneuver, it is divided into three separate steps for purposes of explanation: takeoff roll, rotation, and initial climb (Figure 5-1).

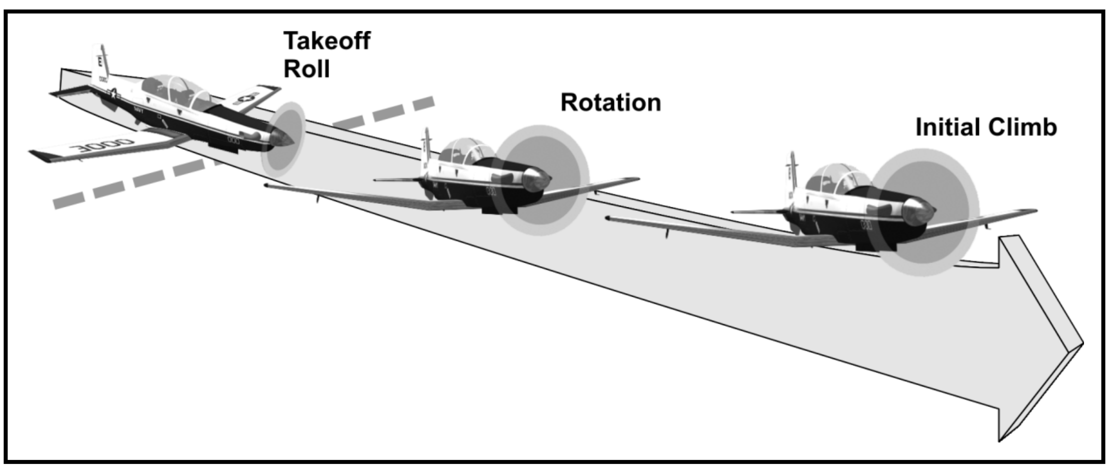

Figure 5-1 The Takeoff Roll, Rotation, and Initial Climb

The takeoff roll is the portion of the takeoff procedure during which the aircraft is accelerated from standstill to an airspeed providing sufficient lift for it to become airborne.

The rotation is the act of raising the nose of the aircraft to a set pitch attitude and allowing the aircraft to become airborne in controlled flight.

The initial climb is the period from just after rotation to when the aircraft has reached a safe maneuvering altitude.

The takeoff roll presents large changes in airspeed and power. As you should recall from Chapter Two, an abrupt application of power will cause the aircraft to yaw sharply left because of the torque effects of the propeller. Counter the yaw with right rudder as the aircraft begins rolling down the runway. Remember, the TAD will not begin making rudder trim adjustments until 80 KIAS and weight off wheels. As speed increases, more and more pressure will be felt on the flight controls, particularly the elevator and rudder. Since the tail surfaces receive the full effect of the propeller slipstream, they become effective first.

For takeoff in crosswind conditions, the aircraft will tend to weather-vane into the wind and the upwind wing will begin to rise even in light-to-moderate crosswinds. This tendency can be controlled with rudder and aileron. Use up to full aileron deflection into the wind at the beginning of the takeoff roll, and relax aileron input as speed increases to the amount required to keep wings level at liftoff. Use rudder as necessary to maintain centerline. Realize that a left crosswind will add to the aircraft's left yawing tendency from engine torque. After rotation, level the wings, allow the aircraft to crab into the wind, and check balanced ball centered.

502. TAKEOFF PROCEDURES

1. Call the tower for takeoff clearance.

2. After being cleared on or across an active runway, initiate the Lineup Checklist. Note the winds by checking the windsock.

3. When cleared for takeoff, ensure NWS is off IAW the lineup checklist. For a static takeoff, increase torque to ≈ 30% and check engine instruments. As you progress in training, your instructor may perform rolling takeoffs IAW the NATOPS Flight Manual Chapter Two.

4. Select a reference point. Position the control stick to neutral, or as needed for crosswind control. Release brakes by dropping your heels to the deck. Keep the nose of the aircraft pointed toward your reference throughout the ground roll.

5. Smoothly advance the PCL to maximum allowable power (approximately three seconds). Anticipate the need for right rudder as the engine spools up. Maintain directional control.

6. At 85 KIAS, smoothly apply back stick pressure and position the nose to takeoff attitude (8° Nose High). Allow the aircraft to fly itself off the deck. Do not force the aircraft into the air with excessive back stick pressure as this will only result in an excessively high pitch attitude, and may lead to a stall. Continue using right rudder as necessary to maintain runway centerline.

NOTE

If gusty winds are present, increase rotation speed by 1/2 the gust factor (up to 10 KIAS). For example, if winds are reported at 10 gust 22 (i.e. 12-knot gust factor), rotate at 91 KIAS (85 + 1/2 (12) = 91). This is independent of wind direction.

7. Once two positive rates of climb are verified, raise the gear and flaps IAW the AFTER TAKEOFF Checklist. Report, "Gear up, flaps up at XXX knots, after takeoff checklist complete." Accelerate to 180 KIAS (normal rate of climb) or 140 KIAS (best rate of climb) during the climb. Since power during the initial climb is fixed at maximum, airspeed must be controlled with slight pitch adjustments.

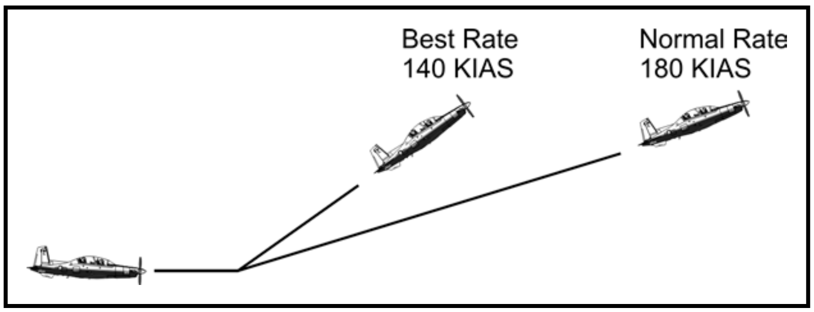

Figure 5-2 Climb Rate

NOTE

Retraction of flaps from the TO to the UP position is not recommended below 110 KIAS.

503. DEPARTURE

After completion of the After Takeoff checklist, execute your assigned departure procedure and contact departure control. Tower will either switch you to departure control prior to your takeoff roll, or after safely airborne. Be vigilant for arriving and departing traffic.

504. AREA ORIENTATION

Become familiar with the airspace where you will be operating, specifically the Pensacola South Military Operating Area (Gator MOA), and Area 1 of Alert Area 292. Understand the geographic boundaries and the operating altitudes. For all of your contact flights, you are expected to remain within the horizontal and vertical boundaries of your assigned area, even if that means modifying maneuver procedures to do so. For example, if during the long and straight level speed change maneuver, you find yourself at an area border, executing a 180° turn to keep from crossing the area boundary is not only acceptable, but expected.

505. TURN PATTERN

The turn pattern is a series of constant AOB with steady altitude and airspeed control. At the instructor's discretion, the turn pattern may be started in slow or normal cruise, but is always commenced from a cardinal heading. It consists of two 15º AOB turns in opposite directions for 30º of heading change, two 30º AOB turns in opposite directions for 90º of heading change, and two 45º AOB turns in opposite directions for 180º of heading change. A smooth, continuous reversal is made from one turn into another, eliminating a straight and level leg. (Figure 5-3)

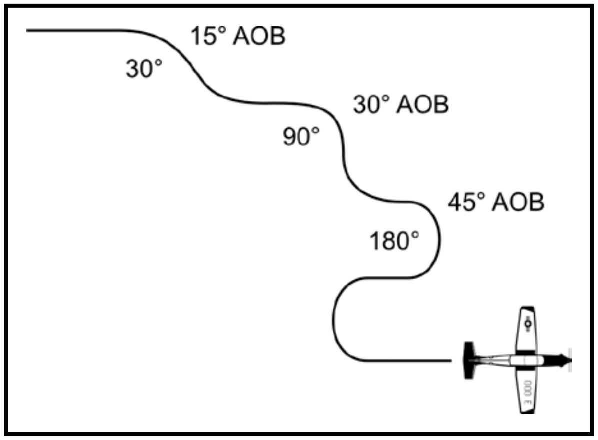

Figure 5-3 Turn Pattern

Throughout the maneuver, trim the aircraft as necessary and clear for traffic. You will use a composite crosscheck for attitude control. Periodically scan the EHSI for turn progress and the torquemeter for power required. To avoid overshooting your roll out heading, lead your roll out by using the "one-third" rule.

The 15º AOB turn will require little back stick pressure or additional power since there is little loss of lift due to bank. 30º and 45º AOB turns will require an increase in pitch of the nose and a slight power increase to compensate for the loss of lift. In order to fly a steady 45° AOB turn, you must pull about 1.4 Gs. Thus, if you are not feeling any Gs in the turn, you will soon begin descending as the nose drops.

506. TURN PATTERN PROCEDURES

NOTE

For all turns, clearing the area in the direction of turn before beginning the turn is required procedurally. A common technique is to verbalize "clear left/right" over the ICS as you commence the turn.

1. Establish the aircraft in level flight on a cardinal heading in the normal cruise (200 KIAS) or slow cruise (150 KIAS) configuration.

2. Initiate a 15º AOB turn for 30º of heading change, and then reverse turn back to the base heading using 15º AOB in the opposite direction.

3. Initiate a 30º AOB turn for 90º of heading change, and then reverse turn back to the base heading using 30º AOB in the opposite direction. Adjust nose attitude to maintain level flight, and increase power as required to maintain airspeed.

4. Initiate a 45º AOB turn for 180º of heading change, and then reverse turn back to the base heading using 45º AOB in the opposite direction. Adjust nose attitude to maintain level flight, and increase power as required to maintain airspeed.

5. Roll out on the original heading. Maintain forward stick pressure to prevent the aircraft from "ballooning" and trim nose down, as required.

6. Reduce power to the normal/slow cruise power setting. Re-trim as necessary to remove all pressures from the flight controls and check the balance ball centered.

507. LEVEL SPEED CHANGE

Level speed changes are taught to familiarize you with the various trim adjustments required with changes in airspeed, power setting, and aircraft configuration.

The level speed change maneuver is commenced from any numbered heading (i.e. 030, 060, 090, etc.). The sequence is flown from normal cruise to the downwind configuration to the landing flap approach configuration and finally, back to normal cruise. Concentrate on proper trim use to relieve control pressures throughout the maneuver.

508. LEVEL SPEED CHANGE PROCEDURES

1. Establish the aircraft in the normal cruise configuration (200 KIAS) on any numbered heading.

2. Reduce power to idle. Trim for deceleration. When airspeed is below 150 KIAS, lower gear and initiate the Before Landing Checklist. A good technique is to always allow a 5-10 knot airspeed buffer before lowering the gear. This technique will ensure the gear is not oversped.

3. Adjust power to ~31% to maintain 120 KIAS. Airspeed will decrease rapidly with PCL at idle, so ensure this step is accomplished expeditiously.

4. Stabilize aircraft in the downwind configuration. Trim off control pressures. Your instructor may want you to practice a few shallow turns in this configuration prior to continuing. Remember, you will see the same nose attitude on the downwind leg when you begin practicing the landing pattern.

5. Lower landing flaps. As airspeed approaches 110 KIAS, advance power ~50% and stabilize in the landing flap approach configuration. Trim.

6. Complete the BEFORE LANDING CHECKLIST. Over the ICS state, "Gear down, flaps landing, speedbrake retracted, before landing checklist complete."

7. Continue maintaining aircraft control in this configuration. Use your composite crosscheck to maintain altitude.

8. At instructor discretion, recover by advancing power to maximum, and raising the flaps and gear. Trim for acceleration.

9. Accelerate to normal cruise. As airspeed approaches 200 KIAS, reduce power to ~54% and re-trim.

509. THE 3C CONCEPT

During all contact maneuvers, a helpful memory aid for setting up and executing procedures is known as "the 3Cs". Perform or direct these steps as appropriate.

C- Configuration - normal cruise, downwind, etc.

C- Checklist - Pre-stalling, spinning, and aerobatic checklist, and Before Landing Checklist (if applicable)

C- Clearing Turn - 45° AOB if clean, or 30° AOB if configured

510. STALL TRAINING

Stalls are taught to develop your ability to recognize an impending stall and to recover with a minimum loss of altitude. The recognition and recovery skills developed here may someday save your life. Read and review "Stall Characteristics" in the NATOPS flight Manual, Chapter 6.

Prior to commencing any intentional stalls, spins, or aerobatics, complete the Pre-Stalling, Spinning, and Aerobatic Checklist. Recovery from all practice stall maneuvers shall be completed by 6000 feet AGL IAW local operating procedures.

511. POWER-OFF STALL

The power off stall is taught to demonstrate approach-to-stall recovery when power is not available. A power off stall could occur, for example, during a dead-engine glide to high key when the pilot gets distracted and fails to maintain proper flying speed. Recovery can only be accomplished with nose pitch, since power is unavailable.

Before starting this maneuver, ensure you have plenty of airspace below you, as you will lose at least 1500 feet during the recovery, and will probably lose another 1000- 2000 while setting up your dead engine glide. Best glide speed in the clean configuration is approximately 125 KIAS with a sink rate of 1100 to 1300 feet per minute. Pay close attention to the nose attitude and flight characteristics of the airplane when flying the power-off best glide speed. After the recovery, you will return to this attitude and airspeed to complete the maneuver.

512. POWER-OFF STALL PROCEDURES

1. Establish the aircraft in the normal cruise configuration (200 KIAS).

2. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist.

3. Reduce power to 4 to 6 percent torque and begin decelerating towards best glide speed.

4. While decelerating, commence a level clearing turn of 180° using 45º AOB. Assertively trim nose up for the deceleration.

5. As airspeed approaches 125 KIAS, lower nose to the 125-knot glide attitude and stabilize the glide. Crosscheck VSI for a 1100-1300 foot per minute sink rate. Re-trim.

6. Smoothly raise the nose to level 8 to 10 degrees nose high. Smoothly increase back stick pressure to hold this nose attitude until the first indication of an impending stall (i.e., airframe stall buffet or stick shaker).

NOTE

Do not initiate the recovery at the landing gear position warning which, if not manually silenced, will sound with airspeed below 120 KIAS and N1 less than 87%.

7. Recover by relaxing back stick pressure, lowering the nose to “slightly below” the 125-KIAS glide attitude. Check wings level and hold this nose attitude, allowing airspeed to increase towards 125 KIAS.

8. Re-establish 125-KIAS glide. Re-trim as necessary to remove all pressures from the flight controls and check the balance ball centered.

513. APPROACH TURN STALL

The approach turn stall (ATS) is taught to develop your skill at recognizing and recovering from an impending stall in the final turn of a traffic pattern. Proximity to the ground necessitates immediate recognition and recovery. During the final turn, if you encounter approach-to-stall indications, such as the stick shaker or airframe stall buffet, you should immediately recover the aircraft and waveoff, as appropriate. Diligent aircraft control and airspeed management will prevent a potential stall from progressing into a catastrophe.

