



EVAIR

Summary Report Bulletin 02



EUROCONTROL VOLUNTARY ATM INCIDENT REPORTING

INTRODUCTION

Welcome to the second edition of EVAIR (EUROCONTROL Voluntary ATM Incident Reporting), the main aim of which is to enable key stakeholders (Airlines and ANSPs) and their safety management systems to be proactive in fixing safety problems.

Establishing the EUROCONTROL voluntary ATM incident reporting started in November 2006, and since April 2008, following the publication of the first Safety Bulletin, voluntary reporting has become known as **EVAIR – EUROCONTROL Voluntary ATM Incident Reporting**.

EVAIR relies on three main pillars:

- a. **Collection and analysis of ATM incident reports from airlines and ANSPs;**
- b. **Feedback channel for the provision of replies on submitted incidents and quick fix of problems;**
- c. **Monitoring and customized analysis to support safety activities of outside stakeholders and different EUROCONTROL Agency programmes and projects.**

This EVAIR Safety Bulletin Summary Report gives a quick snapshot on the most interesting areas. More statistics and explanations can be found on the links given below the associated graphs.

The core of the EVAIR team consists of ATM specialists (Air Traffic Controllers and engineers), supported by Agency specialists dealing with the areas covered by the EVAIR Safety Bulletin.

EVAIR's activities are still evolving, therefore suggestions and proposals to improve our work are welcomed. Please forward proposals to Ms Dragica Stankovic: dragica.stankovic@eurocontrol.int



COLLECTION, ANALYSIS AND RECORDING OF ATM INCIDENT REPORTS

STAKEHOLDERS' PARTICIPATION

After two years of operation more than 40 airlines provide incident report to EVAIR including practically all the biggest European carriers, legacy and low cost. In addition, airlines outside the European region, from South and North Africa, the Middle East, the USA and Asia also participate in EVAIR. The participating airlines cover more than 30% of the overall ECAC traffic. They provide reports on a daily basis, making an average of 100-150 reports a month. There are more than 25 ANSPs who provide feedback information on forwarded requests. Having data on a regular basis gives a good view of the current safety and operational situation and enables all participants to be proactive in solving some of the safety problems, especially those that can be solved in the short-term.

DATA BASE

So far more than 1500 reports have been collected from the commercial airlines.

TOOLS USED BY EVAIR

The following tools are used to record, calculate statistics, incident simulations and automatic occurrence data collection:

- **TOKAI** – Toolkit for the ATM Occurrence Investigation
Toolkit download: http://www.eurocontrol.int/src/public/standard_page/esarr2_tokai.html
- **ASMT** – Automated Safety Monitoring Tool
Available free of charge. Contact: frederic.lieutaud@eurocontrol.int and
- **InCAS** – Interactive- Collision Avoidance Simulator
Available free of charge. Contact: garfield.dean@eurocontrol.int

SECTION 1

STATISTICS DERIVED FROM THE AIRLINES' REPORTS AND ANSPs FEEDBACK

Statistics in the EVAIR Safety Bulletin are based on data received from commercial operators and feedback data provided from the air navigation service providers. Assessment of events is very much based on the subjectivity of those who were involved. EVAIR statistics do not contain severity analysis, since the analysed reports are not officially investigated. Nevertheless, statistics provide a general view of the current operational acceptability.

The whole European airspace is covered by the ATM occurrence reporting since the airlines providing incident reports come from all European Regions, and some of them also outside Europe.

For the period Jan-Jun 2007 and Jan-Jun 2008 more than 500 reports were received and analysed. Data were provided by more than 40 airlines.

Note: In this Safety Bulletin we give the absolute number of incidents and number of incidents versus number of operations.

The period covered by the EVAIR statistics is less than two years. As such it is too soon to provide safety trends.

