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INTRODUCTION

This guide has been prepared by the Transport Canada Aviation Group for the information and guidance of pilots preparing to apply for flight instructor ratings, and for use as a reference by qualified flight instructors.

Some of the material in this guide has been derived from discussions with individual flight instructors and members of Civil Flight Instructor Refresher Courses.

A brief explanation of the content of the various parts in this guide is as follows:

Part I -- Learning and Learning Factors

The techniques to be used by instructors when conducting Ground School training, Pre-flight and Post-flight briefings, and the Air Exercises.

Part II -- The Ground and Air Instruction Syllabus

This part outlines the purpose of each exercise, the essential background knowledge a student must possess before air instruction of the exercise commences, advice to instructors, and a step by step procedure for the instructor to follow when carrying out the air instruction.

PART I

LEARNING AND LEARNING FACTORS

PART I

LEARNING AND LEARNING FACTORS

INTRODUCTION

1. What is a trainer?

2. The Concise Oxford Dictionary definition of the word train is: "Bring to desired state or standard of efficiency by instruction and practice".

3. Flight instructors are trainers. If you are a flight instructor, your aim is to give students good instruction and sufficient practise so that they can fly aircraft proficiently and safely.

4. Part one of this guide is designed to describe some basic instructional techniques that apply to:

   (a) ground school training;
   (b) preparatory ground instruction;
   (c) pre-flight briefing;
   (d) in-flight instruction; and,
   (e) post-flight briefing (debriefing).

5. By using these techniques you will make learning easier for your students as you help them meet the required flight test standards.

LEARNING

6. No one ever learns except through their own activity and there is, strictly speaking, no such art as teaching, only the art of helping people to learn.

   The Instructional Techniques described in this guide suggest actions that can be performed to stimulate student activity. These activities may be mental or physical and it is through this process of directed activity that students learn the skills and knowledge required to become good, safe pilots.

LEARNING FACTORS

7. Listed below are seven learning factors. Read them carefully and determine whether they apply to you as you learn new skills and knowledge. If they apply to you, they will also apply to your students. Attempt to associate a single word that is used to represent the entire learning factor. These words will be used throughout the guide and in test questions on instructional technique.

Learning is made easier when the following factors are used:

(a) READINESS - Ensure students are mentally, physically and emotionally ready to learn.

(b) PRIMACY - Present new knowledge or skills correctly the first time. (Teach it right the first time.)

(c) RELATIONSHIP - Present lessons in the logical sequence of known to unknown, simple to complex, easy to difficult.

(d) EXERCISE - Ensure students are engaged in meaningful activity.

(e) INTENSITY - Use dramatic, realistic or unexpected things, as they are long remembered.

(f) EFFECT - Ensure students gain a feeling of satisfaction from having taken part in a lesson.

(g) RECENCY - Summarize and practice the important points at the end of each lesson, as last things learned and practiced will be remembered longest.

The learning factors listed above are useful "tools" when they are applied correctly. The question of course is how do these learning factors apply to flight instruction? This question will be answered by reviewing and discussing each of the learning factors which offer specific suggestions on what you can do to utilize these "tools" in your instruction.

8. READINESS - Ensure students are mentally, physically and emotionally ready to learn.

(a) To learn, a person must be ready to do so. An effective instructor understands this necessity and does the utmost to provide well-conceived motivation. If a student has a strong purpose, a clear objective and a sound reason for learning something, progress will be much better than if motivation were lacking.

(b) Under certain circumstances you can do little, if anything, to inspire a student to learn. If outside responsibilities, interests or worries are weighing heavily, if schedules are overcrowded, if personal problems seem insoluble, the student will be unable to develop the interest to learn.

(c) Here are some suggestions you can follow to arouse interest and make the student ready to learn:

(1) Start lessons with an ATTENTION GETTING opening. For examples of opening sentences that are effective, listen carefully to the start of documentary films or interviews on television. Writers spend a great deal of time developing the exact words to tune you in.

(2) State SPECIFICALLY WHAT is required during the lesson and how you intend to prove that the student has the knowledge or can master the skill at the end of the lesson. Make all your statements student centred - use the

(3) Tell students the PURPOSE of the lesson and stress the BENEFIT from the new knowledge or skill. Try to give more than one reason for learning, just in case the student doesn't fully accept the first reason.

(4) Specify WHERE the lesson fits into the overall picture, and relate the lessons to past experiences that the students may have had. This statement provides a link with something students have learned before and allows them to build on that knowledge or skill. As an example, if you were giving instruction on how to level out from the climb to a student with a fixed-wing licence, you could point out that the sequence of control movements are the same as in an aeroplane. This concept is closely related to the Learning Factor of Relationship.

(5) If the new material is dependent on students having mastered previous lessons, confirm that the required level has been attained before proceeding with the new material. Conduct a review and, if necessary, clear up any misunderstandings by briefly re-teaching the major points.

(6) Plan for reviews of lesson material. Students start to forget the moment they leave the instructional environment. The greatest rate of forgetting occurs during the first 24-48 hours after learning the material. Ohio State University has carried out extensive research in this area and has designed a recommended schedule of when reviews should be done. Refer to FIG. 1 & 2 and the notes below each diagram.

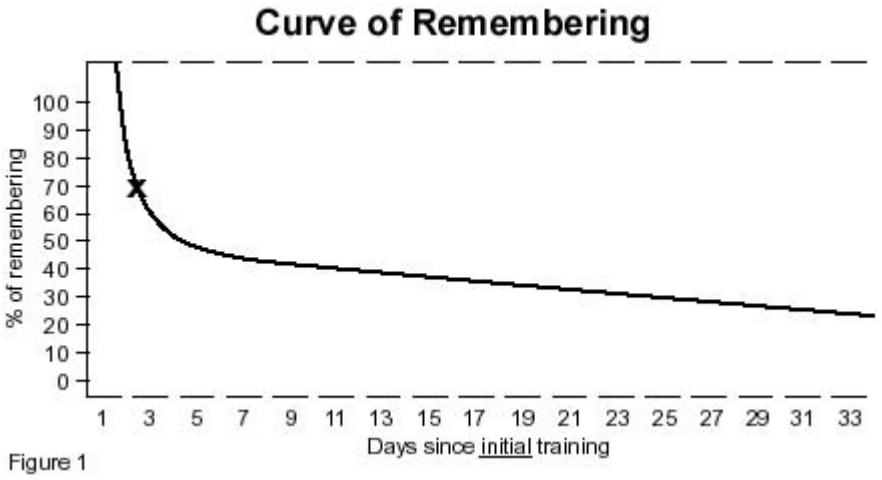

Figure 1

Notes: (1) Statistics are based on an average cross-section of students.

(2) Curve is very steep initially - within two days students will remember less than 70% of what they learned.

(3) At the end of the month without reviews students will only remember approximately 40% of lesson material.

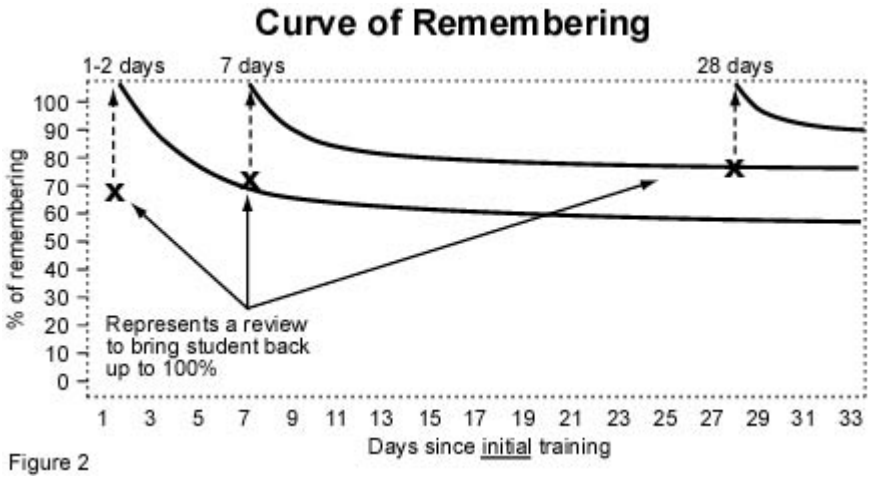

Figure 2

Notes: (1) To maintain at least a 70% level, a review should be conducted within two days.

(2) After learning material a second time the curve flattens out somewhat, but after seven days the student is back down to the 70% level.

(3) Another review and the curve really flattens. The student will be above 70% retention until approximately day 28.

(4) A review at this time will generally cause long lasting retention of lesson material.

(5) The amount of time required for reviews reduces each time a review is conducted.

Example: initial training - 50 minutes
1st review - at 2 days - 15 minutes
2nd review - at 7 days - 10 minutes
3rd review - at 28 days - 5 minutes

9. PRIMACY - Present new knowledge or skills correctly the first time. (Teach it right the first time.)

(a) When students are presented with new knowledge or skills, the first impression received is almost unshakeable. This means that what you teach must be correct the first time. Students may forget the details of lessons, but will retain an overall image of the skill or knowledge for a long time. Frequently you will be required to perform manoeuvres in the aircraft before a student has had the necessary background training. You must perform those manoeuvres correctly or the student may imitate any errors you make. For example, before the exercise on Confined Areas, you and your student may be required to land in a confined area. Any poor example shown at this time would have to be "unlearned" when the exercise came up in a subsequent lesson.

(b) Suggestions:

(1) Rehearse lessons to become thoroughly proficient at the skill or in answering questions related to the subject.

(2) Attempt to give a perfect demonstration of the manoeuvres to be learned in the next lesson. If students read or study exercise material without experiencing the actual exercise, they may form an incorrect mental image.

(3) If practicable, start each lesson with a perfect demonstration. Sometimes it may be better to avoid talking during this demonstration to allow maximum concentration on doing the skill perfectly.

(4) While the student is performing an exercise, supervise the actions very closely. Stop the student as soon as any performance error is noticed and teach the correct method. Close supervision means - NEVER allow a student to make an error during the initial stages of training. Think of how you would go about training a student to defuse a live bomb.

10. RELATIONSHIP - Present lessons in the logical sequence of known to unknown, simple to complex, easy to difficult.

(a) This particular learning factor emphasizes the necessity for your student to understand relationships between new and old facts, or between ideas and skills if learning is to take place. During flight training, students must understand not only why they are learning a particular exercise, but how that exercise combines with previous ones and where it fits into the overall syllabus. Giving students the relationship at the start of the lesson provides preparation for learning. Continuing the process throughout the lesson helps to maintain the desire to learn.

Example: Compare or relate advanced take-offs and landings to normal take-offs and landings; show how a steep approach uses the same techniques.

(b) Suggestions:

(1) Present lessons in a logical sequence:

(a) known to unknown;

(b) easy to difficult;

(c) concrete to abstract;

(d) simple to complex;

(e) familiar to unfamiliar.

(2) Always review basic knowledge before proceeding to the unknown. For example, when teaching students to multiply with a circular slide rule, the first example should be as simple as 2 X 2. The reason is that students already know the answer and are able to follow the manipulation of the slide rule. In the next problem or example, a change of one factor (2 X 4) allows students to build on knowledge already gained. The process is continued until students have mastered all the required knowledge and skill necessary to solve real problems.

(3) Present new material in stages, confirming that students have mastered one stage before proceeding to the next. The length of time for each stage would depend on the complexity of the material covered.

(4) Reinforce students' learning of new facts or ideas by frequently summarizing the major points of your lesson.

(5) Use examples and comparisons to show how the new material being learned is really not much different from that already known by your students. The examples you use may be real or imaginary as the main purpose of an example is to paint a verbal picture so students can visualize relationships between the new material and things that have happened before. This is called using verbal aids for your instruction.

11. EXERCISE - Ensure students are engaged in meaningful activity.

(a) Meaningful mental or physical activity is essential if learning is to occur. During flight training this is achieved through correct practice or repetition. Students learn by applying what they have been told or what has been demonstrated. As learning continues or is strengthened by additional practice, your training syllabus should make provision for this practice time. You must ensure that the practice is directed toward a specific goal. Oral questions, hypothetical problems, dual review, or solo practice are all methods of providing mental or physical activity.

(b) If students are able to answer questions involving the words "how" and "why", it usually means that they have a good understanding of the subject. As a flight instructor these two words are probably the most important in your vocabulary. Study Table 1 and note both the instructor and student activity for each level of learning. Should you attempt to employ the application level of learning without having covered the understanding level, students will encounter much more difficulty than if they had mastered previous levels.

VII	EVALUATION	PROVIDES ITEMS TO BE TESTED	RECORDS AND DRAWS CONCLUSIONS	ALL
VI	SYNTHESIS	PROVIDES EXERCISE SITUATIONS	COMBINES INFORMATION INTO CONCEPTS	ALL
V	ANALYSIS	PROVIDES EXERCISE SITUATIONS	BREAKS ITEMS INTO SMALLER COMPONENTS	ALL
IV	APPLICATION	DEMONSTRATES AND EXPLAINS	IMITATES AND PRACTISES	ALL
III	COMPREHENSION (UNDERSTANDING)	DEVELOPS LESSON BY QUESTIONING	ANSWERS AND ASKS QUESTIONS	WHY? & HOW?
II	KNOWLEDGE (INFORMATION)	PRESENTS LECTURES	LISTENS	WHAT?
I	FAMILIARIZATION	GIVES BRIEFINGS	LISTENS	WHERE? & WHEN?
	LEVELS OF LEARNING	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY	KINDS OF QUESTIONS

Table 1

(c) Suggestions:

(1) Unless testing to see what students have learned, avoid questions that are prefixed by the word "what". Give students the facts, figures and necessary knowledge, then ask "how" and "why" questions to develop understanding of the new knowledge.

(2) Once you have told students a fact, avoid repeating yourself. Instead, have them relate the facts back to you. This strengthens learning and confirms their knowledge of the required material.

(3) Give students challenging problems that fit the level of learning and provide only enough assistance to keep them on track. When students are able to solve the problems alone, they have demonstrated adequate knowledge and ability.

(4) Test students' knowledge and abilities frequently. This reinforces learning and builds confidence. However, before testing you must be reasonably certain that students can answer the questions or perform the skills, otherwise they may become frustrated. Testing will also identify areas in which students have weaknesses; thus, allowing you to re-teach to the required standard.

12. INTENSITY - Use dramatic, realistic or unexpected things, as they are long remembered.

(a) Students learn more from dramatic or exciting experiences than from boring ones. It is a well-known fact that a student's "look-out" while flying will improve considerably after a first experience with a near miss. There is no suggestion here that you provide your student with a near miss, but you should attempt to make your students' learning experiences exciting by being excited yourself and perhaps using any opportunity you can to introduce unexpected things to your students. Example: After students have learned fuel management and other aspects of cross-country navigation, you notice that they disregard the fuel quantity gauge during a cross-country flight. Allow them to continue until the fuel quantity is in close, but safe, proximity to running dry before you mention it. Your students will be shocked to be so close to an actual in-flight engine failure and will probably remember the experience for a long time.

(b) The Learning Factor of Intensity implies that students will learn more from real experiences than from substitutes. You will have to use your imagination to develop vivid experiences for dramatic or realistic effects.

(c) Suggestions:

(1) Show enthusiasm and sincerity for the subject you are teaching.

(2) Attempt to employ a wide range of speech variation in rate, volume and pitch to keep students attentive.

(3) Use appropriate and effective gestures while explaining major points. The lesson will seem to "come alive" and the points made will make a greater impression on your student.

(4) Use a variety of training aids to appeal to as many senses as possible. Each aid must relate directly to the subject matter being taught.

13. EFFECT - Ensure students gain a feeling of satisfaction from having taken part in a lesson.

(a) Learning is strengthened when accompanied by a pleasant or satisfying feeling. Students will learn and remember more under these conditions than when feelings of defeat, frustration, anger or futility are developed. If you were to demonstrate an `Ag Turn' during the first air lesson, students would likely feel some inferiority if not actual fear. The experience would be negative. They might even give up flying at that stage. This example is rather obvious but you need to consider how your actions could produce feelings of

frustration or anger. For example, you ask a student to perform a manoeuvre and then you immediately emphasize all the errors the student made. Your identification of each error may be very accurate but how would the student feel about it? If the objective was to make the student feel defeated, it probably succeeded. It is better to point out the positive aspects of a student's performance first, and then discuss the major errors which were committed and finish with suggestions for improvement.

(b) Whatever the learning situation, it should contain elements that affect your student positively and give feelings of satisfaction. Each learning experience does not have to be entirely successful, nor do students have to master each lesson completely; however, a student's chance of success will be increased with a sense of accomplishment and a pleasant learning experience.

(c) Suggestions:

(1) Involve students in the lesson by developing some of the new material from them. This can be done by asking students questions related to the subject and allowing student contributions of knowledge and ideas.

(2) Throughout your lessons, obtain feedback from students by asking questions, observing the performance of a skill and watching for facial expressions that show a lack of understanding. You must respond to any feedback by answering questions and providing assistance and correction where needed.

(3) Show students how to improve and offer praise when improvement occurs.

(4) Back up all your statements with reasons. Whenever you tell students something give the reason behind it. For example, you say to a student, "This aircraft has two static vents, one on each side of the fuselage." This is a fact but if students do not know the reason for two vents, they will probably pass it off as unimportant and forget. Remember, if a student understands the concept or theory, details may be forgotten but the overall concept will remain and when an aircraft with only one vent is encountered, more attention may be given to instrument readings while making a cross-wind approach.

(5) When a student encounters difficulty in mastering an objective, find a means of allowing some degree of success. For example, the lesson is steep turns and rather than have students attempt the entire manoeuvre, try having them practise the entry. When no difficulty is experienced with the entry, add the next stage, then continue until the entire manoeuvre is completed. Should difficulty still occur, back up a step and attempt medium turns rather than cause too much frustration. Sometimes instructors make the mistake of continuing to have students attempt a manoeuvre when performance is deteriorating. It is better to quit at that point and go back to something the student can do well.

(6) Avoid ridicule or sarcasm. You may feel that it might take the place of humour; however, students seldom have the same feeling, especially if they are the butt of the remark.

(7) Arrange each lesson so that when a student does something correctly, there is a reward. This reward can be in the form of sincere, honest praise. You ask a student to complete a walk-around on a specific aircraft for which you have arranged to have some hydraulic fluid placed on the ground near a skid. Your student does a very thorough inspection of that particular area of the aircraft and is praised for this. If a thorough inspection is not completed, you have an excellent teaching point to emphasize why careful inspections must be done. In no case should you deliberately sabotage an aircraft, unless that aircraft is one that is not to be flown at any time. The consequences are too dangerous should the tampering go unnoticed and someone fly the aircraft.

14. RECENCY - Summarize and practise the important points at the end of each lesson, as last things learned and practised will be remembered longest.

(a) Other things being equal, the last things learned are best remembered. Conversely, the longer students are removed from a new fact or even an understanding, the more difficulty they will have remembering it. The need for reviews was stated earlier and a full circle has been completed - review - learn new material - review, etc.

(b) Suggestions:

(1) Plan for a pre-flight briefing immediately prior to the air lesson and review the main points by questioning. This may sound like the Learning Factors of Readiness and Exercise; however, recency deals with the timing of the practice.

(2) Ensure that students receive a thorough summary of the important points towards the end of each lesson.

(3) After each sequence within an exercise or class presentation, ask questions on the material or summarize the "need-to-know" material.

(4) Conduct a test as the final part of your lesson.

(5) At intervals throughout the course, conduct review periods in which no new material is taught, but reinforcement is obtained.

(6) Attempt to finish lessons with practise of the most important parts of the lesson. This applies to solo lessons as well as dual exercises. Remember, students practise knowledge by answering questions and they practise skills by doing.

15. An important skill as a flight instructor is the ability to ask good oral questions. Good oral questions satisfy all the identified learning factors. The next section of this guide will deal exclusively with oral questions.

ORAL QUESTIONS

GENERAL

1. When presenting a lesson, you have many techniques and aids at your disposal. One aid that can be used to stimulate learning and effectively applied to satisfy all seven learning factors is oral questioning.

2. The actual technique of questioning is a difficult one and is normally one of the most neglected areas of instruction. Good oral questioning requires the ability to think quickly and easily while facing a class or individual student, to shift and change as thought progresses and to phrase questions in clear and simple terms. You must always be mindful of the technique to follow when handling student questions and answers.

PURPOSES OF ORAL QUESTIONS

3.

(a) First, questions can be used to PROMOTE MENTAL ACTIVITY. You can state a fact and provide visual or verbal support to back it up but the surest way for students to remember is working it out for themselves. Whenever you can use an oral question to make your students think and reason out the fact, you should take advantage of the situation. Example: As students work towards an objective it is often necessary for them to recall pertinent data or knowledge learned previously. A well-worded oral question could provide the required information, thus promoting mental activity.

(b) A second purpose of oral questions is to AROUSE AND MAINTAIN STUDENT INTEREST. Merely making a statement will often result in a "so what" attitude, but asking questions makes students feel they are participating and contributing to the lesson, thereby arousing interest. You can maintain this interest throughout the lesson by the continuous development of facts and ideas. Remember - Telling is NOT teaching.

(c) Another purpose of oral questions is to GUIDE THOUGHT. By using questions you can lead students to think through to a logical solution. Questions can direct students' thinking through a definite sequence or to particular objectives. During discussions you can use questions to guide your student's thoughts back to the objective if they seem to be far afield. An experienced instructor can guide students through an entire lesson by asking the right questions at the right time.

(d) A final purpose of oral questions is to EVALUATE LEARNING for the benefit of both instructor and student. Oral questions may be used after each stage of a lesson to ensure students are following before you proceed to the next stage. At the end of the lesson, they confirm that students have attained the objectives for that particular lesson.

NOTE: A drawback of using oral questions to evaluate learning is that only random sampling of a class is obtained, since only one student answers each question. This drawback can be overcome by the use of some sort of student response system by the instructor. On a one-to-one basis, as in pre-flight and post-flight briefings, the above is not a problem.

NOTE: Write your answer in the space provided, then compare your answer with the one on the answer sheet on pages 18 and 19.

QUESTION #1

How can oral questions promote mental activity?

QUESTION #2

Why will oral questions maintain student interest during a lesson?

QUESTION #3

What is a drawback in using oral questions to evaluate learning?

DESIRED QUALITIES OF GOOD ORAL QUESTIONS

4. If Oral questions are to serve the purposes stated in paragraph 3, you must be mindful of the following desirable qualities of good questions when composing or preparing to use them.

(a) EASILY UNDERSTOOD. Questions should be stated in simple straightforward language; they should be brief, yet complete enough that students have no doubt as to the meaning of the question.

(b) COMPOSED OF COMMON WORDS. Questions should be designed to measure knowledge of a subject, not use of language. The use of high sounding words may give you a chance to display your vocabulary, but adds nothing to instruction. Remember, if students do not know the meaning of the words they will not be able to answer the question. Always keep your vocabulary within the grasp of your student.

(c) THOUGHT PROVOKING. Questions should not be so easy that the answer is obvious to all students. Students should be challenged to apply their knowledge. You should avoid using questions where your student has a 50/50 chance of being correct. Examples of these are the YES/NO and TRUE/FALSE type, unless these questions immediately are followed by a "why" or "how" type question.

(d) ON MAJOR TEACHING POINTS OF THE LESSON. Questions must be built around the main teaching points of the lessons. They must be asked at the proper place so that these points are emphasized.

QUESTION #4

Consider the following questions: For each one decide if it meets all the qualities of a good oral question. If it does not, state what desirable quality of a good question is violated.

(a) Was John A. MacDonald the first Prime Minister of Canada?

(b) What goes up the barrel of a rifle?

(c) In the event of catatonic paralysis induced by chronic anxiety neurosis, what is the most efficacious procedure for prevailing upon the gunner to abandon the aircraft?

5. Your students may be confused if questions are asked in a haphazard fashion. The purpose for which a question is intended may be lost. To ensure mental participation by all students, the following procedure is used:

(a) ASK THE QUESTION. You should state the question, applying the qualities of a good question. To do this you must have the question in mind before asking it. If questions are being used to evaluate learning or to confirm attainment of objectives, you should prepare them beforehand and write them in your lesson plan. It is often a good idea for beginning instructors to write out ALL questions until they are accustomed to thinking on their feet.

(b) PAUSE. After asking the question, you should pause for approximately 1 to 5 seconds (depending on the complexity of the question) to allow all students to think it over and formulate an answer. During the pause you should look over the class, being careful not to "telegraph" who you are going to call upon to provide the answer.

