



**Network Manager**  
nominated by  
the European Commission



# EVAIR Safety Bulletin No 9

2008-2011





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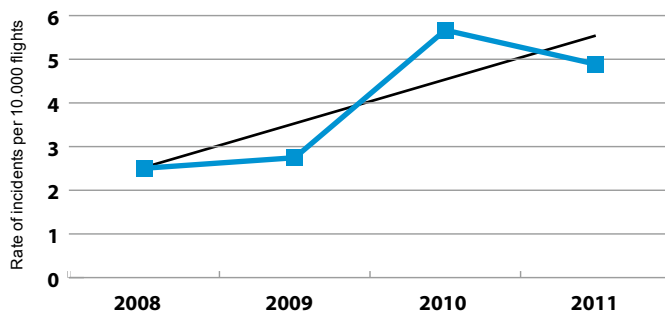
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## EVAIR FUNCTION MANAGER'S PERSPECTIVE

Dear Readers, I'm pleased to present EVAIR Safety Bulletin No 9. This issue covers the period 2008-2011. The associated analysis is based on approximately 10.000 reports received from more than 200 airlines - our main data providers. In addition, the analysis takes into account air navigation service providers' (ANSPs) feedback on 1000 reports. As usual the Safety Bulletin also contains TCAS RA analysis based on data collected automatically from two ANSPs from their 13 radar stations.

In terms of data collection, the trend line for the period 2008 – 2011 (Figure 1) shows an overall increase in the number of ATM occurrences reported to EVAIR. Until 2010 the number of reported occurrences per 10.000 operations rose consistently; however, whilst in absolute figures the number of reports increased in 2011 in relative terms the reporting was down for the first time primarily due to an increase in traffic in 2011 versus 2010.

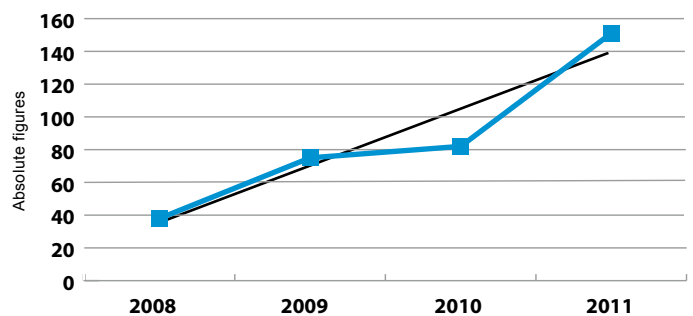


**Figure 1**  
**Incident data collection for 2008 - 2011**

### Data collection

The main EVAIR data providers are the commercial airlines either legacy or low cost. For the period 2008 – 2011 more than 200 different airlines sent their ATM occurrence reports to EVAIR. In 2011 151 airlines provided us with their reports - representing more than 70% of the overall European air traffic. The reason that for the overall period 2008 – 2011 there are more airlines than in 2011 is that for the measured period some of the airlines who reported to EVAIR bankrupted, some of them merged with others and some of them report only when they want to get the feedback.

<sup>1</sup> STEADES – Safety Trend Evaluation and Data Exchange System



**Figure 2**  
**Number of airlines 2008 - 2011**

ANSPs are the second main ATM safety data provider in EVAIR. They pass on important information such as feedback on the airlines' ATM occurrence reports, TCAS RAs collected automatically, laser interferences and call sign similarity/confusion reports. A few ANSPs now provide all their reports on a monthly basis. In the medium to long term we see this as another big part of this voluntary activity and a significant contribution to the different safety activities across EUROCONTROL and Europe in general.

### Verification of EVAIR data

EVAIR is one of the rare data repositories which has established a process to cross-check the robustness and quality of its data with other databases. In EVAIR Safety Bulletins we do this with IATA STEADES<sup>1</sup> data. In addition, for specific types of the occurrence we make cross-checks with airlines and ANSPs as well as with the mandatory data reporting regime. The checks have been done to verify the correctness of identified trends, including new ones, and to see if any information is missing.

