# Helicopter Flight Instructor Manual

ISSUE 3: MARCH 2012

# FOREWORD

One of the important ingredients for a safe and viable aviation industry is a properly resourced flying training sector.

Some of those resources can be quite fundamental. For example, an important contribution to training is for flying instructors to have available to them a basic guide to elementary flying training.

For many years CASA and its predecessors has published such a document for the fixed wing flying training sector and now we are publishing a similar document for the rotary wing sector. This document is Issue 3 of the Flight Instructor Manual – Helicopter developed from extensive feedback from the helicopter training industry. It also includes material developed in conjunction with the Civil Aviation Authority of New Zealand.

Readers are encouraged to provide feedback to ensure that any further versions meet industry needs.

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Where the helicopter manufacturer's flight manual or pilot operating handbook, or similar document describes techniques different to those in this manual, the manufacturer's techniques must take precedence.

All flying schools in Australia are required to maintain an operations manual, the procedures and techniques as laid out in the flying school operations manual must take precedence over the techniques referred to in this manual.

You should also refer to current rules and the Aeronautical Information Publication (AIP) for full details of operational requirements.

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# CONTENTS

# PART 1

## PRINCIPLES AND METHODS OF INSTRUCTION

This part outlines and discusses the various methods and techniques that have proven to be effective for use in the flying training environment.

# INTRODUCTION

## THE TRAINER

What is a trainer?

The Macquarie Dictionary definition of the word train is: 'to make proficient by instruction and practice'.

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

Part one of this guide describes some basic instructional techniques that apply to:

- Ground school training
- Preparatory ground instruction
- Pre flight briefing
- In flight instruction
- Post flight briefing (debriefing).

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

## LEARNING

No one ever learns except through their own activity, and, strictly speaking, there is 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 proficient, safe pilots.

## LEARNING FACTORS

Listed on the next page 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:

**READINESS:** Ensure students are mentally, physically and emotionally ready to learn.

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

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

**EXERCISE:** Ensure students are engaged in meaningful activity.

**INTENSITY:** Use dramatic, realistic or unexpected things, as they are best remembered.

**EFFECT:** Ensure students gain a feeling of satisfaction from having taken part in a lesson.

**RECENCY:** Summarise and practise the important points at the end of each lesson, as the last things learned and practised will be remembered the 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 that offer specific suggestions on what you can do to utilise these 'tools' in your instruction.

**READINESS:** Ensure students are mentally, physically and emotionally ready to learn.

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.

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, or if personal problems seem insoluble, then the student will be unable to develop the interest to learn.

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

- 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.
- 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.
- 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.
- 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 an aeroplane pilot licence, you could point out that the sequence of control movements is the same as in an aeroplane. This concept is closely related to the RELATIONSHIP learning factor.
- 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.
- 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 to 48 hours after the material has been learned. 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 FIGS 1 & 2 and the notes below each diagram.

**Figure 1: Curve of remembering**


Figure 1

Notes: Statistics are based on an average cross section of students.

The curve is very steep initially: within 2 days students will remember less than 70% of what they learned.

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

**Figure 2: Curve of remembering**

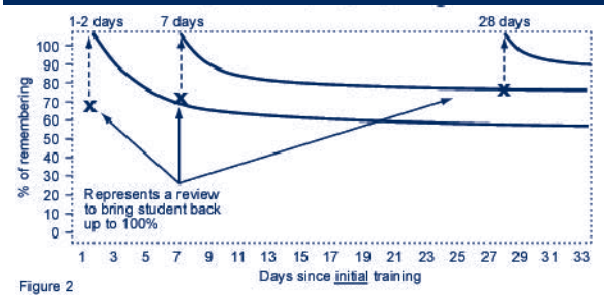



Figure 2

Notes:

- To maintain at least a 70% level, a review should be conducted within 2 days.
- After the material is learned a second time the curve flattens out somewhat, but after 7 days the student is back down to the 70% level.
- Another review at 7 days and the curve really flattens. The student will be above 70% retention until approximately day 28.
- A review at this time will generally cause long-lasting retention of lesson material.
- 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

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

When students are presented with new knowledge or skills, the first impression they receive is almost unshakeable. This means that what you teach must be correct the first time. Students may forget the details of lessons, but they will retain an overall image of the skill or knowledge for a long time. Frequently you will be required to perform manoeuvres in the helicopter 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.

Suggestions:

- Rehearse lessons to become thoroughly proficient at the skill or in answering questions related to the subject.
- 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.
- 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.
- 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 that you 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.

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

This particular learning factor emphasises 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.

Suggestions:

- Present lessons in a logical sequence:
  - known to unknown
  - easy to difficult
  - concrete to abstract
  - simple to complex
  - familiar to unfamiliar.
- 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 $2 \times 2$. 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 ($2 \times 4$) allows students to build on knowledge already gained. The process is continued until students have mastered all the required knowledge and skills necessary to solve real problems.
- 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.

  Reinforce students' learning of new facts or ideas by frequently summarising the major points of your lesson.
- 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 visualise relationships between the new material and things that have happened before. This is called using 'verbal aids' for your instruction.

**EXERCISE:** Ensure students are engaged in meaningful activity.

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 towards a specific goal. Oral questions, hypothetical problems, dual review, or solo practice are all methods of providing mental or physical activity.

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. For you as a flight instructor, these two words are probably the most important in your vocabulary. Study Table 1 opposite and note both the instructor and student activities for each level of learning. Should you attempt to employ the application level of learning without having covered the understanding level, students will probably encounter much more difficulty than if they had mastered previous levels.

Suggestions:

- Unless you are 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 their understanding of the new knowledge.
- Once you have told students a fact, avoid repeating yourself. Instead, have them relate the facts back to you. This strengthens their learning and confirms their knowledge of the required material.
- 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.

**Table 1: Instructor and student activities for each level of learning**

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

- 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 these subjects to the required standard.

**INTENSITY:** Use dramatic, realistic or unexpected things, as they are best remembered.

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 appropriate opportunities you can to introduce unexpected things to your students.

The INTENSITY learning factor 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.

Suggestions:

- Show enthusiasm and sincerity for the subject you are teaching.
- Attempt to employ a wide range of speech variation in rate, volume and pitch to keep students attentive.
- 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.
- 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.

**EFFECT:** Ensure that students gain a feeling of satisfaction from having taken part in the lesson.

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 a 'wingover' type manoeuvre during the first air exercise, 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 emphasise 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 were to make the student feel defeated, then you would probably succeed. It is better to point out the positive aspects of a student's performance first and then discuss the major errors that were committed and finish with suggestions for improvement.

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.

Suggestions:

- Involve students in the lesson by developing some of the new material with them. This can be done by asking students questions related to the subject and allowing students to contribute knowledge and ideas.
- 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 help and correction where needed.
- Show students how to improve, and offer praise when improvement occurs.
- 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 helicopter has two static vents, one on each side of the fuselage.' This is a fact, but if students do not know the reason for the 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 a helicopter with only one vent is encountered more attention may be given to instrument readings while making a cross-wind approach.
- 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. Rather than having 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 causing 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.
- 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.
- 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 pre-flight inspection on a specific helicopter for which you have a component such as a nut placed on the ground under the engine. Your student notices the offending part and brings this to your attention and is praised for this. If a thorough inspection is not completed, you have an excellent teaching point to emphasise why careful inspections must be done.

**RECENCY:** Summarise and practise the important points at the end of each lesson, as things learned and practised last will be remembered longest.

Other things being equal, the things learned last 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.

Suggestions:

- Plan for a pre-flight briefing immediately before the air exercise, and review the main points by questioning. This may sound like the READINESS and EXERCISE learning factors; however, recency deals with the timing of the practice.
- Ensure that students receive a thorough summary of the important points towards the end of each lesson.
- After each sequence within an exercise or class presentation, ask questions on the material or summarise the 'need to know' material.
- Conduct a test as the final part of your lesson.
- At intervals throughout the course, conduct review sessions in which no new material is taught, but reinforcement of previously learned material is obtained.
- Attempt to finish each lesson with a practice 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.

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

# ORAL QUESTIONS

## GENERAL

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

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 thoughts progress, 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

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 to work 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.

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 and thereby arouses interest. You can maintain this interest throughout the lesson by the continuous development of facts and ideas. Remember: Telling is NOT teaching.

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 students' 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.

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 that students are following before you proceed to the next stage. At the end of the lesson, such questions 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 issue mentioned above is not a problem.

## DESIRED QUALITIES OF GOOD ORAL QUESTIONS

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.

**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.

**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.

**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.

**ABOUT THE 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 time so that these points are emphasised.

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:

**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.

**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.

**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 recognise 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.

**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; the instructor may say 'Right' to an incorrect answer. This could lead to student confusion. You should always listen to the answer.

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

## HANDLING STUDENT ANSWERS

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

**DISCOURAGE GROUP ANSWERS.** When students answer as a group it is difficult to determine who supplied correct or incorrect answers; this may lead to student confusion. When you are 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.

**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 on 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.

**GIVE CREDIT FOR GOOD ANSWERS.** This is especially true for the weak or shy student. When you are 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.

# HANDLING STUDENT QUESTIONS

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:

**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 minds.

**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.

**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 then say that it is a question you would prefer to discuss after class.

**DO NOT BLUFF.** No matter how knowledgeable you are of your subject, there will be times when you will be asked a legitimate question and will not have an answer. If you do not know the answer, say so—don't bluff. Tell the class you will find the answer. Ensure you do, and then inform the individual who asked, as well as the rest of the class.

**ENSURE THAT 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.

# THE DEMONSTRATION–PERFORMANCE METHOD OF TEACHING

## GENERAL

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 helicopters, interpreting blueprints, driving vehicles, welding, building, shooting, repairing, solving problems, filling out forms—all of these, and many more, can be best taught by using the demonstration–performance method.

The demonstration–performance method can be broken down into five basic procedures:

- explanation
- demonstration
- student performance
- instructor supervision
- evaluation.

## EXPLANATION AND DEMONSTRATION

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

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

- Demonstrate a forced approach and simultaneously give an explanation of what you are doing and why you are doing it.
- Complete the demonstration with no explanation and then give a detailed explanation of what you have done.
- Give an explanation of what you intend to do and then do it.

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.

- On the flight before the exercise on 'practise forced landings' (PFL's), give a perfect demonstration of a PFL. 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 before 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.
- The next step would be for you to give a full detailed explanation of a practise 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; use visual aids to assist student learning.
- 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 that they know the procedure, although they have not yet flown it.
- After completing the practise forced landing approach, and while climbing for altitude, clear up any misunderstandings the students may have and ask questions.
- 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.

## STUDENT PERFORMANCE AND INSTRUCTOR SUPERVISION

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.

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

Referring to our example of the practise forced landing, consider the following suggestion of how to divide the task into segments:

On the student's first attempt:
You, the instructor:

- select the field, making sure that it is within easy autorotational range
- perform all in-flight checks, including LOOKOUT.

The student flies the helicopter and concentrates on making the field.

If the student makes a major error, you take control and place the helicopter in the correct position, then give the 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.)

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

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.

## EVALUATION

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

For the practise forced landing 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 lookout.

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 analyse any errors that the student may make and debrief accordingly.

> NOTE: Of course, you would interrupt the student's performance if safety were to become a factor.

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

## RULES FOR USING THE DEMONSTRATION PERFORMANCE METHOD

Give a perfect demonstration or, if this is not practicable, show the 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.

Give a step by step explanation of the required task. Use reasons, examples and comparisons to make the explanation clear.

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 it is correctly done, before you go on to the next step.

Continue until the student has imitated each step.

Provide student practice, with assistance as necessary.

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.

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.

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

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 navigation 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

The following techniques, if applied in a conscientious manner, will help the flight instructor to give 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 for air instruction on a one to one basis, individual preparatory ground instruction, or pre flight briefings.

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

## PREPARE A LESSON PLAN

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.

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.

What to avoid: Writing material out in full detail (this promotes reading of the material while you are in front of the class); using single space format (this does not allow for revision of the notes the next time the lesson is to be given); writing in longhand, unless you are able to read your notes at a distance of 1 metre. (This makes you appear not to know your material because you have to look closely at your lesson plan rather than just glance at it to jog your memory.)

## PREPARE THE CLASSROOM/TEACHING AREA BEFORE THE LESSON

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 organising aids or rearranging seating.

## PREPARE/CHECK TRAINING DEVICES/AIDS BEFORE THE LESSON

Reason: This avoids embarrassment should an item not work, or should any chart, slide or graph be shown in the wrong order.

