

Flight Operations Threat and Error Management in an Airfield Categorisation Process

Introduction

Airlines are required to 'categorise' all destination, alternate and en-route alternate airfields in order to adequately assess their capabilities for aircraft operations and put in place various risk mitigations as required. Therefore managing the threats associated and reducing the potential for errors, and by extension serious incidents, to occur. This lecture will discuss the fundamentals of a categorisation process, the requirements to have one, what Threat and Error Management techniques are employed and its real life uses.

What is an Airfield Categorisation?

An airfield categorisation process is essentially a risk and capability assessment of an airfield to commence or continue safe aircraft flight operations. Or rather, "how easy is it to fly into this airfield?"

After this process, airfields are given a category A, B or C rating based on the level of difficulty, i.e. risk, associated with the airfield. A more colloquial method of these categories are easy (A), medium (B) and difficult (C)! The more difficult the category, the more threat and error management considerations must be realised, but this will be discussed more later.

Airlines perform this process in house and the categorisation process, and results, can vary from operator to operator. This is due to there not being a widely used standard for the process or categorisation rating essentially due to differences in company safety requirements and fleet capability.

The process examines, but is not limited to, the following aspects:

- Airfield data: Runways, Taxiways and Aprons available (PCNs, dimensions, etc)
- SIDs, STARs, Circling, etc.
- Air Traffic Services and Approach/Landing Systems available
- Rescue and Fire Fighting Services
- Night Operations and LOVIS Capability
- Weather, Terrain, Local Issues (Politics, etc)
- Fuel availability
- Opening Hours and Other Commercial Aspects (customs, military field, etc.)

Why is this needed?

For operators in European Aviation Safety Agency (EASA) member states, the requirement for this process is given in the Part-OPS regulations as below:

ORO.FC.105 Aerodrome knowledge for pilot in command

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The operator shall only designate a flight crew member to act as pilot-in-command/commander if he/she has:

(2) Adequate knowledge of the route or area to be flown and of the aerodromes, including alternate aerodromes, facilities and procedures to be used;

The Acceptable Means of Compliance (AMC) and Guidance Material (GM) expand further on the requirements to categorise aerodromes and to provide flight crew with adequate briefing materials in line with the categorisation process.

Operators are therefore required to categorise aerodromes by law. If they do not comply with this then the National Aviation Authority could, in extreme circumstances, revoke their Air Operators Certificate (AOC).

In less legal terms, the process gives the operator the opportunity to examine and foresee any potential risks and threats associated with flying to the airfield. This is Threat and Error Management (TEM).

The United Kingdom's Civil Aviation Authority defines TEM as follows:

The practical summation of threat and error management for flight crew is the practice of thinking ahead in order to predict and avoid errors and operational threats, and manage any that occur (similar to the practice of defensive driving).

The categorisation process allows an operator to fully assess the airfield, therefore thinking ahead and recording all predicted chances for error, or risk, and any operational threats that become apparent. This summation of the threats will firstly prompt the categorisation level which is an indication of the difficulty, or number of risks, present at the airfield to flight crew. With the list of known threats, the flight operations department can therefore create methods to mitigate these risks, thus assisting the flight crew with their own TEM while flying on the day to reduce the risks or at least likelihood of the risks becoming experienced errors and safety events. These mitigations usually vary depending on the severity and likelihood of the risk and what current mitigations the company has in place as standard. These can be pilot briefing materials outlining the operational difficulties and guidance techniques for these or to full training programmes for a single airfield and nominated pilot schemes (where only certain experienced pilots are permitted to operate the route). Mitigations must be appropriate for the threat and one mitigation technique could be used for many risks, however one risk may also result in a number of mitigations being required. These are demonstrated further in the below examples of two well-known airfields.

Example: Gibraltar LXGB / GIB

Gibraltar is a very good example of a Category C standard airfield. As previously stated, this categorisation of GIB is operator dependant so some operators may have categorised it as B instead of C.