(c) NAME THE STUDENT. A problem you continuously have to face is selecting the student to answer the question. Some effort should be made to fit the question to the individual because students will vary in ability and you have to recognize and provide for these differences. Therefore, you should consider giving the more difficult questions to the most advanced students. You also have to ensure that everyone in the class is called upon to provide answers with reasonable frequency. A number of systems commonly used to ensure this have serious drawbacks. For example, if members of a class are called on according to seating arrangement or alphabetical order, it becomes quite easy for students to determine when they will be named to answer; thus the lazy students will not give serious thought to any question until it is getting close to their turn to answer. Possibly the most practical approach is to call upon students in a random order, then indicate by a check mark on a seating plan card each time a student is asked a question. To get a broader sampling of learning and to maintain interest, you should periodically call upon other class members to confirm the answer made by the first student asked.

(d) LISTEN TO THE ANSWER. Often an instructor, after naming a student to answer a question, will immediately begin to think about phrasing the next question and will not be listening to the answer and may say "Right" to an incorrect answer. This could lead to student confusion. You should always listen to the answer.

(e) CONFIRM THE CORRECT RESPONSE. Student answers must be evaluated carefully so as to leave no doubt as to what is the correct answer.

QUESTION #5

After asking a question, why pause before naming a student to answer?

QUESTION #6

Why is it essential that the instructor always confirm answers to questions?

HANDLING STUDENT ANSWERS

6. Aside from always confirming correct answers, there are certain techniques you must be aware of when handling student answers.

(a) DISCOURAGE GROUP ANSWERS. When students answer as a group, it is difficult to determine who supplied correct or incorrect answers, thereby leading to student confusion. When given a new class, establish early that you do not want group answers but will call upon a student by name to answer. You may, however, want to use group answers at times to increase class enthusiasm.

(b) DO NOT MAKE A HABIT OF REPEATING ANSWERS. This becomes monotonous to students when you always repeat the answer. If the answer provided is not correct or needs clarification, pass the question to another student. If the students do not answer loudly enough for all the class to hear, have them speak more loudly and repeat the answer.

(c) GIVE CREDIT FOR GOOD ANSWERS. This is especially true for the weak or shy student. When using oral questions to develop points from the class, do not reject answers that pertain to the subject although they may not be exactly what you are after. Give praise and try using a newly phrased question to bring out your point. If you receive a completely incorrect answer, don't embarrass your student by saying "Wrong". Diplomatically state that the answer is not what you wanted and ask a supplemental question or refer the question to another student.

QUESTION #7

What technique would you use if a student answers a question and all the class cannot hear it?

QUESTION #8

Why should group answers be discouraged?

HANDLING STUDENT QUESTIONS

7. Never discourage a genuine question pertaining to the lesson. There is an old saying, - "For every student who asks a question there are six others who wanted to ask it". Usually students ask questions because you have not given a clear explanation of the point or fact being queried. Some techniques to follow regarding student questions are:

(a) ENCOURAGE QUESTIONS. Let the class know early in the lesson that you encourage questions at any time the students are not clear on points being taught. If it will not interfere with the presentation of the lesson, it is usually best to allow questions immediately any point arises rather than waiting for a break in the lesson to solicit questions. If you wait for questions, the point of concern may have slipped their mind.

(b) PASS QUESTIONS TO OTHER STUDENTS. Occasionally pass a student question to other members of the class - this will create interest and get class participation. Do not over-use this technique as the students may get the impression that you don't know the answer and are fishing for help. Above all, never use this technique for any question to which you do not know the answer.

(c) REJECT QUESTIONS NOT RELATED TO THE LESSON. Quite often students will ask a question totally unrelated to the lesson. Politely reject the question being careful not to offend the student and say it is a question you would prefer to discuss after class.

(d) DO NOT BLUFF. No matter how knowledgeable you are of your subject, there will be times you will be asked a legitimate question and not have the answer. If you do not know the answer, say so, do not bluff. Tell the class you will find the answer and ensure you do, then inform the individual who asked as well as the rest of the class.

(e) ENSURE ALL THE CLASS HEARS THE QUESTION. When a question is asked, check that all the class has heard it. When you answer the question, answer to the class and not only to the individual asking it. If a long detailed answer is necessary, the remainder of the class may lose interest and "tune out" if you get into a conversation with one student.

QUESTION #9

At what time in a lesson should students be encouraged to ask questions?

QUESTION #10

How would you handle a student's question if it did not pertain to the lesson?

QUESTION #11

How would you handle a question for which you were unable to provide the answer?

ANSWERS FOR QUESTIONS IN THE TEXT

QUESTION #1

Rather than giving students information, using oral questions can call upon their background knowledge and previous experience to reason out the answer, thus promoting mental activity.

QUESTION #2

When students are allowed to participate in a lesson and contribute to its success, interest is maintained to a much greater degree than if students only sit and listen to the instructor.

QUESTION #3

It provides only a random sampling of the class. Use some type of student response system so that one student does not answer all questions.

QUESTION #4

(a) It is not "thought provoking", as a yes or no answer is all that is required.

(b) It is not clearly and easily understood, as answers such as rifling, bullets, pullthrough, air, etc., could be received.

(c) It is not "composed of common words". In plain language the question merely asks "When the gunner freezes, - how do you get him out?"

QUESTION #5

To allow ALL students to mentally formulate an answer before calling on any specific individual to answer.

QUESTION #6

To ensure no doubt is left in the student's mind as to what is the correct answer.

QUESTION #7

Ask for the answer to be repeated so all the class can hear.

QUESTION #8

The instructor cannot determine who provides correct or incorrect answers. Student confusion may result.

QUESTION #9

Providing it does not interefere with the outcome of the lesson, students should be encouraged to ask questions at any time they are not clear on a point or have some doubt about what the instructor is saying.

QUESTION #10

Politely reject the question without offending the student and state that you would prefer to discuss it after class.

QUESTION #11

Don't bluff. Admit you do not know the answer but you will find out and let them know.

TEST QUESTIONS

QUESTION #1

State four purposes of oral questions.

(1)
(2)
(3)
(4)

QUESTION #2

State four desired qualities of good oral questions.

(1)
(2)
(3)
(4)

QUESTION #3

State the procedure to follow when asking a question.

QUESTION #4

State three points to observe in the handling of student answers.

(1)
(2)
(3)

QUESTION #5

State five points to observe in the handling of student questions.

(1)
(2)
(3)
(4)
(5)

NOTE: Confirm your answers by referring to Summary Sheet on the following page. If you have made any errors, re-read the text to determine where you went wrong.

TEST ANSWERS AND SUMMARY SHEET

1. Oral questions are an aid to instruction and when used effectively can successfully apply the principles of instruction during presentation of a lesson. For ready reference, a summary of the material covered in this presentation follows:

(a) PURPOSE OF ORAL QUESTIONS

(1) Promote mental activity.
(2) Arouse and maintain student interest.
(3) Guide thought.
(4) Evaluate learning.

(b) QUALITIES OF GOOD ORAL QUESTIONS

(1) Easily understood.
(2) Composed of common words.
(3) Thought provoking.
(4) On major teaching points of lesson.

(c) PROCEDURE FOR ASKING QUESTIONS

(1) Ask the question.
(2) Pause.
(3) Name the student to answer.
(4) Listen for the answer.
(5) Always confirm correct answer.

(d) TECHNIQUE FOR HANDLING STUDENT ANSWERS

(1) Discourage group answers.
(2) Do not make a habit of repeating answers.
(3) Give credit for good answers.

(e) TECHNIQUE FOR HANDLING STUDENT QUESTIONS

(1) Encourage questions.
(2) Occasionally pass questions to other class members.
(3) Reject questions not related to lesson.
(4) Don't bluff if you do not know the answer.
(5) Make sure all of the class hears the question.

THE DEMONSTRATION-PERFORMANCE METHOD OF TEACHING

1. GENERAL

(a) A student-instructor once asked, "If I had time to learn only one method of lesson presentation, which one should I learn?" The answer is the demonstration-performance method. Why? Well, the primary concern of an instructor is training. Training, in large part, is devoted to the development of physical and mental skills, procedures, and techniques. For example, flying aircraft, interpreting blueprints, driving vehicles, welding, building, shooting, repairing, solving problems, using a slide rule, filling out forms - all of these, and many, many more , can be best taught by using the demonstration-performance method.

(b) The method is not new. It may be one of the oldest known methods of instruction. One can imagine the caveman demonstrating to his son the procedure for making the club, and then have him make one.

(c) The demonstration-performance method can be broken down into five basic procedures. These procedures are:

(1) explanation;
(2) demonstration;
(3) student performance;
(4) instructor supervision; and
(5) evaluation.

2. EXPLANATION AND DEMONSTRATION

(a) The explanation and demonstration may be done at the same time, or the demonstration given first followed by an explanation, or vice versa. The skill you are required to teach might determine the best approach.

(b) Consider the following: You are teaching a student how to do a forced landing. Here are your options:

(i) Demonstrate a forced approach and simultaneously give an explanation of what you are doing and why you are doing it; or,
(ii) Complete the demonstration with no explanation and then give a detailed explanation of what you have done; or
(iii) Give an explanation of what you intend to do and then do it.

(c) You will find that different instructors will approach the teaching of this skill differently. The following represents a suggested approach that appears to work best for most instructors.

(i) On the flight prior to the exercise on forced landings, give a perfect demonstration of a forced landing. It may be better not to talk during this demonstration, since you want it to be as perfect as possible to set the standard for the future performance. There is another advantage of giving a perfect demonstration prior to the forced landing exercise. Your students will be able to

form a clearer mental picture when studying the flight manual because they have seen the actual manoeuvre.

(ii) The next step would be for you to give a full detailed explanation of a forced landing. During this explanation you would use all the instructional techniques described previously. You must give reasons for what is expected, draw comparisons with things already known and give examples to clarify points. This explanation should be given on the ground using visual aids to assist student learning.

(iii) When in the air, give a demonstration, but also include important parts of the explanation. Usually asking students questions about what you are doing or should do, will give them an opportunity to prove they know the procedure, although they have not yet flown it.

(iv) After completing the forced landing approach, while climbing for altitude, clear up any misunderstandings the students may have and ask questions.

(v) The demonstration and explanation portion of the demonstration-performance method is now complete and you should proceed to the next part, which is the student performance and instructor supervision.

3. STUDENT PERFORMANCE AND INSTRUCTOR SUPERVISION

(a) Student performance and instructor supervision are always carried out concurrently during the initial stages of training. A student should not be allowed to make a major error at this time. Your supervision must be close enough to detect the start of an error and you must correct the student at that point.

(b) the student should be allowed to perform the task in small segments with you providing close supervision of each segment.

(c) Referring to our example of the forced landing consider the following suggestion of how to divide the task into segments:

(i) On student's first attempt:

(a) You the instructor;

(1) select the field, making sure that it is within easy autorotational range;
(2) perform all in-flight checks including look-out.

(b) The student flies the aircraft and concentrates on making the field.

(c) If the student makes a major error, you take control and place aircraft in the correct position, then give student control and continue the approach. (Try to ensure that the student makes the field on the first attempt even if you have to help all the way through.)

(ii) On subsequent attempts, depending on the degree of success of the previous attempt, add more items for the student to carry out.

(iii) Continue the process until you feel the student can fly the complete manoeuvre alone. You have now completed the student performance and instructor supervision portion of this method and you should now proceed to the evaluation.

4. EVALUATION

(a) The evaluation portion of the demonstration-performance method is where students get an opportunity to prove that they can do the manoeuvre without assistance.

(b) For the simulated forced approach you should tell students that you will be simulating an engine failure and that they are to carry out the entire procedure including all checks and look-out.

(c) While the student is performing this manoeuvre you must refrain from making any comments. Offer no assistance whatsoever, not even grunts or head nods. You must, however, observe the entire manoeuvre very carefully, so that you can analyze any errors that the student may make and debrief accordingly.

NOTE: You would interrupt the student's performance, of course, if safety became a factor.

(d) Success or failure during the evaluation stage of the lesson will determine whether you carry on with the next exercise or repeat the lesson.

5. RULES FOR USING THE DEMONSTRATION-PERFORMANCE METHOD

(a) Give a perfect demonstration or if not practical show finished product. Example: When teaching map preparation, show a map with a cross-country trip all marked out - students will see the standard expected in preparing their own maps.

(b) Give a step-by-step explanation of the required task - use reasons, examples and comparisons to make the explanation clear.

(c) Have students imitate a step of the skill while you provide close supervision. For example, have students practise the entry to a steep turn until correctly done before going on to the next step.

(d) Continue until the student has imitated each step.

(e) Provide student practice, with assistance as necessary.

(f) Ensure that the amount of time allotted for student practice equals or exceeds the amount of time for the demonstration, explanation, and student performance under very close supervision. Students should take as much time to practise as you take to teach.

(g) Overall rule - while you are demonstrating and explaining, your student listens and observes; while your student is performing, you listen and observe. NEVER ask the student to perform while you are explaining.

(h) Complete the exercise with an evaluation (final check-up) in which students have the opportunity to prove what they can do.

(i) NEVER just explain and demonstrate a skill or procedure for students. ALWAYS have students perform the skill to ensure that the skill or procedure is done properly. STICK WITH THEM UNTIL THE SKILL IS DONE CORRECTLY. For example, a student is about to proceed on a solo cross-country trip and asks you how to fill in the aircraft journey log. Explaining how to do it, even with a demonstration, is no guarantee of student success. Have students tell you how to do it or better still, have them make a practice log entry before departure.

INSTRUCTIONAL TECHNIQUES
SUMMARY AND GUIDE

1. The following techniques, if applied in a conscientious manner, will assist the flight instructor in giving effective instruction. Because most flight instructors also carry out some, if not all of the ground school training, references to classroom type instruction are included in this summary. The techniques of instruction, questioning techniques, lesson planning, etc., are equally applicable for providing large group instruction or on a one-to-one basis for air instruction, individual preparatory ground instruction, or pre-flight briefings.

2. To present a lesson in a professional manner, you must prepare in advance and proceed as follows:

   (a) PREPARE A LESSON PLAN

      (1) Reason: A lesson plan acts as a guide and keeps you on track during your presentation. It also ensures that important points are covered and not neglected because of poor memory.

      (2) What to include: Headings of main points - sufficient notes to jog memory on talking points - specific questions and answers to confirm student learning - visual aid instructions (including a chalkboard plan) - a well thought out opening and closing statement - estimates of the amount of time to be spent on each major idea or item - a visual aids plan - any other point that you feel will help to get the lesson across.

      (3) What to avoid: Writing material out in full detail (this promotes reading the material while in front of the class); using single space format (this does not allow for revising notes next time the lesson is to be given); writing in longhand unless you are able to read your notes at a distance of three feet (this makes you appear not to know your material because of having to look closely at your lesson plan rather than just glance at it to jog your memory).

   (b) PREPARE THE CLASSROOM/TEACHING AREA BEFORE THE LESSON

      (1) Reason: The class must be arranged for best student learning. If students cannot see all the aids, they may miss a point. Lesson preparation appears more professional if no time is wasted organizing aids or re-arranging seating.

(c) PREPARE/CHECK TRAINING DEVICES/AIDS BEFORE THE LESSON

(1) Reason: It avoids embarrassment should an item not work, or if any chart, slide or graph were to be shown in the wrong order. Always ensure you have extra light bulbs for any projection device.

(d) PREPARE YOUR STUDENTS FOR LEARNING

(1) Reason: If students are to learn, they must be physically, mentally and emotionally ready to do so.

(2) How to do it:

(a) Tell students specifically what is required of them during the lesson and what they will be able to do at the end of the lesson.

(b) Tell students why they should take part in the lesson and how the new skill or knowledge will benefit them. Give as many advantages as you possibly can for having students learn, as they may not agree with some of your reasons.

(c) Give students an over-all picture of the lesson, and show them how it fits into the entire course. Attempt to relate the new material to some past and/or future experience of your students.

(d) The length of time required for preparing students to learn depends primarily on their background knowledge and the complexity of the material. As a general guide, the amount of time needed is approximately ten percent of the lesson.

(e) START THE PRESENTATION OF NEW MATERIAL AT THE STUDENTS' LEVEL OF UNDERSTANDING

(1) Reason: If you begin your presentation at a level where your students do not understand, there will be confusion and time wasted. Little or no learning will take place.

(2) How to determine the students' level of understanding:

(a) Before the instruction starts, conduct a Threshold Knowledge Test (T.K.T.) to determine what your students know, or do not know. A Threshold Knowledge Test is simply some form of examination, written or oral, of sufficient length to inform you as to the actual level of knowledge.

(b) During the course of instruction have periodic reviews.

(c) Conduct a review of previous lessons before starting each lesson. The review should consist of a series of questions. If your students answer

correctly, proceed. If they do not, reteach.

(d) Check with other instructors for the strengths and weaknesses of your students, and arrange your material to fit the students' needs.

(f) PROCEED AT THE RATE OF STUDENT COMPREHENSION

(1) Reason: If you get ahead of your students during the presentation, you are in the same position as if you started above their level.

(2) How to ensure that you are proceeding at the required rate:

(a) Arrange your material in stages. Stop at the end of each stage and ask specific questions on the material you have just covered. If your students answer correctly, proceed. If they do not, re-teach. The length of time for a stage depends on the complexity of the material being presented, but a good general rule is 8-12 minutes.

(b) Write out in full a number of well thought out questions. Put these questions on your lesson plan and make sure they are asked during the presentation. The feedback you get from these answers will determine whether or not your students understand.

(c) Observe your students closely for facial expressions which could indicate that they do not understand a particular point. If students say they understand, ask them a question to make sure.

(d) Encourage students to ask questions on points which they do not fully understand.

(e) Provide for lots of practice of basic skills before going on to the more complex parts.

(g) IDENTIFY AND EMPHASIZE MAJOR POINTS FOR THE STUDENTS

(1) Reason: During any presentation there is a mixture of "need-to-know" material, that is extremely important, and "nice-to-know" material, which may or may not have to be remembered for a long period of time.

(2) How to identify and emphasize points for your students:

(a) Prepare a visual aid of the main points - approximately 75% of learning comes from vision, whereas only about 13% comes from hearing. The visual aid may be a heading on a chalkboard, chart, or projected image.

(b) Have students write the main points down in their notebooks, or provide notes which include these main points.

(c) Make a verbal statement to the students such as: "This particular point is very important; remember it."

(d) Prepare an orientation board (chalkboard or sheet of paper), that identifies the major points for a lesson. Students can refer to this board throughout the lesson, and this helps their thoughts to be guided to a specific area.

(e) Raise the volume of your voice and reduce the rate of delivery while stating an important point, to add emphasis.

(f) Besides emphasizing main points, you should also emphasize safety and points that are easily forgotten or difficult to remember.

(g) Provide emphasis according to relative importance. The most important things get a greater amount of emphasis.

(h) Emphasize points by giving verbal examples (real or imaginary) - by comparisons (similarity or difference to known facts) - and perhaps most important, by giving reasons for each point you make. Students tend to remember better if they understand the reasons behind every point they must learn.

(i) Repeat the point frequently - by using summaries, or have your students repeat the point by answering your questions.

(j) Conduct periodic reviews of the "need-to-know" material.

(k) Have the students complete a home assignment of the important points of a lesson.

(l) Have students record, in note form, the major ideas or items you feel must be emphasized. By having them write ideas down, you are using another sense and so learning may be reinforced.

(m) Use a variety of training aids to appeal to several senses (touch, feel, etc.).

(n) Do not emphasize "nice-to-know" material.

(h) GIVE CLEAR EXPLANATIONS AND DEMONSTRATIONS

(1) Reason: If students do not understand an explanation, you will have to re-teach by rephrasing, or by going over the material a second time. The same applies to a sloppy or inaccurate demonstration.

(2) Suggestions for ensuring that your explanations and demonstrations are clear.

(a) Start verbal explanations by referring to something already known by your students. Association of ideas makes it easier to follow your explanation.

(b) Use words and phrases that are commonly used. Avoid showing off your command of the English language by using such phrases as: "Elaborate on the fundamental ramifications of hylampherism. Instead, ask ("What happens when the lever is lifted?")

(c) Attempt to reduce complex material and ideas to a simple, easy to understand form. The best way to do this is to start with something your students know about and build on that knowledge in small steps.

(d) If you are required to demonstrate something, make sure you can do it correctly before you show the students.

(e) Make sure all students can see even the smallest points of a demonstration - if necessary, gather them around you.

(f) If you are doing a simultaneous demonstration and explanation, break the demonstration down into small steps and explain each step thoroughly giving reasons, examples and comparisons.

(i) USE VISUAL AIDS AND USE THEM EFFECTIVELY

(1) Reason: Approximately 75% of all learning comes through sight.

(2) Sources of ideas;

(a) graphic artists or personnel associated with the production of visual aids,

(b) other instructors can often give the spark to an idea,

(c) commercial displays in newspapers, magazines, television and stores,

(d) finally, your own imagination, if you give it full rein, is an excellent source of ideas for aids.

(3) Types of visual support;

(a) actual equipment,

(b) mock-ups, charts, diagrams, pictures or models,

(c) films, video tape and cassette recordings,

(d) sometimes - people.

(4) Guidelines:

(a) Plan the lesson first, and then select the type of visual support that helps students learn the material. DO NOT select a visual aid and then try to

build a lesson around it. Just because the aid looks impressive, it does not mean it will fill the need - the need being to help your student learn the "must-know" information.

(b) Plan to use a visual display of all major points that are covered during your lesson. Simple wording on the chalkboard is usually better than repeating the main points over and over again.

(c) Make your aids simple and clear. Eliminate all unnecessary data. Avoid the tendency to produce ornate, detailed artwork.

(d) Manufacture aids that can be seen by all the students. Before you use it, put the aid in the position in which it is to be used. Go to the position of the student farthest away, and ensure that you can see the aid clearly.

(e) Use a variety of colour to add interest, but make sure you keep associated parts or ideas or a repeating idea in the same colour. In this way you help your students to follow your presentation more easily.

(f) When an aid is not in use, cover it up or remove it from sight. It can act as a distraction for your students if it is there but not being used.

(g) If the aid includes written words, have someone check for correct spelling and grammar. You would be surprised how many times mis-spelled words are displayed for students.

(h) If possible, stand well away from the aid and use a pointer, so that you do not obstruct the view of any student.

(i) If using charts, it is sometimes advisable to have two copies, one labelled and one unlabelled. The unlabelled one can be used later to test student knowledge. Alternatively, a duplicate work sheet of the chart can be given to each student to fill in or label.

(5) Consider: Will the aid help the student learn better, easier, or faster? You should "show them as well as tell them".

(j) VARY THE RATE, VOLUME AND PITCH OF YOUR VOICE WHEN DELIVERING THE LESSON

(1) Reason: Any form of variety adds to student interest. Speaking in a dull manner will generally put students to sleep, or at least allow their minds to wander off the subject.

(2) Consider:

(a) Speak at a fast rate while presenting "nice-to-know" material. This produces the effect of observable enthusiasm, and enthusiasm is contagious.

(b) Speak at a slow rate when identifying "must-know" information. This allows students to separate the "need-to-know" from the "nice-to-know" material, and in most cases adds emphasis to the points being made.

(c) Adjust the volume of your voice to the conditions under which you are instructing. If there is background noise you must raise the volume of your voice so that all the students can hear what you are saying. In an aircraft, this is a "must".

(d) Generally you will have very little control over the pitch of your voice, but adjusting the volume and varying the rate of delivery will often help to vary the pitch to some extent.

(k) OBTAIN FEEDBACK FROM STUDENTS BY LOOKING AT THEM (EYE CONTACT)

(1) Reason: It gives students the feeling that you are interested in them and allows you to determine whether or not they understand what you are presenting. This is a little difficult to do in an aircraft.

(2) Consider:

(a) Look directly at students, but do not stare at any particular individual for too long at a time. If students avert their eyes, look at someone else or out the window, it means you have stared too long and possibly caused some embarrassment.

(b) Make your eye contact impartial. Do not favour any individual student or group of students; include them all in your presentations.

(l) PROVIDE FOR MAXIMUM STUDENT ACTIVITY DURING THE LESSON

(1) Reason: Students learn more easily if they are actively engaged in the learning situation.

(2) Consider:

(a) When learning a theory subject, students' practice of that theory is usually in the form of answering questions. Ensure that you ask questions throughout the presentation.