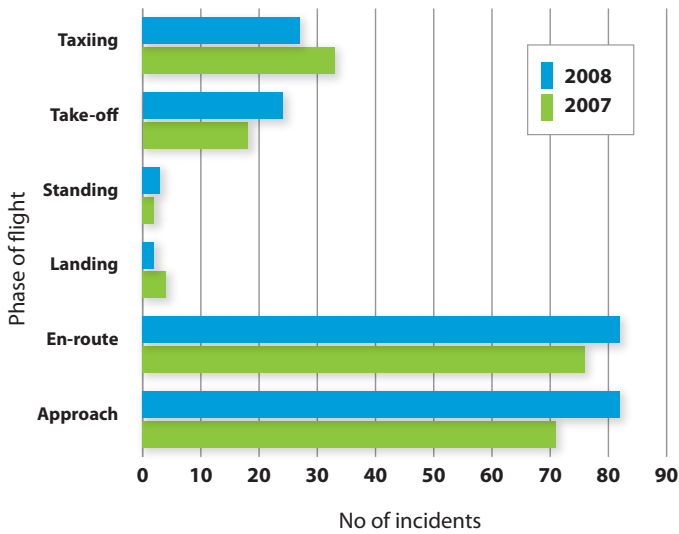


Figure 1: Phases of flight. Period: Jan-Jun 2007/8.

Figure 1 shows the comparison for Jan-Jun 2008 with the same period in 2007. Before drawing conclusions it is important to note that in 2008, the team of EVAIR ATM incident data providers has grown. Therefore, the increase of the absolute number of incidents could also be related to the increase of data providers also.

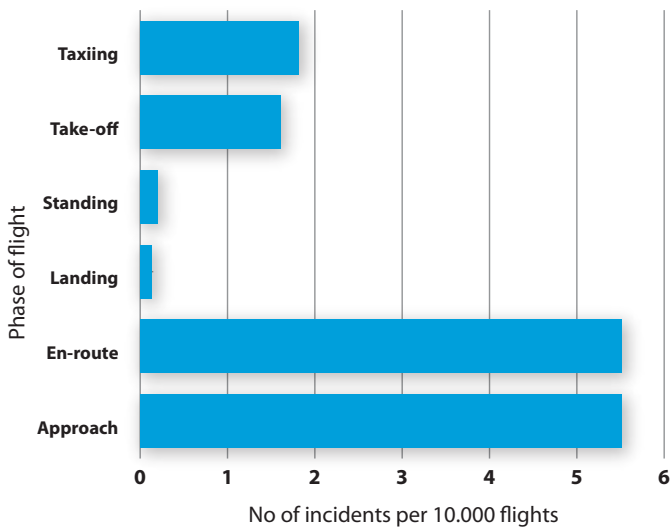


Figure 2: Phase of flight Jan-Jun 2008 per 10,000 flights. Period Jan-Jun 2008.

Figure 2 shows the rate between numbers of incidents per phase of flight and number of operations of the carriers participating in EVAIR. Due to the short period of monitoring it is very difficult to say whether the rates are high or low.

CONTRIBUTORS TO ATM INCIDENTS

During consultations with data providers seven contributory areas have been identified as areas to be monitored. These are areas that are related to the monitoring of the current European Action Plans for the prevention of Level Bust, Runway Incursion and Air/Ground Communication, and also areas identified within the Action Plans such as: Hear back and Read back, language issues Radio/Telephony phraseology and plain language, ATC clearance instructions etc. Depending on trends identified the list of contributory areas can be enlarged or reduced; this will be carried out in coordination with data providers and supported by the permanent data collection and analysis activity.

Figure 3: Contributors to ATM incidents. Period Jan-Jun 2007/8.

Comparison shows the decrease of the majority of ATM incident contributors. The only increase for Jan-Jun 2008 is related to spoken communication, which equates to 17% of the overall contributors for the period Jan-Jun 2008.