## PREPARE YOUR STUDENTS FOR LEARNING

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

How to do it:

- 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.
- 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.
- Give students an overall 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.
- The length of time required to prepare students for learning depends primarily on their background knowledge and the complexity of the material. As a general guide, the amount of time needed is approximately 10% of the lesson.

## START THE PRESENTATION OF NEW MATERIAL AT THE STUDENTS' LEVEL OF UNDERSTANDING

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

How to determine the students' level of understanding:

- Before the instruction starts, conduct a Threshold Knowledge Test to determine what your student knows or doesn't 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.
- During the course of instruction have periodic reviews.
- Conduct a review of previous lessons before you start each lesson. The review should consist of a series of questions. If your students answer correctly, proceed. If they do not, re-teach.
- Check with other instructors for the strengths and weaknesses of your students, and arrange your material to fit the students' needs.

## PROCEED AT THE RATE OF STUDENT COMPREHENSION

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

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

- 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 to 12 minutes.
- 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.
- Observe your students closely for facial expressions that could indicate that they do not understand a particular point. If students say they understand, ask them a question to make sure.
- Encourage students to ask questions on points that they do not fully understand.
- Provide for lots of practice of basic skills before you go on to the more complex parts.

## IDENTIFY AND EMPHASISE MAJOR POINTS FOR THE STUDENTS

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

How to identify and emphasise points for your students:

- 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.
- Have students write the main points down in their notebooks, or provide notes that include these main points.
- Make a verbal statement to the students, such as: 'This particular point is very important: remember it.'
- 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.
- Raise the volume of your voice and reduce the rate of delivery while stating an important point, to add emphasis.
- Besides emphasising the main points, you should also emphasise safety and the points that are easily forgotten or difficult to remember.
- Provide emphasis according to relative importance. The most important things get a greater amount of emphasis.
- Emphasise points by giving verbal examples (real or imaginary); by comparisons (similarity to, or difference from, known facts); and, perhaps most importantly, by giving reasons for each point you make. Students tend to remember better if they understand the reasons behind every point they must learn.

- Repeat the point frequently by using summaries, or have your students repeat the point by answering your questions.
- Conduct periodic reviews of the 'need-to-know' material.
- Have the students complete a home assignment of the important points of a lesson.
- Have students record, in note form, the major ideas or items that you feel must be emphasised. By having them write ideas down you are using another sense, so learning may be reinforced.
- Use a variety of training aids to appeal to several senses (touch, feel, etc.).
- Do not emphasise 'nice-to-know' material.

## GIVE CLEAR EXPLANATIONS AND DEMONSTRATIONS

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.

Suggestions for ensuring that your explanations and demonstrations are clear:

- Start verbal explanations by referring to something already known by your students. Association of ideas makes it easier to follow your explanation.
- 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?')
- 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.
- If you are required to demonstrate something, make sure you can do it correctly before you show the students.
- Make sure all students can see even the smallest points of a demonstration; if necessary, gather them around you.
- 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.

## USE VISUAL AIDS AND USE THEM EFFECTIVELY

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

Sources of ideas:

- graphic artists or personnel associated with the production of visual aids
- other instructors, who can often give spark to an idea
- commercial displays in newspapers, magazines, television and stores
- finally, your own imagination, which (if you give it full rein) is an excellent source of ideas for aids.

Types of visual support:

- actual equipment
- mock-ups, charts, diagrams, pictures or models
- DVDs, films, videotape and cassette recordings
- sometimes, people.

Guidelines:

- 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 students learn the 'must-know' information.
- Plan to use a visual display of all major points that are covered during your lesson. Simple wording on the whiteboard is usually better than repeating the main points over and over again.
- Make your aids simple and clear. Eliminate all unnecessary data. Avoid the tendency to produce ornate, detailed artwork.
- 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.
- Use a variety of colours 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.

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.

- If the aid includes written words, have someone check for correct spelling and grammar. You would be surprised how many times misspelled words are displayed for students.
- If possible, stand well away from the aid and use a pointer, so that you do not obstruct the view of any student.
- If you are 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.

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

## VARY THE RATE, VOLUME AND PITCH OF YOUR VOICE WHEN DELIVERING THE LESSON

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.

Consider:

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

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

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.

Consider:

- Look directly at the students, but do not stare at any particular individual for too long at a time. If students avert their eyes it means you have stared too long and possibly caused some embarrassment—look elsewhere.
- Make your eye contact impartial. Do not favour any individual student or group of students; include them all in your presentations.

## PROVIDE FOR MAXIMUM STUDENT ACTIVITY DURING THE LESSON

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

Consider:

- 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.
- Use sound questioning technique, as outlined in the section 'Oral Questions'.
- Distribute your questions evenly among all the students, to avoid having a few answer all the questions.
- Make your questions thought provoking and challenging.
- Avoid questions that require a simple YES or NO answer, unless you immediately follow up with a 'why' or 'how' question.
- 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.
- 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.

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

# DEVELOPMENTAL TEACHING OR TEACHING BY QUESTIONING

Developmental teaching is based upon a student-centred philosophy of teaching that requires you to reason with students to have them meet predetermined objectives. By using the students' background knowledge, you ask questions that lead the 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.

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 that 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.

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 the students' progress.

Careful planning for developmental teaching is critical because you must formulate appropriate questions that 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.

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

## RATES OF LEARNING

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 redirecting your instruction to level them out as much as possible.

## ADVANCES AND PLATEAUS

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 that 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 1: Curve of remembering**

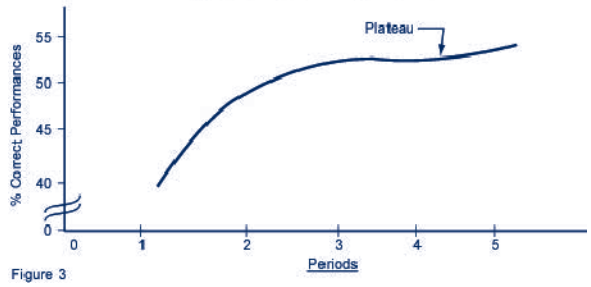



Figure 3

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.

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:

- diversions
- lagging or lacking motivation
- emotional disturbances
- upset training schedule
- weather
- equipment breakdown
- unavoidable absences.

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, and this 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.

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.

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.

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 practice. Students may be nearly ready for a flight test at an early stage, and added training will only show slight, slow improvement.

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, particularly to the detriment of other evolutions.

# INDIVIDUAL DIFFERENCES

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 recognise that students are different. You must recognise that this fact dictates how much you can teach, at what rate, and when.

## PERSONALITY DIFFERENCES

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 whether 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.

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

Emotions play an important part in the training of a student. You must know the kinds of emotions and the techniques needed to control 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 paralysed. 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 recognise and overcome it.

## DEGREES OF EMOTION

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

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.

STRONG EMOTION: This degree of emotion is not felt very often in everyday life, but it 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.

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

## THE EFFECT OF STRONG EMOTIONAL TENSION

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.

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

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 that indicate that a student is using escape mechanisms.

- PROJECTION: transferring the blame from oneself to someone or something else.
- RATIONALISATION: finding a believable excuse for one's actions or failure; trying to justify unjustifiable behaviour
- RESIGNATION: becoming resigned to the situation; giving up
- FLIGHT: physically or mentally removing oneself from the tension-producing situation.
- AGGRESSION: taking one's tension out on someone else by becoming belligerent or argumentative.

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

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 analysed the situation and determined the differences, seek help from more experienced instructors or supervisors when necessary. You will attempt to equalise 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.

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

**NERVOUS OR UNDERCONFIDENT**. Nervousness or under confidence in a student is a trait that 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 helicopter attitudes, unless they are essential to the lesson being taught. Take the time to build the student up to exercises involving extreme helicopter attitudes.

**OVERCONFIDENT 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.

**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.

**Table 2: Student traits and how to address them.**

| 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 | | • | • | • | | • | | • | • | | • | • | • |

**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.

**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.

**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.

**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 more than likely attain a greater degree of maturity. Your attitude is of prime importance in setting an example. You must encourage and help these students mature into the role of a responsible pilot whenever possible.

**AIRSICKNESS.** Some students may suffer from airsickness induced by motion, negative G, apprehension, claustrophobia, tension 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.

# THE STUDENT–INSTRUCTOR RELATIONSHIP

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 helicopter. They must follow your example and strive to carry out your instructions and suggestions for improvement.

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 cooperation. 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.

You want your teaching to result in good pilots who are able to use the initiative, judgement and skills that 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:

- Inspire your students to set goals that will stand them in good stead in aviation. Your exemplary conduct and high ideals will help in this goal.
- Be decisive. Weigh all the factors necessary to make decisions and then act with conviction.
- Be interested in your students and let them know by being familiar with their backgrounds, problems and achievements.
- Respect their rights and, when correcting mistakes, do so in a straightforward manner, never using sarcasm as a correction method.
- Acknowledge your own mistakes. The admission that 'You were right and I was wrong' does much to develop morale.
- If you do not know the answers to relevant questions, say so, find the answers, and tell the students later.
- Be enthusiastic. Instructor enthusiasm is reflected in student learning.
- 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 that they must not overstep.
- Be impartial and fair: never show favouritism.
- Never bluff: much of your subsequent instruction may be distrusted.
- Use humour. Appropriate humour creates goodwill and can be used to teach difficult subject material—but don't become so humorous that the business at hand becomes secondary.
- 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.
- Be aware that the use of cockpit intercommunication demands suitable phrasing, speech level, clarity, and discipline.
- Teach your students to have mastery over the helicopter, to fly with verve and spirit to the limit of the helicopter's flight envelope, and to know what they can and cannot do, but draw a very definite distinction between intelligent confidence and foolhardiness.
- 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 that you may not hear about otherwise. To your student, failure to debrief may appear to imply a lack of importance of the exercise or a lack of interest on your part.

- 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 almost certainly be given details in a verbal debriefing that may not be included in a written report.
- Maintain a professional image.

# FAULT ANALYSIS

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 realise that the sole purpose of fault analysis is to improve future student performance. A valid critique contains three essential elements:

1. Strenghths
2. Weaknesses, and
3. Specific suggestions for improvement.

Without each of these elements, fault analysis is ineffective.

Strengths are analysed to give a feeling of satisfaction and to show that you recognise 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 the student than any number of remedial suggestions on your part.

The necessity of analysing 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.The recommended format to follow when conducting fault analysis is:

When in the air:

- identify major strengths
- pinpoint a major weakness
- suggest a remedy to correct that major weakness.

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

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.

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.

Honesty is the best policy for critiquing. The situation where you may attempt to motivate a weak student by giving better grades than deserved jeopardises 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

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.

This is a list of subjects from the appropriate Study and Reference Guide that the student should have learned or have become 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

Classroom-type instruction, normally on a one to one basis, but not excluding group instruction, covering the steps necessary to fly an air exercise. Whereas the 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 'how to do an air exercise'.

This is a presentation given by the instructor when introducing a new exercise. Ideally it should be given no more than 24 hours before the related training flight and should be given in the form of a mass briefing.

# PRE-FLIGHT BRIEFING

## PRE-FLIGHT BRIEFING DEFINITION

Discussion on a one to one basis just before 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, which should have been covered in the mass briefing, but including these important aspects:

- What are we going to do?
- How are we going to do it?
- Safety considerations.

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:

- meteorological and aerodrome conditions, and NOTAM's
- the helicopter to be used, its fuel state and other relevant information
- where the exercises will be conducted
- take off time, duration of flight, and time when the helicopter is due to land back at base
- the sequence of exercises to be covered during the flight
- a review of relevant airmanship points.

# IN FLIGHT INSTRUCTION

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 HELICOPTER

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

- When you, as pilot in command, wish to give control to your student, say clearly 'Handing over'. Teach your student to take control only when ready and to always say 'Taking over'. You do not relinquish control until you hear this phrase. Formalise this portion of the evolution by saying 'You Have Control'.
- When you want to take control, say 'Taking over' and then take control, ensuring that your student says 'Handing over' when relinquishing control. Formalise this portion by saying 'I Have Control'.
- 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.
- 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 touch down autorotations, when there is little time available to the instructor to correct errors. This procedure should be adhered to at all times.

## IN FLIGHT TEACHING

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.

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.

As your student gains proficiency, you may look for minor errors and correct them in the same manner. Remember, though, that learning to fly proficiently 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 acknowledge- good performance.

If practicable, conclude the air exercise with a perfect demonstration of the manoeuvre to be learned on the next lesson. This will help your student to fully understand the home study for the next exercise and will 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 were to be a review or a repeat of a lesson.