Pay close attention to rudder control during the recovery from the ATS. When maximum power is applied at a low airspeed, the torque produced by the T-6A will always necessitate right rudder application to maintain balanced flight, regardless of turn direction. Misapplication of the flight controls (most notably the rudder) during recovery can cause a rapid departure from controlled flight.

514. APPROACH TURN STALL PROCEDURES

1. Establish the aircraft in the downwind configuration (gear down, 120 KIAS, power ~31%).

2. Perform the Pre-Stalling, Spinning, and Aerobatic Checklist and start the Before Landing Checklist.

3. Begin a 30° AOB clearing turn for approximately 180° of heading change (or two 90° turns). Roll out and stabilize the aircraft at 120 KIAS on the simulated downwind leg.

4. Start the "4Ts" at the simulated abeam position:

Transition: Reduce power to 15%, lower flaps to the TO position.

Trim: for 115 KIAS.

Turn: start a descending, 30° AOB approach turn in the direction of the last clearing turn.

Talk: Report over the ICS, "Gear down, flaps takeoff, speedbrake retracted, Before Landing Checklist complete."

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

6. At the first indication of a stall, whether stick shaker or airframe buffet, recover utilizing the "MAX RELAX LEVEL BALL" method.

MAX: Power to maximum (PCL full forward, a.k.a. firewalled).

RELAX: Gently relax back stick pressure to decrease AOA. Do not dump the nose.

LEVEL: Level the wings while simultaneously establishing a positive climb

BALL: Apply right rudder as necessary to center the balance ball.

NOTE

While "max, relax, level, ball" is an excellent technique for remembering stall recovery procedures, it is important to understand that stall recoveries are not mechanical step-by-step procedures. Rather, the recovery inputs are nearly simultaneous.

7. Confirm a positive climb, as verified by both the altimeter and VSI. Once verified, state over the ICS, "Aircraft climbing." During the climb, you will be max performing the aircraft, and the stick shaker may activate. Remember the goal – climb away from the ground prior to

impact! Crosscheck AOA gauge for less than 18 units and adjust the nose to accelerate out of the stick shaker, as required.

8. After a safe climb is established, accelerate to and establish a 115-knot climb. Level off at the next 500 feet MSL interval. Reduce power to ~34% and maintain level flight at 115 KIAS.

9. Re-trim as necessary to remove all pressures from the flight controls and check balance ball centered.

515. SPIN

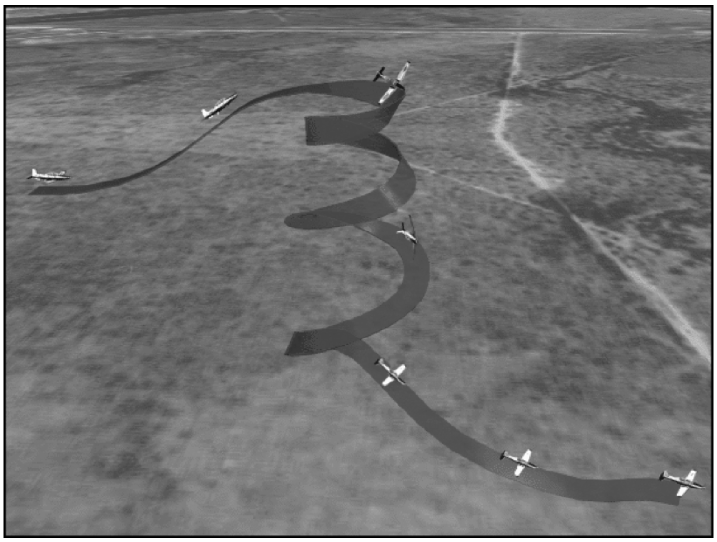

Figure 5-4 The Spin

NOTE

Read and review all sections on spins from Chapter 6 in the NATOPS Flight Manual. Be prepared to discuss these sections in the preflight briefing.

Spins are taught to increase your situational awareness and confidence in extreme unusual attitudes and out-of-control flight (OCF). Spins require two conditions: stall and yaw. During practice spins, the stall comes from a nose high, idle-power entry and the yaw comes from a fully deflected rudder. Straightforward and procedural, the spin entry is not a finesse maneuver. It requires full back stick (ailerons neutral), fully deflected rudder, and idle power.

The spin is used to introduce students to OCF. OCF has three phases: poststall gyrations, incipient spin, and steady state spin. Aircraft progress from one phase to the next as long as pro-spin controls are applied. Failure to promptly apply proper recovery procedures during the first two stages eventually results in a steady state spin. It's important to understand the recovery method required in each phase.

Poststall Gyrations

Post-stall gyrations are the first phase of OCF. A post-stall gyration can usually be identified by uncommanded (and often rapid) aircraft motions about any axis, a feeling that the controls are no longer effective nor acting in the normal sense, stalled or near –stalled angle of attack, transient or erratic airspeed indications, and random turn needle deflections. Neutralizing controls and reducing the power to IDLE (i.e., INADVERTENT DEPARTURE FROM CONTROLLED FLIGHT Procedure) is the proper recovery.

Incipient Spins

Incipient spins are the spin-like motion that occurs between a poststall gyration and a fully developed spin. An incipient spin can be identified by an oscillatory spin-like motion, a fully deflected turn needle, a stalled angle of attack, and airspeed that is accelerating or decelerating toward the steady-state value. The incipient spin phase lasts approximately 2 turns. Neutralizing controls and reducing the power to IDLE (i.e., INADVERTENT DEPARTURE FROM CONTROLLED FLIGHT Procedure) is the proper recovery.

Steady State Spins

This stage represents the final evolution in OCF. It is characterized by:

1. 18+ units AOA (stalled AOA),

2. Airspeed 120-135 KIAS, and

3. Turn needle fully deflected in the direction of spin.

NOTE

The balance ball gives no useful information about spin direction. Visual clues may also be misleading. The only reliable instrument indicating spin direction is the turn needle. (Figure 5-5)

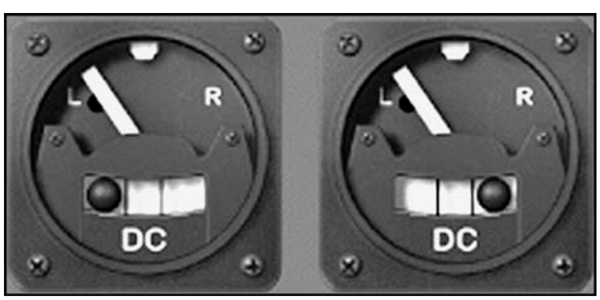

Figure 5-5 Both Depictions Indicate a Spin to the Left

NOTES

1. Recovery from a confirmed steady-state spin by maintaining neutral controls is possible, but time to recover and altitude loss will be greater than with use of proper anti-spin control.

2. There is a difference between a “neutral controls” recovery and a “controls free recovery”. Reference NATOPS Chapter Six for details and as always, resolve any questions with your instructor.

Your spin training will require you to recover from a steady state erect spin using the NATOPS Erect Spin Recovery Procedure. Correctly following the spin procedure below will ensure you enter an erect, steady-state spin and not something undesirable or unsafe, such as a spiral. It is especially important to recall the T-6A Prohibited Manuevers, from Chapter Five of the NATOPS Flight Manual, since seven of these maneuvers restrict spin operations.

516. SPIN PROCEDURES:

1. Establish the aircraft in the slow cruise configuration (150 KIAS, power ~33%).

NOTE

Initiate the spin at or very near to the top of the MOA. From initiation to recovery, a typical steady state spin will last for approximately 6 turns and lose approximately 4500 feet of altitude.

2. Perform the Pre-Stalling, Spinning, and Aerobatic Checks.

3. Begin a 45° AOB clearing turn for approximately 180° of heading change (or two 90° turns).

4. Roll out of the clearing turn and reduce power to idle. Referencing the EADI, check wings level and raise the nose to approximately 20° to 30° nose high.

5. At the stick shaker, begin slowly feeding in rudder in the desired direction of spin (same direction as last clearing turn). Increase back stick pressure to hold pitch attitude.

6. At the stall (recognized by visible nose drop or uncommanded roll), smoothly increase to full rudder in the desired direction of spin while applying full aft stick (ailerons neutral). Maintain these spin control inputs.

7. As the aircraft enters the incipient spin phase, over the ICS, begin continuously calling out:

   a. Altitude

b. AOA

c. Airspeed

d. Turn needle deflection and direction. (Figure 5-6)

Figure 5-6 Example of Spin ICS Calls

8. Upon reaching steady state spin indications, initiate the recovery by first applying full rudder opposite the turn needle. Then, Position control stick forward of neutral with ailerons neutral.

NOTE

Failure to enter a steady state spin after completing approximately 3 turns may indicate an undefined state of OCF or a spiral. For any OCF aside from an erect, steady state spin, recover with IDLE power and neutral controls IAW INADVERTENT DEPARTURE FROM CONTROLLED FLIGHT Procedures.

WARNING

A spiral is often mistaken for a spin, but is not steady-state in that airspeed is increasing through 160 KIAS and motions are oscillatory. Anti-spin controls may not be effective in arresting a spiral and may actually aggravate the situation. The best response to a spiral is to recover with IDLE power and neutral controls IAW INADVERTENT DEPARTURE FROM CONTROLLED FLIGHT Procedures.

9. Hold recovery inputs until rotation stops, then momentarily neutralize the flight controls.

10. Recover from the nose low attitude by checking wings level and initiating a straight pull to the horizon. Avoid secondary stalls and do not exceed aircraft G limitations.

11. Check the oil pressure within limits and then smoothly advance PCL to the desired power setting.

12. Re-trim as necessary to remove all pressures from the flight controls and check the balance ball centered.

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CHAPTER SIX
LANDING PROCEDURES

Figure 6-1 T-6 on Approach

600. INTRODUCTION

This chapter discusses procedures for the T-6A to enter and operate at different airfields. During contact and subsequent stages of training, you will operate in a variety of landing pattern environments. A defining characteristic of a particular pattern is whether or not the airfield has an operating control tower. For example, Sherman Field is a tower-controlled field, whereas Barin Outlying Field (OLF) is uncontrolled. You will also see operations at civilian fields, perhaps both controlled and uncontrolled. Although differences exist, the fundamentals are similar in the different pattern environments.

The first part of this chapter details the general flow of landing pattern procedures for different types of airfields. The last part of the chapter details considerations for the most crucial part of aviation, the landing.

601. LANDING PATTERN TERMINOLOGY

These terms generally flow in the order you will see them from entry to exit from the pattern.

Initial: A straightaway segment 2-5 miles in length (or as defined by local procedures) prior to the landing runway on extended runway centerline. Entering initial sets you up for an overhead break over the airfield.

Break: A decelerating, 180° overhead transition flown to position the aircraft on the downwind leg

Upwind: The extended runway centerline past the landing area and beyond.

Crosswind: The pattern leg, perpendicular to the runway, between upwind and downwind

Downwind: The portion of the traffic pattern offset from the runway in the opposite direction of landing.

Abeam: The position on downwind leg abeam the intended point of landing.

180º position: The position on downwind leg from which the approach turn is commenced. This is typically the point opposite the intended rollout point.

90º Position: A point perpendicular to the runway, halfway around the final turn.

Base: The civilian/Air Force term for the 90°.

Aimpoint: A point on the runway used as a reference to fly the aircraft down final approach. The aimpoint remains fixed in the windscreen on final. In the absence of a landing flare, the aimpoint would equal the intended point of landing.

Flare: A gentle, controlled descent of the aircraft that happens between bringing the PCL to IDLE and wheels on deck.

Intended Point of Landing: This is the point on the runway where you intend to touch down and should be within the first 1/3 of the runway. If a crash truck, Runway Duty Officer (RDO), etc. is positioned at the approach end of the duty runway, land past their position.

Touch and Go: A landing followed immediately by another takeoff (as opposed to a full-stop landing).

Visual Wingtip Distance (WTD) References (Figure 6-2): Specific T-6A WTD are used in subsequent explanations as a means to measure offset and are defined as:

3/4 WTD	Where blue meets white on the wing leading edge
2/3 WTD	Fuel cap
1/4 WTD	Where the canopy rail visually bisects the wing

Figure 6-2 T-6A Defined Wingtip Distances

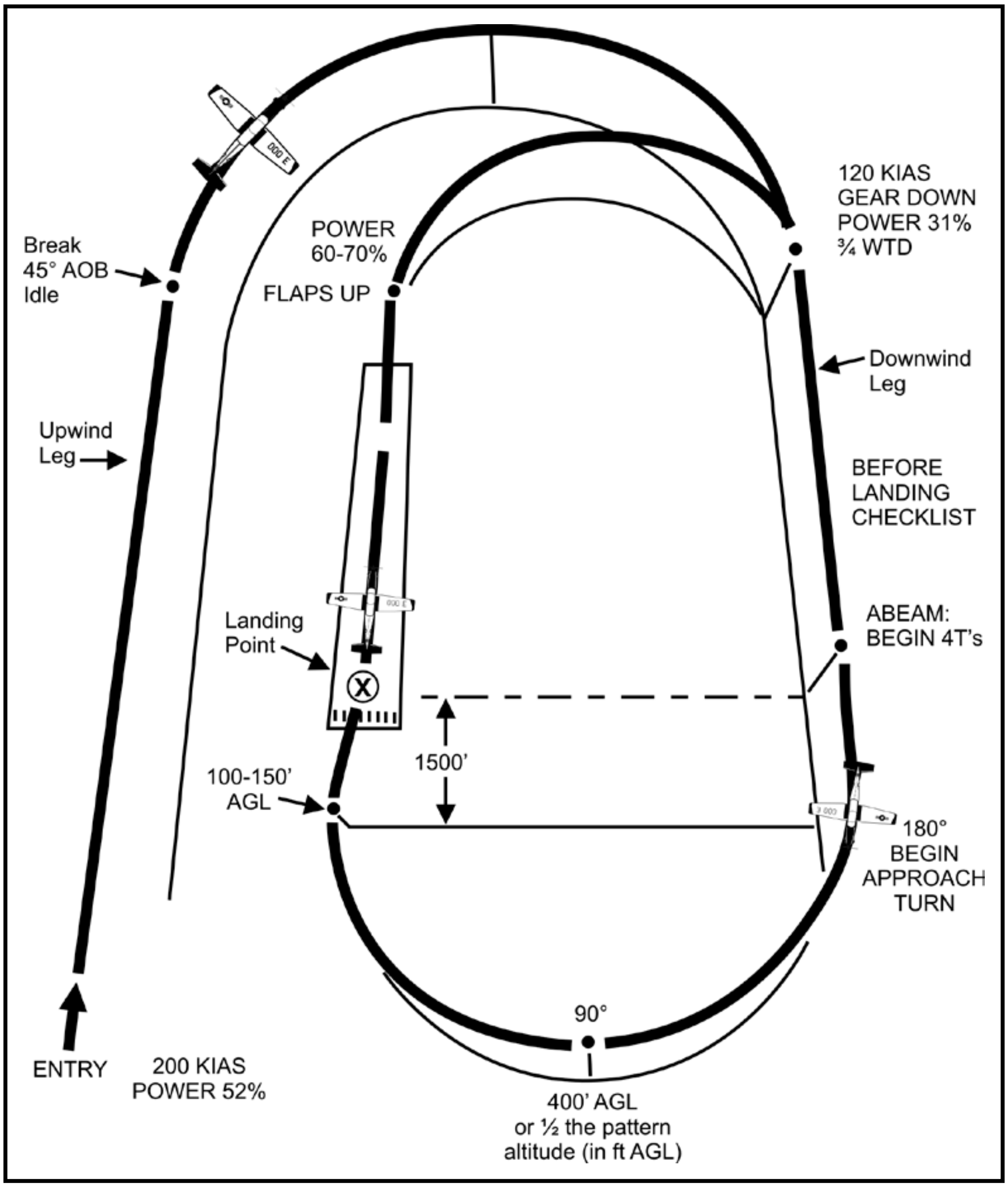

Figure 6-3 T-6A Landing Pattern: Initial – Touch & Go

602. T-6A LANDING PATTERNS

Military training fields, in part because of high traffic volumes, have more rigid procedures for entering and operating in than do civilian fields. This section focuses on military field operations, specifically outlying field (OLF) operations.