(b) Use sound questioning technique as outlined in the section "Oral Questions".

(c) Distribute your questions evenly among all the students, to avoid having a few answer all the questions.

(d) Make your questions thought-provoking and challenging.

(e) Avoid questions that require a simple YES or NO answer, unless you immediately follow up with a "why" or "how" question.

(f) Always have enough information in the stem of your question to guide the students' thoughts towards a particular area. Avoid general or ambiguous questions, such as "What goes up the cylinder of an engine?" You may not get the answer you are looking for.

(g) Meaningful activity while learning a skill is normally a combination of answering questions and practising the various steps of the skill. Arrange to have students involved in the practice as soon as possible after the start of the lesson. If possible, build into the first part of the lesson a "hands-on" opportunity for your students. This increases their interest, and in most cases will give them a positive desire to learn more.

(h) Always supervise student practice very closely; do not allow them to make mistakes from which they could begin to learn bad habits. If you do, it means you will have to reteach them. The phrase "practice makes perfect" is only true if the person practising receives close guidance and supervision. REMEMBER, ONLY CORRECT PRACTICE MAKES PERFECT.

(i) When students are able to perform a task with a reasonable degree of proficiency, introduce some competition (speed or ability), or introduce a variation of the skill - but after they have almost mastered the basic skill.

DEVELOPMENTAL TEACHING
OR TEACHING BY QUESTIONING

1. Developmental teaching is based upon a student centred philosophy of teaching which requires you to reason with students to have them meet predetermined objectives. Using students' background knowledge, you ask questions which lead students to determine the next step in a procedure, the logical application of a principle, or the final solution to a problem. The rate of progress in developing the more complex ideas of the lesson is governed by the students' perception and comprehension. Questions should be asked to review previously learned material. The process of developmental teaching begins when students are required to reason out and make suggestions with respect to new material.

2. Developmental teaching has been used throughout the years by all good teachers. Because of the requirement for every student to participate, developmental teaching is effective with small groups and with individual students. It can be used at any level of student knowledge provided you know or determine the appropriate level and proceed accordingly. Depending upon the subject matter, some lessons can be entirely "developmental". More frequently, however, there will be a combination of teaching by explanation, where it may be more efficient to explain certain material, and developmental teaching where crucial areas of the subject matter can be reasoned with your students. In almost every lesson, some developmental teaching is appropriate and desirable.

3. The main advantage of developmental teaching is that it promotes efficient student learning because it satisfies all the basic aspects of learning. Since students participate in meaningful activity, they are forced to think about the material being learned, as questions are answered verbally. Consequently, interest is maintained, a sense of accomplishment is gained and effective learning takes place. You receive constant feedback and frequent confirmation of a student's progress.

4. Careful planning for developmental teaching is critical because you must formulate appropriate questions which demand reasoning on the part of your students. The standard questioning techniques must be observed, and student responses must be handled with tact and discretion. In addition to being a master of the subject material, you must be flexible in your approach. You must permit adequate discussion, yet exercise sufficient control to move towards the lesson objectives. Frequent summaries are necessary to consolidate the material as the lesson progresses.

5. Novice instructors are frequently apprehensive about trying developmental teaching. Experience has shown that students consistently surprise instructors if given the chance to participate actively in the learning process. The disadvantage of lecturing during preparatory instruction is that students are frequently told material that they already know, or that they reasonably can be expected to deduce on their own. The best teaching occurs when students are led to a point from which they can systematically direct their own reasoning to the solution of a problem. The secret of effective learning is to keep students mentally active in the learning process. With developmental teaching students are forced to think.

STUDENT PROGRESS

1. RATES OF LEARNING

(a) Although it would be convenient if the rate of learning could be consistent and predictable, it is not always so. Students may progress rapidly for a period, and then suddenly progress more slowly or even retrogress for a time. Such variations are to be expected. It is your responsibility to detect them as soon as possible, and to try to eliminate their causes by re-directing your instruction to level them out as much as possible.

2. ADVANCES AND PLATEAUS

(a) Learning proceeds rapidly at first when a new task is introduced, then slows as a reasonable degree of proficiency is achieved. When plotted on a graph, this decrease in the rate of learning is shown as a levelling of the ascending curve which represents progress (FIG 3). As students achieve the ability to bring together other aspects of training, progress then tends to resume its upward climb at a slower but fairly constant rate.

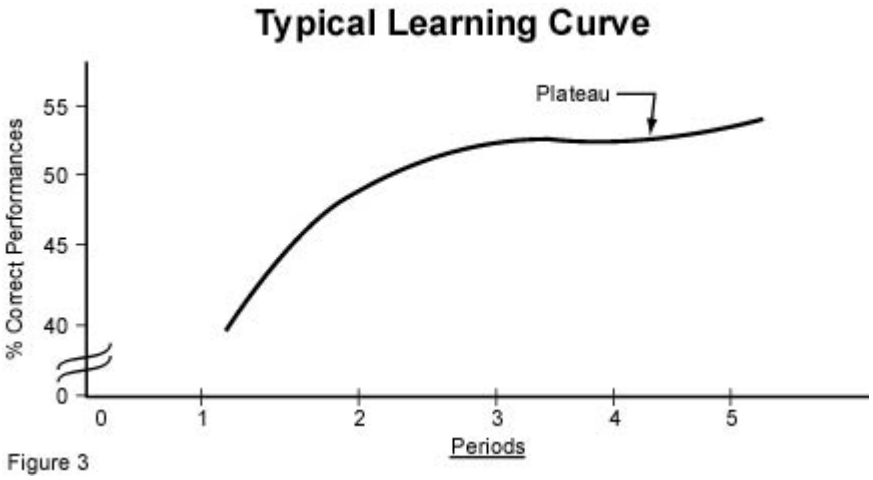

Figure 3

(b) The relatively level portion of the learning curve is termed a plateau. It may represent a period of training during which the student is perfecting the application of the new skill. The correlation of the new skill with the other learning tasks may not yet be obvious.

(c) The rate of progress in learning is affected by so many outside influences that it is not often predictable. The rate of learning is affected by such things as:

(1) diversions;
(2) lagging motivation;
(3) emotional disturbances;
(4) upset training schedule;

(5) weather;
(6) equipment breakdown; and
(7) unavoidable absences.

(d) Slumps or plateaus in the rate of learning are more likely to occur as your student advances to more complicated operations, such as hovering or transitions. Often the reason is that a student has failed to master one basic element of the operation, which leads to the appearance of deficiency in the performance of later elements. Improvement usually becomes normal again when this one basic element is mastered. You can accelerate improvement by careful fault analysis and by concentrating instruction on that one phase of the operation concerned.

(e) Without competent instruction, students will probably not understand why they aren't improving and will become discouraged. This discouragement tends to prolong the plateau. During such periods of discouragement, you should step in to isolate and correct the situation, and to provide special incentives until normal progress is resumed.

(f) Reversals sometimes occur, during which a student's performance becomes worse with continued practice. Generally such reversals are due to a faulty habit pattern involving one of the basic elements of the manoeuvre or operation involved. This faulty habit causes your student to practise an erroneous performance repeatedly, until correction becomes very difficult. You must not accept such errors and misunderstandings as normal plateaus in the learning process. They must be corrected before progress can resume.

(g) During advanced stages of learning, the rate of progress can be very slow. Example: An acrobat who can perform a routine to a level of 9.6 continually practises to improve the performance. Raising the score up to 9.8 or 10 requires extensive training and practise. Students may be nearly ready for a flight test at an early stage and added training will only show slight, slow improvement.

(h) Reversals in the rate of learning could also take place if you were to place too much emphasis on a single phase, element or manoeuvre.

INDIVIDUAL DIFFERENCES

1. You are likely to be discouraged when you discover that a well-planned lesson does not teach all students with equal effectiveness. Usually, however, you soon see that this is natural. One manifestation of the difference among students is that they seldom learn at the same rate. Differences in rates of learning are based on differences in intelligence, background, experience, interest, desire to learn, and countless psychological, emotional, and physical factors. You must recognize that students are different. You must recognize that this fact dictates how much you can teach, at what rate, and when.

PERSONALITY DIFFERENCES

2. Attitude: - Students have their own personal attitudes and methods of thinking. Thinking patterns and reactions to the various philosophies and types of training must be reconciled. The instructor must consider if the attitude is caused by hereditary or environmental factors. The root of attitude problems may sometimes be found in the general attitude of the school staff.

3. Interest: - People sense ideas and activities that possess special values, uses or attractions for them. Three general categories of interest are the vocational, educational, and avocational. The interests of students in different aspects of flying will differ. Efforts should be made to take advantage of these, and to channel students into different areas as needed.

EMOTIONS

4. Emotions play an important part in the training of a student. You must know the kinds of emotions and techniques for controlling them. Most of us think of emotion as overpowering feelings such as passion, hatred, or grief.These are not typical of the entire range of emotions. Everything we do, or with which we come in contact, is coloured by some emotional feeling. Emotions vary from mildly pleasant or unpleasant feelings, all the way up to feelings so intense that physical and mental activity is paralyzed. All of us experience a wide variety of emotions every day. Rarely do they bother us or interfere with our ability or willingness to do our job. However, students in flight training are in an abnormal emotional condition. Students are in unfamiliar situations where accelerated pressures are experienced over a long period of time. The learning situation tends to intensify the students' emotional problems more than we would expect in everyday life. You cannot ignore this problem but must learn how to recognize and overcome it.

DEGREES OF EMOTION

For our purposes, we will divide the various levels of emotion into 3 categories:

5. Mild Emotion: - This is the everyday type of emotion such as a small amount of satisfaction or dissatisfaction with our jobs, our personal lives, or with other people. Mild emotions affect motivation.

6. Strong Emotion: - This degree of emotion is not felt very often in everyday life, but causes most of our emotional problems in flying training. Strong emotions cause a large amount of tension in an individual, and no one can live or work normally with prolonged tension; however, strong emotion can be coped with.

7. Disruptive Emotion: - These are very severe, deep-rooted emotional tensions which will disrupt logical action and clear thinking. Persons suffering disruptive emotions usually require the assistance of a psychiatrist; however, they occur so rarely that you need only be aware that they exist.

THE EFFECT OF STRONG EMOTIONAL TENSION

8. A person cannot tolerate strong emotional tension over any length of time. It causes extreme nervousness, irritability, and an inability to relax. It interferes with normal eating and sleeping habits, and makes the subject generally miserable. Everyone either consciously or subconsciously, tries to relieve prolonged emotional tension.

9. The effect of emotional tension on learning depends on the method chosen by the student for relieving it. If the problem is attacked directly, and solved, then learning is enhanced. For example, students may have strong feelings of frustration or worry due to deficiency in one phase of the flight training program. If they work harder, study more, and receive extra instruction, progress will probably become satisfactory and tension will disappear. On the other hand, if the real problem is avoided, an escape mechanism may be used to reduce tension and learning will suffer.

USE OF EMOTIONAL ESCAPE MECHANISMS

10. Students in flight training will often use the following escape mechanisms. Occasional use of escape mechanisms is normal in everyone, but their over-use indicates strong emotional problems. You, therefore, must learn to identify the symptoms which indicate that a student is using escape mechanisms.

(a) PROJECTION - transferring the blame from oneself to someone or something else.

(b) RATIONALIZATION - finding a believable excuse for one's actions or failure; trying to justify unjustifiable behaviour.

(c) RESIGNATION - becoming resigned to the situation; giving up.

(d) FLIGHT - physically or mentally removing oneself from the tension producing situation.

(e) AGGRESSION - taking one's tension out on someone else by becoming belligerent or argumentative.

11. A student's over-use of one or more of the escape mechanisms, along with other symptoms, may indicate an emotional problem. You should not wait until emotional tension becomes extreme before taking corrective action.

MEETING THE DIFFERENCES

12. You must be aware of the differences in aptitude, personality, and emotions among your

students, and understand the necessity to treat students as individuals. When you have analyzed the situation and determined the differences, seek assistance from more experienced instructors or supervisors when it is necessary. You will attempt to equalize the different levels of understanding, ideally raising the level of some without retarding the progress of others. Coping with differences among students is perhaps the greatest challenge of instructing, and finding the correct approach for each student is essential.

13. Some traits and faults of students are fairly common and can be recognized easily. These are discussed in the following paragraphs, together with suggested corrective actions. (Refer to Table 2)

(a) NERVOUS OR UNDERCONFIDENT. Nervousness or underconfidence in a student is a trait which may or may not disappear. Instruction may be too rapid and material may not be absorbed. Repeating the fundamentals and ensuring mastery will often alleviate this condition. You must ensure that this type of student receives deserved praise whenever possible. Harsh rebukes should be avoided. Patience is very necessary when dealing with a student of this nature. The student must be aware that you are trying to help. Nervous students may be so apprehensive that they may not be suitable for pilot training. You should avoid manoeuvres involving extreme aircraft attitudes, unless they are essential to the lesson being taught. Take the time to build the student up to exercises involving extreme aircraft attitudes.

(b) OVER-CONFIDENT OR CONCEITED. You must first ensure that this type of student has the ability to match the confidence and, if so, set more difficult tasks that require greater accuracy. More criticism of imperfections is advisable. If the student has little ability, counselling may be required. Any signs of familiarity must be discouraged.

PROBLEM / SUGGESTED ACTION	Learns slowly	Know-it-all	Timid	Wastes time	Too aggressive	Antagonistic	Learns rapidly	Finds fault	Immature	Courts favours	Stalls, evades	Dominating	Inattentive
Provide less work	•												
Provide more work		•			•		•			•		•	
Give more individual instruction	•		•								•		
Be patient in correcting mistakes	•		•										
Give no chance to dodge responsibility		•	•	•				•	•	•	•		•

Rigidly check student's work		•		•	•			•	•	•	•	•	•
Let student know what is expected		•		•		•		•	•	•	•	•	•
Determine validity of grievances						•		•					
Give student more responsibility				•	•	•	•	•			•		•
Give more difficult assignments		•			•		•						
Require student to prove ability		•						•		•		•	
Have student work alone				•			•				•	•	
Keep student informed of progress		•		•				•	•		•		•
Tell student why progress is poor			•	•		•		•	•		•		•
Check at first occurrence				•				•	•	•	•	•	
Have a personal talk with student		•	•	•		•		•	•		•	•	•

Table 2

(c) FORGETFUL OF INSTRUCTION. At the beginning of training, students may forget previous instruction. Students with this problem require a great deal of patience and probably need more review than the average student. Extra time spent in briefing and debriefing, and more study on the student's part should be rewarding for all concerned.

(d) INCONSISTENT. Many students, at one time or another throughout the course, appear to lack consistency in flying proficiency. There are many reasons for this and you must try to find the one that fits a particular student. You must look at yourself and your attitude towards the student. Most of us have good days and bad days, but when a student shows large fluctuations in proficiency the instructor must look closely at the teaching activities. A change in approach or even a change in instructors may be called for.

(e) SLOW STARTERS. Slow starters are students who find difficulty doing more than one thing at a time. Again, patience is mandatory. Progress may be slow, but encouragement will help.

(f) FAST STARTERS. Fast starters are usually students with previous exposure to flight training who quickly grasp the initial air exercises. You should not omit anything from the briefings. Watch for signs of weakness when new work is

introduced. This type of student usually slows down to the level of the others shortly after going solo. A high degree of proficiency throughout the course should not be anticipated unless the student has above average ability.

(g) IMMATURE. You must not be too harsh with students who appear immature. You will find that within a short time in the flying training environment, the students will attain a greater degree of maturity. Your attitude is of prime importance in setting an example. You must encourage and assist these students whenever possible.

(h) AIRSICKNESS. Some students may suffer from airsickness induced by motion, negative G, apprehension, claustrophobia, tensions or excitement. You must attempt to determine what affects the student. When signs of airsickness show up, try methods of prevention such as letting the student fly straight and level, stopping instruction, inducing relaxation, making conversation about something else, or whatever will keep a particular student from becoming airsick.

STUDENT - INSTRUCTOR RELATIONSHIP

1. The primary responsibility for establishing a favourable student-instructor relationship rests with you. The successful performance of your job requires that your relationship with students accomplishes three things. It must maintain discipline and respect for you the instructor - these are necessary for any leader. Students must obey your directions, especially in an aircraft. They must follow your example and strive to carry out your instructions and suggestions for improvement.

2. The desire to help your student solve a problem is an important part in student-instructor relations. An obvious willingness to help students with problems will do more than anything else to hold respect, loyalty, and co-operation. This willingness is demonstrated, and often the students' problems are solved by counselling. It is a continual process and informal counselling takes place any time an attempt is made to help students with problems concerning training.

3. You want your teaching to result in good pilots who are able to use the initiative, judgement and skill which you have nurtured in them throughout the course. If students are to respect rather than fear or resent your authority, you must be fair, firm and friendly. Do the following and you will be considered to have some of the qualities of a good instructor.

(a) Inspire your students to set goals which will stand them in good stead in aviation. Your exemplary conduct and high ideals will help in this goal.

(b) Be decisive. Weigh all the factors necessary to make decisions and then act with conviction.

(c) Be interested in your students and let them know by being familiar with their backgrounds, problems and achievements.

(d) Respect their rights and when correcting mistakes, do so in a straightforward manner, never using sarcasm as a correction method.

(e) Acknowledge your own mistakes. The admission that "You were right and I was wrong" does much to develop morale.

(f) If you do not know the answers to relevant questions, say so, find the answers and tell the students later.

(g) Be enthusiastic. Instructor enthusiasm is reflected in student learning.

(h) Encourage student initiative, self-reliance, ideas and suggestions. By doing so, you teach your students to reason for themselves instead of driving them to rigid conformity. However, stress that there are certain boundaries which they must not overstep.

(i) Be impartial and fair - never show favouritism.

(j) Never bluff - much of your subsequent instruction may be distrusted.

(k) Use humour. Appropriate humour creates goodwill and can be used to teach difficult subject material. But do not become so humorous that the business at hand becomes secondary.

(l) If you doubt a student's progress or motivation, arrange for an independent check. Perhaps some modification to your teaching approach may be needed. In extreme cases a change of instructors may be in order, if your school situation will allow.

(m) Be aware that the use of cockpit intercommunication demands suitable phrasing, speech level, clarity, and discipline.

(n) Teach your students to have mastery over the aircraft; to fly with verve and spirit to the limit of the aircraft's flight envelope; to know what they can and cannot do; but draw a very definite distinction between intelligent confidence and foolhardiness.

(o) Plan all solo lessons. Give your students thorough pre-flight and post-flight briefings, and make sure that they clearly understand the requirements and aims of the exercises. Thorough debriefings allow you to find out about difficulties which you may not hear about otherwise. To your student, failure to debrief may appear to imply a lack of importance to the exercise or a lack of interest on your part.

(p) Be present when your students are being debriefed after check rides or tests. You may find out points that you may have missed while flying with your student, and you will certainly get details in a verbal debriefing that will not be included in a written report.

(q) Maintain a professional image.

FAULT ANALYSIS

1. Fault analysis is necessary at all levels of flight training. The ability to debrief effectively does more to separate the successful instructor from the poor one than does above average flying ability. You must realize that the sole purpose of fault analysis is to improve future student performance. A valid critique contains three essential elements: (1) strengths, (2) weaknesses, and (3) specific suggestions for improving. Without each of these elements, fault analysis is ineffective as it does not accomplish its sole purpose.

2. Strengths are analyzed to give a feeling of satisfaction and to show that you recognize what students can do well. If you are unable to identify strengths, it will be difficult for students to believe that your identification of weaknesses is accurate. Positive reinforcement of a student's strengths will frequently do more for students than any number of remedial suggestions on your part.

3. The necessity of analyzing weaknesses is readily apparent. This leads into the third element - specific suggestions for improvement. Whenever you are critiquing a student consider the following: - if you are unable to suggest a remedy for overcoming the weakness, your student does not have that weakness. Positive suggestions are mandatory for improving future performance; however, you should limit your critique to the identification of a maximum of three weaknesses with suggested remedies. Attempting to correct all the weaknesses that a student may have at one time could result in your student not being able to correct any weaknesses. During actual flight instruction you should attempt to pinpoint a single major weakness before considering the next. Improvement in a student's performance takes time - an expert will not appear overnight. More will be learned if a definite improvement in performance is experienced each time the student takes part in a lesson.

4. The recommended format to follow when conducting fault analysis:

(a) When in the air;
- identify major strengths,
- pinpoint a major weakness,
- suggest a remedy to correct that major weakness.

(b) On the ground;
- identify major strengths,
- identify a maximum of three major weaknesses,
- suggest remedies to correct the major weaknesses.

NOTE: One way to think of a major weakness is: "What item, if corrected now, would result in the correction of the greatest number of other faults?" As student performance improves, the weaknesses that originally were considered minor ones now become the only weaknesses. All weaknesses will be dealt with but in order - the most important ones first.

CHARACTERISTICS OF EFFECTIVE FAULT ANALYSIS

1. Effective fault analysis always strives for maximum objectivity. You should never allow personal bias to affect the grading or analysis of any particular flight. Objectivity should be considered in both student personality and flying techniques. At times personality conflicts occur but as a professional instructor you will hold these to a minimum. In the area of flight technique, you may become dogmatic and accept only one way to accomplish a manoeuvre. Always keep in mind that there are many techniques that accomplish the same manoeuvre correctly.

2. You must be consistent in your analysis. Always attach the same importance to an error, provided the circumstances remain the same. Without a consistent set of rules, you will be considered arbitrary or accused of playing favourites.

3. Honesty is the best policy for critiquing. The situation where you may attempt to motivate a weak student by giving better grades than deserved jeopardizes the effectiveness of your instruction. Students must know exactly where they stand and be given specific suggestions for their improvement. This is the sole purpose of fault analysis and emphasis must be placed on this function.

GROUND SCHOOL TRAINING

Ground School Definition

1. Classroom type instruction, generally to more than one person, covering items to be taught in the curriculum. This prepares the student for the written examination, although instruction may also be extended to cover the air exercises.

2. This is a list of subjects from the appropriate Study and Reference Guide that the student should have learned or be familiar with before the Preparatory Ground Instruction is given. These points should not form part of the Preparatory Ground Instruction or Pre-flight Briefing.

PREPARATORY GROUND INSTRUCTION

Preparatory Ground Instruction Definition

1. Classroom type instruction, normally on a one-to-one basis, but not excluding group instruction, covering the steps necessary to fly an air exercise. While basic theory of flight, where applicable, would previously have been covered in ground school, some theory may be necessary to explain a point related to the conduct of the air exercise. Essentially Preparatory Ground Instruction should cover the "how to do an air exercise".

2. This is a presentation given by the instructor when introducing a new exercise. Ideally it should be given within 24 hours prior to the related training flight.

PRE-FLIGHT BRIEFING

Pre-flight Briefing Definition

1. Discussion on a one-to-one basis just prior to the conduct of an air exercise to ensure that the student understands exactly what will take place. This is essentially a practical briefing on the Air Instruction in Part II of this guide, avoiding theory but including the important aspects:

(a) what are we going to do;

(b) how are we going to do it; and,

(c) safety Considerations.

2. This is separate from the ground presentations. It should precede all flights, whether or not there is a new exercise to be covered. It is also particularly important when sending a student solo. Points that should be covered include:

(a) meteorological and aerodrome conditions, and NOTAM;

(b) the aeroplane to be used, its fuel state and other relevant information;

(c) where the exercises will be conducted;

(d) take-off time, duration of flight and time when the helicopter is due to land back at base;

(e) the sequence of exercises to be covered during the flight; and,

(f) a review of relevant airmanship points.

IN-FLIGHT INSTRUCTION

1. The in-flight exercise is the culmination of all ground training and preparation. To achieve maximum effectiveness, it must be flown immediately after the pre-flight briefing, and to avoid confusion it should be flown as briefed. The following is a guide to the conduct of a training flight. Variations may be necessary to suit individual student requirements.

CONTROL OF AIRCRAFT

2. There should never be any doubt as to who has control of the aircraft. The procedure for giving and taking control is:

(a) when you as pilot-in-command wish to give control to your student, say clearly "You have control". Teach your student to take control only when ready and then to say "I have control". You do not relinquish control until you hear this phrase;

(b) when you want to take control, say "I have control" and then take control, ensuring that your student says "You have control" when relinquishing control;

(c) as pilot-in-command, you have the final authority. Your request to give or take control should not be questioned but acted on as quickly as possible by your students; and

(d) when the student has control, you must not "ride" the controls. Your student may feel that you are taking control and this could lead to a dangerous situation. Additionally, you may rob your student of the feeling of accomplishing the manoeuvre independently. This is particularly difficult during critical manoeuvres, such as full-on autorotations, when there is little time available to the instructor to correct errors. This procedure must be adhered to at all times.