## FAULT ANALYSIS

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 analyse the errors in a particular sequence; usually this will happen during the later 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 analyse the problems from the student's description of actions and the helicopter'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 analyse the performance and correct any faults.

## PLANNING OF FLIGHT INSTRUCTION

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.

# POST FLIGHT BRIEFING (DEBRIEFING)

## POST FLIGHT BRIEFING (DEBRIEFING) DEFINITION

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.

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

- the student's own assessment of the flight and performance
- your assessment of the student's performance. This should include both the strong and weak points, and advice on how to correct any errors.
- answering any questions the student may have
- assigning study subjects where appropriate.

Note: Debriefings should always be conducted in private and in a manner mindful of the sensitivities of the student.

# FLIGHT SAFETY

Flight safety is an important aspect of flight training. Both aircrew and ground crew must be aware of the need for correct safety practices. You are in a position to reduce incorrect, unsafe and illegal practices. You are also in a position to influence the attitudes and disciplines of future pilots in this industry. 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!

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

- being alert to unsafe practices and taking the appropriate action
- following up when you see an unsafe practice by informing the people involved that they have been seen
- promoting the principles of effective flight safety to students and other aircrew and groundcrew.

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

# A CHECKLIST FOR GOOD INSTRUCTION

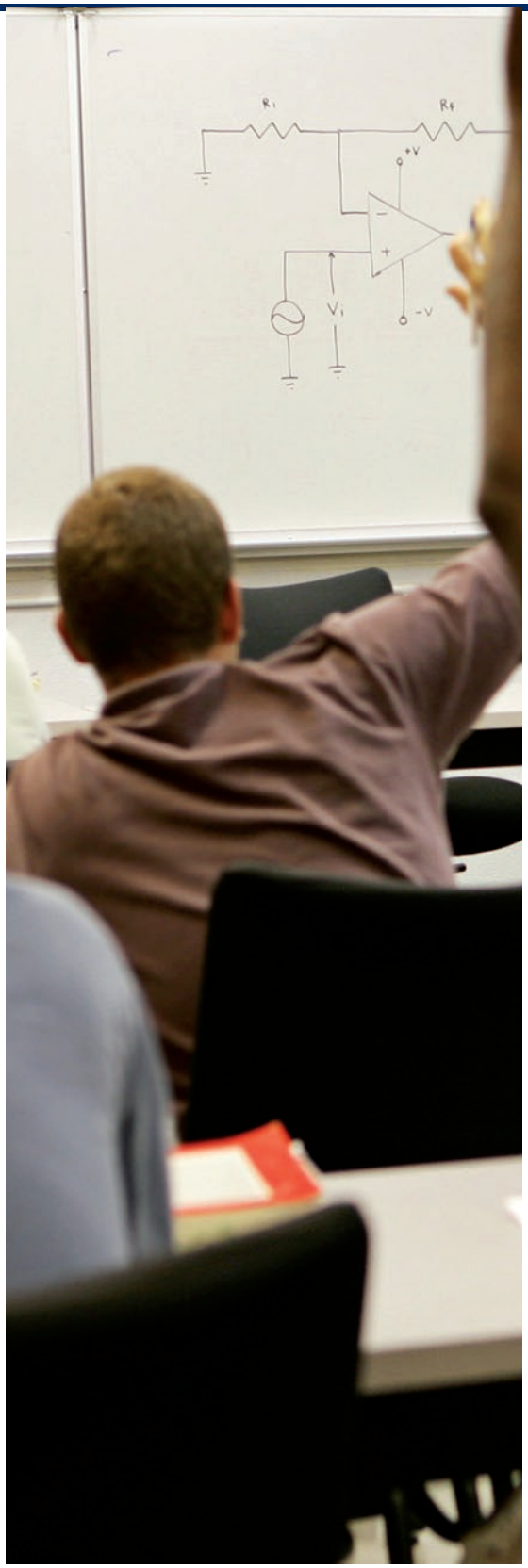
**Each instructor should:**

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. whiteboard, orientation board, or other visual aids)
   (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 the student's past and/or future experiences (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.
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)
   (d) taking student questions.
10. Respond to feedback by:
    (a) answering questions
    (b) stopping students from 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)
    (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 help to achieve 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. Conduct periodic reviews of critical areas of the lesson.
22. Summarise the main points of each stage.
23. Evaluate level of student learning at the end of each stage.
24. Test students on the main points of the entire lesson towards the end of the lesson.
25. Provide a final summary that links all stages to the objective(s) of the lesson.
26. Re-motivate students by telling them how the new knowledge or skill will benefit them.
27. Ensure they are well prepared for the programmed lesson prior to meeting with student.

# PART 2

## GROUND AND AIR INSTRUCTION EXERCISES

This part outlines the purpose of each exercise, the essential background knowledge a student must posess before commencing the air exercise, advice to the instructor and a simple outline for each air exercise.



# INTRODUCTION

## GROUND AND AIR INSTRUCTION EXERCISES

This part 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 exercise.

Autorotation, being an extensive and involved subject, has been presented as three separate 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.

The aerodynamic stresses to which an airframe is exposed during the vortex ring state are virtually unknown. Exercise 24, which deals with this condition of flight, has been retained, but the emphasis should be placed on early recognition and avoidance rather than practising a fully developed vortex ring state. Control of 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, and it is recognised that simulating this effect in a training helicopter is almost impossible. Therefore, again, the emphasis is to be placed primarily on 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:

### GROUND SCHOOL

This is a list of subjects that the student should have learned or should be familiar with before the preparatory instruction is given. These points should not form part of the preparatory instruction or the pre-flight briefing.

### PREPARATORY INSTRUCTION

This is the presentation given by the flight instructor when introducing a new exercise. Ideally you should give it in the form of a mass briefing and no more than 24 hours before 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 students to understand and assimilate the new skills and knowledge they are about to acquire. This is a good time to discuss any related problems they may have.

**Motivation**

Give students a good reason why they 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 helicopter 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 exercise is likely to be effective. Give students ample opportunity to ask you questions so as to remove any doubts or problems they might have.

### PRE-FLIGHT BRIEFING

This is a separate 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:

- local weather and meteorological conditions
- the helicopter to be used, its fuel state, and any other relevant information
- where the exercises will be conducted
- take-off time, duration of flight, and estimated landing time back at base
- the sequence of exercises to be covered during this flight
- a review of relevant airmanship points.

## AIR EXERCISE

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.

## POST-FLIGHT DE-BRIEFING

This follows all flights, dual and solo.

- Points should include:
- the student's assessment of the flight and performance
- your assessment of the student's performance; this includes both strong and weak points, and advice on how to correct any repeated errors
- answering any student questions
- assigning study subjects where appropriate.

## TIPS FOR INSTRUCTORS

These are aimed to help you in your role as an instructor. The points mentioned should not be included in your ground or air presentations.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# 01
# HELICOPTER FAMILIARISATION

## GROUND SCHOOL POINTS

Familiarise the student with the layout of the school, including briefing rooms, crew rooms, etc., and introduce him or her to members of the staff who are associated with the flight training.

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 authorised; how progress is monitored; and any other information necessary to the student in his or her day-to-day attendance at the school.

## PREPARATORY INSTRUCTION

**Aim**

To introduce the student to:

- the helicopter
- tarmac and air traffic control procedures
- training procedures
- the local flying area including prominent landmarks.

**Airmanship**

**Explain:**

- how to enter and leave the helicopter with the rotors turning
- that seat belts or harnesses should be done up at all times during flight
- the necessity for positive hand-over and take-over of the controls as discussed in Part 1.
- the need for a constant and thorough lookout for other aircraft. Describe the clock method of reporting aircraft to the other crew member.
- the need for flight clothing commensurate with the weather, area of operation and role being performed.

## AIR EXERCISE

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.

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.

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

## TIPS FOR INSTRUCTORS

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

Avoid over-emphasising the difficulties of learning to fly a helicopter.

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

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

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

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

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

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.


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# 02
# 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 helicopter accidents and incidents are due to poor preparation and inadequate planning.

### Teaching Points

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

- flight planning
- checking of helicopter documents
- inspection of the helicopter and completion of checks and procedures.

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 part increasingly in all the aspects of preparation for flight.

Explain that it is the pilot-in-command's responsibility to ensure that the helicopter is safe and fit in all respects for the intended flight.

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

Explain the procedures for the student to follow, should he or she discover a snag or unserviceability in the training helicopter during the inspection or pre-take-off phase. Stress that students should not fly the helicopter if they have any doubts about its airworthiness.

Documents: Show the student all the documents required by legislation to be on board the helicopter in flight. Explain the significance of each and its bearing on airworthiness.

Inspections and checks

While walking to the helicopter, point out that the student should always note:

- wind velocity
- the presence of any helicopter or obstacle that might affect the starting of the rotors or the departure procedure.

Demonstrate the external inspection and the checks and procedures to be carried out before take-off, as appropriate to type.

Demonstrate shut-down checks and procedures appropriate to type.

## TIPS FOR INSTRUCTORS

Although treated here as a separate exercise, it may be more convenient to combine the introduction to Preparation for Flight with Exercise 2.

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

Explain the importance of the student becoming familiar with the helicopter and its components when all is normal and serviceable so that any abnormality becomes readily and easily apparent when conducting the pre flight inspection.

# 03
# EFFECTS OF CONTROLS

## GROUND SCHOOL POINTS

Theory of flight:

- definitions
- helicopter controls

Function of flight and engine instruments

Function of ancillary controls

## PREPARATORY INSTRUCTION

**Aim**

For the student to learn:

- effects of flight controls in cruising flight
- the use of ancillary controls.

**Review**

Exercise 2: Preparation for Flight

**Motivation**

This exercise is a basis for all future helicopter flight operations.

**Airmanship**

- Lookout
- Handing Over/Taking Over
- Aircraft Limitations

**Teaching Points**

- Cyclic pitch control

  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. Explain that there are secondary effects comprising changes in altitude and RPM.

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

- **Collective pitch control**

  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.

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

- **Throttle**

  Move the twist grip to open and close the throttle.

  Explain the function of the throttle as appropriate to the type. The primary effect is RPM control (engine and rotor RPM). Explain that there are secondary effects comprising YAW and MAP changes.

- **Tail rotor pedals**

  Movement of the pedals causes a change in pitch of the tail rotor blades. The result of this is a yaw. Stress that, in the cruise, this yaw is a large skidding motion. Explain that there are secondary effects comprising RPM changes and IAS errors. The pedals should not be used to change the helicopter's direction of flight.

- **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.

## AIR EXERCISE

Before take-off:

- make sure the student is seated comfortably and ensure all checks are completed by using a checklist
- demonstrate the correct use of frictions, trims and control adjustments, as appropriate to type
- demonstrate the effect of cyclic control movements on the rotor disc, including how the horizon is used as a reference to interpret the helicopter's attitude.
- demonstrate opening and closing the throttle.

- **Cyclic Control**

Establish a straight and level cruise at a safe altitude.

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

Student practice

When the student demonstrates reasonable competency, point out the flight instrument indications.

Re-establish a straight and level cruise.

Demonstrate rolling movement (gentle and medium turns).

Student practice

Point out flight instrument indications.

Re-establish a straight and level cruise.

Demonstrate a combination of pitching and rolling movements.

Student practice

Point out flight instrument indications.

- **Collective Control**

Re-establish a straight and level cruise.

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

Student practice.

- **Throttle**

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

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

Student practice

- **Tail Rotor Pedals**

Re-establish a straight and level cruise.

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

Student practice

- **Ancillary Controls**

As appropriate to type:

Demonstrate the use of ancillary controls.

Student practice

- **All Controls**

Have the student practise 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.

## TIPS FOR INSTRUCTORS

As this is to be the student's first flight training exercise, spare no pains to explain everything carefuly. Emphaisis is necessary, since all future flight training exercises are based around the basic principles learned in this exercise.

This exercise should be tailored to the student's previous flying experience if applicable.

Students will often get very tense in the earlier air exercises. The instructor should make every effort to ensure that the student is comfortable and relaxed as much as possible.

Ensure that the helicopter is reasonably stable before handing over control to the student.

Emphasise the use of verbal comfirmation before commencing any turns.

The use of a model helicopter will make preparatory instruction much more effective.

Stress the need for correct, comfortable posture in these early stages.