### Feedback - Support to quick fixes

The feedback mechanism is one of the major driving and motivation factors for voluntary reporting. During 2009 - 2011 EVAIR received requests to facilitate feedbacks for about 1064 occurrences from approximately 60 different airlines. These requests were forwarded to 46 different ANSPs inside and outside, Europe. Feedbacks were received for 753 reports. This says that when EVAIR has been used as the feedback facilitator the ANSPs responsiveness was a bit more than 70%, which is very encouraging. It is very difficult to check what happened with the other 30% since in some cases ANSPs forward the feedback directly to the

airlines without putting EVAIR in the copy. However according to the airlines' repeated requests for the feedback in order to close their opened investigations we assume that some of them were pending the reply from the ANSP. We will continue monitoring the situation and looking for the further improvements.

The usual feedback response time frame varies from a few days to a few weeks up. Occasionally it takes several months. For the simpler occurrences, ANSPs generally respond quicker and the time frame for the provision of feedback can be measured in days rather than weeks/months. This has been welcomed by the airlines and their associations. Moreover, the aircraft operators also appreciate the regular meetings between the ANSPs and airlines which are supported by EVAIR and IATA data and their lessons learned from previous meetings and data analysis. These meetings also help build a better understanding of mutual concerns and are a useful forum to discuss mitigations to identified problems.

Of note, more recently, we have an increase in the number of ANSPs who are requesting feedback from airlines, rather than the other way around. This is a healthy sign which completes the feedback process in the best way.

## **Main trends:**

### **Phases of flights**

Across six phases of flights monitored by EVAIR the largest number of occurrences was reported within the 'Approach' phase. After four years of monitoring, year 2011 saw, for the first time, a drop in the number of reports covering the five phases of flight monitored by EVAIR. The only phase with a slight increase was 'Standing'. EVAIR will continue to monitor the situation to see if the trend continues and whether it is related to the improvement of safety performance, traffic increase or a reduction in reporting.

### **Events**

In this Safety Bulletin, EVAIR presents the comparison between five different types of events: Runway Incursion, Call Sign Confusion, Go Around, ACAS RA and Level Bust. The only events which recorded an increase in 2011 versus 2010 are Runway Incursion with 0.5% and Call Sign Confusion with 42.7%. The other three

events decreased: Go-Around 22.5%, ACAS RA 19.7% and Level bust 15.2%. In the IATA STEADES repository the situation is slightly different. Except Call Sign Confusion all other events showed an increase in 2011 versus 2010. Further monitoring and more in-depth analysis of data is required to fully explain this difference in 2011 data.

### **Contributors to incidents**

EVAIR is one of the rare ATM data repositories which can show causes to different type of events. Indeed, its unique blend of data, makes EVAIR the only ATM repository in Europe capable of producing safety analysis and statistics that can be used to help resolve different ATM safety problems. EVAIR is currently the only repository which monitors the EUROCONTROL Call Sign Similarity Project (see pages 16 to 19) as well as ACAS logic and issues arising on the operational field. At the request of its partners outside and inside EUROCONTROL, EVAIR produced a number of different customized analyses. The most recent covered "Loss of Communication" (see pages 22 to 23).

This Safety Bulletin also contains statistics for the top 7 contributors to the aforementioned 5 event types. In 2011, except 'Clearance Instructions' and 'Coordination Issues', which recorded increases of 6.6% in 2011 versus 2010, all other contributors decreased. The two highest contributors 'Mistakes' and 'Air-Ground communication' both of which saw significant decrease in 2011: 'Mistakes' by 39% and 'Air-Ground communication' by 42%. This was the first decrease recorded for these areas following 3 years' successive growth.

