CFP 146

MANUAL OF FLYING TRAINING (EXPEDITOR)

Issued on the Authority of the
Air Officer Commanding Training Command

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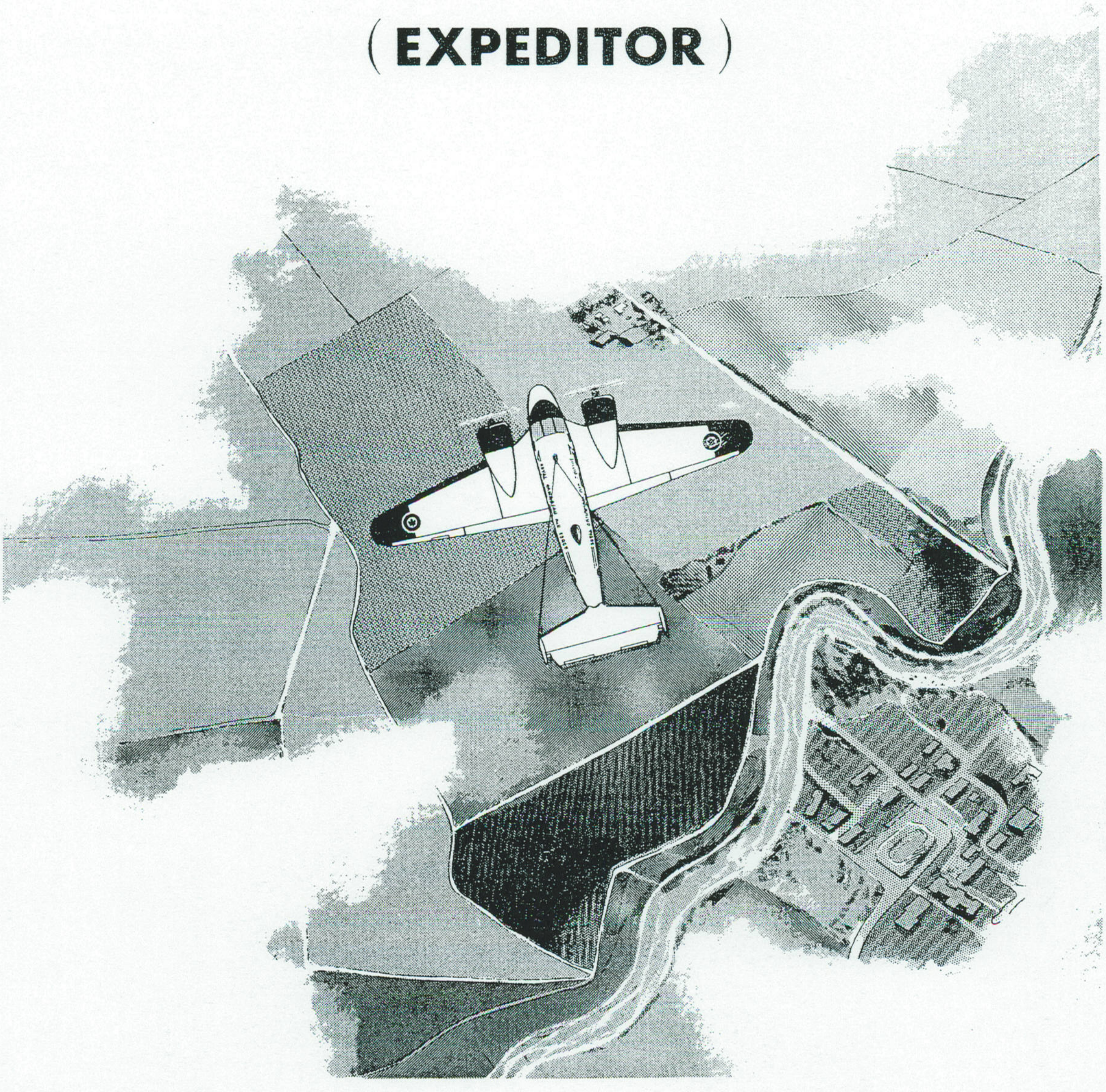

PREFACE

Manual of Flying Training (Expeditor) is the basic publication for students on the twin-engine advanced flying course.

Individuals may correspond directly with the CFS editor when suggesting improvements to this publication. Units making official recommendations shall use normal channels to TCHQ.

March 1966

RECORD OF AMENDMENTS

The amendments promulgated in the undermentioned Amendment Lists have been made in this publication.

Amendment List		Amendment Made By	Date
Number	Date		

INTRODUCTION

This publication has been prepared to supplement the flying instruction taught at 3 FTS and to assist the student to learn to fly the Expeditor aircraft. It provides study material which is designed to help the student to prepare for his pre-flight briefings and air instruction.

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CHAPTER 1

STUDENT PREPARATION

1.01 - INTRODUCTION

(1) Military pilots must be skilled and highly competent. Initiative, good judgement, trained reflexes and skilful techniques are all attributes of good airmanship and contribute towards your becoming a professional pilot. On graduation you will be awarded your pilot's "wings" which signify that you have taken your place among the graduate pilots of the Canadian Armed Forces.

(2) This manual is designed to help you to convert to the Expeditor. Close co-ordination between the classroom and the flight line is a pre-requisite, since each clarifies and enhances the other. Theory mastered in the classroom builds up the knowledge and confidence that you require to fly the aircraft well. The information given in this manual, together with ground school instruction, is the foundation on which your instructor will base your flying training.

1.02 - PHYSICAL CONDITION AND MENTAL ATTITUDE

(1) Your physical condition is important. If flying lessons are to be absorbed quickly and completely, you should have a reserve of physical stamina. Nevertheless, even if you are in top condition, the first few days on the flight line are apt to be fatiguing, owing to mental stress. Try to keep your mind free to take in everything that your instructor says.

1.03 - QUESTIONS

(1) DON'T BE AFRAID TO ASK QUESTIONS. Make sure that you seek a solution to each problem, for no one can learn too much about flying. Pilots with thousands of hours and years of experience ask questions, so why shouldn't you?

(2) A pre-flight briefing is held before each flight. At this time your instructor will tell you what you are expected to do, and why and how you are to complete the flight. Question any point that is not clear.

(3) After each lesson your instructor will review the air exercise. This is the time to clear up any doubts that you may have about the exercise. You must grasp each lesson

fully - so ask questions while the problems are still fresh.

1.04 - YOUR INSTRUCTOR

(1) Your instructor is well-qualified to achieve his aim of helping you to become a competent pilot. Do your part by helping him! He will always expect the best of you, and if he places emphasis on exactness, he does so for your benefit.

1.05 - BE READY TO FLY

(1) To make full use of a flying period - be prepared. Read and assimilate all the material pertaining to the work to be done, and ensure that your flying equipment is in good order and ready for use.

(2) Be alert, think ahead, and be ready to fly. Initiative, resourcefulness and intelligence, which are qualities essential to a good pilot, should be apparent in your attitude and approach to your duties.

1.06 - COCKPIT FAMILIARIZATION

(1) Sometimes while awaiting your turn to fly, you may be without a specific assignment. Such free time can be used to become better acquainted with the cockpit of the aircraft, its controls and instruments. If you use the aircraft for cockpit training, DO NOT SWITCH ON ANY ELECTRICAL SYSTEMS OR TOUCH THE LANDING-GEAR LEVER. Be sure to get your instructor's permission before doing cockpit drills in the aircraft.

(2) While studying the cockpit, consult TC-11, Expeditor Check List, and review the prescribed procedures. As you go through the check lists, visualize the movement of the controls and the readings on the instruments. Follow the check lists and try to develop a system, because having a system becomes important later when you are actually flying the aircraft. The sooner you become familiar with the check lists, the cockpit arrangement and the aircraft in general, the sooner your whole attention can be devoted to flying the aircraft. Remember that when you are actually flying the aircraft, you will be reading some of the checks from the Challenge Check List. Get to know it well.

1.07 - AIRCRAFT OPERATING INSTRUCTIONS

(1) Aircraft Operating Instructions (AOI) is an Engineering Order containing all the essential information relative to one particular type of aircraft. A copy of the Expeditor AOI (EO-05-45B-1) has been issued to you, and should be used as a reference. Each publication is divided into four parts.

(a) Part 1 describes the controls and equipment, and includes diagrams of the fuel, oil, hydraulic and electrical systems.

(b) Part 2 describes the normal handling of the aircraft and details the necessary checks.

(c) Part 3 describes the emergency handling of various systems, such as the procedures to be used in the case of a fire, engine failure or forced landing, etc.

(d) Part 4 describes the airframe and engine limitations plus other relevant operating data.

Review the complete AOI frequently to learn all about the Expeditor and pay particular attention to Part 3.

(2) TC-11 is basically an extract from Parts 2 and 3 of the AOI. Carry your copy of the check list on every flight.

1.08 - FLIGHT SAFETY

(1) The overriding factor in all aspects of flying is safety.

(2) On the ramp there is usually a great deal of activity and noise caused by fuel trucks, the starting of engines and the taxiing of aircraft. Because of the noise, you must use your eyes constantly; never trust your ears to warn you of the approach of a truck or aircraft.

(3) Before take-off, make sure that all the necessary checks and procedures have been completed. A careless pilot is not only a danger to himself, but also to the occupants of other aircraft. Remember that any item neglected on a pre-flight check can easily become the most important factor of your life. For your own sake, get into the habit of making thorough pre-flight checks.

(5) A most important flight safety requirement during your flying training is a clear and positive understanding of who has control of the aircraft. The procedure for changing control is:

Instructor: "You have control"

Student's Response: "I have control"

When your instructor wishes you to relinquish control, the order is given over the interphone as:

Instructor: "I have control"

Student's Response: "You have control"

Control must never be relinquished until both the order and the response have been given.

1.09 - LOOK-OUT

(1) It is of vital importance to keep a good look-out for other aircraft. Conceivably. a jet aircraft could be approaching. head on, at a closing speed of over 700K. or flying on a collision course at close to 500K. Obviously. then, you must stay alert to prevent the development of any situation which could require desperate evasive action. Good look-out techniques learned NOW can be extremely helpful later. Remember to look above. below and on all sides at ALL times, and be particularly conscious of other aircraft known to be in the area. Use extra caution in areas of heavy traffic congestion, such as in the circuit or during an instrument approach. Keep in mind that your ability to see other aircraft is reduced at high altitude.

(2) Before beginning a turn, scan your whole circle of vision and pay particular attention to the direction in which you are about to turn. Remember to look in ALL directions. Some pilots prefer to look first in the direction opposite to the turn and then in the direction of the turn, but the method is not as important as the extent of your look-out and your awareness.

(3) Besides watching for other aircraft, you will be expected to know your position relative to the aerodrome, and to stay clear of cloud. For the first few hours, remembering to look in the proper direction at the proper time will keep you busy. Before going solo, however, your awareness will have improved to such an extent that you will be able to see other aircraft in the vicinity, know your position in relation to the aerodrome, check the positions of the nose and the wing tips, and require only a quick glance to check the instruments.

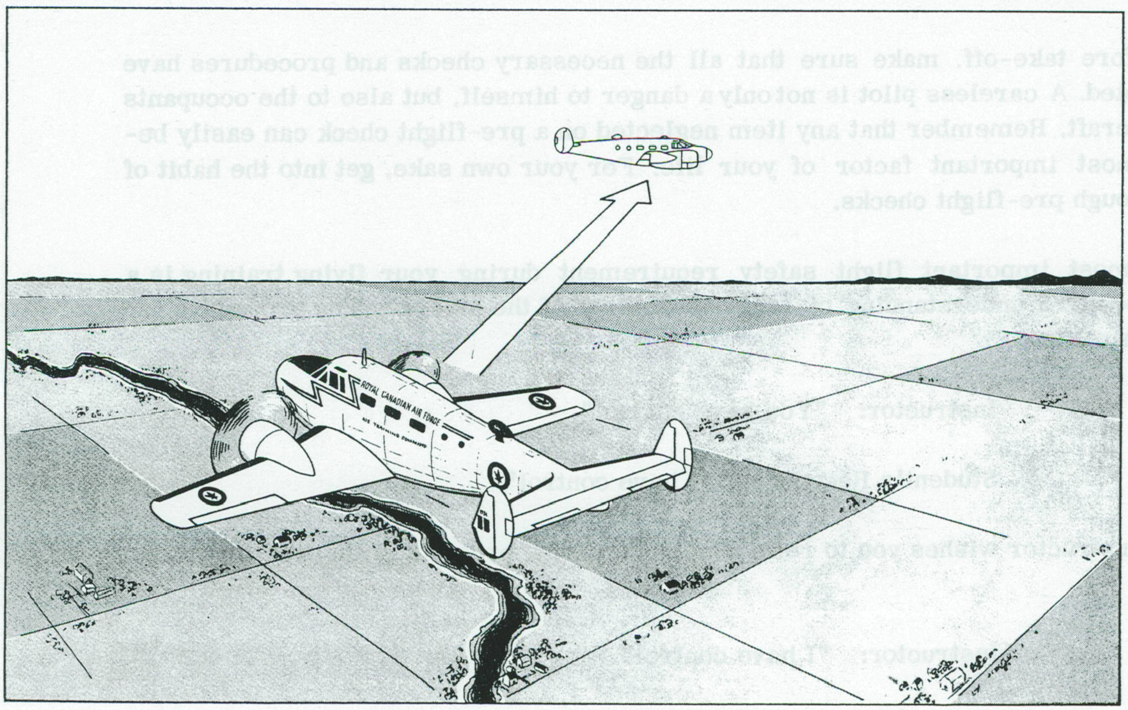


Figure 1. Clock-elevation System

(4) Remember, there is a blind spot beneath you. NEVER ASSUME THAT OTHERS SEE YOU!

(5) Your instructor will explain the clock-elevation system of pointing out other aircraft. An example of an aircraft at "2 o'clock high" is shown in Figure 1.

1.10 - LOCAL FLYING REGULATIONS

(1) Besides the general flying rules covered in this publication, certain local regulations are in effect at each station. These regulations are published in Station Standing Orders and Local Flying Orders, and cover such subjects as flying areas, traffic rules and patterns. These regulations are important since they are written to ensure safe, efficient flying. Copies are available in the flight room, and you must read and understand them thoroughly.

1.11 - FLYING CLOTHING

(1) When your flying clothing is issued to you at the supply section, be sure that everything fits comfortably. After flying, always hang your clothing in your locker so that air can circulate freely. Take care of your flying clothing and it will take care of you.

1.12 - AIRCRAFT CHECKS

(1) In the Expeditor, most aircraft checks are read from the Challenge Check Lists which are contained in the aircraft and in TC-11. Instead of relying on memory when the pilot calls for a check, the co-pilot reads from the Challenge Check List while the pilot does the checks and makes the appropriate responses.

(2) The Challenge Check List does not include all the aircraft checks, therefore you must learn those checks which have been omitted. Those are to be found in the pilot's amplified check list at the front of TC-11.

(3) The Tarmac Check is fully explained in art 2.08 of this manual.

(4) All critical emergency procedures detailed in TC-11 shall be memorized.

CHAPTER 2

GROUND HANDLING

2.01 - FLIGHT AUTHORIZATION AND AIRCRAFT ACCEPTANCE

(1) Each flight must be authorized and acknowledged on an RCAF Flight Authorization Form (F-17). In addition, since it is the captain's responsibility to ensure that the aircraft is serviceable, check the Aircraft Maintenance Record Set (L-14) carefully, and also the L-14(T) Travelling Copy which you shall take with you if you are planning to land away from base.

(2) Before signing the L-14, you must fulfil the following requirements.

(a) Check the aircraft data sheet for

(i) the time to the next inspection, and
(ii) operational restrictions.

(b) Note all major unserviceabilities and rectifications.

(c) Note all minor unserviceabilities and rectifications.

(d) Check the fuel and oil quantities.

(e) Check the validity of the Primary Inspection (PI).

(f) Check the validity of the Between-Flight Inspection (BFI).

2.02 - PRE-EXTERNAL CHECK

(1) The Pre-External Check must be completed before doing the External Check. This check is detailed in the AOI and in TC-11.

(2) PROPELLER ANTI-ICER - Turn the anti-icer switch to "NORMAL", and check that the pump does not stall; return the switch to "MAX", and check the fluid quantity; then turn the switch "OFF". During the External Check turn each propeller to ensure that fluid is being delivered to BOTH distribution nozzles on the propeller. Ensure that the nozzles are not bent or clogged, and that fluid is reaching the propeller roots.

2.03 - EXTERNAL CHECK

(1) The External Check, which is a very important preliminary to each flight, is detailed in the AOI and TC-11. While doing the check, inspect the area around the aircraft for safety hazards such as misplaced chocks, fire extinguishers, etc.

2.04 - INTERNAL CHECK

(1) Make a complete check of the interior of the aircraft before each flight. This check is detailed in the AOI and in TC-11.

2.05 - STRAPPING IN

(1) When you are ready to strap into the seat, proceed as follows.

(a) Using the small crank which is located below the forward edge of the seat, adjust the seat's position forward and up, or backwards and down, until you are comfortable and can apply full rudder in both directions.

(b) Fasten and adjust the shoulder harness and lap belt.

2.06 - PRE-START CHECK

(1) This check is designed to prepare the aircraft for starting, and is detailed in the AOI and in TC-11. Do NOT attempt to memorize this check - use the Challenge Check List.

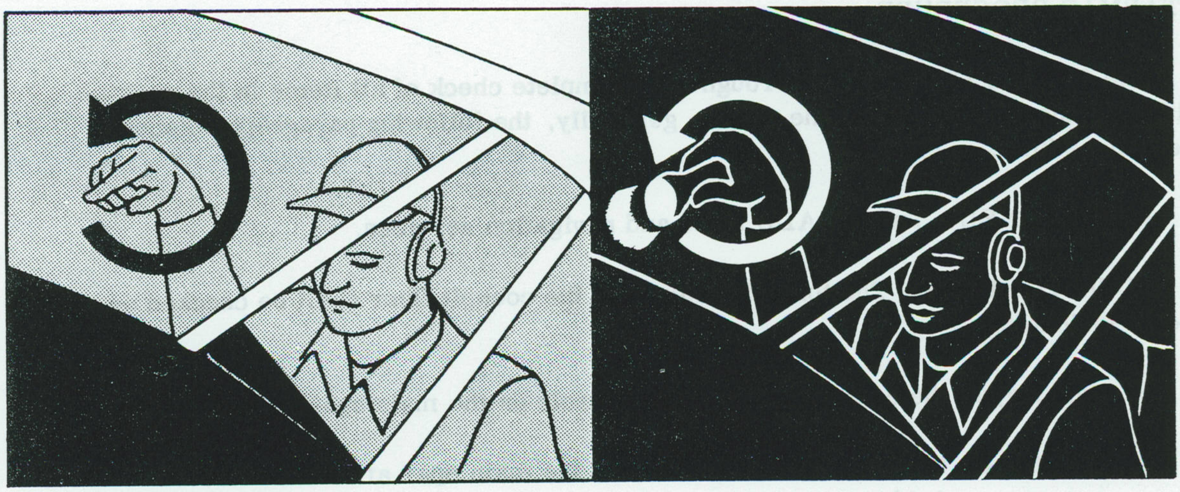
2.07 - GROUND HAND SIGNALS

(1) The chart on the opposite page details the hand signals which are used most frequently during ground handling.

2.08 - STARTING

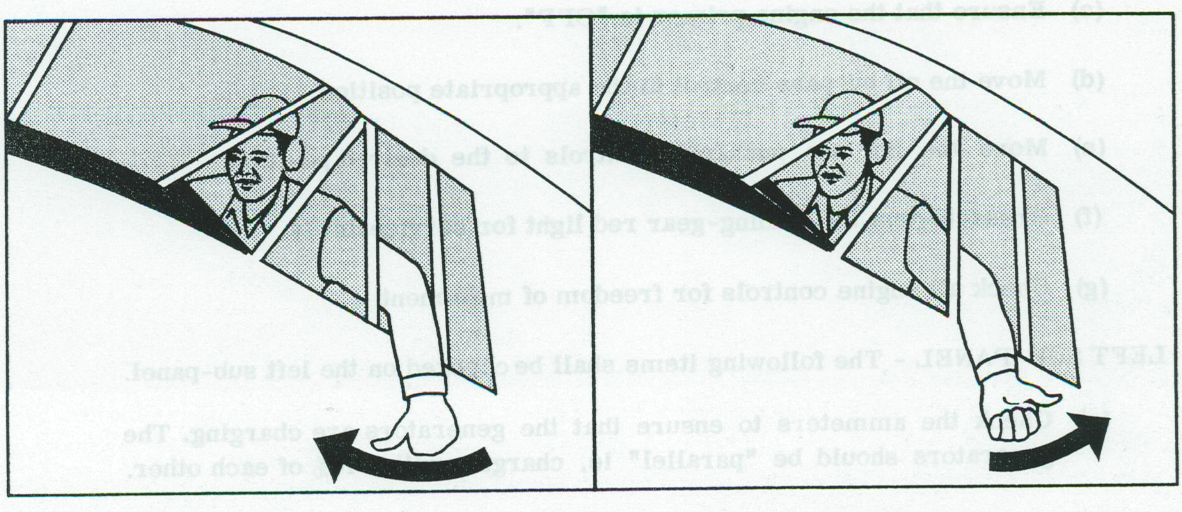
(1) The engines may be started by using either external power or the internal batteries. The starting procedure is listed in the AOI and TC-11.