# 04
# POWER AND ATTITUDE CHANGES AND STRAIGHT AND LEVEL FLIGHT

## GROUND SCHOOL POINTS

Flight manual: engine, transmission and airspeed limitations

## PREPARATORY INSTRUCTION

### Aim

For the student to learn:

- the relationship of horizon and fuselage attitudes to indicated airspeed
- the correct methods of selecting or changing engine power (e.g. manifold pressure and rotor RPM)
- 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

- Lookout
- Engine and transmission limitations

### Teaching Points

- Airspeed changes

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

  Move the cyclic aft to raise the nose of the helicopter.

  Pause while the airspeed stabilises.

  Adjust airspeed as necessary.

  Explain the method of accelerating to a specific airspeed:

  Move the cyclic forward to lower the nose of the helicopter.

  Pause while the airspeed stabilises.

  Adjust the airspeed as necessary.

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

- **Power changes**

  Describe the relationship between collective and throttle movement, as appropriate to type.

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

  Where appropriate, describe the methods of:

  changing manifold pressure at constant rotor RPM

  changing rotor RPM at constant manifold pressure.

- **Straight and level flight**

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

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

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

  Explain that during flight at a specific airspeed altitude corrections are controlled with the collective, and during flight at a specific power setting corrections are made with the cyclic.

  Describe how to reduce airspeed in straight and level flight:

  Select a slightly higher nose attitude (cyclic aft).

  Reduce power to prevent climbing (collective/throttle).

  Prevent yaw - maintain balance (pedals)

  Adjust power and attitude as required to maintain desired airspeed.

Describe how to increase airspeed in straight and level flight:

- Select a slightly lower nose attitude (cyclic forward).
- Adjust power to prevent sink (collective/throttle).
- Prevent yaw - maintain balance (pedals)
- Adjust power and attitude and maintain balance with pedals as required to maintain desired airspeed.

## AIR EXERCISE

Review previous air exercise.

Demonstrate airspeed changes.

Student practice

Demonstrate power changes.

Student practice

Demonstrate straight and level flight at cruise power.

Student practice

Demonstrate changes of airspeed in straight and level flight.

Student practice

Briefly let the student attempt to hover at the conclusion of each exercise until completion of Exercise 11.

## TIPS FOR INSTRUCTORS

Students will often tend to pay excessive 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.

Changes of airspeed during the early stages of this air exercise will result in changes of altitude. It is important therefore, to conduct this lesson at 1000 feet AGL or more, and in good weather conditions, to avoid the nearness of obstacles distracting the student.

Changing airspeed at constant altitude and heading is a useful coordination exercise that can be reviewed at various stages through the training course.

# 05
# CLIMBING, DESCENDING AND TURNING

## 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.

For the student to learn how to carry out:

medium level turns

medium climbing and descending turns

### Review

Exercise 4: Power and attitude changes.

### Motivation

Accurate control of the helicopter is vital in this and later air exercises.

### Airmanship

Lookout

Helicopter limitations

### Teaching points for climbing and descending

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

- Describe how to proceed from straight and level cruise to the climb:

  Lookout

  Increase POWER to required setting and adjust ATTITUDE for desired AIRSPEED.

  Prevent yaw (BALANCE)

  TRIM (if applicable)
- Describe how to level out from the climb to the cruise:

  Anticipate required altitude.

  Select ATTITUDE for straight and level cruise.

  Allow airspeed to increase when desired HEIGHT and AIRSPEED are obtained.

  Reduce POWER to cruise POWER setting.

  Prevent yaw (BALANCE)

  TRIM (if applcable).
- Describe how to proceed from straight and level cruise to the descent:

  Lookout

  Reduce POWER to required setting POWER.

  Prevent yaw.

  Select ATTITUDE for descent speed.

  ADJUST if necessary TRIM.
- Describe how to level out from a descent to the cruise:

  Anticipate required altitude.

  Increase POWER to cruise setting POWER.

  Prevent yaw.

  Select ATTITUDE for cruise speed.

  ADJUST as necessary TRIM.

Describe how to proceed direct from a descent to the climb:

Lookout

Increase POWER to climb setting.

Prevent yaw.

Maintain airspeed or select climb speed as required.

### Teaching points for turning

- Define angles of bank as applying to light helicopters and explain how to judge bank angles.
  - gentle - up to 15
  - medium - between 15 and 30
  - Steep - over 30

Level Turns

Describe how to enter a level turn:

Lookout

Select the angle of bank by reference to the horison using lateral cyclic.

- Describe the visual and instrument indications that the helicopter is in a BALANCED level turn at a constant angle of bank.
- Describe how to maintain:
  - angle of bank with lateral cyclic
  - airspeed with fore and aft cyclic
  - altitude with collective
  - balanced flight with pedals
- Describe how to rollout onto a selected heading:
  - Anticipate heading
  - Apply lateral cyclic as required.

**Climbing and descending turns**

Describe how to initiate, maintain and rollout from climbing and descending turns. Point out the similarity in technique to level turns.

## AIR EXERCISE

Review straight and level cruising flight.

Demonstrate establishing a climb at a selected power and airspeed, and levelling out to cruise flight.

Student practice

Demonstrate establishing a descent at a selected power and airspeed, and levelling out to cruise flight.

Student practice

Demonstrate climbing to a pre-selected altitude.

Student practice

Demonstrate descending to a pre-selected altitude.

Student practice.

Demonstrate proceeding direct from a descent to the climb.

Student practice

Turns can be introduced if the student grasps this exercise easily.

Demonstrate gentle and medium level turns in both directions

Student practice

Demonstrate medium turns rolling out onto a nominated heading.

Student practice

Demonstrate climbing turns, rolling out onto a nominated heading and levelling off at a nominated altitude.

Student practice

Demonstrate descending turns rolling out onto a selected heading and levelling out at a nominated altitude.

Student practice

## TIPS FOR INSTRUCTORS

Emphasise the need for lookout, and the difficulty of spotting other aircraft, particularly when they are below the horizon.

It is important that turns be practised in both directions to show the different visual references in the helicopter.

Becuase of the increased emphasis on accuracy, the student should be taught how to monitor instrumentation without sacrificing lookout.

Steep turns are covered separately in Exercise 18.

Turns in autorotation are covered separately in Exercise 16.

# 06
# HOVERING

## GROUND SCHOOL POINTS

Ground Effect

Flight manual performance charts:

- Hover in-ground effect
- Hover out-of-ground effect

  HV Graph - Risks Associated
- Over-pitching - Rotor Stall

## 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**

- The hover

  Define hovering as maintaining a constant height and heading over a given ground position.

  State the hover height, as appropriate to type.

  Explain that facing into the wind results in the helicopter being easier to control and uses less power.

Explain the effects of controls at the hover:

- Cyclic

  Point out the following:

  The cyclic controls the disc attitude which in turn controls the helicopter's position over the ground. 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 an appreciable lag in this chain of events.

  Regaining the hover from movement in any direction requires two attitude changes: one to stop the movement, and a second to stabilise the helicopter.

  All cyclic movements should be small. Cyclic trim should be employed, if applicable.
- Collective

  Point out the following:

  The collective controls the height above ground.

  Changes in collective pitch will produce yaw and RPM changes unless prevented.
- Throttle

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

  When an in-flight low Rotor RPM condition exists, explain that if the condition is allowed to deteriorate to a dangerously low Rotor RPM, Rotor Stall can occur with severe or fatal consequences. Explain that immediately the throttle must be increased and simultaneously the collective lowered, as appropriate, to recover from the low Rotor RPM condition. Emphasize the importance of avoidance and early recognition (via: engine noise, warning horn or light) of a low Rotor RPM condition.
- Pedals

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

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

## AIR EXERCISE

Demonstrate the use of the cyclic at the hover into wind.

Students practise with the cyclic only, until a hover can be maintained without excessive effort.

Demonstrate the use of the collective and pedals.

Student practice

Student practice using all controls

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

## TIPS FOR INSTRUCTORS

This exercise demands a high degree of coordination and should not be taught until the student has acquired a reasonable state of competence in Exercises 1 to 6. Introducing it earlier than this could lead to frustration and undue fatigue for both student and instructor.

An alternative technique is to use slow flight to introduce hovering. This procedure takes the form of low, slow flight into the 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 is 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 11.

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.

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.

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.

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

# 07
# TAKE-OFF AND LANDING TO/FROM HOVER

## GROUND SCHOOL POINTS

Dynamic rollover

Ground resonnance

Flight manual: checks

Over-pitching - Rotor Stall

## 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

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

- pre-take-off checks
- effects of controls during take-off:

  cyclic to maintain position over the ground

  collective to gain height

  pedals to prevent yaw.
- Hover check as appropriate to type, but including:

  centre-of-gravity check

  power required to hover

  control response normal.

Point out the dangers of over-pitching- leading to low Rotor RPM and Rotor Stall. As appropriate to the type, describe the avoidance and recovery actions, including:

- Knowledge of the preconditions of over-pitching and low Rotor RPM
- Recognition of the symptoms for low Rotor RPM
- Skill in applying the appropriate recovery technique

Describe the symptoms of incipient dynamic rollover, avoidance and recovery action:

- Landing

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

the need to start the manoeuvre from a stable and accurate hover

the effects of controls during landing from the hover:

- use the cyclic to maintain position. Stress the need to avoid sideways or rearwards drift.
- use the collective to control the rate of descent
- use the pedals to prevent yaw.

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

Point out the need to anticipate ground resonance, if applicable to type.

## AIR EXERCISE

Demonstrate the take-off to the hover.

Demonstrate hover check.

Student practice

Demonstrate landing from the hover.

Student practice

## TIPS FOR INSTRUCTORS

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

Ensure students keep looking at their reference points in front of the helicopter and not down at the ground.

Monitor the collective closely on the initial attempts to land so as to guard against sudden and excessive movements. Ensure once landing is achieved, the collective is smoothly lowered full-down.

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.

When the student is working smoothly and accurately, introduce lifting from the 'skids light' condition to a low hover before going to normal hover height to preclude dynamic rollover.

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

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

# 08
# AIR/GROUND TAXI AND SPOT TURNS

## GROUND SCHOOL POINTS

Flight manual: Performance charts

## PREPARATORY INSTRUCTION

**Aim**

For the student to learn how to:

- turn at the hover
- hover-taxi.

**Review**

Exercise 6: 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 parking area. These are important exercises that must be mastered completely.

**Airmanship**

- Lookout: obstacles
- Helicopter limitations

**Teaching Points**

- Turn at the hover

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

The effects of weathercocking must be taken into account.

There can be problems with yaw control and a need for increased power when the helicopter is downwind, or crosswind, in strong wind conditions

Lookout is important during all hovering manoeuvres and, in particular, for low obstacles that are hard to see and that can snag the landing gear or tail rotor.

In strong or gusty wind conditions, a turn away from into the wind should be in the opposite direction to the 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.

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.

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 the wind should be avoided on some types of helicopter because of the dangers from carbon monoxide in the cockpit.

In some helicopters 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 when:

- turning into the wind
- landing straight ahead.

- Hover-taxi

State the height and ground speed to be used, and relate them to the safety considerations.

Describe the effects of the controls.

## AIR EXERCISE

Hovering turns

Demonstrate 360° hovering turns in each direction, commencing into the wind and pausing at each 90° point.

Student practice

Hover-taxi

Demonstrate hover-taxiing into the wind.

Student practice

Demonstrate hover-taxiing out of the wind.

Student practice

## TIPS FOR INSTRUCTORS

Dual instruction in this exercise should be carried out in a wide 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.

Pausing at each cardinal point enables the instructor to point out the different cylic positions into the wind; when the student is competent, complete the 360° turn without pause.

Whenever possible, when hover-taxiing, keep the skids parallel to the helicopter movement in case of engine failure or the need to run the helicopter onto the ground in an aft C of G condition.

Turns around the tail are covered separately in Exercise 10.

Sometimes the student will use cyclic instead of pedal to help turn the helicopter, particularly in strong winds.

When the student is proficient at the basics, introduce some hover patterns requiring taxiing and pedal turns.

# 09
# ADVANCED HOVERING - e.g. sideways and rearwards flight

## GROUND SCHOOL POINTS

Flight manual:

- Limitations
- Performance - HV Graph, IGE and OGE Hover Charts

## PREPARATORY INSTRUCTION

### Aim

For the student to learn:

- sideways and rearwards flight facing into and out of the wind
- turns about the tail and nose.

### Review

Hovering exercises: Exercises 7, 8 and 9

### Motivation

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

### Airmanship

Lookout: obstacles

Helicopter limitations

### Teaching Points

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.

- Sideways flight

  State the height and ground speeds to be used in this exercise.

  Explain the effects of controls, as follows:

  cyclic to control direction of movement and ground speed

  pedals to control helicopter heading

  collective to control height.

