

UNIT 5

Environmental threats

COMMUNICATION FUNCTIONS

- ◆ Communicating weather information
- ◆ Communication errors: expectation bias (1)
- ◆ Correcting
- ◆ Describing a flight path
- ◆ Reading back and confirming
- ◆ Clarifying and rephrasing
- ◆ Using coded/numerical sources
- ◆ Saying why you are unable to do something

Lead in

“ The flight crew had the sensation of being pushed down and sideways as the co-pilot began flaring the aircraft for landing at Australia's Sydney Airport. The co-pilot increased pitch attitude and thrust, but the high sink rate continued until the Boeing 747-400 touched down hard on the runway.

Mark Lacagnina, *Escape from a Microburst*, Flight Safety Foundation *AeroSafety World*, April 2010

1a Answer these questions.

- 1 During which flight phase are the described events occurring?
- 2 Explain what *flare*, *pitch attitude*, and *sink rate* mean.
- 3 Why must pilots and controllers have frequently updated weather reports? What information do these reports need to contain?
- 4 What different sources of weather information do you use?
- 5 What sudden changes in weather have you experienced?

b In pairs, make lists of these things. Then compare your lists with another pair.

- 1 types of precipitation, e.g. rain
- 2 wind-related phenomena, e.g. crosswind
- 3 obscuration, e.g. fog
- 4 environmental phenomena which are not weather-related, e.g. bird strikes

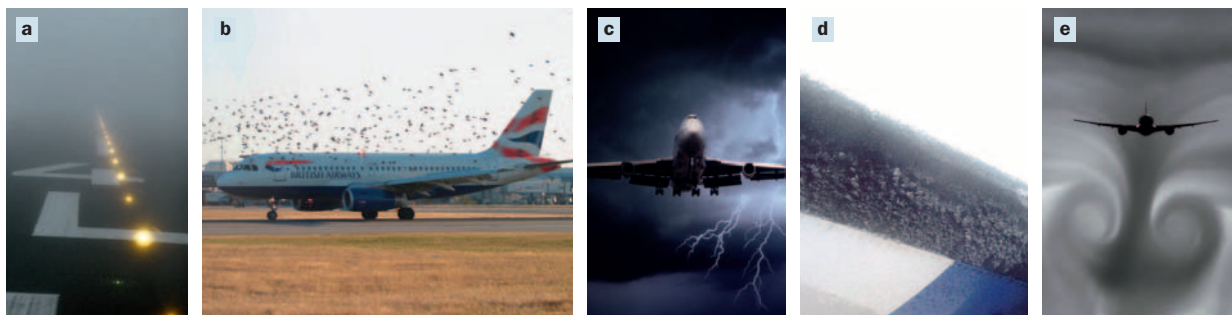


UNIT 5 ENVIRONMENTAL THREATS

Environmental phenomena

2a Match the environmental phenomena to the pictures (a-j).

bird strike crosswind cumulonimbus fog ice build-up lightning strike
 rain standing water volcanic ash wake turbulence



fog



b In pairs, discuss in what ways each phenomenon may be dangerous. Decide on precautionary measures, as pilot or controller, to avoid or reduce the consequences of each phenomenon.

3a **2.01** Listen to eight ATC transmissions and identify the environmental conditions they are referring to.

drifting snow drizzle glare 1 gusts hail low ceiling smoke windshear

b Choose the correct adjective for each noun.

- | | | | |
|---------------------------------|----------------|-----------------------------|------------|
| 1 <u>thick</u> / heavy / severe | smoke | 6 high / bright / weak | glare |
| 2 bright / scattered / hard | cloud | 7 poor / short / light | visibility |
| 3 overcast / low / heavy | rain | 8 drifting / strong / heavy | wind |
| 4 deep / thin / severe | turbulence | 9 weak / scattered / high | showers |
| 5 high / deep / long | standing water | 10 thick / few / strong | fog |

c **2.02** Listen and check your answers. Then repeat the phrases.