IN-FLIGHT TEACHING

3. For most new exercises you should first review the main points of the manoeuvre and then give a perfect demonstration. The review must be short. Include such items as airspeeds, power settings, altitudes, etc. Usually you can obtain this information from your student. Your demonstration should be a complete manoeuvre and should set the standard you want your student to ultimately achieve.

4. In the case of a complex manoeuvre, after the perfect demonstration, demonstrate a small portion of the manoeuvre giving a brief explanation either before, during or after the demonstration. Have your student attempt this small portion. Watch closely for any major error. If you observe a major error, take control immediately and explain to your student what was done incorrectly, then demonstrate as soon as possible what to do to correct the error. Allow practice of that small portion before proceeding to the next portion. Continue the process of demonstration, explanation and practice with close supervision of each step or portion, until your student has completed the entire manoeuvre. Then, allow continued practice, slowly withdrawing your guidance and assistance.

5. As your student gains proficiency, you may look for minor errors and correct them in the same manner. Remember though, learning to fly well takes time and you should concentrate on the major points first. Many of the minor errors will be corrected as your student corrects the major faults. Also, remember to praise for good performance.

6. If practical, conclude the air exercise with a perfect demonstration of the manoeuvre to be learned on the next lesson. This will help your student fully understand the home study about the next exercise and also provide a positive mental picture about what will be taking place during the next flight. Of course, you would not give a demonstration of new material if the next lesson was to be a review or a repeat of a lesson.

FAULT ANALYSIS

7. When discussing a student's faults, always take control so that your student may devote full attention to the instruction. In some cases you may ask the student to analyze the errors in a particular sequence, usually this will happen during latter stages of training. Do not be overly critical of minor faults during early stages. Correct major faults first and then, as improvement is noted, correct the minor errors. If a student indicates problems on a solo flight, it may be possible to analyze the problems from the student's description of actions and the aircraft's response. The correct technique can then be reviewed and practised on the next flight. Sometimes, however, students may not be able to identify or describe a problem clearly enough for a good ground analysis to be made. You should then fly the exercise on the next dual flight where you can analyze the performance and correct any faults.

PLANNING OF FLIGHT INSTRUCTION

8. To make efficient use of the time available, you should plan the flight to avoid delays between exercises. Fuel limitations, area restrictions and weather conditions should all be considered. Your flight should be planned so that one exercise is logically and directly followed by another with a minimum of time spent losing or gaining altitude or in transit from one area to another.

9. Time spent going to and from the practice area can be utilized to full advantage. Suggested items among other things, that might be included are:

(a) airspeed changes;

(b) ground speed checks;

(c) low level navigation;

(d) VOR or ADF introduction;

(e) discussions of traffic pattern joining procedures should wind change;

(f) emergency procedures;

(g) D.F. Steers;

(h) map reading;

(i) estimated times of arrival;

(j) application of rule of thumb procedures; and

(k) diversions (navigation).

POST-FLIGHT BRIEFING (DEBRIEFING)

Post-flight Briefing (Debriefing) Definition

1. Review with the student each exercise undertaken during the flight. In the case of a dual flight, the debriefing should include strengths and weaknesses and suggestions to improve performance. An outline of the next training session should be given along with study assignments.

2. This should follow all flights, dual and solo. Points should include:

   (a) the student's own assessment of the flight and performance;

   (b) your assessment of the student's performance. This should include both the strong and weak points, and advice on how to correct any errors;

   (c) answering any questions the student may have;

   (d) assigning study subjects where appropriate;

FLIGHT SAFETY

1. Flight safety is an important aspect of flight training. Both aircrew and groundcrew must be aware of the need for correct safety practices. You are in a position to reduce incorrect, unsafe and illegal practices. To be successful, a flight safety program requires the correct attitude, proper supervision, rigid enforcement, and proper training. Your student learns by example - you must set this example.

2. An experienced instructor is an effective supporter of the principles of good airmanship and flight discipline. As you gain experience, learn to recognize unsafe practices and do something to correct the situation. Practice flight safety by:

   (a) being alert to unsafe practices and taking the appropriate action;

   (b) following-up when you see an unsafe practice by informing the people involved that they have been seen; and

   (c) promoting the principles of effective flight safety to students and other aircrew and groundcrew.

3. Flight safety consciousness by all personnel must become the fashion. Unsafe procedures must be watched for, identified, and their elimination effected by firm and consistent action. Throughout your instruction, stress the importance of being fuel conscious, the need for proper lookout and the danger of loose articles in the aircraft.

A CHECK LIST FOR GOOD INSTRUCTION

Each instructor should:

1. Tell the students specifically what is required of them during the lesson and at the end of the lesson (the "what" of the introduction).

2. Identify the main teaching points for the student by:

   (a) using visual support (i.e. chalkboard, orientation board, or other visual aids); and

   (b) verbally referring to the visual aids.

3. Tell the student the purpose of the lesson and stress the advantages of the new knowledge or skill (the "why" of the introduction).

4. Tell students where the lesson fits into the overall picture.

5. Relate the lesson to past and/or future experiences of the student (the "where" of the introduction).

6. Confirm that students are at the required level before having them learn new material.

7. Present the new material in stages (a stage should normally be 8-12 minutes duration).

8. Introduce each stage of the lesson and provide a link or bridge between stages.

9. Obtain student feedback throughout the lesson by:

   (a) asking questions;

   (b) observing student performance of a skill;

   (c) looking at students (watching for facial expressions); and

   (d) student questions.

10. Respond to feedback by:

    (a) answering questions;

    (b) stopping students doing a step of a skill incorrectly;

    (c) reviewing material or steps;

    (d) asking questions;

    (e) correcting the student if an error has been made;

(f) explaining why the student's performance is incorrect;

(g) using verbal support;

(h) re-teaching (if necessary); and

(i) praising students for good work.

11. Appear enthusiastic about the subject being taught.

12. Use speech variation in rate, volume and pitch.

13. Have students answer questions related to the objective(s) for the lesson during the presentation of new material.

14. Use correct questioning techniques.

15. Use a variety of training aids to appeal to as many senses as possible whenever these aids contribute to achieving of the objective(s) of the lesson.

16. Provide sufficient meaningful practice of the main points of the lesson so that students confidently achieve the objective.

17. Allot time relative to the importance of the teaching point.

18. Identify and correct errors or mistakes made by the students at the time they occur or as soon thereafter as practicable.

19. Use clearly worded explanations.

20. Deliver the lesson in a logical sequence.

21. Have students carry out speed and/or ability competitions during latter stages of practice, if suited to the objective(s).

22. Conduct periodic reviews of critical areas of the lesson.

23. Summarize the main points of each stage.

24. Confirm student learning at the end of each stage.

25. Test students on the main points of the entire lesson towards the end of the lesson.

26. Provide a final summary that links all stages to the objective(s) of the lesson.

27. Re-motivate students by telling how the new knowledge or skill will benefit them.

PART II

THE GROUND AND AIR INSTRUCTION SYLLABUS

SECTION 2

This section is presented as a series of Exercises. These are specific skills that either singly or in a group form a convenient unit for the student to learn.

In most cases, when presenting a new exercise to a student, you should be able to follow the sequence shown. There will be occasions however, when the type of helicopter, the weather or some other local factor, will dictate that you vary the sequence of training. The student's rate of learning may, in some cases, allow you to combine two or more exercises into one air lesson.

Autorotation, being an extensive and involved subject, has been presented as three seperate exercises. This is because the sequence is vital to your student's progress and safety, as is its place in the training syllabus. Navigation and Confined Areas on the other hand, have been presented here under single exercise headings despite the fact that they will also entail more than one lesson.

There are certain exercises which have to be taught to a student before first solo, these are listed in the Pilot Training Record. It is recommended that Exercises 18 and 19 should be included, and that Exercises 23 and 24 deserve consideration depending on the area. The student should have done these four exercises, and Exercise 25 in certain geographic locations, before attempting the first solo cross country.

The aerodynamic stresses to which an airframe is exposed during Vortex Ring State are virtually unknown. Exercise 26 which deals with this condition of flight has been retained, but the emphasis should be placed on the early recognition and avoidance rather than practising a fully developed Vortex Ring State. Controlling the rate of descent should be stressed in situations where Vortex Ring is likely to develop.

Some types of helicopter are susceptible to lack of tail rotor effectiveness, it is recognised that simulating this effect in a training aircraft is almost impossible. Therefore, again, the emphasis is to be placed primarily on the recognition and avoidance, and then the recovery procedure. Classroom discussion is the normal technique used for this subject because of the difficulty in simulation.

Each exercise is presented in the following manner.

1. GROUND SCHOOL

   This is a list of subjects that the student should have learnt or be familiar with before the Preparatory Instruction is given. These points should not form part of the Prep. Instruction or the Pre-flight Briefing.

2. PREPARATORY INSTRUCTION

This is the presentation given by the flight instructor when introducing a new exercise. Ideally you should give it within 24 hours prior to the related training flight.

Preparatory Instruction is presented as follows:

Aim

State the aim in terms of not so much what you the instructor are about to teach, but what your student is about to learn.

Review

Review previously learned facts, this will generally help the student to understand and assimilate the new skills and knowledge he is about to aquire. This is a good time to discuss any related problems he may have.

Motivation

Give the student a good reason why he should learn this skill. Use specific terms to suit the individual student and training situation.

Airmanship

Airmanship points will vary with the type of training helicopter and local conditions. Always stress the safety aspects of any training.

Teaching Points

These are self-explanatory. They are sometimes listed in broad terms, so as to cover all training aircraft and conditions. Occasionally you will need to amend them to your specific needs.

Confirmation

This is a reminder to you to ask the student appropriate questions to confirm that learning has taken place, and that the air lesson is likely to be effective. Give students ample opportunity to ask you questions so as to remove any doubts or problems they might have.

3. PRE-FLIGHT BRIEFING

This is a seperate part of the ground presentation. It should precede all flights, whether there is a new exercise to be covered or not. It is also particularly important when sending a student solo.

Points to be covered include:

(a) local weather and meteorological conditions,

(b) the helicopter to be used, its fuel state and any other relevant information,

(c) where the exercises will be conducted,

(d) take-off time, duration of flight and estimated landing time back at base,

(e) the sequence of exercises to be covered during this flight, and

(f) a review of relevant airmanship points.

4. AIR LESSON

This is the recommended sequence of introducing an exercise to a student. The sequence of further demonstration, practice and fault analysis, will vary from one student to another.

5. POST-FLIGHT DE-BRIEFING

This follows all flights, dual and solo.
Points should include:

(a) the student's assessment of the flight and performance,

(b) your assessment of the student's performance, this includes both strong and weak points, and advice on how to correct any repeated errors,

(c) answering any student questions, and

(d) assigning study subjects where appropriate.

6. TIPS FOR INSTRUCTORS

These are aimed to assist you in your role as an instructor. The points mentioned should not be included in your ground or air presentations.

HELICOPTER FAMILIARIZATION

GROUND SCHOOL POINTS

(1) Familiarize the student with the layout of the school, including briefing rooms, crew rooms etc., and introduce him to members of the staff who are associated with the flight training.

(2) Explain the course syllabus and how it will be applied, including details of how, when and where ground school, preparatory instruction, pre-flight briefings and post flight debriefings are carried out; how dual and solo flights are authorized, how progress is monitored, and any other information necessary to the student in his day-to-day attendance at the school.

PREPARATORY INSTRUCTION

Aim

To introduce the student to:

(1) the helicopter;
(2) ramp and air traffic control procedures;
(3) training procedures;
(4) the local flying area including prominent landmarks; and
(5) all basic manoeuvres.

Airmanship

Explain:

(1) how to enter and leave the helicopter with rotors turning;

(2) that seat belts or harnesses should be done-up at all times during flight;

(3) the necessity for the positive hand-over and take-over of the controls. The person flying the helicopter should ensure that the other is on the controls before saying "You have control". The person assuming control should say "I have control" and fly the helicopter;

(4) the need for a constant and thorough lookout for other aircraft. Describe the clock method of reporting aircraft to the other crew member; and

(5) flight clothing commensurate with the weather and area.

PRE-FLIGHT BRIEFING

AIR LESSON

(1) Identify the main components of the helicopter. This can be done during the instructor's external check but care should be taken not to confuse the student with too many details.

(2) Seat the student in the pilot's position in the helicopter and explain the general function of the controls and instruments. Demonstrate adjustment of the controls for comfort and safety, as applicable to type.

(3) Carry out a short familiarization flight, pointing out prominent landmarks and giving the student an opportunity to handle the controls in cruising flight. Student performance should not be criticized or corrected at this stage.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Avoid confusing the student by presenting too much detailed information at this initial stage.

(2) Avoid over-emphasizing the difficulties of learning to fly a helicopter.

(3) Relate this exercise to the student's flying background and level of experience.

(4) Many people are somewhat nervous when first experiencing the sensation of flying. Avoid sudden or violent manoeuvres that will aggravate this situation.

(5) This exercise provides the instructor an opportunity to evaluate the student's attitude and temperament.

(6) If your student enjoys this first trip it will probably be a positive foundation for the rest of the course.

(7) Explain that procedures which seem complicated at this time will become easier with more exposure and use.

(8) Positive hand-over/take-over of the controls is always vital to safety. This is particularly so in the early stages of training, when either the student or the instructor is "following through", and both persons are on the controls for a long period of time.

PREPARATION FOR FLIGHT

PREPARATORY INSTRUCTION

Aim

To introduce the student to the preparation necessary before commencing a flight.

Motivation

Stress the fundamental part that proper preparation for flight plays in flight safety. Explain that a high percentage of aircraft accidents and incidents are due to poor preparation and inadequate planning.

Teaching Points

(1) Explain that the sequent of events leading up to the take-off and departure can be conveniently considered in 3 phases:

- (a) Flight planning.
- (b) Checking of aircraft documents.
- (c) Inspection of the aircraft and completion of checks and procedures.

(2) Point out that during the initial stages of training, the flight planning phase will be covered by the instructor during Pre-Flight Briefings. As the course progresses, the student will be required to take an increasing part in all the aspects of preparation for flight.

(3) Explain that it is the pilot-in-command's responsibility to ensure that an aircraft is safe and fit in all respects for the intended flight.

(4) Explain the need to wear or have on board the aircraft, proper survival equipment, clothing and footwear for existing or anticipated weather conditions in case of an unscheduled landing away from base.

(5) Explain the procedures for the student to follow, should he discover a snag or unserviecability in the training aircraft, during the inspection or pre-take-off phase. Stress that he should not fly the aircraft if he has any doubts about it's airworthiness.

(6) Documents - show the student all the documents required by Air Regulations to be on board the aircraft in flight. Explain the significance of each and its bearing on airworthiness.

(7) Inspections and Checks

- (a) While walking to the helicopter, point out that the student should always note:
  - (i) W/V; and
  - (ii) the presence of any aircraft or obstacle that might affect starting the rotors or the departure procedure.
- (b) Demonstrate the external inspection and the checks and procedures to be carried out prior to take-off, as appropriate to type.

(8) Demonstrate shut-down checks and procedures appropriate to type.

EXERCISE 2

TIPS FOR INSTRUCTORS

(1) Relate this exercise to the student's background. For example, paragraphs 1 - 4 of the Presentation are primarily for the benefit of ab-initio students rather than those with previous flying experience.

(2) Although treated here as a separate exercise, it may be more convenient to combine the introduction to Preparation for Flight with Exercise 3. (See Lesson Plan No. 2).

(3) Student practice of the external inspection, and pre-take-off procedures, should be carefully monitored until reliable proficiency is attained, and checked at regular intervals thereafter.

EXERCISE 3

EFFECT OF CONTROLS

GROUND SCHOOL POINTS

(1) Theory of flight:

(a) Definitions.
(b) Helicopter Controls.

(2) Function of flight and engine instruments.

(3) Function of ancillary controls.

PREPARATORY INSTRUCTION

Aim

For the student to learn:

(1) Effects of flight controls in cruising flight

(2) The use of ancillary controls.

Review

Exercise 2 - Preparation for Flight.

Motivation

This exercise is a basis for all helicopter flight operations.

Airmanship

(1) Lookout

(2) Transfer of control.

Teaching Points

(1) CYCLIC PITCH CONTROL

(a) Explain that moving the cyclic causes the rotor disc to tilt. As a result of this, the helicopter will either pitch or roll, or a combination of the two, depending on the direction in which the cyclic is moved.

(b) Describe the visual and instrument indications resulting from various cyclic control movements.

(2) COLLECTIVE PITCH CONTROL

(a) Moving the collective causes an equal change of pitch to all main rotor blades. The primary effect of moving the collective alone, in cruising flight, is a change in height.

(b) Explain that there are secondary effects comprising changes of attitude, heading and RPM. For this reason, the collective is seldom moved without co-ordinating movements of the cyclic, pedals and throttle. This aspect will be covered in the following exercise.

(3) THROTTLE

(a) Explain how to open and close the throttle.

(b) Explain the function of the throttle as appropriate to type.

(4) TAIL ROTOR PEDALS

Explain that movement of the pedals causes a change in pitch of the tail rotor blades. The result of this is a yaw. Stress that at the cruise, this yaw is a large skidding motion. The pedals should not be used to change the helicopter's direction of flight.

(5) ANCILLARY CONTROLS

Describe the use of the ancillary controls e.g. carburettor heat, mixture, trim, rotor brake, anti-ice, windscreen, de-fogging, heater, etc., as appropriate to type.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Before take-off:

(a) make sure the student is seated comfortably and ensure all checks are completed using a check list;

(b) demonstrate the correct use of frictions, trims and control adjustments as appropriate to type;

(c) demonstrate the effect of cyclic control movements on the rotor disc, including how the horizon is used as a reference to interpret the aircraft's attitude; and

(d) demonstrate opening and closing the throttle.

Cyclic Control

(2) Establish a straight and level cruise at a safe altitude.

(a) Demonstrate pitching movement in the normal range. Point out the sensitivity or lag as appropriate to type.

(b) Student practice.

(c) When student demonstrates a reasonable competency, point out flight instrument indications.

(3) Re-establish a straight and level cruise.

(a) Demonstrate rolling movement (gentle and medium turns).

(b) Student practice.

(c) Point out flight instrument indications.

(4) Re-establish a straight and level cruise.

(a) Demonstrate a combination of pitching and rolling movements.

(b) Student practice.

(c) Point out flight instrument indications.

Collective Control

(5) Re-establish a straight and level cruise.

(a) Demonstrate the effects of raising and lowering the collective, pointing out the visual and flight instrument indications.

(b) Student practice.

Throttle

(6) Where appropriate to type, re-establish a straight and level cruise.

(a) Demonstrate the effects of opening and closing the throttle, pointing out the visual and flight instrument indications.

(b) Student practice.

Tail Rotor Pedals

(7) Re-establish a straight and level cruise.

(a) Demonstrate the effects of right and left pedal movement, pointing out the visual and flight instrument indications.

(b) Student practice.

Ancillary Controls

(8) As appropriate to type:

(a) Demonstrate use of ancillary controls.

(b) Student practice.

All Controls

(9) Have the student practice simple flight manoeuvres by application of the basic principles of this exercise. Stress the need for smooth operation. Rather than demand accuracy at this stage, monitor the controls to avoid excessive control movements by following-through as necessary.

(10) Briefly introduce hovering and let the student attempt to hover.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) As this is to be the student's first flight training exercise, spare no pains to explain everything carefully. Emphasis is necessary since all future flight training exercises are based around the basic principals of this exercise.

(2) This exercise should be tailored to the student's flying experience.

(3) Students will often get very tense in the early air lessons. The instructor should make every effort to ensure that the student is comfortable and relaxed as much as possible.

(4) Ensure the helicopter is stabilized before handing over control to the student.

(5) Emphasize the use of verbal confirmation before commencing a turn.

(6) Any transit time to a practise area should be used for demonstration and practise. This applies to ALL exercises.

(7) The use of a model helicopter will make the preparatory instruction much more effective.

AIR SPEED AND POWER CHANGES
STRAIGHT AND LEVEL FLIGHT

GROUND SCHOOL POINTS

Flight Manual - engine, transmission and airspeed limitations.

PREPARATORY INSTRUCTION

Aim

For the student to learn:

(1) The relationship of rotor disc and fuselage attitudes to indicated airspeed.

(2) The correct methods of selecting or changing engine power, e.g. manifold pressure and rotor r.p.m.

(3) How to fly straight and level in balanced flight at selected airspeeds or power settings.

Review

Exercise 3 - Effects of Controls.

Motivation

Airspeed and power changes form the basis of all helicopter flying and they must be performed smoothly and accurately.

Airmanship

(1) Lookout.

(2) Engine and transmission limitations.

Teaching Points

(1) Airspeed Changes

(a) Explain how a reduction in speed from the cruise to a specific airspeed is effected (e.g. from 70 kt to 50 kt):

(i) cyclic aft to raise the nose of the aircraft
(ii) pause whilst airspeed stabilizes
(iii) adjust airspeed as necessary.

(b) Explain the method of accelerating to a specific airspeed:

(i) cyclic forward to lower the nose of the aircraft
(ii) pause while airspeed stabilizes
(iii) adjust airspeed as necessary.

(c) Point out that cyclic movements should be small and made smoothly. Large or hurried movements should be avoided.

(2) Power Changes

(a) Describe the relationship between collective and throttle movement as appropriate to type.

(b) Describe the effect that power changes have on balanced flight due to torque changes.

(c) Where appropriate, describe the methods of:

(i) changing manifold pressure at constant rotor RPM, and
(ii) changing rotor RPM at constant manifold pressure.

(3) Straight and Level Flight

(a) Explain that straight and level flight means flight at a constant altitude and heading.

(b) Describe the power and airspeed settings used for straight and level cruising flight as appropriate to type.

(c) Describe how to maintain airspeed at a constant altitude and heading using visual and instrument cues such as the relationship between the disc and the horizon, airspeed indicator, altimeter, etc.

(d) Explain that when flying at a specific airspeed, altitude corrections are controlled with the collective, and when flying at a specific power setting, corrections are made with cyclic.

(e) Describe how to reduce airspeed in straight and level flight:

(i) Select a slightly higher nose attitude (cyclic aft)
(ii) Reduce power to prevent climbing (collective/throttle)
(iii) Prevent yaw (pedals)
(iv) Pause, to allow airspeed to stabilize.
(v) Adjust power and airspeed as required.

(f) Describe how to increase airspeed in straight and level flight:

(i) Select a slightly lower nose attitude (cyclic forward)
(ii) Increase power to prevent sink (collective/throttle)
(iii) Prevent yaw (pedals)
(iv) Pause, to allow airspeed to stabilize
(v) Adjust power and airspeed as required.

EXERCISE 4

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Review previous air lesson

(2) Demonstrate airspeed changes

(3) Student practice

(4) Demonstrate power changes

(5) Student practice

(6) Demonstrate straight and level flight at cruise power

(7) Student practice

(8) Demonstrate changes of airspeed in straight and level flight

(9) Student practice

(10) Briefly let the student attempt to hover at the conclusion of each exercise until completion of Exercise 8.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) See 1 in previous exercise.

(2) Students will often tend to pay much attention to the flight instruments in this exercise. Care must be taken to ensure that a proper scan between the instruments and external references is established and that a good lookout is maintained.

(3) Changes of airspeed during the early stages of this air lesson will result in changes of altitude. It is important therefore, to conduct this lesson at 1,000 feet AGL or more, and in good weather conditions, to avoid the nearness of obstacles distracting the student.

(4) Changing airspeed at constant altitude and heading is a useful co-ordination exercise that can be reviewed at various stages through the training course.

EXERCISE 5

CLIMBS AND DESCENTS

GROUND SCHOOL POINTS

Flight Manual - Power limitations and performance data as appropriate to type.

PREPARATORY INSTRUCTION

Aim

For the student to learn how to climb and descend at recommended airspeed and power settings.

Review

Exercise 4 - Airspeed and Power Changes

Motivation

Accurate control of the helicopter is vital in later air lessons.

Airmanship

(1) Lookout

(2) Aircraft limitations

Teaching Points

(1) State the power settings and airspeed to be used in this exercise, as appropriate to type.