  Describe the helicopter limitations as appropriate, e.g. weathercocking, flap-back, etc.

  Explain that it is vital to maintain a scan of the direction of movement, helicopter heading, height and instruments.

- Rearwards flight

  State the 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.

  Explain the effects of the controls.

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

  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.

- Turns about the nose and tail

  State the height and rate of turn to be used.

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

  Describe the visual cues.

- OGE (out of ground effect) Hover

  Describe what OGE Hover is. State the situations where an OGE Hover would be required and the risks associated in the OGE Hover. Review the dangers of over-pitching, low rotor RPM - the conditions, symptoms and recovery actions.

  Demonstration and student practice for the OGE Hover manoeuvre should be conducted during the advance transition sequences of Exercise 21 on "Limited Power/ Maximum Performance and Steep Approaches" of this manual .

  Demonstration and student practice of over-pitching, low Rotor RPM may be safely conducted at altitude, well above the HV curve, so that the student can readily identify the over-pitch and safely correct it without the pressure of ground proximity or HV curve as a distraction.

On certain types of piston engine helicopters the student holding the throttle in a 'death grip' during OGE/IGE hover at high Weight/Altitude/Temperature configurations may prevent the throttle governor from automatically correcting for low Rotor RPM and over-pitch. Accordingly, the student should receive ample instruction and practice in OGE/IGE hover operations both with and without the governor engaged.

Where OGE Hover operations are conducted within the HV or Height-Velocity Diagram's shaded areas (avoid areas), prolonged exposures for training purposes must be avoided.

## AIR EXERCISE

Demonstrate sideways flight in both directions, facing into wind.

Student practice

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

Student practice

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

Student practice

Demonstrate rearwards flight facing into wind.

Student practice

Demonstrate rearwards flight on various headings out of wind.

Student practice

Demonstrate turns about the tail in both directions.

Student practice

## TIPS FOR INSTRUCTORS

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.

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 help the student. If none exists, give thought to marking the ground with large squares or circles (hover squares).

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.

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.

# 10 ENGINE FAILURE IN HOVER OR 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 7: Hovering

Exercise 8: Take-off and landing to/from Hover

**Motivation**

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

**Airmanship**

Selection of a suitable area for practice

**Teaching Points**

Point out that at normal hover or 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.

Describe the reaction of the helicopter when the engine fails:

- yaw
- drift
- sink.

Explain that the yaw and drift must be corrected before touchdown. Sink should be controlled by use of the collective, as appropriate to the type of helicopter and the height above ground, to cushion the landing.

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

## AIR EXERCISE

Engine failure in the hover

- Demonstrate into wind as follows:
  - Give a verbal warning.
  - Close the throttle.
  - Counteract yaw and drift.
  - Cushion the landing.
- Student practice

Engine failure at the hover taxi

- Demonstrate into the wind.
- Student practice.

## TIPS FOR INSTRUCTORS

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.

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 students to react to an engine failure, there is little point in their learning throttle control; in other words, the instructor should control the throttle.

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

Always ensure that the surface is suitable for this exercise, particularly after rain.

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.

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

# 11
# TRANSITIONS

## GROUND SCHOOL POINTS

Note: Transitions can be taught in conjunction with the lesson on CIRCUITS unless a student displays problems with the concepts associated with the TRANSITION.

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:

- depart from the hover to the climb
- approach 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

- Transition to the climb

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

Establish a steady hover into wind.

Make a clearing turn and check that the area is clear.

Complete the pre-take-off check.

Select an outside reference to help in directional control, and ease the cyclic forward slightly to initiate movement.

At the same time, if required, adjust power sufficiently to maintain height.

Apply enough forward cyclic to overcome flap-back.

Select the climb attitude and power.

Prevent yaw throughout and adjust the attitude as required to maintain the climb attitude.

- Transition from forward flight to the hover (standard approach)

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

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

**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.

Describe the procedure as follows:

Approach the landing spot into the wind at a specific altitude and airspeed.

Select a suitable approach angle (sight picture).

Initiate the approach by reducing power and commencing a progressive decrease in airspeed.

Maintain the approach angle with the collective.

Establish the apparent ground speed (a fast walking pace), and maintain it with the cyclic.

Anticipate the loss of translational lift.

Establish a hover over the selected spot.

Prevent yaw or sideways drift.

Describe the go-around (missed approach) procedures as appropriate to type and local conditions.

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

## AIR EXERCISE

Demonstrate flap-back and a transition from the hover to the climb.

Student practice

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

Student practice

Demonstrate the go-around procedures.

Student practice

## TIPS FOR INSTRUCTORS

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

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 will often lead to undershooting.

Another problem resulting from point 2 is underestimation of the pedal requirements. Explain that the greater the power required to establish the hover, the greater the pedal movement required to keep the helicopter straight, and this can be corrected only by using an outside reference.

Emphasise the need to assess the approach in relation to the groundspeed and sight picture. This can be accomplished only by looking outside the helicopter, with an occasional cross-check of the instruments.

Ensure that the pedals are used to make the helicopter move straight with the direction of travel when close to the ground.

Students should be encouraged to go-around if the rate of descent is high and the airspeed is low.

# 12
# THE CIRCUIT

## GROUND SCHOOL POINTS

Local aerodrome procedures.

## PREPARATORY INSTRUCTION

**Aim**

For the student to learn how to fly an accurate circuit

**Review**

All previous exercises as required.

**Motivation**

Circuits remain an excellent way of consolidating all the previous air exercises in one convenient sequence.

**Airmanship**

- Lookout
- Checks

**Teaching Points**

With the aid of suitable visual aids, describe the circuit pattern to be used, specifying directions, speeds, distances, heights, etc.

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

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

## AIR EXERCISE

Demonstrate a circuit.

Student practice

When circumstances permit, demonstrate:

circuit spacing: speed and circuit size variations, and

acceptance and/or compliance with Air Traffic Service instructions and clearances.

Student practice

When a reasonable standard has been reached normal circuits;

describe the application of Exercise 15 (Emergencies) to the various segments of the circuit, as applicable to type and local conditions; and

Discuss overshoots

Demonstrate emergencies in the circuit.

Student practice

## TIPS FOR INSTRUCTOR

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.

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.

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

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

## PREPARATION FOR FIRST SOLO FLIGHT

**CHECK:**

**All necessary examinations completed.**

**Medical held and current.**

**Student licence issued.**

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

The instructor is qualified to send the student first solo.

Advise control tower where applicable.

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.

Advise control tower where applicable.

**Student Solo**

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

- A safe standard has been reached in Air Exercises 1 - 15.
- A safe and acceptable standard has been reached in circuits.

**Take-off and Landing**

Lift 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.

**Transition and Climb**

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

**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.

**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.

**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.

## TIPS FOR INSTRUCTORS

The first solo is a very important and never-to-be-forgotten experience in a pilot's career. It gains even more importance in a multi student course 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.

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

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.

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

# 13
# ENTRY TO AUTOROTATION

## INTRODUCTORY NOTE

Due to the complexity of this exercise, the autorotation exercise has been broken down into three sections;

- ENTRY TO AUTOROTATION covers basic autorotations with recovery to the climb (Exercise 13)
- POWER TERMINATED AND TOUCH DOWN AUTOROTATIONS covers autorotations terminating in a hover or landing (Exercise 14)
- AUTOROTATION VARIABLES covers range variation techniques (Exercise 15).

## PREPARATORY INSTRUCTION

**Aim**

For the student to learn how to:

Enter autorotation

Descend at the indicated airspeed for minimum rate of descent

Go-around to the climb.

**Review**

Climbs, descents and turns

**Motivation**

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

**Airmanship**

Pre-entry checks, to include:

Pre-landing check

Lookout, particularly below

Select suitable precautionary landing area

Verbal warning.

Post-entry checks as appropriate to type.

Aircraft performance limitations, specifically rotor RPM.

**Teaching Points**

Explain that the helicopter is fully manoeuvrable in autorotation.

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

Describe the entry, as follows:

At a safe altitude, straight and level cruise, into wind, over a suitable area, complete airmanship checks.

Lower collective.

Use throttle to prevent overspeed, as appropriate to type.

When collective is fully down, split needles and select recommended engine RPM.

Prevent yaw.

Explain that:

Heading and airspeed are controlled with cyclic, as in powered flight

Rotor RPM is controlled by collective.

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

Describe the go-around as follows:

At a safe altitude, rejoin the needles, using the throttle as appropriate to type,

Apply climb power.

Select or maintain climb airspeed.

Prevent yaw.

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

## AIR EXERCISE

Demonstrate a straight-ahead autorotation with a go-around to the climb.

Student practice

Demonstrate 90°, 180° and 360° autorotations with a go-around to the climb. Point out increased rotor RPM and rate of descent.

Student practice

Demonstrate an autorotational landing.

## TIPS FOR INSTRUCTORS

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

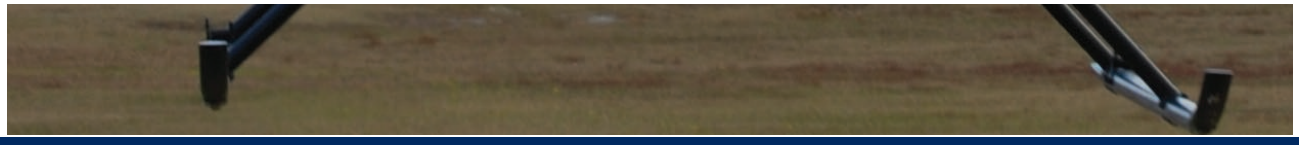
A low cloud base will cause demonstrations to be rushed. Fly this exercise in conditions that will allow sufficient altitude to make the demonstrations effective.

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

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

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

It is a good practice to introduce this exercise at altitude to demonstrate the characteristics and the recovery from autorotation. This generally helps to build students' confidence, as the ground is not 'rushing up' at them in the middle of the power recovery.



# 14
# POWER TERMINATED AND TOUCHDOWN AUTOROTATIONS

## GROUND SCHOOL POINTS

The Autorotative flare
Flare theory
Flight manual emergency procedures

## PREPARATORY INSTRUCTION

### Aim

For the student to learn how to carry out a safe power termination or landing from an autorotation

### Review

Entry to Autorotation
Engine Failure in the Hover or 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 be acquired and maintained only with practice.

### Airmanship

Pre-entry checks

Post-entry checks as appropriate to type

Aircraft performance limitations

Suitable landing area

Lookout

### Teaching Points

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

Ensure that a safe landing area is within autorotative range and check the wind velocity.

Enter autorotation and select airspeed for the minimum rate of descent.

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

At the appropriate time above the ground, commence the flare.

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

Describe the post-landing procedures:

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

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.

Carry out pre-take-off checks.

Explain that, where autorotational landings are considered unsafe in light of the aircraft's performance characteristics, the wind conditions, or the density altitude conditions, power terminations to the hover or hover-taxi may be used to provide continuation in autorotation practice. Stress that power terminations are not a substitute for autorotational landings. Autorotational landings must be practised to the extent that the student is competent to survive an emergency when flying solo.

Describe the technique for carrying out a power terminationto the hover or hover-taxi, as appropriate to type and local conditions:

Ensure that a safe landing area is within autorotational range.

Enter autorotation and select the airspeed for minimum rate of descent.

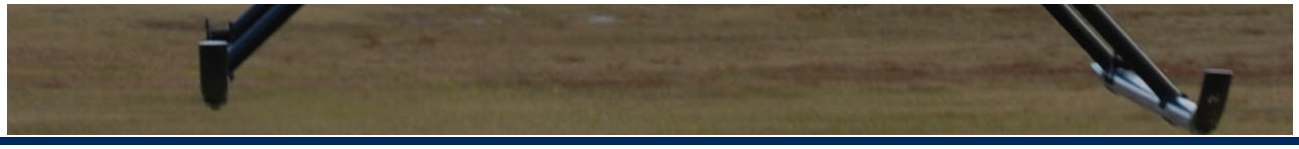
Ensure that the rotor RPM is in the correct range.

At a safe height, adjust RPM as appropriate.

At the appropriate height, flare.

At the appropriate height, level the aircraft.

Apply power to stop sink and establish a hover or hover-taxi; and prevent yaw and drift.



## AIR EXERCISE

Demonstrate an autorotation into wind, terminating in a landing or power recovery

Student practice (dual only)

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

Student practice (dual only)

Demonstrate an autorotation terminating in a power recovery to the hover or hover-taxi.

Student practice (dual only)

## TIPS FOR INSTRUCTORS

Training accidents that 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 aft during or immediately after touchdown.

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.