(2) When both engines are running, give the groundcrew the signals to disconnect the power and remove the chocks. Idle the engines at 700 rpm for 30 seconds after starting, and preferably until the ground crew have disconnected the external power and removed the chocks. When the external power has been disconnected, turn the battery switch, generator switches, inverter and compass switches "ON". Warm up the engines at 1000 rpm. Check that the gyro horizon erection light goes out within 30 seconds.



START ENGINES – CIRCULAR MOTION AT HEAD LEVEL

REMOVE CHOCKS – SIDE TO SIDE MOTION ABOVE HEAD



EXTERNAL POWER IN

EXTERNAL POWER OUT

Figure 1. Hand Signals

2.09 - TARMAC PROCEDURE

(1) The Tarmac Check is a thorough and complete check of all items in the cockpit. Although the AOI outlines the check generally, the following paragraphs discuss each item more fully.

(2) RADIO PANEL - Turn on ALL radio and navigation services.

(3) COCKPIT FLOOR - The following items on the cockpit floor shall be checked or adjusted as indicated.

(a) Adjust the cabin push/pull air controls on the main spar.

(b) Check that the light rheostats on the main spar are "OFF" or are set as required.

(c) Check that the cross-feed valve is "OFF".

(d) Check that the landing gear/flap crank is not engaged.

(e) Check that the landing-gear clutch cover is down.

(f) Adjust the cockpit heat louvres as required.

(g) Adjust the cockpit push/pull heat controls as required.

(4) PEDESTAL - The following items shall be checked on the pedestal.

(a) Move the fire extinguisher selector to "NEUTRAL".

(b) Ensure that the oil shut-off levers are lock-wired "OFF".

(c) Ensure that the engine primer is "OFF".

(d) Move the oil by-pass control to the appropriate position.

(e) Move the hot air push/pull controls to the desired position.

(f) Press-to-test the landing-gear red light for serviceability.

(g) Check all engine controls for freedom of movement.

(5) LEFT SUB-PANEL - The following items shall be checked on the left sub-panel.

(a) Check the ammeters to ensure that the generators are charging. The generators should be "parallel" ie, charging within 10% of each other.

(b) Check that the anti-collision light is "ON".

(c) Check the fire-warning lights for operation.

(d) Check that the pitot heat is working by switching it "ON" and "OFF". You should notice a slight movement of the ammeter. Another method of telling whether the pitot heat is working is to turn the switch "ON" during the Pre-External Check, and then turn it off after completion of the check. The pitot head should be warm when you touch it during the External Check.

(e) Move the navigation-light switch to the appropriate position.

(f) Move the landing-light switches to "OFF".

(g) Check that the battery and generator switches are "ON".

(h) Check that all circuit breakers are in.

(6) RIGHT SUB-PANEL - The following items shall be checked on the right sub-panel.

(a) Ensure that the propeller anti-icer rheostat is "OFF".

(b) Check the de-icer control. The de-icer boots should be operated through one complete cycle. The normal sequence is: main wing outboard, main wing inboard, followed by the horizontal stabilizer boots. Check that the de-icer pressure is 7 to 9 psi. Ensure that the boots are being inflated and deflated in pairs; that is, both outers together and then both inners together.

(c) Check that the starter selector switch is "OFF".

(d) Check that the gyrosyn compass de-slaving switch is "ON".

(e) Check that the cabin light switch is "OFF", or is set as required.

(f) Check that the inverter switch is "ON" and that the inverter-failure warning light is out.

(g) Check that all circuit breakers are in.

(7) MAIN INSTRUMENT PANEL - The following items shall be checked on the main instrument panel.

(a) Check that the fuel-tank gauge is selected for the tanks in use.

(b) Check that the airspeed indicator reads approximately zero.

(c) Set the pilot's altimeter to field barometric pressure and check that the altitude reading is within ± 50 feet of the field elevation.

(d) The gyrosyn compass is operating correctly when dots and crosses alternate in the annunciator window. If either a steady dot or cross appears, rotate the pointer using the setting knob. When the gyrosyn reading approximates that of the stand-by compass, alternate dots and crosses should appear in the annunciator window. Take care that you do not set the gyrosyn 180° off heading, since this will also result in alternate dots and crosses appearing in the annunciator window. Check the compasses on as many headings as practicable while taxiing, and again when the aircraft is lined up on the runway for take-off. Also, the gyrosyn compass should be checked for the correct response during taxiing turns. Check the compass correction card which is located in a holder near the magnetic compass. Make sure that the card is current by taking it out of the holder and checking the date on the back of the card. To be valid, the information on the card must relate to a compass "swing" which has been done within the past 180 days.

(e) Check the turn and slip indicator for freedom of movement by pressing the face of the instrument with your finger.

(f) Set the elevator trim tab for take-off.

(g) Check that the attitude gyro is erect and annunciating, and that the red light is out.

(h) Check that the rate of climb indicator is reading zero.

(j) Check that the flap-position indicator registers zero.

(k) Press-to-test the left engine fuel-pressure warning light.

(l) Set the marker-beacon lights to bright or dim, as required.

(m) Check that the compass rose is free, that there is fluid in the case of the compass and that there are no bubbles. Also check that it is registering approximately the correct heading.

(n) Check that the clock is operating and is set to Greenwich Mean Time (GMT).

(o) Check that all engine instruments are functioning.

(p) Press-to-test the generator-failure warning lights.

(q) Press-to-test the right engine fuel-pressure warning light.

(r) Set the co-pilot's altimeter to field barometric pressure and check that the altitude reading is within ±50 feet of the field elevation.

(s) Uncage and set the directional gyro indicator to coincide with the gyrosyn heading.

(t) Check the co-pilot's turn and slip indicator. The needle can be checked for freedom of movement by pressing the face of the instrument with your finger. At the same time, watch the ball and ensure that there are no bubbles in the fluid.

NOTE: When checking the glass face of any instrument that has cautionary markings, it is important to check that the glass is not loose.

(8) SHELF ABOVE THE MAIN INSTRUMENT PANEL - The shelf above the main instrument panel shall be checked as follows.

(a) Check that the summer/winter switch is set in accordance with the AOI.

(b) Check the feathering-button guards and feathering buttons to see that they are tight and free of foreign material.

(c) Check that the feathering circuit-breaker is "ON" (forward).

(9) AUTOMATIC RADIO COMPASS - Check the Automatic Radio Compass (ARC) as follows.

(a) Move the function switch to "ANT" (Antenna).

(b) Move the band selector and check the alignment on two bands.

(c) Check the operation of the "CW/Voice" switch.

(d) Move the function switch to "LOOP".

(e) Move the "CW/Voice" switch to "CW" and check that you are receiving a carrier wave.

(f) Check that the "Left/Right" switch rotates the loop both ways.

(g) Check that you are receiving a "null".

(h) Move the "CW/Voice" switch to "Voice" and the volume control knob to minimum volume.

(j) Select "COMP", and check that the bearing indicator points to a known station.

(k) Retune the frequency and check the operation of the tuning meter.

(10) LOW FREQUENCY RADIO - Tune in the Low Frequency (LF) radio to a known station and check reception. Note that TACAN-equipped aircraft do not have an LF installation.

(11) INSTRUMENT LANDING SYSTEM - If you are at an aerodrome which is equipped with an Instrument Landing System (ILS), select an ILS frequency and check the identifiers. When the aircraft approaches the applicable runway, ensure that the localizer and glide path indicators are functioning properly.

(12) VERY HIGH FREQUENCY RADIO - Check the Very High Frequency (VHF) radio by requesting taxi clearance.

(13) TACAN - In TACAN-equipped aircraft, some of the controls for the radios and navigational aids are in different locations; also, there are the following radio equipment differences.

ADDED	REMOVED
TACAN	
Multi-frequency UHF transceiver	LF receiver
ARN/6 radio compass	ARN/7 radio compass
10-channel VHF transceiver	24-channel VHF transceiver

In addition, the ARC bearing indicator is combined with the TACAN bearing indicator and the distance reading drums into one instrument called a Distance and Radio Magnetic Indicator (DRMI) Similarly, the ILS indicator and the TACAN Course Deviation Indicator (CDI) are combined into one instrument called a Course Indicator (CI).

(14) To avoid repetition, the testing of the radio equipment in TACAN-equipped aircraft is dealt with separately and not in sequence as positioned in the aircraft. After the engines have been started, check the wiring and the operation of the three-position emergency-system inverter switch by moving the switch to "EMERGENCY" and the gyrosyn compass slaving switch to "ON". The system is operating when the pilot's C-2 compass is on, the attitude gyro annunciators are annunciating and the inverter-failure warning light is on. Next, move the inverter switch to "NORMAL" and check that the pilot's C-2 compass and the attitude gyro annunciator are operating. The inverter-failure warning light should go out. When you select "EMERGENCY," the Ultra High Frequency (UHF) inverter operates both the UHF radio and the aircraft instruments.

(15) Check the UHF and VHF radios by calling the tower first on VHF for taxi clearance and then, later, on UHF for take-off clearance. Normally, the function switch of the UHF set should be at "TR/G".

(16) Check the TACAN equipment as follows.

(a) Move the function switch to "T/R".

(b) Select the appropriate channel.

(c) Allow the set to warm up by waiting until the "OFF" flag disappears on the CI and the DRMI. Also wait until the bearing indicator shows a constant bearing and the Distance Measuring Equipment (DME) "locks on".

(d) Read off the bearing shown at the head of the TACAN indicator of the DRMI. Use the course-setting knob to alter the figures shown in the course selector window of the CI, until the course shown corresponds to that shown at the head of the TACAN indicator of the DRMI. Adjust the course-setting knob until the CDI is in the centre. Check that the full deflection of the CI is approximately 10 degrees and the first dot is at a deflection of approximately 5 degrees. Now check the course which appears in the course-setting window against that shown by the TACAN indicator of the DRMI. The difference between the two readings should not exceed ±2 degrees. Finally, make sure that "TO" is showing in the "TO/FROM" window of the DRMI.

(e) Using the reciprocal bearing shown at the tail of the TACAN indicator of the DRMI, follow the procedure outlined in (d). This time however, make sure that "FROM" appears in the "TO/FROM" window of the DRMI.

(f) Use the course-setting knob to set the applicable radial for a known position on the aerodrome. (Some aerodromes have TACAN test positions marked on the taxiways.) When the aircraft is on a known position, the CDI should be in the centre or within four degrees of the centre of the CI, and the DME should read the correct distance to the position. The TACAN bearing indicator of the DRMI should read approximately the same as the course in the course selector window of the CI.

2.10 - TAXIING

(1) THE PRE-TAXI CHECK - The Pre-Taxi Check is detailed in the AOI and in TC-11. Do NOT attempt to memorize this check; use the Challenge Check List.

(2) SAFETY PRECAUTIONS WHILE TAXIING - Continue to observe the taxiing safety precautions which you learned during basic flying training. Although visibility from the cockpit of the Expeditor is good, in some respects it is restricted when compared with the Tutor. Therefore, you must double your efforts to keep a sharp look-out to ensure safety while taxiing. Remember to maintain a constant listening-watch on the appropriate ground control or tower frequency. When you doubt whether the wing tips will clear obstacles, stop and arrange for a member of the groundcrew to guide you. Be particularly careful

when you are turning close to the edge of a taxi strip or tarmac, since the tail wheel may leave the hard surface during a short turn, resulting in possible damage to the empennage.

(3) Before taxiing, ensure that you receive tower clearance and that the taxi area is clear.

(4) Set the throttles at 1000 rpm, release the parking brake and allow the aircraft to roll forward. When the aircraft begins to roll, gently test the brakes, ensuring that the co-pilot also checks his brakes, and then reduce power to maintain a reasonable taxiing speed. Although the throttle setting for normal taxiing speed varies with the strength and direction of the wind and with the load, 800 to 900 rpm is generally sufficient. The direction of the aircraft should be controlled with gentle use of brake. Avoid throttle-juggling while taxiing, and DO NOT RIDE THE BRAKES. Always remember that you are taxiing a light transport aircraft and that you should attempt to taxi as smoothly as possible. If the aircraft has a tendency to turn continually in one direction, advance the throttle of the engine towards the inside of the turn to avoid the necessity of riding one brake.

(5) In a strong crosswind, raise the upwind aileron and use as much differential throttle as may be necessary.

(6) TURNING - Start a taxiing turn by applying gentle brake pressure. Keep the aircraft moving at normal taxiing speed throughout the turn. Although a turn can usually be controlled with brake, you may have to assist the aircraft to turn by using differential throttle. Make every effort to keep the amount of throttle movement to a minimum.

(7) INSTRUMENT CHECK - While you are taxiing the aircraft to the run-up position, check the instruments during taxiing turns. Do not attempt these checks while you are leaving the line or when the aircraft is in a congested area. Check the attitude indicator, gyrosyn compass and turn and slip indicator for serviceability; check the compasses on a known heading.

2.11 - THE PRE-RUN-UP CHECK

(1) At the run-up area, select a spot near the edge of the tarmac and, if possible, position the aircraft into wind so that it does not block traffic. Check to make sure that the tail wheel is on the tarmac and is straight.

(2) When you are satisfied that the aircraft is properly positioned, do the Pre-Run-up Check. Do NOT memorize this check. Use the Challenge Check List.

2.12 - RUN-UP

(1) Use the check given in the AOI or TC-11 to check the engine and accessories. During this check, keep a sharp look-out to ensure that the aircraft does not creep forward. Remember that the procedure for checking the reference rpm is valid only when the aircraft is facing directly into wind.

2.13 - POST-LANDING CHECK

(1) After landing, taxi the aircraft clear of the active runway and bring it to a stop before doing the Post-Landing Check. Do NOT memorize this check. Use the Challenge Check List.

(2) Bear in mind that a flight is not complete until the aircraft has been parked and shut down and the appropriate entries have been made in the L-14. All taxiing procedures and safety precautions previously mentioned apply until the end of each flight. After turning into the parking position, the aircraft should be taxied in a straight line for a short distance to ensure that the tail wheel is straight and can be locked.

2.14 - SHUT-DOWN PROCEDURE

(1) The aircraft shall be shut down in accordance with the procedure given in the AOI. When the engines have stopped, do a Post-Shut-down Check. Do NOT memorize this check. Use the Challenge Check List.

NOTE: Oil dilute as directed by the AOI.

2.15 - SIGNING-IN ACTION

(1) Complete the L-14 and F-17 when you return to the blister.

CHAPTER 3

AIR HANDLING - GENERAL

3.01 - PRE-TAKE-OFF CHECK

(1) After the run-up and just before take-off, do a Pre-Take-off Check. Do NOT memorize this check; use the Challenge Check List.

3.02 - TAKE-OFF

(1) After you have requested and obtained take-off clearance, check for aircraft on the approach and, when it is safe to do so, taxi to the centre of the runway. Allow the aircraft to roll forward sufficiently far down the runway to straighten the tail wheel; then, when the aircraft is pointing straight down the runway, push the tail-wheel locking lever.

(2) Start the take-off roll by smoothly opening the throttles to take-off power. The settings for take-off power vary in accordance with Outside Air Temperature (OAT), if the carburettor heat is not pre-set. At the beginning of the take-off roll, keep the aircraft straight by gentle use of brakes until the rudders become effective at approximately 40K. Once the rudders become effective, use rudder rather than brake for directional control. Although under certain conditions the Expeditor has a slight tendency to swing to the left on take-off, you can control direction easily by using a combination of rudder and brake pressure until the rudders are properly effective. Since most directional control difficulties are caused by over-controlling, try to use gentle but positive pressures.

(3) During the take-off roll, hold the control column in the neutral position until the tail begins to rise at approximately 40K. Do not attempt to force the tail up early. It is during the aircraft's rotation to flying attitude that gyroscopic and asymmetric blade effects tend to swing the aircraft to the left. Once the tail is in the flying attitude, exert a slight forward pressure on the control column to maintain the proper attitude. Do not allow the aircraft to bounce or skip before it becomes airborne; lift it smoothly and gently off the runway at an airspeed of 70 to 75K. The wheels should not touch the runway again after lift-off. Once the aircraft is airborne, partially level off to an attitude that will result in a gradual climb. Accelerate as quickly as possible to V_2 (90K) and, when the aircraft is safely airborne at a safe altitude (approximately 25 feet), raise the landing gear. As the aircraft accelerates through V_2, reduce the take-off power to "MAXIMUM CONTINUOUS" ($33\frac{1}{2}$"MP and 2200 rpm) and complete the Post-

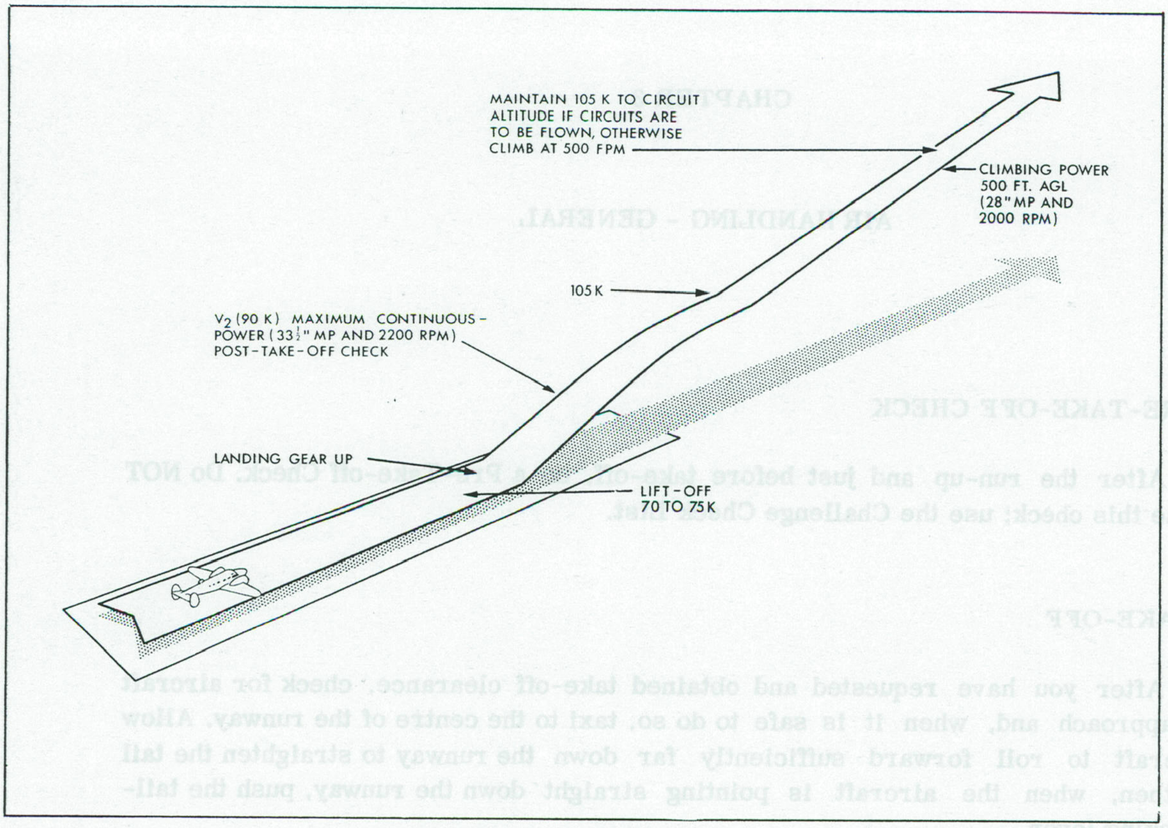


Figure 1. The Normal Take-off

Take-off Check. Do NOT memorize this check; use the Challenge Check List. Figure 1 depicts a normal take-off.

3.03 CROSSWIND TAKE-OFF

(1) When the wind is not down the runway use a crosswind take-off technique. The Expeditor tends to "weather-cock" into wind to a degree that is dependent on the wind angle and the wind strength. A take-off in the Expeditor is limited to a maximum cross-wind of 15 mph at 90 degrees to the runway heading. Another factor to be considered during a crosswind is that the wind tends to lift the upwind wing. The Pre-Take-off Check is completed as for a normal take-off.

(2) Line up the aircraft in the centre of the runway and raise the upwind aileron to prevent the wind from lifting the wing. As the aircraft gains airspeed, the ailerons become more effective, and the amount of aileron required to hold the wing down decreases. Open the throttles slowly and smoothly. You may use asymmetric power to help you to maintain directional control; that is, advance the throttle of the upwind engine until its MP gauge registers a few inches more than the amount shown on the MP gauge of the downwind engine. In addition, you can use the brakes to maintain directional control. When the tail starts to come up and the rudders become effective, use rudder to maintain directional control. Once the tail of the aircraft is in flying position, set both throttles

to equal take-off power and use the rudders to control direction.

(3) During a crosswind take-off, hold the Expeditor firmly on the runway until the aircraft attains a lift-off speed of 75K. Do not allow the aircraft to "skip". At 75K to 80K, lift the aircraft cleanly off the runway by exerting a firm pressure on the control column; do not allow the aircraft to touch the runway after lift-off. As the aircraft becomes airborne, use the ailerons to keep the wings level.

(4) After lift-off, use "crab" to maintain direction as the aircraft climbs.

3.04 - MINIMUM-ROLL TAKE-OFF

(1) Start a minimum-roll take-off with a normal Pre-Take-off Check, but lower the flaps 10 degrees to give maximum lift.