### **ACAS RA data collection**

Within the automatic monitoring of ACAS RA downlink messages, the activity has been expanded in the last 12 months to cover a larger number of radars in Europe. The procedures for monitoring have also been changed by using the Automated Safety Monitoring Tool (ASMT) to monitor Radar Local Area Network (LAN) recordings rather than being connected on line. Standard radar LAN recordings are transferred to ASMT on a daily basis and the detection process in ASMT is run once for each Mode-S radar source storing detected events in a dedicated radar community database. This process is now used by two ANSPs and the radar coverage area now extends beyond the FIR boundaries.

### **Laser Interference**

The threat to flight safety posed by Laser interference across Europe continues. In absolute figures EVAIR recorded more reports in 2011 than in 2010. However, since 2011 traffic increased versus 2010, the trend shows a slight decrease. Unsurprisingly, the most affected phase of the flight is 'Approach' with 88% of the laser interference reports. EVAIR data generally addresses green laser interferences; however, a recent report provided details for the first time, about a blue laser interference event. These lasers can be more harmful against the eyes. Luckily the perpetrators were located and arrested.

Besides the number of States who have introduced new legislation/regulation to tackle some of the issues, EASA has recently been taking a more active role to address solutions in its role as the European aviation regulator. In this context there is an ongoing dialogue between certain stakeholder groups related to potential new technologies which could be used to protect pilots and ATC tower controllers from the harmful effects of lasers.

### **Callsign Confusion**

Besides the airlines, twelve European ANSPs have started providing 'Call Sign Similarity/Confusion' data. Airlines and ANSPs recognise the benefits of identifying Call Sign Similarities and correcting them quickly by using the EUROCONTROL mechanism. Using the established feedback mechanism, individual airlines have made amendments to their own schedules and airlines have also been put in contact with each other to resolve reported similarities. These actions are actively reducing the risk of having 'Callsign confusion' incidents. According to the airlines' reports 65% of the Call Sign Confusions occurred between flights from the same airline and the remaining 35% between flights from different airlines. The statistics from the ANSPs data provided to EVAIR are a slightly different. These data say that 48% of the Call Sign Similarities occurred within the same company and 52% between different airlines. According to the airlines' reports 'Call Sign Confusion' occurred at 65 different locations across Europe involving about 40 different airlines. The data coming from the airlines and/or the ANSPs shows that Call Sign Similarity and Confusion is a wide European issue and requires large scale preventative action to improve the situation.

### **Stakeholders' Corner - IATA**

The International Air Transport Association (IATA) safety department, as one of the EVAIR partners on our request conducted analysis of selected topics related to Air Traffic Management (ATM) reports. Specifically IATA was asked to focus on the following types of reports:

- Altitude Deviation reports;
- Runway Incursion reports;
- Go-Around reports;
- Airborne Collision Avoidance System/Traffic Alert and Collision Avoidance System (ACAS/TCAS) reports; and
- Call Sign Confusion reports.

With the exception of 'Altitude Deviation' and 'Call Sign Confusion' reports, where the rates remain steady over the period analyzed, all other event categories showed increased rates from 2008 to 2011. The increases may be due to a number of factors including improved reporting cultures and new airlines joining STEADES. Runway Incursion reports showed an increase throughout the entire time period analysed.

Additionally, IATA prepared charts for reports related to:

- Loss of Communications; and
- Wake Turbulence

IATA analysis was conducted on Air Safety Reports (ASR) held in IATA's Global Safety Information Centre (GSIC) Safety Trend, Analysis, Evaluation and Data Exchange System (STEADES) database. The STEADES database is comprised of de-identified safety incident reports from over 145 participating airlines throughout the world, with an annual reporting rate now exceeding 100.000 reports per year. The STEADES database incorporates a number of quality control processes that assure the integrity of the analysis results. The scope of this analysis included research of ASRs for the years 2008 to 2011. During this period a total of 289.992 reports were submitted and collated into STEADES. The airlines participating and submitting data to STEADES represent a total of 25.057.023 flights from 2008 to 2011. This is equivalent to an average of 14% of the world's flights during the period. Analysis of report narratives for contributing factors was not performed.

