1. Introduction

1.1. The reporting of aviation safety occurrences is important for several reasons:

(a) It allows the causes of occurrences to be investigated;

(b) Based on the findings of the investigation, action may be taken to prevent similar occurrences;

(c) Subsequent occurrence reporting will indicate whether the corrective action was successful;

(d) Important safety information uncovered as a result may be shared with other operators.

1.2. There are three main categories of safety occurrences:

(a) Accidents and Serious Incidents;

(b) Incidents;

(c) Other Safety Occurrences.

1.3. The basic requirements for the reporting of all types of safety occurrence are laid down by ICAO. For aircraft operators, these are amplified by JAA and by national authorities[1]. Similar regulations are laid down by JAA for manufacturers and by EUROCONTROL for air navigation service providers (ANSPs).

1.4. Reporting of safety occurrences of all categories is important because it allows an accurate picture of the safety situation to be built up so that timely and effective accident prevention measures can be taken. It is also a valuable tool to judge the effectiveness of such measures.

Accidents and Serious Incidents

1.5. Accidents and serious incidents are defined by ICAO[2] and must be reported. The only difference between an accident and a serious incident is in its result: a serious incident may be regarded as an accident that almost happened.

Incidents

1.6. Incidents are also defined by ICAO[2]. They are occurrences which fall short of the definition of Accident or Serious Incident, but which nevertheless affect, or could affect, the safety of the aircraft. They should be reported under a national mandatory incident reporting system[3].

1.7. Examples of incidents include level bust, airborne collision avoidance system (ACAS) resolution advisory (RA) (except for nuisance warnings) and near mid-air collision (AIRPROX).

1.8. In practice, not all such incidents are reported, either because the pilot or the operator does not realise that they are reportable incidents, or because the pilot fears some form of punishment.

1.9. Incidents have occurred where two aircraft operating within the same geographic area have been issued with the same transponder code. Such incidents have obvious relevance to the level bust issue and should always be reported and investigated.

1.10. Air traffic incidents and ACAS RAs should also be reported separately under the relevant incident reporting schemes.

Safety Occurrences

1.11. Some safety occurrences are not sufficiently serious to require reporting under a mandatory incident reporting system, but are nevertheless important. These lesser safety occurrences should be reported under a voluntary incident reporting system.[4]

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[1] See Section 7 of this briefing note for details of ICAO and JAA regulations.

[2] ICAO Annex 13 Chapter 1.

[3] ICAO Annex 13 Chapter 8 paragraph 8.1.

[4] ICAO Annex 13 Chapter 8 paragraph 8.2.

2. Voluntary Incident Reporting System

2.1.   The voluntary incident reporting system should be used for reporting all types of safety occurrence, whether or not there is a mandatory requirement to report them to the national aviation authority.

2.2.   The total body of safety occurrences may be visualised as an iceberg where only the accidents, serious incidents, and some other reportable incidents are visible above the water line (See Figure 1).

Accidents & Serious Incidents

Reportable Incidents

Other Safety Occurrences

Figure 1 – The Incident Iceberg
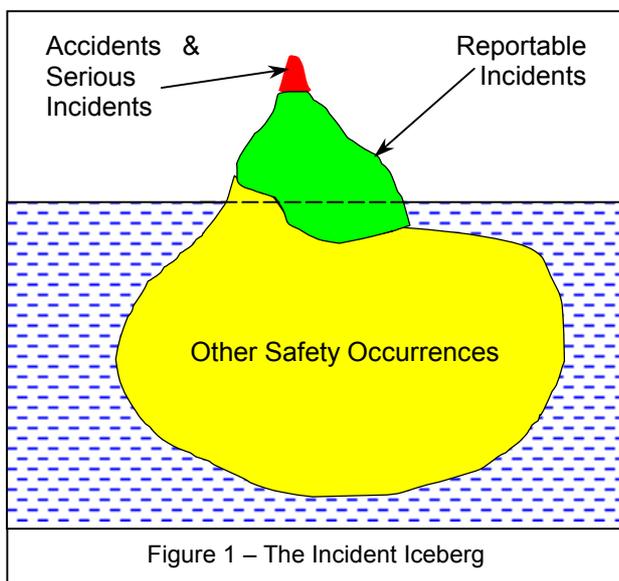
2.3.   Out of sight lies a large body of unreported incidents and safety occurrences of greater or lesser seriousness, many of which would be made visible by an effective voluntary safety incident reporting system.