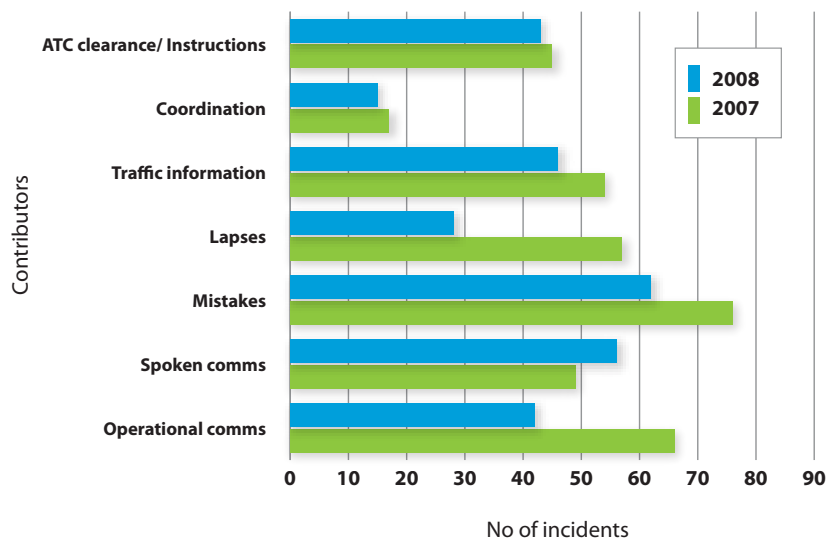
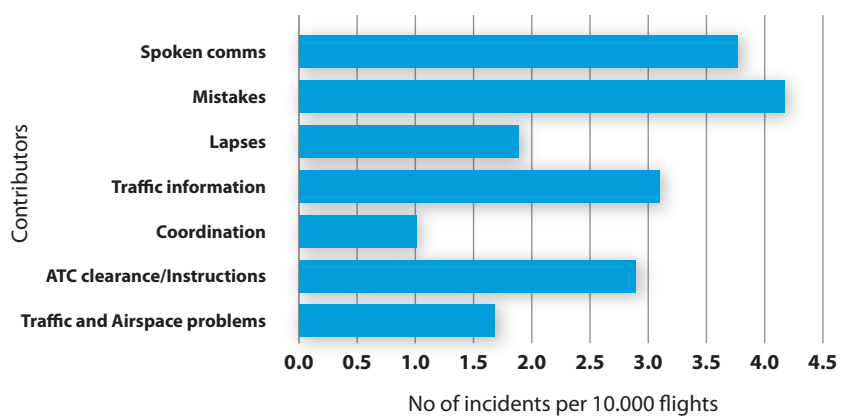


Figure 4: Contributors to ATM incidents Jan-Jun 2008 per 10.000 flights. Period Jan-Jun 2008.

Mistakes with the 4,2 incidents per 10,000 flights have the highest rate.



TYPES OF CONTRIBUTORS

- **ATC clearance/instructions related items:** authorisation for an aircraft to proceed under conditions specified by an air traffic control unit and deviations from the clearance which cause runway incursions, taxiway incursions, apron incursions and unauthorised penetration of airspace.
- **Coordination:** internal coordination encompassing coordination with sectors within the same unit, and sectors within the ATC suite; external coordination, civil/civil and civil/military; and special coordination, covering expedite clearance, prior permission required, revision and other special coordinations.
- **Traffic Information:** essential and local traffic information provided by an air traffic controller to the pilot. The situation can be Yes (meaning provided), No (meaning not provided), Late, Unknown or Incorrect. Essential information is related to the provision of traffic information containing:
 - a) direction of flight of aircraft concerned;
 - b) type and wake turbulence category (if relevant) of aircraft concerned;
 - c) cruising level of aircraft concerned; and
 - d) estimated time over the reporting point nearest to where the level will be crossed; or
 - e) relative bearing of the aircraft concerned in terms of the 12-hour clock as well as distance from the conflicting traffic; or
 - f) actual or estimated position of the aircraft concerned.

Local traffic in this context consists of any aircraft, vehicle or personnel on or near the runway to be used, or traffic in the take-off and climb-out area or the final approach area, which may constitute a collision hazard to the other aircraft and about which the information has to be provided.

