Network Manager
nominated by
the European Commission

EUROCONTROL

EVAIR Safety Bulletin No 12
Summer Seasons 2008-2013

"You are under Air Traffic Control"

CONTENTS

EVAIR FUNCTION MANAGER'S PERSPECTIVE

The EVAIR team is pleased to present EVAIR Safety Bulletin No 12; this issue covers the summer periods of 2008-2013. The analyses are based on almost 7500 reports received from more than 200 different airlines during this period. In addition, our database encompasses ANSPs' reports related to specific types of events e.g. 'Call Sign Similarity' and 'ACAS RAs'. Our analysis also includes the data set coming from ANSPs' feedback on the airlines' occurrence reports.

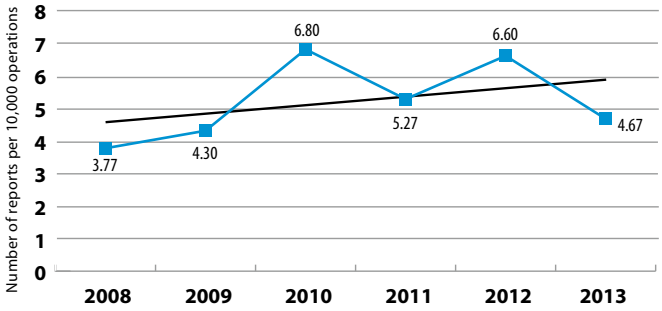


Figure 1
Incident data collection for Summer seasons 2008 - 2013

Data collection overview

The trend line for the summer periods 2008 – 2013 (Figure 1) shows a rise in the number of reports received per 10.000 flights. However, during the summer 2013 we recorded a drop in the number of reports, having 4.67 reports per 10.000 operations versus 6.60 in the summer 2012. Put in the context of daily occurrences, it means that within ECAC airspace during the summer 2013 there were from 12 - 15 occurrences per day of a lower level severity.

During the reporting period about 200 different airlines submitted their ATM occurrence reports to EVAIR; on average each year we received reports from approximately 95-100 different airlines. These companies are members of various industry associations (e.g. IATA, IACA, ERAA and ELFAA) and they account for about 80% of the overall ECAC air traffic.

European ANSPs are equally important data providers to EVAIR. Besides providing feedback on the airlines' occurrence reports which is a key motivating factor for improved reporting among pilots and air traffic controllers - ANSPs provide 'Call Sign Similarity/ Confusion' reports and ACAS RA data. For the summer periods 2008 – 2013, we received about 3000 'Call Sign Similarity/ Confusion' reports and through the automatic data collection of ACAS RAs (from 13 radars) we identified that in the summer 2013 there were on average 3 to 4 ACAS RAs daily.

EVAIR continues to promote its activities to the airlines and ANSPs by keeping them informed about the benefits of being the member of this activity, facilitating the feedback process and bringing together aircraft operators (AOs) and ANSPs at regional meetings.

Verification of EVAIR data with IATA STEADES

Our cooperation with IATA STEADES[1] continues in this EVAIR Safety Bulletin. One of the tasks is to cross-check the robustness and quality of EVAIR data with the IATA STEADES information. However, the cooperation goes beyond statistics and covers visits to specific regions and cross-checks of the data findings with ANSPs. So far, the cooperation between ANSPs and AOs supported by the EUROCONTROL Voluntary ATM Incident Reporting shows good results and has been well accepted.

Feedback – Reporting motivator and support to quick fixes

The feedback process is the major contributor to a good level of reporting and the increasing number of reports received and number of airlines participating in EVAIR activities. The feedback rate rose from 2.8% in summer 2008 to 21% in summer 2013. As mentioned in previous EVAIR Safety Bulletins, we now receive feedback requests from ANSPs as well as from airlines. This is very good for the overall process and very encouraging for us working in EVAIR, since it confirms the importance of the feedback process which EVAIR facilitates and is a sign of mutual trust and cooperation. In terms of content, the feedback information ranges from a few sentences up to a few pages providing explanations of the root of the problem. Very often explanations are supported by the radar snap shots, voice recordings or transcripts. The availability of occurrence reports and feedback, gives the opportunity to EVAIR to reconstruct events and to identify their causes - another important part of our analysis. We are very proud to say that, when requested, ANSPs who are outside of the European region have also shown a willingness to provide their feedback which again

[1] *STEADES – Safety Trend Evaluation and Data Exchange System*

strengthens the overall process. In addition to 'closing the loop' and finding solutions or mitigations for the identified problems, the provision of feedback is one of the elements which helps to build trust between the two major stakeholders, ANSPs and AOs.

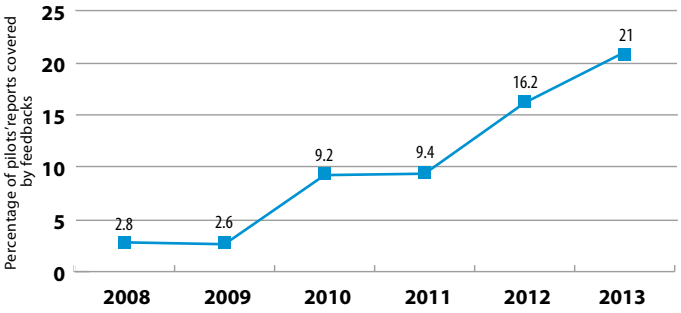


Figure 2

Percentage of pilots' reports covered by ANSPs feedbacks

Main trends

Events

All five monitored types of ATM safety events ('Level Bust', 'RWY Incursion', 'Missed approach/Go-around', 'ACAS RA' and 'Call Sign Similarity/Confusion') within the EVAIR repository recorded a decrease in summer 2013 versus 2012. However, the situation within IATA STEADES - which is a global repository - is slightly different. Namely, there we saw an increased number of reports for 'RWY Incursions', 'Go-around', and 'ACAS RAs'. Further monitoring will show if this trend will continue.

Contributors to incidents

Within the top seven contributors identified by EVAIR as common to the majority of ATM safety events, three of them ('Air-Ground Communication', 'Mistakes' and 'Traffic Information') recorded a decrease and the other four ('Lapses', 'Coordination issues', 'ATC clearance/Instructions' and 'Traffic and Airspace problems') showed an increase in summer 2013. The contributor with the highest increase in 2013 was 'Traffic and Airspace problems' with a 77% rise compared to summer 2012. It is interesting that this contributor has recorded the increase for the last three years.

ACAS RA data collection

Within the EVAIR repository, the trend line of the ACAS incidents reported by pilots shows a downward trajectory and for summer 2013 the recorded decrease was 36%. However, in the same period, IATA STEADES recorded an increase of 9%. From the automatic data collection perspective, as of 2011, EVAIR receives the ACAS RAs recorded by 13 Mode – S radars from two ANSPs. The average number of ACAS RAs increased from 2-3 daily in the summers 2010 and 2011 to 3-4 daily in the summers 2012 and 2013.

Laser Interference

In summer 2013, EVAIR recorded an increase in the number of laser attacks versus the same period in 2012. It is important to highlight that some ANSPs have established effective reporting procedures to inform the police and their regulator about the laser problems. In addition, according to our discussions with EASA we hope that next year more steps will be taken to further mitigate laser problems.

Call Sign Confusion

For the last two summer seasons EVAIR has recorded a significant decrease in the number of 'Call Sign Confusions' (CSCs) provided by pilots. The situation in IATA STEADES is slightly different, namely after an increase during summer 2012 a reduction in the number of 'Call Sign Confusions' was recorded during summer 2013. The picture of the 'Call Sign Similarity/Confusions' as depicted by the ANSPs data is more complete, and gives more details. In 2013 we had 13 ANSPs providing the data versus 8 in the summer 2012. It is important to highlight that the recorded number of 'Call Sign Confusions' within the cohort of Call Sign Similarity Tool-users (CSST) is 65% lower than the number of 'Call Sign Confusions' for non-CSST users. However, in summer 2013 we recorded an increasing percentage of 'Call Sign Similarities' within the CSST -users. We continue with the monitoring to identify the main reasons behind this increase – improved reporting of 'Call Sign Similarity' (CSS) events by ANSPs and the growth in the number of CSST users may explain away some of the increase but there may be other factors associated with CSST usage that need to be explored. Whatever the reasons the 'Network Manager ' (NM) CSMC (Call Sign Management Cell) and the ANSPs often intervene by asking the airlines with the similar call signs to change one of them thus contributing to the decrease of the number of 'Call Sign Confusions'.

Stakeholders' Corner - IATA

The International Air Transport Association (IATA) safety department conducted analysis of five selected topics related to Air Traffic Management (ATM) reports. The analysis was conducted on Air Safety Reports (ASR) held in IATA's Global Aviation Data Management (GADM) Safety Trend, Analysis, Evaluation and Data Exchange System (STEADES) database. The STEADES database is comprised of de-identified safety incident reports from over 170 participating airlines throughout the world, with an annual reporting rate now exceeding 150,000 of all type of reports per year. The scope of this analysis included research of ASRs for summer periods (April 1st to September 30th inclusive) over the years from 2008 to 2013. During these summer periods a total of 338,885 reports were submitted and collated into STEADES. The airlines participating and submitting data to STEADES represent a total of 19,348,033 flights during the summer periods from 2009 to 2013. This is equivalent to an average of 22% of the world's flights during these summer periods. It is interesting to note that all five of the selected event types may be related to traffic density, meaning that errors are likely to increase as traffic (and pilot/controller workload) increases.

Delta Airline

In this issue we have the honor to present an article about Delta Airlines Safety Management System (SMS). The article also touches the airline's reporting and safety culture. Delta is a large global airline with a very complex and integrated business. Therefore reading this article is a small effort in comparison with the value of the provided information.

Security and Confidentiality

In collecting and processing data, EVAIR follows strict security and confidentiality arrangements. Safety data provided are properly safeguarded and de-identified and the information is only used for the promotion and enhancement of aviation safety.

EVAIR Suggestions/Improvements

EVAIR is constantly looking at ways to improve its services and products. Suggestions and proposals are more than welcome. Please forward any thoughts, ideas and comments to Ms Dragica Stankovic EVAIR Function Manager:
dragica.stankovic@eurocontrol.int

INTRODUCTION TO EVAIR STATISTICAL DATA

EVAIR Safety Bulletin No 12 covers the summer periods 2008 -2013. The analyses are based on almost 7500 reports received from more than 200 different airlines. Statistics are based on low level severity ATM occurrences. Airlines providing data are members of the major airline associations operating in Europe (IATA, IACA, ERAA, and ELFAA). We have 13 European ANSPs who are providing on a monthly or a daily basis 'Call Sign Similarity' reports; moreover, two of them provide, on a monthly basis, ACAS RAs recorded from Mode-S radar stations. Most important of all though is that all European ANSPs, and a few of them outside the European region, provide feedback on the airlines' ATM air safety reports when asked to do so.

We repeat that the occurrence analysis is very much based on pilots' reports and their subjectivity in describing the traffic situation in which they were involved. However, through the improved feedback processes, the analysis is increasingly based on the replies provided to EVAIR by the ANSPs. **EVAIR statistics do not contain severity classification**, since the analysed reports are not officially investigated. What is very important to say is that we receive a number of reports where no incident actually occurred but where the potential for an incident existed. Indeed, this type of report provides an opportunity for AOs and ANSPs to act preventively.

Occurrence reports provided to EVAIR by member airlines and feedback provided by ANSPs cover the whole ECAC airspace as well as some neighbouring airspaces such as the Eastern part of the ICAO EUR region, Middle East, North Africa etc.

Notes:

1. *In this EVAIR Safety Bulletin within the **manual** part of reporting, only **relative figures** are presented - i.e. the number of reported occurrences **per 10,000 flights** of the airlines participating in the reporting. Within the automated **ACAS RA data collection** sections, the data comprises **absolute values**.*
2. *The graphs which show a drill down through the database identifying causal factors could count the same incident more than once. The reason for that is that one incident could be associated with more than one causal factor and vice versa.*

Definitions

Definitions for the majority of elements contained in the graphs can be found in the Annex 2.

ATM EVENTS AND SUPPORT TO EUROPEAN SAFETY ACTION PLANS

EVAIR analysis is a contribution to aviation ATM safety monitoring insofar as it provides a unique and additional perspective of ATM safety based on safety data provided voluntarily by the airlines and ANSPs. EVAIR is another piece of the operational ATM mosaic. Each added part to the overall picture may help us to better understand and possibly change our view on ATM safety priorities or confirm already identified areas of concern at a pan-European level.

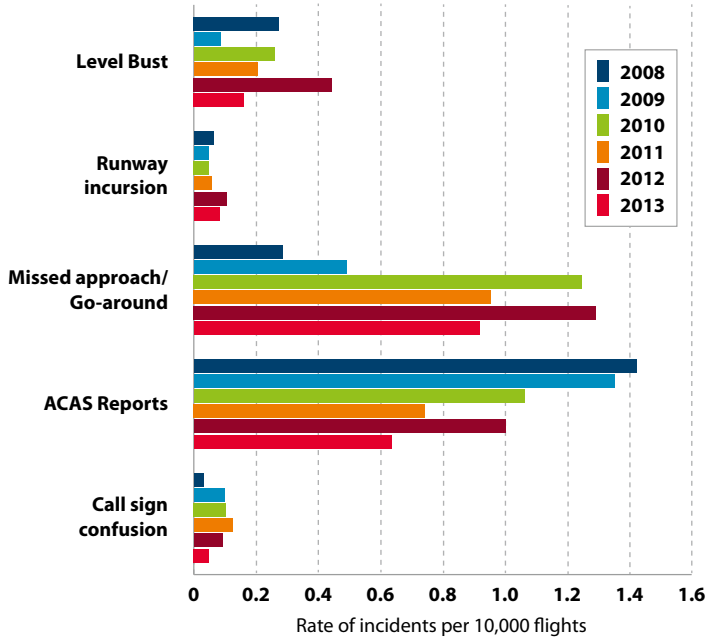


Figure 3:
European ATM Events Summer seasons 2008 – 2013

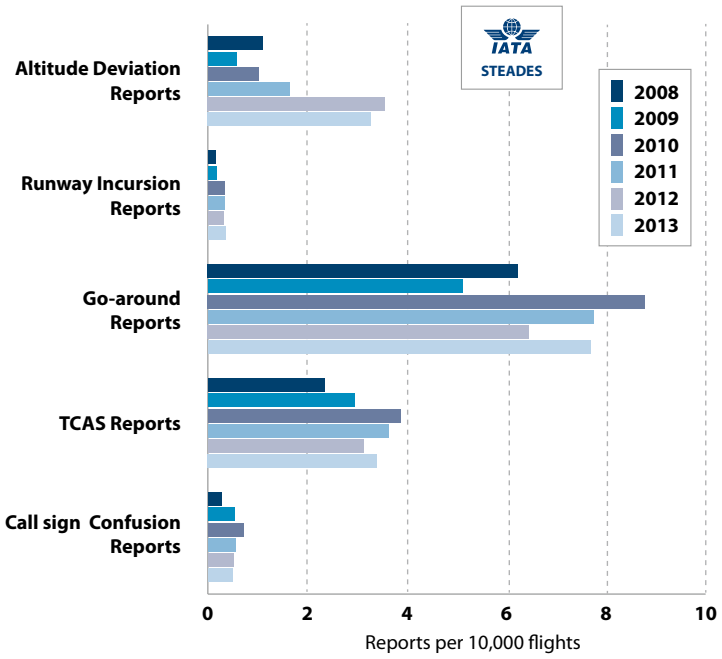


Figure 4:
ATM events Summer seasons 2008 – 2013

EVAIR Safety Bulletin No 12 uses the collected data to show among others, trends of ATM event types which are addressed in various European safety action plans, studies or projects. Thanks to the cooperation between EUROCONTROL and IATA, besides European trends we can also see global ones as recorded by IATA STEADES.