This exercise should be practised only in areas known to be safe and suitable for landing.

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

Both zero-speed and run-on touchdowns should be practised and the student taught when to employ each technique.

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.

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

# 15
# AUTOROTATIVE VARIABLES

## GROUND SCHOOL

Flight manual: Limitations

## PREPARATORY INSTRUCTION

### Aim

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

### Review

Entry to Autorotation and power terminated/touchdown autorotations

Autorotational flight envelope, including airspeed and rotor RPM limitations

Effects of airspeed on range and rate of descent in autorotation

### Motivation

Autorotation at the manufacturer's recommended airspeed is the ideal. It is vital, that the student be capable of taking full advantage of the helicopter's capabilities in autorotation to reach the intended landing spot.

### Airmanship

- Safety checks
- Safe landing area
- Lookout
- Wind velocity

### Teaching Points

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

Extending the range

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.

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

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.

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

Reducing the range

Explain that there are two methods of reducing range in autorotation: reducing airspeed, and turning.

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

Point out the hazards associated with a zero-airspeed autorotation owing to excessive rate-of-descent and controllability problems. Explain that it is preferable to maintain at least some indicated airspeed (10 to 20 knots) and accept the resulting ground speed. Describe hazards associated with negative airspeed.

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.

**Turns**

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

State the average altitude lost in a 180° and 360° autorotation.

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 come only with frequent practice.

## AIR EXERCISE

Over a selected point at a safe height above ground, enter autorotation and descend at the manufacturer's recommended speed for the minimum rate of descent. Point out the visual cues of rate of descent and range.

Student practice (dual only)

Over the same selected point at the same height: autorotate at the manufacturer's recommended airspeed for maximum range in autorotation. Point out the increased rate of descent and range.

Over the same selected point at the same height: 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.

Over the same selected point at the same height, autorotate at a low airspeed (10 to 20 knots). Point out:

the high rate of descent

the height lost in recovering from low forward speed to minimum descent speed

the distance covered.

Student practice (dual only)

Select a spot on the ground and demonstrate autorotative approaches from various height, speeds and directions.

Student practice (dual only)

## TIPS FOR INSTRUCTORS

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 that the student appreciates the difference in distance for each type.

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 make the landing spot. When students have grasped the basics, introduce situations that require them to assess and use a combination of different techniques.

Emphasise that, when you vary the range, the helicopter should be returned to the normal autorotational touchdown profile by 150 to 200 feet.

# 16 EMERGENCIES

## GROUND SCHOOL POINTS

Note: Many of these subjects will be covered by briefing only.

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

**Teaching Points**

Review the emergency procedures in the flight manual.

Explain that it is good airmanship to make a precautionary landing whenever unusual instrument readings, control forces, vibrations or noises occur that indicate a situation critical to continued safe flight even if the helicopter appears to be performing normally in other respects.

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

- Identify the emergency.
- Reduce the power/airspeed where appropriate.
- Select a suitable landing area.
- Transmit a MAYDAY or PAN call.
- Land into wind if possible.

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

## AIR EXERCISE

Demonstrate in-flight emergencies as appropriate to type.

Student practice

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

Student practice.

## TIPS FOR INSTRUCTORS

When appropriate, transit time may be utilised to discuss/practice reactions to simulated emergencies. This must to be carefully managed to ensure the primary exercise objectives are still met and the student is not overloaded.

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 practice.

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

# 17
# STEEP TURNS

## GROUND SCHOOL POINTS

Flight manual: Power Limitations

Requirements for a Steep Turn

## PREPARATORY INSTRUCTION

**Aim**

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

**Review**

Medium turns: Exercise 5

**Motivation**

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

**Airmanship**

- Lookout
- Power limitations

**Teaching Points**

Describe the visual cues, and where applicable, instrument indications.

Review the effects of controls in the turn.

## AIR EXERCISE

Demonstrate steep turns in both directions.

Student practice

## TIPS FOR INSTRUCTORS

Emphasise the importance of a good lookout before and during the turn. Set a good example when giving the demonstration.

This is an excellent coordination exercise of all controls at altitude, but when practised at low level, emphasise the dangers of slipping in a turn.

# 18
# PRACTISE FORCED LANDINGS

## GROUND SCHOOL POINTS

AIP: Search and Rescue

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: Exercise 14, 15 and 16.

**Motivation**

Although helicopter engines are nowadays generally reliable, failures do still occur. The lives of pilots and their passengers are dependent on pilot skill and judgement should an engine failure occur.

Airmanship

**Teaching Points**

Describe the immediate actions that must be taken in the event of an engine failure:

- Enter autorotation
- Select a suitable landing area
- Plan approach
- Select airspeed(s) and heading(s) in order to make the selected area
- Transmit MAYDAY
- Identify the cause of failure and correct it if possible
- Actuate the ELT (if equipped with manual control)
- Warn passengers
- Switch off electrics if fire is suspected
- Land.

Describe the actions that should be taken, time, height and other factors permitting, during a forced landing:

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 the prime consideration. 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.

Remind the student that turns and speeds above or below the manufacturer's recommended speed in autorotation increase the rate of descent substantially.

Discuss the problem associated with ditching a helicopter.

Discuss the techniques of forced landing into trees, mountainous terrain and built-up areas.

Point out that an engine failure when flying at low level over obstacles will result in a forced landing that is difficult to successfully accomplish without damage and injury. For this reason, pilots should always fly as high as the task and common sense allow.

## AIR EXERCISE

Demonstrate forced approaches from a height that will allow the full procedure to be carried out without haste.

Student practice

Demonstrate practice forced landings of increasing difficulty from different altitudes.

Student practice

## TIPS FOR INSTRUCTORS

This is not a procedure that can be allotted a certain time period for the course and left at that. After students are competent they should be given surprise practise engine failures without sufficiently warning them 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.

# 19
# QUICK STOPS

## PREPARATORY INSTRUCTION

### Aim

For the student to learn how to come to the hover into wind from various speeds, at a constant altitude

### Review

Airspeed and Power Changes: Exercise 4

### Motivation

Rapid decelerations straight ahead are a useful exercise for developing coordination 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 practical application in the avoidance of obstacles or bad weather conditions under operational conditions.

### Airmanship

- Lookout
- Engine and airframe limitations.

### Teaching Points

Straight ahead into wind

Describe how to carry out a rapid deceleration straight ahead into wind as follows:

From cruise at 30 to 50 feet AGL, commence a gentle flare.

At low forward speed, start levelling the helicopter.

Anticipate loss of translational lift and establish a hover.

Maintain height throughout with the collective.

Maintain RPM throughout with the throttle.

Prevent yaw with the pedals.

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.

Explain that when you are 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.

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.

Review the dangers of potential vortex ring state when reducing speed downwind or height is lost at low or no forward airspeed.

With level turn into wind

Describe the technique for performing a rapid deceleration involving a level turn of up to 180° into wind, as follows:

From cruise at 30 to 50 feet AGL, from level flight,commence a level, balanced turn.

Initiate a flare while in the turn.

Roll out facing into wind.

At a low forward speed, level the helicopter.

Come to a hover or resume forward speed.

Maintain height throughout.

Maintain balanced flight and prevent yaw.

Emphasise that the student must keep the helicopter in balance and the airspeed above translation in the 180° turn into wind, otherwise the helicopter will be set up for vortex ring state or settling with power.

## AIR EXERCISE

Demonstrate a straight-ahead deceleration from cruising flight into wind.

Student practice

Demonstrate a straight-ahead rapid deceleration into wind.

Student practice

Demonstrate a rapid deceleration involving a 90° turn into wind. (Note that pedals move in relation to pedals and not cyclic)

Student practice

Demonstrate a rapid deceleration involving a 180° turn into wind.

Student practice

## TIPS FOR INSTRUCTORS

Decelerations involving a turn into wind require a high level of coordination and accuracy. They should be introduced as an advanced exercise towards the end of the training syllabus.

It is important to stress smoothness and accuracy. The student should initially master gentle decelerations from airspeeds outside the avoid areas of the height/velocity diagram for the helicopter 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.

After smoothness and accuracy have been established, the entry speeds can gradually be increased to the cruise and the rate of deceleration increased.

Loss of height as translational lift is lost is a common fault.

# 20
# SLOPING GROUND

## GROUND SCHOOL POINTS

Dynamic rollover

Flight manual: Limitations

Tail rotor drift and roll

## PREPARATORY INSTRUCTION

### Aim

For the student to learn procedures and techniques for operating from sloping ground

### Review

Exercise

### Motivation

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.

Explain that sloping ground techniques, involving gentle and cautious control movements and are very similar for landing on any type of doubtful surface (e.g. packed snow, marshy, rocky or sandy surfaces).

### Airmanship

- Lookout: obstacles
- W/V
- Helicopter limitations
- Escape path

### Teaching Points

Explain that sloping ground operations can be divided into four phases:

reconnaissance

planning/manoeuvring

landing

take-off.

Reconnaissance:

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.

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.

Explain that landing into wind is always desirable for helicopter 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 helicopter limitations.

Point out that, in view of the above, it is vital to make a careful assessment of the ground before attempting to land.

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.

Landing

Describe the landing performance and limitations of the type of training helicopter being used.

Describe how to land on sloping ground, as follows:

Establish a steady hover/

Lower the collective gently until the upslope skid contacts the ground.

Continue lowering the collective, at the same time moving the cyclic gently towards the slope, to prevent lateral movement of the helicopter.

When both skids are in full contact with the ground, smoothly lower the collective until it is fully down.

Prevent yaw throughout.

Carry out a security check by making small gentle movements of the collective and pedals.

When you are certain the helicopter will not slide,

centre the cyclic and reduce RPM, if required.

Point out the need for smooth and accurate control movements and for not overcontrolling. Explain that with one side of the landing gear in contact with the ground it is possible to induce a rate of roll that is impossible to counteract with opposite cyclic.

Describe the signs that tell you cyclic control limits are being reached because of excessive slope. Explain that when they start to occur, or if the helicopter starts to slide, the helicopter should be brought smoothly back to the hover and landed elsewhere.

Point out the importance of maintaining flying RPM until the collective is fully down and security checks are complete.

Take-off

Describe how to take off from sloping ground, as follows:

Ensure that the RPM is at the take-off setting.

Raise the collective gently and ease the cyclic into the slope, keeping the helicopter level so that it breaks contact with the ground vertically. Stress the vital importance of avoiding any excessive lateral movement.

Prevent yaw throughout.

Operational considerations

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, to embarking and disembarking passengers. Explain that it is the pilot's duty to brief passengers and ground crew in this regard, whenever possible.

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.

## AIR EXERCISE

Select an area of sloping ground well within the helicopter's limits and demonstrate reconnaissance of, and manoeuvring over, the intended landing area.

Student practice

Demonstrate cross-slope landings in both directions, pointing out the difference in helicopter performance where appropriate.

Student practice

Demonstrate an up-slope landing.

Student practice

Select an area of sloping ground that is close to the helicopter's limits and demonstrate landings and take-offs.

Student practice

Select an area of sloping ground that is beyond the helicopter's limits and demonstrate the indications that the limits are being approached, and the methods of aborting the landing.

Student practice

Demonstrate wind/slope trade-off.

Student practice of reconnaissance and selection of landing points

## TIPS FOR INSTRUCTORS

The performance and techniques involved with different types of helicopter on sloping ground vary. This exercise should be tailored to meet the performance of the training helicopter.

(1) 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.

(2) Students will tend to look at the ground close to the helicopter. Overcontrolling frequently results, and it will often be necessary to remind the student to raise his or her eyes and use the horizon as a datum.

(3) When students are proficient, let them make the decision where to land so as to judge their own ability to evaluate slopes.

(4) Start the student on `beginners slopes' and gradually increase the severity as proficiency improves.

(5) Ensure that the student is shown some slopes that are a mix of cross slope and up/down slope, so that the helicopter has to be landed diagonally on the slope.

# 21
# ADVANCED TRANSITIONS - limited power/maximum performance & steep approaches

## GROUND SCHOOL POINTS

Flight manual:

Limitations

Load and density altitude performance charts

Vortex ring

Over-pitching - Rotor Stall

## PREPARATORY INSTRUCTION

### Aim

For the student to learn additional take-off and landing techniques for use under operational conditions

### Review

Take-off and Landing – Exercise 7

Transitions – Exercise 11

### Motivation

Although the techniques learned in Exercises 7 and 11 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

Helicopter limitations

### Teaching Points

No-hover take-off

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.

Describe the technique for carrying out a no hover take-off, as follows:

Complete take-off checks, making sure that the RPM is at the maximum take-off setting.