(2) Line up the aircraft in the centre of the runway with the tail wheel as close as practicable to the end of the runway. Stop, pump the brakes and then hold them on with maximum foot pressure. Hold the control column fully back and open the throttles slowly and smoothly to 30"MP. Be prepared for the aircraft to lurch ahead owing to the reaction of the "walking" oleos as the throttles are advanced through 25"MP. Maintain the brake pressure and hold the control column fully back.

(3) When the throttles have been advanced to 30"MP, release the brakes and simultaneously advance the throttles to full take-off power. Maintain directional control as for a normal take-off. Release the control column pressure and hold the control column in the neutral position. As the tail begins to rise at approximately 40K, assist it into the flying position with a slight forward pressure on the control column. Lift the aircraft off the runway at 65 to 70K. You should anticipate lift-off (V_{LOF}) and start to apply back pressure to the control column 2 to 3K before the aircraft reaches the lift-off airspeed. Lift the aircraft cleanly off the runway at V_{LOF}. When the aircraft is safely airborne and you are sure that it will not settle back on the runway, retract the landing gear and momentarily level the aircraft so that it accelerates to V_2 as quickly as possible (Figure 2 overleaf). At 80K lift the flaps and allow the aircraft to accelerate to V_2, then reduce power to "MAXIMUM CONTINUOUS"; be prepared for any change of attitude. Do the Post-Take-off Check and after the aircraft is clean, follow normal climbing procedures.

(4) If you are required to do a minimum-roll take-off to clear an obstacle at the upwind end of the runway, the procedure is the same except that the aircraft is climbed at 90K with 10 degrees of flap until there is sufficient altitude to clear the obstacle. At the appropriate height, raise the flap, reduce power to "MAXIMUM CONTINUOUS", complete the Post-Take-off Check and then follow the normal climbing procedures. Figure 3 (overleaf) depicts a minimum-roll take-off to clear an obstacle at the end of the runway.

3.05 - CLIMBING

(1) After the aircraft has reached V_2 and you have made the first power reduction,

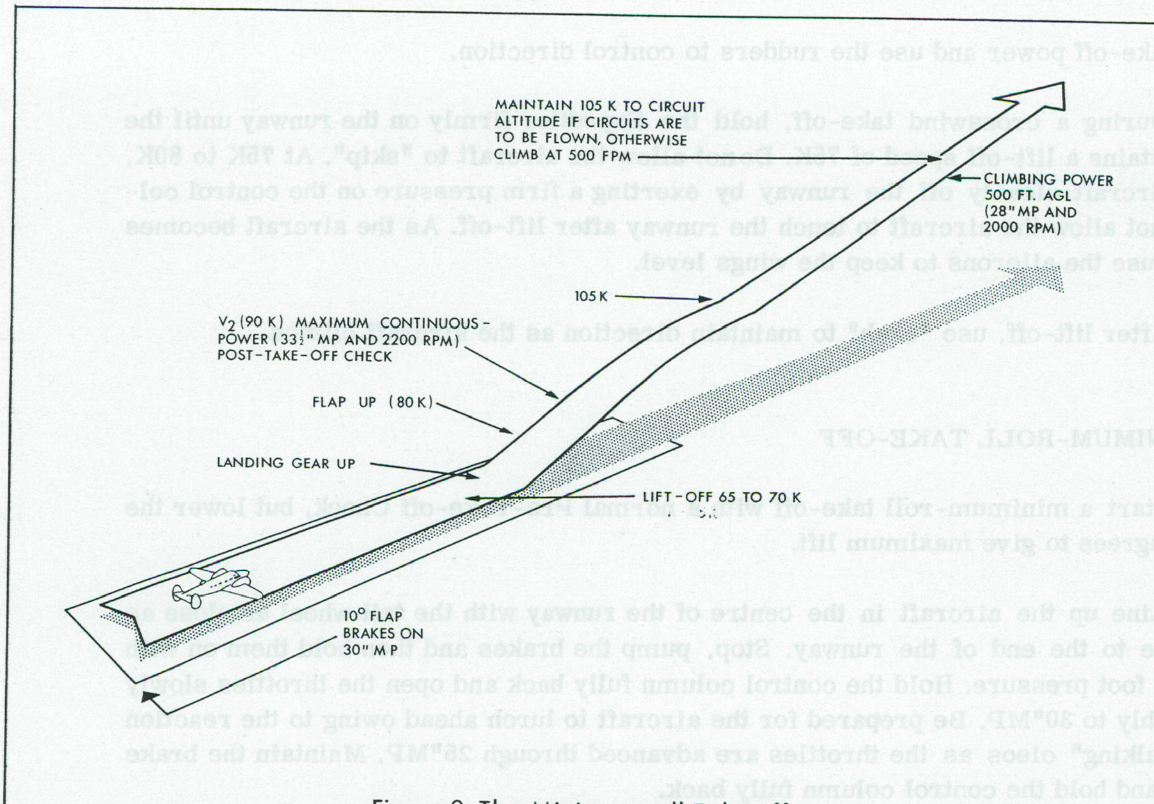


Figure 2. The Minimum roll Take-off

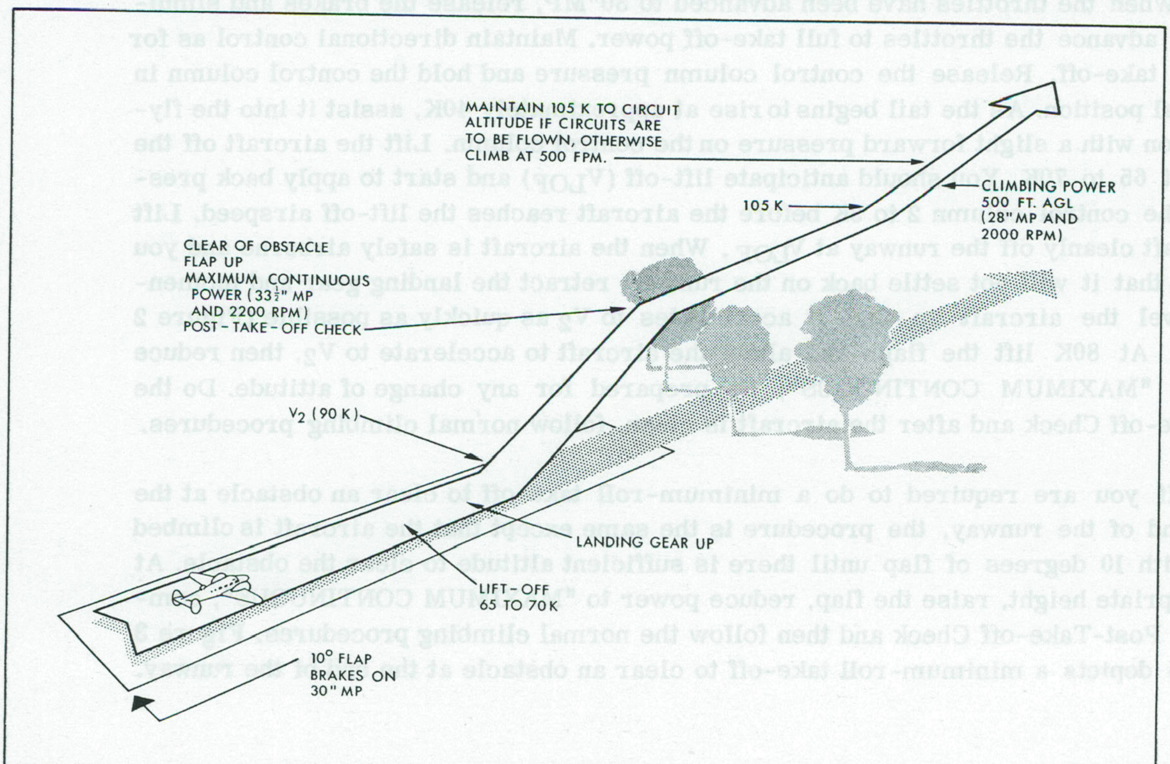


Figure 3. The Minimum-roll Take-off to Clear Obstacle

allow the airspeed to increase to 105K; maintain this airspeed to a predetermined height usually 500 feet or the minimum circling altitude. At the appropriate altitude, reduce the power to climbing power (28"MP and 2000 rpm) and adjust the aircraft attitude to obtain a rate of climb of 500 feet per minute (fpm). Maintain this rate of climb to cruising altitude. If you intend to remain in the circuit, maintain an airspeed of 105K throughout the climb to circuit altitude. During the climb, ensure that the pointers of the cylinder head temperature and the oil temperature and pressure gauges remain within the proper operating ranges (ie, are in the "GREEN").

3.06 - LEVEL-OFF

(1) As the aircraft approaches the desired altitude, begin a smooth level-off approximately 50 feet below cruising altitude. Maintain climbing power until the airspeed is approximately 2 to 3K below the desired indicated airspeed (IAS); then adjust the MP and rpm to the desired settings. There is a rule-of-thumb that you can use to assist you in establishing the amount of MP required for a given airspeed. The rule is that an increase or decrease of one inch of MP results in an increase or decrease of 5K IAS, respectively. Usually, 1800 rpm and approximately 20"MP give 105K IAS. The MP that you use should be related to the desired airspeed, but remember that you must not exceed the MP limitations specified in TC-11 and the AOI. Details of the limitations are given in chart form for various combinations of power settings. Although on local training exercises 1800 rpm is the usual setting, 1700 rpm gives better specific fuel consumption on cross-country exercises.

3.07 - STRAIGHT AND LEVEL FLIGHT

(1) After trimming the aircraft for straight and level flight, do a general cockpit check as follows.

(a) Move the fuel selector switch to the appropriate tanks.

(b) Do a "drag" check (no ancillaries hanging).

(c) Adjust the carburettor heat and oil temperature controls.

(d) Check the airspeed and make minor power adjustments.

(e) When the cylinder head temperature (CHT) has stabilized in the normal cruising range, lean the mixture using the method outlined in the AOI. Remember that too rich a mixture will result in a sharply increased fuel consumption, and that too lean a mixture will result in a sharply decreased airspeed. Any subsequent adjustment of over 1" in MP must be preceded by an enrichment of the mixture.

(f) Re-check the airspeed, carburettor heat temperature, and oil temperature.

3.08 - CHANGING AIRSPEED

(1) The procedure for increasing airspeed in the Expeditor is similar to that taught on aircraft which you have flown previously.

(2) INCREASE - To increase the airspeed, enrich the mixture and open the throttles until the MP is 2 to 3" higher than that which is required to maintain the desired airspeed. When the airspeed is 2 to 3K lower than the desired airspeed, reduce power and adjust the mixture. To avoid exceeding the maximum permissible MP, you may have to increase the rpm.

(3) DECREASE - To reduce the airspeed, enrich the mixture and reduce the MP 2 to 3" below the calculated setting that is required to maintain the desired IAS. Apply the power that is required to maintain the calculated IAS 2 to 3K before attaining the new IAS, and adjust the mixture.

3.09 - TURNING

(1) Although most turns made in transport aircraft are Rate 1 turns, you will be required to become proficient in turning the aircraft while using up to 45 degrees of bank.

(2) Turns using up to 30 degrees of bank result in minimal airspeed changes. Any turns requiring more than 30 degrees of bank necessitate an increase in MP to maintain altitude and airspeed.

(3) Until you become accustomed to the Expeditor, you may have some difficulty in maintaining a constant altitude during turns. This is caused partly by the pilot's seat being off-set from the longitudinal axis of the aircraft which results in different visual reference points being required for left and right turns. The Expeditor's short nose makes the use of visual references more difficult. Another point of interest is the gyroscopic effect of the propellers which causes the nose to drop in a turn to the right and lift in a turn to the left. All the foregoing problems are minor and are easily overcome with practice.

(4) ENTRY - Enter a turn by smoothly cross-checking your visual reference points and ascertaining the amount of bank by means of the attitude gyro. If you are going to use more than 30 degrees of bank, increase the MP as the aircraft banks through 30 degrees. Up to 45 degrees of bank, an increase of 2 to 3"MP should be sufficient to maintain airspeed and altitude. The amount of control column back pressure which is required to maintain a constant altitude increases in proportion to the amount of bank. The Expeditor ailerons have a progressive effect, ie. you must apply aileron until the aircraft has reached the desired bank; you must then reverse the pressure to stop the roll and to maintain the degree of bank. When you apply aileron pressure, use co-ordinated rudder pressure to offset aileron drag and inertia which cause yaw. When the "ball" is in the centre, you are using the correct amount of rudder to enter or recover from a bank.

(5) RECOVERY - Roll out of a turn by using the same rate of roll as you used to enter the turn. If you had to increase power during the turn, take the extra power off

during the recovery while the aircraft is passing through 30 degrees of bank. Remember that the amount of control-column pressure needed to make the aircraft return to level flight varies in proportion to the amount of bank.

(6) To recover on a given heading or reference point, start the roll-out before the aircraft reaches the reference point. A rule-of-thumb which is used to establish the required "lead" is: start the roll-out at a number of degrees equal to one-third the number of degrees of bank used; eg, with 30 degrees of bank, begin the roll-out 10 degrees before the aircraft reaches the desired heading.

3.10 - DESCENDING

(1) A normal descent in the Expeditor is made at 500 fpm. You can use slower or faster rates when circumstances warrant it, but you should not descend at more than 750 fpm. The configuration and airspeed can vary during a descent, but the procedure of entry remains the same, as does the following rule-of-thumb: while maintaining a constant airspeed, reducing the MP by 1" results in a rate of descent of 100 fpm. The mixture control must be at full "RICH" before you adjust the throttles to start a descent.

(2) ENTRY - Begin the descent by reducing power sufficiently to give the desired rate of descent and airspeed. When the airspeed stabilizes, adjust the attitude to give the desired rate of descent, and then maintain the airspeed and rate of descent by making minor power adjustments.

(3) RECOVERY - Recover from a descent by simultaneously increasing power and easing back on the control column. Fifty feet above the desired altitude, start the level-off and maintain the desired airspeed by applying power.

CHAPTER 4

TRAFFIC PATTERN, CIRCUIT AND LANDING

4.01 - CIRCUIT PATTERN

(1) JOINING THE CIRCUIT - Before joining the circuit you must obtain landing instructions from the control tower. If there are special circuit-entry procedures in effect at a particular aerodrome, they are usually included in the landing instructions. Figure 1 depicts four common entries to a left-hand circuit. All turns within the circuit area should be in the same direction as those within the circuit. Aircraft Number 1 in Figure 1 is shown joining the circuit on the downwind leg. The other three aircraft are entering the circuit from the dead side well above aircraft which are taking off or over-shooting.

(2) The purpose of a standard circuit entry and pattern is to ensure a safe, orderly flow of a maximum number of aircraft with a minimum of congestion. As shown in

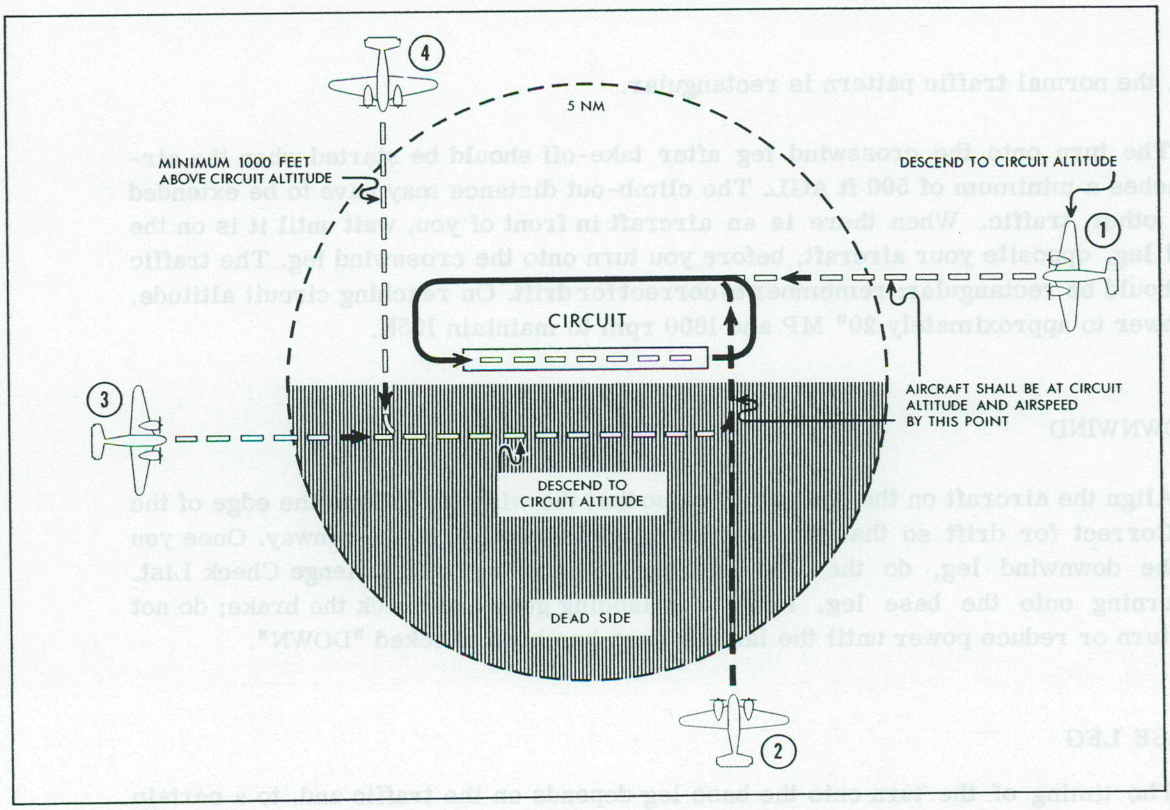


Figure 1. Joining the Circuit

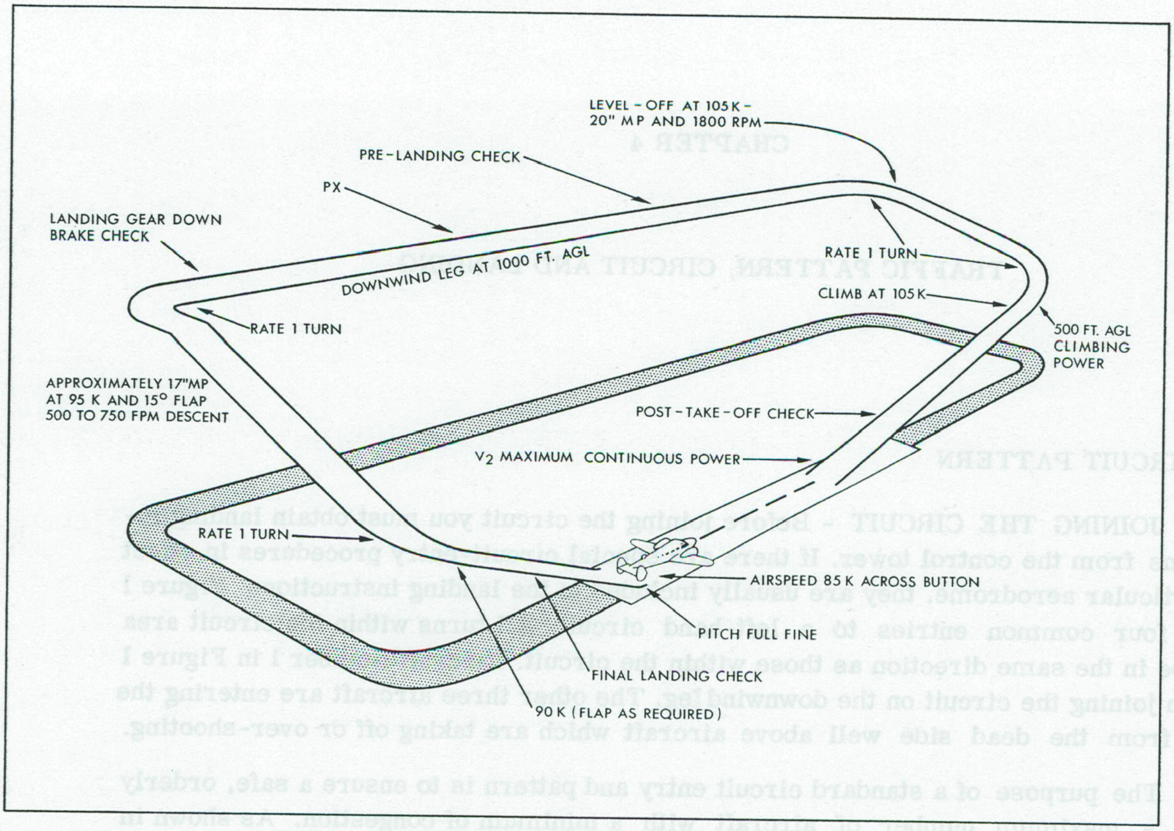


Figure 2. The Normal Traffic Pattern

Figure 2, the normal traffic pattern is rectangular.

(3) The turn onto the crosswind leg after take-off should be started when the aircraft reaches a minimum of 500 ft AGL. The climb-out distance may have to be extended to avoid other traffic. When there is an aircraft in front of you, wait until it is on the downwind leg, opposite your aircraft, before you turn onto the crosswind leg. The traffic pattern should be rectangular; remember to correct for drift. On reaching circuit altitude, reduce power to approximately 20" MP and 1800 rpm to maintain 105K.