In line with existing European action plans or studies, this section of the Safety Bulletin (as usual) looks at 5 selected event types:

- Level Busts
- Runway incursions
- Missed Approach/Go around
- ACAS RAs
- o Call Sign Similarity/Confusion

All five monitored type of events recorded a decrease during summer 2013. The highest decrease recorded was 'Level Bust', which showed a drop of almost 71%. 'Call Sign Confusion' decreased about 50% and 'ACAS RA' by about 36%. It is necessary to highlight that 'Call Sign Confusion' shows a steady decline since 2011 when the Call Sign Similarity de-confliction project started. The first phase of the project was the advice to the airlines to use the alpha numeric call sign and the 2nd phase offered the airlines' community the opportunity to use the Call Sign Similarity de-confliction tool (CSST) which helps to de-conflict the similarities within a single aircraft operator's schedule

A reductions in the number of 'Call Sign Confusion' events helps to reduce the occurrence of 'Level Bust' since 'Call Sign Similarity/ Confusion' has been identified as a contributor to 'Level Bust' events. An additional element contributing to the decrease in the number of 'Call Sign Similarities' is the fact that, besides airlines, the European ANSPs play a very active role by collecting CSS/CSC data on a daily or monthly basis. This 'Call Sign Confusion' data is then sent to EVAIR and CSMC who then request the airlines to modify the 'Similar Call Signs'. We are pleased to report that, so far, the cooperation between ANSPs and airlines is excellent and our plea to the community is to continue this cooperation in the future. It is also important to note that a similar trend with the 'Call Sign Similarity' has been recorded within the IATA STEADES data repository. More detailed information is provided in the chapter 'EVAIR support to call sign similarity implementation project' on the page 15.

As far as Level Bust are concerned it is interesting to note that the number of Level bust in quotation rose significantly in summer 2012 and then fell substantially during summer 2013. IATA STEADES data recorded a similar pattern, but without the high variances, , for the same two summer seasons. Further monitoring will show if after summer 2013 we will have a more stable situation with the Level bust in quotation. We would like to highlight that the June 2014 EUROCONTROL Safety Forum Airborne Conflict event organized by FSF, ERA and EUROCONTROL, found that 'Level Busts' and CSSs are part of the airborne conflict scene, providing confirmation of the findings of EVAIR. The Forum encouraged ANSPs and AOs to continue using the EUROCONTROL toolkits for the prevention of the 'Level Bust' and 'Call Sign Similarity'.

http://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Level_Bust;
http://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Runway_Incursions;http://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Runway_Excursions_(EAPPRE)

The EVAIR and IATA STEADES data indicates that for summer 2013, once again, 'Go-around' and 'ACAS RAs' were the top two most reported types of the events. Reports of both type of events decreased within EVAIR during the summer 2013 whereas within STEADES reports of both had an increase. Further monitoring will show if it is a trend or indication of a difference in the performance in the European system compared to the world as a whole or just random noncompliance between EVAIR and STEADES repositories. (http://www.skybrary.aero/index.php/Portal:Go-Around_Safety).

CONTRIBUTORS TO ATM OCCURRENCES

Figure 5 presents the top seven high-level contributors common to the majority of different types of events presented in the EVAIR Safety Bulletins and certainly to those presented in the figure 3. The contributor 'Air-Ground communication' consisted of 'Operational and Spoken communication', which besides 'Mistakes' has the highest trends, is examined further in the chapter Air-Ground Communication on page 22.

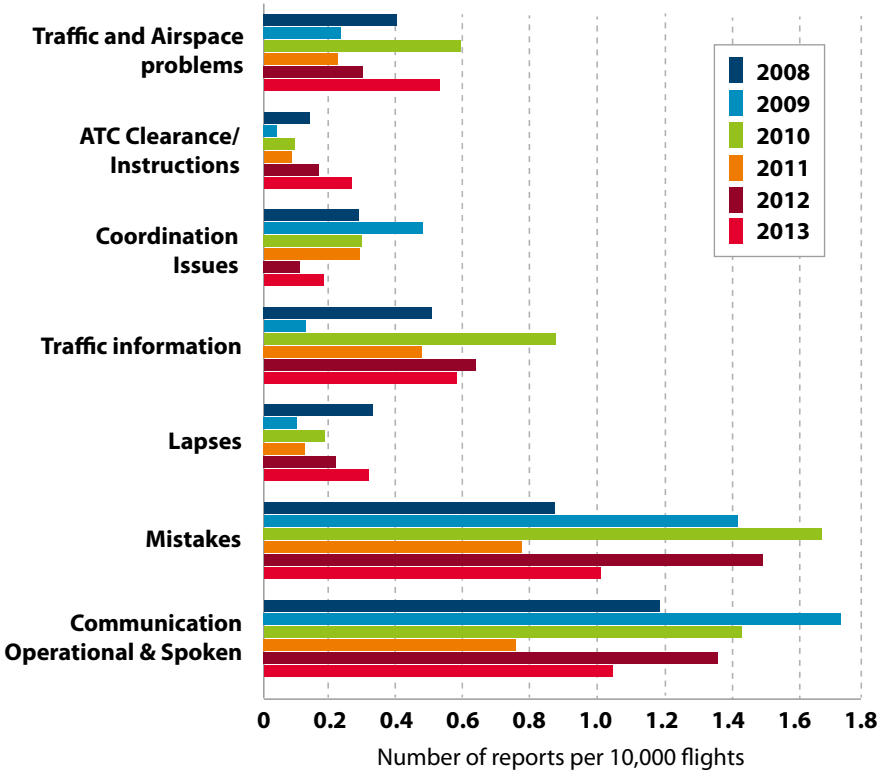


Figure 5:
Contributors to ATM incidents – all phases of flight Summer seasons 2008 – 2013

Within the top seven contributors three of them recorded a decrease. ('Air-Ground Communication', 'Mistakes' and 'Traffic Information'), while the remaining categories recorded an increase over 2012 levels. We would like to draw the attention to 'Traffic and airspace problems', which was highlighted as one of the issues on the mentioned 'Safety Forum', has been recording a steady increase for the last three years. The major issues regarding this contributor have been observed within Terminal Management Areas (TMAs) and are related to the need to redesign SID and STAR procedures within certain TMAs across Europe.

STAKEHOLDERS' CORNER

In this issue we have the honor to present an article about Delta Airlines Safety Management System (SMS). The article also touches the airline's reporting and safety culture. Delta is a large global airline with a very complex and integrated business. Therefore reading this article is a small effort in comparison with the value of the provided information.

Ben Crown Program Manager – Safety Management System (SMS)

In the United States, implementation of air carrier Safety Management Systems (SMS) is not yet mandated by the Federal Aviation Administration in the form of a regulation. While a final rule is anticipated within the next year, the FAA has offered airlines the opportunity to participate in a voluntary implementation pilot project for SMS, with the intent of establishing the necessary internal processes and infrastructure to support compliance with the final regulation, once released. Delta Air Lines, Inc. was the first passenger air carrier to formally be offered and join the FAA's SMS pilot project, which sets forth a phased approach to SMS implementation. Phase I (of IV) required Delta to submit an organizational structure and program process plan to the FAA. This was accomplished in late 2007.

Although divisional participation was voluntary, all operational divisions (Flight, Ground Operations, Inflight, Cargo, Maintenance, Dispatch) committed to participation in the program. By the time of Delta's merger with Northwest Airlines in 2008, the company was well into the second phase of the pilot program which works to improve reactive processes and basic risk management techniques. In January 2011, Delta achieved the last phase of the pilot project, indicating the company's move into continuous improvement of SMS processes; by June of 2011, Delta formally completed the pilot project.

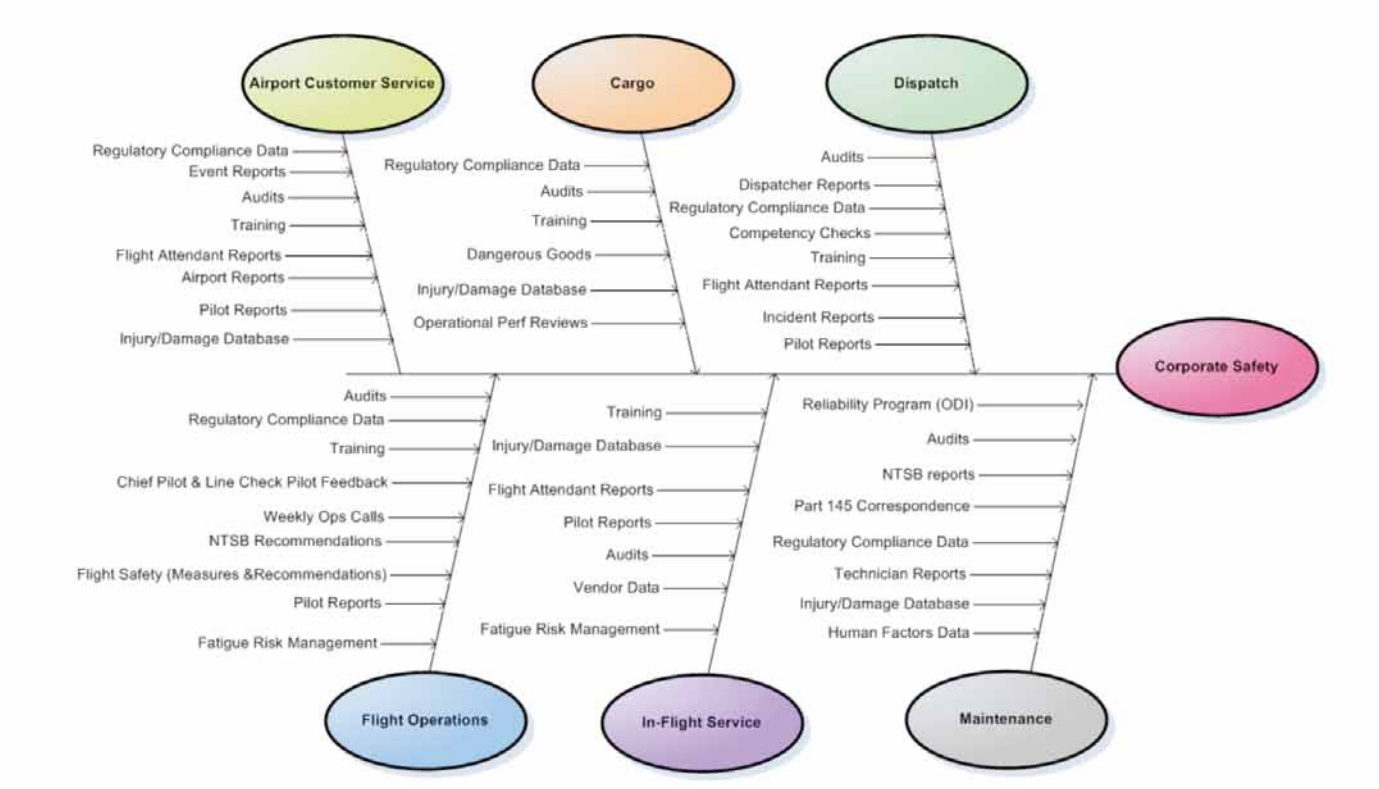


Figure 5a

Delta's strong safety culture, structure and organizational commitment, coupled with robust hazard identification data tools such as the Aviation Safety Action Program (ASAP), Flight Data Monitoring (or FOQA) and our Quality Management System (QMS), have allowed Delta to implement comprehensive SMS processes.

At Delta, SMS is in work every day. The concepts of SMS are not complex; however, a large, global airline like Delta is a very complex and integrated business. In addition to flying an airplane between two city pairs, each one of those airplanes must be maintained, catered, loaded and unloaded, and dispatched with safe and accurate flight plans including weather, routing, and any other unique information the flight crews need to know. Each of those activities is a separate process with inherent risks and comprehensive mitigation strategies. Delta's SMS considers each of these processes individually, but also takes into account the organizational interfaces and potential process changes needed to run the business safely and efficiently. SMS allows those changes to be managed effectively within the scope of the entire airline's operation.

As part of the SMS process, Delta utilizes a series of divisional safety committees, known as the Safety Round Tables (SRTs), to continuously monitor operational risk. The SRTs are charged with the development of a unified strategy to address safety issues at the divisional and the corporate level. A multi-departmental committee, the

Integrated Safety Round Table (ISRT), is comprised of business leaders from each operating division who manage cross-divisional issues that require broad coordination. Participants identify higher-level issues where impact cannot be addressed or effectively mitigated at the divisional level. The safety data sources are key inputs into the Safety Round Table process.

The development of a comprehensive SMS business model at Delta enables each of the operating divisions to own and control safety implications specific to their organization. This allows for a higher degree of oversight by the safety organization, improving accountability and responsibility of the operating division, allowing the divisional leaders to have a better insight of their safety performance, and enabling them to influence the outcome; thus ensuring sustainable improvement in the long term.

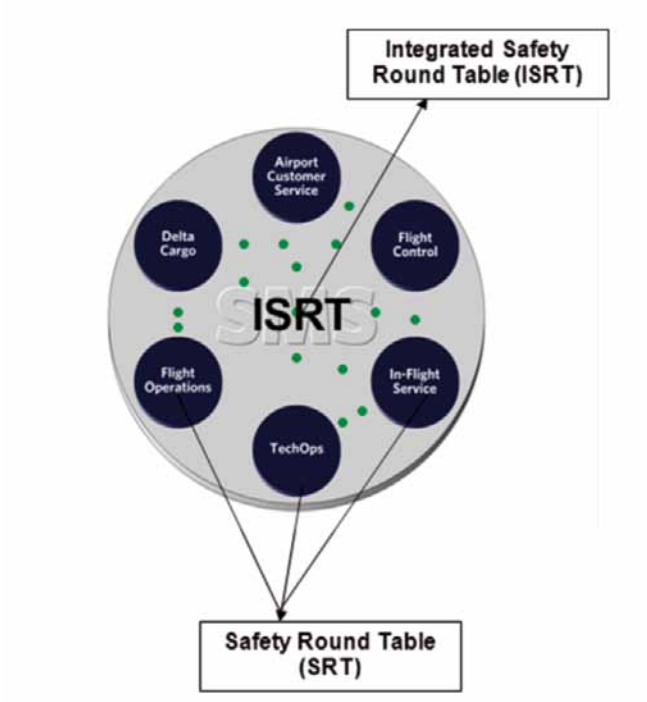


Figure 5b

Specific to the air traffic arena, Delta utilizes data collection tools to identify precursor events to larger, undesirable outcomes such as: Controlled Flight Into Terrain (CFIT), Tail Strike, Runway Excursion, Turbulence, Loss of Control (LOC), In-Flight Hazards, Undershoot, Hard Landing, Taxiway/Runway Incursion, Mid Air Collision. Examples of precursor events for these undesirable outcomes include lateral/altitude/speed deviations, late landing gear extension, un-stabilized approaches, airspeed decay, excessive pitch/bank, and ground proximity warning system (GPWS) alerts. These precursors are identified via Delta's safety reporting systems (i.e., FOQA, ASAP, air safety reports) and are analysed through the Data Analysis Group (DAG), which is a valuable input into the Safety Round Table (SRT) process.

