UNIT 2: LOST

SUBJECT BACKGROUND:

# NAVIGATION AND FLIGHT PLANNING

## Introduction

In the very early days of powered flight, pilots were content simply to get airborne and fly short distances. It was not long, however, before they began to fly further and had a need to find their way safely and efficiently to their desired destination, thus leading to the development of **air navigation**. Navigating a course in the air is fundamentally different from navigating on land as one cannot simply stop in order to decide the best course to follow. A plane can also only carry a limited amount of fuel and failure to reach its destination (or another safe landing area) before this fuel runs out might well have fatal consequences.

## VFR / IFR

Nowadays all flights operate under **VFR (Visual Flight Rules)** or **IFR (Instrument Flight Rules)**. A VFR pilot is qualified and authorised to fly only in good weather conditions and is responsible for maintaining separation from other aircraft and obstructions on the basis of what he / she can see. An IFR pilot is permitted to fly in all weather conditions and relies on flight instruments and **navigational aids** to follow a safe course. Most IFR flights take place in **controlled airspace** where air traffic control services issue instructions to pilots to ensure the safe and efficient flow of traffic. Commercial passenger flights, always fly under IFR, but if a friend offers to take you for a short spin around your local area on a sunny day, then this is most likely VFR.

## Basic Navigation (VFR)

In the early days of flight, navigational aids did not exist. Flights were at low altitude and the pilot simply looked out the window and navigated with reference to known landmarks. In some cases, it was just a question of following a road, river or railway to the desired destination. While a VFR pilot today will still use this technique, there is an obvious danger of getting lost, particularly if bad weather sets in suddenly. VFR pilots are nowadays advised to plan their flight carefully before taking off using the detailed **aeronautical charts** they have at their disposal. They decide on their route, taking into account natural obstacles and airspace which may be restricted or controlled (they will either need prior authorization to enter or it may not be open to them at all). They then mark this route on their charts. For all aircraft and light aircraft in particular, wind is an important factor in flight planning.

A pilot who tries to fly along a planned route risks being blown off course unless a suitable **heading** is chosen based upon meteorological forecasts of wind strength and direction. (A **heading** is expressed in degrees with magnetic north as a reference, it should not be confused with the term **bearing**, also expressed in degrees, where the reference should be explicitly stated (eg a beacon)). The chosen heading will probably need to be altered in flight in response to changes in the strength or direction of the wind. Note that the word **track** is also used to refer to the actual route taken by the pilot when, as frequently happens, the plan changes.

A technique known as **dead reckoning** serves as a check that all is going to plan. The pilot selects some easily recognizable landmarks along the planned route and calculates how long it will take to reach these points taking into account both the planned **airspeed** and wind. These points are known as **fixes** and when the planned time has elapsed the pilot expects to identify these landmarks on the ground. When this happens he / she has **made a fix** and can confidently proceed with the next stage along the planned route.

The basic navigational aid that a VFR pilot will make use of is the **magnetic compass**. These days many pilots flying VFR will also carry a simple hand-held GPS system as extra backup.

Despite all their training and the existing regulations, VFR pilots do get lost from time to time, wander into airspace that they shouldn't normally be flying in, or find themselves in **IMC (Instrument Meteorological Conditions)** for which they are not necessarily equipped or trained. The consequences are potentially very serious and it often falls to the highly skilled air traffic controllers or perhaps to other more experienced pilots who are flying in the vicinity to do what they can to help.

## IFR Navigation

The first and most obvious difference in navigation procedures for IFR is that pilots need to be qualified and licensed to fly IFR and there are many who are not (amateur pilots who only ever fly VFR). Procedures are more scientific and an ability to use more complex navigational aids is required.

IFR pilots usually fly in controlled airspace. They have at their disposal special charts which indicate recommended IFR routes between **navigational beacons** (unless they are travelling 'off the beaten track' in which case they have a lot of work to do themselves to determine a suitable route). Distances between beacons, the bearings to be taken as well as the **lowest safe altitude (LSALT)** are clearly marked for these recommended routes. This latter measure is particularly important in minimizing the risks of **CFIT (Controlled Flight into Terrain)**, a usually fatal hazard for VFR as well as IFR pilots.

Assuming that an IFR pilot is flying through controlled airspace then he / she needs to file a flight plan with air traffic control services. In the case of commercial airlines that fly the same route again and again they would normally file a repetitive flight plan that is valid for a period of perhaps six months.

## Navigational Aids

**ADF (Automatic Direction Finding):** ADF is a fairly old system of radio navigation, but it is still in use today. A pilot is able to pick up a radio signal from a **non-directional beacon (NDB)**, the cockpit display then shows the direction of the beacon from the aircraft.

**VOR (Very High Frequency Omni-directional Range):** This is a more developed system and is currently the primary air navigation system in countries where sufficient infrastructure is in place. A VOR station can determine and transmit to the pilot the exact bearing that will take the pilot over that point. Many VOR stations also have distance measuring equipment (DME) in which case the pilot is informed of his / her distance from the station.

**GPS (Global Positioning System)**: Just as many cars are now fitted with a GPS system so that you can drive around without consulting a map, pilots are making increasing use of GPS satellite navigation. Originally very expensive, prices have come down considerably in recent years and even if a light aircraft is not fitted with a GPS cockpit system, many pilots will not take off without a hand-held device.