4.02 - DOWNWIND

(1) Align the aircraft on the downwind leg so that the wing tip follows the edge of the runway. Correct for drift so that the aircraft track is parallel to the runway. Once you are on the downwind leg, do the Pre-Landing Check using the Challenge Check List. Before turning onto the base leg, lower the landing gear and check the brake; do not start the turn or reduce power until the landing gear has been checked "DOWN".

4.03 - BASE LEG

(1) The timing of the turn onto the base leg depends on the traffic and, to a certain extent, on the wind, but usually you can turn as the trailing edge of the wing passes the

threshold of the runway. As the aircraft rolls into the turn, reduce the throttle setting to approximately 17"MP. Reduce airspeed to 95K during the turn and, after rolling out, select 15 degrees of flap. Ideally, the remainder of the approach should be completed without any further power adjustments and with a rate of descent of 500 to 750 fpm. Once you have established the correct rate of descent, use careful elevator movements to regulate minor airspeed adjustments.

4.04 - FINAL APPROACH

(1) Good judgement is required on the final approach leg, which is the most important of the traffic pattern. Having selected 15 degrees of flap on the base leg, begin the turn onto the final approach. Throughout this turn, you MUST maintain a speed of 95K. Select a second 15 degrees of flap on completion of the turn and, when the aircraft is lined up with the runway, use "crab" if necessary to eliminate drift. If you see that the aircraft is overshooting or undershooting, do not hestitate to adjust the power. During the final approach, do the Final Landing Check which is detailed in TC-11. Do NOT memorize this check, but use the Challenge Check List. On the final approach, maintain 90K, and use the flaps so that the aircraft arrives over the button at 85K. Lower the last 15 degrees of flap as required, but before starting the round-out.

4.05 - LANDING

(1) THE ROUND-OUT - Maintain the final approach airspeed until you start the round-out. Just before the round-out, move the pitch control levers to full "FINE" so that full power is available for over-shooting. Moving the lever to full "FINE" at this time also allows you to concentrate on the landing without the distraction of a pitch change at a more crucial moment. For a normal landing, you should use the button of the runway as the aiming point. Plan to arrive over the button at approximately 10 to 20 ft AFL, and then start the round-out by gently easing back on the control column. Be careful not to overcontrol to such an extent that the aircraft balloons. During the round-out the aircraft continues to descend, and it must be rotated to arrive over the touch-down point in a tail-down attitude. As the aircraft is rotating smoothly, continue to reduce power so that it is fully off at the completion of the round-out. You can find the landing attitude perspective by remembering the perspective of the runway from the cockpit during the line-up and take-off.

(2) FLOAT - There is a short "float" period between the round-out and the touch-down. The distance the aircraft floats varies with the configuration, the wind speed, and the IAS at the completion of the initial round-out. During the float period, the attitude of the aircraft should be changed continually as the airspeed falls off. Continue to hold the aircraft off in a tail-down attitude, just above the runway, until the main wheels touch. Note that the round-out is a co-ordinated manoeuvre which consists of control-column pressures, power reductions and a "hold-off" to touch-down. For simplicity, the round-out has been treated in paras (1) and (2), as two separate manoeuvres but, in fact, it is one continuous process.

(3) TOUCH-DOWN - The Expeditor should usually touch down in a tail-down attitude with the power fully off. As the wheels make contact with the runway, relax the back pressure on the control column to prevent the aircraft from bouncing. Do not force the tail down onto the runway; allow it to drop naturally. While the aircraft is slowing down, the rudders remain effective until the tail is on the runway.

(4) AFTER-LANDING ROLL - After the touch-down, maintain directional control by using a combination of rudder and brakes. While the rudders are still effective, use only small amounts of brake, but as the rudders become less effective, maintain directional control by use of brakes alone. Do not overcontrol, since the aircraft should not require harsh use of brakes or rudders; use asymmetric power in an emergency to assist you to maintain directional control. As soon as the aircraft is firmly on the runway, raise the flaps.

(5) POST-LANDING CHECK - After landing, reduce speed until the aircraft is moving at a safe taxiing speed and, just before the turn-off point, unlock the tail wheel. Taxi clear of the landing runway onto the taxi strip, stop, and do the Post-Landing Check. Do NOT attempt to memorize this check. Use the Challenge Check List. If you anticipate having to dilute the oil, open the oil shutters to reduce the oil temperature preparatory to oil dilution at shut-down.

4.06 - THE EFFECT OF WIND ON THE CIRCUIT

(1) If the approach is going to be made into a strong wind, you must be prepared for a steeper angle of descent, as shown in Figure 3. The attitude of the aircraft remains the same, but if you have made no adjustment to the circuit, more power will be required if the aircraft is to reach the predetermined spot for the touch-down. The strength and direction of the wind is one of the items in the landing instructions; therefore you should begin to plan the approach leg as soon as you receive landing instructions. The strength of the wind determines when you should turn onto the base leg to allow for a normal final approach.

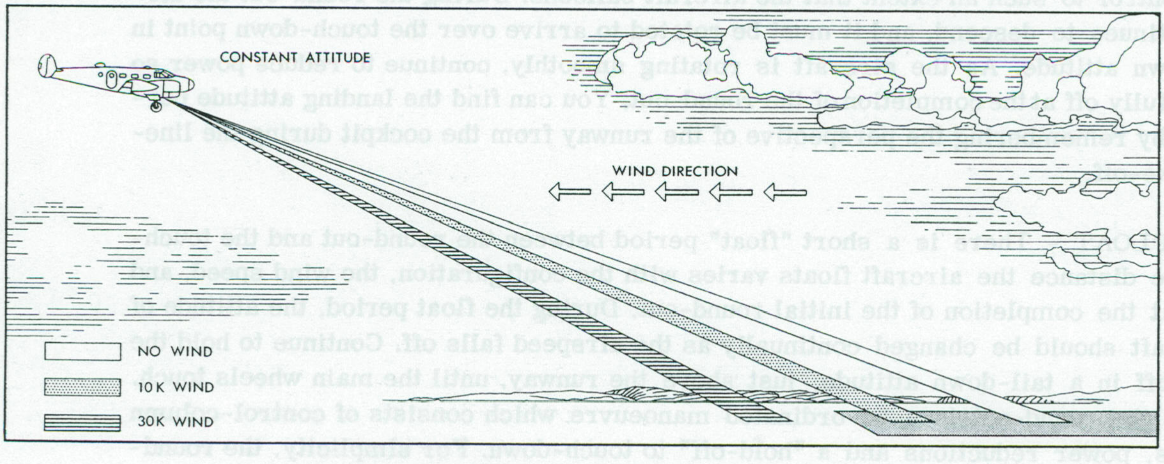


Figure 3. The Effect of Wind on the Approach

(2) A strong vertical shear has a noticeable effect on the approach. For example, if you are aware of a strong approach headwind at circuit altitude (50K) and a weak surface headwind (10 mph) you can assume that the decrease in wind strength during your descent will affect the approach path. If you take no compensating action, there will be a continual tendency for the airspeed to decrease and consequently you will find it necessary to lower the nose. Since you thus steepen the descent path and at the same time shorten the approach path, you will then have to apply power late in the approach. Although this situation should never become a critical problem in propeller-driven aircraft, an awareness of the cause should eliminate any approach problems. During the last portion of the descent in a strong wind shear, you should be prepared to add power should the airspeed drop-off be more than you have anticipated. After having done several consecutive circuits and when you are fully aware of the situation, start the approach at a higher-than-normal power setting to compensate for the anticipated drop-off in airspeed.

4.07 - THE EFFECT OF FLAPS

(1) The Expeditor is equipped with simple lift-drag type flaps. When lowered, these flaps increase the value of the Co-efficient of Lift (C_L) by increasing the effective camber of the aerofoil section without altering the plan area of the wings. The downward deflection, however, also has the effect of substantially increasing the drag. The first ten degrees of flap usually increase the lift more than the drag, and any subsequent lowering increases the drag more than the lift. Therefore, lowering flap on the approach has the following advantages.

(a) The increased drag permits a steeper gliding angle without increasing the airspeed.

(b) The visibility is improved.

(c) The aircraft has a lower touch-down speed.

(d) During the float and after-landing roll, the flaps act as an airbrake and shorten the rolling distance.

(2) The amount of flap used depends on the type of landing that you have planned and, also, on the strength of the wind. If you attempt to shorten the approach by diving steeply with the flaps "UP", the airspeed will build up to such an extent that the aircraft will tend to float above the ground until the forward speed has been dissipated. By intelligent use of flaps however, you can make a steeper approach without building up excessive speed, and the aircraft, being close to the minimum flying speed at round-out, will land almost immediately. When you use full flap, more control column movement is needed to bring the aircraft into the correct landing attitude. You should allow for this and time your round-out accordingly. If you use partial flap for landing, do not use less than 30 degrees.

(3) The approach path should always be as constant as possible; therefore as the

amount of flap is increased during the approach, you must adjust the pitch attitude to keep the airspeed constant. However, if the aircraft is undershooting the desired point of touch-down, apply power and change the attitude to maintain the correct airspeed. If the aircraft is overshooting the desired point of touch-down, and you already have full flap down, reduce power and change the attitude to maintain the correct airspeed.

(4) Do not lower flap on the final approach when the aircraft is close to the ground, since doing so will spoil your judgement of the approach path and, consequently, will spoil the landing. NEVER RETRACT THE FLAPS ON THE FINAL APPROACH. This is an EXTREMELY DANGEROUS PRACTICE when the aircraft is close to the ground, since flap retraction is rapid and the subsequent loss of lift during the last 10 degrees of flap retraction causes the aircraft to lose altitude. The airspeed is relatively low on the final approach and the aircraft could stall. The effect of flaps on the gliding angle is illustrated in Figure 4.

4.08 - CROSSWIND LANDING

(1) Crosswind landings in the Expeditor are not difficult, provided you use the proper procedure. Do not attempt to land when the crosswind exceeds the limits detailed in the AOI and TC-11. After allowing for wind in the circuit pattern, start the procedure for a crosswind landing while the aircraft is still on the final approach.

(2) FINAL APPROACH LEG - On the final approach use "crab" to keep the aircraft lined up with the centre of the runway. Maintain a final approach speed approximately 5K higher than for a normal approach, since you may have to contend with gusts or a varying wind shear. The use of flaps is not recommended when the wind speed exceeds 20 mph or when the wind speed plus the wind angle exceeds a factor of 40. For example, a wind speed of 20 mph at 30 degrees off the runway, equals a factor of 50. These rules do not apply for winds under 10 mph. In gusty winds, a flapless crosswind landing requires an IAS of 95K for the final approach and an across-the-button speed of 90K.

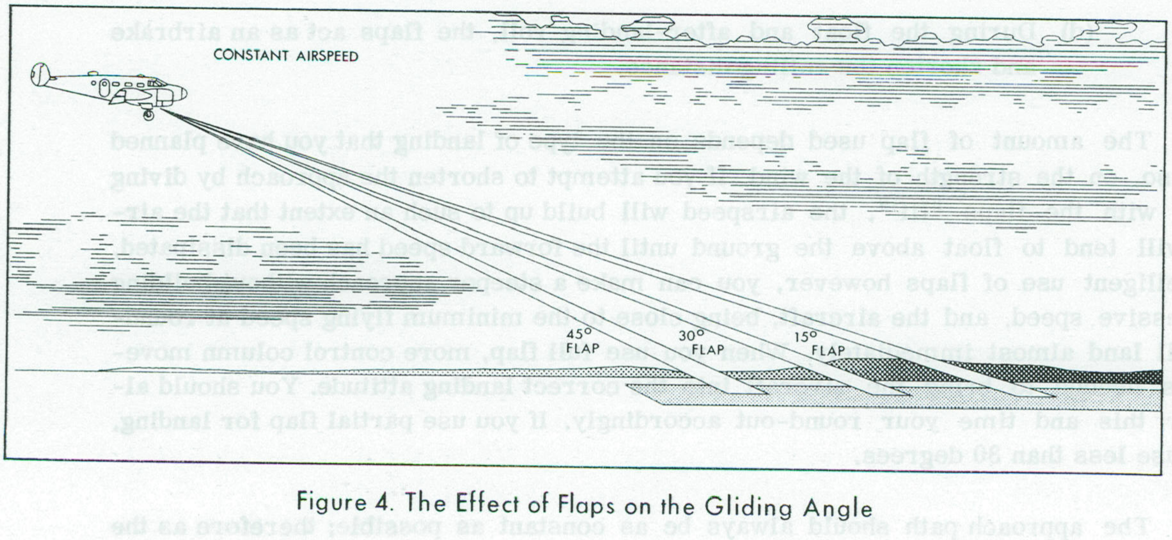


Figure 4. The Effect of Flaps on the Gliding Angle

(3) ROUND-OUT - When you start to round out, take off the "crab" and, at the same time, lower the into-wind wing and apply opposite rudder to keep the nose pointing along the runway. This co-ordinated manoeuvre causes the aircraft to side-slip into wind and prevents drift during the touch-down. Note that as the airspeed decreases you must increase the amount of aileron and rudder pressure to prevent the aircraft from drifting. Do not touch down with drift or "crab". During the early stages of practising crosswind landings your instructor may require you to take off "crab" earlier on the approach and apply the "wing-down" technique.

(4) TOUCH-DOWN - When the aircraft touches down, one wing should be down into wind and the wheel on that side should be the first to touch the runway. Fly the aircraft onto the runway in a semi-flying attitude with the tail slightly down. When a crosswind approaches the limits detailed in TC-11, you may have to keep some power on until the wheels are on the runway.

(5) AFTER-LANDING ROLL - Maintain directional control normally, using asymmetric power if required and more into-wind aileron. The rest of the landing follows the sequence of a normal landing.

4.09 - FLAPLESS LANDING

(1) BASE LEG - Flapless landings are required in strong winds or crosswinds. Start a flapless approach on the base leg by setting approximately 15"MP and maintaining the airspeed at 95K.

(2) FINAL APPROACH AND ROUND-OUT - On the final approach, maintain the airspeed at 95K and cross the button at 90K. The round-out is the same as that done during a normal landing, but the amount of rotation is less because of the flatter approach attitude of a flapless landing. The rotation and handling of power is the same as for a normal landing, except that there is a longer float distance. The position of the touch-down point should be the same as for a normal landing; to achieve this however, your aiming point must be further from the intended touch-down point than it would be in a normal landing.

(3) The touch-down and after-landing roll are the same as for a normal landing.

4.10 - MINIMUM-ROLL LANDING

(1) A minimum-roll landing starts with a normal circuit, but the pitch is set at 2000 rpm during the Pre-Landing Check. With this pitch setting of 2000 rpm, there is a faster engine response to throttle movements; this is advantageous, since you may find that quick engine response is necessary when flying at the lower airspeeds. The base leg is flown as in a normal landing. On completion of the turn onto the final approach, reduce the airspeed by early selection of flap, and maintain the airspeed at 80K. Aim at a point 100 to 200 feet short of the intended point of touch-down.

(2) ROUND-OUT - Start the round-out at approximately 10 to 20 ft AGL, 100 to 200 feet short of the point of touch-down. Rotate the aircraft into a three-point attitude just before it arrives over the threshold. The distance from the threshold depends on the expected float period, which varies as discussed in art 4.05(2). Although you should use trim during the approach, you will need some increased control-column pressure to hold the aircraft in the three-point attitude and to keep the wheels from touching before the aircraft reaches the landing point. The aircraft should cross the button of the runway at 70 to 75K.

(3) TOUCH-DOWN - Touch down with the aircraft in a tail-down attitude. With the tail in this position there is very little tendency for the aircraft to swing. As soon as the aircraft is on the runway, raise the flaps and simultaneously apply as much brake as practicable taking care not to lock the brakes or nose the aircraft over.

(4) AFTER-LANDING ROLL - Maintain directional control by use of brakes.

4.11 - TOUCH-AND-GO

(1) When doing touch-and-go landings, complete the landing to the point where the tail of the aircraft is on the runway and the flaps are "UP". Then, with the aircraft fully under control, do an overshoot. This procedure allows you to derive maximum benefit from circuits and landings, especially if you practise all types of landings.

4.12 - OVERSHOOTING

(1) There are two types of overshoots:

(a) those from above 300 feet; and

(b) those below 300 feet.

(2) ABOVE 300 FEET - When overshooting from above 300 feet, apply "MAXIMUM CONTINUOUS" power ($33\frac{1}{2}$"MP and 2200 rpm) and select an attitude which allows the aircraft to accelerate as rapidly as possible. Raise the landing gear and, if the airspeed is below 80K, raise all but 10 degrees of flap. At 80K raise the remaining flap and then complete the Post-Take-off Check. Apply climbing power when the aircraft reaches the predetermined height (normally 500 feet), or at minimum circling altitude, whichever is applicable.

(3) BELOW 300 FEET - When overshooting from below 300 feet, apply full take-off power. When the aircraft is safely clear of the ground and is climbing straight ahead, raise the landing gear. If the airspeed is below 80K, raise all but 10 degrees of flap and select an attitude which allows the aircraft to accelerate as rapidly as possible. At 80K, lift the remaining flap, and at V_2, reduce the power to "MAXIMUM CONTINUOUS" power and do the Post-Take-off Check.

(4) During any circuit, do not hesitate to overshoot from any unsatisfactory approach or landing.

CHAPTER 5

STALLS AND SLOW FLYING

5.01 - INTRODUCTION

(1) The sequences which are covered in this chapter are taught to familiarize you with the symptoms and recovery from stalls, and the feel of the controls at low airspeeds.

(2) THE THEORY OF STALLS - The term "stall" is used to describe a condition of flight in which the lift from the wings can no longer support the weight of the aircraft. Normally, the airflow over the wings is smooth with some minor turbulence towards the trailing edge. As the angle of attack is increased above the optimum angle, the airflow begins to break up and becomes progressively more turbulent, with the area of turbulence thickening and spreading towards the leading edge. Greater angles of attack produce even more turbulence, until a point is reached beyond which there is a sudden loss of a large percentage of the total lift. This angle is known as the "Critical" or "Stalling Angle". The indicated airspeed at which the wings stall is known as the "Stalling Speed", but an aircraft can stall at ANY airspeed, in ANY attitude and at ANY power setting, provided the critical angle is exceeded. The most important factors which affect the indicated stalling speed are weight, power, flaps and load factor.

(3) One further phenomenon occurs as the angle of attack is increased. The centre of pressure (C of P) moves steadily forward until the stalling angle is reached, and then it moves sharply back.

(4) Because of the loss of lift and the movement of the C of P, two things happen at the stall.

(a) The aircraft loses height.

(b) The nose drops.

5.02 - SYMPTOMS AND RECOGNITION OF STALLS

(1) The Expeditor will stall at various airspeeds depending on the configuration, throttle setting and all-up weight (AUW). The stalling speeds given in the AOI are for maximum AUW; therefore, since you will be practising stalls without cargo and with only partial fuel loads, the resultant stalling speeds will be lower.

(2) To start the stall, trim the aircraft for level flight and reduce the throttle settings as applicable. Maintain a constant altitude using elevators. As the airspeed falls off, the attitude becomes nose-high. LEAVE THE TRIM SET FOR LEVEL FLIGHT. The nose-high attitude is more pronounced at high power settings.

(3) Immediately before, and during, the stall, the aircraft will display some or all of the following symptoms:

(a) nose-high attitude;

(b) low airspeed;

(c) sloppy controls;

(d) mushing (always present);

(e) judder (almost always present); and

(f) nose drop possibly coupled with a wing drop.

The symptoms listed are in the normal progression of events, but sometimes some of them may not be evident depending on the configuration, the power settings, and the AUW.

5.03 - STALL RECOVERY

(1) After practising a recovery from a complete stall, recover from subsequent stalls at the first indication, and attempt to recover with a minimum loss of altitude by skilful use of the elevators.

(2) Recover by simultaneously relaxing the back pressure on the control column to unstall the wings and applying maximum MP for the rpm selected. For practice stalls use 2000 rpm and use 28"MP. As soon as the aircraft is at full power, raise the landing gear and then raise the flaps to 10 degrees. Raise the remainder of the flap when the aircraft is climbing and the airspeed has increased to 80K.

(3) AIRMANSHIP - Even when you are doing a clean stall, it is good airmanship to go through the motions of selecting landing gear and flaps "UP" as a precaution. During the stall you will likely have a tendency to concentrate on instruments; because of the lower airspeed and varying power settings, you will have to monitor temperatures and pressures closely. However, you must not neglect look-out; after practising each stall, always have a good look around.

5.04 - PRE-STALL CHECK

(1) Before practising stalls, do the Pre-Stall/Slow Flying Check as detailed in TC-11. Do NOT memorize this check.

5.05 - CLEAN STALL

(1) A "clean stall" is defined as a stall in which the landing gear and flaps are "UP" and the throttles closed.

5.06 - LANDING ATTITUDE STALL

(1) A "landing attitude stall" is defined as a stall in which the landing gear and flaps are "DOWN", and the power is set at 15"MP.

5.07 - SLOW FLYING

(1) When you are practising slow flying use an airspeed of 65K to 70K, a power setting of 2000 rpm, and lower the landing gear and flaps. The use of flaps allows slow flying to be done at a low airspeed and increases the forward visibility. The use of 2000 rpm produces greater airflow over the control surfaces and provides for instantaneous power response when it is required.

(2) Before practising slow flying, do a Pre-Stall/Slow Flying Check, decrease the airspeed to landing gear and flap lowering speed, and then lower the landing gear and flaps. At an airspeed 2K to 3K above the airspeed selected, apply approximately 24" to 26"MP to maintain the IAS. It is important to maintain a constant altitude and to ensure that the aircraft is properly trimmed.