Gibraltar's existing threats are its proximity to high terrain of 'The Rock', its own micro-climate of strong winds and thunderstorm activity, a short runway with sea at both ends and

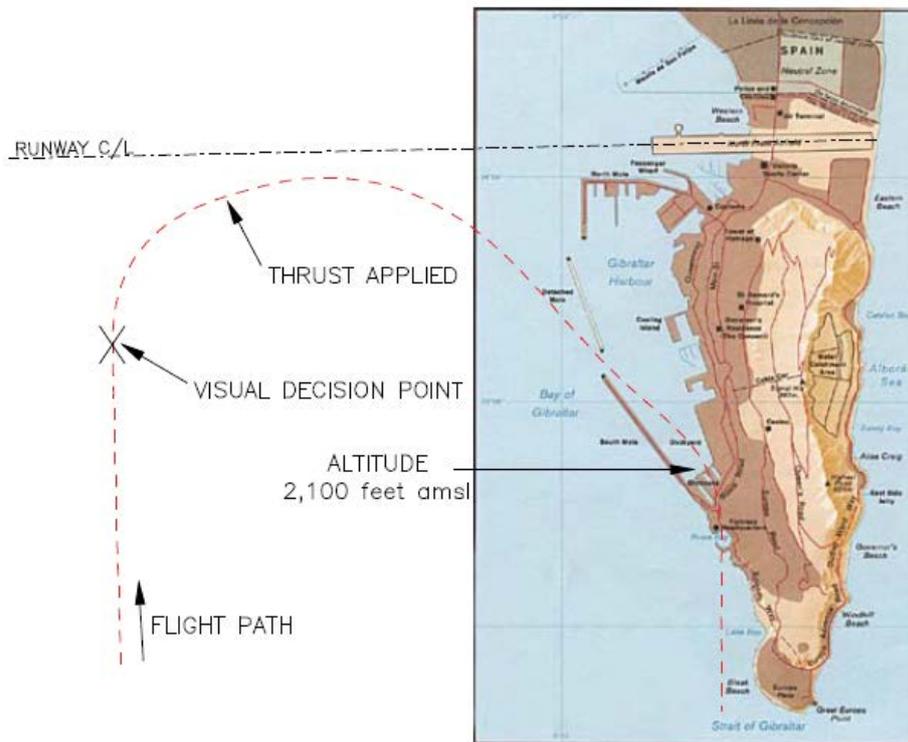
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then a heated political situation between the UK/Gibraltar and Spain which restricts the surrounding small airspace! Some of the threats, risks and mitigations are stated below:

Threats	Risks	Potential Mitigations
High Terrain on one side of airfield – the Rock	Controlled Flight Into Terrain (CFIT)	Aircraft Physical Status Checks with Mainrol and Ops Control (EGPWS)
Weather Phenomenon	Loss of Control, Runway Excursion	Weather Forecasting between Ops Dispatch and Captain
Relatively short runway with sea at either end	Runway Excursion	Nominated/trained captains
Lack of ILS	Runway Excursion	Nominated/trained captains
Political Instability	Commercial/Business risks	Adherence to arrival procedures, Pilot Briefing Materials

Why We Categorise?

On 17th March 2006, a Monarch Airlines Boeing 757-200 aircraft performed a go-around at Gibraltar after losing visual contact with runway 09 – this was after the visual decision point. The go-around was not performed to procedures but air traffic control provided sufficient instructions on heading to avoid a controlled flight into terrain incident (CFIT), The subsequent AAIB report (8/2006) stated that the lowest altitude the aircraft was at over the land was 2100ft and the highest point on the land (The Rock of Gibraltar) was at 1420ft, meaning a clearance of only 680ft. At the time, the operator required nominated commanders to land the aircraft at the airfield and it was categorised as B. The below diagram taken from the AAIB report shows the flight path of the aircraft and terrain.



Following the incident, both the operator and airport reviewed approach procedures into Gibraltar and made appropriate changes. Currently, overflight of the terrain is strictly prohibited and Monarch re-categorised the airfield as C, the highest level, which required a more extensive brief to be produced and nominated captains requiring training flights and supernumerary observations flights before being approved to operate. Due to these additional briefing materials and training, as a result of the incident and re-categorisation, it is believed that the operator did not experience a similar incident again.

Example: Innsbruck LOWI / INN

Innsbruck is another example of a Category C airfield.