- **Lapses:** psychological issues encompassing: Reception of information, Identification of information, Perception of information, Detection, Misunderstanding, Monitoring, Timing, Distraction, Forgetting and Loss of awareness.
- **Mistakes:** psychological issues encompassing: Information wrongly associated, Workload issues, Information not detected, Failure to monitor, Recall of information, Misunderstanding or insufficiently learned information, Judgement, Planning, Decision making, Assumptions and Mindset.
- **Spoken communication:** human/human communication encompassing air-ground and ground-ground communications but also call sign confusion, noise interference and other spoken information provided in plain language. Air-ground communication refers to language/accents, situation not conveyed by pilots, pilot's breach of radio telephony (R/T), workload, misunderstanding/misinterpretation, and other pilot problems. Ground-ground communication refers to misunderstanding/misinterpretation, poor/no coordination.
- **Operational communication:** Air-Ground, Ground-Ground and Use of equipment verification testing. Air-Ground communication encompasses hear back omitted, pilots' read back, standard phraseology, message construction, R/T monitoring including sector frequency monitoring and emergency frequency monitoring, handling of radio communication failure, unlawful radio communications transmission. Ground-Ground communication refers to the standard phraseology, speech techniques, message construction, standard use of equipment like, radio frequency, telephones, intercoms etc.

More statistics related to the contributors to the ATM incidents can be found on the following link:

http://www.eurocontrol.int/esp/public/standard_page/evair.html

SECTION 2

ACAS REPORTING

Operational monitoring of ACAS in Europe aims to ensure the continued safe operation of ACAS.

ACAS is the Airborne Collision Avoidance System intended to improve air safety by acting as a 'last-resort' method of preventing mid-air collisions or near collisions, between aircraft. ACAS is the generic term for Airborne Collision Avoidance Systems, of which TCAS II is the only example. Implementation phase 2 of ACAS has been terminated. However, ACAS monitoring continues as a safety tool to improve safety by identifying technical and procedural deficiencies.

ACAS data has been collected through automated reporting via the Automated Safety Monitoring Tool (ASMT) developed by EUROCONTROL and manual (airlines' and ANSPs' reports). Statistics given in this section are derived from manual reporting provided by volunteering airlines, and data collected automatically from one Mode S radar station provided by the relevant volunteering ANSP. The period covered by the EVAIR ACAS statistics is still short and giving safety trends, comments and conclusions at this stage is premature.

MANUAL ACAS REPORTING

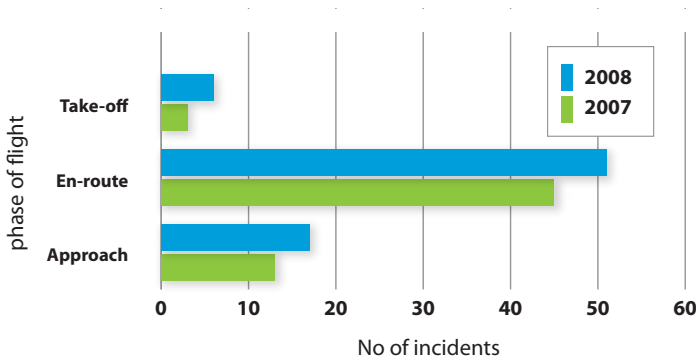


Figure 5: ACAS reports per phase of flight in absolute figures.
Period: Jan-Jun 2007/8.

