EGAST
Component of ESSI

DECISION MAKING

FOR GENERAL AVIATION PILOTS

SAFETY PROMOTION LEAFLET

GA 2

CONTENT

INTRODUCTION

It is generally understood that most accidents are the result of the pilot's actions, including **THE DECISIONS THAT THEY MAKE**. This leaflet explains some of the factors that influence how the pilot's decisions affect the safety and survival of the aircraft and its occupants.
Every flight requires the pilot to make decisions. Some are between two exclusive choices; the 'go/no-go' decision. Others require the pilot to work out a course of action from available information. The same factors affect both types of decision.

However, it is most important that the pilot is aware of the situation at all times and must be able to recognise early that a decision is necessary.

TO GO OR NOT TO GO

A ›› WEATHER

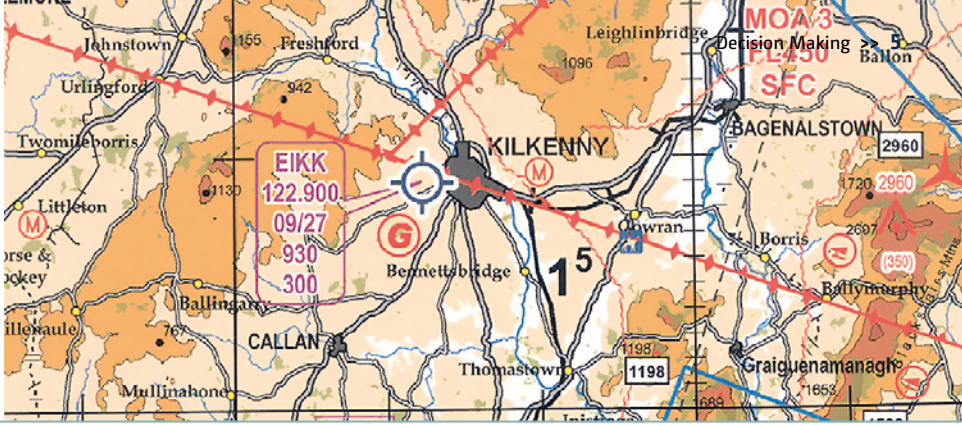
A major factor in many accidents is the pilot's decision to begin, or continue, a flight in unsuitable weather conditions. A UK study found that over 80% of Controlled Flight Into Terrain (CFIT) accidents happened when the pilot either continued flying into worsening weather, or did not understand the effects of the actual conditions. Only one pilot who lost control in Instrument Meteorological Conditions (IMC) had an Instrument Rating.

Weather-related landing accidents, often happen in high or gusty crosswinds, or on wet surfaces. These are seldom fatal, but often result in broken aircraft and painful injuries.

Weather does not stay constant, and often does not act as the forecast predicts. It can deteriorate very fast. Respect the weather, and its effects on safety; know your safe escape routes, and watch out for worsening conditions behind and around you as well as ahead.

B ›› I CAN'T TURN BACK NOW!

If you go-around from an approach, or turn back when weather seems poor ahead, it does not mean you are a bad pilot. It shows **YOU HAVE GOOD JUDGEMENT AND ASSESS SITUATIONS REALISTICALLY**. Every pilot should be prepared, and willing, to make more than one approach, and to divert or turn back if conditions deteriorate. Make sure you have enough fuel to divert, and money to get home or pay for a hotel. Always carry your driving



↑ (B) EXAMPLE OF MAXIMUM ELEVATION FIGURE (MEF)

licence, cell phone and credit card. Remember that even a long delay in your arrival is better than never arriving at all!

The decision to turn back will be easier if you have decided in advance what your **MINIMUM VFR FLYING ALTITUDE** should be.

Some charts may have a Maximum Elevation Figure (MEF) printed in each 30 minute 'square' area (1^5 means 1,500 feet). A simple way to calculate a minimum VFR flying altitude would be to add your own margin to that figure. Most pilots and, to be more accurate, you must study terrain and obstacles on and near your route, and add a safety margin. Before conditions force you below that altitude, turn back or divert. If cloud is forecast to be lower, should you go?

It also helps if you have practised flying manoeuvres on instruments. Be able to make a 180º turn, and if necessary a climb above an IFR Minimum Safe Altitude (MSA).

C ›› CHAIN OF EVENTS

Many accidents involve a chain of events: one shortcut or error of judgement often leads to another. The apparent 'cause' of an accident may be that the pilot has attempted a landing from a too fast approach, or in marginal weather conditions. It may be the pilot did not turn back or divert when visibility reduced, or descended below MSA to try

to find their position. These are seldom isolated cases of bad judgement. More likely pilots were 'forced' into them by a lack of safe options, or fuel, because their pre-flight planning was poor.