To prepare yourself for operating at an OLF, it is imperative you reference the procedures for each field. These procedures are located in the Fixed Wing Operating Procedures Instruction (COMTRAWINGFIVE INSTRUCTION 3710.2S) and the TRAWING SIX In Flight Guide. Also, reference the TW6 Standard Operating Procedures (COMTRAWING SIX INSTRUCTION 3710.1L) for the latest procedures for Sherman Field.

603. OLF PROCEDURES

The following procedures guide you from OLF entry to OLF departure. Although they are uncontrolled, many OLFs have a Runway Duty Officer (RDO) and a crash crew positioned at the approach end of the runway. They observe and monitor pattern operations and provide traffic de-confliction/general information for aircrews. A few of the radio calls are provided, however, you should review the Voice Communications FTI for expanded radio procedures in the pattern.

1. Determine the duty runway. Select the appropriate frequency and transmit, “Field name, landing” over the radio. The RDO/crash crew will reply with the duty runway.

2. As you diligently clear for traffic, proceed inbound to intercept the traffic pattern from an initial or high key position.

3. Approaching the airfield, offset the runway up to 1/4 WTD on the opposite side of the break direction (i.e. offset to the left for a right break). As you offset, attempt to determine wind direction (windsock, etc.). Begin intently clearing for pattern traffic on the downwind and/or crosswind legs. Locate your “interval” traffic (the aircraft you will be following).

4. When at the upwind numbers and “#1 upwind, with interval,” transmit the break radio call.

5. Simultaneously, roll into a 45° AOB level turn, reduce power to 10%, and extend the speed brake. Trim for deceleration.

6. During last half of the break turn, use bank as required (not to exceed 45°), to roll out 3/4 WTD from the runway. Decelerating through 150 KIAS, retract the speed brake.

7. Roll out wings level on the downwind leg and establish proper displacement. Use the wingtips for reference.

8. Below 150 KIAS, lower the landing gear handle and call for the Before Landing Checklist. Approaching 120 KIAS, lower the nose to maintain 120 KIAS and descend to pattern altitude (power remains at 10%).

9. Approaching pattern altitude, increase power to ~31% to maintain 120 KIAS and level off.

10. Abeam the intended point of landing (ABEAM position), begin the 4Ts:

TRANSITION: Reduce power to 15% and lower flaps to desired position. Use TO flaps unless directed otherwise by the IP.

TRIM: Trim for deceleration and flap deployment.

TURN: On airspeed, initiate descending turn, utilizing AOB as required to fly to the 90° position. Pitch attitude should be approximately 2/3 ground and 1/3 sky.

TALK: "*Call Sign*, 180, gear down."

NOTE

Airspeeds in the approach turn for no-flap, takeoff, and landing flaps are 120/115/110 KIAS, respectively. Speeds on final will be 110/105/100 KIAS. Never fly slower than the AOA on-speed indication (amber donut) in the pattern. While operating at or near maximum allowable gross weight, the AOA on-speed indication may in rare instances be faster than the defined pattern speeds.

Planned bank angle for the final turn is approximately 30°. This allows a "cushion" for increasing or decreasing bank angle so you can roll out on final without angling or overshooting. You may increase bank angle up to a maximum of 45° in the final turn. If you will still overshoot at 45° of bank, execute a go-around. You should then adjust downwind displacement slightly wider on subsequent patterns so that you can fly the final turns at 30° bank.

NOTE

Pattern interval will be established in the break or crosswind turn. Do not delay the 180° or vary the approach turn ground track. If aircraft spacing is insufficient, waveoff from the final turn.

11. Fly to the 90° position, perpendicular to the runway and on airspeed. The altitude at the 90° is 400 feet AGL (or 1/2 the pattern altitude in feet AGL). Report over the ICS, "Gear down, flaps ___, Before Landing Checklist complete."

604. FINAL APPROACH

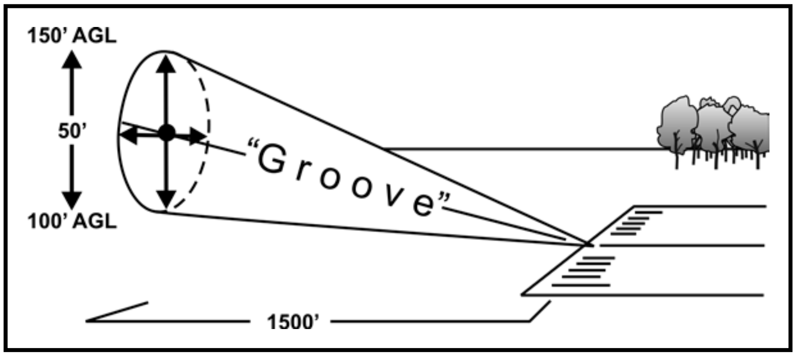

Figure 6-4 The Groove

The goal leaving the 90° position is to position the aircraft on final approach on airspeed and in the "Groove." The groove is defined as 100 to 150 feet AGL with approximately 1500 feet of straightaway (Figure 6-4). The turn to final will normally necessitate a power reduction to decrease airspeed to final approach speed (110/105/100 KIAS) and to counter the increase in lift, resulting from leveling the wings.

Once on final approach in a VFR pattern, attempt to position the correct aimpoint at the right level in the windscreen. Correct airspeed with coordinated nose attitude and power changes. Figure 6-5 illustrates an aimpoint. Flying the proper glide path down final will hold the aimpoint steady in the correct windscreen position all the way down to the flare. Make pitch corrections and power adjustments for airspeed as necessary. In the absence of a landing flare, the aimpoint would equal the intended point of landing.

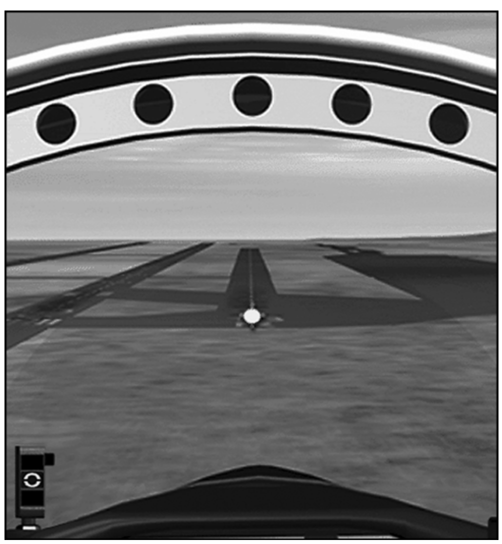

Figure 6-5 Aimpoint On Final

605. LANDINGS

Crossing the runway threshold, further power reduction may be required to stay on speed. When five to ten feet above the runway surface, transition your eyes down the runway and begin a smooth power reduction to idle. In ground effect, set the landing attitude, steadily increasing back stick pressure to flare the airplane and touchdown at the intended point of landing. The landing attitude in the T-6A is slightly higher than the takeoff nose attitude. Use the rudders as necessary to keep the fuselage aligned with the runway.

If the landing is to a full stop, use rudder and ailerons to maintain runway centerline. Do not apply brakes above 80 KIAS on landing roll-out, unless stopping distance on the runway is questionable. Be very smooth and coordinated with brake applications to bring the aircraft to a safe taxi speed. As a reminder, the N1 will automatically reduce from flight idle (67%) to ground idle (60%) approximately four seconds after touchdown. After the aircraft is at a safe taxi speed and the rudder pedals are verified neutral, engage nose wheel steering to taxi off the runway.

606. CROSSWIND LANDINGS

In crosswind conditions, fly the same ground track around the pattern, crabbing into the wind as required. Once established on final, use the rudders as necessary to keep the fuselage aligned with the landing runway. Use the ailerons as necessary to maintain centerline. This will necessitate lowering the wing into the wind to offset the crosswind-induced drift (Figure 6-6). Maintain this “wing-low” attitude all the way down to the flare and landing. Touchdown on the upwind main gear tire first, as required. Maintain ailerons deflected into the wind during ground roll and takeoff, if touch & go. After liftoff and positive climb verified, allow the aircraft to crab into the wind. Discontinue the wing low method and check balance ball centered.

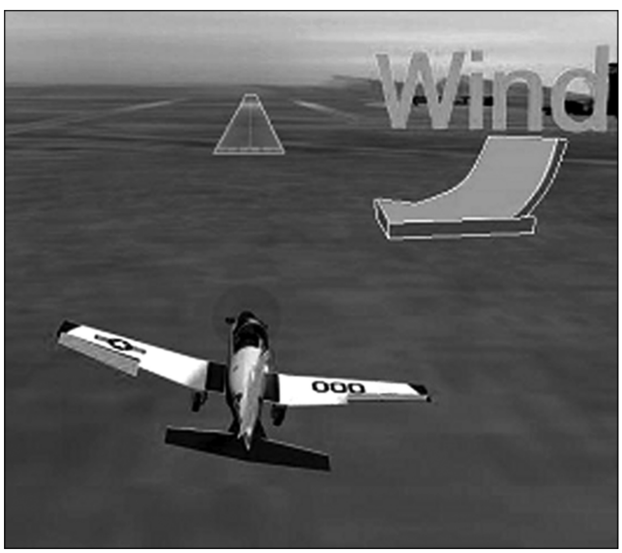

Figure 6-6 Crosswind Approach

607. WAVEOFF (GO-AROUND)

The waveoff or go-around is an intentional discontinuation of an approach. Generally speaking, a waveoff should be initiated for three basic reasons: runway not in sight (this typically happens during instrument approaches in IMC conditions), directed to by an external source (like the tower or RDO), or unable to make a safe landing. The first two reasons are clear-cut. As you gain experience, you will better recognize unsafe approaches that should lead to waveoffs. Examples of unsafe approaches are unsafe altitude, unsafe airspeed, overshooting approach, insufficient traffic separation, and drifting or crabbing prior to touchdown.

The waveoff can be initiated anywhere inside the 180° position all the way to the landing flare. Waveoffs are an invaluable tool to safe pattern operations and should not be viewed as an abnormal procedure unless executed too late. Once you've initiated a waveoff, do not change your mind and attempt to land.

608. WAVEOFF PROCEDURES

Use good judgment when executing the waveoff procedure. Depending on where the waveoff is initiated, procedures may be modified to fit existing conditions.

1. Advance PCL to maximum power (firewall).

2. Level the wings and set pitch as required to begin climb.

3. Once a positive rate of climb is confirmed, select flaps up and transmit radio call, "Call Sign, waveoff." Trim.

4. Reduce power, as appropriate. Accelerate to and climb at 120 KIAS. Adjust your flight path, moving to either side of the runway, as necessary, to avoid conflicting traffic and to keep aircraft on the runway in sight.

5. With interval, call crosswind to re-enter downwind or depart the pattern.

NOTES

1. The preceding waveoff procedure is specific to VFR pattern operations. If in IMC Conditions, a waveoff is normally followed by a return to the radar pattern, in which the gear shall be raised. Refer to the "Missed Approach" and "Go Around/Waveoff" sections in Chapter 2 of the NATOPS.

2. A common and potentially lethal waveoff situation you should be aware of and understand occurs in any landing pattern where practice Emergency Landing Patterns (ELP) are flown on the opposite side of touch & go traffic (such as at some OLFs). The potential conflict exists when one aircraft is inside the 180°

position on one side of the pattern and another aircraft (normally executing a practice PEL is inside the low key position on the other side of the pattern (Figure 6-7). Both aircraft are converging to the same runway. PEL traffic always has priority over traffic already established in the pattern. Therefore, be vigilant to clear visually and over the radios during your touch & go practice. If there is any question as to a possible conflict with traffic inside low key (on the opposite side), waveoff your approach. If you have any questions about this potential conflict situation, ask your IP.

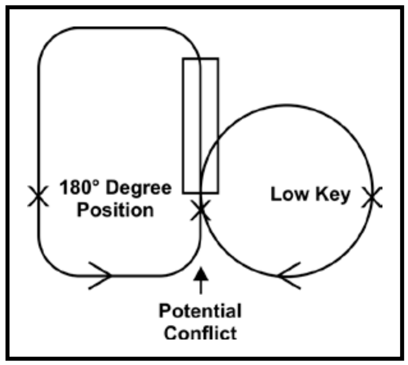

Figure 6-7 Potential Conflict with ELP Traffic

609. TOUCH AND GO PROCEDURES

Touch and goes will normally be flown on contact sorties to maximize training repetition. Ensure the airfield's runway is of sufficient length IAW Wing and Squadron operating procedures.

1. Once the main tires touch down, smoothly lower the nose gear to the runway and increase power to maximum (firewall). Commensurate with PCL movement, apply right rudder to counteract the engine/propeller induced left yaw.

2. After the engine spools up and with 85 KIAS minimum, raise the nose to the takeoff attitude. Allow the aircraft to fly itself off the runway. Once a positive rate of climb is confirmed, fully retract the flaps, however, leave the gear down. Trim.

NOTE

Retraction of flaps from the TO to the UP position is not recommended below 110 KIAS to preclude the aircraft settling back to the runway. However, there is no settling when raising the flaps from the LDG to the TO position.

3. Reduce power to 60 to 70 percent torque. Accelerate to and climb straight ahead at 120 KIAS. Begin visually acquiring interval traffic.

4. When above 400 feet AGL and "#1 with interval," make the crosswind radio call and begin the crosswind turn. Maintain 120 KIAS in the climb.