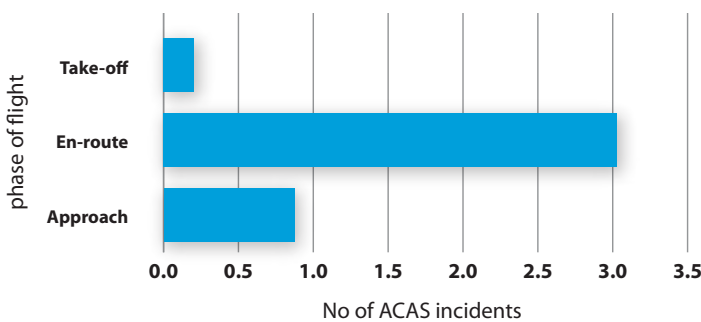


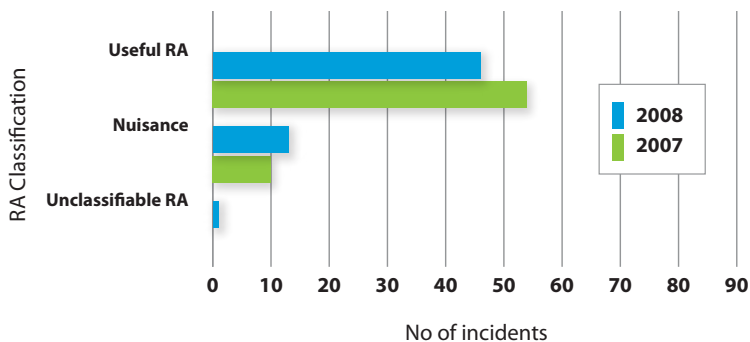
Figure 6: ACAS versus phase of flight (per 10.000 flights).
Period: Jan-Jun 2008

Figure 7: RA Classification.

Period: Jan-Jun 2007/8.

According to the Harmonisation for European Incident Definition Initiative for ATM (HEIDI) taxonomy, Resolution Advisories (RAs) have been classified as:

- **Useful RA** – The TCAS II system generated an advisory in accordance with its technical specification in a situation where there was, or would have been, a risk of collision between the aircraft.



- **Nuisance RA** - The TCAS II system generated an advisory in accordance with its technical specification in a situation where there was not, or would have not been, a risk of collision between the aircraft.

- **Unclassifiable RA** - The TCAS II system generated an advisory that cannot be classified because of insufficient data.

The extent to which pilots and controllers correctly follow these classifications when filling out their reports is unknown. The assessment of events (e.g. severity, usefulness) is based on subjective assessment of those who were involved. Nevertheless, these values arguably provide a general measure of the current operational acceptability of ACAS.

More statistics related to the ACAS Manual reporting can be found at the following link:

http://www.eurocontrol.int/esp/public/standard_page/evair.html

ACAS RAs COLLECTED AUTOMATICALLY FROM ONE MODE-S RADAR STATION

An Automated Safety Monitoring Tool (ASMT) is being used to record and analyse all TCAS advisory messages downlinked by one Mode S radar in European airspace. This set of statistics has been assembled from data that has been collected between 07 January 2008 and 30 June 2008.

NUMBER OF EVENTS RECORDED

Events with valid RA Messages	Events with erroneous RA Messages	Complex RA Events	Grand Total
1073	3170	21	4204

DOWNLINK ANOMALIES

There were 218 airframes detected that incorrectly issued downlink requests of which 52 were detected 10 or more times during the 6 month period. From the 3170 Erroneous Message events, 2636 were from this set of 52 airframes.

41 aircraft sent downlink messages with an incorrect Mode C altitude reported for the intruder.

In summary, a small number of aircraft are non-compliant with the SARPS and pollute the Radio Frequency (RF) environment. Action is being taken to contact the operators and manufacturers concerned.

INTRUDER EQUIPAGE BY TCAS SENSITIVITY LEVELS

Figure 8 shows the number of events recorded with Resolution Advisories (RAs) on both aircraft and the number of events where only one aircraft reported an RA.

Events shown as an RA with a Mode S intruder are to a very large extent TCAS equipped. TCAS does not symmetrically generate RAs. There are many events where only one aircraft receives an RA, even though both are TCAS equipped. RA intruder Mode C are confirmed as Mode C intruders by the Own RA downlink.