(2) Describe how to proceed from straight and level cruise to the climb:

- (a) Lookout
- (b) Select **ATTITUDE** for climb speed **ATTITUDE**
- (c) Increase **POWER** to required setting **POWER**
- (d) Prevent yaw **TRIM**
- (e) **ADJUST** if necessary

(3) Describe how to level out from the climb to the cruise:

- (a) Anticipate required altitude
- (b) Select **ATTITUDE** for straight and level cruise
- (c) Allow airspeed to increase **ATTITUDE**
- (d) Reduce **POWER** to cruise setting **POWER**
- (e) Prevent yaw **TRIM**
- (f) **ADJUST** as necessary

(4) Describe how to proceed from straight and level cruise to the descent:

- (a) Lookout

(b) Reduce **POWER** to required setting **POWER**
(c) Prevent yaw
(d) Select **ATTITUDE** for descent speed **ATTITUDE**
(e) **ADJUST** if necessary **TRIM**

(5) Describe how to level out from a descent to the cruise:

(a) Anticipate required altitude
(b) Increase **POWER** to cruise setting **POWER**
(c) Prevent yaw
(d) Select **ATTITUDE** for cruise speed **ATTITUDE**
(e) **ADJUST** as necessary **TRIM**

(6) Describe how to proceed direct from a descent to the climb:

(a) Lookout
(b) Increase power to climb setting
(c) Prevent yaw
(d) Maintain airspeed or select climb speed as required.

Confirmation

PREFLIGHT BRIEFING

AIR LESSON

(1) Review straight and level cruising flight
(2) Demonstrate establishing a climb at a selected power and airspeed, and levelling out to cruise flight
(3) Student practice
(4) Demonstrate establishing a descent at a selected power and airspeed, and levelling out to cruise flight
(5) Student practice
(6) Demonstrate climbing to a pre-selected altitude
(7) Student practice
(8) Demonstrate descending to a pre-selected altitude
(9) Student practice
(10) Demonstrate proceeding direct from a descent to the climb
(11) Student practice
(12) Turns can be introduced if the student grasps this exercise easily.

POST FLIGHT DEBRIEFING

EXERCISE 6

TURNS

PREPARATORY INSTRUCTION

Aim

For the student to learn how to carry out:

(1) medium level turns; and
(2) medium climbing and descending turns

Review

Climbs and Descents

Motivation

The ability to carry out accurate balanced turns at selected airspeeds and angles of bank, is vital to safety.

Airmanship

Lookout

Teaching Points

(1) Define angles of bank as applying to light helicopters. Describe instrument indications and explain the problems of judging angles without appropriate flight instruments.

(a) Gentle - up to 15°.
(b) Medium - 15° to 30°.
(c) Steep - over 30°.

(2) Level Turns.

(a) Describe how to enter a level turn:

(i) lookout; and
(ii) select the angle of bank by use of lateral cyclic.

(b) Describe the visual and instrument indications that the aircraft is in balanced level flight at a constant angle of bank.

(c) Describe how to maintain:

(i) angle of bank with lateral cyclic;
(ii) airspeed with fore and aft cyclic;
(iii) altitude with collective; and
(iv) balanced flight with pedals.

(d) Describe how to roll-out onto a selected heading:

(i) anticipate heading; and
(ii) apply lateral cyclic to level the aircraft.

(3) Climbing and Descending Turns.

(a) Describe how to initiate, maintain, and roll-out from, climbing and descending turns. Point out the similarity in technique to level turns.

(b) Stress how the rate of climb decreases as bank is applied in a climbing turn, and the rate of descent increases in a descending turn.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate gentle and medium level turns in both directions.

(2) Student Practice

(3) Demonstrate medium turns, rolling out onto a selected heading

(4) Student practice

(5) Demonstrate climbing turns, rolling out onto a selected heading and levelling out at a selected altitude

(6) Student practice

(7) Demonstrate descending turns rolling out onto a selected heading and levelling out at a selected altitude

(8) Student practice

(9) Introduce Autorotation 1.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) It is important that turns be practised in both directions to show the different visual references in the helicopter.
(2) Because of increased stress on accuracy, the student should be taught how to monitor instruments without sacrificing look-out.
(3) Steep turns are covered separately in Exercise 17.
(4) Turns in autorotation are covered separately in Exercise 7.

AUTOROTATION 1

GROUND SCHOOL POINTS

(1) Theory of autorotation
(2) Distribution of the autorotative force
(3) Autorotative performance
(4) Rate of descent in autorotation

PREPARATORY INSTRUCTION

Aim

For the student to learn how to:

(1) enter autorotation;
(2) descend at the indicated airspeed for minimum rate of descent; and
(3) overshoot to the climb.

Review

Climbs, descents and turns.

Motivation

This is an introduction to autorotation, which is a basic and essential emergency procedure.

Airmanship

(1) Pre-entry checks, to include:

(a) pre-landing check;
(b) lookout, particularly below;
(c) select suitable precautionary landing area; and
(d) verbal warning.

(2) Post-entry checks as appropriate to type.

(3) Aircraft performance limitations, specifically rotor RPM.

Teaching Points

(1) Explain that the helicopter is fully manoeuvrable in autorotation.

(2) State the manufacturer's Indicated Airspeed and rotor RPM for minimum rate of descent in autorotation.

(3) Describe the entry as follows:

(a) at a safe altitude, straight and level cruise, into wind, over a suitable area, complete airmanship checks;
(b) lower collective;
(c) use throttle to prevent overspeed, as appropriate to type;
(d) when collective is fully down, split needles and select recommended engine RPM; and
(e) prevent yaw.

(4) Explain that:

(a) heading and airspeed are controlled with cyclic, as in powered flight; and
(b) rotor RPM is controlled by collective.

(5) Point out that turns in autorotation increase the rate of descent and rotor RPM.

(6) Point out that it is advantageous to roll out as soon as possible in order to reduce the rate of descent, and to simplify the flare prior to landing.

(7) Describe the overshoot as follows:

(a) at a safe altitude, rejoin the needles, using the throttle as appropriate to type;
(b) apply climb power;
(c) select or maintain climb airspeed; and
(d) prevent yaw.

(8) Explain that whereas reaction has to be quick in the event of an actual engine failure, the accent during this introduction will be on smoothness and accuracy.

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate a straight-ahead autorotation with overshoot to the climb.

(2) Student practice.

(3) Demonstrate 90, 180 and 360° autorotations with overshoot to the climb. Point out increased rotor RPM and rate of descent.

(4) Student practice.

(5) Demonstrate an autorotational landing.

POST FLIGHT DEBRIEFING

EXERCISE 7

TIPS FOR INSTRUCTORS

(1) Ground presentations and air demonstrations should make the point that autorotations need not be a stressful or frightening manoeuvre.

(2) A low cloud base will cause demonstrations to be rushed. Fly this exercise in conditions that will allow sufficient altitude to make the demonstrations effective.

(3) Encourage students that throughout the course they will practise autorotations until they are totally proficient and their actions become second nature.

(4) It should be noted that this exercise is to familiarize students with autorotation, not to unnerve them. Keep demonstrations and attitudes gentle until confidence is acquired.

(5) Most schools have approved areas for all autorotational exercises and only practise them dual. Be sure that your students are aware of the school policy.

(6) It is a good practice to introduce this exercise at altitude, (at least 2000 feet AGL), to demonstrate the characteristics and the recovery from autorotation, before positioning the student close to the ground. This generally helps to build students' confidence as the ground is not "rushing up" at them in the middle of the power recovery.

HOVERING

GROUND SCHOOL POINTS

Ground Effect
Flight Manual performance charts
- Hover In Ground Effect
- Hover Out of Ground Effect

PREPARATORY INSTRUCTION

Aim

For the student to learn how to hover.

Motivation

This is an exercise fundamental to all helicopter operations.

Airmanship

Lookout
Engine limitations

Teaching Points

(1) The hover:

(a) define hovering as maintaining a constant height and heading over a given ground position;
(b) state the hover height as appropriate to type; and
(c) explain that facing into wind results in the helicopter being easier to control and uses less power.

(2) Explain the effects of controls at the hover

(a) Cyclic

Point out the following:

(i) The cyclic controls disc attitude. A change of disc attitude is followed by a change in fuselage attitude. This results in the helicopter moving over the ground. In some types of helicopter there is appreciable lag in this chain of events.

(ii) To regain the hover from movement in any direction, requires two cyclic movements; one to stop the movement, and a second to stabilize the helicopter.

(iii) All cyclic movements should be small. Cyclic trim should be employed, if fitted.

(b) Collective

Point out the following:

(i) The collective controls height above ground.

(ii) Changes of collective pitch will produce yaw and RPM changes unless prevented.

(c) Throttle

Where appropriate to type, describe the use of the throttle to maintain RPM.

(d) Pedals

Describe the effects of pedal control movements on heading and RPM.

(3) Describe the visual cues used to maintain the hover and stress the importance of looking well ahead of the helicopter.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate the use of the cyclic at the hover into wind.

(2) Student practice with cyclic only, until a hover can be maintained without excessive effort.

(3) Demonstrate the use of the collective and pedals.

(4) Student practice.

(5) Student practice using all controls.

(6) Demonstrate the differences in power required to hover in and out of wind, ground effect, and over different types of surface (e.g. tarmac, long grass etc.).

POST FLIGHT DEBRIEFING

EXERCISE 8

TIPS FOR INSTRUCTORS

(1) This exercise demands a high degree of co-ordination and should not be taught until the student has acquired a reasonable state of competence in exercises 1-7. Introducing it earlier than this could lead to frustration and undue fatigue for both student and instructor.

(2) An alternative technique is using slow flight to introduce hovering. This procedure takes the form of low slow flight into wind across a suitable clear area. Speed and height are progressively reduced in successive passes until the helicopter is creeping forward at a walking pace in ground effect, and then momentarily halted before transitioning into forward flight again. These momentary pauses are in fact periods of hovering, however brief, and are gradually extended as competency improves, until prolonged periods of hovering are achieved. This procedure is outlined in Exercise 12.

(3) Whichever technique for teaching the hover is used, the student will generally tend to tire quickly. Air exercises should be kept short and terminated as soon as the first signs of fatigue appear.

(4) Initially the student may not be able to use more than one control at a time, and it may even be necessary to limit the travel of that control.

(5) Allow frequent rest periods to enable the student to relax, and try to practise other exercises or perform other demonstrations to give the student a break from hovering.

(6) Keep a close watch on the temperatures, pressures and wind velocity during prolonged hovering.

EXERCISE 9

TAKE-OFF AND LANDING

GROUND SCHOOL POINTS

Dynamic Roll over
Ground Resonance
Flight Manual - checks

PREPARATORY INSTRUCTION

Aim

For the student to learn how to take-off to and land from the hover.

Review

Hovering exercises

Motivation

Full and accurate control of the helicopter in the take-off and landing phase is vital to flight safety.

Airmanship

Pre take-off and hover checks.

Teaching Points

Take-off

(1) Describe the procedures for take-off to the hover into wind as appropriate to type and including:

- (a) Pre take-off checks.
- (b) Effects of controls during take-off:
  - (i) cyclic to maintain position over the ground;
  - (ii) collective to gain height; and
  - (iii) pedals to prevent yaw.
- (c) Hover check as appropriate to type but including:
  - (i) centre of gravity check;
  - (ii) power required to hover; and
  - (iii) control response normal.

(2) Point out the dangers of overpitching if appropriate to type, and describe avoidance and recovery action.

(3) Describe the symptoms of incipient dynamic rollover, avoidance and recovery action.

EXERCISE 9

Landing

(4) Describe the procedure for landing from the hover into wind as appropriate to type, and including:

(a) The need to start the manoeuvre from a stable and accurate hover.
(b) The effects of controls during landing from the hover:

(i) cyclic to maintain position. Stress the need to avoid sideways or rearwards drift;
(ii) collective to control rate of descent; and
(iii) pedals to prevent yaw.

(5) Point out the need to anticipate the increase in ground effect during a landing in light or nil wind conditions.

(6) Point out the need to anticipate ground resonance if applicable to type.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate the take-off to the hover

(2) Demonstrate hover check

(3) Student practice

(4) Demonstrate landing from the hover

(5) Student practice

TIPS FOR INSTRUCTORS

(1) Do not teach this exercise unless the student can consistently maintain a steady hover.

(2) Ensure students keep looking at their reference points in front of the helicopter and not down at the skids.

(3) Monitor the collective closely on the initial attempts to land so as to guard against sudden and excessive movements.

(4) It is generally an advantage to strive for smoothness and accuracy before speed during these manoeuvres. Student technique should nonetheless be developed to the point where contact with the ground is made and broken cleanly, particularly in helicopters prone to ground resonance.

(5) When the student is smooth and accurate, introduce lifting from `skids light' condition to a low hover before going to normal hover height to preclude dynamic rollover.

(6) Be aware that, when getting close to the surface, some students try to `feel' the ground by rocking the cyclic laterally.

(7) As with hovering this exercise is very tiring, break it up by practising other exercises when necessary.

EXERCISE 10

HOVERING EXERCISES

GROUND SCHOOL POINTS

Flight Manual - Height Velocity Chart

PREPARATORY INSTRUCTION

Aim

For the student to learn how to:

(1) turn at the hover; and
(2) hover-taxi.

Review

Exercise 8 - Hovering

Motivation

Manoeuvring close to the ground and obstacles is very much part of the operational environment, particularly in confined areas and when clearing a ramp. These are important exercises therefore, that must be mastered completely.

Airmanship

Lookout - obstacles
Aircraft limitations

Teaching Points

(1) Turns at the hover

Describe the techniques for making hovering turns and stress the following points:

(a) The effects of weathercocking.

(b) The problems of yaw control and increased power required when the helicopter is downwind, or crosswind, in strong wind conditions.

(c) The importance of lookout during all hovering manoeuvres and in particular for low obstacles that are hard to see and which can snag the landing gear or tail rotor.

(d) In strong or gusty wind conditions, a turn away from into wind should be in the opposite direction to torque reaction (i.e. to the left in a helicopter with a counter-clock turning rotor). In this way it is possible to ensure that there is sufficient tail rotor control available. If control limits are reached at this stage, a safe return to into-wind is easily accomplished.

(e) No turns or any movements from the hover should be initiated until the helicopter is settled in an accurate hover at the required RPM and power setting.

(f) The continuous use of high power in this exercise means that a careful watch should be kept on engine temperatures and pressures. Prolonged hovering out of wind should be avoided on some types of helicopter because of the dangers from carbon monoxide in the cockpit.

(g) In some aircraft at certain C of G configurations (i.e. high cabin loading) it is possible to reach the aft cyclic limits when hovering downwind. Warn the student of this possibility and describe the safe recovery actions:

(i) turning into wind; or
(ii) landing straight ahead.

(2) Hover Taxi

(a) State the height and ground speed to be used and relate to safety considerations.

(b) Describe the effects of controls.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Hovering Turns

(a) Demonstrate 360° hovering turns in each direction, commencing into wind, and pausing at each 90° point.
(b) Student practice.

(2) Hover Taxi

(a) Demonstrate hover-taxiing into wind.
(b) Student practice.
(c) Demonstrate hover-taxiing out of wind.
(d) Student practice.

POST FLIGHT DEBRIEFING

EXERCISE 10

TIPS FOR INSTRUCTORS

(1) Dual instruction in this exercise should be carried out in a range of wind conditions. This will prevent the situation arising where the dual instruction is given on a calm day and the student meets the problems of strong winds when solo on another.

(2) Pausing at each cardinal point enables the instructor to point out the different cylic positions into the wind, when competent, complete the 360 degree turn without pause.

(3) Whenever possible, when hover taxiing, keep the skids parallel to the aircraft movement in case of engine failure, or having to run the aircraft onto the ground in an aft C of G condition.

(4) Turns around the tail are covered separately in Exercise 16.

(5) Sometimes the student will use cyclic instead of pedal to assist in turning the aircraft, particularly in strong winds.

(6) When proficient at the basics introduce some hover patterns requiring taxiing and pedal turns.

ENGINE FAILURE AT THE HOVER/HOVER TAXI

GROUND SCHOOL POINTS

Flight Manual - Height Velocity Chart

PREPARATORY INSTRUCTION

Aim

For the student to learn how to land safely following an engine failure at the hover or hover taxi.

Review

Exercise 9 - Hovering
10 - Take-off/Landing

Motivation

Engines can fail just as easily at the hover/hover-taxi as in flight. The helicopter will land very quickly should this happen and it is vital that the pilot can react quickly and prevent an incident from becoming an expensive accident.

Airmanship

Selection of suitable area for practice.

Teaching Points

(1) Point out that at normal hover/hover-taxi heights, it will not be possible for the pilot to enter autorotation. In fact, lowering the collective following an engine failure, will result in a heavy landing. This manoeuvre should not be considered an autorotation, the pilot relies on the inertia in the rotor system to land safely.

(2) Describe the reaction of the helicopter when the engine fails:

(a) yaw (to the left in American aircraft);

(b) drift (to the left in American aircraft) and to the rear; and

(c) sink.

(3) Explain that the yaw and drift must be corrected before touch-down. Sink should be controlled by use of the collective as appropriate to type of aircraft and height above ground, to cushion the landing.

(4) Explain that should the failure occur at the hover taxi, the pilot should avoid any rearward movement of the cyclic, and accept a run-on landing.

Confirmation

PRE FLIGHT BRIEFING

EXERCISE 11

AIR LESSON

(1) Engine Failure at the Hover

(a) Demonstrate into wind as follows:

(i) verbal warning;
(ii) close throttle;
(iii) counteract yaw and drift; and
(iv) cushion landing.

(b) Student practice

(2) Engine Failure at the Hover Taxi

(a) Demonstrate into wind.
(b) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) This exercise should be introduced by providing the student with plenty of warning before each practice. The manoeuvre can then be speeded-up to flight test standards where the student is given minimal warning of the practice engine failure.

(2) Closing the throttle and cushioning the landing with the collective takes a good deal of manual dexterity in most helicopters. Since the aim of this exercise is for the student to react to an engine failure, there is little point in his learning throttle control, in other words the instructor should control the throttle.

(3) Tail-rotor failure at the hover/hover-taxi, which does require coordinated use of the throttle and collective by the student should be practiced at a later stage in training.

(4) Always ensure that the surface is suitable for this exercise, particularly after precipitation.

(5) This is a good exercise to demonstrate to the student the landing stage of an autorotation. It is a good skill to practise just before starting a full-on autorotation exercise.

(6) Exercise caution as a student may react to a simulated engine failure by rapidly lowering the collective. Be sure to state a verbal warning before closing the throttle.

(7) The demonstration of this exercise is easily split to show the three control movements separately, do three separate demos letting the student focus each time on an individual control movement, then combine all three before student practise.

TRANSITIONS

GROUND SCHOOL POINTS

Ground effect
Translational lift
Dissymmetry of lift and flap back
Tail rotor drift
Vortex ring
Flight Manual - Height Velocity Chart
- Climb and descent power
- Airspeed settings.

PREPARATION INSTRUCTION

Aim

For the student to learn how to:

(1) depart from the hover to the climb; and
(2) approach to the hover from forward flight.

Review

Straight and level flight, climbs and descents, hovering.

Motivation

Accurate transitions are extremely important, particularly in an operational environment.

Airmanship

Lookout
Wind Velocity
Checks

Teaching Points

(1) Transition to the climb

Describe the transition from the hover to the climb as follows:

(a) establish a steady hover into wind;
(b) make a clearing turn and check area clear;
(c) complete pre-take off check;
(d) select an outside reference to assist directional control and ease cyclic forward slightly to initiate movement;
(e) At the same time, if required, increase power sufficiently to prevent sink;
(f) apply enough forward cyclic to overcome flapback;
(g) select climb attitude and power; and

(h) prevent yaw throughout and adjust cyclic as required to maintain climb attitude.

(2) Transition from forward flight to the hover (Standard Approach)

(i) Explain that the transition to the hover involves two separate requirements that have to be combined into one coordinated manoeuvre:

(a) Height Reduction: Height must be reduced from approach altitude to the hover height above ground. Explain the straight-line or constant angle approach, describing the visual indications.

(b) Speed Reduction: Speed must be progressively reduced from the approach airspeed to a zero groundspeed at the hover. Varying approach angles and/or wind conditions will cause the airspeed to vary a great deal from one approach to another. It is vital therefore, that the student learns to refer to groundspeed only.

(ii) Describe the procedure as follows:

(a) approach landing spot into wind at a specific altitude and airspeed;
(b) select a suitable approach angle (sight picture);
(c) initiate the approach by reducing power and commencing a progressive decrease in airspeed;
(d) maintain the approach angle with collective;
(e) establish apparent ground speed (a fast walking pace), and maintain it with cyclic;
(f) anticipate loss of translational lift;
(g) establish hover over the selected spot; and
(h) prevent yaw or sideways drift.

(iii) Describe overshoot procedures as appropriate to type and local conditions.

(iv) Introduction to hovering:

If transitions are employed for introducing hovering, approaches should initially be made at a constant speed and constant angle, followed by a low overshoot.Speeds should be progressively reduced in subsequent approaches, first to a fast hover taxi, then to the point of losing translational lift, and finally to the hover itself. Sideways or rearward flight should be avoided. Ensure that the student regains forward flight before losing control of the hover.

(3) Explain that wind velocity will significantly affect helicopter performance and handling characteristics, as appropriate to type.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate flapback and a transition from the hover to the climb.

(2) Student practice

(3) Demonstrate a transition to the hover, showing the visual cues resulting from failure to maintain a constant approach angle.

(4) Demonstrate a transition to the hover, showing the visual cues of a constant approach angle and the correct rate of closure.

(5) Student practice.

(6) Demonstrate overshoot procedures.

(7) Student practice

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) The concept of making an approach at a constant angle and at a progressively decreasing ground speed, is a difficult one for the student pilot to grasp. The use of diagrams in pre-flight briefing is essential.

(2) The instructor should be prepared for the fact that in the early stages, the student will almost certainly fail to anticipate the amount of power required when translational lift is lost coming to the hover. This can easily lead to either overpitching, over-revving, over-boosting/torquing or even incipient power settling.

(3) Another problem resulting from #2 is underestimating pedal requirements. Explain the greater the power required to establish the hover, the greater the pedal movement required to keep the aircraft straight, and this can only be corrected by using an outside reference.

(4) Emphasize assessing the approach in relation to groundspeed and sight picture. This can only be accomplished by looking outside the helicopter with an occasional cross check of the instruments.

(5) Ensure the helicopter is moving straight with the direction of travel by use of pedals when close to the ground.

(6) Students should be encouraged to overshoot if the rate of descent is high and the airspeed is low.

(7) This exercise may be used as a means of teaching the hover. (See Exercise 10).

AUTOROTATIONS 2

GROUND SCHOOL POINTS

The Autorotative Flare
Flare Theory
Flight Manual - Height Velocity Chart
- Emergency Procedures

PREPARATORY INSTRUCTION

Aim

For the student to learn how to carry out a safe landing from an autorotation.

Review

Autorotations 1 - Exercise 7
Engine Failure at the Hover/Hover Taxi - Exercise 11

Motivation

The primary purpose of autorotations is to save crew and passengers from injury, following an in-flight engine failure or similar major emergency. In practice autorotations, there is also the need to avoid damaging the helicopter. These skills can only be acquired and maintained with practice.

Airmanship

(1) Pre-entry checks.
(2) Post-entry checks as appropriate to type.
(3) Aircraft performance limitations.
(4) Suitable landing area.
(5) Lookout.

Teaching Points

(1) Review the procedures in Autorotation 1 and describe the technique for landing as follows:

(a) ensure that a safe landing area is within autorotative range, check the wind velocity.

(b) Enter autorotation and select airspeed for minimum rate of descent.

(c) When certain that the landing will be in the safe area, close throttle completely, where appropriate to type.

(d) At the appropriate height above ground, commence the flare.

(e) Level the aircraft and apply collective pitch as required to reduce the rate of descent and cushion the landing. Prevent yaw throughout with pedals.

(2) Describe the post landing procedures:

(a) Ensure that the cyclic is in a neutral or forward position. Avoid moving the cyclic aft during or after touchdown.

(b) Lower the collective slowly to the bottom position. Care must be taken if the tail boom is pitching due to forward movement on the ground.

(c) Carry out pre take-off checks.

(3) Explain that where autorotational landings are considered to be unsafe due to aircraft performance, wind or density altitude conditions, power recoveries to the hover or hover taxi may be used to provide continuation in autorotation practice. Stress that power recoveries are not a substitute for autorotational landings. Autorotational landings must be mastered to the extent that the student is competent to survive an emergency when flying solo.