Make a careful all-round lookout.

Smoothly apply collective to initiate a vertical climb. After checking skids are clear of all obstructions, use cyclic to set the climb attitude.

Adjust helicopter attitude when clear of obscuring phenomena.

Point out that since this type of take-off is not preceded by a hover check, it is doubly important to ensure that the helicopter is within weight and C of G limits and that there is sufficient power available for the intended departure.

Cushion creep take-off

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 that is free of obstacles. This technique is effective in circumstances where it is not possible to take off into wind.

Describe the technique for carrying out a cushion take-off, as follows:

Carry out a hover check at a low hover in maximum ground effect facing into wind.

Lookout

Initiate slow forward movement with cyclic.

Apply sufficient power to prevent sink.

Maintain gentle acceleration, staying in maximum ground effect.

As the ground effect is lost and translational lift is acquired, select climb power and airspeed.

Stress that in order for this type of take-off to be effective all control movements must be gentle and progressive.

Vertical or towering take-off

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.

Describe the technique for carrying out a vertical or towering take-off, as follows:

Establish a low hover into wind and complete a power check and take-off checks.

Apply sufficient power to initiate and maintain a gentle vertical climb.

Ensure that the climb is vertical by reference to obstacles ahead and to the side of the helicopter.
As the approach point is reached, check for a positive rate of climb, then ease the cyclic forward so that the helicopter moves forward and continues to climb.
As translational lift is attained, select a climb attitude and apply climb power.

No-hover landing

Explain that this type of landing is useful in conditions where it is not desirable to approach to or hover, such as in dust, powdery snow or turbulence. It requires less power than a normal approach to a hover.

Describe the technique for carrying out a no-hover landing, as follows:
Approach the selected landing spot as required.

When the approach is almost completed, and groundspeed is close to zero, anticipate loss of translational lift by applying sufficient power to minimise the rate of descent.

Let the helicopter sink gently through the cushion onto the ground.

Point out that this type of landing requires careful prior confirmation that the selected spot is suitable for landing.

Run-on landing

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.

Describe the technique for carrying out a run-on landing, as follows:

Approach the selected landing area as required.

As the approach is completed, run on at slow walking pace.

Apply sufficient power to cushion the landing.

After landing, maintain the cyclic and collective positions until forward movement stops.

Approaches

Explain that in operational conditions it is sometimes necessary to approach to land at an angle other than standard, as follows:

Steep approach

This approach is for avoiding obstacles on the final approach path. Point out that airspeed will be lower than normal and that more power will be required.

Always prepare for a no-hover landing.

Stress the need to maintain reasonable airspeed for as long as possible owing to the danger of a vortex ring state occurring or of insufficient power to prevent a hard landing.

Shallow approach

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.

Stress that care should be taken to avoid making the approach angle too shallow, i.e. flat. This requires more power and can lead to problems in decelerating to a hover because of the possibility of the tail striking the ground.

## AIR EXERCISE

Review the standard take-off and departure. Note and compare the power required, after demonstrating with the following techniques:

no-hover take-off and standard departure

cushion creep take-off

Vertical or towering take-off.

Student practice

Review the standard approach to the hover into wind. Note and compare the power required, after demonstrating with the following techniques:

standard approach to a no-hover landing

standard approach to a run-on landing

steep approach to a no-hover landing

shallow approach to the hover

shallow approach to a no-hover landing.

Student practice

Demonstrate a flat approach (i.e. too shallow) and point out the power required difference.

## TIPS FOR INSTRUCTORS

Introduce these techniques in a flat, clear training area. 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.

Care should be taken that the student does not adopt an excessively nose-down attitude when practising no-hover take-offs.

No-hover landings can, and should, be practised from any type of approach.

Point out the similarities of the run-on landing to an engine failure in the hover with regard to groundspeed and pedal control.

When practising cushion creep take-offs, stress the need to have a positive airspeed (approximately 30 to 40 knots) before adjusting to the climb attitude.

Initially, when you are demonstrating steep approaches use an open area, preferably with a line of trees or bushes over which you can shoot the approach. Ensure that the student can see the intended landing spot over the trees.

Steep approaches and towering/vertical take-offs lead on naturally to confined area operations.

# 22
# CONFINED AREAS

## GROUND SCHOOL POINTS

Vortex Ring

Recirculation

Height/Velocity Graph Considerations

Dynamic Rollover

Wires

Loss of Wind

Legal Aspects including Permission

## PREPARATORY INSTRUCTION

**Aim**

For the student to learn safe confined area operations.

**Review**

Advanced Take-offs and Landings – Exercise 15

**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 be able to take full advantage of this ability.

**Airmanship**

Lookout

Wind velocity

Performance

**Teaching Points**

Explain that this exercise can be considered in six stages, as follows:

Power Check conducted and margins established.

Initial or high reconnaissance

Point out to students that they must first positively identify the intended landing area. At this initial stage it is essential to carry out a power check to establish the size of the area they can consider.

The initial reconnaissance will generally be flown in a circular pattern to the pilot's side at an airspeed appropriate to the type of helicopter.

Three factors should be considered at this stage:

power available. The size and difficulty of a confined area vary with the density altitude and AUW/power available.

W/V. An initial assessment of the wind should be made, to be verified later.

general suitability. Establish that the confined area is worth closer inspection and that there is no more suitable alternative in the vicinity.

Low reconnaissance

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.

Prior to descending from the initial reconnaissance, check the wind and verify its strength and direction. Smoke, ripples on water, long grass, flags or clothes on a line all give a good indication.

Factors that the student should take into consideration must include the seven'S's:

1 **Size:** Is it big enough?

2 **Shape:** Does the shape favour an approach from a particular direction?

3 **Slope:** Is the ground level enough for landing?

4 **Surface:** What is the surface of the area? Are there obstacles that might be obstructions, or a surface that might be a hazard, such as dust or snow?

5 **Select** the touchdown spot.

6 **Surrounds:** Do the surrounding obstacles, including wires, favour an approach from a particular direction?

7 **Sun:** Might the sun restrict the pilot's visibility on final approach?

The height and airspeed at which this reconnaissance is carried out will vary. The criterion 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. The reconnaissance should be flown to the student's side, with the confined area in sight throughout.

Dummy approach (if applicable)

During initial training and at any time where the student thinks it necessary or prudent, the actual approach should be preceded by a dummy approach. This should be the same as the intended approach to follow but will terminate with an overshoot at obstacle height.

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 it should not drop below the translational lift airspeed of approximately 15 knots.

A power check should be carried out on the overshoot. The intended departure path can also be checked at this stage for obstacles, escape routes and any low-level turbulence.

From the overshoot the student continues into the circuit. This is normally flown between 300 and 500 AGL at a slightly slower speed than normal. The size and direction will be governed by terrain, wind and open areas.

Approach

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.

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.

The student must be very aware of any obstacles that can catch 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.

Departure

Departures should be initiated from as low a hover as is practicable and at the maximum safe distance from the obstacles on the departure path. This gives the student the best power difference in case of emergency.

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 or she can safely clear the obstacles ahead having made a standard departure.

If the obstacles are too high or too near, a vertical or towering departure should be considered.

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 or her close to the obstacles without first having achieved translational lift.

Aborted departure

If there is a mechanical failure or similar emergency, or if the pilot makes an error of judgement, the departure will have to be aborted. This is a critical manoeuvre, and the pilot should remember that:

the earlier the decision to abort is made, the easier the recovery

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:

When carrying out the power check before landing in a confined area, the pilot should estimate what the AUW will be when he or she 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 especially about whether to use this Confined Area or not.

A pilot should always inspect the general area surrounding the proposed landing site. There might well be an alternative site close by that is less confined and therefore easier and safer to use.

## AIR EXERCISE

Introduce the full confined area procedures, using an area that is large enough to permit a 'standard' approach and departure.

Student practice in the same confined area

Student practice in a different confined area of the same size

Demonstrate the full procedure in a smaller area that requires a steep approach and departure.

Student practice in the same area

Student practice in other areas of similar size

Demonstrate out-of-wind approaches, taking advantage of shape and surrounds.

Student practice

Demonstrate aborted departures.

Student practice

Student practice at selecting the most suitable confined area in a specific locale

## TIPS FOR INSTRUCTORS

This is a comprehensive exercise that may well require more than one session of preparatory ground instruction.

If there is a shortage of suitable confined areas in the local training area, consider planning cross-country navigation exercises to locations farther afield where there is more scope.

When introduced to this exercise, all students will require more than one orbit of the area to obtain all the information they require. Encourage them to cut down this number as their proficiency increases, until experience reduces it to a practical minimum.

Ensure that students pick out a reference near the area so that they maintain situational awareness.

Explain that the order in which the seven'S's are presented is flexible, and variations are permissible, providing all points are covered.

Usually the more different types of areas students are exposed to for demonstration and practice, the more proficient and confident they become in this important part of the course.

Explain the importance of looking for wires on the approach and on the final stages of the final approach.

Point out that, depending on the wind velocity, it is permissible to accept crosswind components to take advantage of size, shape, and gaps in obstacles.

Alert the student to the possibility of losing the wind when descending below the height of the obstacle, normally on the final stages of the approach.

# 23
# LOW-LEVEL OPERATIONS

## GROUND SCHOOL POINTS

Risk Management

Operational Planning

Mast Bumping

Low Level Operations Over Smooth Water

## PREPARATORY INSTRUCTION

**Aim**

For the student to learn safe techniques for flying at low level

**Review**

Quick Stops: Exercise 19

**Motivation**

Although helicopter pilots should fly as high as is reasonably possible, operational tasks often dictate the need for flying close to the ground.

**Airmanship**

- Lookout: obstacles, other helicopter
- Low-level emergency procedures
- Wind observations

**Teaching Points**

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:

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 helicopter.

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. Ostrich farms and horse stables, among others, are particularly sensitive areas.

Trees

Helicopter operations very often involve flying low over trees, and the pilot may have no choice in the matter despite the obvious dangers of an engine failure or similar emergency. However, when pilots do have a choice they should fly the clearest flight path available.

Rising ground

Pilots should fly towards rising ground at an angle of less than 90°. This will make turning away easier in the event of an emergency or meeting downdrafting air.

Water

During over water operations in poor visability, to avoid loss of visual horizon, maintain visual contact with fixed references such as shore line, ship or other structures, if possible. Particluar note is to be made of the hazards associated with low level operations over smooth water surfaces.

High winds

Point out the hazards of flying low level in high winds, including:

drift during turns

the danger of losing airspeed whilst trying to maintain groundspeed when turning from into wind to downwind. This is particularly hazardous when flying at high AUW at high-density altitudes.

Point out that radio performance generally deteriorates quickly at low altitudes.

Demonstrate the technique for carrying out a low-level autorotation.

Assign a local cross-country route to be flown at minimum legal and safe altitude involving as many of the above points as possible.

Special Techniques

**Turning and Climbing - Low Level**

**Minimum radius turns can be achieved by reducing speed during the turning manoeuvre.**

**For climbs, cyclic is more effective at speeds above the Rate of Climb (ROC) speed whilst collective is more effective below ROC speed.**

## AIR EXERCISE

Fly the cross-country as assigned and planned by the student.

Demonstrate low-level flying techniques.

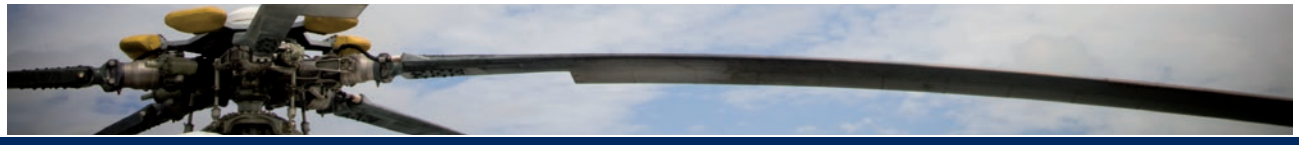
Student practice

## TIPS FOR INSTRUCTORS

Brief the student on the use of both the cyclic and collective together to avoid obstacles such as wires or trees.

Include a check of temperatures and pressures at each turning point to ensure they are not forgotten.

Legal requirements to be explained regarding low level operations. Particular emphasis should be placed on the often misgotten notion that a low level approval allows the holder to transit to and from a low level workplace low level.



# 24
# NAVIGATION

## GROUND SCHOOL POINTS

Maps/charts: symbols, scales, etc.