SMS is already the future of global aviation and Delta leaders embrace its principles and values. While the U.S.-based industry awaits the FAA's formal regulation on SMS, Delta's program has already achieved a high level of maturity. As a leader in the FAA's implementation process, Delta continues to evaluate and improve our processes utilizing SMS as a core business attribute.

GO-AROUND

We are repeating in all EVAIR Safety Bulletins when writing about 'Go-around' that although procedure for which pilots and controller are trained to handle, there are safety issues associated with the event that must be managed. This is one of the reasons that EVAIR and IATA STEADES monitor 'Go-Arounds'. Dealing with the European region, EVAIR monitors at the pan-European level while IATA STEADES provides a global view. The identification of safety concerns and failed barriers, which forced pilots to make a 'Go-around' and controllers to issue go-around instructions, is the main aim of our monitoring. The final objective of the monitoring is to assist in mitigating the situation and possibly eliminating the causes of 'Go-arounds'. Indirectly, mitigation or elimination of the safety issues related to the 'Go-Around' contributes towards improved flight efficiency, fuel saving and airspace capacity. We want to highlight that we always encourage pilots and controllers to continue to use 'Go-around' as one of the last safety barriers established to prevent potential safety problem.

In the past six years in both the EVAIR and IATA STEADES repositories, the yearly number of 'Go-around' reports has fluctuated up and down. However the both repositories' trend lines show a steady increase in the number of occurrences per 10.000 operations. It is interesting that during summer 2013 the rate of 'Go-around' events recorded a reduction within EVAIR while within IATA STEADES summer 2013 recorded an increase in the rate of 'Go-arounds'. Continuous monitoring will show if the trend lines will change direction. We have to highlight that in general the number of reported events depends very much on the reporting culture and the motivation of pilots and controllers to report. When they see that there are corrective actions taken following after their reports they are motivated to report more.

Figure 8 shows EVAIR in-depth analysis of the 'Go-around'. The analyses identified a large number of contributors.

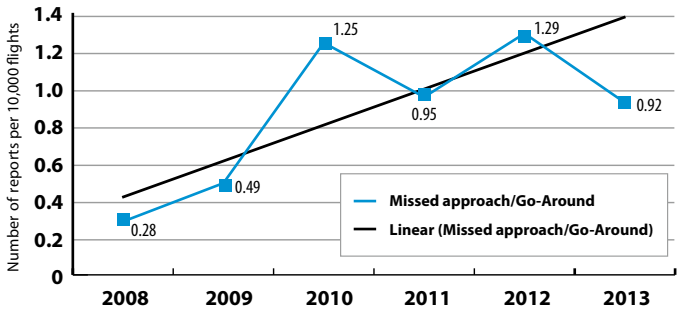


Figure 6

Missed approach-Go-around Summer seasons 2008-2013

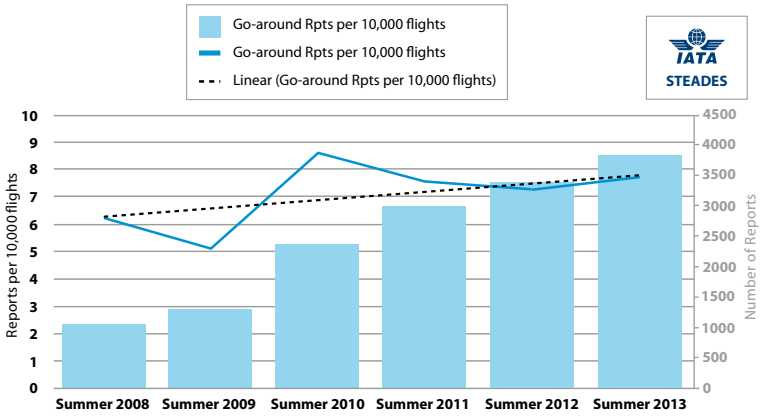


Figure 7

Go-around reports Summer seasons 2008-2013

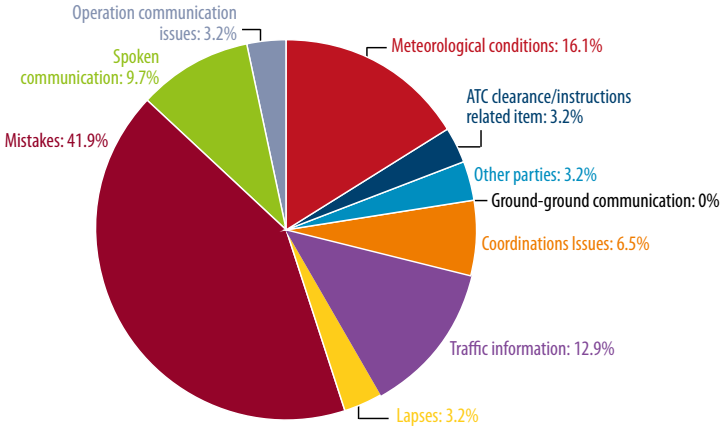


Figure 8

Go-Around contributors - Summer seasons 2008-2013

RUNWAY INCURSIONS

EVAIR and STEADES 'Runway Incursions' yearly trends differ. However the trend lines show a steady increase (Figures 9 & 10). In EVAIR, the lowest number of events was recorded in 2009 while 2012 recorded the highest number of 'Runway Incursions' (RIs). It is encouraging to see though, that 2013 recorded a decrease versus year 2012. In IATA STEADES the runway incursion rate shows a steady overall increase through 2008-2013. Within the EVAIR repository, almost 90% of the 'Runway Incursions' occurred between two aircraft, the rest involved ground vehicles and others including emergency and maintenance vehicles. Within EVAIR data, we also found that 'Runway Incursion' occurred at 51 different locations across Europe and involved 29 different Air Operators. Although, 'Runway Incursions' only account for about 1.3% of the reports in the EVAIR database, it is worth noting that these are often high risk events.

Engagement of safety experts, especially those from the airports' local runway safety teams, has been seen as a very important contributor to the further improvement of the situation in the field of 'Runway Incursion'. We repeat our invitation to the safety experts to have a look at the existing European Action Plan for the Prevention of the Runway Incursions to spare time in finding faster ways to implement mitigations and solutions of the local runway ATM safety problems. http://www.skybrary.aero/bookshelf/books/151.pdf

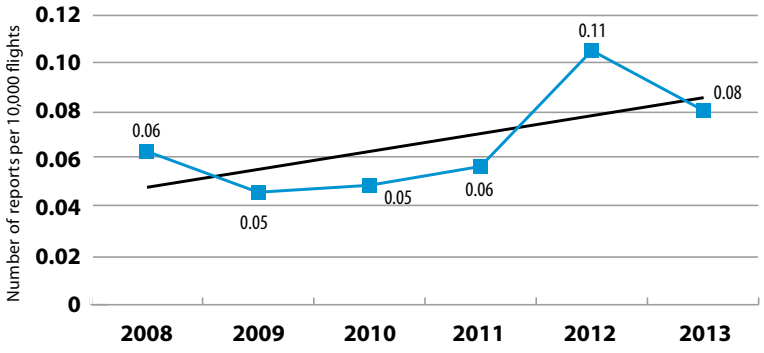


Figure 9
Runway Incursion Summer seasons 2008-2013

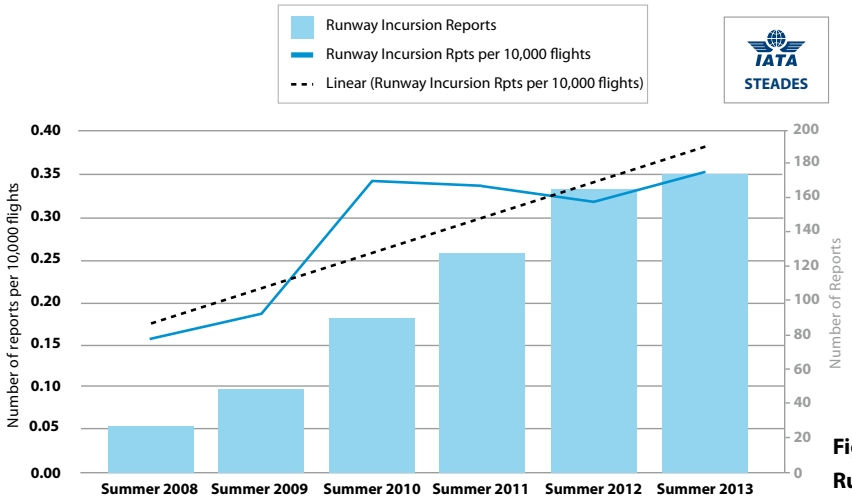


Figure 10
Runway Incursion Summer seasons 2008-2013

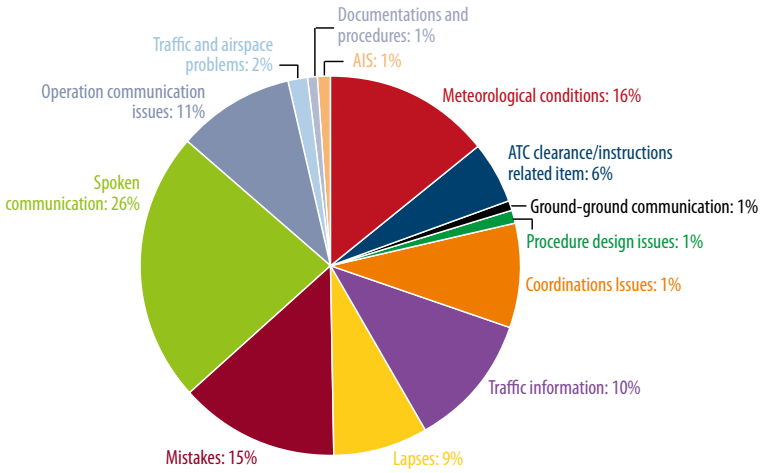


Figure 11
Runway Incursions main contributors Summer seasons 2008 – 2013

About 22% of the 'Runway Incursions' involved a Go-around. In 6% of cases we saw problems concerning ATC clearances and within them we recorded 2 instances where the landing clearances were missing. At the Flight Safety Forum held in Brussels in June 2014, 'Air-Ground Communication' was (unsurprisingly) highlighted as one of the problems with the longest history; it also related to almost all type of ATM safety events. In the EVAIR repository we see that 'Air-Ground Communication' was one of the contributors to the 'Runway incursions' in 38% of the recorded events. 'Spoken communication', which includes 'Misunderstanding', 'Call Sign Similarity', 'Internal and External Communication' etc. is a main element of the 'Air-Ground Communication'. It was one of the contributors in almost 26% of the recorded events while 'Operational Communication', which includes 'Phraseology', 'Hear-back/Read-back', 'Handling of Radio Communication' and 'Transfer of Communication' was a contributor to almost 11% of 'Runway Incursions'.

LEVEL BUST

As for the previous periods, 'Level Bust' occurrences account for about 5% of the overall EVAIR reports for the summer period 2008-2013. Of these, 66% occurred during the en-route phase which is more than during the summer periods 2008 - 2012 when 64% of the 'Level Busts' occurred during the en-route phase. 23% of 'Level Busts' occurred within the approach phase. ACAS as the last airborne safety barrier, acted in 11% of the 'Level Busts', which is 2% less than during the summer period 2008-2012. The trend lines in both EVAIR and IATA repositories indicate an increase (Figures 12 & 13). After a significant increase in 2012 recorded in both repositories, EVAIR recorded a steep drop in 2013. IATA STEADES also indicated a decrease of 'Level Busts' in 2013 but not as pronounced as EVAIR.

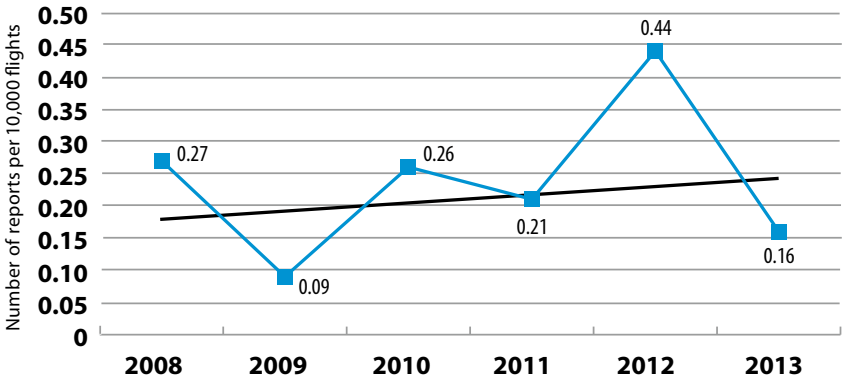


Figure 12
Level Bust Summer seasons 2008-2013

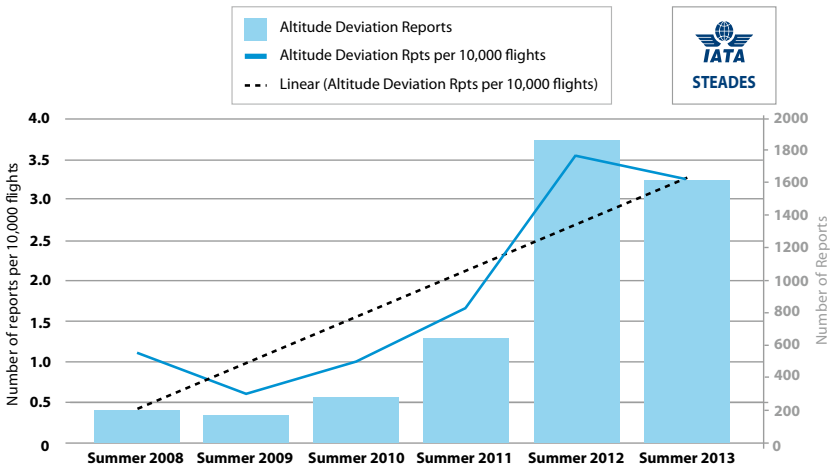


Figure 13
Altitude Deviation Summer seasons 2008-2013

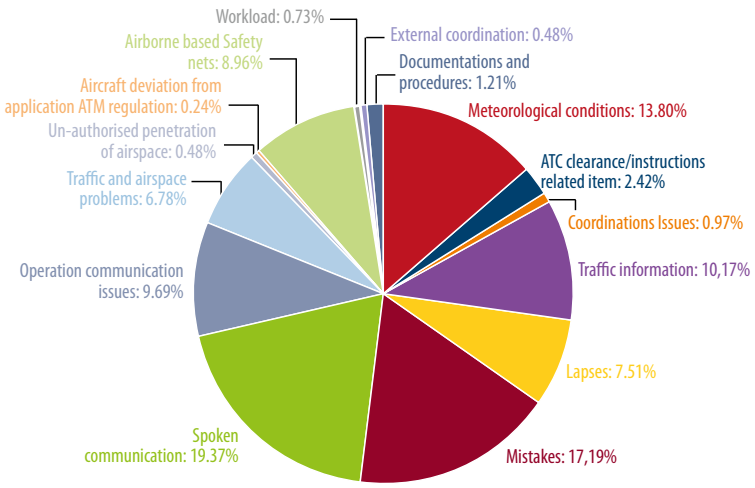


Figure 14
Level Bust contributors Summer seasons 2008-2013

Cumulative figures for the period 2008-2013 (Fig. 14) show quite a large number of contributors to 'Level Busts'. As usual, the area with the largest number of reports are 'Mistakes', which when related to 'Level Busts' have 'Judgment' and Planning' as the main sub categories, and both of them related to the work of air traffic controllers. However, other areas within 'Mistakes' are also important to be highlighted and they are, related to the 'Violations', 'Decision making', 'Overload issues', etc. The area having the largest number of reports is 'Air-Ground communication' with 'Spoken communication' 19.37%, and 'Operational Communication' with 9.69%. We would like to highlight the relatively high percentage of the impact of 'Meteorological conditions' on 'Level Busts'. In a few cases due to unexpected turbulence, we saw an altitude deviation of more than 500 feet.