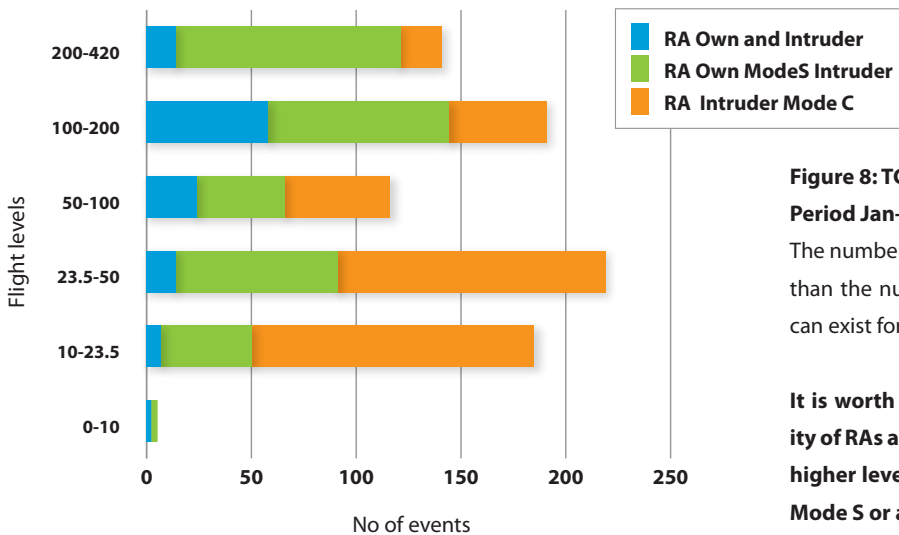


Figure 8: TCAS equipage in Encounters. Period Jan-Jun 2008.

The number of events at each sensitivity level is lower than the number of RAs because more than one RA can exist for each event.

It is worth noting that at lower levels, the majority of RAs are against Mode C intruders, whereas at higher levels, most RAs are against intruders with Mode S or are coordinated TCAS encounters.

RESPONSE

Aircraft response is assessed by ASMT using the established assessment criteria.

For an RA that does not change for at least 2 radar cycles (10 seconds) we see that 94% have responded to the RA. There were 79% achieving the requested vertical rate, 6% exceeding the requested rate and 9% either slow or failing to achieve the requested rate. Six percent were calculated to give opposite responses.

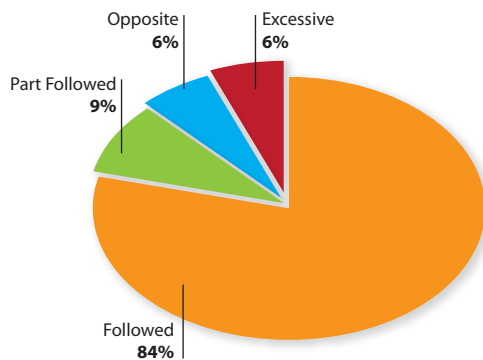


Figure 9: Response to Standard RAs.

Period: Jan-Jun 2008.

For changing RAs (where the RA is observed to change after one radar cycle) compliance with the RA is not as good (even though TCAS expects a quicker response from pilots). **The high level of Opposite responses to changing RAs is a cause for concern and re-emphasises the need for pilots to be trained to follow the full sequence of RAs that they receive.**

VERTICAL RATES AT THE TIME OF THE RA

At the time of the first RA 30.6% of aircraft had a vertical rate exceeding 1500fpm.

Pilots should be aware of the following provision in PANS-OPS that is in force from 20th November 2008:

“Pilots should use appropriate procedures by which an aeroplane climbing or descending to an assigned altitude or flight level, especially with an autopilot engaged, may do so at a rate less than 8 m/s (or 1 500 ft/min) throughout the last 300 m (or 1 000 ft) of climb or descent to the assigned altitude or flight level when the pilot is made aware of another aircraft at or approaching an adjacent altitude or flight level, unless otherwise instructed by ATC. These procedures are intended to avoid unnecessary airborne collision avoidance system (ACAS II) resolution advisories in aircraft at or approaching adjacent altitudes or flight levels. For commercial operations, these procedures should be specified by the operator.”