(4) Describe the technique for carrying out a power recovery to the hover or hover taxi as appropriate to type and local conditions:

(a) ensure that a safe landing area is within autorotational range;

(b) enter autorotation and select airspeed for minimum rate of descent;

(c) ensure that rotor RPM is in the correct range;

(d) at a safe height, rejoin the needles;

(e) at the appropriate height, flare;

(f) at the appropriate height, level the aircraft;

(g) apply power to stop sink and establish a hover/hover taxi; and prevent yaw and drift.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON 1

(1) Demonstrate an autorotation into wind, terminating in a landing.

(2) Student practice.

(3) Demonstrate autorotations including 90° and 180° turns, terminating with a landing into wind.

(4) Student practice.

AIR LESSON 2

(1) Demonstrate an autorotation terminating in a power recovery to the hover/hover taxi.

(2) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Training accidents which involve striking the tail with the main rotor blades during an autorotational landing are very frequent. These can generally be avoided by the instructor ensuring that the cyclic is not moved after, during or immediately after touchdown.

(2) There is a need for the instructor to follow through on the controls during autorotational landings. Take care that you do not make the exercise worthless by inadvertently leading rather than following through.

(3) This exercise should only be practised in areas known to be safe and suitable for landing. Consideration should be given wherever possible to using an area where crash facilities are available.

(4) The student should practise autorotations in as many varied conditions as possible because the type of autorotative flare will vary in these conditions. Conditions include the area available, size, surface, wind and obstacle clearance.

(5) When proficiency is shown, obtain the decision from the student as to what degree and duration of flare to employ, taking into account the conditions in #4.

(6) Both full stop and run-on touchdowns should be practised and the student taught when to employ each technique.

(7) This is a stressful and demanding exercise for both student and instructor. Resist the temptation to attempt `just one more' at the end of the lesson as you will usually find the student's performance will get worse not better.

(8) Brief the student on the school's policy on autorotations to touchdown. Most schools do NOT allow them to be practised solo.

EMERGENCIES

GROUND SCHOOL POINTS

AIP - Search and Rescue (SAR)
ANO V No. 6 - Distress and Urgency Signals Order
Flight Manual - Emergency Procedures

PREPARATORY INSTRUCTION

Aim

For the student to learn how to carry out safe procedures following an in-flight emergency.

Motivation

Repeated practice handling in-flight emergencies under simulated conditions, will prepare the student for handling a real emergency should one occur.

Teaching Points

(1) Review the emergency procedures in the flight manual.

(2) Explain that it is good airmanship to make a precautionary landing whenever unusual instrument readings, control forces, vibrations or noises occur, even if the helicopter appears to be performing normally in other respects.

(3) Describe the procedures for making an emergency or precautionary landing as follows:

- (a) identify the emergency;
- (b) reduce power/airspeed where appropriate;
- (c) select a suitable landing area;
- (d) transmit a Mayday or Urgency call; and
- (e) land, into wind if possible.

(4) Explain that it is important to make a radio call even though it may be transmitted blind. This will often minimize time spent on the ground in cases where the flight cannot be continued.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate in-flight emergencies as appropriate to type.

(2) Student practice.

(3) Demonstrate tail rotor failures and hydraulic off flight (if applicable to type).

(4) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Transit time from all lessons can be utilised to practise reaction to simulated emergencies. A verbal warning should be given in the initial stages.

(2) Discuss the actions to be taken following the landing, all too often a student lands and has no idea what to do once on the ground. Setting scenarios with the student providing the actions to be taken is good practise.

(3) Hydraulics off, if applicable to type, should be introduced in flight at altitude, progressing to approach and landing.

THE CIRCUIT

PREPARATORY INSTRUCTION

Aim

For the student to learn how to fly an accurate circuit.

Review

All previous exercises as required.

Motivation

Although circuits do not have the same significance in helicopter operations as they do with aeroplanes, they remain an excellent way of consolidating all the previous air exercises in one convenient sequence.

Airmanship

Lookout
Checks

Circuits 1

Teaching Points

(1) With the aid of a diagram, describe the circuit pattern to be used, specifying directions, speeds, distances, heights, etc.

(2) Where applicable, explain the use of the radio and the significance of Air Traffic Services instructions and clearances.

(3) Where there may be other traffic in the area, describe how to maintain separation and avoid wake turbulence.

(4) Where applicable, describe local procedures for joining and leaving the circuit.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON - 1

(1) Demonstrate a circuit.

(2) Student practice.

(3) When circumstances permit, demonstrate:

- (a) circuit spacing - speed and circuit size variations;
- (b) wake turbulence avoidance; and
- (c) acceptance and/or compliance with Air Traffic Service instructions and clearances.

(4) Student practice

POST FLIGHT DEBRIEFING

Circuits 2 (Emergencies)

Teaching Points

When a reasonable standard has been reached in Air Lesson 1;

(1) describe the application of Exercise 14 (Emergencies) to the various segments of the circuit, as applicable to type and local conditions; and

(2) discuss overshoots.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON - 2

(1) Demonstrate emergencies in the circuit.

(2) Student Practice

POST FLIGHT DEBRIEFING

Circuits 3 (First Solo)

A student's first solo can be considered when the following requirements have been met:

(1) A safe standard has been reached in Air Exercises 1 - 14.

(2) A safe and acceptable standard has been reached in Circuits, Air Lessons 1 and 2. A guide to this standard is given below:

(a) Take-off and Landing

Take-offs and landings should be reasonably smooth and consistently vertical. They should be with no yaw, sideways or rearward drift. Hovering should be well controlled.

(b) Transition and Climb

A clearing turn should precede the transition as a normal airmanship manoeuvre. The transition should be smooth and well controlled as regards airspeed and power settings.

(c) Crosswind, Downwind and Base Legs

The circuit should be consistently safe. The student should be aware of any inaccuracies and able to correct them without assistance from the instructor.

(d) Final Approach

The student should be able to fly a safe approach and able to correct large deviations from the selected approach angle. Reduction of forward speed should be smooth and progressive. The approach should consistently terminate with a hover over the selected spot at the recommended height.

(e) Emergencies

The student must be able to recognise and take corrective action for any emergency during the first solo trip, including an engine failure from any point in the circuit.

(3) Meteorological and air traffic conditions are suitable, the helicopter is fully serviceable with sufficient fuel, etc.

(4) Solo flying privileges have been certified in accordance with Pilot Licensing Handbook Volume 1, Chapter 2.

(5) The instructor is qualified to send the student first solo.

AIR LESSON - 3

(1) Student practice (dual)

(2) Brief student for first solo. This should be a short briefing, given in the cockpit immediately prior to the solo, explaining to the student that weight and C of G will be different, detailing the duration of the solo practice and where the flight is to terminate.

(3) Advise control tower where applicable.

(4) Student Solo.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

Air Lesson 1

(1) This exercise should be introduced when a reasonable level of competence at transitions and the preceding exercises has been reached. Otherwise the result will be time-wasting and hard on the student's morale.

(2) When flying in the circuit encourage the student to strive for perfection, but not to the detriment of look-out by concentrating too much on the instruments.

(3) Impress upon your student to overshoot rather than trying to make a good approach from a poor one.

(4) Make the pattern easy to remember by use of landmarks and crosschecking of compass headings to ground features.

EXERCISE 15

Air Lesson 2

(1) Simulate all emergencies in various legs of the circuit so as not to become predictable, this is especially important when teaching more than one student at the same level of experience at the same time.

(2) Correct any persistent errors, but by this stage, students should be self critical enough to recognise and remedy most faults themselves.

Air Lesson 3

(1) The first solo is a very important and never-to-be-forgotten experience in a pilot's career. It gains even more importance in the school environment, particularly with a student who is a slow learner. In this case it is generally necessary to play down the significance of the first solo to prevent low morale and an even slower rate of learning. Avoid referring to "average hours to first solo" or condoning a spirit of competition between students who are at the same phase of the training curriculum.

(2) The pre-solo flight should not exceed 45 minutes in order to keep fatigue to a minimum.

(3) It is not advisable to tell students that they are about to fly solo until just before the actual flight. The possible apprehension could delay the very flight that you are planning for them.

(4) Before sending the student on the first solo, carry out several dual circuits to confirm consistency and competency, and that suitable conditions exist.

SIDEWAYS AND REARWARDS FLIGHT

GROUND SCHOOL POINTS

Flight Manual - Limitations

PREPARATORY INSTRUCTION

Aim

For the student to learn:

(1) sideways and rearwards flight facing into and out of wind; and
(2) turns about the tail.

Review

Hovering Exercises - Exercise 10

Motivation

Sideways and rearwards flight and turns about the tail form an important part of helicopter operations, often in among obstructions.

Airmanship

(1) Lookout - obstacles

(2) Aircraft limitations

Teaching Points

(1) Point out that it is preferable to hover taxi forwards rather than sideways or rearwards if at all possible. This is because of lookout and engine failure considerations.

(2) Sideways Flight

(a) State height and ground speeds to be used in this exercise.
(b) Explain the effects of controls as follows:

(i) cyclic to control direction of movement;
(ii) pedals to control aircraft heading; and
(iii) collective to control height.

(c) Describe aircraft limitations as appropriate, e.g. weathercocking, flap-back, etc.

(d) Explain that it is vital to maintain a scan of the direction of movement, aircraft heading, height and instruments.

(3) Rearwards Flight

(a) State height and ground speeds to be used in this exercise. Height will generally be higher, to ensure adequate tail rotor clearance, speed will be slower.

(b) Explain the effects of controls.

(c) Describe the visual cues and point out the hazards of disorientation when attempting to look in the direction of movement.

(d) Point out that from an operational viewpoint, protracted rearward flight is seldom a requirement. If for some reason, it is necessary to move rearward over a long distance, frequent stops should be made to re-check that the area is free from obstacles.

(4) Turns About The Tail

(a) State the height and rate of turn to be used.

(b) Explain the effects of controls, pointing out the similarity to sideways movement.

(c) Describe the visual cues.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate sideways flight in both directions, facing into wind.

(2) Student practice.

(3) Demonstrate sideways flight in both directions facing 90° to the wind.

(4) Student practice.

(5) Demonstrate sideways flight in both directions facing 180° to the wind.

(6) Student Practice.

(7) Demonstrate rearwards flight facing into wind.

(8) Student practice.

(9) Demonstrate rearwards flight on various headings out of wind.

(10) Student practice.

(11) Demonstrate turns about the tail in both directions.

(12) Student practice.

EXERCISE 16

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Make a thorough reconnaissance of the area before and during the lesson, looking particularly for bushes, fences, rocks, stumps and loose articles (FOD), as you will be operating close to the ground.

(2) References on the ground are a good aid to accuracy during this exercise. Where possible use a line feature such as a fence or runway edge to assist the student. If none exist, give thought to marking the ground with large squares or circles (hover square).

(3) Most students find this to be a tiring exercise the first time around. Keep a close eye on your student for signs of fatigue and break up the lesson with a circuit. This has the additional benefit of giving the helicopter time to cool down from the high temperatures and power settings in the hover.

(4) Show the students some hovering patterns incorporating all the hovering exercises taught thus far in the course. Before sending the student to practise this exercise solo check that the wind is suitable, it is also wise to brief that hover patterns be practised in conjunction with other exercises.

EXERCISE 17

STEEP TURNS

GROUND SCHOOL POINTS

Flight Manual - Limitations
Blade loading.

PREPARATORY INSTRUCTION

Aim

For the student to learn how to carry out steep turns.

Review

Medium Turns - Exercise 6.

Motivation

Operationally, the steep level turn is an emergency flight manoeuvre that can be used for traffic, obstacle or terrain avoidance. It is included in the pilot flight test for this reason.

Airmanship

(1) Lookout
(2) Aircraft limitations

Teaching Points

(1) Define the angle of bank and airspeed as applicable to type.

(2) Describe the visual cues, and where applicable, instrument indications.

(3) Review the effects of controls in the turn.

(4) Discuss power requirements for maintaining altitude and airspeed.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate 360° steep turns in both directions.

(2) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Emphasize the importance of a good look-out before and during the turn. Set a good example when giving the demonstration.

(2) This is an excellent coordination exercise of all controls at altitude, but it should also be practised at low level as an introduction to emergency turns in Exercise 21, Rapid Decelerations. When low level, point out the dangers of slipping in the turn.

AUTOROTATIONS 3

GROUND SCHOOL

Flight Manual - Limitations

PREPARATORY INSTRUCTION

Aim

For the student to learn how to vary range in autorotation.

Review

(1) Autorotations 1 and 2 - Exercises 7 and 13.

(2) Autorotational flight envelope, including airspeed and rotor RPM limitations.

(3) Effects of airspeed on range and rate of descent in autorotation.

Motivation

Autorotation at the manufacturer's recommended airspeed is the ideal because it results in the minimum possible rate of descent. The resulting range however, will not necessarily result in landing at the desired spot under actual emergency conditions. It is vital therefore that the student be capable of taking full advantage of the helicopter's capabilities in autorotation to achieve the intended landing spot.

Airmanship

(1) Safety checks.
(2) Safe landing area.
(3) Lookout.
(4) Wind Velocity.

Teaching Points

(1) State the airspeed and RRPM for maximum range and VNE in autorotation, point out the increase in rate of descent, as appropriate to type.

(2) Extending the range

   (a) Point out that there is no benefit from exceeding the manufacturer's recommended maximum range speed and that exceeding autorotational VNE will result in drastic rotor RPM decay.

   (b) Describe the difference in visual cues between an autorotation at minimum rate-of-descent speed and maximum range speed.

   (c) Describe the procedure for entering and maintaining maximum range autorotation, as appropriate to type.

(d) Point out that it is advantageous to reduce the airspeed to minimum rate-of-descent speed as early as possible in order to reduce the rate of descent to more desirable proportions.

(e) Describe the technique for carrying out a touchdown from a maximum range approach, as appropriate to type.

(3) Reducing the range

(a) Explain that there are two methods of reducing range in autorotation - reducing airspeed and turning.

(b) Describe the procedure for entering and maintaining an autorotation at low airspeed.

(c) Point out the need to avoid a zero airspeed autorotation due to excessive rate-of-descent and controllability problems. Explain that it is preferable to maintain at least some indicated airspeed (10-20 kts) and accept the resulting ground speed. Do not achieve a negative airspeed.

(d) Stress the need to increase airspeed to the minimum rate-of-descent speed as soon as possible, in order to reduce the rate of descent to manageable proportions. Minimum rate of descent speed should be acquired before entering the shaded area of the height velocity chart (most types approximately 150-200 feet).

(4) Turns

(a) Describe how to shorten the range in autorotation by means of turning.

(b) State the average altitude lost in a 180° and 360° autorotation.

(5) Explain that an autorotation following an actual emergency will often involve several changes of airspeed and direction in order to arrive at the selected landing point. Point out that this requires both skill and judgement, which will only come from frequent practice.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Review autorotations at minimum rate of descent speed as follows:

(a) over a selected point at 1,500 feet above ground, enter autorotation and descend at the manufacturer's recommended speed for minimum rate of descent. Point out the visual cues of rate of descent and range; and

(b) land.

(2) Student practice.

(3) Over the same selected point at the same height:

(a) autorotate at the manufacturer's recommended airspeed for maximum range in autorotation. Point out the increased rate of descent and range; and

(b) land.

(4) Over the same selected point at the same height:

(a) autorotate at the manufacturer's recommended airspeed for maximum range in autorotation and recommended minimum rotor RPM. Point out the rate of descent and range; and
(b) land.

(5) Over the same selected point at the same height, autorotate at a low airspeed (10-20 kts). Point out:

(a) the high rate of descent;
(b) the height lost in recovering from low forward speed to minimum descent speed; and
(c) the distance covered.

(6) Student practice.

(7) Select a spot on the ground and demonstrate autorotative approaches from various height, speeds and directions.

(8) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) On the initial demonstration of each type of range variation use the same line feature, such as a fence or road, as a reference point to enter. Always enter using the same height, speed or power setting. This ensures the student appreciates the difference in distance for each type.

(2) After teaching the individual methods of range variation, be sure that students understand that these are the basics, and that they usually have to use combinations to achieve the landing spot. When students have grasped the basics, introduce situations that require them to assess and use a combination of different techniques.

(3) Emphasize that when varying the range, the helicopter should be returned to the normal autorotational touchdown profile by 150-200 feet. A rule of thumb for a zero speed auto is 100 feet loss in altitude for 10 knots gain in airspeed.

(4) Point out that in some instances #3 is not always possible and it may be necessary to accept a slight crosswind, or a little less airspeed, than to be turning in the flare immediately prior to touchdown when very close to the ground.

PRACTICE FORCED APPROACHES

GROUND SCHOOL POINTS

AIP - Search and Rescue (SAR).
ANO V No 6 - Distress and Urgency Signals Order.
Flight Manual - Emergency Procedures.

PREPARATORY INSTRUCTION

Aim

For the student to learn how to carry out a safe forced landing following an engine failure.

Review

Autorotations - Exercises 7, 13 and 18.

Motivation

Although aircraft engines are nowadays generally reliable, failures do still occur. The lives of the pilot and his passengers are dependent on his skill and judgement should an engine failure occur.

Airmanship

Teaching Points

(1) Describe the immediate actions that must be taken in the event of an engine failure:

- (a) enter autorotation;
- (b) select a suitable landing area;
- (c) select airspeed(s) and heading(s) in order to make the selected area; and
- (d) land.

(2) Describe the actions that should be taken, height and other factors permitting, during a forced landing:

- (a) transmit MAYDAY;
- (b) identify cause of failure and cure if possible;
- (c) actuate ELT (if equipped with manual control);
- (d) warn passengers; and
- (e) switch off electrics if fire is suspected.

(3) Stress that pilots should be aware of wind velocities at all times. It is always preferable to be into-wind on a forced approach, but a suitable landing area is a prime consideration and may well take precedence. In other words, it is better to land down-wind in an open field when the only alternative is to land in tall trees with the wind on the nose.

(4) Remind the student that turns and speeds above or below the manufacturer's recommended speed in autorotation, increase the rate of descent substantially. Straight flight at the optimum speed should therefore be achieved as early as possible in the final stages of a forced approach.

(5) Discuss the problem of ditching a helicopter and review ANO II, Number 8, the Life Saving Equipment Order.

(6) Discuss the techniques of forced landing into trees, mountainous terrain, built-up areas and flying at night.

(7) Point out that an engine failure when flying at low level over obstacles will result in a forced landing that is difficult to pull off successfully, without damage and injury. For this reason, pilots should always fly as high as the task and common sense allow.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate forced approaches from a height that will allow the full procedure to be carried out without haste (2,000 ft. AGL or above, if possible).

(2) Student practice.

(3) Demonstrate forced approaches of increasing severity from different altitudes.

(4) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) This is not a procedure which can be allotted a certain time period for the course and left at that. After students are competent they should be given surprise engine failures on as many dual trips as possible. This enables students to practise the procedure regularly and will develop the judgement skills necessary to consistently make the selected area.

NAVIGATION

GROUND SCHOOL POINTS

(1) Maps/Charts - symbols, scales, etc.
(2) Computer
(3) Departure and arrival procedures
(4) Track selection - drift lines, increments
(5) NOTAMS
(6) Weather reports and forecasts
(7) Lost procedures
(8) Radio procedures
(9) Publications - VFR Supplement
(10) Aircraft documents
(11) Flight Plans/Notifications

PREPARATORY INSTRUCTION

Aim

For the student to learn how to carry out safe and effective cross-country flights.

Motivation

The ability to navigate effectively is a necessary basic skill for all pilots.

Teaching Points

(1) Assign a cross-country for the student to plan, that will take approximately 45-60 minutes to fly, consisting of 3 or more legs.

(2) Review and discuss the student's plan.

(3) Review the practical aspects of the different departure procedures and select the appropriate one for the first air lesson.

(4) Describe the visual cues that the student can expect to see and how to use them for track correction.

(5) Discuss in-flight calculation of ground speed and estimated time of arrival.

(6) Point out the advantages of flying as high as the weather and common sense will allow.

(7) Review the radio calls that it will be necessary to make during the air lesson.

(8) Review lost procedures including:

(a) returning to the last known position;

(b) reading "ground to map"; and

(c) use of radio aids.

(9) Review the practical aspects of carrying out diversions due to weather, emergencies or task requirements.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON 1

Fly the cross-country exercise as prepared in Teaching Points (1) as follows:

(1) First leg:

(a) demonstrate the departure;

(b) demonstrate enroute procedures including maintaining track/returning to track, calculating ground speed and ETA; and

(c) student concentrates on procedures and following the map.

(2) Second leg:

student flies, instructor assists with navigation.

(3) Third and subsequent legs;

student flies and navigates.

AIR LESSON 2

Student plans, flies and navigates a dual cross-country of approximately 1 hour duration. Where possible, this lesson should include landing at an unfamiliar airport.

AIR LESSON 3

(1) Student plans.

(2) Demonstrate lost procedures.

(3) Student practice.

(4) Demonstrate low level navigation.

(5) Student practice.

(6) Demonstrate diversion techniques and procedures.

(7) Student practice.

EXERCISE 20

AIR LESSON 4

(1) Student plans local cross-country.

(2) Demonstrate techniques for flying and navigating in actual minimum safe meteorological conditions.

(3) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Show the student the use of hiliters and marking the prominent checkpoints to ease scanning the map for this information.

(2) If the student becomes uncertain of his position, allow a sufficient period of time for reorientation. If completely lost after using appropriate `lost procedures', pinpoint your position for the student and continue. This is especially important in the earlier dual lessons as some students could suffer a loss of confidence.

(3) Dual instruction should relate to any previous experience the student may have. It should be remembered however, that the need to keep the right hand on the cyclic at all times, will impose difficulties that even an experienced fixed-wing pilot will find trying. It is important to demonstrate correct organisation of the cockpit to minimize these difficulties.

(4) The solo cross-country exercise involves the application of all skills and experience accumulated by the students throughout the training course. Before authorizing solo flights, assure yourself and the students that they are competent to complete this exercise successfully. Ensure that they have carried out adequate pre-flight planning and preparation unassisted, and check the results carefully.

(5) Extreme care should be taken to ensure the weather is suitable, the helicopter is serviceable, with sufficient fuel for the intended flight, and that the student has been thoroughly briefed on the correct procedure to be followed for any probable event which may occur during the flight.

(6) During the low flying stress the changes in visual cues, and if using a large scale map, the speed which the helicopter moves over the map.

(7) If possible expose the student to different scales of map, particularly 50,000 and 250,000.

(8) Students should have had some exposure to Ex. 24 Sloping Ground and Ex. 25 Confined Areas before being sent on the first solo cross country. This is to ensure they are capable of landing at a suitable site, in the event of any unusual circumstance, when flying over inhospitable terrain.

RAPID DECELERATIONS

PREPARATORY INSTRUCTION

Aim

For the student to learn how to come to the hover into wind from cruising speed, at a constant altitude.

Review

Airspeed and Power Changes - Exercise 4

Motivation

Rapid decelerations straight ahead are a useful exercise for developing co-ordination and accuracy during training. They are also a means of aborting a departure from larger confined areas. Those involving a level minimum radius turn, have a practical application in the avoidance of obstacles or weather conditions under operational conditions.

Airmanship

Lookout
Engine and Airframe limitations.

Teaching Points

Straight Ahead Into Wind

(1) Describe how to carry out a rapid deceleration straight ahead into wind as follows:

- (a) from cruise at 30-50 ft AGL, commence a gentle flare;
- (b) at low forward speed, start levelling the aircraft;
- (c) anticipate loss of tranlational lift, establish a hover;
- (d) maintain height throughout with collective;
- (e) maintain RPM throughout with throttle; and
- (f) prevent yaw with pedals.

(2) Explain that the deceleration will initially be gentle and gradual, from a fairly low speed of entry, in order to concentrate on smoothness and accuracy. The manoeuvre can be speeded-up as necessary after the basic ability has been acquired.

(3) Explain that when making a more rapid deceleration, there is a larger change of attitude in the flare and a greater resultant tendency to gain height. This in turn will require larger collective movements to prevent a climb, and larger pedal movements to prevent yaw.

(4) Point out that at no time should the flare be so harsh that it is necessary to split the needles in order to prevent an overspeed. It is important however, to explain and demonstrate the recovery sequence should this happen inadvertently.

(5) Review the dangers of vortex ring if height is lost at low or nil forward speed.