2.4.   There is obvious merit in reporting to the company system the following classes of safety occurrence:

(a) When a level bust almost occurred, especially when the aircraft actually deviated from its cleared altitude;

(b) When the ACAS operated in an unsatisfactory manner, including nuisance warnings;

(c) When similar callsigns could have given rise to confusion.

2.5.   All employees – not just flight crew but cabin crew, operations staff, engineers, etc. – should be encouraged to report safety occurrences of which they become aware.

2.6.   In the first case, occurrences are usually reported to the flight safety department, which reviews the reports and takes appropriate formal reporting

action if necessary. The flight safety department may also decide to instigate an investigation if appropriate.

2.7.   To be effective, a voluntary incident reporting system must have the full support of airline employees. This implies that:

(a) Employees must not be punished on the basis of evidence contained in voluntary reports where occurrences would not otherwise have come to light;

(b) The confidentiality of reporters must be protected;

(c) Reporters must be confident that the incident reporting scheme is worthwhile and that their reports are acted on.

2.8.   ICAO Annex 13 Chapter 3 Paragraph 3.1 states a fundamental principle that should guide all occurrence reporting:

The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

2.9.   Usually, a computer database is the most effective means of managing a safety incident reporting system.

2.10. Schemes exist for the sharing of the information contained in such databases without revealing the identity of the reporter or the operator.

3. Just Reporting Policy

3.1.   Full and free occurrence reporting is fundamental to the establishment of a strong safety culture within an airline. For this to exist, employees must be confident that they will be treated fairly following an occurrence report.

3.2.   The person reporting an occurrence should be protected from punishment where a genuine error was made that would not otherwise have been discovered, to the extent that this is possible within the law and national aviation regulations.

3.3.   The confidentiality of reporters must also be protected so that they are not exposed to humiliation as a result of their reports being made public.

3.4. Operators should bear in mind that operational errors may occur for a number of reasons which are as much the responsibility of the operations or training departments as the reporter himself. It is important that they should learn of these system failures and correct them to prevent future unsafe situations. The following are typical examples:

(a) The structure or wording of operating procedures may be unsatisfactory;

(b) Training methods may be inadequate;

(c) A culture may exist within the airline where good procedures and sound training are often disregarded;

(d) The cockpit layout may make a mistake more likely.

3.5. The Company Reporting Policy should be prepared in consultation with representatives of the employees. It should be endorsed by the Chief Executive, inserted in the company Operations Manual and brought to the attention of all employees.

3.6. A draft statement contains the essential elements of a just reporting policy is shown below.

Draft Statement of Just Reporting Policy

The safety of operations is a paramount responsibility of airline management and personnel and is in the interests of air transport users, the company and its employees; it is therefore important that any event that affects air safety is reported fully, freely and in a timely manner.

The purpose for encouraging any person concerned to report any event or incident that might affect safety is to establish facts and cause and thereby prevent further occurrence; it is not to apportion blame or liability. The identity of any person making such a report will not be disclosed unless required to do so by the company's national authority or by law.

Normally, disciplinary action will be contemplated only in those instances in which the company considers that the employee concerned has acted recklessly, or omitted to take action, in a way that is not in keeping with training, responsibilities and/or experience.

In considering the event or incident, the company will take favourable account of the fact that an employee has complied with his/her responsibilities to co-operate and to report the circumstances of the event/incident.

3.7. Managerial staff at all levels must actively support the company reporting policy and must be seen to do so.

3.8. At first, employees may be suspicious and it may take some time to build up a sufficient level of trust so that they feel confident that the company will honour the spirit of its policy statement.

3.9. A single case of apparent injustice can undermine or even destroy the confidence of employees. It is therefore recommended that when any form of discipline is contemplated, the matter should be discussed with the employees' representatives (pilot's union, etc.).

3.10. Guidance on the establishment and operation of a safety management system is obtainable from many civil aviation authorities, including those listed in *Section 8 – Resources*.

4. *Flight Data Analysis[5]*

4.1. As with other classes of occurrence, the analysis of data from flight data recorders can be a valuable source of information:

(a) To assist in the investigation of level bust incidents; and,

(b) To identify unreported level busts.