NOTE

You are “#1 upwind, with interval” for the crosswind turn when: 1) the aircraft ahead of you is abeam or behind your wingtip and has completed at least 90º of turn, or 2) the aircraft ahead of you on the upwind leg has departed the pattern (thus doing away with any “abeam” requirement to turn).

5. Initiate level off 50 feet prior to pattern altitude by lowering the nose and reducing power to ~31%. Level off, maintain 120 KIAS, and establish 3/4 WTD spacing from the duty runway. In perfectly calm wind conditions, the downwind heading (reciprocal of runway heading) will maintain the proper spacing. This is not true when crosswind conditions exist. If there is a crosswind, angle or crab the aircraft sufficiently into the wind to prevent drifting into or away from the runway. It is not uncommon to alter the downwind heading as much as 10º to maintain the proper 3/4 WTD spacing parallel the runway.

6. Initiate BEFORE LANDING checklist. From this point, procedures are identical to steps 9-10 on the OLF procedures (Section 603).

610. DEPARTING THE OLF PATTERN

To depart an OLF, you must be #1 upwind. You are “#1 upwind” when: 1) the aircraft ahead of you has begun the crosswind turn (no abeam requirement), or 2) the aircraft ahead of you on the upwind leg has departed the pattern. Note the differences from “#1 upwind, with interval,” which is required to turn crosswind.

NOTE

Reducing power to 60-70 percent torque is only required to maintain spacing on the aircraft in front of you until you are #1 upwind. In the absence of traffic conflicts, accelerate with max power, taking care to not overspeed the gear.

1. After rotation on the last touch and go, raise flaps and accelerate IAW normal Touch and Go Procedures.

2. When above 400 feet AGL and “#1 upwind,” transmit departing radio call, “(OLF name) RDO/tower, (call sign), number one upwind, departing.”

3. Advance PCL to max power.

4. Raise the landing gear handle, and complete the AFTER TAKEOFF Checklist.

5. When clear of the pattern, switch to area common frequency and comply with course rules for departure.

611. TOWER-CONTROLLED FIELDS

A tower-controlled field is any airport having an operational control tower. Many of the procedures are quite similar to those of an OLF, but important differences exist. The following discussion will give you a basic introduction to tower-controlled airfield operations.

612. VFR ENTRY TO TOWER CONTROLLED FIELDS

Most tower controlled fields have Automatic Terminal Information Service (ATIS) or Automated Surface Observing System (ASOS) information. You should obtain that information prior to arrival. During your preflight planning, refer to the appropriate FLIP to get the right frequency. If the tower is in Class C airspace, you will first contact the appropriate approach control to receive clearance to the airfield. For Class D airspace, you can usually contact the tower directly for entry. However, coordination with approach control may be needed for certain maneuvers like a high key entry to a Class D airfield adjacent to Class C airspace.

Example

SNFO: "Mobile approach, BUCK 322, 20 miles southeast of Mobile Downtown with information Alpha, request."

Approach: "BUCK 322, squawk 1032, say request."

SNFO: "BUCK 322, request high key entry to Mobile Downtown, then VFR with tower."

Some civilian airfields are familiar with military procedures like the overhead break approach and ELP. Consult the FLIP Enroute Supplement and check with your instructor for details. In lieu of established procedures, use OLF procedures for the overhead break, and NATOPS procedures for the ELP.

For civilian fields, you should also become familiar with other types of visual pattern entries. Visual approaches will vary, depending on altitude and aircraft position relative to the runway, traffic, weather, and tower instructions. Typical VFR entries are straight-in, downwind, and base entries (Figures 6-8 and 6-9).

Follow ATC's instructions to the airport (if applicable). They will direct you to contact tower, when appropriate. Once under tower control, again state your intentions, i.e. overhead, straight in, downwind, high key, etc. and position. It's possible the tower controller may not be able to accommodate your request because of traffic, weather, or other factors. If that is the case, the tower controller will direct your entry accordingly.

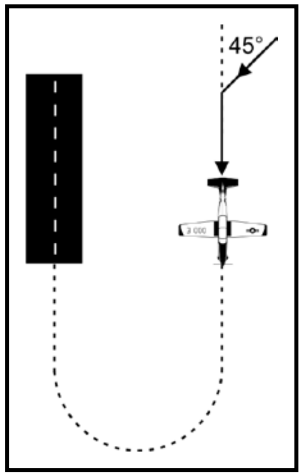

Figure 6-8 Downwind Entry

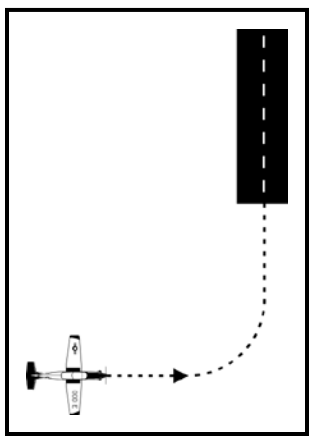

Figure 6-9 Base Entry

Example

SNFO: “Downtown tower, KATT 612, four miles east for high key, Runway Three Two.”

Tower: “KATT 612, unable high key, intercept a left downwind Runway Three Two.”

SNFO: “KATT 612, left downwind Three Two.”

If the tower controller clears/directs you to enter a right downwind, attempt to intercept the downwind leg with a 45° intercept with the runway off your right side. A right downwind causes right traffic pattern turns (Figure 6-8), whereas a left downwind causes left traffic pattern turns. Similarly, intercepting a right base will give you a right turn to final, and intercepting a left base will give you a left turn to final. (Figure 6-9)

613. TOWER CONTROLLED FIELD PROCEDURES

1. Establish contact with ATC to communicate your request and/or intentions.

2. Fly the aircraft at as required to position it for the appropriate approach.

3. Transition to the landing configuration by slowing below 150 KIAS, lowering the landing gear, and completing the Before Landing Checklist. This should be done no later than base leg (if used) or a two mile final. Lower flaps as appropriate.

4. Obtain landing clearance prior to landing and report the gear down prior to crossing the runway threshold.

After the initial approach and landing, you will most likely remain in the traffic pattern for touch and goes. Touch and go procedures at controlled fields are the same as they are at OLFs, with the exception of tower direction and radio procedures. You must request and be cleared by tower to turn crosswind after a touch and go. Tower may clear you for each crosswind turn, or they may instruct you to "execute continuous right/left closed traffic." This alleviates the need to request crosswind on each touch and go.

While established in the pattern, the tower controller will be ***directive*** with radio calls as he/she de-conflicts traffic. Thus, you can expect more delayed turns and maneuvers that aid in aircraft separation at a tower-controlled field. This is different from an OLF, where the aircrew themselves are doing the de-conflicting. Still, this "extra set of eyes" in no way relieves you from your continuous visual clearing duty!

Example

Tower: "KATT 611, extend your upwind leg, I'll call your crosswind turn."

SNFO: "KATT 611, extend upwind."

Tower: "KATT 611, extend your downwind, I'll call your base."

SNFO: "KATT 611, extend downwind."

For radio calls, substitute "right/left base" for "180" or "90" if appropriate, at civilian fields. You must also report gear down to the tower prior to crossing the runway threshold, and repeat back your landing clearance.

Example (turning from downwind to base)

SNFO: "KATT 622, right base, gear down."

Tower: "KATT 622, wind 160 at 8, Runway One Four, cleared option."

SNFO: "KATT 622, cleared option, One Four."

When ready to depart, give the tower some lead-time to de-conflict traffic. It is customary to call the tower on the next-to-last pass to inform the controller you will be departing after the next touch & go/low approach, etc.

614. LANDING ERRORS

1. **Description.** A deviation from a normal landing which could cause a dangerous situation to quickly develop.

2. **General.** Airspeed in the flare is only slightly above stall airspeed. Even at slow airspeeds, the elevator is still very effective. An abrupt change in pitch could result in a balloon, a bounce, or even a stall. When any of these conditions are encountered, apply MAX power, adjust the pitch attitude and WAVEOFF if it is unsafe to continue the landing. If power is applied and the aircraft continues to settle, do not try to hold it off by raising the nose above the landing attitude. Hold the landing attitude and let the aircraft touch down. MAX power cushions the touch down. In case of a hard landing, do not raise the gear. The following are examples of landing errors.

a. **High Flare:**

Cause. Flare performed too early or with excessive pitch up. Flare begun too early or with excessive pitch up.

Effects.

Inability to flare normally due to excess altitude.

Possible premature touchdown of nose gear caused by abrupt pitch down to compensate for high flare.

Stall if flare continued with excess altitude.

Hard landing due to high sink rates as airspeed decreases at higher than normal altitude.

Recovery. With adequate airspeed and runway remaining, release a small amount of backpressure to increase descent rate. As aircraft approaches normal altitude, increase backpressure to reestablish normal flare.

If too high on final, causing an excessively steep glideslope, do not attempt landing, WAVEOFF. Remember, as landing attitude is attained, the aircraft is rapidly approaching a stall and there is insufficient margin-of-error for radical pitch changes in the flare.

b. **Late or Rapid Flare:**

Cause. Higher than expected descent rate or misjudged altitude.

Effects.

Firm touchdown due to higher than normal descent rates or insufficient time to complete flare.

Abrupt flare to prevent premature or firm touchdown may lead to an accelerated stall. This is a dangerous situation that may cause an extremely hard landing and damage to the main gear. This may or may not be a controllable situation, depending on airspeed.

Recovery. Hold landing attitude and add power. Immediate use of power increases thrust, lift, and controllability while simultaneously decreasing AOA and enables a recovery and waveoff. The main gear may contact the ground a second time, but if recovered properly, the second contact is usually moderate.

c. **Porpoising:**

Cause. Incorrect (flat) landing attitude and airspeed. At touchdown, the nose gear contacts the runway before the main gear.

Effects.

The aircraft bounces back and forth between the nose gear and main gear. Without immediate corrective action, the porpoise progresses to a violent, unstable pitch oscillation. Repeated heavy impacts on the runway ultimately cause structural damage to the landing gear and airframe.

Recovery. Immediately position the controls to the takeoff attitude (spinner approximately on the horizon) to prevent the nose wheel from contacting the runway and simultaneously advance the PCL to MAX and WAVEOFF.

Do not attempt to counteract each bounce with opposite control stick movement. The combined reaction time of pilot and aircraft is such that this control movement aggravates the porpoise. Hold the controls in the recovery position to dampen the oscillations. Power increases control effectiveness by increasing airspeed.

d. **Floating:**

Cause. Late power reduction, excessive airspeed, or improper flap setting.

Effects. Long landing. Possible balloon or bounce.

Recovery. Dependent on magnitude of float and runway remaining.

For a slight float, gradually increase pitch attitude as airspeed decreases and landing speed is approached.

Avoid prolonged floating, especially in strong crosswinds. If a long landing (outside safe landing zone) is inevitable, WAVEOFF.

e. **Ballooning:**

Cause. Rapid flare. Rapidly raising the nose to the landing attitude with excessive airspeed.

Effects. Altitude gain (dependent on airspeed and pitch rate).

Recovery. Landing may be completed from a slight balloon. Hold landing attitude as the aircraft settles to runway. Maintain wing-low crosswind controls through the balloon and landing. WAVEOFF from a pronounced balloon. Do not attempt to salvage the landing.

f. **Bounce:**

Causes.

Overly firm or hard touchdown causes aircraft to bounce off runway.

Contact with ground before landing attitude is attained. Landing with excessive rate of descent/energy.

Late recognition that aircraft is settling too fast, combined with excessive back-stick pressure.

Effects. Height reached depends on the force with which the aircraft strikes the runway, the amount of back-stick pressure held, and the speed at touchdown.

Recovery. Same as a balloon, depending on severity of bounce.

Slight Bounce. Continue the landing. Maintain direction with wing-low crosswind controls and smoothly adjust pitch to the landing attitude just before touchdown.

Severe Bounce (aircraft rising rapidly). Do not attempt a landing, WAVEOFF immediately.

Simultaneously apply MAX power, maintain direction, and set a safe pitch attitude. Continue waveoff even if another bounce occurs.

Bouncing in Crosswinds. Use extreme caution. When one wheel strikes the runway, the other wheel touches down immediately after. The crosswind correction is lost and the aircraft drifts. Reestablish crosswind controls to stop the drift and either continue the landing or waveoff, depending on the situation.

g. **Landing in a Drift or Crab:**

Cause. Failure to apply sufficient wing-low crosswind corrections.

Effects. Excessive side loads on landing gear and potential gear damage.

Recovery. WAVEOFF if unable to apply proper crosswind controls before touchdown.

h. **Wing Rising After Touchdown:**

Cause. Lift differential combined with rolling moment. During crosswind landing, airflow is greater on the upwind wing because the fuselage reduces airflow over the downwind wing. This causes a lift differential. The wind also strikes the fuselage on the upwind side and this causes a rolling moment about the longitudinal axis, which may further assist in raising the upwind wing. When effects of these two factors are great enough, one wing may rise even though directional control is maintained.

Effect. Depending on the amount of crosswind and degree of corrective action, directional control could be lost. If no correction is applied, one wing can raise enough to cause the other wing to strike the ground.

Recovery. Use ailerons to keep the wings level. Use rudder to maintain directional control. As the wing rises, the effect increases as more wing area is exposed to the crosswind.

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CHAPTER SEVEN
EMERGENCY PROCEDURES

700. INTRODUCTION

Arguably the most significant training you will receive during the contact stage will be in Emergency Procedures (EPs). You will learn how to appropriately interpret and apply NATOPS Emergency Procedures, establish strong crew coordination during an emergency, and manage the external radio communications required. Moreover, beyond merely developing these skills for the future, realize now that should an emergency occur during your T-6A training, you will be expected to be a proactive, contributing crewmember from day one on the flight line.

Figure 7-1 Aircraft Emergency

The T-6A NATOPS Flight Manual, Section III, will be your governing publication for all T-6A EPs and the primary focus of your study and preparation. This chapter of the FTI merely expands and amplifies certain procedures from the NATOPS. If discrepancies exist between the FTI and the NATOPS Manual, the NATOPS takes precedence.

You are required to memorize all of the NATOPS boldfaced emergency procedures. During your preflight briefings and in the aircraft, you will be expected to verbalize boldfaced items. Although not required to commit non-boldfaced items to memory, you should have an in-depth understanding of each step of the emergency procedure. Apply your knowledge of T-6 systems to understand the "how" and "why" of EP composition.

When an airborne emergency occurs, three basic rules apply. These rules should be thoroughly understood by all aircrew:

Maintain aircraft control: Establishing the aircraft in safe controlled flight should always be your first priority in any emergency. This often requires nothing more than continuing in straight and level flight at a safe altitude. However, if performing aerobatic maneuvers, stalls, or spins, maintaining aircraft control will require an OCF, or unusual attitude recovery in order to establish aircraft control.