Pilots must conduct the approach down the relatively narrow Inn Valley, in the Austrian Alps, to the runway threshold. This means mountain wave activity can cause extreme turbulence in the valley and clouds reducing visibility which could result in unstable approaches, go-arounds or, worst case scenario, a risk of proximity with terrain. Pilots are usually required to be 'Innsbruck checked' meaning they have been determined as competent and trained on the specific Innsbruck procedures. Some of the threats, risks and mitigations are stated below:

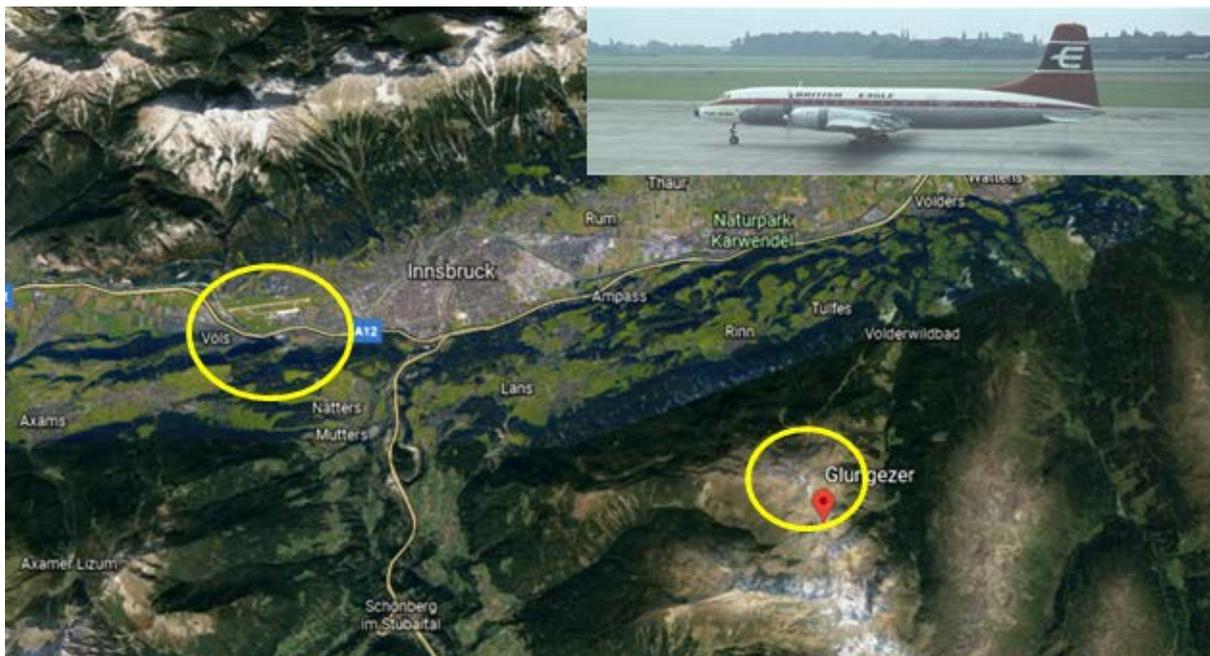
Threats	Risks	Potential Mitigations
High Terrain on all sides of airfield	Controlled Flight Into Terrain (CFIT)	Aircraft Physical Status Checks with Maintrol and Ops Control Company specific engine out procedures or arrivals
Weather Phenomenon (Fohn)	Loss of Control	Weather Forecasting

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Wind)		between Ops Dispatch and Captain Pilot Briefing Materials
Relatively short runway	Runway Excursion	Aircraft Physical Status Checks with Maintrol and Ops Control
Go Around Procedures into terrain areas	Controlled Flight Into Terrain (CFIT)	Nominated/trained pilots

Why We Categorise?

In 1964, British Eagle International Airlines Flight 802 crashed into Glungezer Mountain which is located in the vicinity of Innsbruck, on the southern perimeter of the Inn Valley. The aircraft lost contact with the ground, while operating under VFR procedures, in low cloud and snow flurries. The aircraft crashed into the mountain at 8500ft. The subsequent investigation found the flight crew had descended below the minimum safe altitude, attempting to re-establish visual ground contact, and was in fact in violation of Austrian regulations when operating to INN. At the time other aircraft were successfully operating into and out of INN and may have attributed to the pilots' decision to continue the approach.