(3) During slow flying, monitor the engine temperatures and pressures closely. At the slow IAS used in slow flying, temperatures rise rapidly; therefore you must make appropriate adjustments as required.

(4) When you turn the aircraft at slow-flying airspeeds the same factors apply as were discussed in art 3.09. In slow flying, the roll into and out of a turn must be smooth and co-ordinated. During slow flying, do not exceed a Rate 1 turn and remember that the amount of bank required for a Rate 1 turn is considerably less at low airspeeds (approximately 15 degrees). During a turn, monitor the IAS closely, since it is in the critical range. Additional power will be required for all turns at an IAS of 65K to 70K.

(5) When you wish to recover from slow flying, apply climbing power, raise the landing gear and then raise the flaps to 10 degrees. At 80K, raise the remaining flap and allow the aircraft to accelerate to cruising airspeed.

CHAPTER 6

ASYMMETRIC FLIGHT

6.01 - INTRODUCTION

(1) While flying in any aircraft you may be faced with the possibility of a partial or complete loss of power. In multi-engined aircraft, the possibility of a complete loss of power is remote, but since one or more engines may fail, you are required to practise and become proficient in single-engine procedures.

(2) The theory of the forces involved in asymmetric flight are detailed in TC-46, Pilots' Manual for Multi-Engine Aircraft. The handling of the Expeditor with asymmetric power is simple, since the procedures follow a basic and logical progression.

6.02 - ENGINE FAILURE ON THE RUNWAY DURING TAKE-OFF

(1) If an engine fails during take-off before the aircraft is airborne, use the procedure which is detailed in the AOI and in TC-11. You must be able to do this procedure correctly, without reference to a check list, and your reactions must be instantaneous.

(2) Since you must attempt to stop the aircraft within the remaining length of the runway, hold the control column fully back to help to prevent the aircraft from nosing over; then apply maximum brake pressure. If you are to ground-loop the aircraft, make the decision as early as possible, basing your decision on the surface condition of the overrun and the infield. Remember that a controlled ground-loop results in very little damage to the aircraft.

6.03 - ENGINE FAILURE AFTER TAKE-OFF (AIRSPEED BELOW V_2)

(1) If an engine fails after take-off, but before the aircraft reaches safety speed, use the procedure which is detailed in the AOI and in TC-11. You must be able to carry out this procedure correctly, without reference to a check list, and your reactions must be effective within a minimum time.

(2) Depending on circumstances, you may be able to sacrifice altitude to increase the airspeed to V_2 and thus complete a single-engine circuit and landing. If you cannot increase the speed to V_2, make a forced landing in a suitable area with the help of the good engine.

6.04 - ENGINE FAILURE AFTER TAKE-OFF (AIRSPEED ABOVE V_2)

(1) If, after take-off an engine fails after the aircraft reaches safety speed, use the procedure which is detailed in the AOI and in TC-11. You must be able to carry out this procedure correctly, without reference to a check list, and your reactions must be accurate and effective.

(2) During this emergency you may be inclined to hurry the procedure. Remember that it is better to do this check smoothly and accurately than to hurry and risk missing some item.

(3) After completing the control, power, and drag check, conserve the good engine by reducing power to "MAXIMUM CONTINUOUS" as soon as the airspeed reaches 95K with the aircraft "clean" and climbing (Figure 1). Maintain the engine temperatures and pressures within their operating ranges, and do the Post-Take-off Check. Inform the controlling agency of the situation by declaring an emergency, and thus obtain priority in the circuit which will enable you to concentrate on flying. Do not be in a hurry to shut down the failed engine, since this can be done with safety whenever time permits.

(4) Turn onto the downwind leg as soon as the aircraft is at a safe altitude (200 to

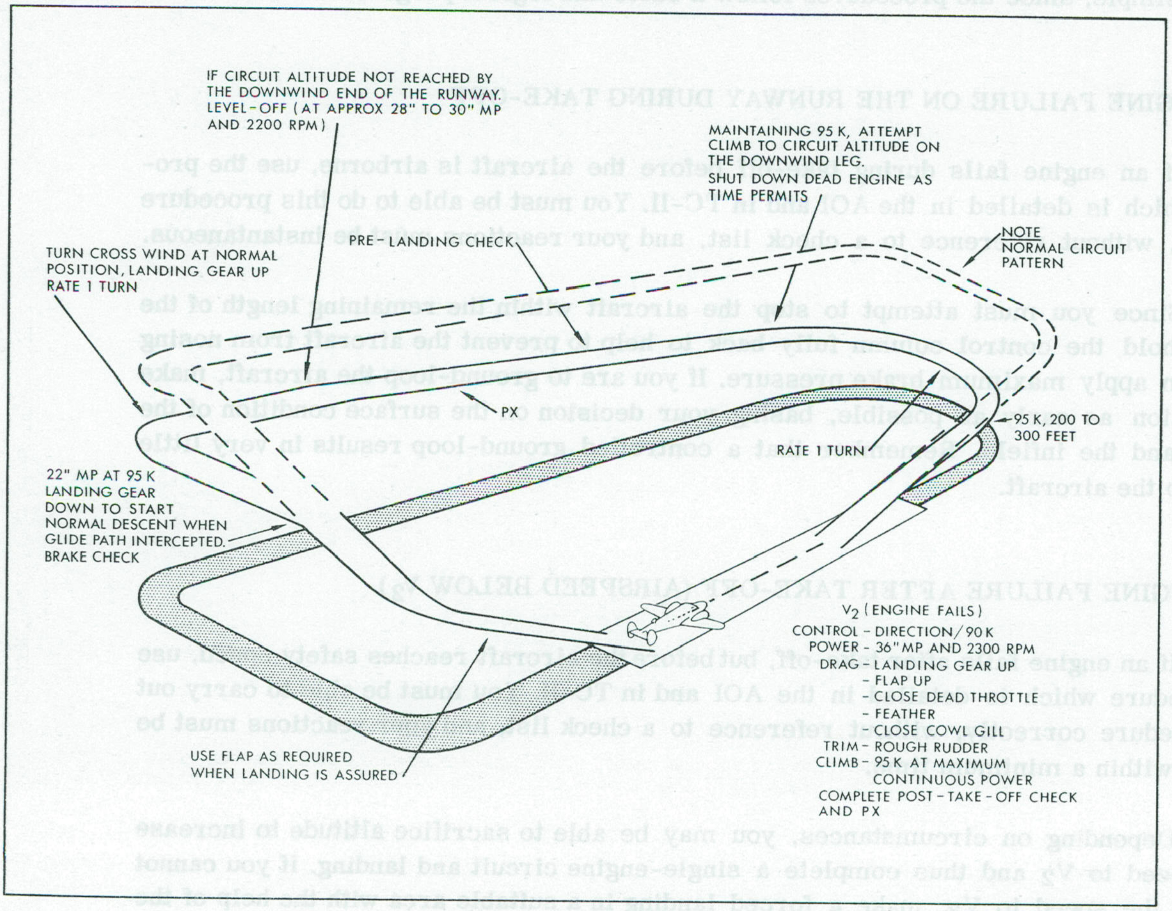


Figure 1. The Single-engine Circuit

300 feet). When there is only limited visibility, or when the climbing characteristics of the aircraft are poor, you may have to turn at a lower altitude. Limit all single-engine turns to a maximum of Rate 1. When you turn onto the downwind leg, arrange the turn so that the wing tip appears to be travelling along the runway that you intend to land on. As the aircraft gains altitude, keep the wing tip in this perspective so that, if the aircraft reaches circuit altitude, you will arrive at the normal circuit position for lowering the landing gear. Do not overlook the possibility of landing on a runway other than the one that you used for take-off.

(5) During the downwind portion of the circuit, you can shut down the failed engine, do the Pre-Landing Check and give the position report (PX) for a normal circuit.

(6) Reduce the MP to maintain circuit airspeed (105K) as soon as the aircraft reaches circuit altitude; maintain 2200 rpm. If the aircraft has not reached circuit altitude by the time it is opposite the button, level out and maintain "MAXIMUM CONTINUOUS" power until the airspeed reaches circuit airspeed.

(7) If the aircraft is at circuit altitude, make the turn onto the base leg as if you were flying a normal circuit, and lower the landing gear in the normal position. If the aircraft is not at circuit altitude, do not lower the landing gear until the aircraft reaches the normal descent path. Lower the landing gear before you reduce power to start the descent on the approach path.

(8) After lowering the landing gear, retard the live throttle to approximately 22" MP and adjust the rudder trim. This power setting and configuration should result in the rate of descent of a normal approach.

(9) Use an airspeed of 95K on the final approach and, if you are to lower flap, use no more than 15 degrees until the landing is assured. After the landing is assured, lower the remaining flap, as required, so that the aircraft crosses the button at 85K. If you make an error in judgement, it is better to land further down the runway, than to touch down short of the runway. All other single-engine landing techniques are the same as those for a normal landing.

(10) A good single-engine circuit and landing depends, to a great extent, on the use of trim; for example, you should always alter the rudder trim immediately after a throttle adjustment.

6.05 - SINGLE-ENGINE OVERSHOOT

(1) If you see that you are going to have to do a single-engine overshoot, make the decision as early as possible.

(2) When doing a single-engine overshooot, apply "MAXIMUM TAKE-OFF" power (36"MP and 2300 rpm) and retract the landing gear and flaps. After the aircraft accelerates to 95K, reduce the power to "MAXIMUM CONTINUOUS", do the Post-Take-off Check and continue a single-engine circuit as described in art 6.04.

6.06 - SINGLE ENGINE AT ALTITUDE

(1) If an engine fails during flight at altitude (above 1000 ft AGL), follow the procedure detailed in the AOI and in TC-11. You must be able to carry out this procedure without using a check list.

(2) After completing the checks, make a decision about your subsequent actions. Always inform the appropriate controlling agency of your situation and fly in the direction of the nearest suitable aerodrome. You should attempt to land as soon as possible. Set "MAXIMUM CONTINUOUS" power if this will help to maintain 110K (maximum range single-engine speed).

6.07 - SIMULATING SINGLE-ENGINE PERFORMANCE

(1) When you are PRACTISING single-engine procedures do not feather the Expeditor propeller. Above 1000 ft AGL, to simulate the single-engine performance of the aircraft with one engine feathered, close the throttle and move the pitch control level to full "COARSE" on the simulated dead engine. Open the throttle to increase the MP one inch for each 100 rpm. Maintain minimum operating temperatures and pressures on the simulated dead engine.

(2) Below 1000 ft AGL, or in the circuit, to simulate single-engine performance of the aircraft with one engine feathered, adjust the pitch control lever of the "dead" engine to the same position as that of the live engine, and open the throttle to 12"MP.

(3) Adjust the engine controls after you have simulated feathering. To indicate feathering, lower the feathering-button guard only. Do not point at the feathering button or feather the propeller. Do not PRACTISE single-engine overshoots if the aircraft is below 250 ft AGL and you have already selected more than 10 degrees of flap, or if the airspeed is below V_2. Simulated single-engine touch-and-go landings are not permitted.

6.08 - ENGINE FIRES

(1) For engine fires, follow the procedure detailed in the AOI or in TC-11. You must be able to carry out this procedure correctly and without reference to a check list. Your reactions must be effective within a minimum time, and you must adhere to the sequence detailed in the AOI or in TC-11.

(2) Once the fire is under control, set up the aircraft for asymmetric flight.

CHAPTER 7

CREW CO-OPERATION

7.01 - INTRODUCTION

(1) Training Command Instructions (TCI) list the minimum composition of a crew required for the operation of Training Command aircraft. The operation of multi-engined aircraft within the Command generally involves the team-work of a crew. The operation of the Expeditor normally involves the team-work of a two-man crew: a pilot and a co-pilot.

(2) The efficiency of an aircrew depends on crew co-operation; this requires that each member should have a thorough knowledge of the duties to be performed, not only by himself but by the other members of the crew as well. The aircraft captain is responsible for ensuring that the duties of each crew member are specific, and that each member knows and understands his assigned task.

7.02 - DEFINITIONS

(1) The following definitions apply to members of the crew of an Expeditor aircraft that is being used for training.

(a) CAPTAIN - The Captain of the aircraft is the person who has signed for the aircraft and is responsible for its safe operation. He may be the pilot or he may be acting as co-pilot in his capacity as an instructor.

(b) PILOT - The Pilot of the aircraft is the person who is actually flying the aircraft either from the left-hand or right-hand seat.

(c) CO-PILOT - The Co-pilot of the aircraft is the person who sits in the right-hand seat. Besides those duties specifically assigned by the Captain, the Co-pilot shall:

(i) read all check lists when requested to do so by the captain;
(ii) do all R/T work;
(iii) do all log keeping;
(iv) read, and take the action required for, the Post-Take-off Check;
(v) maintain a constant look-out for other aircraft; and
(vi) monitor temperatures and pressures.

7.03 - LIMITED CREW CO-OPERATION

(1) As well as flying the aircraft during the early stages of your training, you will be required to take over most of the duties that you will be delegating to a co-pilot at a later stage of training. After you have passed the clear-hood handling test, the division of work between the captain and co-pilot will be explained, and thereafter you will practise full crew co-operation.

(2) Although co-pilot duties are virtually non-existent before the clear-hood handling test, you must remember to tell the occupant of the right-hand seat what he is to do in an emergency.

(3) Initially, your instructor will take over many of the duties for you, but as you become more proficient, you will be expected to fly the Expeditor without any assistance. During the initial stage of your training, the pilot's and co-pilot's duties are as follows.

(a) At the pilot's command, the co-pilot or instructor shall read all check lists.

(b) Before take-off, the pilot shall do all radio checks and shall obtain all clearances.

(c) On completion of the Pre-Take-off Check, the pilot shall tell the co-pilot to follow through on the throttles, with his hand below and behind the pilot's hand, to prevent slippage when the pilot removes his hand to raise the landing gear.

(d) When circuit flying, the pilot shall request the co-pilot to do all R/T procedures.

(c) The pilot shall be responsible for the proper power settings and instrument readings at all times.

7.04 - FULL CREW CO-OPERATION

(1) This Standard Operating Procedure (SOP) is designed to eliminate repetitious briefings and commands by the pilot, but does not relieve him in any way of the full responsibility for the proper operation of the aircraft. Rather, it permits him to use both hands, and to devote most of his attention to flying the aircraft while controlling the co-pilot's duties in a supervisory capacity only.

(2) To eliminate errors and misunderstandings, the co-pilot shall acknowledge all commands. Commands are normally given over the interphone but, if you can't use the interphone, give and acknowledge commands orally. Whenever you are giving or acknowledging commands orally, always remember that it is of the utmost importance that they are given clearly and loudly enough to be heard above the noise of the engine. This precaution will obviate all possibility of misunderstanding.

7.05 - BEFORE TAKE-OFF

(1) The co-pilot will do all, or part of, the radio check, except when otherwise directed by the pilot and, as applicable, shall obtain all R/T clearances.

(2) In reply to the challenge "Take-off Briefing" during the Pre-Take-off Check, the pilot shall give the co-pilot the following information.

(a) The intended take-off procedure (in brief).

(b) The corrected MP for take-off power.

(c) Any instructions relating to emergencies.

For example: "This will be a normal take-off using 35 inches MP. In case of engine failure, I'll handle all the controls, and you do the R/T and checks at my command. Landing runway 31."

7.06 - DURING THE TAKE-OFF AND CLIMB

(1) The term "NORMAL TAKE-OFF", shall have the following meaning when used during the pre-take-off briefing.

(a) The pilot shall line up the aircraft on the runway and, when in position, shall call, "Tail wheel locked".

(b) The pilot shall open the throttles to 30"MP (unless he specified otherwise during the pre-take-off briefing). The co-pilot shall follow through with his hand below, and behind, the pilot's hand. Upon reaching 30"MP, the co-pilot shall tap the top of the pilot's hand lightly, the pilot shall remove his hand, and the co-pilot shall continue to advance the throttles smoothly, to the setting specified during the pre-take-off briefing.

(c) During the take-off run, the co-pilot shall monitor the MP used for take-off, check for over-speeding, and advise the pilot immediately of any adverse engine instrument readings.

(d) In the event of a malfunction, the pilot shall decide whether to abort or continue the take-off. If he decides to abort, he shall call out, "Abort", take control of the throttles and reduce power as required.

(e) At V_2, the pilot shall raise the landing gear and signal the first throttle reduction by extending his hand over the throttle, palm up, and drawing his hand slowly back. Simultaneously he shall call out, "MAXIMUM CONTINUOUS", and the co-pilot shall retard the MP and rpm, smoothly. After the co-pilot has set "MAXIMUM CONTINUOUS" power, the pilot shall call out, "Post-Take-off Check", as a signal for the co-pilot to read and do the check.

(f) At the pre-determined altitude (generally 500 ft AGL), or at minimum circling altitude and at climbing airspeed, the pilot shall call out "Climbing Power" while making the same signal as that described in (e).

(g) For the remainder of the climb to altitude, the co-pilot shall maintain the MP at climbing settings, and shall make the appropriate adjustments for temperatures and pressures, as required.

7.07 - IN FLIGHT

(1) When the attitude is changed to level flight and cruising power is required, the pilot shall signal for the power reduction by placing his hand palm-downwards over the throttles and moving his hand from left to right. Simultaneously, he shall call for the desired horsepower or a power setting. When the pilot specifies a horsepower, the co-pilot shall refer to the horsepower charts to determine the exact setting and shall adjust the MP and rpm accordingly. Power may be further adjusted to maintain an IAS. The co-pilot shall complete a level-off check, and shall allow the cylinder-head temperature to stabilize before he leans the mixture.

(2) The co-pilot shall monitor all temperatures and pressures, and shall ensure that they remain in the required ranges for the remainder of the trip. Any deviations shall be brought to the attention of the pilot immediately. This does not relieve the pilot of the responsibility of monitoring the temperatures and pressures.

(3) In addition to keeping the flight log and doing the R/T work, the co-pilot shall carry out any other duties which may be assigned to him by the pilot.

(4) At the start of a descent, the pilot may hand over certain duties to the co-pilot or he may choose to do these himself; eg, he may set the mixture and the required MP, or he may ask the co-pilot to set these for him, in which case the co-pilot would adjust them periodically during the descent, decreasing the MP as required.

(5) The pilot may call for power settings during a circuit or instrument approach. When ordered to do so, the co-pilot shall set the required power. The pilot shall have control of the throttles on the final approach.

(6) At the appropriate time, the pilot shall ask the co-pilot to read the Pre-Landing Check. The pilot shall complete the check.

(7) The pilot shall ask the co-pilot to read the Final Landing Check. The pilot shall complete the check.

(8) When doing touch-and-go or full-stop landings, the pilot may raise the flaps or orally direct the co-pilot to do so.

(9) After the aircraft has landed and cleared the runway, the pilot shall call for the Post-Landing Check. The co-pilot shall read the check to the pilot, who shall make the appropriate adjustments. Some items such as "unnecessary radios off" may be done by the co-pilot, as directed by the pilot.

CHAPTER 8
(unallocated)

CHAPTER 9
(unallocated)

CHAPTER 10

BASIC INSTRUMENT FLYING

10.01 - INTRODUCTION

(1) Any instrument flight, regardless of how long and complex it is, is simply a series of connected basic instrument manoeuvres; therefore, a thorough grounding in the techniques of basic instrument flying is important. This part of the syllabus is designed with two aims in view: to familiarize you with the layout of the Expeditor's instrument panel, and to teach you to fly the aircraft competently and safely within the limitations of the instruments. After you have completed this part of the course, you will be proficient in the interpretation of information presented by the instruments and in the methods of efficient cross-checking.

10.02 - BASIC INSTRUMENT FLYING

(1) The position of an aircraft's nose and wings in relation to the earth is known as the attitude of the aircraft. There are two references by which you can judge the aircraft's attitude. One of these references is the earth itself - or the natural horizon; the other is the attitude indicator - an instrument which substitutes a horizon bar to represent the actual horizon and presents a visual picture of the aircraft's attitude.

(2) Power is controlled by reference to the tachometer and the MP gauge. A combination of good power control with good attitude control results in the aircraft's following the desired flight path. The instruments to which you refer when controlling the attitude and power are called the CONTROL INSTRUMENTS and consist of the attitude indicator, tachometers and MP gauge.

(3) The performance of the aircraft is shown by the PERFORMANCE INSTRUMENTS, that is, the altimeter, the vertical speed indicator (VSI), the distance and radio magnetic indicator (DRMI), the gyrosyn compass, the directional indicator (DI), the airspeed indicator (ASI), and the turn and slip indicator. The performance of the aircraft is always determined by reference to the performance instruments, regardless of whether the aircraft's attitude is controlled by reference to the natural horizon, the attitude gyro, or both.

(4) In addition to the control and performance instruments, there is a third group termed the NAVIGATION INSTRUMENTS: the ARC, LF radio, ILS and TACAN fall into this category. The navigation instruments show the position of the aircraft in relation to a selected station, thus you can interpret the aircraft's position in relation to some de-

sired position. When you know the aircraft's position, you can decide what aircraft performance is necessary to complete the flight.