4 **Pilots** Prepare a pilot report (PIREP) to advise ATCOs and other pilots of a significant weather phenomenon. **ATCOs** Prepare transmissions to advise pilots of the presence, location and seriousness of four of the phenomena in Exercise 3a.

Pilot Lufthansa 3675 reporting strong gusting crosswinds during flare and touchdown on Runway 31 Left.

ATCO Be advised that incoming flights have experienced strong gusting crosswinds near the threshold of Runway 31 Left.

Communicating weather information: METAR, TAF and ATIS

5a In pairs, complete this table of meteorological abbreviations used in METARs (Meteorological Airport Reports) and TAFs (Terminal Aerodrome Forecasts). Match the abbreviations in the box with the correct words.

BCFG BR DRSN DU DZ FU FZRA GR HZ IC MIBR RA RASH SCT SN SQ TS VA

1	rain	7	hail (from French <i>grêle</i>)	13	scattered
2	dust	8	squall	14 <i>BCFG</i>	fog patches
3	drizzle	9	ice	15	drifting snow
4	snow	10	volcanic ash	16	freezing rain
5	haze	11	thunderstorm	17	rain showers
6	mist (from French <i>brûme</i>)	12	smoke (from French <i>fumée</i>)	18	shallow mist (from French <i>mince</i>)

b **2.03** Listen to two METARs and one TAF report and complete the missing information below. What are the differences in layout and units used between the American and European reports?

- METAR KBUF (Buffalo Niagara International) 12 1755 Z AUTO 210 16G 24 KT 180 V240 1SM R _____/P _____ ft – _____ BR BKN _____ OVC025 _____/04 A _____.
- METAR EPKK (Krakow) 06 _____ 120 _____ 1400 R _____/P _____ N +SN _____017 M04/ _____ Q _____ NOSIG
- TAF SBRF _____ 070801Z 210 _____ KT 9999 BKN _____ RA BKN008 TEMPO 0712/0718 _____ 015=

c **2.04** Listen to and repeat five METAR and two TAF reports. Then summarise them.

6a Prepare an updated weather report in plain English about a location which you know.

b Work in pairs. Read your weather report to your partner. Your partner will take notes and then check that they have understood correctly. Then change roles.

7a **2.05** Listen to two ATIS (Automatic Terminal Information Service) transmissions and complete the tables below.

ATIS 1

Airport		Visibility	
Information		Cloud	
Time		Temperature	
Departure RWY		Dew point	
Wind velocity		QNH	

ATIS 2

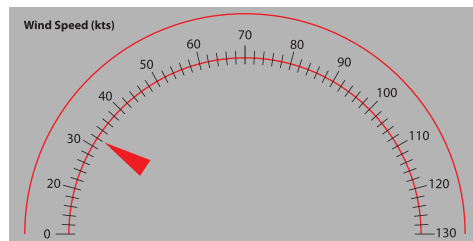
Airport		Visibility	
Information		Precipitation	
Time		Ceiling	
ILS RWY		Temperature	
RWY condition		Dew point	
Transition level		QNH	
Runways closed		Special instructions	
Wind velocity			

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- b In what order is ATIS information usually given? What information is mandatory? What information may be optional? Why is this information so critical for both pilots and controllers?
- c **Student A → p133** **Student B → p141** Take turns to give an actual updated weather report. Use the blank table to take notes.
- d Cross-check your notes verbally with your partner.

LANGUAGE FOCUS: Changing conditions

The wind is **strengthening/increasing** (+) / **weakening/decreasing** (-) to eight knots.
 The wind is **veering** (clockwise) / **backing** (counter-clockwise) to the north-east.
 The wind is **gusting** (+) to 24 knots.
 The temperature is **increasing/rising** (+) / **decreasing/dropping/falling** (-) to 15°.
 The fog is **thickening** (+) / **lifting** (-).
 The precipitation is **intensifying** (+) / **lessening** (-).
 The visibility is **increasing** (+) / **decreasing** (-) to 800 metres.
 The cloud cover is **extending/increasing** (+) / **receding/decreasing** (-).
 The weather is **improving** (+) / **deteriorating/worsening** (-).