EVAIR SUPPORT TO CALL SIGN SIMILARITY IMPLEMENTATION PROJECT

EVAIR continues to monitor the use and effectiveness of the EUROCONTROL Call Sign Similarity de-confliction Tool (CSST) and the associated CSS Service Level 1, namely, the detection and de-confliction of similar callsigns in a single Aircraft Operator's schedule. Since the EVAIR monitoring results of CSS/C will be used among other facts for the CSST safety assessment and as a decision making element to go on with the Level 2, we provide more details than for the other monitoring areas.

Call Sign Similarity Tool (CSST) Operations Update

Further refinements continue to be made to the Tool and these came into effect with the NM 18.0 software release in March 2014. These refinements are in response to user feedback and are all intended to make the CSST more user-friendly and/or to improve its detection and de-confliction capabilities. Additional refinements are also planned for the NM 18.5 Release effective in October 2014 and for the NM 19.0 Release in March 2015

Those Aircraft Operators (AOs) who have not yet started using the CSST are invited to join the growing number (now 35+) who already used the CSST to partially or fully de-conflict their flight schedules. Our data shows us that the average deconfliction rate for AOs using the Tool is just over 90%. This is in line with previous seasonal figures and is well above expectations. The really good news is that this success rate is also reflected in 'live' operations. As will be shown in the later graphs in this section, the absolute number and rate of CSS/C events for CSST Users is very small in particular when compared with non-CSST Users. So at this stage of the CSS Project we can say that the Tool is working as envisaged – the number of similarities and confusions (at least for Tool Users, is down) which is good news for safety. Simultaneously, there have been efficiencies in the de-confliction process.

It is also pleasing to report that through the CSST performance monitoring regime – supported by EVAIR – we also continue to contact many AOs who are not using the Tool but who are willing to make ad hoc mid-seasonal changes to known (reported) conflicts. This is also a major success for the Project; of course we would like more CSST Users (see below) but this random cooperation is better than doing nothing, as was often the case in the past.

However and notwithstanding these successes, we cannot rest on our laurels. There is still a large number of AOs who we would like to see make the transition from interest in the CSST to actually using it. Furthermore, there are many more airlines that have not shown any interest in CSST and it's our job to reach out and encourage them to join us. Globally there is a lot of interest in what we are doing and we continue to receive enquiries from the Middle and Far East as well as North America and Africa. So, if you are reading this and you're not sure if your airline is using CSST then please go and ask; likewise, if you're a controller and not sure if you ANSP is sending call sign similarity/confusion data to EVAIR then please ask the appropriate person. The data we receive help us understand how effective the CSST is in 'live' ops and as explained many times before, EVAIR is happy to facilitate contact and feedback between AOs and between AOs and ANSPs to resolve call sign similarities/confusions and other operational issues.

CSST Access and Additional Tokens

As an additional incentive to use the CSST, until April 2014, it was possible to obtain a free NM Token to access CSST. However, unfortunately that privilege has now been withdrawn and AOs who would like to access the Tool or who up until now have had a free Token can either do so by adding CSST to an existing paid Token or by purchasing another Token. The cost of this is only €200 and once added CSST access will be guaranteed for the remaining life of the Token. It is only a small price to pay in comparison with the time saved by using CSST and we hope that AOs will not be discouraged from signing up to use the Tool – it's good value for money.

To make things run more smoothly, AOs need to clearly identify the request for the access to the CSST. To that end, AOs who are applying for a new Token or asking to extend an existing one, must ensure that 'CSST' is put in the 'Purpose of Request' box. To extend an existing Token it will also be necessary to insert user ID (CCID).

The application form can be found at http://www.eurocontrol.int/network-operations/access-service-request-form

AOs applying for the CSST will be contacted by NM Customer Support during the process to validate credentials and complete the service agreement.

Call Sign Management Cell (CSMC) Support

The CSMC (nm.csmc@eurocontrol.int) is also on hand to help the AOs to pass through the application process. The CSMC prepares the CSST for the forthcoming season and is available to discuss AOs' training requirements. Familiarization sessions can be provided in Brussels or, if requested and subject to CSMC staff availability, may be provided on-site at the AOs' premises.

Learn More About Call Sign Similarity

If you are interested in learning more about the CSS Project then please contact the CSS Project Manager and co-chair of the CSS User Group, Mr Richard Lawrence, at:
richard.lawrence@eurocontrol.int or
via callsign.similarity@eurocontrol.int

You can also contact the Call Sign Management Cell (CSMC) at nm.csmc@eurocontrol.int

And find more information on the Call Sign Similarity Project please at:
http://www.eurocontrol.int/services/call-sign-similarity

The latest Call sign Similarity/Confusion data reported to EVAIR and the comparison with IATA STEADES data is shown below.

CALL SIGN SIMILARITIES AND CONFUSIONS TRENDS

EVAIR uses two tracks to monitor Call Sign Similarities and Confusions: One from the airlines and the other from ANSPs. Reports coming from pilots are mainly related to confusions, while those coming from ANSPs are similarities and confusions.

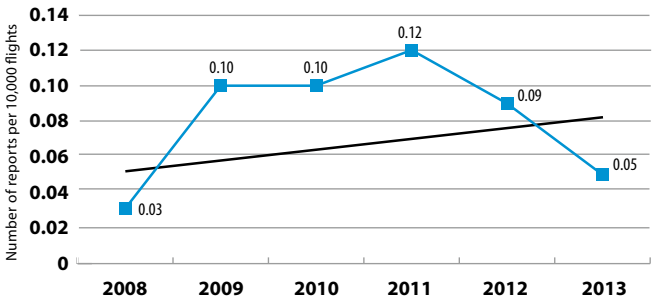


Figure 15
Callsign Confusion Summer seasons 2008-2013

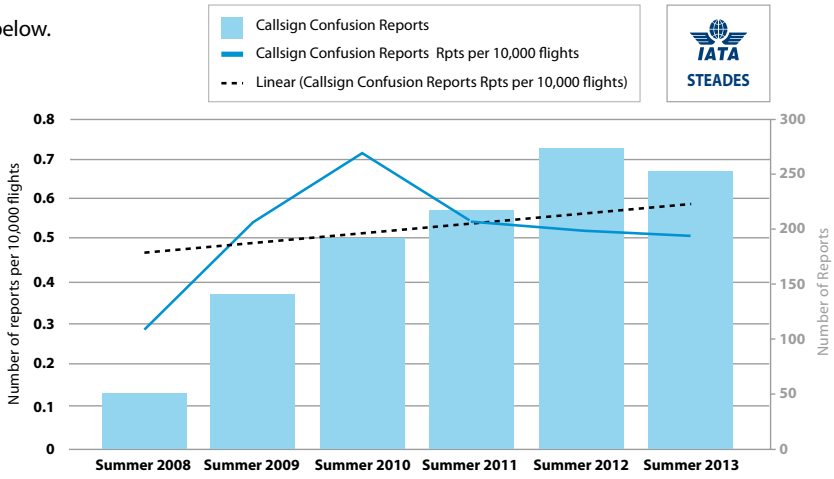


Figure 16
Call Sign Confusion Summer seasons 2008-2013

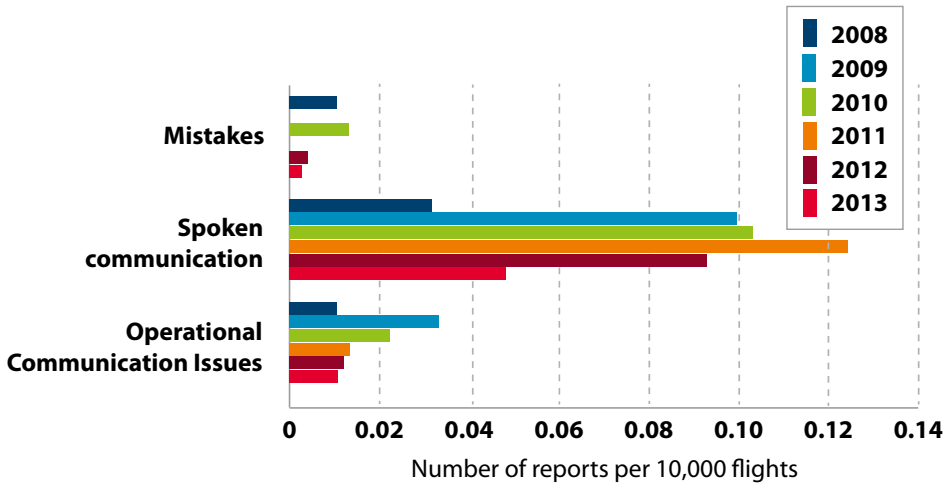


Figure 17
Call Sign Confusion ATM Contributors Summer seasons 2008 - 2013

In both repositories, EVAIR and IATA STEADES (Figures 15 and 16), which are dealing with the AOs reports on 'Call Sign Confusions' the trend lines for the Summer periods 2008 – 2013 show a slight increase. However, after 2011, the EVAIR repository shows a significant decrease of 'Call Sign Confusions', IATA STEADES noted an increase until 2010 followed by a inconsistent decrease up to 2013. Certain differences could be due to the fact that IATA presents the global view and 'Call Sign Similarity' project has a European focus. The decrease in 'Call Sign Confusions' after 2011, and especially 2012 within EVAIR, as said earlier is most likely linked to a number of things: firstly, the increased application of the alphanumeric logic for creating call signs from 2010; the use of the Call Sign Similarity Tool as of 2011 by volunteering airlines; and the established process for mid-season change of the similar call signs and airlines willingness to change similar call signs when requested by the ANSP or EUROCONTROL Call Sign Management Cell (CSMC). We continue to involve AOs and ANSPs in the monitoring process in order to be able to check if the alphanumeric logic and Call Sign Similarity Tool deliver the expected benefit as it was planned when the Call Sign Similarity project started. The initial results are encouraging.

'Call Sign Confusion' contributors (Figure 17) during the summer periods 2008 – 2013 recorded a decrease on all three areas: 'Mistake', 'Spoken Communication', and 'Operational communication'. The highest decrease was recorded within 'Spoken Communication' amounting to a 48% reduction. We will continue to monitor in the hope that the downward trends will be sustained.

AIR NAVIGATION SERVICE PROVIDERS' CALL SIGN SIMILARITIES AND CONFUSIONS

Data provided by the ANSPs give much bigger data set than the data provided by the AOs. These data give possibilities for more statistics and wider view in some areas. It is pleasing to see that from year to year the number of ANSP providers has grown and consequently increased the number of AOs identified as having similar call signs. This is of a great importance for the EVAIR task to monitor the 'Call Sign Similarity/Confusion' project in terms of the efficiency of the Call Sign Similarity Tool and the associated de-confliction algorithms. For this Safety Bulletin the data were supplied by 13 ANSPs (Figure 18) providing more than 2700 'Call Sign Similarity/Confusion' reports.

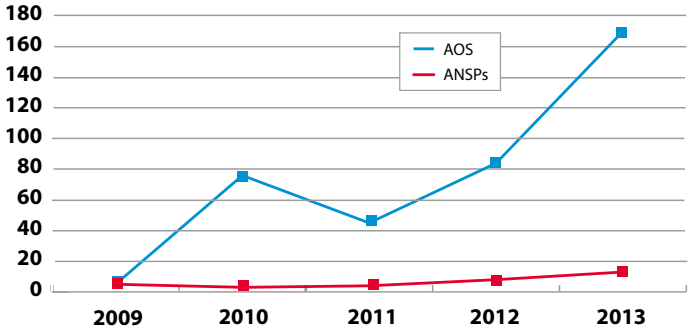


Figure 18

Number of ANSPs providing CSS/C events and No AOs identifed by ANSP with the CSS Summer seasons 2009 – 2013

These 'Call Sign Similarity/Confusion' events were identified within more than 12 million flights for the summer periods 2008 –2013. During summer 2013, ANSPs identified 170 airlines (Figure 18) with similarities. It gave the opportunity to these ANSPs but also to EUROCONTROL CSMC, when requested, to act quickly by informing the airline and asking for a change of the similar call sign. The reactions of the airlines in general have been very positive. Whenever it is possible the AOs change their call signs within a few days or weeks. In other instances the AOs prefer to wait for the preparation of the new season schedule before effecting a change. Only a small number of negative replies have been received and usually they are with the valid justification. Namely, before changing the call sign the AOs wanted be sure that the confusion is not the consequence of a delay of one of the flights involved in the reported similarity/confusion event. Moreover, in some cases it is not possible for the AO to change the call sign because of overflight permissions or airport slot constraints etc.

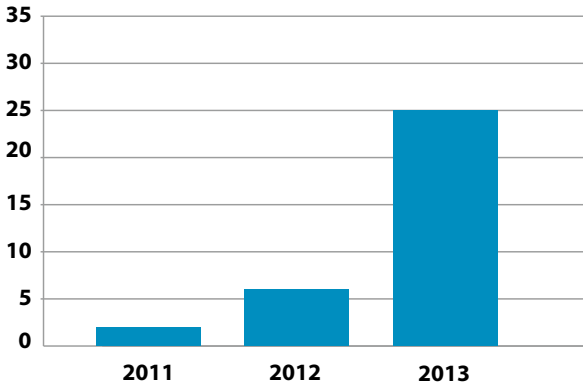


Figure 19

Number of Air Operators (AOs) using the tool Summer seasons 2011 – 2013

Since 2011 when the first volunteering airlines started using the CSST, the number of airlines using the Tool (to either partially or fully de-conflict their schedules) has increased from season to season (Figure 19). The hope is that the good results of the de-conflictin of similar call signs within the same airline will motivate the other airlines to start using the CSST.