Analyze the situation and take proper action: Next, analyze the indications you have to determine the nature of the emergency. You should verify what you see in your cockpit with the other crewmember. Once the problem is diagnosed, apply any applicable boldfaced items, then open your Pocket Checklist and with good aircrew coordination, continue with the emergency procedure. Part of taking the proper action will involve coordinating your intentions with controlling agencies. Do this only after the aircraft in under control, appropriate checklists have been run, and a recovery plan has been developed.

Land as soon as conditions permit: The severity of the problem will dictate the course of action to take to safely recover the aircraft. As the SNFO, you should always identify the nearest suitable landing field. Review the definitions for "Land as soon as possible" and "Land as soon as practical" in the T-6A NATOPS, Section III Introduction.

701. EMERGENCY LANDING PATTERN

The ELP is a 360º overhead pattern designed to position the aircraft for landing when the possibility of a power loss exists (Precautionary Emergency Landing [PEL]) or no power is available (Forced Landing). In the case of a Forced Landing, ELPs should only be flown to prepared fields, as ejection is strongly preferred over forced landings into unprepared terrain. The underlying function of the PEL is to establish the aircraft in a position such that, if the engine quits, you will have sufficient energy (altitude and airspeed) to perform a propeller-feathered glide to a suitable runway.

Unlike the total power loss scenarios, power is available in a PEL and should be used, if necessary, to an intercept point on the ELP. Power can also be used while on the ELP anytime the aircraft is off profile. Once established on the ELP profile, set power to 4 to 6 percent torque. If weather precludes a climb to high key, accelerate to intercept the ELP at some point below high key.

702. MANAGING PROFILE ENERGY

NOTE

> SNFOs will not be at the controls once the aircraft reaches high key in the ELP. The student will inform the IP of the ELP check points and ensure the aircraft is on profile.

At 125 KIAS the aircraft should glide 2 miles per 1000 feet AGL. 125 KIAS is the maximum glide distance airspeed for clean configuration with the propeller feathered. Realize the 2 NM/1000 feet glide ratio is based on no wind conditions. A strong headwind can degrade glide performance considerably.

One method to correct for low energy is to delay gear/flap extension once established in the ELP If you find yourself low on energy and unable to make high key, aim for another intercept on the ELP, whether it be cross key, low key, or base key. If you find yourself low on energy once established in the ELP, delay gear/flap extension and lower your ground track as needed.

If excess altitude exists during the glide to high key, the three most common methods to lose altitude are bow ties, S-turns, and slips. Any one or all of these methods may be used while gliding to high key. Lowering the gear to increase your decent rate to high key should be a last resort option since the emergency hydraulic system does not allow for raising the gear once lowered.

Bow ties are essentially a continuous set of mild turns in the shape of a bow tie flown approximately ½ WTD away from the approach end of the runway. With each bow tie, you should attempt to keep the landing runway in sight. Bow ties are not precise maneuvers and different techniques exist on how to fly them. Your instructor will provide guidance; however, a good technique is to depart the bow ties for high key at least 1000 feet above high key altitude.

S-turns are used to affect a milder altitude loss and may be specifically used to make controlled corrections while proceeding direct to high key. Designed to increase the actual track over the ground, S-turns are simply lazy turns back and forth deviating from a straight-line ground track in order to provide more time to descend.

Lastly, the slip is a faster method than the other two to affect a controlled altitude loss. As explained in Chapter Three, the slip is uncoordinated flight where the airplane slides sideways toward the center of the turn. This is purposely accomplished by lowering one wing and applying opposite rudder (remember "wing down, top rudder").

In general, you should avoid large turns away from the field. However, to manage energy properly, sometimes turns away from the field may be unavoidable. (Figure 7-2) Be certain you have enough altitude to “play” with. A 360° turn, flown at 125 KIAS can lose approximately:

2000 feet at 30° bank
1500 feet at 45° bank
1000 feet at 60° bank

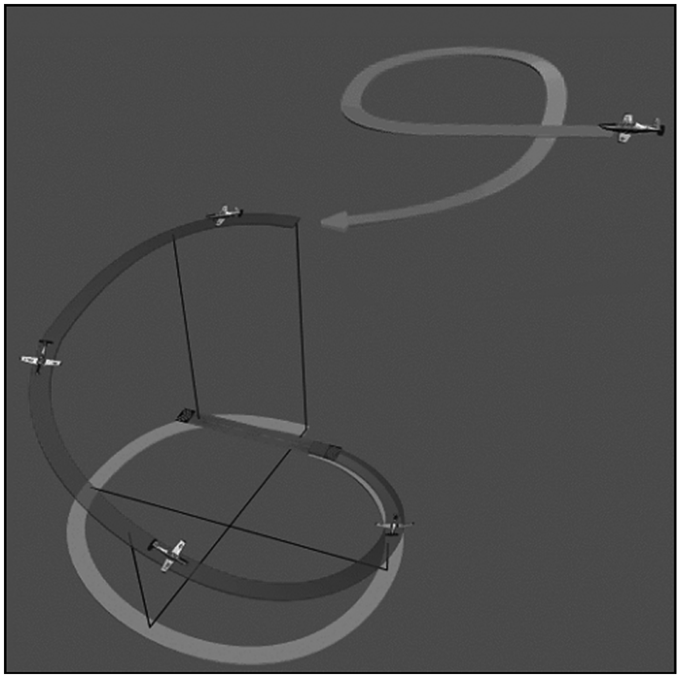

Figure 7-2 ELP 360° Turn

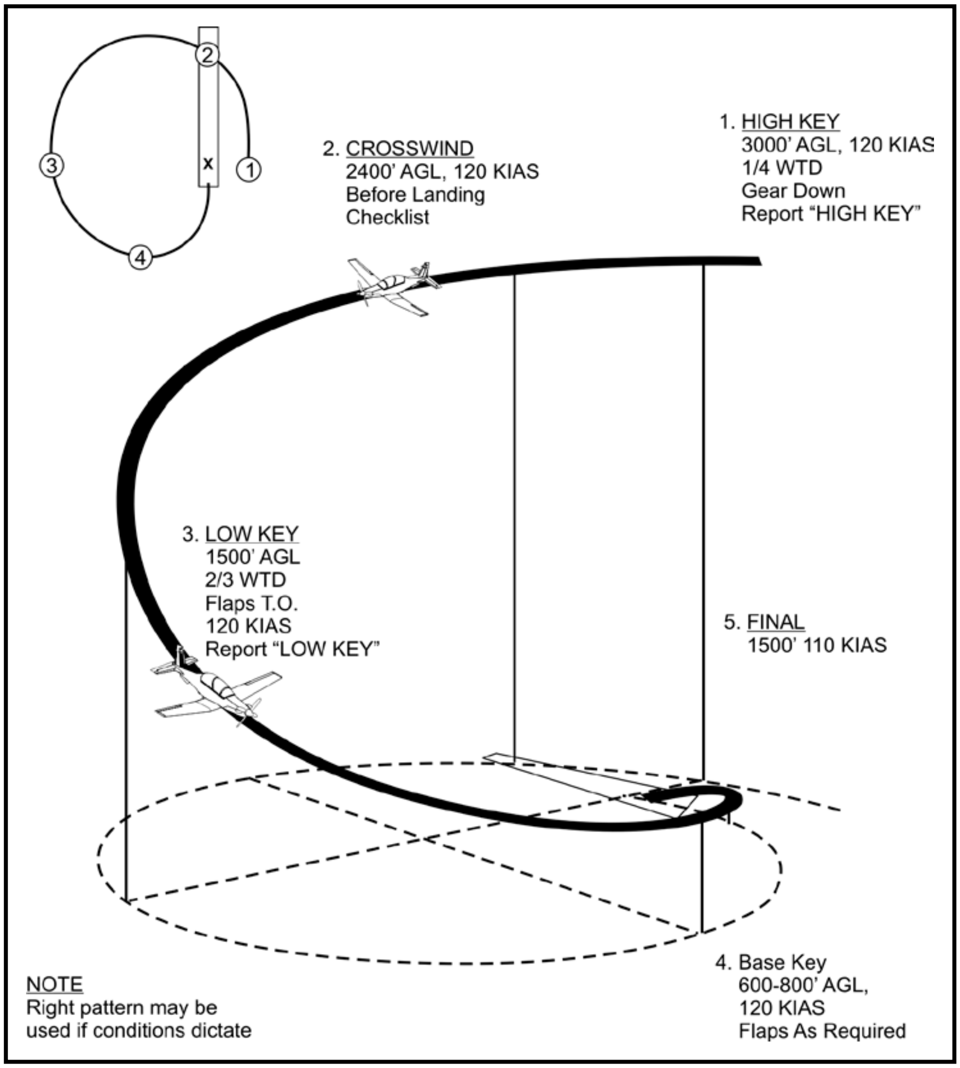

Figure 7-3 Emergency Landing Pattern

703. PRACTICE EP IN FLIGHT

The instructor, will initiate the simulated EP above 3000 feet AGL. This may occur at any airspeed and configuration. Fly to intercept the ELP profile while simultaneously executing the appropriate procedures. At the instructor's discretion, simulated EPs may ultimately be resolved by a Forced Landing, PEL, successful airstart, or ejection. Stay focused during the emergency, follow the appropriate procedures, and carry the simulated emergency to a logical conclusion.

NOTE

When conducting simulated emergencies in flight, verbalize emergency procedures that actually move switches or the PCL with "simulated." For example, use "PMU Switch – "Simulated Off". During your airborne EP training, **DO NOT** actually manipulate switches or position the PCL to OFF in flight. In response to "PCL" – "Simulated Off" the instructor will set the power to 4 to 6 percent to simulate the feathered propeller condition, when appropriate.

An alert crewmember is constantly on the lookout for suitable landing fields in the event of an actual emergency. If available, a 5000 feet or longer, hard-surfaced runway with no obstructions (trees, power lines, etc.) on the approach end is ideal. The absolute minimum recommended field length for *emergency* operations is 3000 feet. Always be aware of wind direction and velocity. A strong headwind is helpful in many respects, but it can make an ELP a challenge, *especially* for forced landings. Visually, the best wind indicator is blowing smoke. If unable to determine the winds, use your last known wind.

704. PRACTICE ELP PROCEDURES

1. Receive the appropriate clearance for high key entry from tower control, RDO, or approach control (if applicable).

2. Manage energy accordingly to arrive at High Key on altitude with proper runway displacement.

3. Report "High Key" to controlling agency (as required)

4. Maintain airspeed on ELP IAW Forced Landing Procedures, even if simulating a PEL.

5. Complete the BEFORE LANDING Checklist

6. Arrive at Low Key on altitude with proper runway displacement. Report "Low Key, Gear Down" to controlling agency.

7. Lower Flaps as required.

NOTES

1. Do not lower flaps to LDG until landing is assured. Because drag will increase dramatically once landing flaps have been lowered, attempt to utilize LDG flaps more as means to shorten landing roll and less as a means to manage energy in the ELP.

2. At low key, do not lower the flaps if below profile. If engine power is available (PEL), add power to maximum allowable per

emergency procedure, regain profile, and select flaps to TO. If without power, continue on the ELP, modify ground track if required, regain profile, and select flaps as required.

705. EMERGENCY VOICE REPORTS

The FIH, Section A directs all communication (verbal and non verbal) for aircraft in distress. Ensure you bring the FIH on all flights for reference.

Emergency voice reports are presented with the Identification, Situation, Position, and Intention (ISPI) format. Emergency voice reports of an immediate or serious nature are prefaced with "MAYDAY, MAYDAY, MAYDAY." Emergency reports of a delayed or less serious nature are preceded with "PAN-PAN, PAN-PAN, PAN-PAN." An example of an emergency voice report of an engine failure is as follows:

"MAYDAY, MAYDAY, MAYDAY, Call Sign, engine failure, five miles northeast of Barin OLF at 6000 feet, executing forced landing at Barin, Runway 09."

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CHAPTER EIGHT
AEROBATICS

800. INTRODUCTION

The FAR AIM defines aerobatics as an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight. The instructor will fly aerobatics as demonstration items on your contact checkride, but also may fly them on other contact flights, depending on your tolerance to airsickness. SNFOs are responsible to know the geometric shapes of the maneuvers, as well as their defining parameters (Figure 8-1).

Aerobatic Maneuver	Entry Airspeed	Gs Required	Altitude Change	Exit Airspeed	Energy Classification
Loop	230 – 250	High	NC	230 - 250	Neutral
Wingover	200 – 220	Low	NC	200 - 220	Neutral
Barrel Roll	200 – 220	Moderate	NC	200 - 220	Neutral
Aileron Roll	180 – 220	Low	NC	200 - 220	Loser
Split S	120 – 140	High	- 2500 feet	220	Neutral
1/2 Cuban Eight	230 – 250	High	NC	230 - 250	Neutral
Chandelle	200 – 250	Moderate	+ 3000 feet	Flying A/S	Gainer
Cloverleaf	200 – 220	Moderate/High	NC	200 - 220	Slight Loser
Immelmann	230 – 250	High	+ 2500 feet	Flying A/S	Gainer

Figure 8-1 Aerobatic Maneuver Parameters

Prior to performing aerobatic maneuvers, perform an Anti-G Straining Manuever (AGSM), complete the Pre-Stalling, Spinning, and Aerobatic Checks, and accomplish a clearing turn. Start your aerobatic maneuvers from an altitude which will permit a complete maneuver and a return to straight and level flight at or above 6000 feet. You must not exceed the maximum altitude permitted for your operating area. Many aerobatic maneuvers performed require approximately 2500 feet vertically.

801. G-INDUCED LOSS OF CONSCIOUSNESS

G-induced loss of consciousness (G-LOC) is a fainting episode caused by gravity-induced physiological changes on the human body. G forces are common when pulling out of a high speed dive, or during a high AOB turn. The G force is felt from head to foot and gives the feeling of being squashed down in the seat. Positive Gs cause blood to pool in the lower body extremities. This pooling dramatically reduces the available blood to the brain and eyes, thereby reducing the oxygen required to maintain consciousness and vision.

An impending sign of G-LOC is “grayout” in which there is a loss of peripheral vision. In “blackout”, vision is lost completely. GLOC usually coincides with blackout and lasts from 15-30 seconds. When the aviator wakes, it is to a disoriented or “dream-like” level of consciousness, which can last from only a few seconds to several minutes. Amnesia, uncontrollable muscle spasms, and a feeling of weakness are common occurrences. This impaired ability to fly may last as long as 30 minutes.

The Air Force and Navy have reported numerous Class A mishaps since identifying G-LOC as a possible causal factor for aircraft accidents. The Air Force estimates at least 12% of all fighter/trainer pilots have experienced G-LOC at least once. The G loading capability of the T-6A is comparable to most fighter/trainer jets and is therefore notorious for causing G-LOC among new pilots. Most G-LOC incidents in similar aircraft occur during G loading of 3 to 5 Gs during rapid G loading intervals of two to five seconds.