One of the benefits of GPS is the greater degree of precision that it affords to both pilots and controllers. A pilot's position can now be identified within a few metres. For this reason required minimum levels of separation between planes are less nowadays than they were.

One of the criticisms of GPS is that it was developed and is owned by the US military. It has been freely available for civilian use for several years, but the worry that one day this might change has led the Europeans to develop their own new satellite navigation system – **Gallileo** – which is expected to be operational in a few years time.

## Air Traffic Control

IFR pilots can obviously not usually follow their desired course blindly while disregarding other traffic. When flying through controlled airspace a pilot will often ask for or receive **vectors** (instructions as to which direction to take, or we can say that the controller 'vectors the pilot') from an air traffic controller who is responsible for ensuring and maintaining safe separation between aircraft.

### for fun

You might like to share the following joke with your students (unknown source). The pilot is VFR, and the request on the part of the controller that he / she make 90 degree turns is a commonly used technique in such cases for quick and sure **radar** identification.

***Student Pilot:*** *I'm lost; I'm over a lake and heading toward the big E.*

***Controller:*** *Make several 90 degree turns so I can identify you on radar.*

*(short pause) ...*

***Controller:*** *Okay then. That lake is the Atlantic Ocean. Suggest you turn to the big W immediately ...*

# Teacher's Book material




UNIT 2

## Section 2

**1** This is a warm-up exercise prior to listening. Make sure that students understand when they do this exercise that they are not expected to actually come up with the right sequence. The aim is simply for them to discuss plausible alternatives and to be alerted to some of the key parts of the pilot-controller dialogue they are about to hear.

**2** As in shipping, 'Mayday, Mayday, Mayday' is the standard phrase for declaring an emergency. Note that pilots may sometimes contact a controller with a problem but not actually need to or wish to declare an emergency (when in doubt, a controller will ask, 'are you declaring an emergency?'). In this particular case, the situation was clearly of sufficient seriousness for the pilot to have no hesitation.

**2.2.1 Tapescript**

| | |
|---|---|
| Prochnow | Mayday. Mayday. Mayday. Auckland Control. November-four-fife-Alpha-Charlie. I'm lost. I'm a Cessna 188 AgWagon. |
| AUK ATC | November-four-fife-Alpha-Charlie, Auckland centre roger mayday. |
| Captain Vette | Tango-Echo-one-zero-tree contacting November-four-fife-Alpha-Charlie. Tango-Echo-one-zero-tree contacting November-four-fife-Alpha-Charlie. |
| Prochnow | November-four-fife-Alpha-Charlie. Copy. |
| Captain Vette | November-four-fife-Alpha-Charlie. We are a DC-10 en route from Fiji to New Zealand. We received news of your situation and we are offering assistance. Can you tell me what happened? |
| Prochnow | Tango-Echo-one-zero-tree. Thanks. I took off from Pago Pago at three this morning. I wanted to have enough light to see my fixes and I filled the tanks to give me around 22 hours endurance. But during the flight the ADF stopped working correctly and took me off course. At the moment I know I'm off track and I can't calculate my position. November-four-fife-Alpha-Charlie. |
| Captain Vette | November-four-fife-Alpha-Charlie. We are flying in your direction. You are not alone. We are going to try to establish VHF communication with you. Tango-Echo-one-zero-tree. |
| Prochnow | Again, thank you. November-four-fife-Alpha-Charlie. |
| Captain Vette | November-four-fife-Alpha-Charlie. Turn towards the sun and report your heading. |
| Prochnow | Wilco. My heading is two-seven-four degrees. |
| Captain Vette | November-four-fife-Alpha-Charlie. We are facing the sun. Our heading is two-seven-zero. The difference is four degrees, which means you are south of our position. |
| Captain Vette | November-four-fife-Alpha-Charlie. Now hold out your hand. How many fingers do you have between the horizon and the sun? |
| Prochnow | About two and a half fingers. |
| Captain Vette | November-four-fife-Alpha-Charlie. Two and a half fingers. We have four fingers. We believe you are south west of our position. Fly heading tree-one-fife. |
| Prochnow | Heading tree-zero-fife. |
| Captain Vette | November-four-fife-Alpha-Charlie. Maintain your position. We're going to try to establish your position using the radio signal. We're going to maintain our heading until we lose contact. Then we will then turn left to re-establish contact, and then try to box you in this way. We'll contact you again very soon. |
| [PAUSE] | |
| Captain Vette | November-four-fife-Alpha-Charlie. It's getting dark. What time is your sunset? |
| Prochnow | The sun is setting now, and it zero-seven-fife-two-zulu. |
| Captain Vette | November-four-fife-Alpha-Charlie. Sunset on Norfolk Island is zero-seven-tree-zero zulu. That means you are fife-decimal-six degrees east and tree-zero degrees south of Norfolk Island. Maintain your heading. You're going to make it! |
| Prochnow | Tango-Echo-one-zero-tree. I can see a light, yes it's a light, it looks like a ship, no I think it's an oil rig. |
| Captain Vette | November-four-fife-Alpha-Charlie. Your coordinates are 31°S 170° 21'E. We are on our way. You are one-fife-zero miles from Norfolk Island. We'll guide you to Norfolk Island. |
| Prochnow | Maintaining heading tree-zero-fife. November-four-fife-Alpha-Charlie. |

1 d 2 e 3 a 4 b 5 c

Once an emergency has been declared, all possible assistance will be provided to a pilot, whether from air traffic control services or other pilots who pick up the emergency call. There is a strong bonding between pilots such that they will do anything they possibly can to assist a fellow pilot in danger.