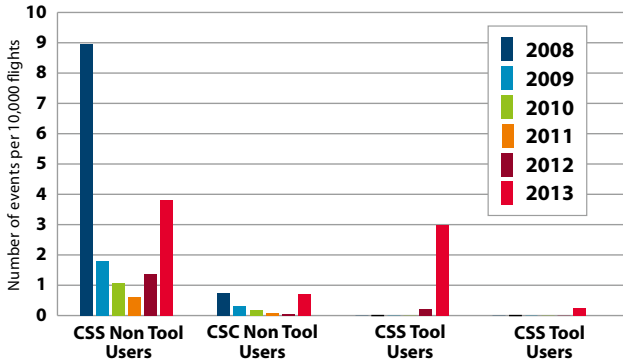


Figure 20

Call Sign Similarities/Confusions – De-confliction tool users and non-users Summer seasons 2008 - 2013

Figure 20 gives a good view of the situation between the number of 'Call Sign Similarities' and 'Call Sign Confusions' between CSST users and non-users. Looking at 'Call Sign Similarities' we see a significant increase in the summer 2013 within tool and non-tool users. The increasing percentage within tool-users is much higher than within non-tool users. We continue with the monitoring to see if the trend will continue and to identify the main reasons behind this increase which may be linked to more reporting.

We would like to highlight that the recorded number of 'Call Sign Confusions' within CSST users is 65% lower than the number of the 'Call Sign Confusions' within the non-tool users. EUROCONTROL CSMC as well as EVAIR continue supporting the process by providing airlines contacts or when asked by ANSPs contacting the airlines directly and asking for a call sign change.

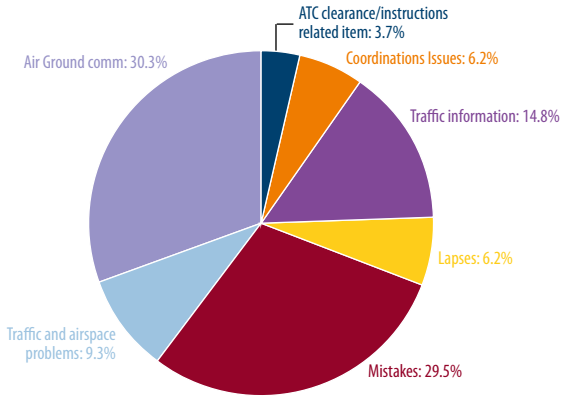


Figure 21

Contributors to ATM Incidents cumulative figures Summer 2008 - 2013

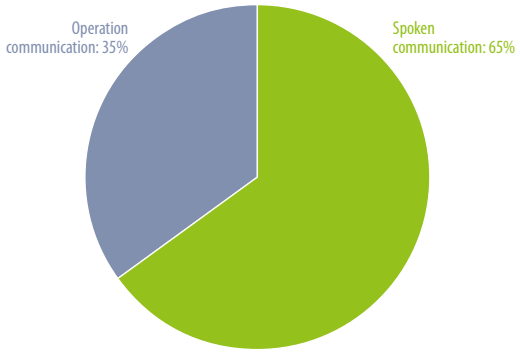


Figure 22

Air-Ground communication cumulative figures Summer 2008 - 2013

AIR-GROUND COMMUNICATION

According to the EUROCONTROL HEIDI (Harmonization of European Incident Definitions Initiative for ATM) taxonomy 'Air–ground communication' consists of two main areas: 'Spoken' and 'Operational' communication.

Figure 21 shows seven ATM contributors which are common to the majority of the different types of ATM events. 'Air-Ground communication' with 30.3% has the highest percentage. 'Air–ground communication' contributes to a number of different events like 'Runway Incursions', Level Busts', 'ACAS RAs', 'Call sign Similarities/ confusions', 'Go-Around' etc.

Figure 22 shows that within the area of 'Air-ground communication', 'Spoken Communication' with 65%, in spite of a 3% decrease for the summer period 2008 – 2013, is still much higher than 'Operational communication'.

'Spoken communication' covers 'Human/human communication' encompassing 'Air-ground' and 'Ground-ground' communications. Subsets of 'Air-ground' and 'Ground-ground' 'Spoken' communication are: 'Language/accent', 'Situation not conveyed by pilots', 'Pilot's breach of radio telephony (R/T)', 'Workload', 'Misunderstanding/misinterpretation', 'Other pilot problems' and 'Poor/no coordination'.

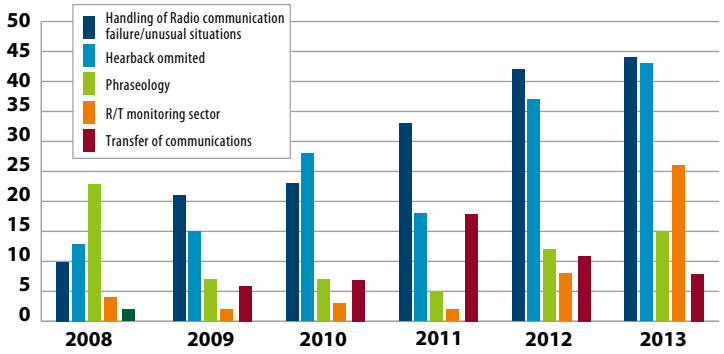


Figure 23

Operational communication Summer seasons 2008-2013

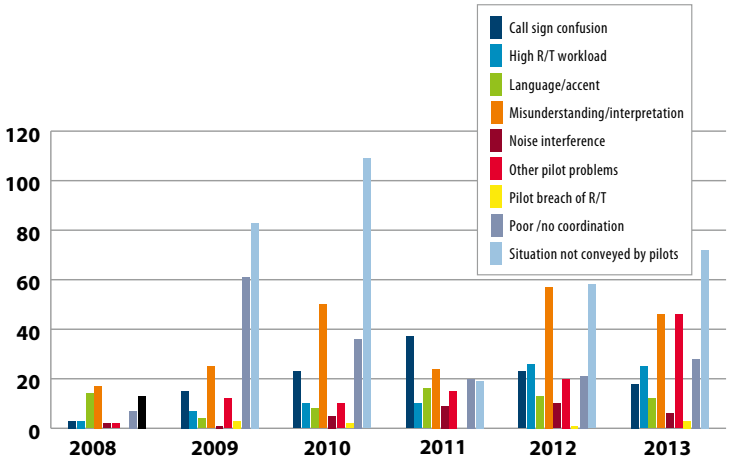


Figure 24

Spoken communication Summer seasons2008-2013

Within 'Operational Communication' (Figure 23) except 'Transfer of communication' all other areas recorded an increase during the last three years. 'Hear back omitted', which includes 'Read Back' and 'Handling of radio communication failure/unusual situations', areas which already had high levels, recorded further increases in 2013. However, the highest increase was seen with the 'R/T monitoring sector'.

Examination of 'Spoken communication' (Figure 24), shows nine different contributors. It is encouraging to see that five of them recorded a decrease in summer 2013 versus 2012. However, we saw a higher number of 'Other pilot problems' (forgetting to switch on loud speakers, low tone volume selection, forgetting to contact next ATC unit after being transferred etc.), and 'Poor or no coordination', which is related to the ATC.

'Situation not conveyed by pilots' has a higher trend throughout the whole examined period. The main contributors are generated by a number of factors including: the use of two languages (i.e. English and a national language) on the same frequency; pilots' lack of the familiarity with the area where they fly; 'hear-back read-back'; 'loss of communication'; and ambiguous or very poor instructions by air traffic controllers associated with a lack of requests for clarification from pilots.

LOSS OF COMMUNICATION SUMMER SEASONS 2008 - 2012

For the summer periods 2008-2013 more than 130 'Loss of communication' occurrences were recorded involving more than 20 different airlines contributing to EVAIR.

EVAIR and IATA trend lines, after having different trends for 2008-2012 whole years, showed similar declining trends for the summer periods 2008 – 2013. However, we still see differences. In the EVAIR repository we noted a steep movement of the reports rate for the summer 2013, while IATA STEADES recorded only a modest decline versus 2012.

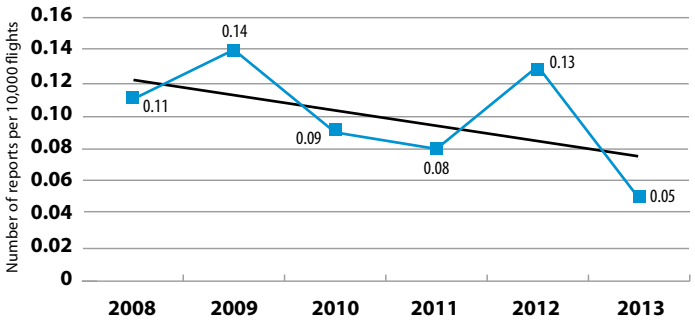


Figure 25
Loss of communication Summer seasons 2008 - 2013

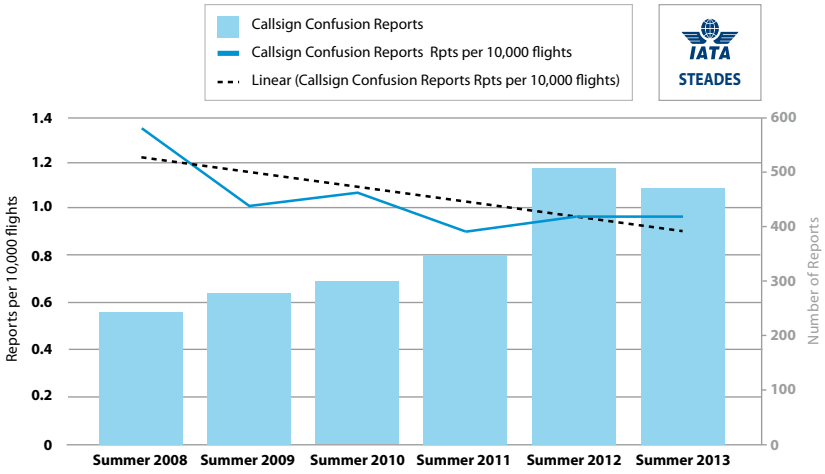


Figure 26
Loss of communication Summer seasons 2008 - 2013

During the summer 2013 within the EVAIR repository, we found that 'Loss of Communication' occurred in 7 European states at 14 different locations. For the period 2012 – 2013, 72% of the overall 'Loss of Communications' occurred within two states.

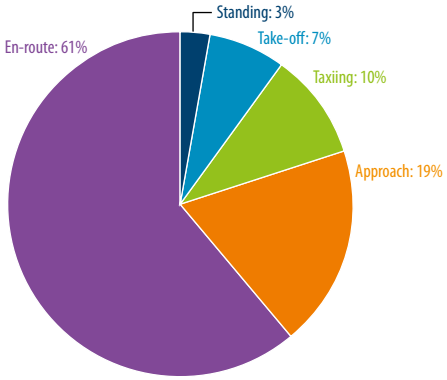


Figure 27
Loss of communication – Phases of flight Summer seasons 2008 - 2013

In terms of phases of flight, 61% of the temporary 'Loss of Communication' occurred within the en-route phase. In some instances losses of communication are followed by military interceptions. Although the 'Approach phase' recorded less 'Loss of Communication' reports than 'en-route' (Figure 27), the risk is much higher when these events occur during approach phase.

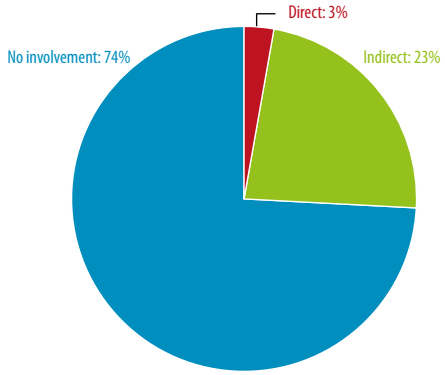


Figure 28
Loss of Communication – ATM system contribution Summer seasons 2008 - 2013

ATM system contributions to the temporary 'Loss of communication' show that 'Direct ATM involvement' is very low, 3%. 'No involvement', with 74% indicates that the problem was on the other side, i.e. in the majority of cases the airborne systems and people.

The most frequent roots of the 'Loss of Communication' for summer 2013 were: 'Weak transmission', 'Forgotten hand over between two sectors', 'Blocked frequency', 'Frequency interferences', 'Problems with the Back-up transmission', 'Wrong setting' and 'Busy frequency'.

In summer 2013, 'Loss of communication' events were also associated with 'Runway incursions'; 'Go-arounds'; and VHF failures'.

SPECIFIC EVENTS
LASERS THREATS ACROSS EUROPE

After showing a significant decrease in the number of reports in summer 2012, we saw an increase for summer 2013. Overall, the laser threat trend line shows an increase for the summer periods 2009 – 2013.

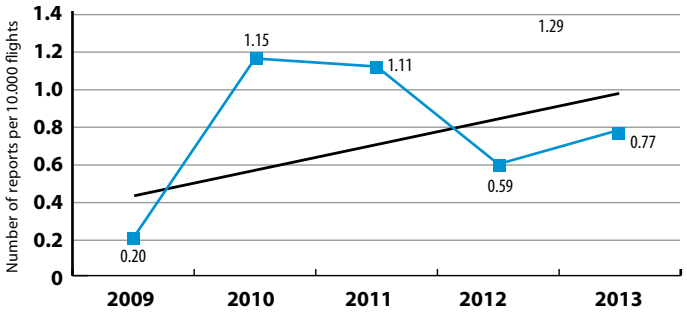


Figure 29
Laser Summer seasons 2008-2013

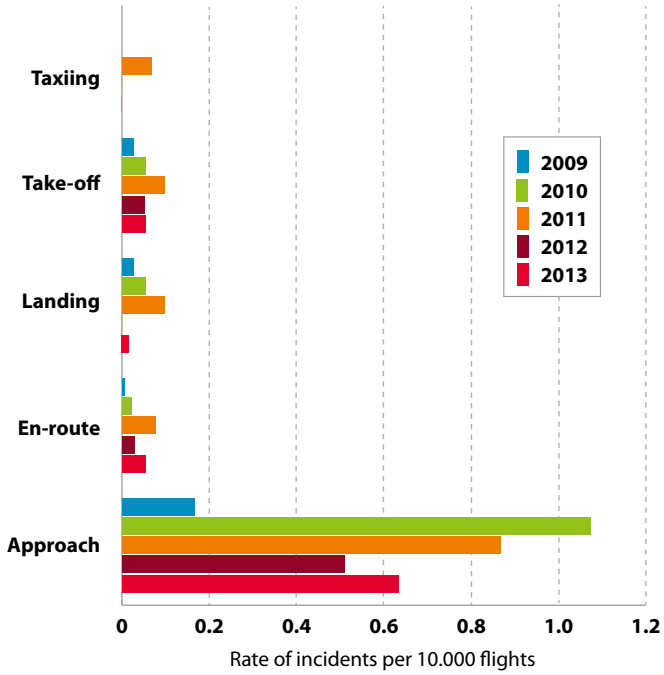


Figure 30
Laser Summer seasons 2009-2013

As usual the Approach phase is the most affected although we see laser attacks within take-off and landing as well as during en-route. The affected en-route traffic is not at high altitude but those aircraft that are preparing for the approach or flying on lower altitudes.

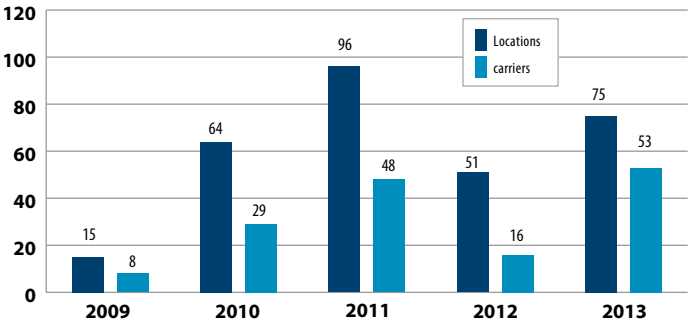


Figure 31
Laser interferences No of locations and No of affected carriers Summer seasons 2009-2013

During the summer 2013, laser attacks were recorded at 75 different locations and 53 different Air Operators were affected. We would like to highlight that certain AOs and ANSPs have established the good practice of informing each other about the problem and that some of the ANSPs have established reporting procedures to inform police and their regulator about the laser problems.