802. THE ANTI-G STRAINING MANEUVER

There are two components to the recommended Anti-G Straining Maneuver (AGSM):

1. A continuous and maximum contraction (if necessary) of all skeletal muscles including the arms, legs, chest, and abdominal muscles (and any other muscles if possible). Tensing of the skeletal muscles restricts blood flow in the G dependent areas of the body and thereby assists in the retention of blood in the thoracic (chest) area, the heart and brain.

2. The second component of the AGSM involves repeated closing of the respiratory tract at 2.5 to 3.0 second intervals. Its purpose is to counter the downward G force by expanding the lungs and increasing chest pressure, thereby forcing blood to flow from the heart to the brain.

The respiratory tract is an open breathing system which starts at the nose and mouth and ends deep in the lungs. It can be completely closed off at several different points, the most effective of which is the glottis. Closing the glottis (which is located behind the “Adam’s Apple”) yields the highest increase of chest pressure. The glottis can be closed off by saying the word “HICK” and “catching” it about ¾ of the way through the word (“Hiii-“). This should be said following a deep inspiration, followed by forcefully closing the glottis as you say “HICK.” Bear down for 2.5 to 3.0 seconds, and then rapidly exhale by finishing the word HICK (“ka). This is immediately followed by the next deep inhalation repeating the cycle until the G loading is discontinued. The exhalation and inhalation phase should last no more than 0.5 to 1.0 second.

NOTES

1. Do not hold your respiratory straining too long (more than five seconds) since this will prevent the proper returning of blood to the heart and may result in loss of consciousness.

2. Anticipate a rapid-onset, high G exposure whenever possible. The skeletal muscles should be tensed prior to the onset of Gs and coupled with the “Hick” cycle as the increasing of G's begins. Initiating the AGSM too early can inhibit the body’s natural cardiovascular reflex responses. Starting the AGSM too late is a difficult situation to make up without reducing the G- stress.

3. If you have trouble or are in doubt about using the AGSM correctly, see your Wing Aeronautical Medical Safety Officer (AMSO) or squadron flight surgeon.

803. LOOP

The loop is a 360º turn in the vertical plane. Since it is executed in a single plane, the primary control surface used is the elevator. Ailerons and rudder are used for coordination and directional control. The objective of this maneuver is to maintain a constant nose track. (Figure 8-2).

The loop begins from straight and level flight and passes successively through a climb, inverted flight, a dive, and a return to level flight. The loop teaches understanding of the elevator in aerobatics, and situational awareness throughout the entire range of pitch angles. The loop is probably the oldest and one of the simplest aerobatic maneuvers, yet one which requires finesse to do well.

Figure 8-2 The Loop

804. WINGOVER

The wingover is a 180º reversal in the direction of flight accomplished by combining a smooth climbing turn of 90º with a smooth diving turn of 90º, recovering at the same airspeed and altitude at which the maneuver has started, but on the opposite heading (Figure 8-3). It is a slow, smooth maneuver when properly executed. No abrupt control movements are necessary.

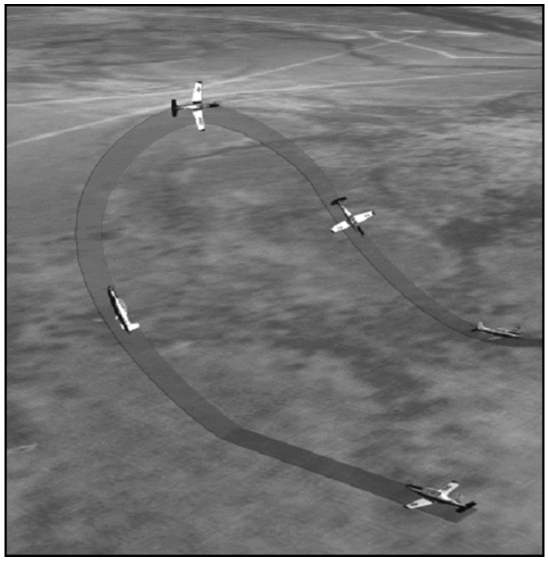

Figure 8-3 Wingover

805. BARREL ROLL

The barrel roll is a maneuver in which the aircraft is rolled 360º about an imaginary point 45º off the nose of the aircraft.

The barrel roll will help develop your confidence, coordination and situational awareness while flying the aircraft through rapidly changing attitudes and airspeeds. Since attitude, heading, bank and altitude change rapidly, this is an excellent maneuver for developing your ability to maintain orientation.

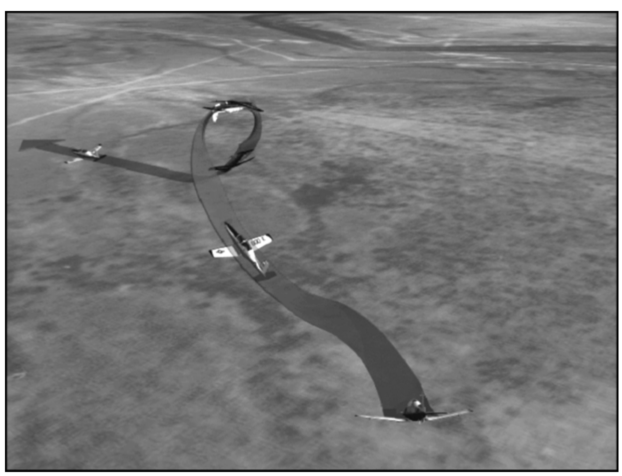

Figure 8-4 Barrel Roll

806. AILERON ROLL

The aileron roll is a 360º roll about the longitudinal axis of the aircraft. Roll at a rate to return the nose to the horizon as the wings return to level and reestablish straight and level flight.

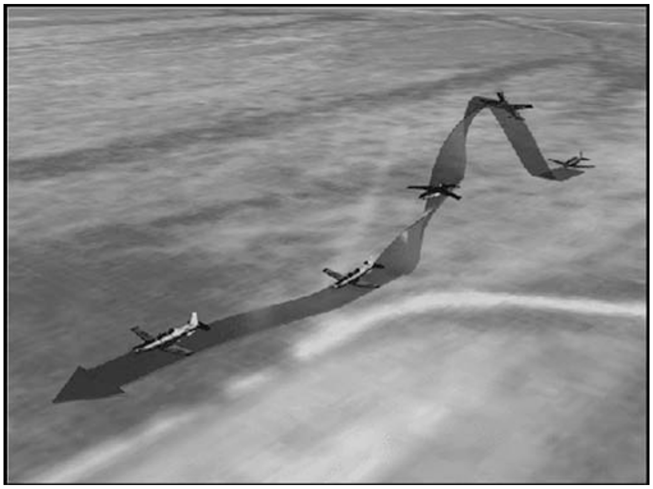

Figure 8-5 Aileron Roll

807. SPLIT-S

The Split-S maneuver combines the first half of an aileron roll with the last half of a loop. By seeing this maneuver demonstrated you will develop an appreciation of how rapidly airspeed increases and altitude decreases in such a situation.

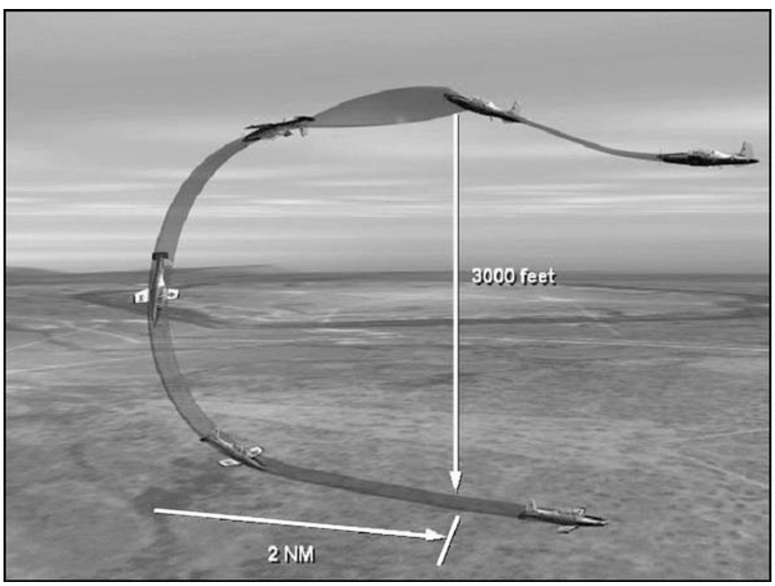

Figure 8-6 Split S

808. ONE-HALF CUBAN EIGHT

The one-half Cuban Eight starts with the first half of a loop and continues to a point where you are inverted, nose 30º below the opposite horizon. At this point a half roll is performed to a wings level attitude in a 45º dive. Commence a recovery to level flight. The maneuver accomplishes a 180° change in direction.

Figure 8-7 One-Half Cuban Eight

809. IMMELMANN

The Immelmann is the combination of the first half of a loop followed by a half-roll to the wings level attitude (Figure 8-8). It achieves a 180º change of direction and a gain in altitude (approximately 2500 feet).

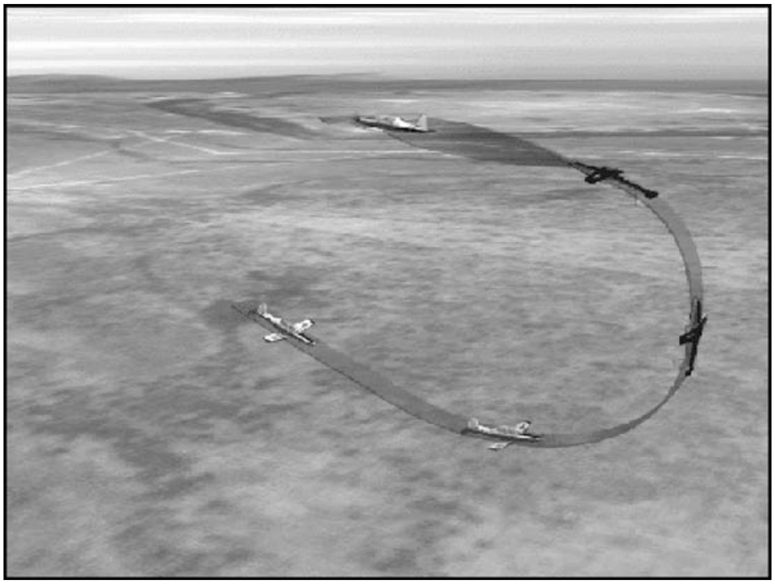

Figure 8-8 Immelmann

810. CHANDELLE

The chandelle is a180° steep climbing turn with a maximum gain of altitude. During the maneuver, the nose of the aircraft tracks along a line at a constant angle to the horizon. In a properly executed chandelle you should:

1. Keep the nose of the aircraft rising at a constant rate during the climb.

2. Achieve the maximum altitude gain possible and still have enough airspeed to return to level flight without stalling the aircraft.

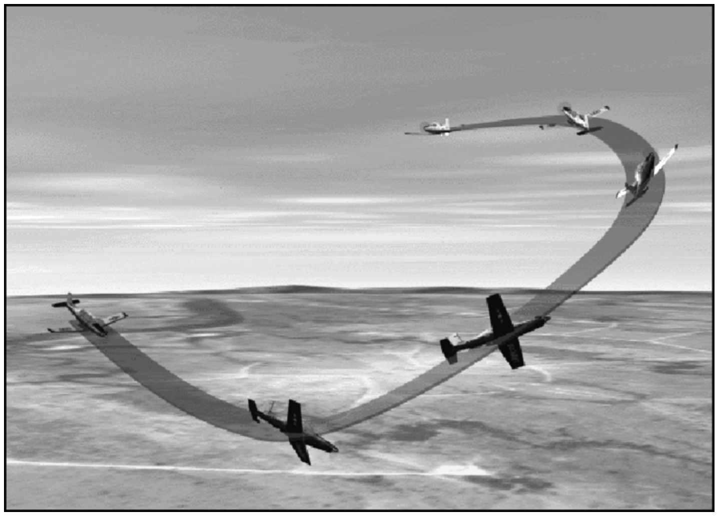

Figure 8-9 Chandelle

811. CLOVERLEAF

The cloverleaf is composed of four identical leaves, each begun 90° from the preceding one. The pull-up resembles a nose high power-on stall entry followed by a nose high recovery. The diving portion of the cloverleaf is like a modified loop or split S.

In a properly executed cloverleaf you should complete all four leaves in succession with no repositioning between leaves. The nose should be pointed at the 90° reference and be wings-level inverted passing through the horizon on each leaf.

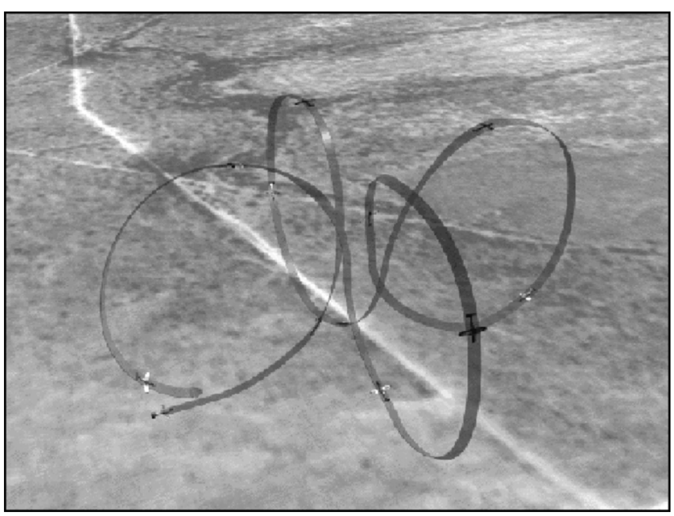

Figure 8-10 Cloverleaf

CHAPTER NINE
NIGHT CONTACT

900. INTRODUCTION

Your night contact flight is designed to expose you to the night flying environment and familiarize you with the fundamentals of night flying. Many military operations are launched at night to negate the enemy threat. Consequently, basic night operating skills have increased in their importance to mission accomplishment.

901. NIGHT FLYING PHYSIOLOGY

You will remember from previous lectures on flight physiology that the eye uses different parts for night vision (rods) than for day vision (cones). Because these components function differently, there are a few considerations to prepare your eyes for night vision.

First, allow adequate time for your vision to adapt to the night. Secondly, minimize the use of white light, immediately before, and during flight. Bright light degrades your night vision. Just as you don't stare directly into oncoming headlights when driving at night, the same thing applies in the aircraft. Avoid staring at lights or objects. Instead, maintain a visual scan around them.

The lack of visual cues and a well-defined horizon at night can have several physiological effects on a pilot. Listed below are some of the common ones.

Vertigo

Vertigo is a feeling of dizziness or disorientation. Lack of a well-defined horizon can trigger vertigo, as can taking off from a well-lit runway environment into darkness. Vertigo can also be brought on from flashing strobe lights while flying through clouds. If you encounter vertigo, trust and use your instruments.

Visual Illusions

Night also makes you more susceptible to visual illusions. Lack of visual cues and human physiology can team up to cause visual auto-kinesis, or the apparent motion of stationary objects. This can create difficulty distinguishing between moving and stationary objects. Maintain a good cross-check and do not stare at objects when night flying.