Computer

Departure and arrival procedures

Track selection: drift lines, increments

NOTAM's

Weather reports and forecasts

Lost procedures

Radio procedures

Publications

Helicopter documents

Flight plans/notifications

Minimum equipment to be carried onboard

## 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**

Assign a cross-country route of three or more legs for the student to plan.

Review and discuss the student's plan.

Review the practical aspects of the different departure procedures relevent to the particular aerodrome and select the appropriate one for the first air lesson.

Describe the visual cues that the student can expect to see, and how to use them for track correction.

Discuss in-flight calculation of ground speed and estimated time of arrival.

Point out the advantages of flying as high as the weather and common sense will allow.

Review the radio calls that it will be necessary to make during the air lesson.

Review lost procedures, including:

- returning to the last known position
- reading 'ground to map'
- use of radio aids (where applicable)

Review the practical aspects of carrying out diversions due to bad weather, emergencies, or task requirements.

## AIR EXERCISE

Fly the cross-country exercise as prepared

- Demonstrate the departure.
- Demonstrate en-route procedures, including maintaining track/returning to track and calculating ground speed and ETA.
- The student should concentrate on procedures and maintaining an accurate track.

Increasing student responsibility for navigation as they pick up the basic concepts.

Demonstrate low-level navigation.

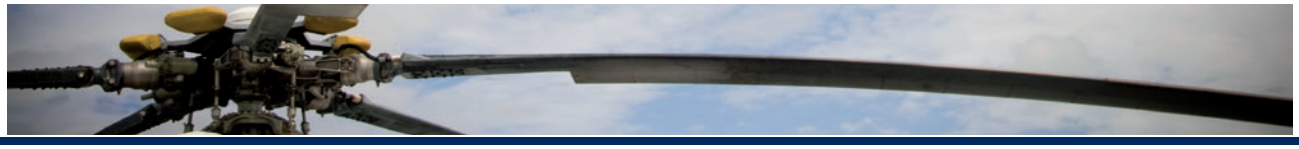
Student practice

Demonstrate diversion techniques and procedures.

Student practice

Demonstrate techniques for flying and navigating in actual minimum legal meteorological conditions.

Student practice



## TIPS FOR INSTRUCTORS

If students become uncertain of their positions, allow a sufficient period of time for reorientation. If they are completely lost after using appropriate `lost procedures', pinpoint your position for them and continue. This is especially important in the earlier dual lessons, as some students could suffer a loss of confidence.

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 minimise these difficulties.

The solo cross-country exercise involves the application of all skills and experience accumulated by the students throughout the training course. Before authorising 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.

Extreme care should be taken to ensure that the weather is suitable; the helicopter is serviceable, with sufficient fuel for the intended flight; and the student has been thoroughly briefed on the correct procedure to be followed for any event that likely to occur during the flight.

During the low flying, stress the changes in visual cues and (if you are using a large-scale map) the speed at which the helicopter moves over the map.

If possible, expose the student to different scales of map, particularly 500 000 and 250 000.

Students should have had some exposure to Exercise Sloping Ground and Exercise  Confined Areas before being sent on the first solo cross-country. This is to ensure that they are capable of landing at a suitable site in the event of any unusual circumstance when flying over inhospitable terrain.

# 25
# HAZARDS

## GROUND SCHOOL POINTS

Theory of flight covering:

Vortex ring

Loss of tail rotor effectiveness (LTE)

Low "G" and mast bumping

Over-pitching/Low Rotor RPM - Rotor Stall

Recirculation

Retreating blade stall

Dynamic rollover

Ground resonance

The theory session on the aforementioned hazards must include:

The avoidance, conditions, symptoms and recovery actions to normal flight or a safe landing. Where a maneouvre is prohibited or is limitation restricted to be demonstrated or practised by the student, emphasis must be placed on avoidance and early recognition of the hazard including the skill or knowledge for the recovery actions to be taken, as appropriate to the type.

## PREPARATORY INSTRUCTION - e.g. Vortex Ring

The aerodynamic stresses to which the airframe and rotor system are exposed during the vortex ring state are virtually unknown. Emphasis should be placed on early recognition and avoidance rather than on practising a fully developed vortex ring state. Control of 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, instead using classroom discussion and scenarios to cover the subject. Recovery can still be practised in the air by simulating vortex ring as described in Tips For Instructors over page.

### Aim

For the student to learn the practical avoidance of, and recovery from, the vortex ring state

### Motivation

It is preferable that the pilot altogether avoids the flight conditions that could result in vortex ring. It is nonetheless desirable that he or she recognises 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

- Helicopter limitations
- Lookout

### Teaching Points

Review the causes, conditions, and symptoms of vortex ring (see Tips for Instructors).

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 such as trying to continue with a go-around.

Review recovery action, discussing the advantages and disadvantages of:

increasing the airspeed

entering autorotation.

Describe the techniques for initiating and recovering from vortex ring safely under training conditions, as follows:

In nil or light wind conditions, climb to an altitude sufficient for safe recovery.

Carry out a good lookout, particularly below.;

Initiate a rate of descent with low airspeed.

Apply power.

Observe the signs and rate of descent, as appropriate to the type of helicopter. When the symptoms have sufficiently developed, recover by transition to forward flight or by entering autorotation.

Stress that avoidance is preferable and that by being constantly aware of W/V and rates of descent it should be possible to prevent vortex ring from occurring.

## AIR EXERCISE

Demonstrate incipient vortex ring, together with safe recovery procedures.

Student practice

## TIPS FOR INSTRUCTORS

This exercise need not necessarily involve a separate air lesson but can be combined with another dual flight.

The airflow conditions that give rise to the formation of a vortex ring state will occur only if the following are present:

- The helicopter has induced flow passing down through the rotor system (IN POWERED FLIGHT).
- There is an external flow directly opposing the induced flow (RATE OF DESCENT).
- The indicated airspeed is low (DOWNWIND OR CALM WIND CONDITIONS).

Brief the student on the following signs of vortex ring:

- judder and stick shake
- random yawing off heading
- rapid increase in rate of descent
- cyclic stick less effective
- random rolling and pitching.

# 26
# PRACTICAL LOADING AND MAXIMUM WEIGHT OPERATIONS

## GROUND SCHOOL POINTS

Flight manual: Weight and balance
Performance charts

## 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 pilots can make full use of the helicopter's capabilities, at the same time being fully aware of its safe limitations.

### Airmanship

- Helicopter limitations
- Passenger safety

### Teaching Points

Describe the practical aspects of loading and unloading cargo, as applicable to type, including the following:

- storage
- security
- dangerous cargo
- passenger operations.

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:

- location and operation of the ELT
- location and operation of EXITS
- location and operation of all doors and windows
- location and operation of cargo compartment(s) or pods
- operation of seat belts and shoulder harnesses
- location and operation of fire extinguisher(s)
- smoking
- location of first aid kit(s) and survival gear.

**Other Operations**

hazards associated with the main and tail rotor

specialised instructions concerning the job at hand

hand signals for ground crew.

Point out the effects of increased weight and/or density altitude on the power required, power available and performance, including autorotational performance, as applicable to type.

## AIR EXERCISE

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.

Exercises that are reviewed at different helicopter weights.

# 27
# SLING-LOAD OPERATIONS

## GROUND SCHOOL POINTS

Flight manual:

Limitations
Weight and balance
Marshalling signals

Legal considerations

## 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**

Show and describe the cargo hook fitted to the helicopter, together with the systems of arming, loading, release, emergency manual release, and emergency external release.

Show and describe the nets, straps, barrel hooks and any specialised equipment, together with the inspections for suitability and serviceability.

Describe, in detail, the procedures used in sling-load operations, including:

- pre-flight checks of the equipment
- briefing of ground crew
- hooking-up, with and without ground crew
- in-flight procedures, including emergencies
- release, with and without ground crew.

Students should be made aware of the possibility jettison the load and for this reason, routes should be selected over open country to minimise the danger of persons or property.

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 stabilised before hook-up. Explain that should oscillations occur in flight they can often be minimised, either by an increase in power or a reduction in airspeed or by making gentle balanced turns.

If, despite all efforts to prevent or cure oscillations, they start to hazard the safety of the helicopter 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.

Explain the advantages of a well-sited mirror.

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 EXERCISE

Demonstrate pick-up and release procedures with ground crew.

Student practice

Demonstrate use of manual release, and external release by ground crew.

Student practice

Where practical, demonstrate enroute procedures that minimise danger to persons and property on the ground.

Student practice

Demonstrate the slinging of difficult loads and oscillation-dampening procedures.

Student practice

Demonstrate pick-up and release procedures without ground crew.

Student practice

## TIPS FOR INSTRUCTORS

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.

Impress upon students the fact that they should use a swivel between the helicopter and the load.

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.

Describe how to plan ahead to obtain the best fuel load.

Explain the importance of keeping the slinging area clear of debris, such as hats, tarps, boards, etc.

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.

Demonstrate as many different types of load using as many types of slinging equipment as possible.

# 28
# MOUNTAIN FLYING AWARENESS

## GROUND SCHOOL POINTS

Maps/charts

Flight plans/notifications

Weather (mountain) reports and forecasts

Flight manual: Performance limitations

## PREPARATORY INSTRUCTION

**Aim**

To develop student awareness of mountainous terrain considerations and to introduce the student to basic mountain flying techniques.

**Review**

Advanced take-off and landings (Exercise 7)

Confined Area Operations (Exercise 22)

Low Level Operations (Exercise 23)

Navigation Principles (Exercise 24)

Practical loading and maximum weight operations (Exercise 26)

**Motivation**

By their very nature, helicopters are often required to fly though and operate in mountainous terrain. Although it takes many years to accrue the necessary experience to operate safely in mountainous areas, all helicopter pilots should understand, and be able to apply, the fundamental techniques required to land at unprepared sites in mountainous terrain as the basis for more advanced training.

**Airmanship**

- Lookout
- Air as a fluid
- Importance of pre-flight planning
- Efects of Density Altitude
- Power Considerations
- Escape Route considerations

**Teaching Points**

AIRCRAFT HANDLING

- Horizon awareness
- Height and altitude considerations

WEATHER PATTERNS AND WIND AWARENESS

- Mountain weather
- Wind awareness

TRANSIT FLYING

- Pre-flight planning
- Flying techniques

APPROACH AND LANDING TO UNPREPARED SITE

- Reconnaissance
- Power checks
- Wind direction and demarcation line
- Approach direction and angle
- Commital point and escape route
- Airming point/hover or touchdown point
- Typical features
- Main/tail rotor awareness

EMERGENCIES

- Controlled flight into terrain
- Forced/Precautionary Landings

HUMAN FACTORS

- Situational awareness
- Aircraft management
- Airmanship
- Aviation medicine
- SAR aspects

## AIR EXERCISE

Fly a low altitude route (Not below 500'AGL) through mountainous terrain.

Review low-level map reading techniques.

Teach valley flying taking into account updrafting/downdrafting air and other considerations (eg; sun, wires).

Teach ridge/saddle crossing techniques.

Student practice.

Teach approach and landing to an unobstructed area (eg; valley floor or farm airstrip) without a natural horizon, in wind conditions of 5 to 15 knots.

Student practise.

Teach approach and landing/hover to a rounded mountainous terrain feature not above 5,000'AMSL:

Review reconnaissance/power check procedures.

Teach wind finding.

Experience flight upwind and downwind of demarcation line.

Teach straight-in constant angle ('gun barrel' approach as the basic building block.

Teach overshooting to escape route at or before committal point.

Student practice

If time permits, demonstrate approach and landing/hover to various rugged terrain features, including those above 5,000' AMSL or different types of appraches.

Review EMERGENCY procedures.

Practice engine failures,  with recovery from autorotation NOT BELOW the proscribed minimas.

## TIPS FOR INSTRUCTORS

Mountain flying is very exhilarating for the experienced pilot but is very demanding and possibly daunting for the student. Avoid progressing too quickly to avoid the student suffering psychological distress or information overload.

A corollary to that is that this brief introduction to mountain flying qualifies the student to fly only in the most benign circumstances. The student, even once qualified as a pilot, should not attempt more advanced exercises without further training.

Stress that mountain flying simply requires the application of fundamental flying techniques previously learned; compared to operating at the home airfield, the differences are a matter of degree, not principle. For example, do not forget to conduct periodic/pre-landing checks.

An awareness of wind direction and strength should be developed at every opportunity. Students should be encouraged to be able to estimate wind at all times either through surface cues, by visualising airflow or by feeling the wind's effect on the helicopter.

You should demonstrate that you always have a 'plan' or escape route in case of an engine failure or an adverse environmental situation. Encourage the student to do likewise by asking "what would you do if...?"