As we said in EVAIR Safety Bulletin No 11, we are in contact with EASA, supporting them in their role of the European aviation regulator, including laser interferences. According to our discussions with EASA we hope that next year more steps will be taken to further mitigate laser problems.

EVAIR continues to monitor all type of laser interferences; therefore, as for the other types of the ATM occurrences, please send your reports to: Dragica.stankovic@eurocontrol.int

Further information about lasers and aviation is available on SKYbrary (www.skybrary.aero).

ACAS REPORTING

Our readers and data providers already know that EVAIR is a part of the ACAS monitoring activity. The aim of the monitoring is to support the continued safe and effective operation of ACAS by identifying issues associated with Resolution Advisories (RAs); monitoring their trends; and taking preventive measures where necessary.

ACAS is the generic term for Airborne Collision Avoidance Systems, of which TCAS II is the only implementation so far. ACAS is intended to improve air safety by acting as a 'last-resort' method of preventing mid-air collisions or near collisions between aircraft. Although ACAS II implementation was completed in 2005, ACAS monitoring continues to improve safety by identifying technical, procedural and operational deficiencies. EVAIR has already started monitoring TCAS II version 7.1 whose equipage and performance will be mandated in European Union airspace on all civil aircraft over 5700 kg MTOM or 19 passengers seats as of December 2015.

ACAS data have been collected either automatically via the Automated Safety Monitoring Tool (ASMT) developed by EUROCONTROL, or manually analysing the airlines and Air Navigation Service Providers (ANSPs) reports.

It should be noted that a number of ACAS/TCAS statistics based on pilots' reporting, rely on pilots' and air traffic controllers' perceptions and memories of the events rather than measured or calculated values. However others are supported by the ANSPs feedback based on the operational investigation which includes radar and voice records. Therefore, care is needed when comparing manually collected data and data that are captured automatically. Messages about typical performance should generally be taken from the Automatic recording of events. Manual reporting tends to emphasise the more significant events and insights into perception of the ACAS II system.

MANUAL ACAS REPORTING

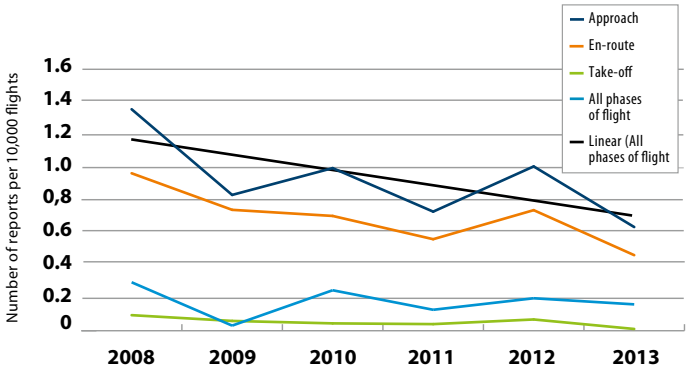


Figure 32

ACAS events reported by pilots through all phases of flights Summer seasons 2008 – 2013

ACAS incidents collected manually for the summer periods 2008 – 2013 show a slight decreasing trend in relative figures although in absolute figures we have more reports. How ever, due to traffic increase, the trend has a downward direction. Summer 2012 cumulative figures for all phases (Figure 32 purple line) recorded a slightly higher level with a little more than 1 event per 10,000 flights. Meanwhile, in summer 2013, we saw a decrease, recording 0.6 events per 10,000 flights. Translating this situation on a daily level, it means that during the peak summer months (Jun – Sep 2013) when within ECAC airspace there were around 30,000 flights daily, there were about 2 ACAS RAs reported each day by pilots across European airspace.

The largest number of ACAS reports still comes through the manual channels and concern mostly the en-route phase of flight, which contrasts to the data collected automatically, which show that the most RAs occur within TMAs.

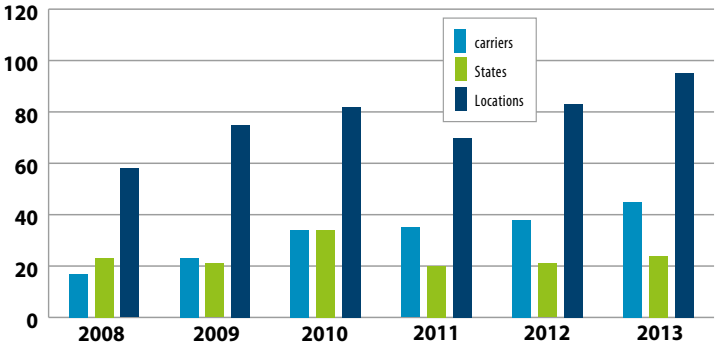


Figure 33

Manually reported ACAS incidents per states, locations & carriers Summer seasons 2008 - 2013

The number of affected carriers providing reports and the number of affected locations record a constant increase during the last three years. For instance, during the summer 2013 there were 45 different carriers reporting ACAS RAs versus 38 during the summer 2012. The increase in the number of carriers providing us reports, assures us of the improvement of the reporting culture and trust in the EVAIR process. As mentioned previously this includes the facilitation of a feedback channel which then enables provision of the additional information and help to motivate pilots to report more. During the last three years there was a slight increase in the number of states where the occurrences took place; whilst the number of locations had an even greater rate of growth. In 2012 we saw ACAS RAs at 83 locations and in 2013 at 95. New locations not only appeared within the high density traffic areas but also in the vicinity of the holiday destinations which were popular during summer 2013.

ICAO ADREP definitions of types of RAs are shown below.

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

For the whole monitored period the majority of ACAS RAs were reported by pilots as 'Useful RAs' and were followed by flight crew. During the last three summer seasons the number of 'Useful RAs' shows a steady rise. Summer 2013 increase was 50%. After a high increase in summer 2012 'Nuisance RAs' decreased significantly during the summer 2013, which is a good signal but further monitoring should show if this is a trend or only a yearly move. Namely, the majority of the 'Nuisance RAs' are the consequence of a high vertical rate. If the trend of the reduction continues it will be a positive indicator that we are on a good track with our activities related to pilots' awareness of the negative impact of a high vertical rate on the ACAS RAs activation. One of the activities are ACAS bulletins issued by EUROCONTROL.

http://www.skybrary.aero/index.php/ACAS_Bulletin_-_EUROCONTROL

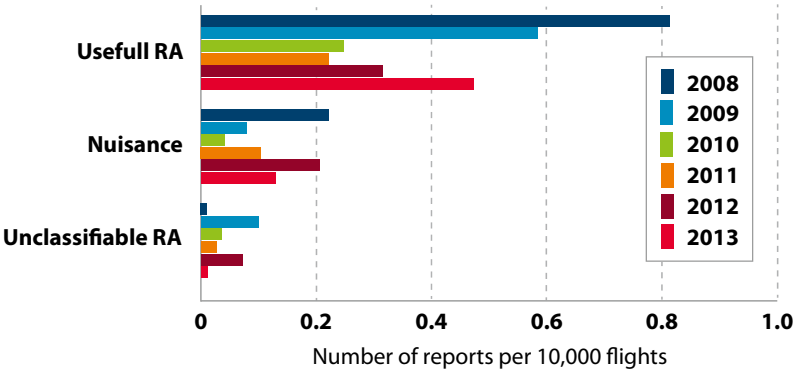


Figure 34
ACAS RA Classification Summer seasons 2008 - 2013

ACAS RA INSTRUCTIONS

As already mentioned, the highest number of ACAS RAs occurred due to high vertical rate, which is typically followed by the ACAS instruction 'Adjust vertical speed adjust' and with the ACAS II Version 7.1 with the 'Level off Level off'. In the previous EVAIR safety bulletin we already said that the new ACAS II version 7.1 replaced the previous instruction with 'Level off level off'. As of the next EVAIR safety bulletin we will replace 'Adjust vertical speed adjusts' with the 'Level off level off' information.

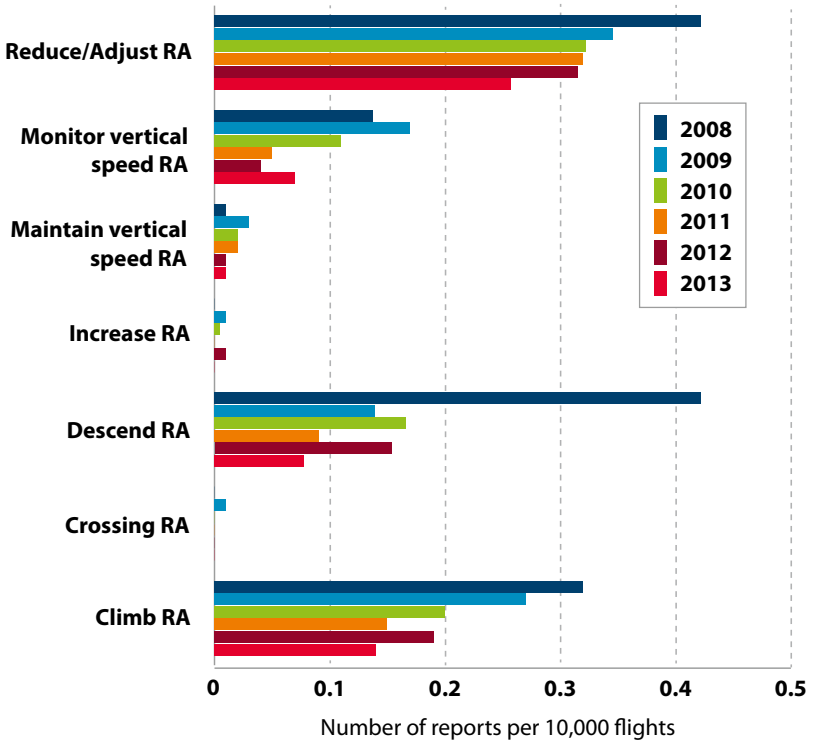


Figure 35

ACAS RA Instructions Summer seasons 2008-2013

ACAS FL DISTRIBUTION

The summer periods 2008 – 2013 (absolute figures) show that ACAS RAs are distributed in three main clusters: i.e. between FLs 090 - 150; FLs 190 – 250; and FLs 290 - 380. The summer seasons have slightly larger clusters than full years; this is in line with the traffic patterns, which are generally more complex during the summer.

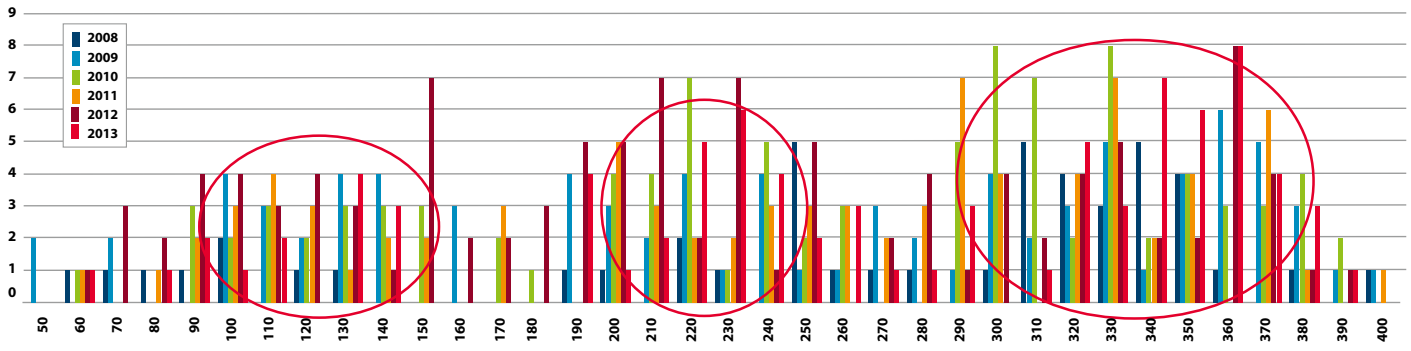


Figure 36

ACAS Flight Level Distribution Summer seasons 2008-2013 absolute figures

ACAS RAS COLLECTED AUTOMATICALLY FROM MODE-S RADAR

The Automated Safety Monitoring Tool (ASMT) is being used to record and analyse a set of ACAS RAs downlinked by a number of Mode S radars in Europe. The set of statistics has been assembled from data collected during 2010-2013 Summer Periods (i.e. from 1st of April to 30th of September of each of these years).

Definitions

RA event	A sequence of RAs (i.e. the initial RA and secondary RAs if any) received from an aircraft
Initial RA	First RA of an RA event
Secondary RA	All other RA of an RA event (i.e. RA received after the initial RA)
Intruder	A transponder-equipped aircraft within the surveillance range of ACAS for which ACAS has an established track (as defined within ICAO Annex 10). In the context of EVAIR, we only consider intruders against which RAs are triggered
1,000ft level-off encounter	Either an aircraft in vertical evolution levelling-off 1,000ft apart from a level aircraft or two aircraft in opposite vertical evolution both levelling-off 1,000ft apart from each other

Availability of data

Before 2009, EVAIR automatic monitoring analysis relied on Mode S radar data received from only one radar (in busy airspace). In 2009 and 2010, Mode S radar data from respectively nine and then two additional radars have started to become available. The EVAIR Programme now monitors RA downlink data from thirteen radars from two ANSPs

Number of events recorded

The following table provides an average of daily and monthly rates for RA events occurrence in each radar coverage region for each Summer Period since 2010.

Year	Daily RA event rate (average)	Monthly RA event rate (average)	Radar coverage
2010	2-3	~ 70	10 radars from two ANSPs
2011	2-3	~ 80	12 radars from two ANSPs
2012	3-4	~ 110	13 radars from two ANSPs
2013	3-4	~ 120	13 radars from two ANSPs

Table 1
Averages of RA events recorded (2010-2013 summer seasons)

The figures presented in Table 1 show an increase in the number of RA events recorded by the EVAIR Programme due to an increase in radar coverage and traffic since 2010. On average, around three to four RA events have been recorded per day during the 2013 summer seasons in the region covered by the thirteen radars available to the EVAIR Programme.
As EVAIR radar coverage has increased since 2010, the absolute number of RA events has automatically increased. Therefore, only percentages will be provided to present an indication of ACAS performance over time.

RA events by flight level bands and type of intruder equipage

The following figure provides the number of RA events recorded by flight bands for the 2013 summer seasons with a split between the cases where the intruder is Mode C (e.g. VFR or military traffic), Mode S (TCAS II equipped to a large extent but not only), or TCAS II equipped with a triggered RA.