Surface Wind	110° 20 Kts
CrossWind R20	20
Temperature	12
Dew Point	10
QNH	1001
Visibility	5000
Present Weather	HZ
Designator - A	Hotel
Designator - D	Golf

- 8 **Student A → p133** **Student B → p141** Take turns to ask and answer about how the weather is changing.
 - A What is the wind doing?
 - B The wind is strengthening to 12 knots and veering to the north-west.

Communication errors: Expectation bias

- 9 **Student A → p133** **Student B → p141** Take turns to correct communication errors. Communicate with your partner in both standard phraseology and plain language. Request confirmation. Your partner will make any appropriate corrections. Then change roles. Pay attention to your fluency and pronunciation and to stressing the key words when you correct.
 - B Lufthansa 3165, caution: there is a thunderstorm 200 miles ahead of you and ten miles to the south-east of your projected flight path, moving north-west.
 - A Roger. Confirm thunderstorm 200 miles ahead and ten miles north-west of our flight path
 - B Negative. The thunderstorm is ten miles south-east of your projected flight path and moving north-west.

ICAO FOCUS

“Bias in understanding a communication can affect pilots and controllers. The bias of expectation can lead to shifting a clearance or instruction from one parameter to another (e.g. perceiving a clearance to maintain a 280° heading as a clearance to climb/descend and maintain FL 280).”

Flight Safety Foundation *ALAR Briefing Note 2.3: Pilot-Controller Communication*

- ◆ What experience have you had of someone assuming something because that is what they expected to hear?
- ◆ What sorts of information could be confused?

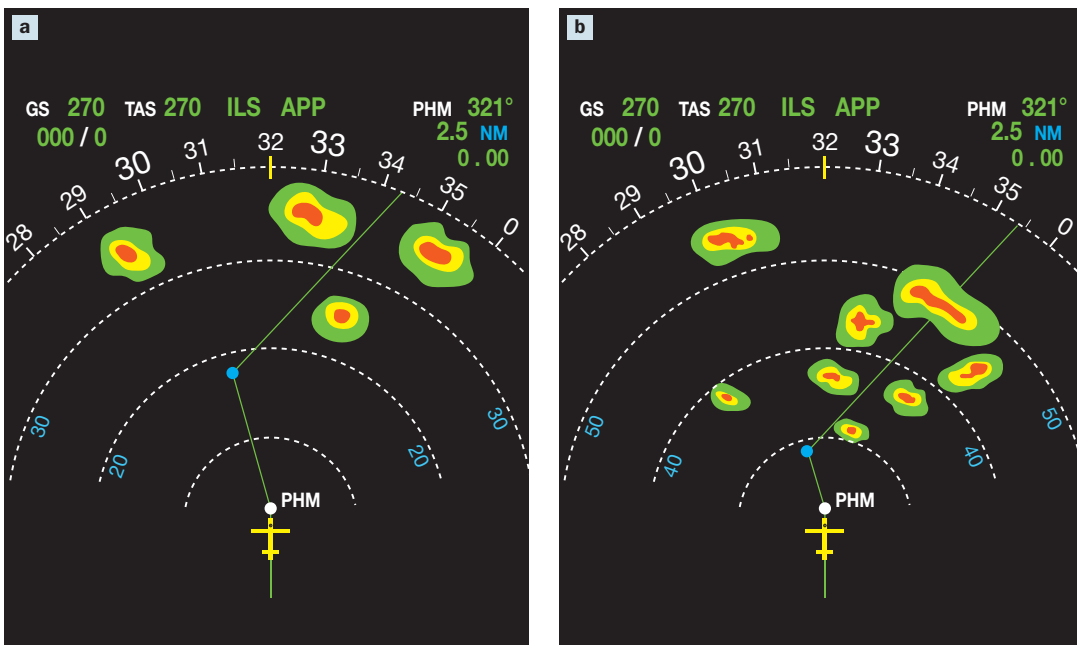
The effect of weather on a flight path

To avoid a large storm, the flight crew must make decisions while still 40 nautical miles away from it. Therefore, the flight crew should select appropriate ranges on the NDs (Navigation Displays):

- Pilot non-flying (PNF) appropriate ranges to plan long-term weather avoidance course changes (in cruise, typically 160 nm and below)
- Pilot flying (PF) appropriate ranges to tactically avoid adverse weather and monitor its severity (in cruise, typically 80 nm and below).