10.03 - ATTITUDE CONTROL

(1) Proper control of the aircraft's attitude depends on your ability to hold a constant attitude accurately, to change the attitude smoothly by a definite amount, and to know when and by how much to change the attitude. You can maintain or change the aircraft's attitude by referring to the attitude indicator. This instrument displays the position and movement of a miniature aircraft symbol in relation to a horizon bar, and presents a pictorial indication of the aircraft's attitude. Any change in attitude shows an immediate, corresponding change in the attitude of the miniature aircraft in relation to the horizon bar. Thus any changes of attitude are immediately indicated on the instrument, and appropriate action can be taken to control them.

(2) PITCH CONTROL - Definite pitch attitude changes are made by changing the "pitch attitude" of the miniature aircraft by definite fractions or multiples of the thickness of the horizon bar (Figure 1). Generally these corrections are referred to as "bar widths".

(3) BANK CONTROL - The angle made by the wings of the miniature aircraft with the horizon bar, and the position of the bank pointer on the index scale are used to indicate the bank attitude. The bank index scale is graduated at 0, 30, and 60 degrees of bank. By referring to the attitude indicator, you can establish and maintain desired amounts of bank.

10.04 - POWER CONTROL

(1) Proper power control depends on your knowing when and by how much to change the power indications, and your ability to establish the desired power indications. Power control means setting a desired rpm on the tachometer, and selecting the appropriate manifold pressure. You can maintain desired power settings with a minimum of attention, except in climbs and descents or steep turns (45 degrees of bank) when you may have to make frequent adjustments.

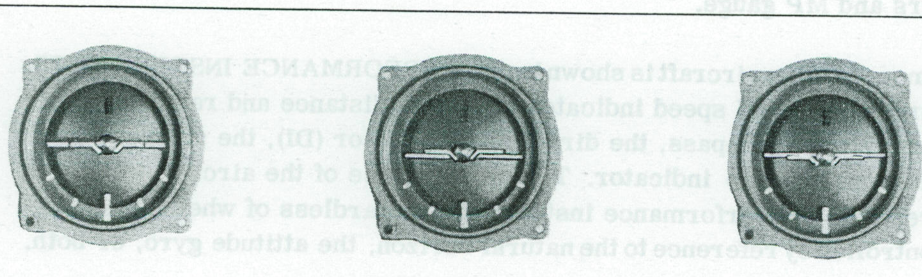


Figure 1. Indications of Attitude by Attitude Gyro

10.05 - PERFORMANCE INSTRUMENTS

(1) Since controlling the attitude and power gives a desired performance, you must be able to recognize the need for a change. Also, you must know what to change (pitch attitude, bank attitude, or power) and how much change is needed. Proper interpretation of the performance instruments gives the answer.

(2) The performance instruments show the results of the present attitude and power. When the instruments reflect anything other than the desired indication, you should change the attitude or the power or both. The performance instruments show you when a change is needed.

(3) To know what to change (bank, pitch or power) you must remember that bank attitude control is always used to maintain a heading or a desired turn, and that power control is used to maintain or change the airspeed, except during manoeuvres for which there is a fixed power setting. Pitch attitude control is used primarily to maintain altitude, or to control the rate of climb or descent. When a fixed power setting is employed, as in a full-power climb, the pitch attitude control is used to maintain the airspeed.

(4) The amount of change required to alter the attitude or power must be learned through experience. When the attitude must be changed, the adjustment is made on the attitude indicator or the power instruments or both. After, or during the adjustment, check the performance instruments to see if the change is giving the correct result. If it is not correct, make a further adjustment. Instrument flying is a continuous repetition of this process.

10.06 - CROSS-CHECK

(1) During instrument flying, you must divide your attention between the attitude indicator, the performance instruments and the power indicators. Proper division of attention and the sequence for checking the instruments varies from pilot to pilot, and throughout a flight. You must learn to divide your attention properly and to know the symptoms of an incorrect cross-checking technique. The sign of an incorrect or slow cross-check is a continual "chasing" of the instruments.

(2) The attitude indicator is probably the only instrument to which you can devote your attention for any appreciable time. Also, the attitude indicator is the instrument that is checked the greatest number of times. A normal cross-checking technique is to glance from the attitude indicator to a performance instrument; back to the attitude indicator; a glance to another performance instrument, back to the attitude indicator, and so forth.

10.07 - BASIC MANOEUVRES

(1) Any instrument flight, regardless of how long or complex it is, is simply a series of connected basic instrument manoeuvres. The more accurately you learn to fly the aircraft in the basic manoeuvres, the more accurately and safely you can complete

your flight.

(2) Failure to consider a flight as a series of basic manoeuvres is a common error which leads to erratic aircraft control. The information received from navigation instruments, a radar controller, etc., should be thought of as advice to perform a basic manoeuvre or to make a minor adjustment. Approach charts consist of a series of connected basic manoeuvres such as a fixed airspeed descent, a descending turn, changing airspeeds, straight and level flight, and so on. By visualizing the next basic manoeuvre, you can plan ahead and know exactly what techniques of cross-checking and aircraft control you are to use during the manoeuvre.

10.08 - TRIM

(1) Proper trim technique is essential for smooth instrument flying. The aircraft must be in trim for any given flight condition. Relieving all control pressures makes it easier for you to hold a given attitude constant, thus ensuring smooth and precise control. Primarily, control pressures vary with airspeed changes, power changes, and with the use of ancillary controls (landing gear and flaps).

(2) To trim the aircraft, apply sufficient control pressure to establish or hold a desired attitude, and then relieve all pressures by using the trim. Do not attempt to change the aircraft's attitude by means of the trim, since this usually leads to erratic aircraft control.

10.09 - STRAIGHT AND LEVEL FLIGHT

(1) Straight and level unaccelerated flight is a matter of maintaining a desired altitude, heading, and airspeed. Pitch attitude control is used to maintain or correct the altitude. Bank attitude control is used to maintain, or correct, the heading. Power control is used to establish and maintain the airspeed.

(2) When you detect an altitude error on the performance instruments, make a pitch attitude correction of a definite amount on the attitude indicator. The amount of the attitude adjustment may be measured by adjusting the horizon bar in relation to the miniature aircraft. Monitoring the performance instruments shows whether the size of the adjustment is correct or whether you will require a further adjustment.

(3) Changes of indications on the altimeter and VSI lag behind changes in pitch attitude. You must learn to recognize and accept this lag. Often you will have to hold a new pitch attitude constant for a short period before the change is reflected on the altimeter and VSI. Do not reach a premature decision that an attitude correction is ineffective, since you may make an unnecessary additional correction and may start overcontrolling the pitch attitude.

(4) Oscillation of the VSI in rough air may cause you to over-control the pitch attitude of the aircraft. Also, devoting too much attention to the VSI is a common mistake.

Remember to make sufficient reference to the attitude indicator to ensure good attitude control.

(5) You can easily maintain a desired heading by first ensuring that the attitude indicator is in the level-flight position. Then, by referring to the C-2 compass or DI, you can determine whether the desired heading is being maintained; if it is not, establish a desired amount of bank on the attitude indicator to return the aircraft to the desired heading at the desired rate. For minor adjustments, start a reasonable rate of correction by establishing an angle of bank on the attitude indicator equal to the number of degrees needed to return the aircraft to a heading. Normally, the bank should not exceed that required for a Rate 1 turn.

(6) The attitude indicator is affected by gyroscopic precession during turns, acceleration and deceleration. Because of this error in the attitude indicator, the aircraft may require an attitude slightly different from the expected one. Cross-check the performance instruments to achieve the correct control.

(7) When you are initially controlling the power to establish a chosen airspeed, a knowledge of the approximate power setting required is of great value. The general rule is that every inch of MP which you add or subtract from the normal cruising setting results in an airspeed increase or decrease of 5K.

(8) When you nqtice that there is an error in airspeed, check the altimeter and VSI to see if a change in pitch attitude is required; if not - make a power adjustment.

(9) When you use a power change to change airspeed, do it as follows.

(a) To increase the airspeed, increase the MP approximately 2 inches more than the power setting that will be required to maintain the increased airspeed. Increase the rpm if the MP required is more than that detailed in the AOI and TC-11.

(b) To decrease the airspeed, reduce the MP approximately 2 inches below that required to maintain the reduced airspeed.

(c) When increasing or decreasing the airspeed, set cruising power approximately 2 to 3K before the aircraft reaches the desired airspeed.

10.10 - TURNS

(1) When entering a turn, refer to the attitude indicator and roll the aircraft smoothly until the indicator is near the desired position on the bank index. Decrease or reverse the aileron pressure as the aircraft reaches the desired angle of bank. To help you to hold the bank constant throughout the turn, make frequent references to the attitude indicator. Cross check with the turn needle to establish the amount of bank required for any given rate of turn. Make any corrections required by referring to the attitude indicator

(2) When rolling out of a turn onto a desired heading, lead the roll-out by a number of degrees of heading equal to one-third the amount of bank. Experience will help you to judge the amount of lead your technique requires.

(3) Maintaining a constant altitude and airspeed during a turn involves control of pitch and power changes. Controlling pitch requires the same technique as in straight and level flight. Normally the airspeed does not change appreciably up to 30 degrees of bank, but, if you intend to use more than 30 degrees of bank, you will have to increase the power by approximately 2" to 3"MP. You should anticipate this and increase the power as the aircraft passes through 30 degrees of bank - do not wait until the change in airspeed is registered on the ASI. The amount of power required varies with the altitude, the aircraft, and the OAT.

(4) During the recovery from a level turn, decrease the power proportionately as you reduce the bank angle through 30 degrees.

10.11 - CLIMBS AND DESCENTS

(1) At constant airspeeds, constant-rate climbs and descents are a matter of maintaining a desired airspeed and a desired vertical speed.

(2) Before you start a descent at cruising airspeed, select the power that will give the desired rate of descent and simultaneously select an attitude to maintain the airspeed. A reduction of 1"MP usually results in a rate of descent of 100 fpm. When the descent is to be made in conjunction with a reduction in airspeed, reduce power sufficiently to attain both the reduction in airspeed and vertical speed. After calculating and applying the power setting, maintain altitude until the aircraft reaches the desired airspeed and then maintain the airspeed by changing the pitch attitude on the attitude indicator. You can generally adjust the rate of descent by adjusting the attitude while simultaneously adjusting the power to maintain the airspeed. Minor changes in the rate of descent are accomplished by a slight change in pitch attitude.

(3) All climbs are usually made with climbing power (2000 rpm and 28"MP) and at a rate of climb of 500 fpm. You can control the rate of climb by adjusting the attitude on the attitude indicator and climbing at the resulting airspeed. Do not climb at an airspeed of less than 105, even if you have to sacrifice rate of climb. When you have to climb at a constant airspeed and at a constant rate of climb, you can control the airspeed by adjusting the power, and the rate of climb by adjusting the attitude.

10.12 - OVERSHOOTING

(1) Normally, an instrument overshoot requires transition from level flight with landing gear "DOWN" and a slightly low airspeed, to a constant rate or a 105K climb with landing gear "UP". The two type of overshoots are:

(a) overshoots from minimum circling altitude and above; and

(b) overshoots from below minimum circling altitude.

(2) MINIMUM CIRCLING ALTITUDE AND ABOVE - Apply "MAXIMUM CONTINUOUS" (2200 rpm and $33\frac{1}{2}$"MP) and raise the landing gear. As the airspeed reaches 105K, select an attitude that gives 500 fpm and assume a constant rate climb. Re-trim the aircraft and call for the Post-Take-off Check. Reduce power for a normal climb (28"MP and 20000 rpm) while maintaining 500 fpm.

(3) BELOW MINIMUM CIRCLING ALTITUDE: Apply maximum power and raise the landing gear. Establish an attitude to maintain 105K and re-trim. When the aircraft passes through minimum circling altitude, reduce power to "MAXIMUM CONTINUOUS" to establish a constant rate climb at 500 fpm and call for the Post-Take-off Check. On completion of the check, reduce power for a normal climb, while maintaining 500 fpm.

(4) Overshoots require smooth, well planned control owing to the simultaneous changes in power, airspeed, attitude and trim and the effect of the landing-gear retraction. Throughout the various changes, a pre-planned heading must be maintained. Concentrate first on power, directional control and attitude; then, when a climb is established, continue with the other details of the overshoot.

10.13 - UNUSUAL ATTITUDES

(1) During instrument flying, unusual attitudes sometimes result from inattentive cross-checking or unusual weather conditions. The two general procedures for recovery from unusual attitudes are:

(a) the nose-low recovery; and

(b) the nose-high recovery.

Since there is the possibility of incorrect readings from the attitude indicator, the needle, ball and airspeed are used.

(2) NOSE-LOW RECOVERY - If the airspeed is too high or rapidly increasing, reduce the power to idle, centre the turn needle and gently ease back the control column. When the airspeed stops increasing, and the altimeter indicates level flight, the attitude is approximately level. As the airspeed returns to normal, resume the desired power setting. Whenever the attitude indicator is seen to agree with the turn needle and airspeed indications, it can be included in the cross-check.

(3) NOSE-HIGH RECOVERY - If the airspeed is too low or rapidly decreasing, increase the power to normal climbing power, centre the turn needle and gently ease the control column forward. When the airspeed stops decreasing, and the altimeter indicates level flight, the attitude is approximately level. Do not adjust the power until the airspeed approaches normal and then resume the settings for level flight. Whenever the attitude indicator agrees with the turn needle and the airspeed indications, it can be included in the cross-check.

CHAPTER 11

APPLIED INSTRUMENT FLYING

11.01 - INTRODUCTION

(1) Applied instrument flying is the combination of basic instrument flying and radio procedures. TC-42, Manual of Instrument Flight Procedures, outlines the applied instrument techniques in use in the RCAF for piston-engined and jet-engined aircraft. The purpose of the following paragraphs is to supplement TC-42 with information relating specifically to the Expeditor.

11.02 - HOLDING

(1) When you are asked to hold, maintain cruising airspeed until the aircraft reaches the facility. Enter the holding pattern and maintain track as detailed in TC-42. Do the "4T" Check, adjust the power to maintain 105K with 1700 rpm, and complete a cockpit check as detailed in art 3.07(1).

(2) In preparation for an instrument approach, start planning early and give your co-pilot a thorough briefing. Be sure that he knows the type of approach you are planning and that he will be expected to:

(a) tell you when you are approaching minima on final;

(b) know the services and frequencies that you will be using during the approach and overshoot;

(c) know when to change frequencies;

(d) tell you when he can see the runway; and

(e) help you with certain duties during the approach. (Specify these now if possible.)

11.03 - DF APPROACH

(1) UHF/DF and VHF/DF work on the same general principle and are used in air traffic control to supplement normal approach facilities. Occasionally, aircraft naviga-

tional equipment is unserviceable and the UHF/DF can be used to feed into a GCA approach or even to approach to minima. However, the minima for UHF/DF are not normally as low as for most terminal facilities.

(2) The ground equipment consists of a UHF transmitter/receiver and a bearing indicator which is located in the control tower. The antenna is situated as closely as practicable to the instrument runway.

(3) When the aircraft transmits, the bearing indicator in the tower shows the bearing of the aircraft. The operator interprets the reading and transmits a heading for the aircraft to steer. Usually a 5-second transmission is sufficient. The operator directs the aircraft, giving headings, altitudes and general approach information.

(4) The following technique applies to the Expeditor aircraft in Training Command.

(a) Maintain normal cruising airspeed until you are requested to do the Pre-Landing Check.

(b) After the Pre-Landing Check (landing gear "UP"), adjust the power to maintain 105K.

(c) When the aircraft intercepts the final approach path, lower the landing gear to start the descent at 500 fpm and 100K. For a circling approach, maintain 105K.

11.04 - GROUND CONTROLLED APPROACH

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command.

(a) Maintain normal cruising airspeed until you are requested to do the Pre-Landing Check.

(b) After the Pre-Landing Check, (landing gear "UP"), adjust the power to maintain 105K.

(c) When the aircraft intercepts the glide path, lower the landing gear and adjust the power to obtain the applicable rate of descent. (18"MP with landing gear "DOWN" gives a rate of descent of approximately 500 fpm).

(d) Maintain 100K on the final approach.

11.05 - TACAN APPROACH

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command.

(a) Maintain normal cruising speed until the aircraft is approximately 2 nm from the "GATE". Then reduce the IAS to 105K and do the Pre-Landing Check.

(b) For a "straight-in" approach maintain 100K. For a "circling" approach maintain 105K.

(c) Start the final descent by lowering the landing gear at the "GATE" and adjusting the power to obtain the applicable rate of descent. (18"MP with the landing gear "DOWN" gives a rate of descent of approximately 500 fpm).

11.06 - ADF APPROACH

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command.

(a) Maintain normal cruising speed until the aircraft reaches the facility.

(b) When the aircraft crosses the facility, do the "4T" Check as detailed in TC-42 and reduce the airspeed to 105K.

(c) Except for the final descent, always descend by adjusting the power while maintaining 105K.

(d) Start the final descent from the facility to the field by lowering the landing gear and adjusting the power to maintain the applicable rate of descent. (18"MP with the landing gear "DOWN" gives a rate of descent of approximately 500 FPM).

(e) For a "straight-in" approach maintain 100K on final. For a "circling" approach maintain 105K on final.

(2) When the facility is on the field, the techniques for an ADF approach are identical to those given in para (1) except that the landing gear is lowered and a descent started to minima as soon as the aircraft is tracking inbound.

11.07 - ILS APPROACH

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command.

(a) Maintain normal cruising speed until the aircraft reaches the outer marker or the back marker, as applicable.

(b) After the aircraft reaches the outer marker or back marker, do the

"4T" Check as detailed in TC-42 and reduce the airspeed to 105K.

(c) Until the aircraft arrives at the glide path inbound, make all descents during the procedure by adjusting the power while maintaining 105K.

(d) When the aircraft reaches the glide path, start the final descent by lowering the landing gear and adjusting the power to maintain the applicable rate of descent. (18"MP with the landing gear "DOWN" gives a rate of descent of approximately 500 fpm).

(e) For a "straight-in" approach maintain 100K on final. For a "circling" approach maintain 105K on final.

11.08 - STANDARD RANGE APPROACH

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command.

(a) Maintain normal cruising speed until the aircraft is over the facility.

(b) When the aircraft crosses the facility, do the "4T" Check as detailed in TC-42 and reduce the airspeed to 105K.

(c) Except for the final descent, always descend by adjusting the power while maintaining 105K.

(d) Start the final descent from the facility to the field by lowering the landing gear and adjusting the power to maintain the applicable rate of descent. (18"MP with the landing gear "DOWN" gives a rate of descent of approximately 500 fpm).

11.09 - RADAR TERMINAL CONTROL

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command when you use Radar Terminal Control (RATCON) for an ILS approach.

(a) Maintain normal cruising speed until the aircraft is approximately 6 nm from the outer marker or back marker, do the "4T" Check as detailed in TC-42, and then reduce the airspeed to 105K. (The aircraft's range from the localizer and outer marker or back marker is given to you periodically by the radar controller.)

(b) After the aircraft intercepts the localizer, continue the ILS approach as detailed in para 11.07.

(c) If the final approach is radar-monitored, do an ILS final approach and use the radar information to supplement the information shown on the instruments.

11.10 - RUNWAY PROCEDURES

(1) A runway procedure normally follows an approach to circling minima. The aircraft will be at circling minima at 105K with the landing gear "DOWN". The procedures described in TC-42 are applicable to the Expeditor, using approximately 105K (26"MP) and maintaining visual contact with the runway-in-use.

11.11 - SINGLE-ENGINE INSTRUMENT APPROACH

(1) The following techniques apply to the operation of Expeditor aircraft in Training Command.

(a) If an engine fails before the aircraft has completed the procedure turn or before it has intercepted the inbound track to the facility, use the procedure outlined in art 6.06 for single engine at altitude.

(b) If an engine fails after the aircraft has completed the procedure turn or after it has intercepted the inbound track to the facility, use the procedure outlined in art 6.04 for engine failure after take-off (airspeed above V_2).

(c) If an engine fails during an instrument approach, use normal approach procedures and speeds. If the approach is other than straight in, leave the landing gear "UP" until the aircraft reaches the normal descent path leading to the runway-in-use.

CHAPTER 12

NAVIGATION

12.01 - INTRODUCTION

(1) Navigation exercises are flown as detailed in TC-4, Manual of Pilot Navigation, and in TC-46. During your course, you will be applying the principles contained in these manuals to navigation under Instrument Flight Rules (IFR) and to both medium-level and low-level navigation under Visual Flight Rules (VFR). TC-4 and TC-46 also detail the steps involved in preparing for VFR and IFR navigation exercises. Accuracy in preparation of the flight log and maps will simplify the air work. The necessity for reaching proficiency in IFR navigation is self-evident in view of to-day's increased emphasis on positive control and airways flying. As a military pilot, you may be ordered to deliver paratroops or supplies at a given point and time without the help of radio aids. To assist in avoiding enemy defences, these operations may be flown at low level The importance of arrival on time over a target or rendezvous cannot be over-emphasized. Under these circumstances, an operation will depend for its success on your ability to navigate accurately at low level under visual flight rules.

12.02 - VFR LOW-LEVEL NAVIGATION

(1) Use normal medium-level navigation techniques during low-level navigation exercises. Devote most of your attention to flying the aircraft, map reading, and making mental DR calculations. Your co-pilot shall be responsible for monitoring engine temperatures and pressures, completing fuel and log entries, and adjusting the power as you direct. Remember to use a full "RICH" mixture combined with normal power settings and fuel handling techniques.