We take this opportunity to explain to our readers that throughout the report, relative figures and reporting rates are lower in the EVAIR dataset than in STEADES. Difference between programmes and several other reasons for this may exist, it is noteworthy to mention: 1. Firstly, the impetus for reporting. Airlines that cooperate with EVAIR do not provide all reports; they provide mainly reports for issues where they seek feedback from the specific ANSP and which is facilitated by EVAIR. Whereas the airlines participating in IATA's STEADES program provide all their air safety reports to STEADES as part of their agreement with STEADES. 2. Secondly, the higher reporting rates in STEADES may also be attributable to the fact that STEADES coverage is global. This means that regional differences and/or deficiencies in ATC performance, ATM/CNS infrastructure, applied standards, level of the performance, etc, when compared with Europe, may result in more incidents reported per number of flights. 3. Thirdly, EVAIR deals only with the ATM related incidents, while in the STEADES database there are incidents which are not only ATM related. This is especially noted in the area of Go-around for example. 4. Fourthly, in EVAIR multiple reports of the same event are correlated and counted once as a single incident, for example a single ACAS event reported to EVAIR by both airlines and the service provider involved in the incident is counted as one incident. STEADES, on the other hand, due to its de-identification practices, does not count the number of incidents, but rather counts the number of reports received. For example a single ACAS event reported by two airlines is counted in STEADES as two reports. However, it should be noted that the instances of more than one report being submitted for a single event in STEADES is considered to be low.

### **Flybe**

It is a pleasure for EVAIR to give space in this Safety Bulletin to Flybe UK, one of our most regular and best ATM occurrence data providers. Flybe has shown that successful reporting regimes rely on well structured SMS regimes supported by a positive safety culture. Flybe joined EVAIR in 2008 and since then the levels of cooperation and the trust between EVAIR and Flybe grows. EVAIR receives Flybe reports on a daily basis. More details about the Flybe/EVAIR relationship are on page 24.

### **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](mailto:dragica.stankovic@eurocontrol.int)

## INTRODUCTION TO STATISTICAL DATA

This EVAIR Safety Bulletin covers the period 2008-2011. During this time, to some extent or another more than 200 airlines have provided their ATM occurrence reports to EVAIR. In 2011 there were 151 airlines that provided their occurrence reports to EVAIR.

The statistics presented in EVAIR Safety Bulletins are based on occurrences received mainly from commercial aircraft operators and feedback provided on some of them by ANSPs.

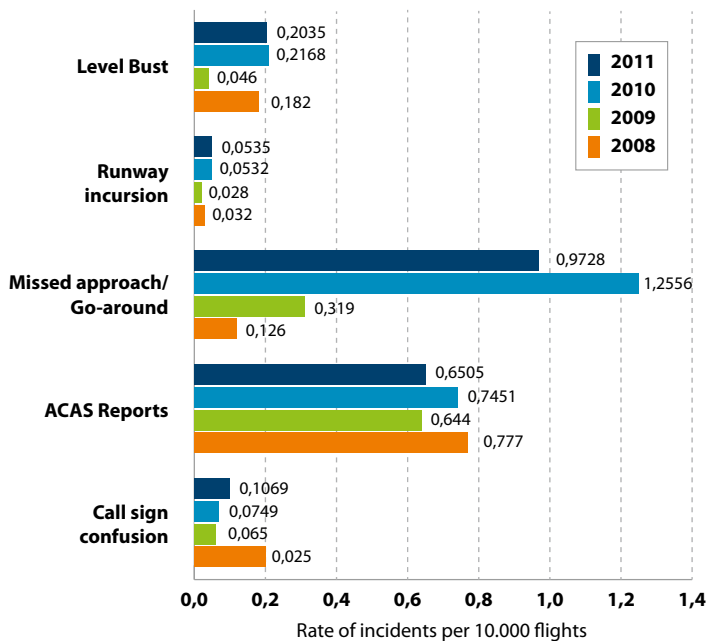
The occurrence analysis is very much based on the subjectivity of pilots who were involved and the filed reports. However, through the improved feedback processes, the analysis is increasingly based on the replies provided to EVAIR by the ANSPs. We repeat that **EVAIR statistics do not contain severity analysis**, since the analysed reports are not officially investigated. There are a lot of reports where there were no incidents but only the potential for an incident existed. Therefore, in such cases there is no a real requirement for the severity assessment. The best examples of this are reports related to: Call Sign Similarities, wrong NOTAMs, confusing ground or air procedures, taxiway naming, deleted taxiway or runway lines etc. The statistics provide a general view and show some main trends in current operational safety. Random checks of the EVAIR analysis versus mandatory reporting (e.g. Annual Summary Template data) and IATA STEADES show that trends for the checked events are similar.