**3** Even allowing for the fact that pilots will always help each other out, the assistance provided by Captain Vette was quite remarkable. He agreed straightaway to incur a significant diversion of his passenger flight in order to search for Prochnow and that search was anything but an easy task since he had very little to go on. The navigational techniques he used to determine Prochnow's approximate position were highly innovative and effective. When he finally spotted Prochnow (he had explained to his passengers what he was doing and asked them to look out the windows!) he then took the time to guide him to Norfolk island. It was a truly heroic effort on the part of Captain Vette and it's not surprising that a film of this event was subsequently made.

1 b 2 b 3 b 4 a 5 a

### Pronunciation – Coordinates

**1** Note that according to standard ICAO phraseology, the following numbers have special pronunciations in aviation English:

*3= tree 5 = fife 9= niner*

Numbers are of critical importance and the aim is that communications should provide no room for ambiguity in this area ('five' and 'nine' could be confused) as well as being easy to pronounce (no 'th' sound!). That said, many pilots and controllers (native English speaking or foreign) do not bother to incorporate these variations when they communicate on the frequency (they should!). In the dialogue given captain Vette does say 'fife' but not 'tree'.

| | |
|---|---|
| Captain Vette | Turn towards the sun and report your heading. |
| Prochnow | Wilco. My heading is two-seven-four degrees. |
| Captain Vette | Sunset on Norfolk Island is zero-seven-tree-zero zulu. That means you are fife-decimal-six degrees east and tree-zero degrees south of Norfolk Island. |
| Captain Vette | Your coordinates are tree-one degrees south, one-seven-zero degrees two-one minutes east. You are one-fife-zero miles from Norfolk Island. |

1 274°
2 5.6°E
3 30°S
4 31°S
5 170°21'E

**2** Students ought to repeat the numbers with the variations above, in line with the model given.

north south east west south-east north-west south-west north-east

two-seven-four degrees

fife-six degrees east, tree-zero degrees south

one-seven-zero degrees, two-one minutes east

one-four degrees, tree-two minutes, four-zero decimal two-fife seconds north

**3** Exact positions on the globe are stated longitudinally and laterally with the earth's surface divided into 360° around each axis. Each degree is divided into 60 minutes and for further precision a number of seconds can also be stated.

This pair work information exchange activity should be fairly straightforward. It is important that they communicate numerical data accurately. You might like to walk around and monitor their rhythm and offer them advice on improving it as necessary.

| Student A | Student B |
|---|---|
| 1 oil rig | 1 Norfolk Island |
| 2 Pagp Pago | 2 Nadi Airport; Fiji |
| 3 Ono-I-Lao | 3 Matthew Island |
| 4 Auckland | 4 Sydney Opera House |

### Pronunciation – Regular past endings

**1** Correct pronunciation of the 'ed' past tense ending is difficult for many nationalities so it is worth checking that all students can hear and reproduce the three basic sounds before moving on.

/d/ *We receiv**ed** news of your situation*
/t/ *the ADF **stopped** working correctly*
/id/ *I want**ed** to have enough light to see my fixes*

**2** This may work best as a collaborative exercise, inviting students to the board to work on the correct classification. Encourage them to actually try saying them. You might want to model one or two of the words if they can't agree, but for the most part they should be able to get close to the correct answers and can check against the recording once they have more or less agreed amongst themselves.

| | | | |
|---|---|---|---|
| 1 /d/ | followed | arrived | tried |
| 2 /t/ | established | approached | tasked |
| 3 /id/ | contacted | departed | calculated |

**3** After successful choral repetition, you might elicit some other regular verbs and ask students which group they join.

**4** This exercise encourages students to go on reproducing the correct sounds in context.

SUBJECT BACKGROUND:

# NAVIGATION AND FLIGHT PLANNING

## Introduction

In the very early days of powered flight, pilots were content simply to get airborne and fly short distances. It was not long, however, before they began to fly further and had a need to find their way safely and efficiently to their desired destination, thus leading to the development of **air navigation**. This was initially based on nautical navigation, hence the term aeronautical. Navigating a course in the air is fundamentally different from navigating on land or at sea, as one cannot simply stop in order to decide the best course to follow. An airplane can also only carry a limited amount of fuel and failure to reach its destination (or another safe landing area) before this fuel runs out might well have fatal consequences (for more on this see Unit 10).

## VFR / IFR

Nowadays all flights operate under **VFR (Visual Flight Rules)** or **IFR (Instrument Flight Rules)**. A VFR pilot is qualified and authorized to fly only in good weather conditions and is responsible for maintaining separation from other aircraft and obstructions on the basis of what he / she can see. An IFR pilot is permitted to fly in all weather conditions, when visibility may be low, and relies on **flight instruments** and **navigational aids** to follow a safe course. Most IFR flights take place in **controlled airspace** where air traffic control services issue instructions to pilots to ensure the safe and efficient flow of traffic. When you board a commercial flight, it is probably flying under IFR, but if a friend or relative offers to take you up in an airplane around your local area on a sunny day, then this is most likely flying under VFR.