Perception

Earth and sky blend together and can be perceived as reversed, especially over water, or sparsely populated areas.

Estimating Distance

At night, the lack of visual clues degrades perception of distance. Bright aircraft, obstacles, or city lights appear closer than they really are.

902. PERSONAL PREPARATION

In addition to the normal flight equipment required for day flight operations, all aircrew on night flights require an operational flashlight and clear visor. Review the operation of aircraft interior and exterior lighting in the T-6A NATOPS.

Come to the preflight briefing prepared to discuss two types of electrical failures per the T-6 NATOPS Flight Manual: generator failure and complete electrical failure. Electrical power is of great importance at night because of the need for interior and exterior lighting, two-way communications, and navigational equipment. An aircraft with no electrical power is virtually invisible at night, and difficult to navigate.

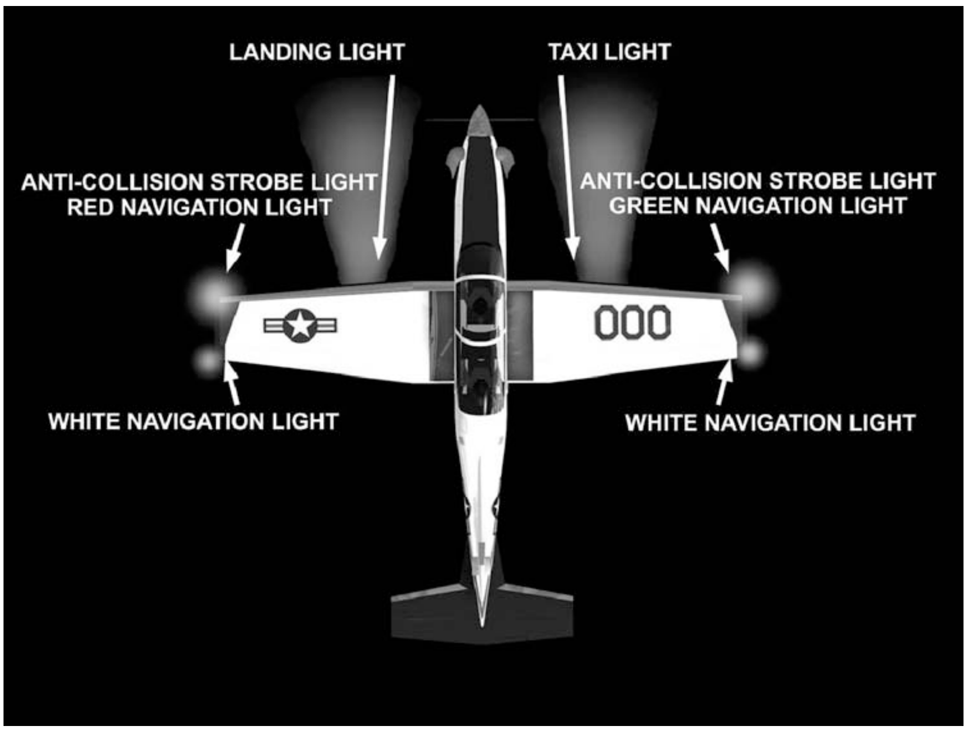

Figure 9-1 T-6A Exterior Lighting

903. PREFLIGHT PROCEDURES

The night pre-flight will include all items checked on day pre-flights with the following additions:

1. Check the operation of all interior lights in both cockpits during the cockpit check.

2. With the battery on, complete a check of all exterior lights. Conduct a walk-around of the aircraft to ensure operation of all exterior lights. Ensure any discrepancies are corrected prior to flight.

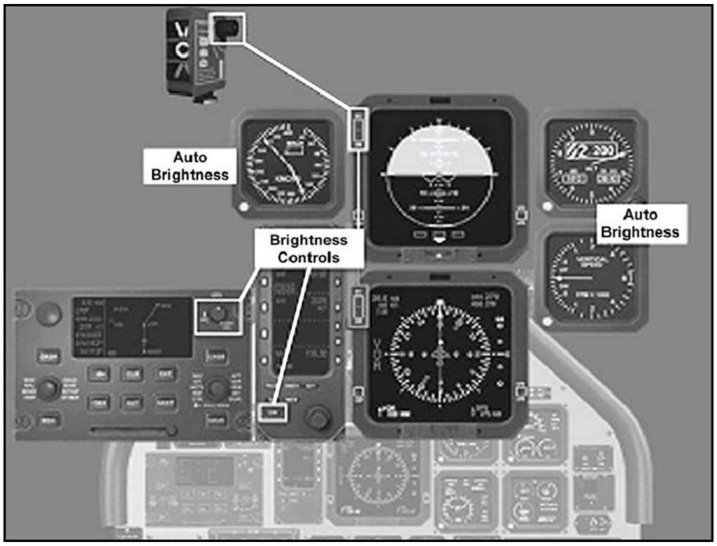

Figure 9-2 T-6A Instrument Panel Lighting

904. START

The start will be accomplished in the same manner as daylight operations except the NAV lights switch will be in the ON position and the ANTI-COLLISION (strobe) lights will be OFF. Cockpit lights will dim during start, so it is recommended you turn the INST FLOOD lights FULL BRIGHT before starting. After start, continue to dim the INST FLOOD lights and LEDs as your eyes become adjusted to the darkness.

When the pilot is ready for the start, he/she will signal the lineman (if available) by rotating the flashlight at the lineman or if ambient light permits use appropriate hand signals for clearance to start. The lineman will repeat the signal with the wand or appropriate hand signal.

905. TAXI

Lack of outside references and depth perception makes taxiing at night a challenge. Use the GPS to monitor taxi speed. Consideration will be given to courteous use of lights to avoid the disorientation of other aircraft, ground support, and tower personnel. If there is any doubt as to your position on the field or any confusion caused by light signals, STOP!

906. NIGHT FIELD LIGHTING

BLUE LIGHTS: Blue lights mark all taxiways. There should be blue lights on both sides of the taxiway.

WHITE LIGHTS: White lights mark the boundaries of the duty runway.

GREEN LIGHTS: Green lights mark the threshold of the duty runway.

RED LIGHTS: Red lights mark all obstructions on the airfield.

ROTATING BEACON: There is a rotating white and green beacon located at fields that are open for night operations. A military airfield's white light will be split by a three degree void. This will give the impression there are two separate, closely timed flashes of light. A civilian beacon only has one flash of light and can be easily distinguished from a military field.

Memorize the following **Airport Traffic Control Light Signals** (a.k.a. Aldis lamp signals). These are standard throughout military and civilian aviation. As the name implies, these light signals are displayed from a colored light gun in the tower, normally in response to radio malfunctions.

Meaning			
Color and Type of Signal	**Movement of Vehicles, Equipment and Personnel**	**Aircraft on the Ground**	**Aircraft in Flight**
Steady green	Cleared to cross, proceed or go	Cleared for takeoff	Cleared to land
Flashing green	Not applicable	Cleared for taxi	Return for landing (to be followed by steady green at the proper time)
Steady red	STOP	STOP	Give way to other aircraft and continue circling
Flashing red	Clear the taxiway/runway	Taxi clear of the runway in use	Airport unsafe, do not land
Flashing white	Return to starting point on airport	Return to starting point on airport	Not applicable
Alternating red and green	Exercise extreme caution	Exercise extreme caution	Exercise extreme caution

Figure 9-3 Airport Traffic Control Light Signals

CHAPTER TEN
CONTACT INSTRUCTOR MANEUVERS

1000. INTRODUCTION

This chapter is designed to provide supplemental information to T-6A Instructors Under Training (IUT). It provides procedures and amplification to instructor-only items you will see during your upgrade training as well as normal student contact maneuvers. Maneuver guidelines and common student errors are provided. Students are not responsible for the information in this chapter.

1001. GROUND OPERATIONS

Ejection seat and CFS safety is of utmost importance. You are responsible for the safety of your student and nearby ground personnel. Be vigilant that you and your student stow and replace the safety pins in the right place at the right time per the NATOPS Flight Manual.

1002. CONTACT MANEUVERS

Bottom line: Since the emphasis of SNFO training is not on developing hands-on flying skills, remain conservative and never allow procedural or basic air work deviations to progress to something unsafe.

Takeoff Common Errors:

1. Not disengaging NWS.

2. Failure to maintain directional control during takeoff roll through improper use of the rudder.

3. Not assuming takeoff attitude at 85 KIAS.

4. Not relaxing back stick pressure as necessary to maintain takeoff attitude, hence over-rotating.

5. Pulling aircraft off the deck prematurely or over controlling.

6. Improper crosswind controls.

7. Failure to verbally report gear and flaps up, as appropriate.

NOTE

The T-6A is susceptible to crosswinds raising the upwind wing. Do not allow the student to let a bad situation develop by not maintaining aileron into the wind.

Turn Pattern Common Errors:

1. Gaining altitude in reversals. Usually, this is from not lowering the nose as the wings pass level flight attitude.

2. Not properly clearing the area in the direction of turn.

3. Not increasing back stick pressure during the 45° AOB and consequently descending.

Level Speed Change Common Errors

Guard the gear handle! Students can easily over-speed the gear.

Power Off Stall Common Errors:

1. While decelerating, allowing the nose to drop during the clearing turn, resulting in descent.

2. Not trimming for 125 KIAS glide.

3. Lowering the nose too far during recovery, resulting in excessive loss of altitude.

4. Breaking the lower MOA vertical boundary because of the cumulative altitude lost during maneuver.

Approach Turn Stall:

Stress to your students that stall recoveries are not mechanical step-by-step procedures. Instead, they need to develop the ability to simultaneously reduce the angle of attack while adding power and leveling the wings.

Approach Turn Stall Common Errors:

1. Failure to maintain AOB during entry.

2. Reducing power to idle before nose is raised to 5-10 degrees.

3. Failure to sufficiently hold the nose up prior to the stall.

4. Not recognizing the “buffet” as an approach to stall indication.

5. Dumping the nose on recovery, resulting in excessive altitude loss.

6. Not aggressively max performing the aircraft to minimize altitude lost.

7. Cycling rudders in an attempt to keep the ball centered before flying speed is attained.

8. Not verifying a positive climb and verbalizing "aircraft climbing."

9. Nose attitude too high on recovery causing a secondary stall.

NOTES

1. Instructors should not allow a poor ATS recovery to progress into departure from controlled flight. If this does occur, immediately assume control of the aircraft and recovery via the Inadvertent Departure From Controlled Flight Emergency Procedure in the NATOPS Flight Manual.

2. IUTs may practice the ATS with LDG, TO, or no flaps. If practicing the maneuver with flaps LDG, remember to select flaps TO immediately after the power addition. Students will only accomplish this maneuver with TO flaps as per the Chapter Five ATS procedure.

1003. SPIN

Refer to the current T-6A NATOPS Flight Manual, Chapter Six for amplified spin discussions.

The Ejection Decision: The T-6A is a very safe and stable spinning platform, however, the unforeseen can always happen. Do not make a bad situation worse by trying to recover an aircraft that may not be recoverable within the envelope for a safe ejection. Do not wait until you are in out-of-controlled flight to think how you are going to treat this situation. In the T-6A, expect to lose approximately 500 feet per turn with an additional 1500 to 2000 feet for a normal post-spin, dive recovery. The NATOPS Flight Manual specifies the ***recommended minimum*** altitude for uncontrollable ejection is 6000 AGL. Discuss with the student your personal ejection minimums, as well as other considerations such as airspace and weather, that will aid in making a safe decision to get out of the aircraft, should the need arise.

Spin Common Errors:

1. Not reducing PCL to idle.

2. Being slow to recognize a steady state spin

3. Not momentarily neutralizing the controls as the rotation stops.

4. Placing the stick in the wrong position during recovery (too far forward or aft).

5. Commencing the pullout too rapidly and/or too early, resulting in a secondary stall.

6. Not reporting oil pressure over the ICS prior to advancing power.

1004. PRECAUTIONARY EMERGENCY LANDING IN THE PATTERN

Much of the same general PEL discussion in Chapter Seven applies to this maneuver as well. The Precautionary Emergency Landing In The Pattern (PEL (p)) affords you the opportunity to practice intercepting the ELP somewhere below high key to the duty or an off-duty runway. The instructor will initiate the PEL (p) at or above 500 feet AGL.

Per the T-6A NATOPS Flight Manual procedure, use the specified power setting and clean up the aircraft as you turn toward the appropriate spot on the ELP. Once you have intercepted the ELP profile, set power to 4 to 6 percent and establish the appropriate configuration for your ELP position. Since we don't normally raise the gear in the pattern be certain to not “skip over” getting the gear back down IAW the Before Landing Checklist.

Common Errors:

1. Failure to consider an off-duty runway.

2. Excessive AOB, resulting in a “tight” low key position.

3. Not maintaining 140 KIAS in the climb as appropriate.

4. Failure to use power when below ELP profile.

5. Excessive altitude at low key

6. Failure to complete the Before Landing Checklist.

1005. AEROBATICS PROCEDURES

NOTE

The following procedures amplify for the IP what is written specifically for the SNFO in Chapter Eight.

LOOP

The loop has six parts:

Entry

Initial pull-up

Vertical

Inverted climbing

Inverted descending

Maneuver completion

Entry: The loop begins with airspeed at 230 to 250 KIAS and MAX power. Complete the pre-aerobatic check, as necessary, then clear the area and align the aircraft with a section line or straight road that extends ahead and behind the aircraft. Check that you have enough altitude above you to complete the maneuver. You will need approximately 3000 feet, depending upon the amount of "g" force you apply in the pull-up.

Initial Pull-Up: Commence your anti-G straining maneuver and increase the back pressure to 3-4 Gs to pull the nose up at a constant rate. If you pull too fast, you may stall by exceeding the critical AOA. If you pull too slow, your airspeed will be slow over the top and you may stall there. When you can't see the horizon in front of you anymore, crosscheck the wing tips to assure they remain parallel to the horizon. Make sure you don't inadvertently bank the aircraft toward the direction you are looking while checking the wing tips.

Vertical: As the airspeed decreases in the climb, more back stick pressure is required to keep the nose tracking at a constant rate. Use right rudder pressure to keep the nose tracking in a straight line, and aileron to keep the wings level. Relax your anti-G straining maneuver as aircraft G-loading decreases.

Inverted Climbing: Shortly after passing the vertical, tilt your head back and pick up the horizon and your reference line. Once you pick up the horizon, use it as the reference to maintain wings-level. Keep the nose track constant by adjusting back stick pressure until you pass through the horizon inverted. Airspeed should be approximately 100 to 120 KIAS wings level inverted.

Inverted Descending: The last half of the loop is the opposite of the first. As airspeed increases, resume your anti-G straining maneuver and increase back stick pressure to maintain the rate of nose track. Right rudder pressure is now reduced to maintain coordinated flight. Continue cross-checking the wingtips and the ball in the turn and bank indicator to maintain wings level and to keep the nose tracking along the reference line.