The categorisation process could've added more TEM techniques and mitigations to prevent this incident through more stringent low visibility company operating procedures into INN, pilot training in the experienced conditions and more adequate briefing materials so the crew would have been more accepting of the diversion possibilities instead of continuing the approach in worsening conditions below minima.

Experience and Risk

Mitigations can put significant burdens on an operator, both in terms of financial and in operational flexibility. It is only natural that business wish to remove these burdens at the earliest opportunity. TEM principles in the categorisation process can assist this. As

experience with the airfield grows in the company, the ability to predict the associated threats also becomes more successful due to an increase knowledge and awareness. Taking the example of crossing the road outside your home, the threat associated with this act is still the same as the first time it was crossed but your experience will mean you are more aware of the potential errors and avoid them as standard. Putting that into flight operations, a nominated pilot scheme can reduce the likelihood of errors due to the more experienced pilots operating the route on start-up. With increase experience, possible due more pilots becoming nominated or the route becomes part of the regular training programme, the nominated scheme may be relaxed to only captains instead of co-pilots too. This development of the mitigation satisfies the principles of TEM and a pro-active performance based approach to managing the threats.

Balancing Act

To fly aircraft in completely risk free environment is to not fly at all. Obviously for an airline business this is not an acceptable course of action. At the other extreme, a lack of risk management, i.e. operating without regards for safety, can result in catastrophe. The result for both scenarios is the company could lose significant assets: financial, property and reputational (a crash and death is never acceptable!). A balance is sought of both aspects between the external factors of commercial pressure, operating costs and passenger requirements, and the flight operations requirements of safety and operational capability. The perfect 'balance' should be a slight bias in the favour of flight operations and safety so that risks are adequately assessed, managed and mitigated against, with appropriate funding, but also the airline is not restricted too severely from a commercial perspective by a lack of operational capability and many financial burdens. When risks become too great to manage then this is when safety must tip the balance!

Summary

Categorisation process is a means to assess all aspects of an airfield to ensure all safety mitigations can be implemented prior to commencing or continuing operations. Categorisation is not only required for regulatory requirements but as part of the company's flight operations involvement in the safety management system, using the techniques associated with Threat and Error Management in which can be surmised as "forewarned is forearmed". It can have huge consequences on operations and commercial areas of an airline's business through the implementation of mitigations and restrictions so that safety risks can be managed appropriately and safety events are more likely to be avoided.

Lecture Questions and Answers

Do airlines not share information regarding categorisations?

There is no formalised procedure for this or any requirement. There are various forums to share safety information but this does not necessarily mean categorisation process output is shared. Sometimes the categorisation process is prompted by a new commercial venture and this may alert business rivals to this. Therefore, sometimes the categorisation process could be for restricted distribution until the route is confirmed. So the safety events

associated with the airfield may be shared but not necessarily the actual categorisation process and outputs.

What is the input of new aircraft technology into this process?

As with experience, advancements in technology can lead to the relief of restrictions resulting from the categorisation process. Required Navigation Performance (Authorisation required) approaches (or RNP[AR]) use Performance Based Navigation (PBN) principles to create three dimensional points and flight paths, specifically for approach and departure procedures, that no longer rely on ground based radio navigation aids. This allows for more complex approaches to be performed in lower visibility. For example, the approach to Innsbruck through the valley can be performed in almost zero visibility with RNP(AR) due to satellite based points being created around the terrain. This can improve the company's commercial aspects as it will reduce the number of diversions due to low visibility and improving the mitigations for controlled flight into terrain (CFIT). Another example is weight savings in modern aircraft through the use of composite materials means the pavement classification number (PCN), i.e. how much weight the airfield surfaces can hold, becomes less restrictive and more airfield options are available.

Have you experienced a company attitude that pressures crew to continue operating through minima and without risk mitigations?

In my experience, no, as I have experienced mainly UK or European operations where the safety culture is now very good. I am aware of some areas of the World where cultural divisions and heritage are contributing to corporate culture of pressurising pilots to fly without, or past, certain risk mitigation means and this never ends well for anyone.

References

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