## Basic navigation (VFR navigation)

In the early days of flight, navigational aids did not exist and the basic technique followed was **pilotage**. Flights were at low altitude and the pilot simply looked out the window and navigated with reference to known landmarks. In some cases, it was just a question of following a road, river or railway to the desired destination. While a VFR pilot today will still use this technique, there is an obvious danger of getting lost, particularly if bad weather sets in suddenly. VFR pilots are nowadays advised to plan their flight carefully before taking off using the detailed **aeronautical charts** they have at their disposal. They plan their route, taking into account natural obstacles and airspace which may be restricted or controlled (they will either need prior authorization to enter or it may not be open to them at all). They then mark this route on their charts.

For all aircraft, and light aircraft in particular, wind is an important factor in flight planning. A pilot who tries to fly along a planned route risks being blown off course unless a suitable **heading** is chosen based upon meteorological forecasts of wind strength and direction. The chosen heading will probably need to be altered in flight in response to changes in the strength or direction of the wind. Note that the word **track** is also used to refer to the actual route taken by the pilot when, as frequently happens, the flight plan changes.

A **heading** is expressed in degrees with magnetic north as a reference. It should not be confused with the term **bearing**, also expressed in degrees, where an alternative reference is explicitly stated (e.g. a particular beacon). For example a pilot may be heading due west (a heading of 270°) having just passed directly over a beacon, in which case the pilot has a bearing of 180° in relation to this beacon.

A technique known as **dead reckoning** serves as a check that all is going to plan. The pilot selects some easily recognizable landmarks along the planned route and calculates how long it will take to reach these points taking into account both the planned airspeed and wind. These points are known as checkpoints, and when the planned time has elapsed the pilot expects to identify the landmarks on the ground. When this happens he / she has made a fix and can confidently proceed with the next stage along the planned route.

The **magnetic compass** is the basic navigational aid that a VFR pilot will use.

Despite all their training and the existing regulations, VFR pilots do get lost from time to time, fly into airspace that they shouldn't normally be flying in, or find themselves in **IMC (Instrument Meteorological Conditions)**, such as flying through cloud, for which they are not necessarily equipped or trained. The consequences are potentially very serious and it often falls to the highly skilled air traffic controllers or perhaps to other more experienced pilots who are flying in the vicinity to do what they can to help. A good illustration of an air traffic controller aiding such a pilot is to be found in Section 3.

## IFR navigation

The first and most obvious difference in navigation procedures for IFR is that pilots need to be qualified and licensed to fly IFR.

IFR pilots usually fly in controlled airspace. They have at their disposal special charts which indicate recommended **IFR routes** between **navigational beacons** (radio stations on the ground which emit signals). If they are travelling in remote areas where there are no navigational beacons, then they have to determine a suitable route by themselves. Distances between beacons, the bearings to be taken and the **lowest safe altitude (LSALT)** are clearly marked for the recommended IFR routes.

If an IFR pilot is flying through controlled airspace, he / she needs to **file a flight plan** with air traffic control services. In the case of commercial airlines that repeatedly fly the same route, they would normally file a repetitive flight plan that is valid for a certain period.

## Navigational aids

**ADF (Automatic Direction Finding):** ADF is a fairly old system of radio navigation, but it is still in use today. A **Non-Directional Beacon (NDB)** emits a radio signal and the pilot's cockpit display will show the direction of the beacon from the aircraft. This, combined with dead reckoning, is the system Jay Prochnow was using for his flight across the Pacific ocean which appears in the reading in Section 1.

**VOR (Very High Frequency Omni-directional Range):** This is a more developed system and is currently the primary air navigation system in countries where sufficient infrastructure is in place. A VOR station can determine and transmit to the pilot the exact direction that will take the pilot over the point where the VOR station is. Many VOR stations also have **distance measuring equipment (DME)** which informs the pilot of his / her distance from the VOR station.

**GPS (Global Positioning System):** Many cars are now fitted with a GPS system so that you can drive without consulting a map. Pilots are also now making use of GPS satellite navigation. Originally very expensive, GPS equipment is now cheaper to buy and so even if a light aircraft is not fitted with a GPS cockpit system, many pilots will use a hand-held device. Had Jay Prochnow been flying today with such a system available, he would not have come so close to disaster.

One of the benefits of GPS is the greater degree of precision that it affords to both pilots and controllers. A pilot's position can now be identified within a few metres. For this reason, required minimum levels of separation between airplanes are less nowadays than in the past.

One of the criticisms of GPS is that it was developed and is owned by the US military. It has been freely available for civilian use for several years, but the worry that one day this might change has led the Europeans to develop their own new satellite navigation system, **Galileo**, which is expected to be operational in a few years' time.

## Air traffic control

IFR pilots can obviously not follow their desired course blindly while disregarding other traffic. When flying through controlled airspace a pilot will often ask for or receive **vectors** (instructions as to which heading to take, or we can say that the controller **vectors the pilot**) from an air traffic controller who is responsible for ensuring and maintaining safe separation between aircraft.

### for fun

**When things go wrong …**

**Student Pilot:** I'm lost; I'm over a lake and heading toward the big E.

**Controller:** Make several 90° turns so I can identify you on radar … OK then. That lake is the Atlantic Ocean. Suggest you turn to the big W immediately ...