CHAPTER 13

NIGHT FLYING

13.01 - INTRODUCTION

(1) Night flying is a very important part of pilot training. The actual circuit is usually no different from an ordinary day circuit, but because of restricted visibility, you must be more careful when manoeuvering on the ground. Apart from the inclusion of a careful check of all lighting equipment, the checks are the same as those used during the day.

13.02 - BRIEFING

(1) During your night flying training, and before you go flying each night, there is a comprehensive briefing which is supervised by the OC Night Flying, assisted by the Duty Forecaster and the Duty Air Traffic Control Officer (DATCO). All pertinent information is discussed, but if you are in doubt about any point - ask questions.

(2) OC NIGHT FLYING - The OC Night Flying details the type of mission to be flown, chooses an alternate aerodrome, and fully discusses the radio facilities which can be used. He ensures that you are aware of any pertinent Local Operating Procedures and Unit Orders and that you are in possession of:

(a) normal daytime flying equipment; and

(b) one serviceable flashlight.

(3) DUTY FORECASTER - The Duty Forecaster gives a complete weather briefing, including wind velocities, best alternate aerodromes, and any weather affecting the intended flying areas or night flying.

(4) DUTY AIR TRAFFIC CONTROL OFFICER - The Duty Air Traffic Control Officer briefs you on the aerodrome lighting, the runway-in-use, taxi routes, R/T and circuit procedures, and emergency procedures.

13.03 - PRE-FLIGHT

(1) STARTING - The External Check is the same as for day flying, but in addition,

the navigation lights should be on "STEADY". During the External Check, pay particular attention to the area surrounding the aircraft - look for stray chocks and other equipment. Immediately before starting the engines, switch the anti-collision light "ON" as an indication to the groundcrew that you are about to start the engines.

(2) After the engines are running, and during the Tarmac Check, press-to-test all warning lights, and set all except the following to "DIM":

(a) fuel warning lights;

(b) inverter failure warning light; and

(c) landing-gear warning lights.

Check again to ensure that the navigation lights are on "STEADY". Forward movement is difficult to detect at night, so ensure that the parking brakes are "ON", and continually check for any aircraft movement.

(3) TAXIING - When you are taxiing at night, you may have a tendency to taxi too fast; keep your taxiing speed down. Use the landing lights when taxiing, except when the aircraft is being marshalled, or when you might blind another pilot. Use the centre of the taxi strip and, whenever you are in doubt about your position, STOP, and obtain assistance or instructions from the tower.

(4) RUN-UP - The run-up is similar to a run-up during the day except that when the engines are running at 1500 rpm, you will have to adjust the intensity of the interior lighting.

13.04 - IN-FLIGHT

(1) TAKE-OFF - Line up in the centre of the runway using the runway lights as a reference. This is a good time to notice the perspective of the runway lights, since later, while landing, you will use this perspective to assist you in estimating the aircraft's height.

(2) During the take-off, be sure that the aircraft is safely airborne before you retract the landing gear. At night you must transfer from visual references to instrument flight before the aircraft reaches the far end of the runway, since, beyond this point, there may be no visual references. Remember to cross-check the attitude indicator with the VSI during this period to make sure that there is a positive rate of climb.

(3) The degree of darkness and horizon definition determines the division of your attention between instruments and external references. On clear or moonlit nights, you can do most of the flying by looking outside the cockpit, using the true horizon as an attitude reference. Quick checks of the instruments are all that is required to confirm visual impressions. When the night is very dark with little or no horizon, the reverse is true.

(4) Whether the night is light or dark, make a gradual transition from instruments to visual references after take-off. You should not transfer to visual flight until the aircraft is 500 ft AGL.

(5) AT ALTITUDE - On a clear night, you can see lights over distances much greater than those over which you can see objects during the day. In consequence, judgement of distance at night is difficult. This, in addition to the fact that there is less visual reference from the ground, means that you must make more frequent use of the instruments.

(6) Cloud at night can cause disorientation. The reflection of the aircraft lights in cloud, or lights on the ground showing through thin cloud can be confusing. If you are in doubt, GO ON INSTRUMENTS AND STAY ON INSTRUMENTS UNTIL YOU ARE COMPLETELY ORIENTATED AGAIN. Ensure that the navigation lights are on "STEADY", and turn off the anti-collision light. REMEMBER TO TRUST YOUR INSTRUMENTS - NOT YOUR SENSES.

13.05 - CIRCUITS

(1) After take-off, climb straight ahead while doing the usual check and procedures of a daytime circuit. To provide adequate separation from the aircraft ahead of you, climb on the runway heading until the preceding aircraft passes your wing tip going downwind. Do not start a turn before reaching 500 ft AGL.

(2) The circuit is the same as that flown during the day; avoid the tendency to make the pattern larger. Keep a good look-out but remember that a combination of visual and instrument flying is necessary. Avoid staring at a light for any length of time.

(3) When the aircraft is lined up on final, assess the drift carefully so that you can correct for any crosswind. Remember that when there is a crosswind, you will have to take the effect of wind shear into consideration. Crosswind and shear are not as obvious at night as they are during the day.

(4) During operational night flying you shall use the landing lights, but during your training you shall be required to become proficient at landing with and without lights.

(5) Single-engine circuits are flown at night in the same way as those flown during the day. Use the landing lights during a single-engine landing, except when atmospheric conditions preclude their use (eg, snow, fog).

(6) After landing, devote your attention to taxiing until the aircraft is clear of the active runway; STOP, do the Post-Landing Check, and then taxi back to the ramp.

13.06 - AERODROME LIGHTING

(1) Approach lighting systems are designed to provide visual assistance in orienting

the aircraft during final approach, particularly when there is a low ceiling or poor visibility or both. Several different systems are in use, and sometimes different types or combinations of types are used on the same aerodrome. GPH-200, FLIP Terminal Low Altitude, depicts the various systems in use, and those should be studied in advance for each aerodrome at which you intend to land.

(2) At most aerodromes, there are facilities for varying the lighting intensity. If, during an approach, you find that the lights are too bright or too dim, do not hesitate to ask the control tower staff to make an adjustment.

CHAPTER 14

FORMATION

14.01 - INTRODUCTION

(1) A formation consists of a number of aircraft whose movements are controlled by an appointed leader. There are many reasons for the aircraft of operational units to fly in formation. Some of these are:

(a) unity of command;

(b) concentration of an attacking force (paratroops);

(c) saturation of enemy defences;

(d) mutual defence;

(e) ease of defence; and

(f) control of navigation.

(2) Expeditor aircraft are relatively easy to fly in formation once you have established the reference points for each position, and you have learned to recognize any deviation from station. You must be capable of changing position and assuming the lead.

(3) A two-plane formation is referred to as an "element"; all two-plane formations can be called echelon formations. A three-plane formation is referred to as a "VIC" or "three-plane". Number 2 is always on the right in "VIC" but, in all other formations, Number 2 formates on the leader.

(4) The three basic types of formation are "VIC", echelon and line astern. Later in your career, when flying as an operational pilot, you may be introduced to other types of formation, but these will be merely variations of the three basic types that are taught on this course.

14.02 - THE PRE-FLIGHT BRIEFING

(1) A thorough pre-flight briefing is necessary for a successful formation flight.

Each man's position in the formation must be detailed, and there must be an outline of the activities for the entire flight, including rendezvous points and emergency procedures. The use of training aids such as blackboards and model aircraft is helpful during a briefing.

14.03 - GROUND HANDLING

(1) STARTING - Pre-arranged hand or radio signals are used to ensure that all the aircraft in the formation start up and taxi together.

(2) CHECK-IN - After you have started the engines, tune in the squadron frequency or the frequency that was agreed to during the pre-flight briefing, and then wait for the leader to call for the check-in. When you check in, report any unserviceabilities that may delay your departure. When subsequent radio channel changes are called for by the leader, the formation "checks in" automatically. At a "check-in", each pilot in turn gives his formation call sign; eg, "Clipper Red Two", "Clipper Red Three". Number 2 starts the "check-in" when sufficient time has elapsed to allow all members of the formation to have changed channels to the new frequency.

(3) TAXIING - The formation taxies to the run-up position as a compact unit. The distance between the aircraft should be sufficient for safety, but should be close enough to prevent other aircraft from entering the formation. The leader calls for all clearances to cross runways and for the line-up and take-off.

(4) RUN-UP - The run-up is the same as that which precedes a flight by one aircraft. When the last pilot has completed his run-up and has done the Pre-Take-off Check, he should inform the leader by R/T or move up so that the leader can see him. Any unserviceabilities preventing take-off should be reported to the leader when they are discovered.

(5) DELAYED OR ABORTED TAKE-OFF - When the take-off of an aircraft is delayed, a rendezvous is made according to the instructions given during the pre-flight briefing. If starting has been delayed, do not rush the Start, Tarmac, Pre-Taxi, Pre-Run-up, and Pre-Take-off Checks in an attempt to rejoin the rest of the formation earlier.

14.04 - TAKE-OFF

(1) When taking off in formation, the "stream" take-off with a time-interval of fifteen seconds between aircraft, is the most commonly used method. When weather conditions are poor and visibility is reduced - for example in snow or rain showers - either this time-interval is increased to more than fifteen seconds, or alternatively, the aircraft may fly out on divergent tracks. If the latter method is used, the aircraft are then able to rendezvous above the bad weather. Before a "stream" take-off, the aircraft are lined up alternately on either side of the centre line of the runway. At a given signal, the leader begins his take-off roll; the other members of the formation begin to time their own take-off from that moment. (Figure 1).

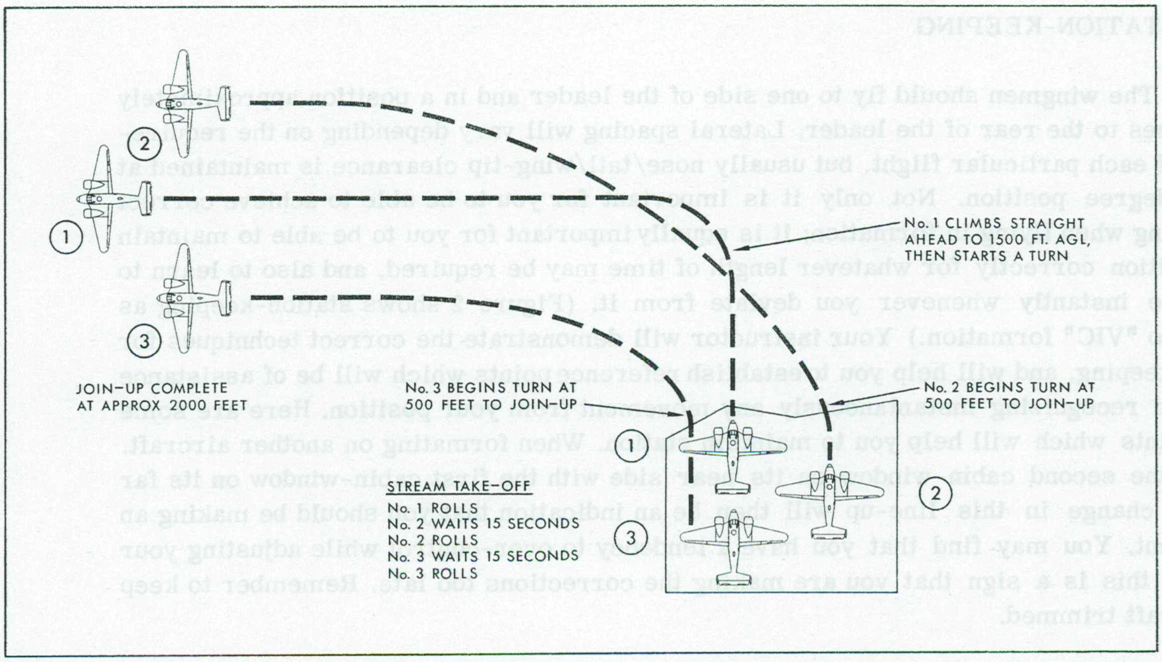


Figure 1. Stream Take-off and Join-up

14.05 - CLIMB

(1) After a "stream" take-off the leader reduces power to 26"MP and 2000 rpm and begins a climbing turn (not over Rate 1) at approximately 1,500 ft AGL. This allows the other members to join up. Numbers 2 and 3 use "MAXIMUM CONTINUOUS" power for the join-up and then reduce power to 28"MP and 2000 rpm to maintain position. The leader should continue to circle the aerodrome until all members have joined up. Usually, for a small formation, a 180-degree turn is sufficient to place all aircraft in position.

(2) When the leader begins to turn, the formation must start a climbing turn (at a safe altitude) onto an intercepting course, keeping below the leader until the join-up is almost completed. An overtaking aircraft should never fly directly at the leader, but should place the leading aircraft in a position approximately 45 degrees off the nose, thus closing the gap. If it is possible to do so, the leader should make a left-hand turn whenever the aircraft are going to fly in "VIC" formation.

(3) The leader should climb at 26"MP and 2000 rpm to allow the formation to maintain position. During formation flying, the co-pilot will carry out his normal duties and, in addition, will monitor the manifold pressure setting to ensure that the pilot does not over-boost the engines while holding position.

(4) The level-off is usually called by R/T. After all the aircraft in the formation are flying straight and level, each crew does a cockpit check, most of which is done by the co-pilot who adjusts the rpm, checks the fuel, etc. It is most important to pay particular attention to the carrying out of this check, since any negligence during its execution might lead to engine failure and this, occurring when flying in formation, could possibly result in a mid-air collision.

14.06 - STATION-KEEPING

(1) The wingmen should fly to one side of the leader and in a position approximately 45 degrees to the rear of the leader. Lateral spacing will vary depending on the requirements of each particular flight, but usually nose/tail/wing-tip clearance is maintained at the 45-degree position. Not only it is important for you to be able to achieve correct positioning when flying in formation; it is equally important for you to be able to maintain that position correctly for whatever length of time may be required, and also to learn to recognize instantly whenever you deviate from it. (Figure 2 shows station-keeping as applied to "VIC" formation.) Your instructor will demonstrate the correct techniques for station-keeping, and will help you to establish reference points which will be of assistance to you in recognizing instantaneously any movement from your position. Here are some useful hints which will help you to maintain station. When formating on another aircraft, line up the second cabin-window on its near side with the first cabin-window on its far side. A change in this line-up will then be an indication that you should be making an adjustment. You may find that you have a tendency to over-control while adjusting your position; this is a sign that you are making the corrections too late. Remember to keep the aircraft trimmed.

14.07 - TURNS

(1) Station-keeping when turning in formation is relatively the same as station-keeping in straight and level flight, with equal amounts of the upper and lower surfaces of the leader's wing in sight. When you are flying the aircraft which is on the inside of the turn, you will usually find it necessary to reduce the amount of throttle slightly; conversely, when you are flying on the outside of the turn, you will usually have to increase the throttle. Normally, the leader gives no signal that he intends to start a turn; therefore, the wingman must always be alert and on the look-out, ready to follow the leader immediately he sees that the leader is starting the turn.

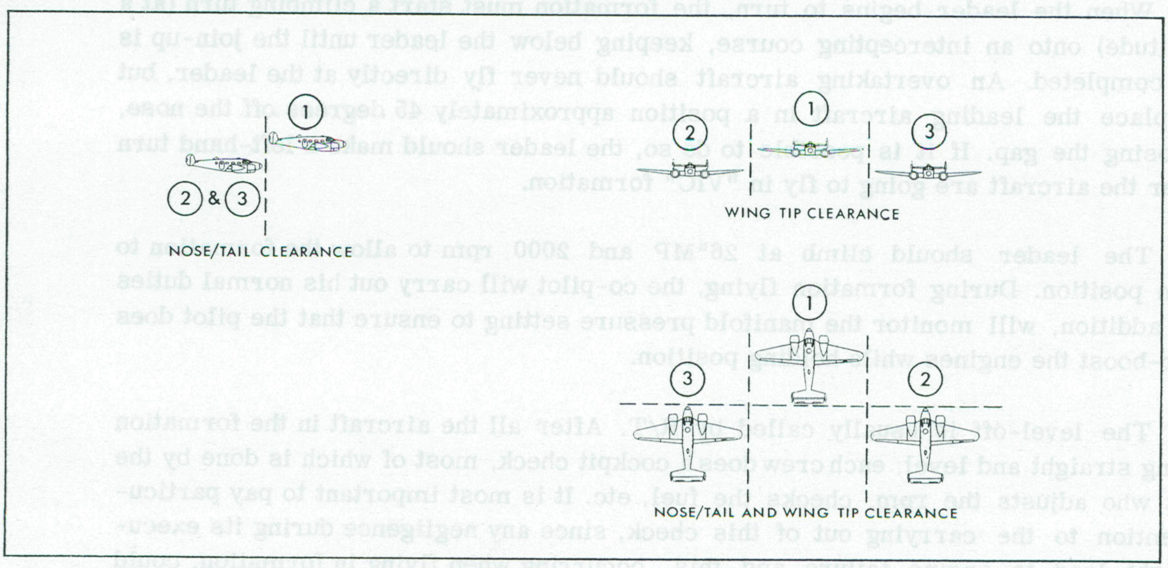


Figure 2. Station Keeping

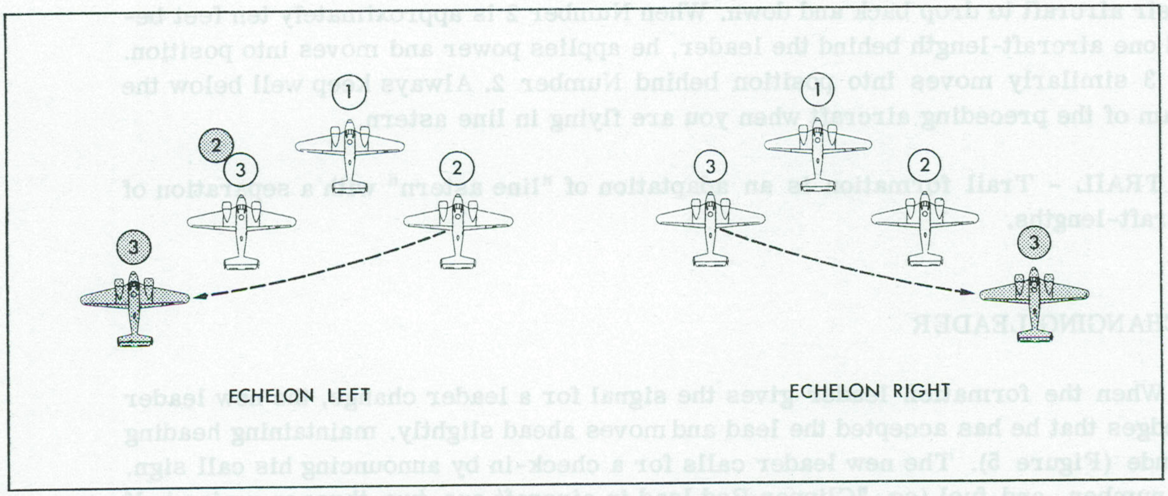


Figure 3. Forming Echelon

14.08 - CHANGING STATION

(1) ECHELON - When the formation leader wishes to form either echelon right or echelon left from a three-plane "VIC" formation, the numerical integrity of the formation must be maintained during and after the change-over (ie, Number 2 continues to formate on Number 1). When the signal is given to form echelon right, Number 3 drops back and down, and then moves over to formate on Number 2, as shown in the diagram (Figure 3). When the leader calls for echelon left, Number 3 maintains position while Number 2 drops back and down, and then moves over to formate on Number 3. Once all the aircraft have taken up their new positions and are flying as a compact formation, the leader will ask the formation to renumber.

(2) LINE ASTERN - A line astern formation can be formed from either echelon or "VIC" (Figure 4); however, changing to line astern from "VIC" is normally avoided since this manoeuvre demands that Number 3 divide his attention between the leader and Number 2 until he is in a suitable position behind Number 2. When flying in echelon and the leader calls for line astern, the pilots of the two following aircraft reduce power and

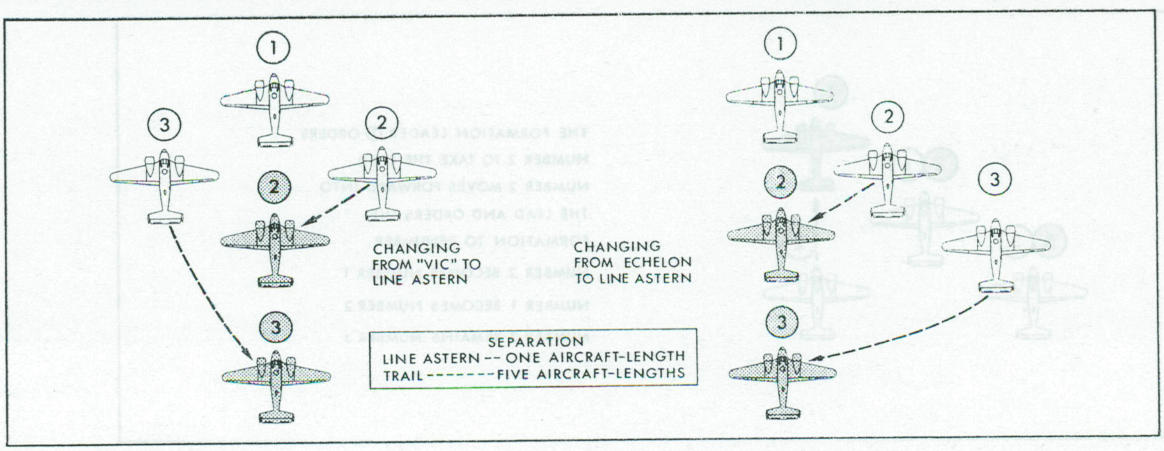


Figure 4. Forming Line Astern

allow their aircraft to drop back and down. When Number 2 is approximately ten feet below, and one aircraft-length behind the leader, he applies power and moves into position. Number 3 similarly moves into position behind Number 2. Always keep well below the slipstream of the preceding aircraft when you are flying in line astern.