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, Africa etc.

## ATM EVENTS AND SUPPORT TO EUROPEAN SAFETY ACTION PLANS

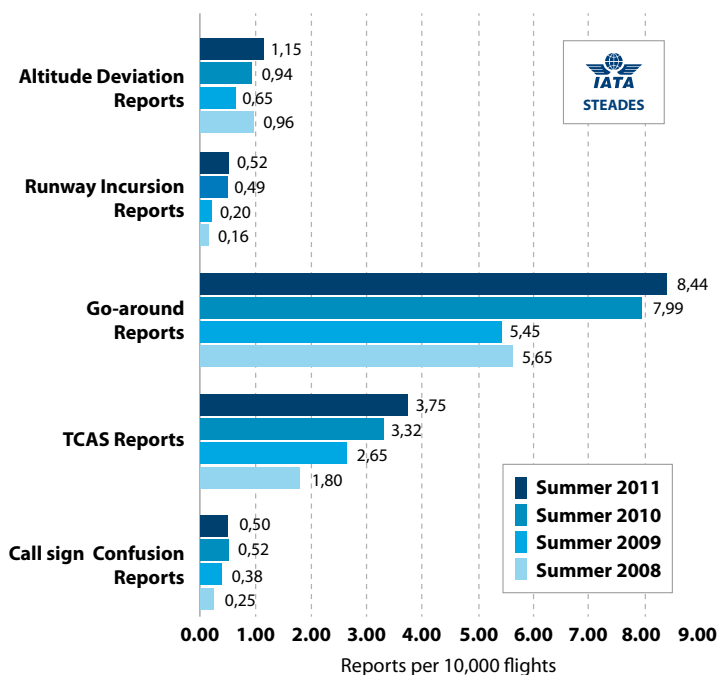
In this EVAIR Bulletin, we show trends for a number of different ATM event types which are addressed in numerous European Safety Action Plans, studies or projects. We provide in one place the EVAIR view on the European trends and an IATA STEADES' view on the global trends.

The intention is to provide operational ATM safety experts with another perspective, which could be added to their picture of operational ATM safety and assist in prioritising actions which could be taken on a pan-European level. This perspective consists of the data provided voluntarily by the airlines and ANSPs.



**Figure 3**  
European ATM Events 2008-2011

Traditionally in both, the EVAIR and IATA STEADES repositories, within the five ATM selected areas the largest number of occurrences are within 'Go-around' and 'ACAS'. In IATA STEADES except 'Call Sign Confusions' all other areas recorded increases. On the other hand, in EVAIR 'Call Sign Confusion' and 'Runway Incursions' showed a slight increase while all others decreased. It is interesting that in both repositories the relationship between different types of events is the same. E.g. 'Level Bust' is higher than CSC - 'Call Sign confusion' and CSC is higher than Runway Incursions. It is important to recognise that in the EVAIR 'Call Sign confusion' graph above reflects only data provided by the airlines. In the chapter dedicated to the 'Call Sign Similarity/Call Sign Confusion' (page 17) based on the data provided by ANSPs the additional monitoring has been done. Data provided by ANSPs are much higher than the aircraft operators'.