Airbus Flight Operations Briefing Notes: *Adverse Weather Operations*

- 10a Why does the PNF have a longer range on his/her radar display?
- b In what ways does a weather radar display differ from the display used by controllers?
- c How can weather avoidance affect a controller's workload?
- d In what way are the consequences different in cruise and during approach?
- 11a What is the difference between these two weather radar displays at the same moment in a flight?

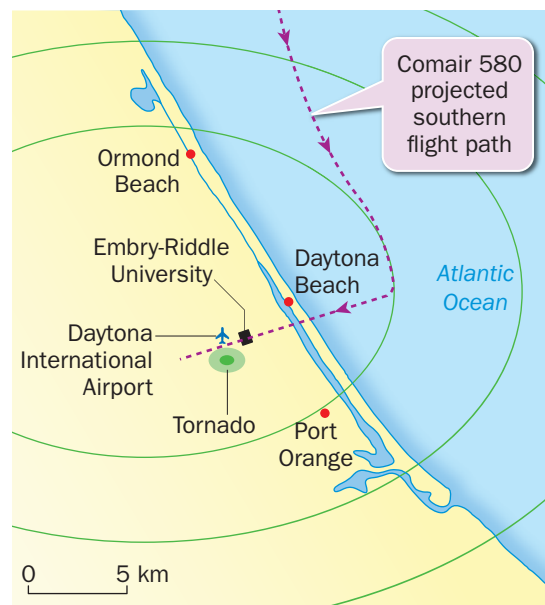


- b How do you interpret the different colours on a pilot display?
- 12a Work in pairs. You and your partner are the pilot flying (PF) and the pilot non-flying (PNF). Discuss your strategy to avoid the cloud formations in the two displays above and plot a new course to avoid the bad weather.
- b Communicate with ATC to alter your course and explain why it is necessary.

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13a **2.06** Listen to a report of a weather-related incident, which occurred in Florida to a regional aircraft on approach during a storm. Identify the order in which the events occurred and the time at which they occurred.

	a		Comair 580 heads south.
	b		Tornado hits Embry-Riddle next to airport.
	c		Controllers re-establish contact with Comair 580.
	d		Comair 580 heads north. Controllers then direct the plane up to a point near Flagler County and bring it back to land safely on a different runway.
1	e	1:39 pm	Comair 580 is nearing its turn for an approach to landing.
	f		Controllers direct pilot to begin turn to head north to go around the storm.
	g		The airport loses power and the controllers lose contact with Comair 580. The pilot misses his place in the landing sequence.
	h		Comair 580 continues off course, flying south.



b In groups, use the completed table to present the flight path of the Comair flight to the class.

14a **2.07** Listen to ten transmissions, each describing a situation in which environmental phenomena are involved. Confirm or read back the information you hear, focusing on your pronunciation and delivery.

A *Freezing rain is expected at destination.*

b **2.07** Listen again and suggest a course of action for the pilot or give a controller instruction to your colleague to avoid or reduce the effects of the phenomenon. Use *must, should, will, may, can*.

A (Pilot) *We must set the probe heat, window heat and wing and nacelle anti-icing on. We should prepare for a longer landing distance.*

A (ATCO) *Up-to-date advisories should be transmitted as required. The longer runway must be used.*

15 **Student A → p134** **Student B → p142** Take turns to ask and answer questions about weather conditions.