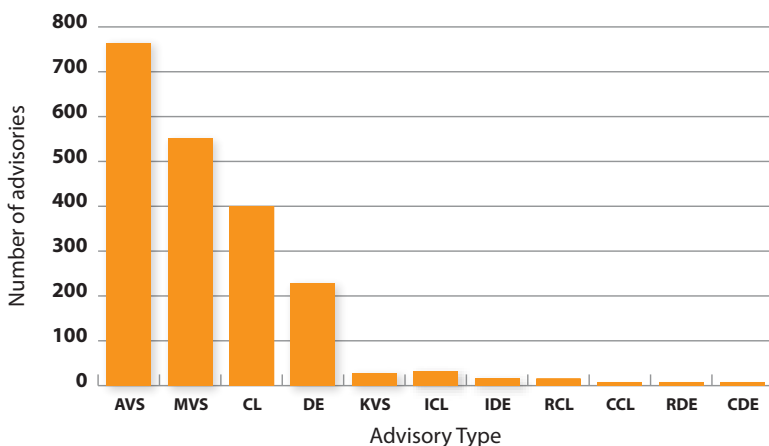


Figure 10: Distribution by RA Type.

Period: Jan-Jun 2008.

Code	Advisory	%
AVS	Adjust Vertical Speed	37.18%
MVS	Monitor Vertical Speed	26.81%
CL	Climb	19.46%
DE	Descent	11.09%
KVS	Maintain Vertical Speed	1.31%
ICL	Increase Climb	1.61%
ICD	Increase Decent	0.78%
RCL	Reversal Climb	0.73%
CCL	Crossing Climb	0.34%
RDC	Reversal Descent	0.34%
CCD	Crossing Descent	0.34%

The TCAS advisories AVS and MVS do not require deviation from ATC clearance unless ATC requests a specific vertical rate. They correspond to 64% of RAs.

ANALYSIS OF RAs WITH HORIZONTAL CLOSEST POINT OF APPROACH LESS THAN 0.2NM

From all recorded events a selection was made to capture events that had a horizontal separation of less than 0.2nm. All RAs that were unlikely to have involved small vertical miss distances were then discarded.

The remaining 31 events were analysed. For those events where TCAS appears to have made a difference, simulations were made with modified trajectories to determine if they would have been close vertically if there was no RA.

22 events are worthy of note:

In 18 events the TCAS advisory was followed and an improvement in vertical separation was achieved.

1 event had a horizontal miss of 0.02nm and 235ft. The TCAS equipped aircraft did not respond to the RA and a collision was avoided by chance. This event is shown in figure 11.

1 military transport would have had a miss of 0.2nm and 67ft with GA aircraft if TCAS had not been followed. Following TCAS gave a vertical miss of 1029ft.

2 events would have had a miss of less than 0.1nm and 200ft if TCAS had not been followed.

In summary, **there were 3 events where separation would have been less than 0.2 nm and 200ft if TCAS had not been present and followed. TCAS continues to save the day.**

A simulation of this event suggests that if the pilot of “green aircraft” had followed his TCAS advisory with expected response (dotted line trajectory) a vertical separation of 637ft could have been achieved between it and the aircraft below. The solid line shows the trajectory actually recorded where vertical separation was less than 250ft.