**Figure 4**  
ATM events 2008-2011

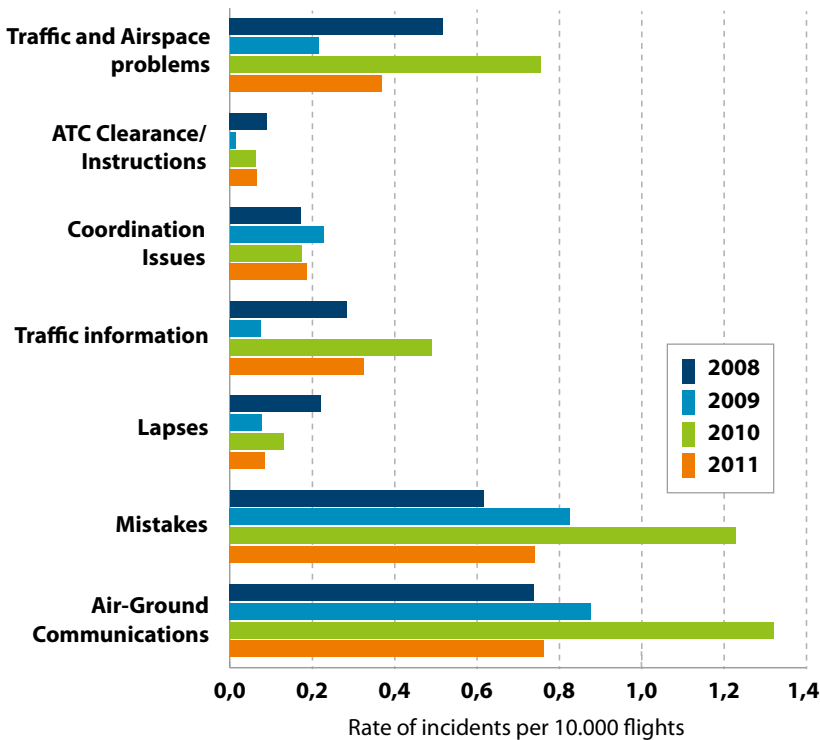
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## CONTRIBUTORS TO ATM OCCURRENCES

As already mentioned in the EVAIR manager introduction, EVAIR is one of the rare European-level repositories which can show causes to the different type of ATM occurrence events. This is possible because the ATM occurrence reports sent to EVAIR have been analysed by EVAIR analysts who are licensed air traffic controllers, engineers and pilots. Pilots and engineers have been especially included in the analysis of ACAS RA events.

Figure 5 presents the common high level contributors for 'Go-around', 'Runway Incursion', 'Level Bust', 'Call Sign Confusion', 'Air-Ground communication' and 'ACAS' events. Each of the presented contributors can be examined further so that we can see what causes are within each of them. E.g. within the chapter 'Air-Ground communication' we present a drill down through the 'Air-Ground communication' contributors.

It is very interesting that except 'Clearance Instructions' and 'Coordination' issues, which recorded increases all other contributors decreased. 'Mistakes' and 'Air-Ground communication', which are the most common contributors showed a significant decrease - 'Mistakes' by 39% and 'Air-Ground communication' by 42%. This is the first time after three years of increases that there was recorded decrease within these areas. It is difficult to know precisely the reasons for the decreases within these areas. It may be that the situation has improved but it is more likely that it is due to variations in traffic levels in 2010 and 2011. Namely, in absolute figures EVAIR received more reports in 2011 than in 2010 but because traffic levels were higher in 2011 the relative rate is lower. EVAIR will continue to monitor the situation and should have a better understanding by the time the next EVAIR Safety Bulletin is issued.