A *How high do the icing conditions extend?*

B *We are still in icing conditions at 8,000 feet. / We left icing conditions at 11,000 feet.*

Windshear

“Overshoot windshear occurs when an aircraft encounters an increasing headwind, a decreasing tailwind or an updraft that causes an increase in indicated airspeed and/or a deviation from the desired flight path.”

Mark Lacagnina, *Escape from a Microburst*, FSF AeroSafety World, April 2010

16 Why is windshear such a threat for aircraft in the final phase of flight? What can ATC do to assist pilots when windshear conditions exist at an airport? What has your experience of windshear been as a pilot or controller?

UNIT 5 ENVIRONMENTAL THREATS

- 17a **02.08** Listen to an account of a windshear incident in Australia and complete the information in the table below.

1 a/c type		9 wind conditions at threshold	
2 flight from		10 wind at 1,000 feet	
3 flight to		11 co-pilot's request to the pilot-in-command	
4 wind at 18:30		12 wind at 500 feet	
5 location of thunderstorm		13 wind at 120 feet	
6 reason why B747 did not hear windshear reports		14 airspeed (CAS) on touchdown	
7 B747's position at 19:22		15 sink rate on touchdown	
8 landing runway		16 pilot-in-command's decision	

- b In pairs, take turns to ask and answer questions about the information you recorded in Exercise 17a.

- A** What type of aircraft was involved in this incident?
B It was a Boeing 747-400.
- B** What were wind conditions like at the threshold?
A Wind direction was 180 degrees and wind speed was 22 knots.

- c Use the table to summarise the incident in the form of a crew briefing or a report to your supervisor.

LANGUAGE FOCUS: The same word used differently

Many words used in an operational context can be employed in different ways.

- ◆ **control** **Control** advised the crew that the wind at the landing threshold was 180 degrees at 22 knots. (noun)
 The pilot flying **controls** the flight path. (verb)
- ◆ **go around** The pilot-in-command's decision to **go around** was appropriate. (verb)
 The pilot performed a **go-around**. (noun)
- ◆ **call out** The PNF's **call-outs** indicated that the wind changed. (noun)
Call out the wind speed, please. (verb)
- ◆ **clear** Can you **clear** the data, please? (verb)
 We are **clear** of the storms. (adjective)

NOTE: Phrasal verbs such as *go around* and *take off* do not take a hyphen (-) and the words *around/off* are stressed. But nouns such as *go-around* and *take-off* have a hyphen; other nouns such as *readback* and *touchdown* are written as one word. *Go/take/read/touch* are stressed. These audio 'signposts' or indicators will help you understand what you hear more easily.

- 18a **02.09** Listen to eight sentences and choose which of the two words you hear.

- | | | | |
|---------------|--------------|---------------|-------------|
| 1 a call-out | b call out | 5 a pull-up | b pull up |
| 2 a readback | b read back | 6 a call-out | b call out |
| 3 a take-off | b take off | 7 a go-around | b go around |
| 4 a touchdown | b touch down | 8 a read-out | b read out |

- b **02.10** Listen and repeat the pairs with the correct intonation.

- 1 *call-out* / *call out*
- 2 *readback* / *read back*

UNIT 5 ENVIRONMENTAL THREATS

19a **Student A → p134** **Student B → p142** Use one of the blank tables to enter the details of an approach in windshear conditions which ends in a decision to go around. Then take turns to ask and answer questions about the approach. Take notes about your partner's approach.

- A** When did the approach take place?
B On August 1st, 2005 at 07:50
A What type of aircraft was involved?
B A Boeing 747-400

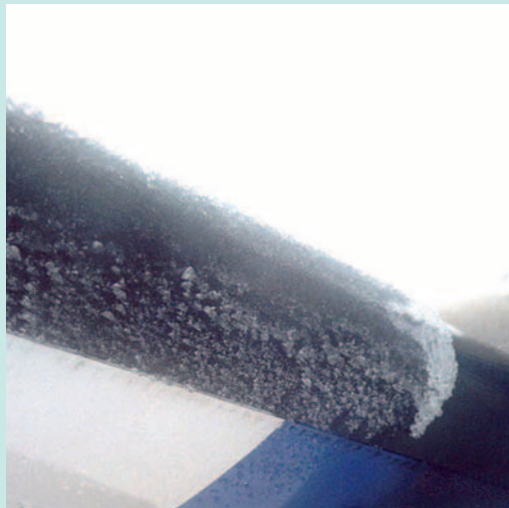
b Use your notes to describe your partner's approach.