*The pilot is VFR, and the request on the part of the controller that he / she make 90° turns is a commonly used technique in such cases for quick and sure radar identification. 'The big E' and 'the big W' refer to the large letters displayed on the compass – East and West.*

# LOST

## Section one – Across the Pacific

This section introduces the true story of a pilot, Jay Prochnow, who is lost while crossing the Pacific Ocean on a solo flight in a single-engine plane. The section teaches the key vocabulary of air navigation and the language function of explaining abbreviations. It also sets the scene for Section 2 in which Jay Prochnow is rescued through the efforts of a commercial airline pilot who picks up his distress call.

**1** The picture and the question should arouse students' curiosity. Flying a light aircraft like this with one engine over long stretches of water is not recommended. You might receive some strong reactions, particularly if you are teaching airline pilots (or trainee airline pilots) whose training emphasizes the importance of avoiding any kind of risk. Air traffic controllers (or trainees) are likely to react in a similar way. It is likely that the students will be intrigued by the situation and motivated to talk about the risks involved.

(Suggested answers)

The aircraft can't carry much fuel, which limits how far it can fly at once.

The aircraft doesn't have sophisticated navigational aids.

There are few landmarks for navigation.

The aircraft only has one engine.

There are few places to land in an emergency.

**2** Note that the word *incident* has a high frequency in aviation English. It refers to any situation in which one or more things went wrong but which did not actually result in an accident. Safety and prevention of accidents relies primarily on the systematic study of incidents and the drawing of appropriate conclusions and recommendations.

a endurance
b fix
c calculate
d incident
e track
f task

**3** This text should be clear and the aviation vocabulary is straightforward or has been defined in Activity 2. *HF signals* stands for high frequency signals. You might need to respond to vocabulary questions of a general nature.

(from top to bottom)
Oakland
Hawaii
Pago Pago
Onu-I-Lau
Norfolk Island

**4** 1 Cessna 188
2 22 hours
3 15 hours
4 110 knots
5 0300
6 1,500 nm

**5** Students read the text a second time in order to make sure they have understood. They might wish to discuss the situation or you could prompt a discussion with some supplementary questions, e.g. *What will happen if he runs out of daylight?* (Navigation becomes impossible and he probably has to ditch in the ocean with little chance of survival.) *How serious is the problem?* (Extremely serious as he's running out of daylight.)

1 An aircraft sales company in Oakland
2 Charts, a compass and an ADF
3 To give maximum daylight hours.
4 There were no navigational aids.
5 When he couldn't see Norfolk Island.

**6** If you wish to vary the activity, ask students to close their books and work in pairs or small groups to brainstorm the advice they would give to pilots like Prochnow.

(Suggested answers)

Carry a GPS device.

Be patient and wait for the best meteorological conditions (completely clear skies, a following wind).

Contact other pilots who have flown a similar route for advice.

Bring some strong coffee or something else to help keep you awake at all time.

## Functional English – Explaining abbreviations

**1** Students could complete the activity in groups A and B to ensure they have the correct answers before beginning the information exchange activity.

NDB = non-directional beacon, ADF = automatic direction finder, VFR = visual flight rules

**2** Encourage students to help their partner with hints (e.g. giving the first word when there's more than one). To feed back on this activity ask students to explain the abbreviations that you don't know (or are not sure of). This could be an authentic and useful exchange of information.

| | |
|---|---|
| DTG | distance to go |
| FAF | final approach fix |
| FDR | flight data recorder |
| OAT | outside air temperature |
| RVR | runway visual range |
| TAS | true air speed |
| TBS | to be specified |
| TOGA | take off, go around |
| ZFW | zero fuel weight |
| ILS | instrument landing system |

## Section two – Finding flight N45AC

This section deals with the rescue of Jay Prochnow. Students listen to the initial contact he made with Auckland air traffic control and the subsequent assistance he received from Captain Vette. The listening activity outlines the considerable aid he received and forms an interesting and challenging listening comprehension activity. Later in the section students practise giving and receiving coordinates as well as the pronunciation of regular past tense endings.

**1** This is a warm-up activity prior to listening. The aim is for the students to discuss the possible order of events and review some of the key parts of the pilot-controller dialogue.

**2** 07, 08, 09 *Mayday. Mayday. Mayday.* is the standard phrase for declaring an emergency. Note that pilots may sometimes contact a controller with a problem but not actually need to or wish to declare an emergency (when in doubt, a controller will ask *Are you declaring an emergency?*). Once an emergency has been declared, all possible assistance will be provided to a pilot, whether from air traffic control services or other pilots who pick up the emergency call.

1 d 2 e 3 a 4 b 5 c

### 07 Listening script

**P = Prochnow, C = controller, V = Vette**

**P** MAYDAY. MAYDAY. MAYDAY. Auckland Control. N45AC. I'm lost. I'm a Cessna 188 AgWagon.

**C** N45AC. Auckland centre roger mayday.

(II)

**V** TE103 contacting N45AC.

**P** N45AC. Copy.

**V** N45AC. We are a DC-10 en route from Fiji to New Zealand. We received news of your situation. We are offering assistance. Can you tell me what happened?

**P** TE103. Thanks. Departed Pago Pago at three this morning with around 22 hours endurance. I wanted to have enough light to see my fixes. But the ADF stopped working correctly and now unable to calculate my position. N45AC.

**V** N45AC. We are going to try to establish VHF communication with you.

### 08 Listening script

**V** Turn towards the sun and report your heading.

**P** Wilco. (II) My heading is 274°.

**V** N45AC. We are facing the sun. Our heading is 270. The difference is 4°, so you are south of our position. Now hold out your hand. How many fingers do you have between the horizon and the sun?