D >> BUT I'VE DONE IT BEFORE!

Some very experienced pilots seem to believe that they can safely fly in marginal conditions. They think they can ignore their safe altitudes, stop in a very short distance, or attempt extreme aircraft manoeuvres. Perhaps they, or others that they know, have done it before successfully. This does not prove that it is safe, nor that they have assessed the risks wisely.

E >> BUT SOMEONE ELSE IS DOING IT!

Pilots who fly in marginal conditions may have more skill than others, or better equipment. They might just be prepared to accept more risk! In any case, their apparent ability does not mean that others can safely copy them.

Succeeding in difficult situations also depends on many other factors, which observers cannot see. To be a competent pilot you must know, and fly within, your own limitations **ON THE PARTICULAR OCCASION.**

F >> EXERCISING SOUND JUDGEMENT

Regulatory authorities trust qualified pilots to make responsible decisions about whether it is safe to fly. The people who issue licences expect pilots to consider their

experience, aircraft type, location, physical and emotional fitness, and prevailing or expected weather conditions.

However, pilots must understand that human factors will affect their decision. They are likely to believe the situation is better than it really is, or that they have greater ability than they really have. Pilots can feel persuaded by others to proceed AGAINST HIS BETTER JUDGEMENT.

G ›› BUT YOU PROMISED!

Never promise to fly on a certain day, arrive at a certain time, or to be somewhere important if you can only get there by flying. If it really is important, organise surface transport as a back-up, and be ready to use it. Do not feel you will disappoint friends or relations if you cancel a promised flight; wait until you are sure you are fit, the aircraft is serviceable and the weather is suitable, before you invite them to fly.

H ›› PEER PRESSURE

Other people may encourage you to take risks when you don't feel comfortable. If they find that you cancelled a flight while they braved the crosswind, low cloud or lack of horizon, they may say: *'You diverted? What an idiot! I would have continued and got there…'.* Perhaps they would; or they might have continued and **not** got there. Perhaps they are just full of bravado and would not have carried on at all. Perhaps they have more experience, a better equipped aircraft, or a death wish. It doesn't matter.

↑ (I) ARE YOU IMPRESSING ANYONE?

Even when no-one else is near them, pilots may feel they are 'letting themselves down' if they fail to do something that they want others to believe they can do. If you are more afraid of others' opinions than of your own death, or more importantly the safety of your passengers, you may not have the character expected of a licence holder.

I ›› ARE YOU IMPRESSING ANYONE?

More than half of the low flying and aerobatic accidents involved an 'audience' – usually friends on the ground, but sometimes passengers taken for a flight. The temptation to 'show off', to impress those watching, proved fatal in too many cases.

J ›› JOINT DECISIONS

A joint decision made by a group of people is usually more extreme than the decision that any one of them, alone, would have made. Pilots tend to be quite adventurous people who are willing to accept a certain amount of risk in order to fly as they wish. Always beware of the committee decision: *'We'll do it!'* is often because no-one has spoken out against it.

K ›› THE BOTTOM LINE

All of these risks can be reduced if you think about them beforehand, preferably during pre-flight planning. If you can minimise the number of surprises you meet during a flight, you will be more able to deal with them safely when they occur.

DIFFERENT RISKS FOR DIFFERENT GROUPS

A ›› AGE GROUPS

Accident investigations, and studies including a UK fatal accident review, have suggested that the risks for young pilots are a little different from older ones. Young pilots seem to be less likely to suffer a stalling accident, but more likely to be involved in accidents caused by poor judgement or airmanship. They sometimes took unnecessary risks in low flying and aerobatic manoeuvres, often in front of friends or others watching. However, pilots who flew into terrain, with full control of their aircraft and without any serious technical failures were, on average, older than pilots involved in other kinds of fatal accident. Typically, they continued flying into bad weather conditions, ignoring their minimum VFR flying altitude (if they had calculated one). Older pilots seem also more likely to try (and fail) to land off a poor approach.

B ›› TOTAL EXPERIENCE LEVEL

Pilots involved in the fatal low flying and aerobatics accidents were usually very experienced. Pilots in fatal CFIT accidents were also typically very experienced. They may have believed that their experience allowed them to fly safely in conditions that others are advised to avoid. If you ever think the same, remember that all of those very experienced pilots in the fatal accident reports also thought that **'IT WOULD BE ALL RIGHT'**.

Pilots with very low hours seem to feature less in the accident reports than those with 200 – 500 hours. who seem to be more likely to lose control of the aircraft during visual flight. Perhaps these still quite inexperienced pilots are trying more ambitious flying for the first time.