The approach took place on August 1st, 2005 at 07:50. The aircraft involved was a Boeing 747-400. It was on approach to Sydney Airport coming from Hong Kong ...

Dealing with icing

Should the pilot encounter icing conditions in flight, some recommendations are:

- In addition to using nacelle anti-icing and wing anti-icing according to procedures, the pilot should keep an eye on the icing process: accretion rate, type of cloud.
- When rapid icing is encountered in stratiform cloud, a moderate change of altitude will significantly reduce the accumulation rate. ATC is obliged to allow a level change if the pilot notifies an operational requirement.



Airbus Getting to Grips with Cold Weather Operations

20a In which conditions do flights most often encounter icing?

- b** What precautions can be taken against ice build-up in flight and on the ground?
c Talk about your experience of the effects of ice on aircraft performance and safety.
d What actions may ATC have to take to assist flight crews in icing conditions?

21a **2.11** Listen to a description of a turboprop flight in New Zealand which encounters severe icing conditions. Mark the following statements True (T) or False (F).

- 1 The flight left Christchurch at 21:08.
- 2 The First Officer asked for a change of routing.
- 3 At 21:22, ATC instructed the flight to descend from FL 130 to 11,000 feet.
- 4 The aircraft descended at 500 feet per minute.
- 5 The First Officer read back the altimeter setting.
- 6 The Flight Data Recorder showed that the aircraft had encountered turbulence.
- 7 Ice build-up on the transponder may have obstructed data transmission.
- 8 The aircraft disappeared from the controller's screen.

b **2.11** In pairs, listen again and check your answers.

UNIT 5 ENVIRONMENTAL THREATS

- c **Student A → p134** **Student B → p142** Use the cues on your page to ask your partner questions about the New Zealand flight.

A *Did the aircraft depart on time?*

- 22 **Pilots → p150** **ATCOs → p160** Take turns to acknowledge lack of understanding and give clarification. Read your transmissions to your partner. They will say if they do not understand or are not sure. Find another, simpler or more correct way of transmitting the same information. Then change roles.

Pilot *We are executing a missed approach.*

ATCO *Say again*

Pilot *We are going around.*

Volcanic ash

“ When something as painful as the volcanic ash shutdown of Europe occurs, there must be safety lessons to be learnt. ”

William R. Voss, President & CEO Flight Safety Foundation, 2010



- 23 In pairs, answer the questions.

- 1 What do these two photos have in common?
- 2 In what ways was the shutdown 'painful'?
- 3 What effects have volcanic eruptions had in your operational experience?

- 24a **02.12** In pairs, match the beginnings of the sentences (1–6) to their endings (a–f). Choose the most appropriate consequence or result. Then listen to six recommendations from Boeing Aero on how to respond to a volcanic ash cloud and check your answers.

- | | |
|--|---|
| 1 Setting idle thrust will result in ... | a the engines from increasing thrust automatically above idle. |
| 2 Turning the autothrottles off prevents ... | b increased engine debris build-up. |
| 3 Climbing out of the ash could result in ... | c will mean systems can be powered in a multiple-engine power loss. |
| 4 Turning on anti-ice devices and air-conditioning packs ... | d engines continuing to produce electrical power, bleed air, and hydraulic power. |
| 5 Starting the APU ... | e use flight deck oxygen at the 100 percent setting. |
| 6 If volcanic dust fills the flight deck ... | f will improve the engine stall margins. |

UNIT 5 ENVIRONMENTAL THREATS

- b **2.12** In pairs, listen again. One of you take notes about points 1, 3 and 5, the other about 2, 4 and 6. Take notes about the action to be taken by the flight crew and the reasons for each action.
- c Exchange information with your partner and discuss what actions you think are the most important.
- d In what ways do you think ATC can best assist flight crews in the event of volcanic ash clouds?