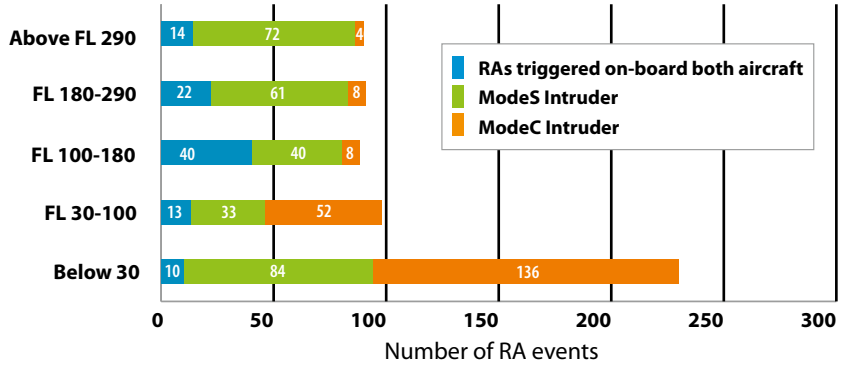


Figure 37
RA events by flight level bands and type of intruder equipage Summer seasons 2013

At low levels, the majority of RAs are triggered against Mode C intruders, whereas at higher levels (i.e. above FL100), most RAs are triggered against Mode S intruders (i.e. ACAS equipped or not, and with or without RAs triggered on-board the intruder). Indeed, above FL100, most aircraft operate IFR. Those who are subject to ACAS mandate are required to be equipped with a Mode S transponder. For the other IFR aircraft, even if the European Commission Implementing Regulation number 1207/2011 only requires Mode S Elementary Surveillance from 2017, most of them are already compliant with it (and so these aircraft are already equipped with Mode S transponders).

In a large majority of events, only one aircraft out of the two receives an RA, even though both are ACAS equipped. Indeed, ACAS does not always symmetrically generate RAs (e.g. in 1,000ft level-off encounters).

The majority of RAs below 3,000ft are triggered against VFR traffic whereas above FL100 RAs are mostly triggered against IFR traffic (e.g. Mode S and ACAS equipped).

Type of RAs

In December 2011, the European Commission published Implementing Rule 1332/2011 mandating the carriage of TCAS II version 7.1 within European Union airspace from December 2015 by all aircraft currently equipped with version 7.0 and from March 2012 by all new aircraft[2]. One of the reasons for developing version 7.1 was cases found in recorded and reported events in which pilots unintentionally responded in the opposite direction to "Adjust Vertical Speed, Adjust" (AVSA) RAs (i.e. the vertical rate was increased instead of reduced). To prevent incorrect pilot responses, AVSA RAs have been replaced by a new "Level Off, Level Off" (LOLO) RA. Currently, and until 2015, both versions of TCAS II (i.e. v7.0 and v7.1) are in operation in European airspace.

[2] *Above 5,700 kg maximum take-off mass or a maximum passenger seating capacity of more than 19*

The following table provides the type of RAs recorded in 2010-2013 summer seasons.

Year	AVSA or LOLO	Monitor VS	CL or DES	Maintain VS	Increase CL or DES	Reverse CL or DES	Crossing CL or DES
2009	34%	24%	34%	2%	4%	1%	1%
2010	38%	21%	34%	2%	1%	2%	2%
2011	49%	20%	28%	1%	1%	1%	0%
2012	44%	19%	33%	1%	0%	1%	1%
2013	40%	27%	25%	3%	3%	1%	2%

Table 2
Type of RAs (2010-2013 Summer seasons)

Type of Initial RAs

The following figure provides the type of Initial RAs recorded in the 2013 summer seasons.

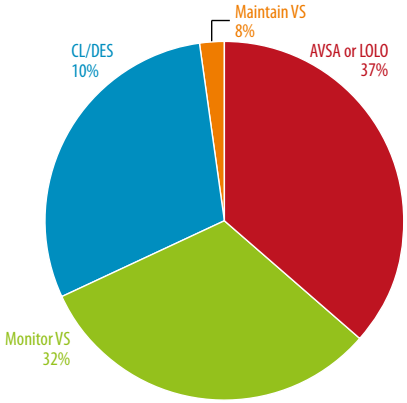


Figure 38
Type of Initial RAs Summer seasons 2013

In the 2013 summer seasons, 70% of recorded RAs did not require a deviation from ATC clearance (i.e. AVSA for version 7.0, LOLO for version 7.1 and, Monitor and Maintain Vertical Speed RAs). For these RA events, ACAS RAs have been compatible with ATC clearances and aircraft operations.

Type of Secondary RAs

The following figure provides the type of Secondary RAs recorded in the 2013 summer seasons. For information, only about 20% of RA events include secondary RAs.

Secondary RAs may be split into two different categories:

- **Weakening RAs** (i.e. AVSA for version 7.0 and LOLO for version 7.1), requesting pilot to level-off after the initial Climb or Descend RAs once the risk of collision is resolved with the objective to limit the deviation caused by ACAS to ATC clearances, and
- **Stronger RAs** (e.g. Reverse and Increase RAs) that either request to go in the opposite direction to the initial RA or increase the vertical rate requested by the initial RAS

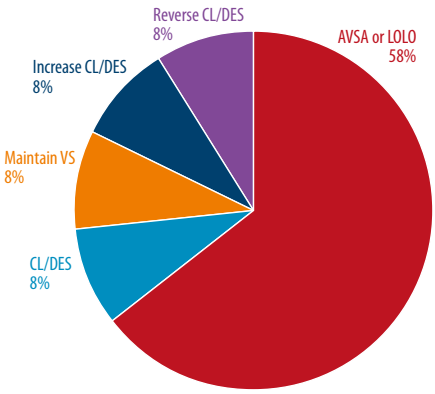


Figure 39
Type of Secondary RAs Summer seasons 2013

In EVAIR recorded data from the 2013 summer seasons, about 60% of secondary RAs were weakening RAs. In this set of data, Reverse and Increase RAs mainly concerned military aircraft that did not follow their initial RA.

Pilot response to RAs

For the mean of the study, pilot responses to RAs have been split into different categories:

- **"Followed":** The pilot responded to the RA as intended by ACAS;
- **"Excessive":** The pilot responded to the RA but by unnecessarily exceeding the vertical rate requested by ACAS;
- **"Below required":** The pilot either correctly responded to the RA but too slowly or failed to achieve the vertical rate requested by ACAS;
- **"Opposite":** The pilot went in the opposite direction to the ACAS RA.

The first sub-section provides information concerning pilot response to initial RAs as opposed to the second sub-section which focuses on secondary RAs. Indeed, since secondary RAs are very rare and stressful for pilots (except for weakening RAs) it is preferable to separate the two sets of statistics for comprehension purposes.

Pilot response to Initial RAs

The safety benefits provided by ACAS highly depend on pilot responses to RAs. The following table and figure provide information concerning pilot response to initial RAs on respectively the 2010-2013 Summer Periods and the 2013 Summer Period only.

Year	Followed	Excessive	Below required	Opposite
2010	75%	8%	9%	8%
2011	76%	8%	12%	5%
2012	76%	7%	9%	8%
2013	72%	5%	16%	7%

Table 3
Pilot response to Initial RAs (2010-2013 Summer seasons)

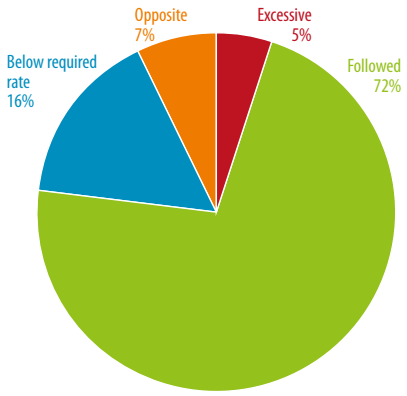


Figure 40
Pilot response to Initial RAs Summer seasons 2013

In the 2013 summer seasons, 72% of the pilots achieved the requested vertical rate, 5% exceeded it, 16% either achieved it but too slowly or failed to achieve it and 7% reacted in the opposite direction. For information, most of the incidents involving opposite responses concerned military aircraft. Generally, initial RAs are satisfactorily followed by pilots.

For information, to further enhance pilot compliance to RAs and thus safety, Airbus has developed, certified and implemented a solution that couples TCAS II to the Auto Pilot for an automatic response to RAs (i.e. AP/FD ACAS RA mode). EUROCAE WG-75 has developed Minimum Aviation System Performance Specification (MASPS) for Flight Guidance System (FGS) coupled to ACAS (ED-224). These standards specify system characteristics that provide guidance to designers, manufacturers, installers and users of the system and equipment.

Pilot response to Secondary RAs

The following table and figure provide information on pilot response to secondary RAs on respectively the 2010-2013 summer seasons and the 2013 summer seasons only.

Year	Followed	Excessive	Below required	Opposite
2010	27%	10%	36%	26%
2011	29%	3%	48%	19%
2012	28%	7%	40%	25%
2013	47%	4%	31%	19%

Table 4
Pilot response to Secondary RAs Summer seasons 2010-2013

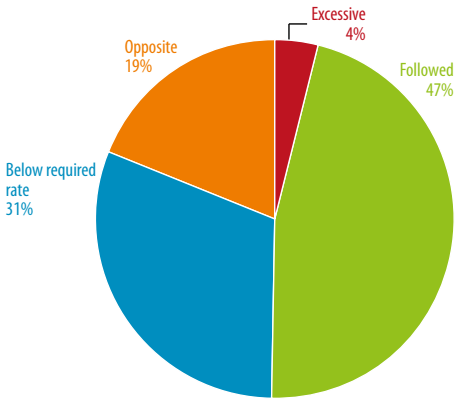


Figure 41
Pilot response to Secondary RAs Summer seasons 2013

Compliance to secondary RAs is not as good as for initial RAs. The main contributors to that are military aircraft.

These figures should serve to emphasize the need for pilots to be trained to follow the full sequence of RAs that they receive. A wider implementation of the AP/FD ACAS RA mode would also contribute to improve the compliance to secondary RAs.

Ownship vertical rate at the time of Initial RA

The following table provides information concerning the vertical rate of ownship at the time of the triggering of the initial RA (on the 2010-2013 Summer Periods).

Vertical rates are split into three categories: "High" vertical rates (i.e. above 1,500 fpm), "Normal" vertical rates (i.e. below 1,500 fpm) and "Level".

Year	High	Normal	Level
2009	18%	62%	20%
2010	24%	66%	11%
2011	27%	58%	15%
2012	25%	56%	20%
2013	29%	60%	11%

Table 5
Ownship vertical rate at the time of Initial RA (2010-2013 Summer seasons)

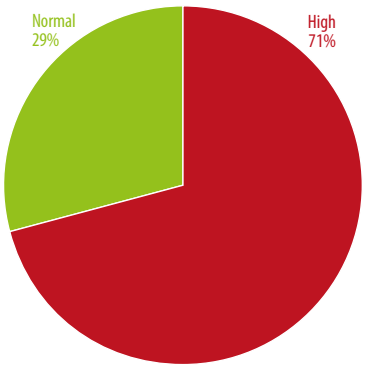


Figure 42
Pilot response to Secondary RAs Summer seasons 2013

Ownship vertical rate at the time of AVSA or LOLO RA

The figure below provides information concerning the vertical rate of ownship at the time of the triggering of the initial AVSA (for version 7.0 of TCAS II) or LOLO (for version 7.1 of TCAS II) RA in the 2013 summer seasons.

About 70% of the 2013 summer seasons recorded AVSA and LOLO RAs were triggered on-board aircraft with vertical rates above 1,500 fpm. AVSA and LOLO RAs are the great majority of RAs triggered during 1,000ft level-off encounters.

A majority of these RAs are perceived as operationally undesired by air traffic controllers and flight crews and could be avoided by complying with the following PANS-OPS provision that is in force since 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."***

However, this recommendation is not always applied. It can only be applied when the pilot is made aware of another aircraft at or approaching an adjacent altitude or flight level. Furthermore, some pilots have reported not being comfortable in modifying autopilot setting when approaching the selected altitude because an erroneous action may lead to an altitude bust while there is another aircraft at or approaching an adjacent altitude.

For information, to prevent the triggering of RAs in 1,000ft level-off encounters, Airbus has developed, certified and implemented a solution called TCAP (TCAS Alert Prevention) that relies on new altitude capture laws taking into account TCAS II TA thresholds. These new altitude capture laws consist in reducing the own vertical speed automatically at the approach of the selected altitude upon various conditions. This solution has been proven to be very efficient and to enable to safely remove more than 90% of the RAs in 1,000ft level-off encounters. EUROCAE ED-224 document also addresses this function in addition to the AP/FD ACAS RA mode.

Example of high vertical rate RA event

The following figures provide an illustration of a same RA event, providing on respectively the left and right sides the horizontal and vertical profiles.

The first figure corresponds to the actual RA event as recorded in EVAIR database. In this example, an aircraft initially climbs at a vertical rate of about 700fpm to FL350, 1,000ft below a level aircraft. Before reaching FL340, the pilot increased the aircraft vertical rate to about 3,000fpm. This increase in vertical rate induced RAs.

The second figure corresponds to the same event but modified to simulate an increase of the vertical rate to only 1,500fpm in compliance with the ICAO PANS-OPS (i.e. a rate of 1,500fpm in the last 1,000ft from FL350). In this modified event, despite the increase of the vertical rate, neither a TA nor an RA is triggered.