**P** About two and a half fingers.

**V** N45AC. We have four fingers, so you are south-west of our position. Fly heading 315.

**P** Heading 315.

**V** N45AC. Maintain your position, so we can establish your position using the radio signal. We'll maintain our heading until we lose contact. Then we will turn left to re-establish contact, and then try to box you in this way. We'll contact you again very soon. (II) N45AC. It's getting dark. What time is your sunset?

**P** The sun is setting now, and it 0752 zulu.

### 09 Listening script

**V** N45AC. Sunset on Norfolk Island is 0730 zulu. That means you are 5.6° east and 30° south of Norfolk Island. Maintain your heading.

**P** TE103. I can see a light. I think it's an oil rig.

**V** N45AC. Your coordinates are 31° south 170° 21' east. You are 150 miles from Norfolk Island.

**3** 07, 08, 09 Even allowing for the fact that pilots will always help each other out, the assistance provided by Captain Vette was quite remarkable. He agreed straightaway to incur a significant diversion of his passenger flight in order to search for Prochnow. He also had little information to go on, making the search very difficult. The navigational techniques he used to determine Prochnow's approximate position were highly innovative and effective. Note the word *transponder* in Question 4. This is the onboard device which allows aircraft to be identified on a controller's radar. Even if Jay Prochnow's aircraft was equipped with a transponder it would not have been any use in the remote area he was flying in as radar coverage was not provided. Had there been radar coverage in the area, an air traffic controller would have been able to give him his precise position and help him to navigate safely to his destination.

1 b 2 b 3 b 4 b 5 a

## Vocabulary – Co-ordinates

**1** 08, 09 Note that according to standard ICAO phraseology, the following numbers have special pronunciations in aviation English: *3 tree 5 fife 9 niner*. Numbers are of critical importance and the aim is that there is no ambiguity in this area. *Five* and *nine* could be confused. The *th* sound is difficult for many nationalities to pronounce and hence *tree* instead of *three*. That said, many pilots and controllers (native English speaking or foreign) do not incorporate these variations when they communicate on the frequency.

1 274°
2 5.6° east
3 30° south
4 31° south 170° 21' east
5 150 miles

**2** 10 Students repeat the numbers.

**10 Listening script**

north
south
east
west
south-east
north-west
south-west
north-east
274°
56° east
30° south
170° 21' east
14° 32' 40. 25" north

**3** Exact positions on the globe are stated longitudinally and laterally with the Earth's surface divided into 360° around each axis. Each degree is divided into 60 minutes and for further precision a number of seconds can also be stated.

In this pair-work information exchange activity, it is important that students communicate numerical data accurately. Monitor students' rhythm and offer them advice on improving it as necessary.

## Pronunciation – Regular past tense endings

**1** 11 Correct pronunciation of the *ed* past tense ending is difficult for many nationalities and it is important in preventing a possibly serious miscomprehension. Make sure all students can hear and reproduce the three basic sounds before moving to the next activity.

**11 Listening script**

We received news of your situation.
The ADF stopped working correctly.
I wanted to have enough light to see my fixes.

**2** 12 You could do this activity with the whole class. Encourage students to say each verb. You could model one or two verbs if they can't agree, but students should be able to complete the table without help. Then play the recording to check.

| | | | |
|---|---|---|---|
| 1 /d/ | followed | arrived | tried |
| 2 /t/ | established | approached | tasked |
| 3 /ɪd/ | contacted | departed | calculated |

**12 Listening script**

| | | | |
|---|---|---|---|
| 1 /d/ | followed | arrived | tried |
| 2 /t/ | established | approached | tasked |
| 3 /ɪd/ | contacted | departed | calculated |

**3** After successful choral repetition, you might elicit some other regular verbs and ask students which group they belong to.

**4** In this activity students practise reproducing the correct past tense endings in context.

# Section three – Lost

This section deals with a situation where a pilot who is qualified to fly only VFR ends up lost in IMC (Instrument Meteorological Conditions). This is a frequent and dangerous occurrence, especially with inexperienced pilots or student pilots flying solo. Often it is the air traffic controller who rescues the pilot by guiding him / her to safety. As well as providing further relevant listening comprehension practice for the students, the section focuses on the vocabulary needed to describe landmarks and also on the functional language of confirming and disconfirming.

**1** Before beginning this activity, review vocabulary for geographical features. Have students keep their books closed and ask them the following question: *What geographical features can help a pilot navigate visually?* Write their suggestions on the board, supplying the vocabulary yourself when necessary.

Then students work in pairs or small groups to complete Activity 1. Be ready to explain any words they are not sure of.

1 built-up area
2 lake
3 high ground
4 mast
5 reservoir
6 valley
7 woods
8 fields
9 highway
10 power lines
11 coast

**2** 13 To provide students with vocabulary revision before completing the table, ask them to close their books and elicit answers to the following question:

*What is the most important information a disorientated pilot needs to give ATC?* (Altitude – the pilot could be dangerously low depending on the terrain – and endurance should be high on their lists. Note that controllers are required to ask how many passengers are on board.)