Maneuver Completion: As you pass vertical and near the bottom of the loop, your airspeed rapidly increases. Continue to increase back stick pressure to keep the nose tracking at a constant rate. Use the rudder to maintain coordinated flight. Keep the nose tracking down the reference line and your wings parallel to the horizon. As the nose of the aircraft approaches the horizon, adjust the back pressure to return to the level flight attitude.

WINGOVER

A wingover is a maneuver which requires constantly changing pitch and bank. It is a slow, “lazy” maneuver.

The wingover is started from wings-level flight with airspeed at 200 to 220 KIAS and power set at 50% to 60%. Perform your pre-aerobatic check, if necessary, then clear the area and ensure that you have enough airspace above and in the direction of turn to complete the maneuver. Place a reference point off the wingtip in the direction of the desired turn. A straight road, cloud, or other prominent landmark makes good references for the wingover.

Once you are set up for the maneuver, blend aileron, rudder and elevator pressures simultaneously to start a gradual climbing turn in the direction of the reference point. Time the turn and pull-up so the nose reaches the highest pitch point (approximately 45°) when the aircraft has turned approximately 45° or halfway to the reference point. Use outside references and the attitude indicator to crosscheck these pitch and bank attitudes. Avoid rolling and turning too fast, think one degree of bank for each degree of pitch. Add lateral stick, aft stick, and rudder pressure as airspeed decreases to maintain coordinated flight, a constant roll rate, and a constant pitch rate.

As the nose of the aircraft passes the 45° reference, look ahead in the turn and find your original 90° reference. Continue the coordinated roll at a constant rate by increasing lateral stick pressure. However, relax back stick pressure so that the aircraft reaches 80 to 90° of bank as the nose reaches the horizon. The rate at which pitch decreases should be the same as it increased during the first 45° of turn. As the nose passes through the horizon, the 90° reference point should move through the center of the windscreen and the airspeed should be approximately 100 KIAS below the entry airspeed.

As the nose passes through the horizon, begin to decrease the bank gradually. When the aircraft has turned 135°, the nose should have reached its lowest attitude. The bank should diminish during the descending turn at about the same rate that it increased during the climbing turn. As airspeed increases, decrease lateral stick and rudder pressure but increase back stick pressure to maintain the pitch and roll rate in coordinated flight. Plan to arrive at the 180° point in level flight with entry airspeed. The original 90° reference point will now be off the opposite wingtip.

BARREL ROLL

Commence your clearing turn at 200-220 KIAS. Roll out of the turn on/parallel to a good section line. Establish a reference point on the horizon 90º from your heading in the direction you intend to roll.

Raise the nose to commence the maneuver and start a roll so that you travel around in an arcing path in the direction of your selected checkpoint. After 45º of turn, the AOB will be 90º and the nose will be at its highest point (approximately 55 to 60 degrees above the horizon).

Continue rolling the aircraft at a constant rate until in a wings level, inverted attitude, heading directly at the 90º reference point on the horizon. Your nose should be slightly above the horizon and the airspeed ~120 KIAS. Fly the aircraft through the inverted position and continue rolling at a constant rate, completing the maneuver on your original heading and altitude at aerobatic cruise speed. Maintain a positive G load throughout the maneuver.

The nose should appear to make an arcing path about the imaginary point on the horizon 45º from your original heading. The last half of the arc will, therefore, be the same distance below the horizon as the first half is above the horizon. Remember, as the airspeed decreases toward the top of the maneuver, it is necessary to increase the deflection of the ailerons, rudder, and elevator to maintain a constant rate of roll and nose movement. Additionally, as the airspeed increases toward the bottom of the maneuver, it is necessary to decrease the deflection of the ailerons, rudder, and elevator to maintain a constant rate of pitch and roll. Notice this roll is started as a climbing turn, and then becomes a continuous roll at a constant rate.

AILERON ROLL

The aileron roll begins from straight and level flight with airspeed at 180 to 220 KIAS and torque set 80% to MAX. To set up for the aileron roll, complete the pre-aerobatic checklist, as necessary, and check your altitude and position before you begin the maneuver. Clear the area, with particular attention in front and above your position. Once you're aligned with a reference point, perform a wings-level pull-up to a pitch angle 20°- 30° above the horizon. Relax back stick pressure prior to initiating the roll.

After relaxing backpressure, begin a brisk coordinated roll in either direction with lateral stick and rudder. The amount of stick deflection determines your roll rate. Hold constant lateral stick and rudder pressure and allow the nose to fall. A roll to the left requires less rudder and aileron deflection than a roll to the right due to engine torque. Do not apply additional back stick pressure to hold the nose on a point or above the horizon. Your roll rate should be fast enough to keep the nose above the horizon as you pass inverted flight.

As you approach the wings level attitude, gradually release aileron and rudder pressure to ensure a coordinated return to wings level.

SPLIT-S

At an entry airspeed of 120 - 140 KIAS, raise the nose to approximately 20° pitch attitude. Relax back stick pressure and momentarily pause in this nose high attitude. The pause is so you don't pull off your reference line when you roll. Roll the aircraft to the wings level inverted attitude.

Once wings level inverted, apply back stick pressure to bring the nose through the horizon. Attempt to achieve maximum nose track, without stalling the aircraft, by applying back pressure between the stick shaker and approximately 17 units AOA. Increase back stick pressure as the airspeed increases to continue maximum performance flight during the pull-through. Apply rudder as necessary to maintain coordinated flight throughout the pull-through. As the nose of the aircraft approaches the horizon, relax back stick pressure at the appropriate lead point and return to level flight. A good lead point for relaxing back pressure is when the horizon crosses the canopy bow.

ONE-HALF CUBAN EIGHT

Do your pre-aerobatic check, if required, then clear the area and align the aircraft either over or parallel to a straight road, section line, or beach line. Check your position and altitude to ensure that you have sufficient altitude above and airspace ahead and behind to do the maneuver.

Begin the Cuban Eight just like the loop and Immelmann with a 3-4 G, wings-level pull. Keep the nose moving upward at a constant rate. Maintain wings level flight after the horizon goes below the nose of the aircraft by cross-checking the wingtips as in a loop. Remember to increase right rudder as airspeed decreases to maintain coordinated flight. After you pass through the vertical, tilt your head up and find the opposite horizon. Use aileron as necessary to keep the wings-level as you pass through the horizon wings-level inverted.

As the nose approaches approximately 45° nose low, relax back stick pressure and perform a half-roll in either direction with lateral stick and rudder. Remember to use opposite rudder during the first 90° of roll and coordinated rudder the last 90° of roll. The nose of the aircraft should roll around a point on the ground directly in front of you. After the roll, the aircraft should be wings-level, 45° nose low, and aligned or parallel to your reference line.

The ground point that the aircraft rolled around during the half-roll is now the aimpoint for the wings-level dive. Maintain the ground reference in the same point of the windscreen and perform a wings-level dive until reaching your lead point to begin the pull-up for the second leaf. A good lead point for the pull-up is about 35-40 knots below entry airspeed. Begin a wings-level pull at 3-4 Gs so that the nose of the aircraft passes through the horizon at briefed entry airspeed. You will also be near your entry altitude at the end of the dive.

IMMELMANN

Begin the Immelmann just like the loop with a 3-4 G, wings level pull. Keep the nose moving upward at a constant rate. Maintain wings-level flight after the horizon goes below the nose of the aircraft by cross-checking both wingtips equal distance from the horizon. Moderate right rudder pressure is required to keep the aircraft coordinated as airspeed decreases. After you pass through the vertical, tilt your head up and find the opposite horizon. Use aileron and rudder as necessary to keep the wings-level as you approach the horizon wings-level inverted.

As the aircraft reaches a point approximately 10° above the horizon inverted, check your airspeed and freeze back stick pressure to stop the nose track. Do not begin the half-roll unless you can remain safely above level flight stall speed during the roll-out. Apply aileron in either direction to initiate a roll to level flight. During the first 90° of roll, rudder should be opposite to the applied aileron pressure. Rudder will be reversed and coordinated in the same direction as applied aileron in last 90° of roll. During the half-roll, the nose remains above the horizon and does not move either left or right. Maintain positive seat pressures throughout the roll.

The nose of the aircraft should not move either left or right during the half-roll. This is accomplished by using rudder to counteract the turning effect of lift. For a half-roll to the right you would use right stick and left rudder the first 90°, and right stick and right rudder the last 90°.

CHANDELLE

The entry parameters for the chandelle are 200 to 250 KIAS with MAX torque. Once you are set up for the maneuver, look in the direction of turn and blend rudder, aileron, and elevator pressure simultaneously to begin a climbing turn. Allow the bank to keep increasing and the nose to keep rising at a constant rate. Time the bank and pitch increase so that the aircraft passes through the horizon in 60° of bank after having turned 30-45°.

After passing through the horizon, maintain 60° of bank and continually increase back stick pressure as the airspeed decreases to keep the nose track constant. You may have to apply lateral stick and rudder pressure opposite the direction of turn as the airspeed decreases to keep the bank angle at 60°. Check your outside references to monitor the amount of turn. Passing 135° of turn, begin the roll-out.

During the roll-out, lift is being gained from decreasing bank but lost from decreasing airspeed. Maintain or increase back pressure as required to keep the nose rising at a constant rate and apply lateral stick and coordinated rudder to level the wings. Observe your reference point and adjust the roll rate so that the wings become level and the nose reaches the highest pitch attitude (about 40-45° nose high; feet on the horizon) at 180° of turn. Hold this pitch attitude momentarily to gain the last bit of altitude possible before returning to level flight. Do not allow the aircraft to stall. The reference point should now be off the opposite wingtip.

After holding the nose momentarily at the highest pitch attitude, lower the nose to wings-level flight without losing altitude. Your airspeed should be above stall speed and sufficient to maintain altitude. The aircraft heading should be 180° from the entry heading.

CLOVERLEAF

The cloverleaf is composed of four identical leaves, each begun 90° from the preceding one. The pull-up resembles a nose high power-on stall entry followed by a nose high recovery. The diving portion of the cloverleaf is like a modified loop or split S.

Begin the cloverleaf in wings level flight at 200 to 220 KIAS and power set at MAX. Ensure that you have enough altitude above and in all directions to perform the maneuver and remain in your area. Perform your pre-aerobatic check, if necessary, before beginning the cloverleaf. Remember to clear the area before and during the maneuver. Align the aircraft with a straight ground reference to start, then find a ground reference or cloud off the wingtip in the direction that you are going to turn, like in a wingover or barrel roll.

Once you have aligned the aircraft with your outside reference and found your first 90° reference, begin a wings level pull-up like you would for a loop with slightly lower G loading (2-3 Gs). Continue the pull-up until you reach 45° nose high (feet on the horizon).

When the aircraft reaches 45° nose high, begin a coordinated roll toward the 90° point. Allow the nose to continue climbing during the roll to decrease your airspeed and keep the maneuver slow and lazy. The roll rate starts slowly at first, then increases as the airspeed and turn radius decrease. Control roll and pitch so that the aircraft passes through the horizon wings-level inverted, pointed at the 90° reference, at a low airspeed (approximately 120 KIAS). If you roll too fast you will undershoot the point. Rolling too slow or pulling too much tends to cause overshooting the point.

As the nose passes through the horizon, begin a coordinated, wings-level pull-through just like a split S. You want to apply and hold more back pressure at the start of the pull-through than during the later part. This keeps the airspeed from rapidly increasing at first and avoids excessive Gs at the bottom of the pull-through. The nose should track along a line on a heading 90° from the entry heading but in the opposite direction of the first turn. Lead the pull-up so that the nose passes through the horizon at the entry airspeed.

Do not pause in level flight but begin the next leaf in the same direction. Reduce back stick pressure as the nose passes through the horizon to the amount of pull that you used on the first leaf pull-up. This will keep the aircraft from climbing too quickly to 45° nose high. Find your next 90° reference during the pull-up and perform the second and subsequent leaves in the same manner as the first leaf.

The cloverleaf is complete after all four leaves are accomplished and the aircraft is in straight and- level flight after the fourth leaf. The aircraft should be on entry airspeed and heading.

APPENDIX A
GLOSSARY OF TERMS

A100. INTRODUCTION – N/A

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APPENDIX B
LIST OF ACRONYMS

ADB - Aircraft Discrepancy Book

AGL - Above Ground Level

AGSM - Anti-G Straining Maneuver

AIM - Airman's Information Manual

a.k.a. - also known as

AMSO - Aeromedical Safety Officer

AOA - Angle of Attack

AOB - Angle of Bank

AOPA - Aircraft Owners and Pilot Association

ASOS - Automated Surface Observing System

ATC - Air Traffic Control

ATIS - Automatic Terminal Information Service

ATS - Approach Turn Stall

CFS - Canopy Fracturing System

CNATRA - Chief of Naval Air Training

CNETINST - Chief of Naval Education and Training Instruction

CRM - Crew Resource Management

EADI - Electronic Attitude Direction Indicator

EHSI - Electronic Horizontal Situation Indicator

ELP - Emergency Landing Pattern

EP - Emergency Procedure

FAR - Federal Aviation Regulation

FIH - Flight Information Handbook

FLIP - Flight Information Publication

FOD - Foreign Object Damage

FTI - Flight Training Instruction

GLOC - Gravity-induced Loss of Consciousness

GPS - Global Positioning System

IAW - In Accordance With

ICS - Integrated Communications System

IFR - Instrument Flight Rules

IMC - Instrument Meteorological Condition(s)

IP - Instructor Pilot

ISPI - Identification, Situation, Position, Intention

IUT - Instructor Under Training

JPATS - Joint Pilot Aircraft Training System

KIAS - Knots Indicated Airspeed

LDG - Landing

MAF - Maintenance Action Form

MNTS - Multi-Service Navigator Training System

MOA - Military Operating Area

MSL - Mean Sea Level

NACWS - Naval Aircraft Collision Warning System

NALCOMIS - Naval Aviation Logistics Command Information System

NATOPS - Naval Air Training and Operating Procedures Standardization

NFO - Naval Flight Officer

NWS - Nose Wheel Steering

OCF - Out-of-Control Flight

OLF - Outlying Field

PAT - Power Attitude Trim

PCL - Power Control Lever

PEDD - Primary Engine Data Display

PEL - Precautionary Emergency Landing

PEL(p) - Precautionary Emergency Landing in the Pattern

PMU - Power Management Unit

RDO - Runway Duty Officer

SA - Situational Awareness

SNFO - Student Naval Flight Officers

SLOJ - Sudden Loss of Judgment

SSK - Seat Survival Kit

TAD - Trim Aid Device

TAS - Traffic Advisory System

TO - Takeoff

TTO - Training Time Out

UDC - Unit Developed Checklist

UTD - Universal Training Devices

VFR - Visual Flight Rules

VSI - Vertical Speed Indicator

WTD - Wingtip Distance