Putting it together: Handling environmental problems

Preparation

- 25 Match the environmental problems (1–8) to their possible consequences (a–h).

- | | |
|---|---|
| 1 The standing water on the runway may result in ... | a the pilot will enter transponder code 7700. |
| 2 The cracked windshield could lead to ... | b near busy airports. |
| 3 If there is an emergency ... | c severely limits visibility during approach and landing. |
| 4 Ingesting volcanic ash can cause ... | d and result in concussion and broken bones. |
| 5 A damaged windshield ... | e seem blurred and causes glare. |
| 6 Bird ingestion is a major concern ... | f you aquaplaning and requiring more stopping distance. |
| 7 Clear air turbulence may surprise passengers walking around the cabin ... | g blade damage and flameout. |
| 8 Heavy rain during approach makes the approach and runway lighting ... | h a cabin depressurisation. |

- 26 **Pilots → p150** **ATCOs → p160** Take turns to explain why you cannot comply. Give information and instructions, or ask questions, using standard phraseology as much as possible. Your partner will explain why they are unable to comply. When you have performed one set of scenarios and are both satisfied, change roles.

ATCO Report established on localizer.
Pilot Unable. Our ILS display seems unreliable and is fluctuating following a lightning strike.

ICAO FOCUS

“ICAO standardized phraseology is a set of clear, concise, internationally recognized, formulaic messages designed for use in most routine situations. ... Standard phraseology, however, cannot address all of the non-routine, abnormal or, occasionally, emergency situations that occur, nor is it sufficient to convey additional information about any situation such as: reasons for a delay, the state of a sick passenger, the weather situation, the nature of a failure, or an obstacle on the runway.”

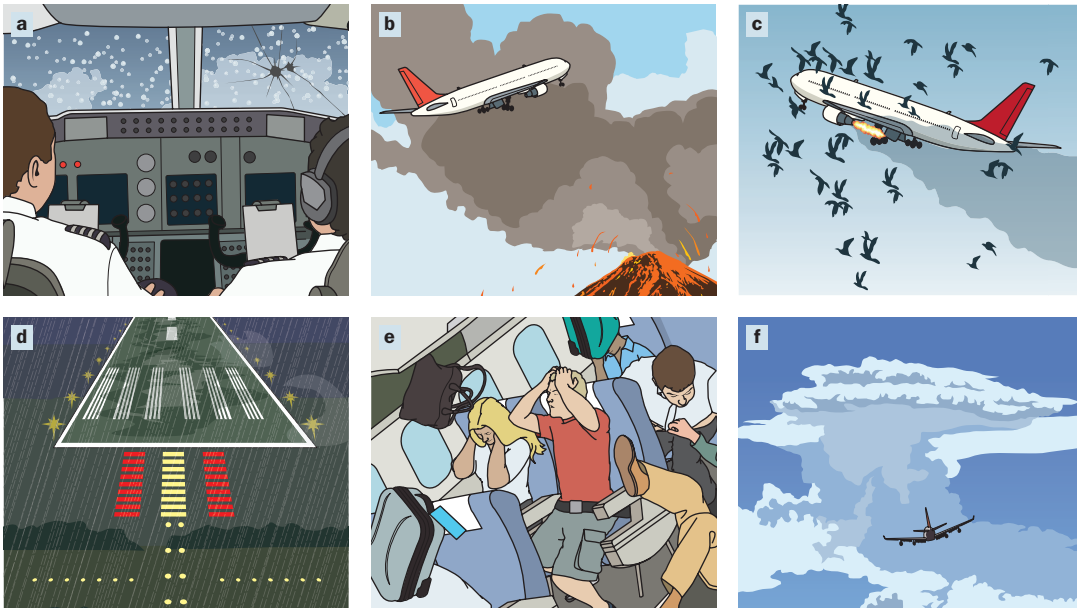
ICAO Circular 323, para. 3.8.3

Give some examples of situations where standard phraseology is not enough, and plain language must be used. Explain why.