1 15
2 south-east
3 Beech Baron
4 3,000
5 110
6 780
7 8
8 1, 30 minutes

**3** 14 For less confident classes, play the recording once and ask the students to just listen. Then play the recording again pausing at regular intervals to give them time to answer.

trees, fields, road, valley, river, reservoir, communications mast, high ground

### 13 Listening script

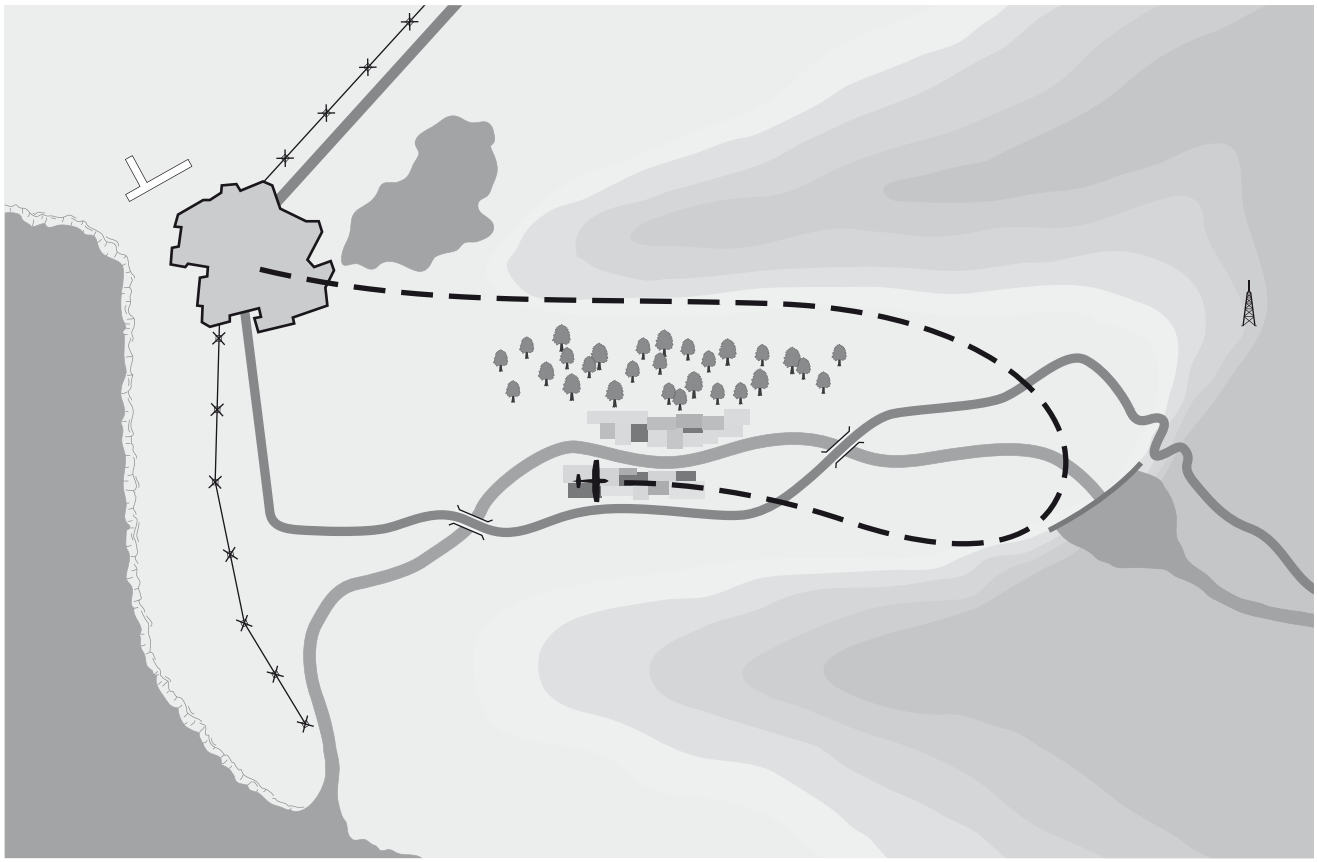
**P = pilot, C = controller**

**P** MAYDAY. MAYDAY. MAYDAY. TJB.
**C** TJB. Pass your message.
**P** MAYDAY. MAYDAY. MAYDAY. We're lost.
**C** TJB. Say last known position.
**P** Last known position was 15 miles south-east of CELRA VOR. TJB.
**C** TJB. Roger, last known position 15 miles south-east of CELRA VOR. Remain straight and level.
**P** I'm straight and level right now. We're in total IMC. I can't see the ground.
**C** TJB. Squawk 7700 on your transponder sir.
**P** Squawking 7700. TJB.
**C** TJB. I don't have you on my screen. Can you confirm your aircraft type, altitude and speed?
**P** We're in a Beech Baron. Altitude 3,000. Speed 110. TJB.
**C** TJB. Please state fuel on board and persons on board.
**P** I have 780 lb of fuel, and eight persons on board. Endurance is approximately one hour and 30 minutes … I can see the ground now. I can see trees, and I can make out … high ground on each side of the aircraft …