(3) TRAIL - Trail formation is an adaptation of "line astern" with a separation of five aircraft-lengths.

14.09 - CHANGING LEADER

(1) When the formation leader gives the signal for a leader change, the new leader acknowledges that he has accepted the lead and moves ahead slightly, maintaining heading and altitude (Figure 5). The new leader calls for a check-in by announcing his call sign, aircraft number, and fuel (eg, "Clipper Red lead in aircraft one-two-three on mains half full"). The members reply by giving their number in the formation, and the aircraft number. When your aircraft is running on different tanks, or if the fuel content differs by 2/10 from the quantity given in the leader's call, report the fuel state. Remember Number 2 always formates on the leader and is always on the right for "VIC".

14.10 - INSTRUMENT CLIMBS AND APPROACHES

(1) CLIMBS - A formation is frequently required to climb through cloud to reach cruising altitude. Usually, the formation joins up below cloud and climbs as a unit on a sustained heading. If you lose sight of the leader in cloud during the climb, immediately revert to instruments, turn twenty degrees away from the climb heading for twenty seconds and then resume climbing on the original heading. The leader must be informed as soon as contact is lost. If the procedure is carried out promptly and accurately, it should be simple to re-join the formation above the overcast or meet at a rendezvous point.

(2) APPROACHES - Normally, formation approaches in cloud are restricted to

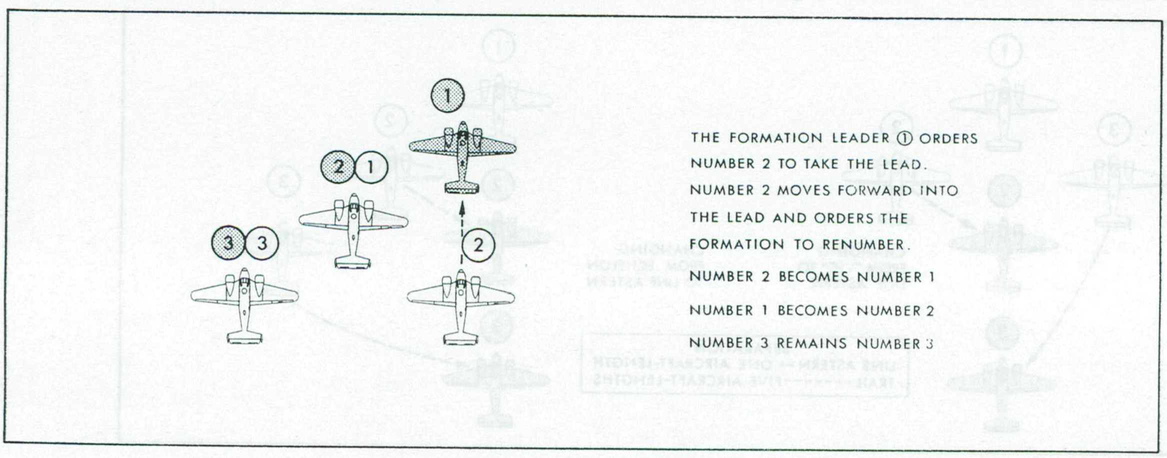


Figure 5. Changing the Lead

sections of two. Line astern should not be used, and the wingman should be placed so that he is on the outside of most turns during the approach. The Pre-Landing Check with the exception of the landing-gear lowering should be completed before starting the approach, and the radios should be changed to the terminal frequency so that all pilots can hear the clearance given to the leader. There should be as few frequency changes as possible during the approach. (The ideal one is one in which all frequency changes are made by the controlling agency.) If you lose sight of your leader in cloud, take appropriate avoiding action as circumstances dictate and resume the approach, under control, as an individual following aircraft.

14.11 - CIRCUIT AND LANDING

(1) Before entering the circuit, the leader should place the formation in echelon opposite to the direction of the circuit pattern (ie, for a left-hand circuit - echelon right). A five-second "break" should be sufficient to space the aircraft behind the leader. The break should consist of two 90-degree turns (Figure 6). After the break, the formation is no longer a compact unit; therefore EVERY AIRCRAFT CAPTAIN IS RESPONSIBLE FOR HIS OWN LOOK-OUT and spacing. Normally the leader should land on the side of the runway nearest the circuit (ie, on the inside) while Numbers 2 and 3 take opposite sides to the aircraft in front of them. In a strong crosswind however, the leader should land on the downwind side of the runway with the following aircraft taking alternate sides. This prevents the slip-stream from the preceding aircraft affecting the landing of the following aircraft.

(2) The leader may decide not to "break" over the runway; if this is his decision, he may instead lead the formation to cross the runway in echelon at 90 degrees and then "break" onto the downwind leg. When this method is used, pilots in the formation should increase the timing between their aircraft a little, since there are less turns to be made for spacing purposes.

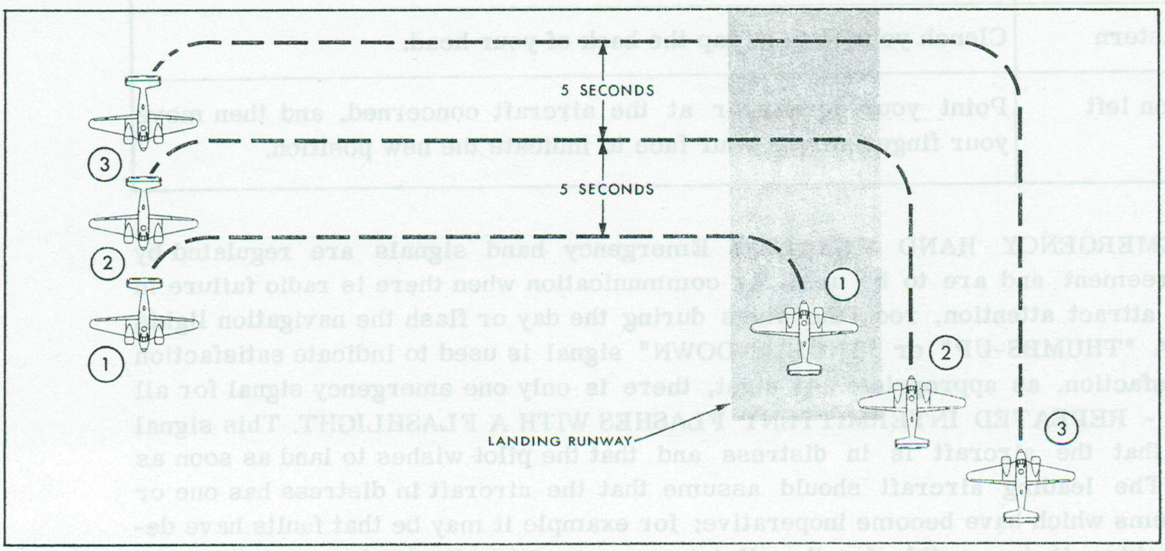


Figure 6. A 180-degree Break

14.12 - FORMATION SIGNALS

(1) Normally, R/T signals are used in formation flying. However, if there is R/T failure or if you wish to maintain radio silence, you can use the hand signals which are given in the following chart. The pilot on the left can see the leader's signals, but the pilot on the right must receive his signal from the leading aircraft's co-pilot, therefore the co-pilot in the leading aircraft is responsible for relaying any hand signals which are given by the leader. In a three-plane echelon formation, Number 2 or his co-pilot must relay the signals as applicable. When R/T is used, the leader always informs the formation of the frequency he intends to use, whether it is for landing instructions or any other purpose. The formation always checks in after a channel change.

MANOEUVRE	SIGNAL
Run-up	Make a circular motion of the hand with the index finger extended.
Leader change	Point your index finger at the new leader; then point forward.
Reform from trail	The leader rocks his wings. Number 2 joins on the right of the leader, regardless of the direction of turn.
Reduce power	Make a backward motion of your hand.
Break from echelon for landing	Make a circular motion of your hand above your head with outstretched fingers displayed according to the desired time interval between the aircraft. Generally, a 5-second break is used. (This signal is passed only to Number 2. The remainder of the formation takes its timing from the interval between the time the leader breaks and the time Number 2 breaks).
Go line astern	Clench your fist and tap the back of your head.
Go echelon left or right	Point your forefinger at the aircraft concerned, and then move your finger across your face to indicate the new position.

(2) EMERGENCY HAND SIGNALS - Emergency hand signals are regulated by NATO agreement and are to be used for communication when there is radio failure in flight. To attract attention, rock the wings during the day or flash the navigation lights at night. A "THUMBS-UP" or "THUMBS-DOWN" signal is used to indicate satisfaction or dissatisfaction, as appropriate. At night, there is only one emergency signal for all situations - REPEATED INTERMITTENT FLASHES WITH A FLASHLIGHT. This signal indicates that the aircraft is in distress and that the pilot wishes to land as soon as possible. The leading aircraft should assume that the aircraft in distress has one or more systems which have become inoperative; for example it may be that faults have developed making it impossible for the pilot to operate either the landing gear or flaps. When the pilot in the leading aircraft knows that an aircraft in the formation is in distress,

he should proceed with extreme caution. At night, when using a flashlight to give distress signals, the pilot giving the signals must be very careful not to dazzle the pilot in the leading aircraft. During the day, the following signals shall be used.

MANOEUVRE	SIGNAL
Desire to land	Move the hand, flat, palm-downwards from above the head forwards and downwards, and finish the movement in a simulated round-out. Alternatively, lower the landing gear.
Systems Failure (HEFOE) To be used only when radio contact is not possible	Clench the fist and hold it to the side window. After passing this signal, hold up the required number of fingers to denote the system involved, according to the following code: H-Hydraulic - one finger E-Electrical - two fingers F-Fuel - three fingers O-Oxygen - four fingers E-Engine - five fingers The pilot receiving the signal will repeat the signal to show acknowledgement. NOTE: If either the "one finger" signal is received or the intercepting pilot is unable to understand the signals of the pilot requiring assistance, then the intercepting pilot is to assume that the aircraft in distress has one or more systems inoperative (eg, flaps or landing gear) and is to proceed with extreme caution.
Radio Failure	Tap the microphone or earphones and give a thumbs-up or thumbs-down signal as appropriate.

(3) FUEL STATUS - The fuel-status hand signal is classed as an "information signal" in the NATO agreement. When fuel status is being requested by the leader, he shall make a drinking motion with a closed hand, thumb extended towards the mouth. The pilot who is reporting the fuel status of his aircraft shall give the estimated flying time remaining by extending his fingers as appropriate. Each finger shall represent ten minutes - while a closed hand shall indicate one hour. (For example, a clenched fist with three fingers extended represents one and a half hours.)

(4) REQUEST TOWER PERMISSION TO LAND - Again, the signals governing permission to land are regulated by NATO agreement. The pilot who is requesting permission to land shall fly across the aerodrome below 1,000 feet in the direction of the intended landing and shall rock the wings. The replies from the tower and their interpretations are shown on the table overleaf.

Art 14.12

MANOEUVRE	SIGNAL
Steady Green	You are cleared to land.
Steady Red	Give way to other aircraft and continue circling.
Red Pyrotechnical Light	Despite previous instructions do not land for the time being.
Series of Green Flashes	Return for landing (Subsequent authorization to land shall be given by a steady green light.)
Series of Red Flashes	Aerodrome unsafe, do not land.

14.13 - RESPONSIBILITIES OF THE LEADER

(1) Some of the responsibilities of a formation leader are as follows.

(a) To maintain a good look-out.

(b) To navigate.

(c) To initiate smooth and co-ordinated manoeuvres.

(d) To maintain a sufficient fuel reserve (formating aircraft use more fuel).

(e) To call for periodic fuel checks.

(f) To avoid changes and manoeuvres in the air that have not been discussed on the ground.

(g) To avoid placing himself in a position directly up-sun of the formation.

(h) To avoid large, sudden throttle changes.

(j) To give an accurate fix to the new leader when changing the lead.

CHAPTER 15

SEASONAL OPERATIONS

15.01 - INTRODUCTION

(1) Extreme temperatures have a considerable effect on the performance of the Expeditor. You should be aware of these effects and have a thorough understanding of coring, icing, slushy runways, engine performance, and turbulence.

(2) You should study the sections relating to hot and cold weather operation which are contained in EO-05-1-1, TC-11 and Unit Flying Orders.

15.02 - FLYING IN COLD WEATHER

(1) Complete the Pre-External and External Checks as detailed in the AOI and in TC-11. There is a separate section in TC-11 which is entitled "COLD WEATHER OPERATION". In the wintertime, be sure to include these extra items regardless of weather because conditions can change at any time during a flight. Remember that the weather at altitude may be considerably different from the weather at ground level.

(2) STARTING - If there is back-firing and rough running when you are starting the aircraft, retard the throttle slightly and keep the engine running by using the priming pump. If the engine is not back-firing but does not run smoothly, move the carburettor heat control to "HOT". This should make the engine run more smoothly and also help to prevent freezing of the carburettor heat controls. If the oil pressure exceeds 90 psi, the oil dilution system may be used to reduce the pressure. However, high oil pressures can be expected at first after a cold-weather start and usually will reduce quickly at idling rpm. Be careful not to over-dilute.

(3) Normally, the aircraft is started with the oil by-pass control at "BY-PASS". This reduces the engine running time at low engine-temperatures and also prevents high oil pressures from rupturing the radiator.

(4) In extremely cold weather, however, you will usually get a "hangar start" (ie, the aircraft towed from the hangar and started immediately). In this case, the oil by-pass control should be set at "NORMAL" since the sudden chilling of the radiator by exposure to a low outside temperature may induce coring if the oil is not circulating through the radiator. In Flight, the cockpit indication of coring is a large rise in oil temperature, which is not reflected in the other instruments. When the engines are at operating

temperatures you can check for coring by opening the oil shutters for approximately 5 seconds and checking for a drop in oil temperature. If there is a drop in oil temperature, this indicates a normal flow through the radiator.

(5) TAXIING - Taxiing in winter weather can be hazardous; therefore you must take extra precautions. After a recent snow fall, there may be hidden patches of ice. In addition, frost on the windscreen and side windows may obscure your vision, and you may find that your taxiing speed is higher than you realize. Do not taxi through snowbanks or turn the aircraft sharply in a place where the tail of the aircraft may be damaged by a snowbank. Keep the taxiing speed to a minimum, especially in congested areas, and always assume that the braking action is poor. Try not to lock the wheels on ice or slippery surfaces. A locked wheel coming into contact with a bare surface, while the aircraft is in motion, causes tire damage, creates unnecessary strain on the landing gear and, in extreme cases, could cause the aircraft to nose-over. If you are uncertain about the braking action, pump the brakes instead of applying a steady excessive pressure. The absence of snow or ice does not preclude the possibility that there is a slippery surface; water or frost can produce a slippery surface.

(6) Taxiing in slush presents an additional hazard owing to slush being thrown onto the under-surface of the aircraft. This can result in the restriction of landing gear and solenoid movements; consequently the landing gear may fail to retract properly, and the landing-gear position indicator may give false information. Avoid areas of slush whenever possible when taxiing.

(7) TAKE-OFF - Various procedures for avoiding over-boosting and detonation are outlined in the AOI under "Cold Weather Operation". Observe these procedures rigidly. note particularly that at temperatures below -20°C, burning efficiency deteriorates and that you should use the carburettor heat. Turn on the pitot heat early so that the pitot head will be heated before the aircraft becomes airborne.

(8) The effects of slush, snow, and water on the take-off roll is dealt with in TC-46. After take-off, leave the landing gear "DOWN" longer than usual, thus allowing the airflow to remove as much slush or moisture as possible. Select landing gear "UP", and then recycle the system to break off the remaining ice.

(9) FLIGHT AT ALTITUDE - During flight at altitude the carburretor heat must be maintained between +5°C and +10°C since it is easier to prevent icing than to remove it. Keep the oil temperature in the upper limits to provide better temperature control and also to prevent coring. Exercise the pitch control through the full range every 30 minutes to flush the cold oil from the propeller hubs. In severe icing, exercise the throttles periodically to prevent them from freezing in one position.

(10) DESCENT - There are no major problems in descending during cold weather other than maintaining the proper engine temperatures and pressures. The most difficult temperature to control is the CHT. In some cases, you may have to lower the landing gear and even the flaps, so that you can increase the manifold pressure and thus increase the CHT. Before you start a descent from cold air into warm air, turn the cockpit heat "ON" to help prevent the windshield from misting. By adjusting the foot louvres, you can

direct the hot air to the windshield.

(11) LANDING - If there is airframe icing on the aircraft, the stalling speed could be increased considerably, therefore approach and landing speeds must be increased. Factors to consider when landing during winter months are braking action, length of usable runway, and obstructions such as drifts of snow. Make your decision about the type of landing after you have considered these factors in conjunction with the normal factors you would consider for a landing on a dry runway. For example, if the runways are slippery, do a minimum-roll landing using the brakes cautiously. If the surface is covered with patchy ice, then you should pump the brakes. After a heavy snowfall when there is a blanket of new snow, a distortion effect can cause you to lose depth perception. This becomes a hazard, since relatively large snowdrifts blend in with runway surfaces and appear to be smooth and flat.

(12) SHUT-DOWN - The shut-down is detailed in the AOI and in TC-11.

15.03 - ICING

(1) The formation of ice on aircraft surfaces is a hazard which you must be prepared for by knowing how to use the anti-icing and de-icing equipment. Remember that ice will form in cloud or precipitation when the temperature is favourable. Since you cannot always avoid flying into areas in which ice will form, you should watch for:

(a) cloud or precipitation combined with a favourable temperature range;

(b) a build-up of ice on the propeller hubs;

(c) a build-up of ice on the edges of the windshield and windshield wipers;

(d) a build-up of ice on the wing roots and plastic navigation light deflectors;

(e) a loss of airspeed;

(f) chunks of ice flying off the propeller and striking the fuselage; and

(g) a build-up of ice on the leading edges of the wings and horizontal stabilizer.

(2) Whenever you suspect airframe icing, use the anti-icing equipment immediately. Turn on the propeller anti-icer, and ensure that the carburettor heat is adjusted to the upper operating limit. Adjust the power as required to maintain airspeed, and consider changing altitude to take the aircraft out of the icing area. (On an IFR trip notify the ATC and ask for instructions for a change of altitude.)

(3) Do not switch the de-icer boots "ON" until there is an accumulation of at least half an inch of ice. Premature operation can crack and stretch a thin coating of ice

without removing it, and can result in a further build-up as the ice formation follows the contour of the extended boots; when this happens the boots become ineffective. After removal of the ice, turn the boots "OFF" and repeat the process.

15.04 - FLYING IN HOT WEATHER

(1) In the summertime you will be flying in temperatures that could be described as tropical. When you are flying during the summer months, you must be aware of the effect of a high OAT on the performance of the aircraft. You should study the information contained in EO-05-1-1, Part 5, Section 4, the AOI, TC-11 and your unit orders.

(2) Although turbulence occurs during any season, it is more prevalent and can be expected to be more severe in the summer months. If you fly into turbulence, do the check which is detailed in TC-11. Do not memorize this check. Attempt to maintain level-flight, and accept variations in airspeed and altitude. Do not fight the controls any more than is necessary to maintain this attitude. Fighting the controls induces fatigue and puts an added strain on the airframe.

(3) There is a decrease in engine efficiency and a corresponding increase in the take-off run when an aircraft is taking off in a high temperature. For example, the "Take-off Distance" chart in the AOI shows that an aircraft with an AUW of 8500 lbs requires 1638 feet of runway to become airborne when the OAT is -5°C and the aerodrome is at sea level. The same aircraft, at the same weight and on the same aerodrome, requires almost 300 feet more runway when the OAT is 35°C. The problem of take-off distance is further complicated when the elevation of the field is higher than sea level; therefore you must consult the "Take-off Distance" charts when taking off from any aerodrome in the summertime.

(4) The effect of temperature on performance is even more serious when you consider the critical single-engine performance of an Expeditor in warm weather. Learn and use the charts in the AOI.

(5) Other factors to be considered when you are flying in warm weather are engine temperatures and pressures. These do not present a problem if you monitor them and make the proper adjustments. You can expect a 25° to 30° rise in CHT during take-off; anticipate the increase and do not have the gills "CLOSED" for prolonged periods while you are awaiting take-off clearance.

(6) When the aircraft is landing during hot weather, watch for sudden up-drafts or down-drafts on the approach or round-out. These result from differences in the temperature of ground surfaces. (eg, the concrete button of the runway reflects the sun's rays more strongly than a grass-covered or plowed field.)

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MANUAL OF FLYING TRAINING

(EXPEDITOR)

RECOMMENDATIONS FOR IMPROVEMENT

To ensure accuracy of content, users are urged to complete the form overleaf and submit it to the CFS Editor.

Additional pages of white bond may be attached as necessary. Units making official recommendations shall use normal channels to TCHQ.

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RECOMMENDATIONS FOR IMPROVEMENT

Date

The Editor
Training Materiel Centre
RCAF Station Winnipeg
Westwin Manitoba

1 It is recommended that this manual be revised as follows:

Name Rank

Unit