4.2. One method[6] of operation compares the altitude set in the Altitude Selector with the actual altitude indicated on the altimeter: this figure should always decrease as the aircraft closes on its cleared altitude. If the difference increases for more than 15 seconds *and* becomes greater than 300 feet, a level bust event is activated.

4.3. Another method uses the flight recorder to detect all occurrences of a return to a just vacated flight level.

4.4. These procedures are not perfect and do not capture all cases; however, they do indicate the most common situations in which level busts occur and so, with the aid of confidential pilot debriefing, improve understanding of the level bust issue.

4.5. A successful flight data analysis scheme relies heavily on the support of the pilots and should not be undertaken without full consultation and the agreement of representatives of the pilot's union.

4.6. *UK CAA CAP 739* contains useful advice on the implementation of a flight data analysis scheme.

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[5] *See Section 7 of this briefing note* for regulations in regard to flight data analysis.
[6] *Air France Flight Data Monitoring Altitude Deviation Programme*

5. Incident Databases

5.1. A number of different proprietary software packages have been developed specifically to handle airline safety incident databases. Some of these are listed at the end of these notes.

5.2. Operators should consider carefully the features offered by each package before making a choice. The ideal system would contain most of the following features:

(a) Easy to use;

(b) Accessible from all departments of the company at any location via company network or intranet;

(c) More than one person may use the system at the same time;

(d) Reports can be filed from remote locations;

(e) Automatic data entry by e-mail or Internet form;

(f) Security system:

– protects unauthorised access;

– protects confidentiality of report filer;

– multi-tiered, allowing limited access according to security clearance;

– prevents amendment or deletion of entries;

– quarantines data following accident or serious incident;

(g) Automatic response to report filer:

– acknowledges receipt of report;

– advises progress of investigation etc.;

(h) Able to record related data of different types, for example, structured report forms, free text notes and photographs;

(i) Powerful analysis features to identified similar or related events.

(j) Compatible with information exchange systems;

(k) Report writing includes:

– extraction of data to word-processor package;

– ability to select specific data for report automatically;

– drawing of charts or graphs;

– extraction of statistics to standard software packages (eg Excel).

(l) Incident Database Software

5.3. The following incident software packages listed in alphabetical order are currently available. Web-site addresses or contact details are shown in each case.

(a) Aeronautical Events Reports Organizer (AERO)

www.aerocan.com

(b) Airbus Incident Reporting System (AIRS) for human factors event reporting

jean-jacques.speyer@airbus.com

(c) AIRSAFE

kathryn.crispin@sabre.com

(d) Aviation Quality Database (AQD)

www.superstructure.co.nz

(e) AVSiS

www.avsoft.co.uk

(f) British Airways Safety Information System (BASIS)

www.winbasis.com

(g) INDICATE Safety Program

www.atsb.gov.au

6. Sharing Information

6.1. Schemes exist and are under development for the sharing of information between operators. These schemes are important because they allow:

(a) the true dimension of a potential safety issue to become apparent;

(b) operators to learn that their experiences are not unique – that others have similar experiences;

(c) operators to learn from the successful preventive measures taken by others – and avoid wasting time on unsuccessful measures;

(d) the effectiveness of national or regional safety measures to be assessed.

6.2.   The Global Analysis and Information Network (GAIN)[7] is an industry led initiative that promotes and facilitates the voluntary collection and sharing of safety information by and among users in the international aviation community to improve safety.

6.3.   GAIN is still under development. However, the Safety Trend Evaluation Analysis & Data Exchange System (STEADES)[8] established by IATA is currently in operation and offers a practical and economical way of sharing information with other operators. STEADES also provides a trend analysis service to participants.

6.4.   Sharing of information with air traffic services should also be encouraged as it allows operators and controllers to gain better understanding of the particular problems each experiences.

6.5.   In the case of specific air traffic incidents, discussion between operators and the relevant air traffic control service is likely to lead to the best preventative measures being developed.

7. Regulation

7.1.   _ICAO Annex 13_ deals mostly with the reporting and investigation of accidents and serious incidents, but Chapter 8 concentrates on accident prevention measures. In particular, it:

   (a) requires states to establish mandatory incident reporting systems to facilitate the collection of information on actual or potential safety deficiencies;

   (b) recommends that states should establish a voluntary incident reporting system to facilitate the collection of information that may not be captured by a mandatory incident reporting system; and,

   (c) makes important recommendations concerning the use of incident databases, the analysis of data and the exchange of information with other states.