With Level Turn Into Wind

(6) Describe the technique for performing a rapid deceleration involving a level turn of up to 180° into wind, as follows:

(a) from cruise at 30-50 ft. AGL, commence a level, balanced turn;

(b) initiate a flare while in the turn;

(c) rollout facing into wind;

(d) at a low forward speed, level the aircraft;

(e) come to a hover or resume forward speed;

(f) maintain height throughout; and

(g) maintain balanced flight and prevent yaw.

(7) Emphasize that the student must keep the aircraft in balance and the airspeed above translation in the 180 degree turn into wind, otherwise the helicopter will be set up for vortex ring.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate a straight-ahead deceleration from cruising flight into wind.

(2) Student practice.

(3) Demonstrate a straight-ahead rapid deceleration into wind.

(4) Student practice.

(5) Demonstrate a rapid deceleration involving a 90° turn into wind.

(6) Student practice.

(7) Demonstrate a rapid deceleration involving a 180° turn into wind.

(8) Student practice

POST FLIGHT DE BRIEFING

EXERCISE 21

TIPS FOR INSTRUCTORS

(1) Decelerations involving a turn into wind require a high level of co-ordination and accuracy. They should be introduced as an advanced exercise towards the end of the training syllabus.

(2) It is important to stress smoothness and accuracy. The student should initially master gentle decelerations from 50 MPH to the hover with the accent on smoothness, accuracy of height and RPM. Overpitching, yaw and tail rotor drift are common errors in the early stages and should be corrected before speeding up the manoeuvre.

(3) After smoothness and accuracy have been established, the entry speeds can gradually be increased to the cruise and the rate of deceleration increased.

(4) Loss of height as translational lift is lost, is a common fault and is potentially dangerous, since the conditions necessary for vortex ring will be present.

LOW LEVEL OPERATIONS

GROUND SCHOOL POINTS

CRC Chapter 2, Section 534

PREPARATORY INSTRUCTION

Aim

For the student to learn safe techniques flying at low level.

Review

Rapid Decelerations - Exercise 20.

Motivation

Although helicopter pilots should fly as high as is reasonable possible, operational tasks often dictate the need for flying close to the ground.

Airmanship

Lookout - obstacles, other aircraft.
Low level emergency procedures.

Teaching Points

(1) Explain that low level operations pose special considerations. Straight line navigation is generally only possible in remote areas that are also flat and free of obstacles. Low level operations will generally involve frequent changes of track for the following reasons:

(a) Wires

Point out that wire strikes are a frequent cause of helicopter accidents. Explain that low level operations demand a constant lookout for wires and describe the technique for crossing lines at posts or towers, preferably at 45° to the line's direction. Describe how wires hang in valleys and how best to locate them. Explain the crew system of alerting each other to the fact that wires have been spotted in front of the aircraft.

(b) Persons and Livestock

Frightening or annoying people and livestock by flying overhead at low level, is at the very least, poor public relations. It is also in many cases illegal and dangerous and must be avoided. Mink farms and racing stables among others are particularly sensitive areas.

(c) Trees

Helicopter operations very often involve flying low over trees and the pilot has no choice in the matter despite the obvious dangers of an engine failure or similar emergency. However, when the

pilot does have a choice, he should fly the clearest flight path available to him.

(d) Rising Ground

Pilots should fly towards rising ground at an angle less than 90°. This will make turning away easier in the event of an emergency or meeting downdrafting air.

(e) Water

Always keep within gliding distance of the shore unless equipped to fly over water. During winter operations do not stray away from references on a shoreline over ice covered bodies of water, risking white out conditions.

(2) Point out the hazards of flying low level in high winds, including:

(a) drift during turns; and

(b) the danger of losing airspeed when turning from into wind to downwind. This is particularly hazardous when flying at high AUW at high density altitudes.

(3) Point out that radio performance generally deteriorates quickly at low altitudes.

(4) Describe the technique for carrying out a low-level autorotation.

(5) Assign a local cross-country to be flown at minimum safe altitude, involving as many of the above points as possible.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Fly the cross-country as assigned, and planned by the student.
(2) Demonstrate low level flying techniques.
(3) Student practice.

POST FLIGHT DE-BRIEFING

TIPS FOR INSTRUCTORS

(1) Brief the student on the use of both cyclic and collective together to avoid obstacles, such as wires or trees.

(2) Include a check of temperatures and pressures at each turning point to ensure they are not forgotten.

SLOPING GROUND

GROUND SCHOOL POINTS

(1) Dynamic Rollover
(2) Flight Manual - Limitations
(3) Tail Rotor Drift and Roll

PREPARATORY INSTRUCTION

Aim

For the student to learn procedures and techniques for operating from sloping ground.

Review

Exercise 8, 9 and 10.

Motivation

(1) Describe the helicopter's ability to operate from unprepared surfaces and sloping ground. Explain that pilots are frequently required to use this ability under operational conditions.

(2) Explain that sloping ground techniques, involving as they do, gentle and cautious control movements, are very suitable for landing on any type of doubtful surface (e.g. packed snow, muskeg, etc.).

Airmanship

(1) Lookout - obstacles
(2) W/V
(3) Aircraft limitations

Teaching Points

Explain that sloping ground operations can be divided into 4 phases:

(1) reconnaissance;
(2) manoeuvring;
(3) landing; and
(4) take-off.

(1) Reconnaissance:

(a) Explain that all landing surfaces require careful attention during landing and take-off. Extra care must be taken where the surface is likely to be soft, slippery, or where there are obstacles such as rocks or tree stumps.

(b) Describe how cross-slope landing performance is affected by cyclic control limitations and the fact that one skid hangs lower than the other at the hover.

(c) Explain that landing into wind is always desirable for aircraft handling, but that there are often occasions when the pilot must "trade-off" wind and slope in order to get the best compromise between the ground and aircraft limitations.

(d) Point out that in view of the above, it is vital to make a careful assessment of the ground before attempting to land.

(2) Manoeuvring

Point out that the tail assembly is particularly vulnerable during sloping ground operations. Pilots should be constantly aware of the tail rotor, particularly when making hovering turns, when landing upslope in conditions where the ground levels out behind the helicopter, or when landing downslope.

(3) Landing

(a) Describe the landing performance and limitations of the training helicopter type.

(b) Describe how to land on sloping ground as follows:

(i) establish a steady hover;

(ii) lower collective gently until the upslope skid contacts the ground;

(iii) continue lowering the collective, at the same time moving the cyclic gently towards the slope maintaining a level attitude;

(iv) when both skids are in full contact with the ground, smoothly lower the collective until it is fully down.

(v) Prevent yaw throughout.

(vi) Carry out a seating check by making small gentle movements of the collective and pedals.

(vii) when certain the helicopter will not slide centre the cyclic and reduce RPM, if required.

(c) Point out the need for smooth and accurate control movements and for not overcontrolling. Explain that it is possible to induce a rate of roll, with one side of the landing gear in contact with the ground, that is impossible to counteract with opposite cyclic.

(d) Describe the symptoms that cyclic control limits are being reached due to excessive slope. Explain that when they start to occur, or if the aircraft starts to slide, the helicopter should be brought smoothly back to the hover and landed elsewhere.

(e) Point out the importance of maintaining flying RPM until the collective is fully down and seating checks are complete.

(4) Take-off

Describe how to take off from sloping ground, as follows:

(a) ensure that the RPM is at the take-off setting;

(b) level the rotor disc so that it is parallel with the horizon;

(c) raise the collective gently and ease the cyclic away from the slope keeping the aircraft level, so it breaks contact with the ground vertically. Stress the vital importance of avoiding any lateral movement; and

(d) prevent yaw throughout.

(5) Operational Considerations

(a) Point out the dangers of turning rotor blades to persons in the close vicinity of the helicopter in this type of operation, and in particular, embarking and disembarking passengers. Explain that it is the pilot's duty to brief passengers and ground crew in this regard, whenever possible.

(b) Review the dangers of dynamic rollover and the need to ensure before take-off, that the helicopter is within C of G limits and that the landing gear is clear of snags and obstacles.

(c) Explain that in some operational conditions, it will not be necessary or desirable to centralize the cyclic after landing or even, in some cases, to lower the collective completely.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Select an area of sloping ground well within the helicopter's limits and demonstrate reconnaissance of, and manoeuvring over, the intended landing area.

(2) Student practice.

(3) Demonstrate cross-slope landings in both directions, pointing out the difference in aircraft performance where appropriate.

(4) Student practice.

(5) Demonstrate an up-slope landing.

(6) Student practice.

(7) Select an area of sloping ground that is close to aircraft limits and demonstrate landings and take-offs.

(8) Student practice.

(9) Select an area of sloping ground that is beyond aircraft limits and demonstrate the indications that the limits are being approached, and the methods of aborting the landing.

(10) Student practice.

(11) Demonstrate wind/slope trade-off.

(12) Student practice of reconnaissance and selection of landing points.

EXERCISE 23

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) The performance and techniques involved with different types of helicopter on sloping ground varies. This exercise should be tailored to meet the performance of the training helicopter.

(2) Students tend to be very tense when introduced to sloping ground operations. They will be likely to overcontrol and will tire quickly. It is vital that the student is proficient at hovering and standard take-offs and landings before this exercise is introduced.

(3) Students will tend to look at the ground close to the aircraft. Overcontrolling frequently results and it will often be necessary to remind the student to raise his eyes and use the horizon as a datum.

(4) When the student is proficient, let him make the decision where to land to judge his ability to evaluate slopes.

(5) Start the student on `beginners slopes' and gradually increase the severity as proficiency improves.

(6) Ensure that the student is shown some slopes which are a mix of cross slope and up/down slope, so that the helicopter has to be landed diagonally on the slope.

ADVANCED TAKE-OFFS AND LANDINGS

GROUND SCHOOL POINTS

Flight Manual - Limitations,
Load and Density Altitude Performance Charts,
Vortex Ring

PREPARATORY INSTRUCTION

Aim

For the student to learn additional take-off and landing techniques for use under operational conditions.

Review

Take-offs and Landings - Exercise 9
Transitions - Exercise 12

Motivation

Although the techniques learned in Exercises 9 and 12 are those that should continue to be used under optimum conditions, operational situations such as high all-up-weight, high density altitude, unfavourable wind conditions or obstacles close to the flight path, may dictate the use of advanced techniques. Another practical application is in conditions of restricted visibility, such as snow, dust or sand.

Airmanship

Lookout - obstacles
Aircraft limitations

Teaching Points

(1) No Hover Take-off

(a) Explain that this take-off can be usefully employed in conditions of blowing snow or where dust, sand or debris may cause a hazard should a normal take-off and departure be used.

(b) Describe the technique for carrying out a no hover take-off as follows:

(i) complete take-off checks, making sure that RPM is at the maximum take-off setting;

(ii) make a careful all-round lookout;

(iii) smoothly apply collective to initiate a vertical climb,use the cyclic to set the climb attitude when passing normal hover height; and

(iv) adjust when clear of obscuring phenomena.

(c) Point out that since this type of take-off is not preceded by a hover check, it is doubly important to ensure that the aircraft is within weight and C of G limits and that there is sufficient power available for the intended departure.

(2) Cushion Take-off

(a) Point out that this type of departure is very economical in power required, since it involves making maximum use of the ground cushion until translational lift has been acquired. It does however, require a relatively flat departure path, free of obstacles. This technique is effective in circumstances where it is not possible to take-off into wind.

(b) Describe the technique for carrying out a cushion take-off as follows:

(i) carry out a hover check at a low hover in maximum ground effect facing into wind;

(ii) lookout;

(iii) initiate slow forward movement with cyclic;

(iv) apply sufficient power to prevent sink;

(v) maintain gentle acceleration, staying in maximum ground effect; and

(vi) as ground effect is lost and translational lift is acquired, select climb power and airspeed.

(c) Stress that in order for this type of take-off to be effective, all control movements must be gentle and progressive.

(3) Vertical or Towering Take-off

(a) Explain that this type of departure is ideal for circumstances where there are obstacles in the departure path. Depending on the height of the obstacles as this method involves the use of high power settings.

(b) Describe the technique for carrying out a vertical or towering take-off as follows:

(i) establish a low hover into wind, complete a power check and take-off checks;

(ii) apply sufficient power to initiate and maintain a gentle vertical climb;

(iii) ensure that the climb is vertical by reference to obstacles ahead and to the side of the helicopter;

(iv) as the top of the obstacle is reached, check for a positive rate of climb, then ease the cyclic forward so that the aircraft moves forward and continues to climb; and

(v) as translational lift is attained, select climb attitude and apply climb power.

(4) No-Hover Landing

(a) Explain that this type of landing is useful in conditions where it is not desirable to approach to or hover, such as dust, powdery snow or turbulence. It requires less power than a normal approach to a hover.

(b) Describe the technique for carrying out a no-hover landing as follows:

(i) approach the selected landing spot as required;

(ii) when the approach is almost completed, and groundspeed is close to zero, anticipate loss of translational lift applying sufficient power to minimize the rate of descent; and

(iii) let the aircraft sink gently through the cushion onto the ground.

(c) Point out that this type of landing requires careful prior confirmation that the selected spot is suitable for landing.

(5) Run-On Landing

(a) Explain that this type of landing can be used in similar conditions as the no-hover landing. Although it requires less power to perform, a large, flat, smooth surface such as a runway is essential.

(b) Describe the technique for carrying out a run-on landing as follows:

(i) approach the selected landing area as required;

(ii) as the approach is completed, run-on at slow walking pace;

(iii) apply sufficient power to cushion landing; and

(iv) after landing, maintain cyclic and collective positions until forward movement stops.

(6) Approaches

Explain that in operational conditions, it is sometimes necessary to approach to land at an angle other than standard, as follows:

(a) Steep Approach

(i) This approach is for avoiding obstacles on the final approach path. Point out that apparent ground speed will be lower than normal and that more power will be required.

(ii) Stress the need to maintain a low rate of descent due to the danger of vortex ring state, or insufficient power to prevent a hard landing.

(b) Shallow Approach

(i) Explain to the student that a shallow approach requires less power than a standard or steep approach. It should be employed when the approach path is free from obstacles and where conditions limit the power available, or where maximum power is available but inadequate for the use of standard techniques.

(ii) Stress that care should be taken to avoid making the approach angle too shallow, i.e. flat. This requires high power settings and can lead to problems in decelerating to a hover, due to the possibility of the tail striking the ground.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Review the standard take-off and departure. Note power required and compare, after demonstrating, with the following techniques:

(a) no-hover take-off and standard departure;

(b) cushion take-off; and

(c) towering take-off.

(2) Student practice.

(3) Review the standard approach to the hover into wind. Note power required and compare, after demonstrating with the following techniques:

(a) standard approach to a no-hover landing;

(b) standard approach to a run-on landing;

(c) steep approach to a no-hover landing;

(d) shallow approach to the hover; and

(e) shallow approach to a no-hover landing.

(4) Student practice.

(5) Demonstrate a flat approach (i.e. too shallow) and point out power required.

POST FLIGHT DE BRIEFING

EXERCISE 24

TIPS FOR INSTRUCTORS

(1) Introduce these techniques in a flat, clear training area initially. When the basic techniques have been mastered by the student, introduce obstacles and unfavourable wind conditions. Limited power situations can be achieved by loading the helicopter or by limiting the amount of power the student is allowed to use, as appropriate to type.

(2) Care should be taken that the student does not adopt an excessively nose down attitude when practising no-hover take-offs.

(3) No-hover landings can and should be practised from any type of approach.

(4) Point out the similarities of the run-on landing to an engine failure in the hover with regard to groundspeed and pedal control.

(5) When practising cushion take-offs stress the need to have a positive airspeed, approximately 30-40 knots, before adjusting to the climb attitude.

(6) Initially when demonstrating steep approaches use an open area preferably with a line of trees or bushes over which you can shoot the approach and ensure that the student can see the intended landing spot over the trees.

(7) Steep approaches and towering/vertical take-offs lead on naturally to confined areas, therefore take the opportunity to demonstrate a confined area at the end of the lesson.

CONFINED AREAS

PREPARATORY INSTRUCTION

Aim

For the student to learn safe confined area operations.

Review

Advanced Take-offs and Landings - Exercise 24

Motivation

The ability to operate from areas where space is confined and restricted is a basic part of the helicopter's place in aviation. It is vital that a helicopter pilot can take full advantage of this ability.

Airmanship

Look-out
Wind velocity

Teaching Points

Explain that this exercise can be considered in 6 stages, as follows:

(1) Initial or High Reconnaissance

(a) Point out to students that they must first positively identify the intended landing area. At this initial stage it is wise to carryout a power check, to establish what size of area they can consider.

(b) The initial reconnaissance will generally be flown in a circular pattern to the pilot's side at an airspeed appropriate to the type of aircraft. Height will normally be that at which the student arrives in the area but will generally be 1,000 ft AGL or more. If the student is at 500 ft AGL or less, the initial and low reconnaissance are generally combined, and in fact, with experience this becomes the normal technique.

(c) Three factors should be considered at this stage:

(i) General Suitability - Establish that the confined area is worth closer inspection and that there is no more suitable alternative in the vicinity.

(ii) Power Available - The size and difficulty of a confined area varies with the density altitude and AUW/power available.

(iii) W/V - An initial assessment of the wind should be made, to be verified later.

(2) Low Reconnaissance

(a) The purpose of the low reconnaissance is to confirm that the area is suitable for the intended operation and to determine the best method of making an approach and landing.

(b) After descending from the initial reconnaissance, the wind should be checked and verified for strength and direction. Smoke, ripples on water, long grass, flags or clothes on a line all give a good indication. The behaviour of the helicopter at fairly low speeds during the low reconnaissance will also give the pilot an accurate picture, due to drift and the tendency for airspeed to fall off when turning downwind.

(c) Factors that the student should take into consideration must include:

(i) **S**ize - Is it big enough?

(ii) **S**hape - Does the shape favour an approach from a particular direction?

(iii) **S**lope - Is the ground level enough for landing?

(iv) **S**urface - What is the surface of the area? Are there snags or obstacles that might obstruct, or a surface that might be a hazard, such as dust, snow or muskeg? Select the touchdown spot.

(v) **S**urrounds - Do the surrounding obstacles favour an approach from a particular direction?

(vi) **S**un - Might the sun restrict the pilot's visibility on final approach?

(d) The height and airspeed at which this reconnaissance is carried out will vary. The criteria is that the student can see well enough to make a sound assessment of the approach and landing area. The height should be the maximum compatible with this aim and will vary between 300 and 500 feet above the nearest obstacles. The reconnaissance should be flown to the student's side with the confined area in sight throughout.

(3) Dummy Approach

(a) During initial training and at any time where the student thinks it necessary or prudent, the actual approach should be preceded with a dummy approach. This should be the same as the intended approach to follow but will terminate with an overshoot at obstacle height.

(b) In situations where the student has not been able to see everything required during the low reconnaissance, the dummy approach can be used to accomplish this purpose and should be flown with the area off to the student's side, to allow maximum visibility. The speed must be slow enough to allow the student to `fill in the blanks' and complete the reconnaissance, but should not drop below the translational lift airspeed of approximately 15 kts.

(c) A power check should be carried-out on the overshoot, and the intended departure path can also be checked at this stage for obstacles, escape routes and any low level turbulence.

(d) From the overshoot the student continues into the circuit, this is normally flown between 300-500 AGL at a slightly slower speed than normal. The size and direction will be governed by terrain, wind and open areas

(4) Approach

(a) Satisfied with the landing area and the dummy approach, the pilot then continues round the circuit for the approach proper.

(b) The approach angle should never be steeper than necessary. If possible set up the sight picture of the spot over the obstacle. Explain single angle, double angle and vertical approaches.

(c) The approach should be made to a hover over ground that is suitable for landing. Making an approach to hover directly above obstacles, or to a position from which it is difficult or hazardous to manoeuvre, should be avoided.

(d) Accidents are all too frequent during this stage of helicopter operations. The student must be very aware of any obstacles that can snag the landing gear or tail rotor. Turns should normally be about the tail. Make sure that the student manoeuvres only when necessary or to take advantage of the area's size or shape for departure or landing.

(5) Departure

(a) Departures should be initiated from as low a hover as is practicable at the maximum safe distance from the obstacles on the departure path. This gives the student the best power difference in case of emergency.

(b) All departures should be preceded by a power check at the hover. The ideal departure is that which requires least power i.e., at a shallow angle. The pilot must therefore assess whether he can safely clear the obstacles ahead having made a standard departure.

(c) If the obstacles are too high or too near, the vertical or towering departure should be considered.

(d) It requires practice and experience to determine which method should be used, but the student should avoid departure in a manner which will put him close to the obstacles without first having achieved climb speed or at least translational lift.

(6) Aborted Departure

(a) If there is a mechanical failure or similar emergency, or if the pilot makes an error of judgement, he will have to abort. This is a critical manoeuvre and the pilot should remember:

(i) the earlier the decision to abort is made, the easier the recovery; and

(ii) that an effort should be made to maintain forward speed and to make co-ordinated turns back to the hover, if at all possible.

Operational Considerations

After the student has achieved competence in confined areas, the instructor should introduce operational considerations in both ground and air instruction. These include:

(a) When carrying out his power check prior to landing in a confined area, the pilot should estimate what the AUW will be when he departs. As a general rule, more power is required for a departure than for an approach, and if power available is found to be limited or marginal during the power check, this factor could be decisive.

(b) A pilot should always be alert to ways of improving a confined area he is using on a continuing basis. He should not be content to work over extended periods in conditions that are difficult, demanding, or even hazardous, unless it is unavoidable. Such things as the removal of trees from the lines of approach and departure, the removal of debris, or the levelling and enlargement of the landing pad whenever possible, will make an operation safer and more effective.

(c) Occasionally an area will require improvement before it can be used at all. A pilot should be able to brief a passenger in the air, during a reconnaissance, pointing out where the necessary improvements should be made. This aspect can be simulated by the instructor during later air instruction.

(d) A pilot should always inspect the general area surrounding the proposed landing site. There might well be an alternate close by that is less confined and therefore easier and safer to use.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON 1

(1) Introduce the full confined area procedures using an area that is large enough to permit a "standard" approach and departure.

(2) Student practice to the same confined area.

(3) Student practice to a different confined area of the same size.

(4) Demonstrate the full procedure to a smaller area that requires a steep approach and departure.

(5) Student practice to the same area.

(6) Student practice to other areas of the similar size.

AIR LESSON 2

(1) Demonstrate out-of-wind approaches, taking advantage of shape and surrounds.

(2) Student practice.

(3) Demonstrate aborted departures.

(4) Student practice.

AIR LESSON 3

(1) Student practice at selecting the most suitable confined area in a specific locale

POST FLIGHT DEBRIEFING

EXERCISE 25

TIPS FOR INSTRUCTORS

(1) This is a comprehensive exercise that may well require more than one session of preparatory ground instruction.

(2) If there is a shortage of suitable confined areas in the local training area, consider planning cross-country navigation exercises to locations further afield where there is more scope.

(3) When introduced to this exercise, most students will require more than one orbit of the area to obtain all the information they require. Encourage cutting down this number as proficiency increases, until experience reduces it to a practical minimum.

(4) Ensure the student picks out a reference near to the area so that he does not `lose' it.

(5) Explain that the order in which the **`S'**s are presented is flexible, and variations are permissible, providing all points are covered.

(6) Usually the more different types of area students are exposed to, for demonstration and practise, the more proficient and confident they become in this important part of the course.

(7) Explain the importance of looking for wires on the dummy approach, and the final stages of the actual approach.

(8) Point out that, depending on the wind velocity, it is permissible to accept crosswind and even downwind components to take advantage of size, shape, and gaps in obstacles.

(9) Alert the student of losing the wind when descending below the height of the obstacle, normally on the final stages of the approach.

(10) If a student has difficulty remembering the sequence, suggest that a memory aid be carried.

VORTEX RING

The aerodynamic stresses to which an airframe and rotor system is exposed during Vortex Ring State are virtually unknown. Exercise 26 which deals with this condition of flight has been retained, but the emphasis should be placed on the early recognition and avoidance rather than practising a fully developed Vortex Ring State. Controlling the rate of descent should be stressed in situations where Vortex Ring is likely to develop.