C >> USE IT OR LOSE IT

Recency is also a safety issue. If you could do something perfectly six weeks ago, it does not mean you can immediately do it now. A skill will slowly disappear if it is not regularly practised. Use your flying time sensibly, take advantage of proficiency checks and ask for post qualification training. If you really must do something when you are out of practice, prepare extra carefully and increase your safety margins.

ONLY HUMAN

A ›› TRUST ME, I'M A PILOT

Pilots may be trained, experienced and competent, but that does not mean that they will always perform perfectly. Everyone can experience an 'off day', become overloaded, suffer false perceptions, or just make a mistake. Aircraft and engine parts are expected to fail from time to time, and this is (correctly) seen as normal. Human pilot performance also has a failure rate, and it is NOT zero.

B ›› HUMANS MAKE MISTAKES

Because we are human beings WE ALL MAKE MISTAKES, no matter how well trained, competent, careful, or skilled we may be. NOBODY is immune from errors, and anyone who thinks that they are infallible is the most dangerous of all.

There are two types of error:

- *'Slips and lapses'* include 'finger trouble', errors in entering or recording data (perhaps writing down the wrong digits), or not noticing changes in instrument indications;
- *'Mistakes'* are actions that we make intentionally, and execute correctly, but which turn out to be a bad plan.

In general, training can reduce mistakes, but they still can and do happen. It is important to recognise and rectify mistakes – and to learn from them. Slips and lapses can happen to anyone, and are probably more likely in highly skilled, experienced people. Distraction errors and routine errors are good examples.

C » **BELIEVING IS SEEING**

Optical illusions can affect pilots' judgement. For example, the approach angle may seem wrong when approaching a sloping runway. An incorrect *mental* 'perception' can be even more dangerous. If a person believes something to be true, they will tend to 'see' only those cues in the environment that are consistent with that belief, treating these as positive confirmation that the belief is correct, and 'not see', 'blot out' or ignore any evidence to the contrary.

Unfortunately, pilots are no exception to this rule. If a pilot believes that his aircraft is in a certain attitude, or at a certain geographic location, then his mind will try to organise whatever information is available to confirm this belief. It is difficult for technically qualified and experienced people to accept this about themselves. However, if you are human, **THIS DOES APPLY TO YOU**.

If we expect navigation features to appear in a certain place, instruments to show a certain reading, or ATC to give us a planned clearance, we must be prepared to distrust our senses. It is important to actually read the map and instruments, listen to the radio carefully, and positively check we have interpreted them correctly.

D » **DO NOT OVERESTIMATE YOUR CAPABILITIES**

More than half the pilots in a university research trial did not abandon their planned flight until conditions were already too bad to survive. Always think and act as if you are less capable than you think you are.

↑ (F) STRESS AFFECTS PILOTS' JUDGEMENT – THINK ABOUT PRE-FLIGHT PLANNING

E ›› LOSS OF CONCENTRATION

To perform well, a human's brain needs to be 'aroused'. A pilot may lose concentration during a routine and unchallenging flight, and not realise that a decision is needed until there are no safe options left. Delaying or failing to make decisions frequently causes accidents.

F ›› STRESS

Stress is one factor which increases arousal, but if arousal becomes too high the brain shuts out information. Stress may be caused by conditions associated with the flight, or by external factors, such as family, health, or work problems. Stress will affect pilots' judgement, and confuse their thinking. They are likely to concentrate on (or over-react to) one particular problem and ignore everything else. This is dangerous.

If there is a problem in flight, **THE PILOT'S FIRST PRIORITY MUST BE SAFETY**. Attention to a faulty radio, airsick passenger, or navigation problem must be a secondary task. You must expect to feel stress during every flight, so if you already feel stressed before you enter the aircraft, consider whether you should cancel.

If you anticipate a period of high workload during the flight, think about your actions and options as part of your pre-flight planning. Prepare as much as possible ahead of time and, above all, remember that your first priority at all times is to **FLY THE AIRCRAFT**.

G ›› REACTION

It is natural for a human to perceive a direct association between his action and something which happens immediately afterwards. For example, if a pilot selects the flap down, and immediately feels an unwanted vibration, he will want to select the flap up again. However, the reaction may not be correct – that vibration may be the stall buffet and raising the flap will make matters worse.

If a circuit breaker opens, it is a natural reaction to close it again immediately, especially if the pilot is under stress. However, a circuit breaker's job is to protect the aircraft – resetting it may cause damage. Think before reacting.

H ›› TEAMWORK

If things are going wrong, you must use all the help you can. If you have already pre-set your navigation instruments, they can give you information when you need it. Ask passengers to look out, and hold maps or a torch if needed.

Air Traffic Services can give you information, and radar can help with navigation. Pre-select useful frequencies and know how to use the services.