7.2.   _ICAO Annex 6 Part 1 Section 3.2_ requires operators to establish and maintain an accident prevention and flight safety programme. Regulations in respect of the establishment and maintenance of flight data analysis programmes are also contained in this section.

7.3.   Operators should refer to national legislation to determine how their national authorities have interpreted ICAO Annexes 13 and 6. This is especially important in states that have not yet adopted JAR-OPS 1.

7.4.   _JAR-OPS 1.037_ requires operators to establish accident prevention and flight safety programmes. These must include occurrence reporting schemes, together with machinery to evaluate information revealed by these schemes, propose remedial action and monitor the effectiveness of such action.

7.5.   _ACJ OPS 1.037(a)(2)_ summarises briefly the characteristics of an occurrence reporting scheme.

7.6.   _JAR-OPS 1.037_ stresses the need to protect the identity of the reporter and that it is not the function of the flight safety programme to apportion blame.

7.7.   JAR-OPS 1.037 is in the course of revision to require flight data monitoring programmes to be established in accordance with ICAO Annex 6. See _NPA OPS-35_.

7.8.   _JAR-OPS 1.085(b)_ specifies the responsibilities of crewmembers for reporting safety incidents while _JAR-OPS 1.420_ details operators' responsibilities for occurrence reporting.

7.9.   _The European Aviation Safety Agency (EASA)_ is expected to adopt Joint Aviation Authority Requirements and in due course propose regulation that will be binding throughout the European Union.

8. Resources

Other Level Bust Briefing Notes

8.1.   The following Level Bust Toolkit Briefing Notes contain information to supplement this discussion:

   ATM 3 – Safety Reporting: Air Traffic Management.

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[7]   GAIN is an industry led initiative that promotes and facilitates the voluntary collection and sharing of safety information by and among users in the international aviation community to improve safety;

[8]   STEADES is the only global safety event database providing analysis of events, with the goal of reducing accident potential and, therefore, costs. It is based on an open, non-punitive, reporting system which is compatible with other reporting systems. STEADES will form an essential part of any Safety Management System.

Access to Resources

8.2.   Most of the resources listed may be accessed free of charge from the Internet. Exceptions are:

ICAO documents, which may be purchased direct from *ICAO*;

Certain Flight Safety Foundation (FSF) Documents, which may be purchased direct from *FSF*;

Certain documents produced by the Joint Aviation Authorities, which may be purchased from *JAA*.

Regulatory Resources

8.3.   Documents produced by regulatory authorities such as ICAO, JAA and national aviation authorities are subject to amendment. Reference should be made to the current version of the document to establish the effect of any subsequent amendment.

ICAO Annex 6 – Operation of Aircraft – Part I Chapter 3 Section 3.2 – Accident Prevention and Flight Safety Programme;

ICAO Annex 13 – Accident & Incident Reporting;

ICAO Doc 9156 – Accident/Incident Reporting Manual;

ICAO Doc 9422 – Accident Prevention Manual;

JAR-OPS 1.037 – Accident Prevention Programme plus associated IEM & ACJ;

JAR-OPS 1.085(b) – Incident Reporting;

JAR-OPS 1.420 – Occurrence Reporting;

JAA NPA OPS-35.

Information on Safety Management Systems

Australian Civil Aviation Safety Authority;

Canadian Civil Aviation Authority;

UK Civil Aviation Authority;

US Federal Aviation Authority.

Incident Reports

NASA ASRS Database Report Set – 50 Altitude deviations.

Other Resources

Air France Flight Data Monitoring Altitude Deviation Programme;

EUROCONTROL Second Level Bust Workshop*:*

Analysis of the Risks of Level Bust;

Level Bust: An Empirical Approach;

NASA: Murphi Busts an Altitude;

UK Airprox Board Report: 2001/2;

UK Airprox Board Report: 2002/1;

UK CAA CAP 712 – Safety Management Systems;

UK CAA CAP 382 – Mandatory Occurrence Reporting Scheme;

UK CAA CAP 739 – Flight Data Monitoring.