### 14 Listening script

**C** TJB. Can you fly into VFR?
**P** Affirm … I can see high ground to the north. I'm flying up a valley, with woods to the north, and fields below me. There is a road below me.
**C** TJB. Confirm that you can see a road.
**P** Affirm. I can see a road.
**C** TJB. What side of the valley is the road on?
**P** The highway is to my right, on the south side of the valley.
**C** TJB. Can you make out a river?
**P** Affirm. There is a river.
**C** TJB. Is the river on the north side of the road?
**P** Affirm. The river is … no … the road is crossing the river. The river is now on the south side of the road.
**C** TJB. Can you clarify that the road crossed the river and is now on the south side of the road?
**P** Negative. The road is now on the north side of the river. The road is now turning south-east. There's a reservoir below me now.
**C** TJB. Can you see a communications mast at 12 o'clock, at about 4 miles?
**P** Affirm. There is a communications mast at 12 o'clock.
**C** TJB. Turn hard left and make a 180° turn, heading 265. Expedite.
**P** Making a 180° left turn, heading 265. TJB. ⏸ I'm coming out of the valley and I can see a built-up area and a lake at one o'clock. TJB.
**C** TJB. There is an airport with a tower 5 miles north-west. Say intentions.
**P** I'd like to land. Can you give me vectors?

**4** 14 Get students to listen again and draw the pilot's path on the map. In large classes, students could work in groups, then exchange their maps with other groups to check their answers.



## Functional English – Confirming and disconfirming

**1** 14 You could review the sentences with the students before listening to the dialogue and get them to predict the answers. After completing the activity, you could review question formation with students.

1 Can 2 Confirm 3 Can 4 Is 5 Can you clarify 6 Can you see

**2** 14

1 ✔ 2 ✔ 3 ✔ 4 then, ✘ 5 ✘ 6 ✔

**3** 14 As well as an effort on the part of the controller to speak more slowly and clearly (as in this example), rephrasing or a reformulation can also help when the pilot is having difficulty understanding (or vice versa). Most controllers and pilots who are speaking English as a foreign language do this automatically. Controllers and pilots who are native English speakers, on the other hand, are sometimes criticized for their lack of sensitivity when checking, confirming and clarifying instructions. You could discuss with your students some of their experiences and difficulties in this area.

(2) is slower and clearer. Requests to confirm information must be spoken slowly and clearly.

## Speaking

This is a free practice activity. Explain to students that they will reuse the language they have studied in this section and that they should confirm, check and clarify the information given by Students A and B. When they have done the activity once, you might like to change pairs and change roles and do it again. You can add an extra challenge this time by telling the pilots to deliberately read back wrongly one of the controller's instructions.

# Section four – Language development

## Functional English – Simple past

**1**
1 made
2 happened
3 reported
4 departed
5 flew
6 did not reach
7 landed
8 believed
9 was
10 were not

**2**
1 Why did you make
2 When did you notice
3 Did you decide
4 Why did you land
5 How did the fire start
6 How many passengers did you have

**3**
1 took place / happened
2 avoided
3 detected
4 steered
5 was
6 was
7 crossed
8 took place / happened
9 issued
10 blamed
11 didn't tell

## Confirming and disconfirming

1 Say last
2 that correct
3 Affirmative
4 what you
5 can see
6 Confirm that
7 Negative
8 give further

## Vocabulary

**1**
1 d
2 b
3 g
4 i
5 h
6 a
7 e
8 c
9 f

**2**
1 Maintain
2 establish
3 maintain
4 lose
5 turn
6 re-establish
7 box
8 contact
9 getting

**3**
type of land
high terrain
marshland
desert
plain
urban area
farmland
features
bridge
footpath
harbour
cemetery
lighthouse
ridge

## PHOTOCOPIABLE ACTIVITY

This is a role-play activity where the students work in pairs. First Student A is a TV journalist interviewing Jay Prochnow and Student B is Jay Prochnow. Then Student A is Captain Vette and Student B is a TV journalist.

Before students start, review what happened to Jay Prochnow and how Captain Vette rescued him (Sections 1 and 2). Students will then need ten minutes preparation time to do the activity and to think of two additional questions. With more confident classes, you can explain that they are not obliged to follow the script.

If you have access to recording equipment, you could video the students' interviews. You should seek your students agreement if you plan to do this.

**Key**

Questions for Student A

1 Why were you flying for such a long distance across the ocean?
2 What special preparations did you make for this flight?
3 When did you realize you were lost?

Questions for Student B

1 Why did you ask Jay Prochnow to fly towards the sun?
2 How did you establish his exact position?
3 What advice did you give him?

## Role card for Student A

First you will play the role of a journalist. You are going to conduct an interview with Jay Prochnow. Look at the words below and put them in the correct order to make questions. Then write two more questions. After you finish the interview you will play the role of Captain Vette and answer your partner's questions. When you and your partner are both ready, conduct the two interviews. You may choose to ask additional questions depending on the responses you receive.

1 a / across / distance / flying / for / long / ocean / such / the / were / why / you

_____?

2 did / flight / for / make / preparations / special / this / what / you

_____?

3 did / lost / you / realize / were / when / you

_____?

**Additional questions:**

_____?

_____?

## Role card for Student B

First you will play the role of Jay Prochnow and answer your partner's questions. After you finish the interview you are going to play the role of a journalist. You are going to conduct an interview with Captain Vette. Look at the words below and put them in the correct order to make questions. Then try to write two more questions of your own. When you and your partner are both ready, conduct the two interviews. You may choose to ask some additional questions depending on the responses you receive.

1 ask / did / Jay Prochnow / to / fly / sun / the / towards / why / you

_____?

2 did / establish / exact / his / how / position / you

_____?

3 advice / did / give / him / what / you

_____?

**Additional questions:**

_____?

_____?