ONLY A MACHINE

A ›› TECHNOLOGY

Just as human beings can make errors, mechanical and electronic devices can be faulty. **THINK** about what your instruments should say – do a mental 'reality check'. Always cross check with a second source (e.g. landmarks in the outside view) if possible. Change – especially movement – attracts our attention, but a static condition, or a very slow rate of change, is likely to go unnoticed. Check all instruments regularly; never think that your attention will be drawn to a deteriorating situation. A gauge fault may keep the fuel needle steady, although actual levels are dropping. There will be no rapid movement or change to attract your attention.

B ›› ELECTRICITY AND ELECTRONICS

You may have electronic flight instruments, or even engine controls. Know your own system, and if the generator fails be ready to follow the Flight Manual drills. These probably include landing as soon as practicable.

A melted fuse or open circuit breaker is protecting you and your aircraft. If you need the service and the rating is low, try one reset only, but allow adequate cooling time.

↑ (C) EXAMPLE OF A PORTABLE GPS © by Garmin International, Inc.

C ›› SATELLITE NAVIGATION

If the pilot understands its limitations and knows how to use it, GPS information can be very helpful when making decisions. However, operating GPS in an aircraft is affected by the same human factors as other activities.

Prepare the system as part of (and never instead of) proper pre-flight planning. The UK CAA's **SAFETY SENSE LEAFLET 25 'USE OF GPS'**[1] includes the following advice:

- **Never** fly in conditions that you would normally avoid because you believe GPS will reduce the risk and get you there safely.
- **Never** use GPS as your primary means of navigation.
- **Never** concentrate on adjusting the GPS while ignoring the outside world.
- **Never** use it to land in poor visibility.
- **Never** believe GPS data without question. It is NOT infallible and it CAN go wrong.

[1] Civil Aviation Authority, Safety Sense Leaflet 25: 'Use of GPS', October 2009
Download at URL: http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=1179 [January 2011]

HOW ACCIDENTS HAPPEN
FROM AN ACCIDENT REVIEW

A ›› CONTROLLED FLIGHT INTO TERRAIN

When apparently serviceable aircraft flew into the ground, the pilots were typically over fifty years old, and very experienced. More than a third were flying in their home area, and accidents were not always in mountainous regions. Almost all of these accidents included unwise reaction to weather conditions (such as continuing to fly into worsening weather). Most pilots had come below their Minimum VFR Flying Altitude (if they had calculated one), trying to get 'below the weather', or hoping to confirm their position. More than a third found too late that they had made a navigation error.

B ›› LOSS OF CONTROL IN VMC

In many loss of control accidents there was an unfamiliar situation, a distraction, or a minor technical failure. Often, an inexperienced pilot appeared to be coping quite well until overloaded by some unexpected event. It is good to practise – even in your mind – exactly what you would do if you had a technical failure, or another distraction.

If the flight you have planned will require all your skill, you will have nothing left in reserve for unusual situations.

↑ (C) AEROBATIC

↑ (D) LOSS OF CONTROL IN IMC

C » **LOW FLYING / AEROBATIC**

Highly experienced young men will be tempted to fly low and perform aerobatics, often with an informal audience. If they do not have enough height to allow for errors, they risk death or serious injury to themselves and others.

D » **LOSS OF CONTROL IN IMC**

More than three quarters of the pilots killed when they lost control in IMC had no instrument qualification. VFR pilots must be able to see and recognise cloud, heavy precipitation or thick haze early enough to avoid it safely. They must always expect, and look for, such bad weather.

Disorientation is more likely if you have not been adequately trained to fly on instruments, **OR HAVE NOT KEPT IN PRACTICE**. Unless you are in regular instrument flying practice, even an Instrument Rating should only be regarded as a **MINIMUM SKILL** to 'get out of trouble' if you accidentally lose visual references.

Don't gamble with your life, and, more important, don't gamble with someone else's!

SUMMARY

Be realistic about the weather:
- Learn about it
- Study the forecast in relation to your planned flight
- Look for signs of worsening weather

Calculate a minimum VFR flying altitude and keep to it

Use your judgement responsibly

Know your own limitations:
- Double check your perceptions
- Beware of reacting too quickly

Don't be pressurised to fly, or to arrive on time.

Prepare thoroughly and allow for contingency:
- Carry enough fuel
- Be ready to go-around, turn back, or divert
- Plan as much as you can before flight

Consider what to do in possible 'situations'

Be aware of the situation around you

Be prepared to ask for help

Don't take unnecessary risks

EGAST
Component of ESSI

APR 2011

EUROPEAN GENERAL AVIATION SAFETY TEAM (EGAST)
Component of ESSI

European Aviation Safety Agency (EASA)
Safety Analysis and Research Department
Ottoplatz 1, 50679 Köln, Germany

Mail egast@easa.europa.eu
Web www.easa.europa.eu/essi/egastEN.html