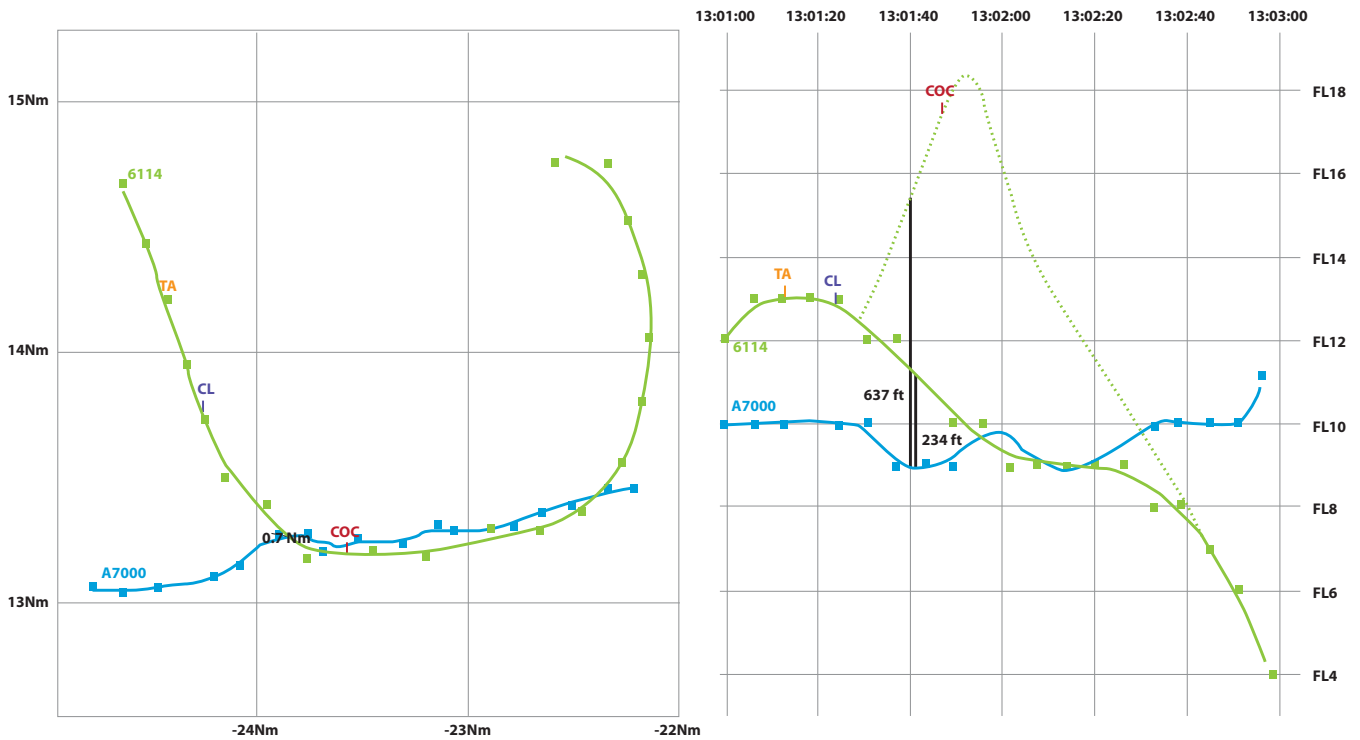


Figure 11

More statistics related to the automated ACAS RA data collection can be found on the following link:
http://www.eurocontrol.int/esp/public/standard_page/evair.html

EVAIR

Summary Report Bulletin 02

PROVIDING FEEDBACK ON SUBMITTED INCIDENTS

EVAIR's Feedback process is one of its essential activities, it enables stakeholders to be proactive and to take measures that quickly fix some safety problems and a list of safety focal points of airlines' and ANSPs' safety and operational people.

CUSTOMISED ANALYSIS

EVAIR provides data to different programmes within the EUROCONTROL Agency and to external stakeholders on request. ACAS monitoring is a regular part of the EVAIR activities and hence is included in the EVAIR Safety Bulletin.

The contact person for the EVAIR team is:

Ms Dragica Stankovic

ATM Safety Expert

EVAIR Function Manager

dragica.stankovic@eurocontrol.int

Tel: +32 2 729 5034

Fax: +32 2 729 9082



© European Organisation for the Safety of Air Navigation (EUROCONTROL)

March 2009

This document is published by EUROCONTROL in the interests of exchange of information. It may be copied in whole or in part, providing that EUROCONTROL is acknowledged as a source. The information contained in this document may not be modified without prior written permission from EUROCONTROL.