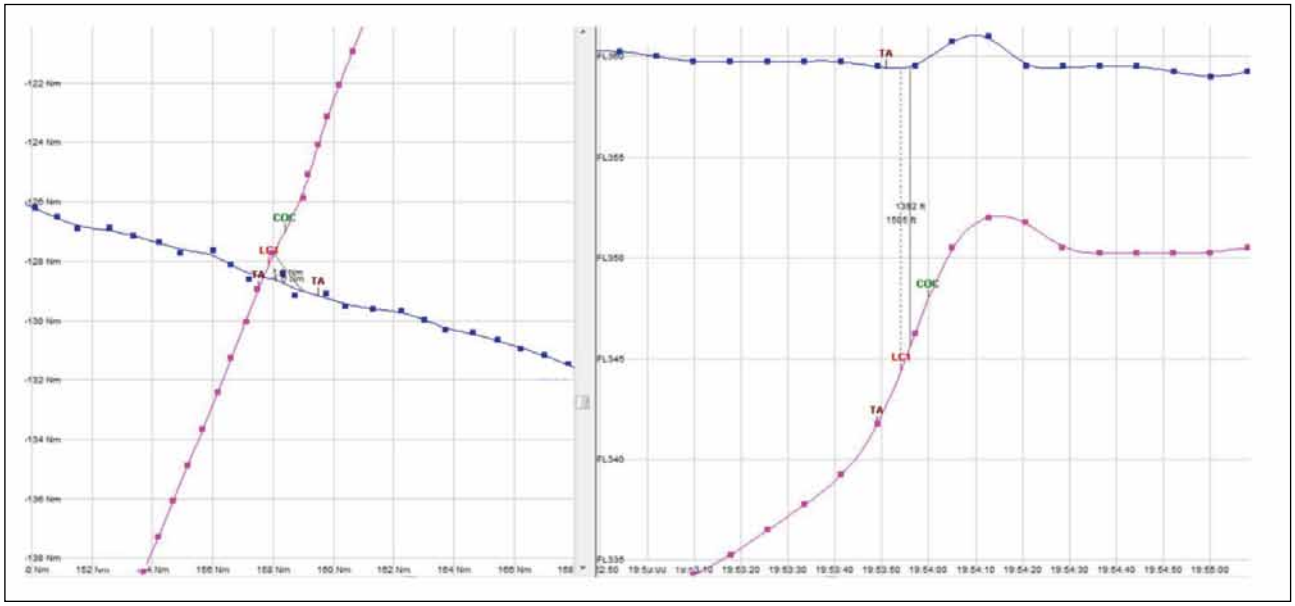


Figure 43
Horizontal & vertical profiles of a high vertical rate RA event (actual)

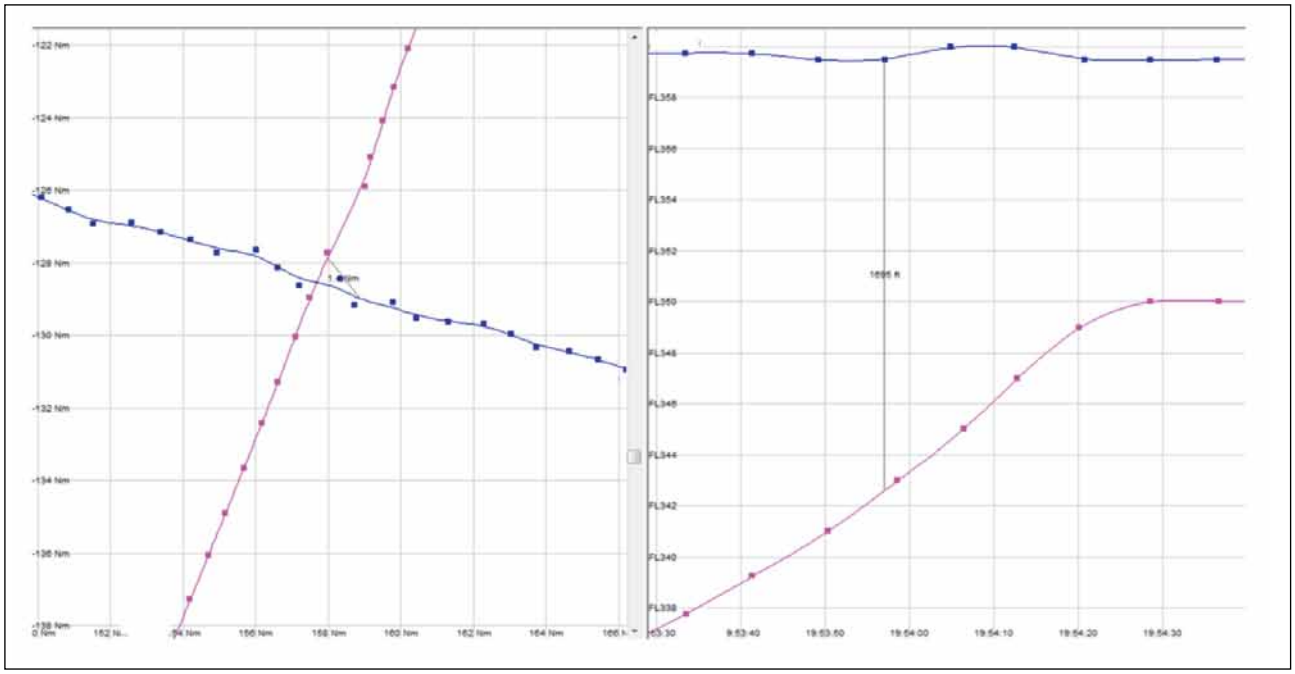


Figure 44
Horizontal & vertical profiles of a high vertical rate RA event (modified)

RA events by Horizontal Geometry

The following figure provides the horizontal geometry involved in the EVAIR 2013 Summer Period recorded RA events.

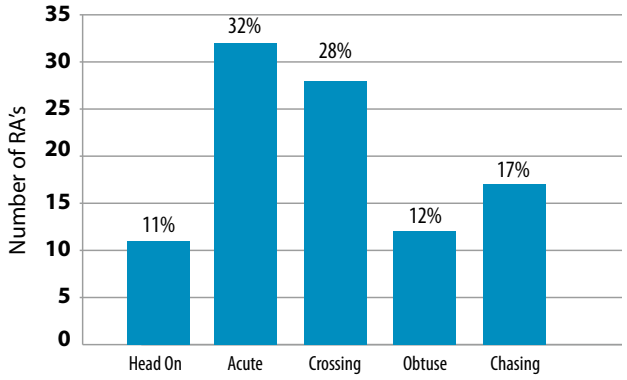


Figure 45
Horizontal Geometry of RA events Summer seasons 2013

In the 2013 summer seasons, a great majority of EVAIR recorded RA events were triggered while aircraft were in acute or crossing trajectories.

ANNEX 1 – EUROPEAN ACTION PLANS

European action plan for Air-Ground communications safety

The Air-Ground Communication (AGC) Safety Improvement Initiative was launched by the EUROCONTROL Safety Team in 2004, and is addressing communications issues identified in the Runway Incursion and Level Bust Safety Improvement Initiatives as well as other issues of the concern such as call sign confusion, undetected simultaneous transmissions, radio interference, use of standard phraseology, and prolonged loss of communication. Communication between air traffic controllers and pilots remains a vital part of air traffic control operations, and communication problems can result in hazardous situations. A first step towards reducing the incidence of communication problems is to understand why and how they happen. The Action Plan is available on the ALLCLEAR Communication Toolkit:
http://skybrary.aero/index.php/Solutions:ALLCLEAR

The european action plan for the prevention of level bust

Reducing Level Busts is one of EUROCONTROL's highest priorities. EUROCONTROL began raising awareness of the Level Bust issue in 2001, organised series of workshops, and established a Level Bust Task Force to define the recommendations and to formulate an action plan to reduce Level Busts.

The Level Bust action plan is the product of work carried out by EUROCONTROL's cross-industry Level Bust Task Force, which was set up in 2003. The Task Force reviewed the evidence available, identified the principal causal factors, and listened to the Air Navigation Service Providers and aircraft operators with experience in reducing Level Busts.

The Action Plan contains recommendations for Air Traffic Management, Air Traffic Controllers, and Aircraft Operators. It designed to reduce the frequency of Level Busts and reduce the risks associated with Level Busts. Implementation of the Action Plan will be monitored by the Task Force monitoring group reporting to the EUROCONTROL Safety Improvement Sub Group (SISG).

http://www.eurocontrol.int/safety/public/standard_page/Level_bust.html

The European action plan for the prevention of runway incursions (EAPRI)

The numbers of runway incursion reports are rising. Accidents continue to take place on runways. Findings from those incident and accident reports have been used to determine the new recommendations contained in the updated European Action Plan for the Prevention of Runway Incursions.

The increasing availability of runway incursion incident reports is a positive indication of the commitment of organisations and operational staff to prevent runway incursions and runway accidents by learning from the past accidents and incidents and sharing this information across Europe.

The new recommendations contained in the Action Plan are the result of the combined and sustained efforts of organisations representing all areas of aerodrome operations.

The organisations that contributed to this action plan are totally committed to enhancing the safety of runway operations by advocating the implementation of the recommendations that it contains. These organisations include, but are not limited to, Aerodrome Operators, Air Navigation Service Providers, Aircraft Operators, and Regulators.

http://www.eurocontrol.int/documents/european-action-plan-prevention-runway-incursions

Call sign similarity (CSS)

The European Action Plan for Air Ground Communication Safety (conceived inter alia by EUROCONTROL, aircraft operators (AOs) and the Flight Safety Foundation) identified call sign similarity (CSS) as a significant contributor to air-ground communication issues. Analysis of ATC reported events shows that 5% involve incidences where CSS is involved. Some aircraft operators are trying to find solutions; the only known ANSP actively operating a service to de-conflict call signs is France's DSNA.

Research and CBA studies show that the most cost efficient way of providing a long-lasting, Europe-wide solution is to create a central management service to de-conflict ATC call signs. This strategy provides economies of scale and rapid pay back of investment (3 years). More importantly, it is calculated that it will eliminate over 80% of the CSS incidences and thus improve safety.

http://www.eurocontrol.int/safety/public/standard_page/Call-sign_Similarity_project.html

ANNEX 2 – DEFINITIONS

Following definitions are extracted from the HEIDI and/or HERA Taxonomies.

HEIDI (Harmonisation of European Incident Definitions Initiative for ATM) intends to finalise a harmonised set of definitions (taxonomy) for ATM related occurrences.

HERA (Human Error in European Air Traffic Management) develops a detailed methodology for analysing human errors in ATM, including all error forms and their causal, contributory and compounding factors.

More information can be found at:

HEIDI: http://www.eurocontrol.int/src/public/standard_page/esarr2_heidi.html

HERA: http://www.eurocontrol.int/humanfactors/public/site_preferences/display_library_list_public.html#5

Definitions

ATC clearance/instruction (HEIDI): Related to incorrect or wrong aircraft action. 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, Level Bust, unauthorised penetration of airspace etc.

Coordination (HEIDI): 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 coordination.

Contributory factors (HEIDI): A part of the chain of events or combination of events which has played a role in the occurrence (either by easing its emergence or by aggravating the consequences thereof) but for which it cannot be determined whether its non existence would have changed the course of events.

Decision-Making (HERA): Cover incorrect, late or absence of decision

Failure to Monitor (HERA): Failure to monitor people, information or automation.

Judgement (HERA): Mainly associated to separation

Lapses (HEIDI): Psychological issues encompassing: Reception of information, Identification of information, Perception of information, Detection, Misunderstanding, Monitoring, Timing, Distraction, Forgetting and Loss of awareness.

Level Bust (HEIDI): Any unauthorised vertical deviation of more than 300 feet from an ATC flight clearance Departing from a previously maintained FL, overshooting, undershooting, levelling-off at a different level than cleared level.

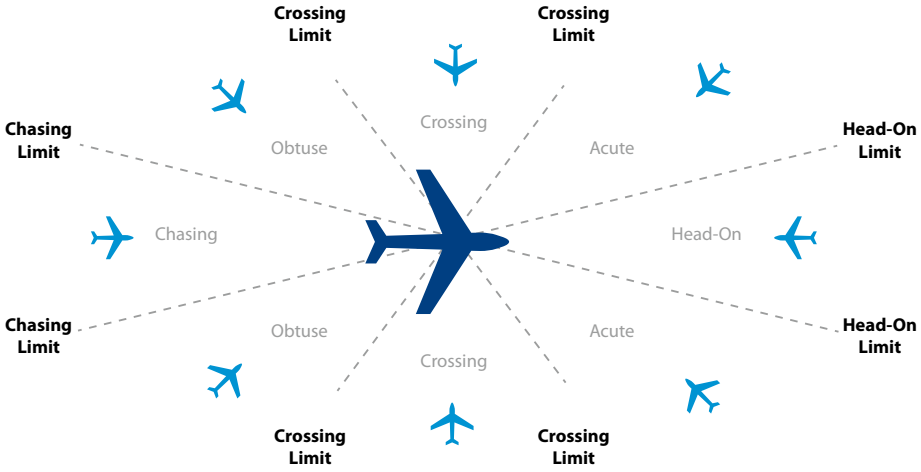
Mental/Emotional/Personality issues (HERA): Include the following items

- Mental capacity: loss of picture or Safety Awareness
- Confidence in self, in others, in information, in equipment, in automation
- Complacency
- Motivation/Morale
- Attitudes to others
- Personality traits: aggressive, assertive, under-confident, risk taking
- Emotional status: stressed, post incident
- Miss-stored or insufficient learned information
- Planning: insufficient, incorrect or failed
- Recall of information: ailed, inaccurate, rare information, past information
- Violations: routine, exceptional

Mistakes (HEIDI): 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.

Operational communication (HEIDI): 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.

RA geometry between two Aircraft (ASMT)



Runway Incursion (ICAO): Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

Spoken communication (HEIDI): 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/accent, 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.

Taxiway Incursion (HEIDI): Any occurrence unauthorized presence on a taxiway of an aircraft, vehicle, person or object that creates a collision hazard or results in a potential loss of separation.

Traffic & Airspace problems (HEIDI): There are four set of causal factors under this element:

- **Traffic load & complexity**, encompassing excessive and fluctuating load, unexpected traffic demand, complex mix of traffic, unusual situations (emergency, high risk, other), Abnormal time pressure, underload and call signs confusion.
- **Airspace problems** composed of flights in non controlled and controlled air space, Airspace design characteristics (complexity, changes, other) and temporary sector activities(military, parachuting, volcanic activity, training)
- **Weather problems** such as poor or unpredictable(snow, slush, ice, fog, law cloud, thunderstorm, wind shear)
- **Pilot problems** concerning language, culture and experience aspects.

Traffic Information (HEIDI): Essential and local traffic information provided by an air traffic controller to the pilot. 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.

Workload issues (HERA): Concern both minimal and excessive workload

ANNEX 3 – ACRONYMS

ACAS	Airborne Collision Avoidance System
ANSP	Air Navigation Services Provider
AO	Aircraft Operator
ASMT	ATM Safety Monitoring Tool
AP/FD TCAS	Automatic guidance (Autopilot - AP) and/or display cues to support pilot guidance (Flight Director - FD) upon Resolution Advisories – defined within ED-224 MASPS
ASR	Air Safety Report
ATC	Air Traffic Control
ATM/CNS	Air Traffic Management/Communication, Navigation, Surveillance
AVSA	"Adjust Vertical Speed, Adjust" RAs (of TCAS II version 7.0)
CL	"Climb" RA
CSC	Call Sign Confusion
CSS	Call Sign Similarity
CSST	Call Sign Similaritu Tool
DES	"Descend" RA
ECAC	European Civil Aviation Conference
ELFAA	European Low Fares Airline Association
ERAA	European Regions Airline Association
EUROCAE	European Standardisation body that produces MOPS for TCAS
EVAIR	EUROCONTROL Voluntary ATM Incidents Reporting
FL	Flight Level
GSIC	Global Safety Information Centre
HEIDI	Harmonisation of European Incident Definitions Initiative for ATM
HERA	Human Error in European Air Traffic Management
IACA	International Air Carrier Association
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
LAN	Local Area Network
LOLO	"Level-off Level-off" RA introduced in version 7.1 of TCAS II (replacing AVSA RAs of version 7.0)
Maintain VS	"Maintain Vertical Speed" RAs
MASPS[3]	Minimum Aviation System Performance Specification
Mode C	Altitude Reporting Mode of Secondary Radar (ICAO)
Mode S	SSR selective mode of interrogation
Monitor VS	"Monitor Vertical Speed" RA
MOPS[3]	Minimum Operational Performance Standards
NM	Network Manager
OPS	Operations
PAN-OPS	Procedures for Air Navigation - Operations
RA	Resolution Advisory
RF	Radio Frequency
RIs	Runway Incursions
RTCA	American Standardisation body that produces MOPS for TCAS
SARPS	Standard And Recommended Practices
SISG	Safety Improvement Sub-Group
STEADES	Safety Trend Evaluation and Data Exchange System
TA	Traffic Advisory
TCAP	"TCAS Alert Prevention". Altitude capture laws to prevent RAs during level-off encounters – defined within ED-224 MASPS
TCAS	Traffic Collision Avoidance System
VFR	Visual Flight Rules
WT	Wake Turbulence

[3] *MASPS are focused on systems (which can be implemented by different equipment) while MOPS are focused on the equipment themselves*