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Communication

- 27a In pairs, choose one of the situations illustrated below. One person will be the pilot and the other the controller. Prepare a scenario in which the pilot describes the conditions on board and the controller those on the ground. Report any specific problems. Discuss the consequences of the environmental conditions, what you may be unable to do, what you must prevent and how you might negotiate a solution.



- b When you are ready, role play your scenario for the class.
 c Discuss the class comments and suggestions about your role play and make comments about theirs.

Debriefing

- 28 Debrief the scenario with the class. Identify what you felt was satisfactory about the communications and what you feel you need to improve.

Progress check

- 1 Complete the progress check for this unit. Assess your proficiency in these areas.
 (1 = I need more work on this, 5 = I feel confident in this area)

<input type="checkbox"/> I am familiar with many environmental terms.	1	2	3	4	5
<input type="checkbox"/> I can understand and transmit meteorological information easily.	1	2	3	4	5
<input type="checkbox"/> I can recognise and interpret the different uses of stress in English.	1	2	3	4	5
<input type="checkbox"/> I can make suggestions and give advice.	1	2	3	4	5
<input type="checkbox"/> I can describe and discuss radar displays.	1	2	3	4	5
<input type="checkbox"/> I can ask and answer questions about past events.	1	2	3	4	5
<input type="checkbox"/> I am able to rephrase information.	1	2	3	4	5
<input type="checkbox"/> I can explain why I cannot comply with instructions.	1	2	3	4	5
<input type="checkbox"/> I can negotiate a solution in an abnormal situation.	1	2	3	4	5

- 2 Choose three areas of communication from this unit which you are less confident in.
 Make plans for improving your skills in these three areas.

UNIT 5 ENVIRONMENTAL THREATS

DVD Unit 5

Volcanic ash hazard

- 29a** You are going to watch a short training DVD in five parts from the Airline Pilots' Association (ALPA) on *Volcanic Ash Hazard: an aviation hazard of explosive proportions* on the effects of a volcanic ash cloud on a flight. What effects do you expect to see?
- b** Watch Part 1 (0.00 – 1.37) and observe:
- 1 the position of the flight at the time of the incident.
 - 2 the first indication of volcanic ash in the flight deck.
 - 3 the first precaution taken by the crew.
- 30a** In Part 2, the captain is going to contact someone on the ground. Who do you think he will contact and what do you think he will say?
- b** Watch Part 2 (1.38 – 2.11) and say:
- 1 who the captain contacts.
 - 2 what the captain does and what he suggests to the First Officer.
- 31a** If the aircraft is flying into a volcanic ash cloud, which aircraft system do you think will be the first affected?
- b** Watch Part 3 (2.12 – 3.01) and observe:
- 1 what happens to the aircraft.
 - 2 what decision the captain makes.
- 32a** What do you think the captain should do now to avoid the volcanic ash cloud and regain control of the aircraft?
- b** Watch Part 4 (3.02 – 4.09) and be ready to talk about:
- 1 the three actions the captain takes.
 - 2 who he now contacts on the ground.
 - 3 the status of the aircraft engines.
 - 4 who you see on the ground.
- 33a** If a flight reports volcanic ash, what action do you think Air Traffic Control will take?
- b** Watch Part 5 (4.04 – 5.25) and take notes about:
- 1 the action taken by ATC.
 - 2 the action taken by United Airlines Dispatch.
 - 3 the information you hear about the diversion airport.
 - 4 the outcome of the flight.
- 34a** Work in pairs. Prepare the outline of an incident report with your partner and identify the information you are missing or not sure of.
- b** Watch all five parts of the video and take any notes about this missing information.
- c** Write the report together using your notes.