BECAUSE OF THE UNKNOWN STRESSES PUT ON THE HELICOPTER MANY SCHOOLS DO NOT FLY THIS AS A FULL EXERCISE, USING CLASSROOM DISCUSSION AND SCENARIOS TO COVER THE SUBJECT. RECOVERY CAN STILL BE PRACTISED IN THE AIR BY SIMULATING VORTEX RING. THIS CAN BE ACHIEVED IF IN TEACHING POINTS EX. 4C THE RATE OF DESCENT IS REDUCED TO 300-400 FEET PER MINUTE.

GROUND SCHOOL POINTS

Theory of Flight - Vortex Ring

PREPARATORY INSTRUCTION

Aim

For the student to learn the practical avoidance of, and recovery from, vortex ring state.

Motivation

It is preferable that the pilot altogether avoids the flight conditions that result in vortex ring. It is nonetheless desirable that he recognizes the symptoms of the incipient stage and can prevent it from developing into the full state, which in most operational situations, will result in an accident.

Airmanship

(1) Aircraft limitations
(2) Lookout

Teaching Points

(1) Review the causes, conditions, and symptoms of vortex ring (see Tips for Instructors, 3 and 4).

(2) Describe typical operational situations where the condition could be encountered, such as a steep approach at high all-up weight and density altitude conditions, with nil wind or a tail wind.

(3) Review recovery action discussing the advantages and disadvantages of:

    (a) increasing the airspeed; or

    (b) entering autorotation.

(4) Describe the techniques for initiating and recovering from vortex ring safely under training conditions, as follows:

(a) in nil or light wind conditions, climb to an altitude sufficient for safe recovery;

(b) carry out a good lookout, particularly below;

(c) initiate a rate of descent in the order of 500-1,500 feet per minute with an airspeed of 0-20 MPH;

(d) apply power;

(e) observe symptoms and rate of descent as appropriate to type; and

(f) recover by transition to forward flight, or entering autorotation.

(5) Stress that avoidance is preferable and that by being constantly aware of W/V and rates of descent, it should be possible to prevent it from occurring.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate incipient (and developed if desired **{NOT RECOMMENDED}**) vortex ring together with safe recovery procedures.

(2) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) This exercise need not necessarily involve a separate air lesson but can be combined with another dual flight.

(2) The airflow conditions which give rise to the formation of vortex ring will only occur if the following are present:

(a) the helicopter has induced flow passing down through the rotor system (IN POWERED FLIGHT);

(b) there is an external flow directly opposing the induced flow (HIGH RATE OF DESCENT); and

(c) the indicated airspeed is low (DOWNWIND OR CALM WIND CONDITIONS).

(3) Brief the student on the following symptoms of vortex ring:

(a) judder and stick shake;

(b) random yawing off heading;

(c) rapid increase in rate of descent;

(d) cyclic stick less effective; and

(e) random rolling and pitching.

(4) Students should avoid situations likely to cause vortex ring state, or if this is impossible, restrict the rate of descent to a low figure (200 FPM) when the airspeed is low (between 0-15 kts). This is because the most likely flight conditions occur when within 500 feet of the ground, when recovery techniques are unlikely to be successful.

PRACTICAL LOADING AND MAXIMUM WEIGHT OPERATIONS

GROUND SCHOOL POINTS

Flight Manual - Weight and Balance
- Performance Charts
- Air Regulations and ANO's re passenger briefing

PREPARATORY INSTRUCTION

Aim

For the student to learn safe loading and operation of the helicopter up to maximum approved gross weight.

Motivation

It is important that the pilot can make full use of his aircraft's capabilities, at the same time being fully aware of it's safe limitations.

Airmanship

Aircraft limitations
Passenger safety

Teaching Points

(1) Describe the practical aspects of loading and unloading cargo, as applicable to type, including the following:

(a) storage;

(b) security; and

(c) dangerous cargo.

(2) Describe the position and use of mandatory safety cards, and the practical aspects of embarking, carrying and disembarking passengers, stressing the need to brief on the following.

(a) location and operation of the ELT;

(b) location and operation of all doors and windows;

(c) location and operation of cargo compartment(s) or pods;

(d) operation of seat belts and shoulder harnesses;

(e) location and operation of fire extinguisher(s);

(f) smoking;

(g) location of first aid kit(s) and survival gear;

(h) hazards associated with main and tail rotor:

(i) specialized instructions concerning job at hand; and

(j) Hand signals for ground crew.

(3) Point out the effects of increased weight and/or density altitude on power required, power available and performance, including autorotational performance, as applicable to type.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Although included as one exercise in this guide, instruction and experience in loading and load carrying should be introduced progressively during the course after completion of the basic exercises. In some turbine helicopters, it is also possible for students to experience passenger carrying by embarking other students on dual training flight.

(2) Exercises that are reviewed at different aircraft weights up to maximum gross weight, should include:

Hovering Exercises (Ex. 10 and 16)
Steep Turns (Ex. 17)
Practice Forced Approaches (Ex. 19)
Sloping Ground (Ex. 23)
Advanced Take-offs and Landings (Ex. 24)
Confined Areas (Ex. 25)

POST FLIGHT DEBRIEFING

SLING LOAD OPERATIONS

GROUND SCHOOL POINTS

Flight Manual	- Limitations
	- Weight and balance
AIP AIR 1-19	- Marshalling Signals
Air Regulations	- Sections 508 and 534

PREPARATORY INSTRUCTION

Aim

For the student to learn safe sling load operations.

Motivation

Slinging forms a significant part of commercial helicopter operations. Properly managed, it is a safe and effective method of carrying loads.

Airmanship

Lookout
Limitations - engine and weight
Route selection

Teaching Points

(1) Show and describe the cargo hook fitted to the aircraft together with the systems of arming, loading, release, emergency manual release, and emergency external release.

(2) Show and describe the nets, straps, barrel hooks and any specialized equipment together with the inspections for suitability and serviceability.

(3) Describe in detail, the procedures in sling load operations including:

(a) pre-flight checks of the equipment;

(b) briefing of ground crew;

(c) hooking-up, with and without ground crew;

(d) in-flight procedures, including emergencies; and

(e) release, with and without ground crew.

(4) Students experiencing serious difficulty in maintaining control, should jettison the load. For this reason, routes should be selected over open country to minimize the danger of persons or property.

(5) Explain that loads that are large in size relative to their weight can cause handling problems in forward flight. Describe the symptoms of load oscillation and how they can often be anticipated and stabilized before hook-up. Explain that should oscillations occur in flight, they can often be cured by either a reduction in airspeed, or by making gentle balanced turns.

(6) If, despite all efforts to prevent or cure oscillations, they start to hazard the safety of the aircraft and crew, the pilot should be mentally and physically prepared to jettison the load before control is lost. This should also be an immediate reaction to an engine failure or similar in-flight emergency.

(7) Explain the advantages of a well sited mirror.

(8) Point out the need for higher hover heights and modified approach and departure paths to maintain obstacle clearance, and the resultant extra power required.

AIR LESSON

(1) Demonstrate pick-up and release procedures with ground crew.

(2) Student practice.

(3) Demonstrate emergency procedures including hydraulics out, use of manual release and external release by ground crew.

(4) Student practice.

(5) Demonstrate enroute procedures that minimize danger to persons and property on the ground.

(6) Student practice.

(7) Demonstrate slinging difficult loads and oscillations dampening procedures.

(8) Student practice.

(9) Demonstrate pick-up and release procedures without ground crew.

(10) Student practice.

POST FLIGHT DEBRIEFING

EXERCISE 28

TIPS FOR INSTRUCTORS

(1) Students will sometimes be apprehensive of slinging and care must be taken not to overstress the problems or difficulties associated with this type of operation.

(2) It is of the utmost importance that the training helicopter be fitted with a mirror on the instructor's side of the aircraft, in addition to the student's mirror. Ensure the student knows how to adjust the mirror, and how to position it for short and long loads.

(3) Impress upon the student to always use a swivel between the helicopter and the load.

(4) If possible use students, under supervision, as ground crew to give them experience of both sides of the operation, be sure to brief them on static electricity.

(5) Describe how to plan ahead to obtain the best fuel load.

(6) Explain the importance of keeping the slinging area clear of debris, such as hats, tarps, boards, etc.

(7) Demonstrate a gradual increase in airspeed up to the highest speed for a particular load, then reduce speed slightly as a safety margin. Make sure that the student resists the urge for more speed, as beyond that point is usually where the oscillations develop.

(8) Demonstrate as many different types of load using as many types of slinging equipment as possible.

TYPE CONVERSION

GROUND SCHOOL POINTS

Flight Manual and any manufacturer's training publication.
Power plant manufacturer's publications.
Turbine/piston theory as appropriate.

PREPARATORY INSTRUCTION

Aim

For the student to learn how to convert safely and effectively from one type of helicopter to another.

Motivation

Thorough conversion from one type of aircraft is essential to flight safety. This is particularly the case where students convert from piston to turbine engined aircraft.

Airmanship

As appropriate to the air lesson.

Teaching Points

These should be as appropriate to type but should include a review of all exercises flown by the student so far. Particular attention should be paid to differences in:

(1) Performance limitations including:

- (a) airspeeds in powered and autorotational flight;
- (b) VNEs;
- (c) Gross weight and C of G;
- (d) engine and transmission limits; and
- (e) emergency procedures.

(2) Handling characteristics including:

- (a) control response;
- (b) idiosyncrasies peculiar to type; and
- (c) ancillary controls.

(3) Visual cues and instrument indications.

EXERCISE 29

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) All previous air lessons should be reviewed. Particular attention should be paid to areas where performance and characteristics are in any way different.

POST FLIGHT DE BRIEFING

TIPS FOR INSTRUCTORS

Time taken will differ from student to student depending on aptitude, experience and helicopter type.

INSTRUMENT FLYING 1
EFFECTS OF CONTROLS

GROUND SCHOOL POINTS

(1) Explain that flight instruments can be divided into three types:

(a) Pitch instruments
(b) Bank instruments
(c) Navigation instruments

Explain the function and mechanical operation of each group of instruments, their limitations, errors and pilot service-ability checks.

(a) Pitch Instruments

attitude indicator (artificial horizon)
airspeed indicator
altimeter
vertical speed indicator.

(b) Bank Instruments

attitude indicator (artificial horizon)
heading indicator (D.I.)
turn and bank indicator

(c) Navigation Instruments

VOR	DME
ADF	marker beacons
ILS	transponder

(2) Explain the application of engine instruments to instrument flying:

(a) manifold pressure gauge/torquemeter. Give specific power settings as applicable to type and local conditions.

(b) tachometer.

(c) engine instruments.

(3) Discuss flight planning procedures and in particular:

(a) Publications, maps, MET forecasts.
(b) Aircraft limitations as appropriate to type
(c) Pre-flight inspection, including pitot heat and static source, as appropriate
(d) Post start and hover taxi checks of flight instruments and radio aids.

EXERCISE 30

PREPARATORY INSTRUCTION

Aim

For the student to learn to fly by sole reference to the instruments and to use radio aids to navigation.

Review

(1) Airspeed and Power Changes (Ex. 4)
(2) Climbs and Descents (Ex. 5)
(3) Turns (Ex. 6)
(4) Steep Turns (Ex. 16)

Motivation

An ability to fly safely on instruments is vital should visual contact with the ground be lost whilst flying at night.

Airmanship

Explain that the avoidance of obstacles and other traffic and the general safety of the flight will be the responsibility of the instructor acting as Safety Pilot.

Teaching Points

(1) Describe the effect of fore and aft movement of the cyclic on the

    (a) attitude indicator
    (b) altimeter
    (c) VSI
    (d) airspeed indicator.

(2) Describe the effect of lateral movement of the cyclic on the

    (a) attitude indicator
    (b) direction indicator
    (c) magnetic compass
    (d) turn and bank indicator.

(3) Describe the effect of the tail rotor pedals on the

    (a) direction indicator
    (b) magnetic compass
    (c) turn and bank indicator
    (d) airspeed indicator
    (e) tachometer (piston engine)

(4) Describe the effect of collective pitch control on the

    (a) altimeter
    (b) vertical speed indicator
    (c) engine instruments.

(5) Explain:

(a) the need to trust the instruments and to ignore body sensations
(b) the need to develop a habit of systematically scanning or cross checking the instruments
(c) that it is often difficult to avoid being able to get visual reference to the ground, when flying under simulated instrument conditions. Stress the importance of not cheating in this regard.

(6) Explain that since the flight instruments are designed for fixed-wing use, it is necessary to maintain positive airspeed at all times when instrument flying. State the minimum IAS to be observed as appropriate to type.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Student practice, Exercises 4, 5, 6 and 16 clear hood.

(2) Demonstrate effect of controls on flight instruments.

(3) Student practice under the hood.

(4) Demonstrate straight and level cruise and very simple changes of altitude and heading.

(5) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Student practice should be kept brief, with frequent rest periods.

(2) Glimpses of the ground in the student's peripheral vision will be very distracting to the student and will encourage disorientation, vertigo or cheating. Every effort should therefore be made to provide an effective hood and to bank-off perspex panels that are in the student's line of sight.

EXERCISE 30

INSTRUMENT FLYING 2

STRAIGHT AND LEVEL FLIGHT
CLIMBS, DESCENTS AND TURNS

PREPARATORY INSTRUCTION

Aim

For the student to learn how to fly in straight and level flight, climbs, descents and turns by sole reference to instruments.

Review

Effects of Controls - Instrument Flying 1

Motivation

A logical sequence towards full control of the aircraft under instrument flight conditions.

Teaching Points

Describe to the student how to select and maintain the following flight regimes, pointing out the required instrument indications, on both full and limited panel:

(a) Straight and level cruising flight.
(b) Airspeed changes at constant altitude.
(c) Climbs and descents at cruise power/airspeed.
(d) Climbs and descents at selected power/airspeed settings.
(e) Climbs and descents to pre-determined altitudes.
(f) Turns.
(g) Turns to pre-determined headings.
(h) Climbing and descending turns.
(i) Climbing and descending turns to pre-determined altitudes and headings.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Demonstrate straight and level flight at various airspeeds, climbs, descents and turns, as briefed.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) This lesson is likely to involve more than one flight, particularly if the student has no previous instrument flying experience.

(2) At the termination of this lesson, the student should be at a standard where ADF/VOR procedures can be introduced without being compromised by inaccurate flying.

finish

EXERCISE 30

INSTRUMENT FLYING 3

UNUSUAL ATTITUDES

PREPARATORY INSTRUCTION

Aim

For the student to learn safe recovery procedures from unusual attitudes in instrument flight.

Motivation

Explain to the student that stress, disorientation or vertigo, and lack of recent practice can lead to insufficient attention or accuracy in instrument flying. This can result in attitudes, airspeeds and power settings falling outside the normal instrument flying envelope. It is vital that the student recognizes instrument indications that this has occurred, and take safe, prompt and effective recovery action.

Teaching Points

(1) Remind the student that it is vital to believe the instruments particularly when other sensory clues suggest otherwise.

(2) Point out that a complete scan of all the instruments is vital when taking recovery action.

(3) Explain that as soon as an unusual attitude is detected, a recovery to level flight must be made as soon as possible, with a minimum loss of attitude.

(4) Describe how unusual attitudes are to be practised during the air lesson:

   (a) Instructor takes control and requests the student to come off the controls and to close his eyes.

   (b) The instructor manoeuvres the aircraft for 3 or 4 minutes, through turns, climbs and descents, terminating in an attitude other than straight and level cruise. (**NOTE** - this manoeuvring should not be violent or abrupt).

   (c) The instructor requests the student to place hands and feet on the controls, open his eyes and take control of the aircraft.

   (d) The student effects a recovery to straight and level cruise flight, carefully monitored by the instructor. Recovery should be made by reference to the airspeed indicator, altimeter, turn and bank, and vertical speed indicator. The attitude indicator can be used in the roll axis but can only be used for the pitch axis in conjunction with the other instruments.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Review earlier exercises.

(2) Practice unusual attitudes, as briefed.

POST FLIGHT DE BRIEFING

EXERCISE 30

INSTRUMENT FLYING 4

EMERGENCIES

PREPARATORY INSTRUCTION

Aim

For the student to learn how to handle in-flight emergencies under instrument flight conditions.

Motivation

Point out that emergencies can occur as easily in instrument as in visual flight conditions. Practising emergency procedures under simulated conditions will make an actual emergency easier to handle.

Teaching Points

(1) Engine Failure

Explain that:

(a) Entry into autorotation should be made normally, with an accent on smooth handling of the controls.

(b) Airspeed should be for minimum rate of descent.

(c) After autorotoation is established, gentle turns can be made if required - e.g. away from known obstacles or into the last known wind.

(d) An autorotation from an actual engine failure would hopefully be terminated under clear hood conditions in a normal manner. Practice autorotations should be terminated with an overshoot at a safe altitude.

(2) Airframe Emergencies

Review as appropriate to type and point out any special considerations for instrument flight.

(3) Communication Failure

Review Emergencies and Equipment Failure - IFR as specified in A.I.P. Canada.

Confirmation

PRE FLIGHT BRIEFING

EXERCISE 30

AIR LESSON

(1) Review earlier exercises as required.

(2) Demonstrate entry into autorotation, descent and overshoot.

(3) Student practice.

(4) Demonstrate emergency procedures as appropriate to type.

(5) Student practice.

(6) Student practice - communication failures.

POST FLIGHT DEBRIEFING

EXERCISE 30

INSTRUMENT FLYING 5

RADIO AIDS

GROUND SCHOOL POINTS

(1) VOR Procedures

(a) establishing position
(b) intercepting a given radial
(c) tracking inbound and outbound, with drift correction
(d) station passage.

(2) ADF Procedures

(a) establishing position
(b) intercepting a predetermined heading
(c) tracking inbound and outbound, with drift correction
(d) station passage.

PREPARATORY INSTRUCTION

Aim

For the student to learn VOR and ADF orientation and tracking procedures.

Motivation

VOR and ADF are very effective aids to navigation, particularly at night and other circumstances when clearly identifiable landmarks are scarce or hard to verify.

Teaching Points

(1) VOR

Review the practical aspects of:

(a) serviceability checks, station tuning and identification.

(b) establishing the aircraft's position relative to the station.

(c) intercepting a given radial.

(d) tracking inbound on a given radial.

(e) indications of station passage.

(f) tracking outbound on a given radial.

(2) ADF

Review the practical aspects of:

(a) serviceability checks, station tuning and identification.

(b) establishing the aircraft's position relative to the station.

(c) intercepting a given inbound track.

(d) tracking inbound with drift correction.

(e) indications of station passage.

(f) tracking outbound, with drift correction.

(3) Other Radio Aids

Review the practical uses and operation of other radio aids with which the training helicopter is equipped.

Confirmation

PRE FLIGHT BRIEFING

AIR LESSON

(1) Review earlier instrument air exercises.

(2) Demonstrate use of the VOR as briefed.

(3) Student practice.

(4) Demonstrate use of the ADF as briefed.

(5) Student practice.

(6) Demonstrate use of other radio aids, as briefed.

(7) Student practice.

POST FLIGHT DEBRIEFING

NIGHT FLYING 1

CIRCUITS

GROUND SCHOOL POINTS

Night Flying Equipment Order. ANO II, No. 6

Rotorcraft Air Transport Operations Order. ANO VII, No. 6

PREPARATORY INSTRUCTION

Aim

For the student to learn how to fly VFR at night.

Motivation

Although there are no new flying skills required for flying at night, there are new sensations and visual cues for the pilot to become accustomed to. Circuits are a good introduction to night flying.

Airmanship

Tail rotors are even less visible at night than by day.

Teaching Points

(1) Point out that eyes take sometime to adapt to the dark. Pilots should avoid bright lights for at least 30 minutes prior to take-off.

(2) Discuss the problems of carrying out an effective pre flight inspection of the helicopter in the dark. When possible, this inspection should be carried-out before dark or in a lighted hangar. Items such as landing, instrument, and navigation lights can be checked separately just before start-up. It is essential that the electrical system and all lights and instruments are fully serviceable.

(3) Point out that the landing light can produce glare and disorientation when hovering or hover taxiing particularly over light coloured surfaces such as concrete. This can generally be avoided by adjusting the beam of the light.

(4) Where landing lights are not adjustable from the pilot's position (e.g. BH 47) it is sometimes safer to hover-taxi with the light out. Adequate ground reference must be available when this is contemplated. Non-adjustable landing lights should be pre-set to approximately 45° to the ground in order to illuminate an autorotation.

(5) Stress the need for good visual cues at night and point out how easy it is to become disoriented without them. A good weather briefing is a vital part of flight planning.

(6) Describe the Air Instruction to the student and stress the following points:

(a) Circuits

(i) Hover taxiing should be higher than by day, and slower.

(ii) Transitions from the hover to forward flight should be of the "towering" type. A rate of climb should be initiated before moving into forward flight, and maintained throughout the transition.

(iii) Climb out, cross-wind and downwind legs as by day.

(iv) On the final leg, identify the landing point and carryout an accurate constant angle approach. The proper reduction of forward speed from the approach airspeed to nil ground speed at the hover, is more difficult than by day. Stress the need for looking out to the side of the helicopter at frequent intervals when making an approach, in order to check on the rate of deceleration.

(v) Due to a comparative lack of visual cues, more reliance has to be made on the flight instruments than by day. This must not be at the expense of a good lookout for ground reference, other traffic, etc.

(b) Emergencies

(i) In the event of an engine failure, the following sequence should be followed:

1. Enter autorotation.
2. Turn into wind if possible.
3. Switch on landing light.
4. Select forward speed for a constant attitude approach.
5. Select a safe area to touchdown.
6. Apply collective and land.

(ii) Constant Attitude autorotations should be used at night whenever possible. This type requires no flare and is useful because the landing light remains effective throughout the landing sequence. Approach speeds are generally lower than those recommended for minimum rate of descent (e.g. BH47-45 kts, BH06-45 KTS).

(iii) Airframe and engine emergencies not requiring an autorotation, as appropriate to type by day.

(iv) Disorientation or loss of visual cues. Revert to flying by instruments, establish straight and level cruising flight followed by a gentle 180° turn in order to regain visual reference to the ground.

Confirmation

PRE FLIGHT BRIEFING

EXERCISE 31

AIR LESSON

(1) Supervise the pre flight inspection.
(2) Demonstrate night pre take-off checks.
(3) Demonstrate hovering exercises and the circuit.
(4) Student practice.
(5) Demonstrate autorotations.
(6) Student practice.
(7) Demonstrate emergencies as appropriate to type.
(8) Student practice.
(9) Demonstrate recovery from losing visual reference with the ground.
(10) Student practice.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) Instructors are reminded that the privileges of a Student Pilot Permit do not include solo night VFR flight.

(2) Before commencing night flying a student should be reasonably proficient in instrument flying.

(3) The 5 hours of instrument flight time is in addition to the 10 hours night flight time. Instrument instruction that is carried-out at night cannot be logged by the student as counting toward both instrument and night flying experience.

(4) Autorotations to touch down by night are feasible but require more judgement than by day. Power recoveries at a safe height are an acceptable method of instruction where the extra risk cannot be accepted. In either case, autorotations should be practised over an area that is known to be flat, level, clear of obstructions and with adequate visual reference.

EXERCISE 31

NIGHT FLYING 2

CROSS-COUNTRY NAVIGATION

PREPARATORY INSTRUCTION

Aim

For the student to become familiar with flying cross-country at night.

Motivation

Visual cues and psychological effects flying cross-country, are different at night. It is preferable that pilots first experience these in a controlled training environment.

Teaching Points

Explain the following:

(1) Comprehensive weather briefing and pre-flight planning are even more important than by day.

(2) Navigation features such as railways and country roads will generally not be visible to the pilot unless the ground is snow covered or there is a bright moon. At the same time cities and towns will often be visible from a greater distance than by day.

(3) Compass headings should be accurately maintained and corrections made only when the position, fixed by check points or radio aids is absolutely certain.

(4) Accuracy in time keeping is essential.

(5) The minimum enroute altitude flown, should be the cruising altitude appropriate to aircraft track, above the minimum enroute altitude (MEA) found on the Enroute Low Altitude and Terminal Area Charts.

(6) Assign a cross-country for the student to plan, that will take approximately 60 minutes to fly, consisting of 3 or more legs. Turning points should consist of features readily identifiable at night.

Confirmation

PRE FLIGHT BRIEFING

Review and discuss the students plan.

AIR LESSON

Fly the cross-country as planned.

POST FLIGHT DEBRIEFING

TIPS FOR INSTRUCTORS

(1) An effective instructional method is to fly a cross-country exercise that starts in the daylight and terminates after dark. In this way, the student can become aware of the problems of flying in fading and half light.