**Figure 5:**  
Contributors to ATM incidents – all phases of flight 2008-2011

## GO-AROUND

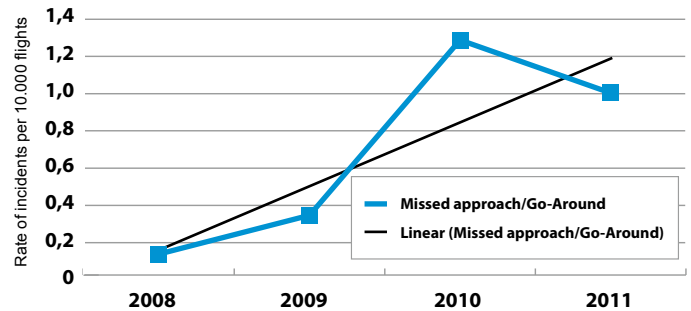
EVAIR continues to monitor 'Go-Around' events. The aim is to identify the ATM related safety barriers which failed and forced pilots to execute a 'Go-Around' manoeuvre. Identification of causes, their mitigation and possible elimination not only has a direct impact on safety improvement but at the same time also helps improve flight efficiency and increase capacity.

In the past years 'Go-Around' events showed a higher rate of growth than other types of events, which prompted a more in-depth look at these manoeuvres. In the EVAIR data, after three years of increase, year 2011 was the first one to record a downturn in the number of 'Go-Around' occurrences. However, the trend line still shows increase as it does in the IATA STEADES data. It is necessary to note that IATA STEADES data recorded an increase in 2011 too, but not as high as it was when comparing 2010 against 2009. One of the possible reasons for the difference in 2011 between EVAIR and STEADES 'Go-Around' is that EVAIR collects mainly those occurrences which are linked and generated within the ATM sphere of operations while IATA STEADES collects and shows 'Go-Arounds' generated by all possible causes including cockpit and avionic problems etc. In addition some of the airlines address to EVAIR only when they want to be provided by the feedback on their ATM incident.

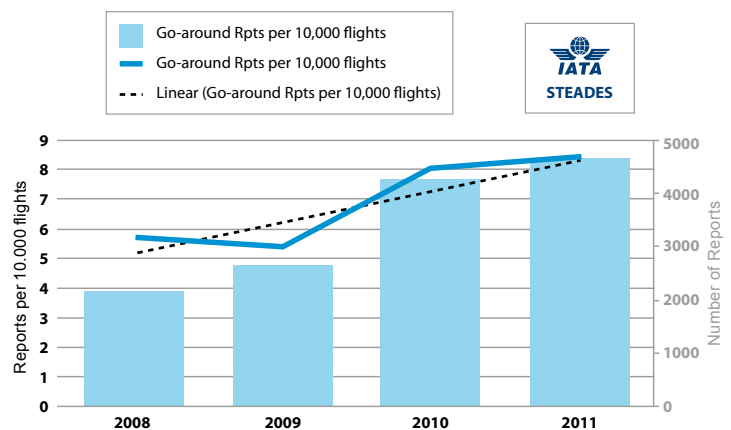
Figure 8 shows results of the more in-depth analysis of the 'Go-around' contributors. The drill down was done through a few areas of which the most important are 'Mistakes', 'Air-Ground communication', 'Weather' and 'Others'. The EVAIR data show that almost 50% of the 'Go-around' events ('Separation minima' almost 30%, 'Unstable approach' 15,4%, 'Late approach clearance' 2,1%, 'Runway Incursion' 0,6%, 'Wake Turbulence' 1,8%,) are with the direct human contributions, either air traffic controllers or pilots. The identification of these contributors could be the indication where to look at further in order to identify more precisely the main issues and to improve the situation.

**Figure 8**  
**Go-Around contributors 2008-2011**

<sup>2</sup> WT- Wake Turbulence

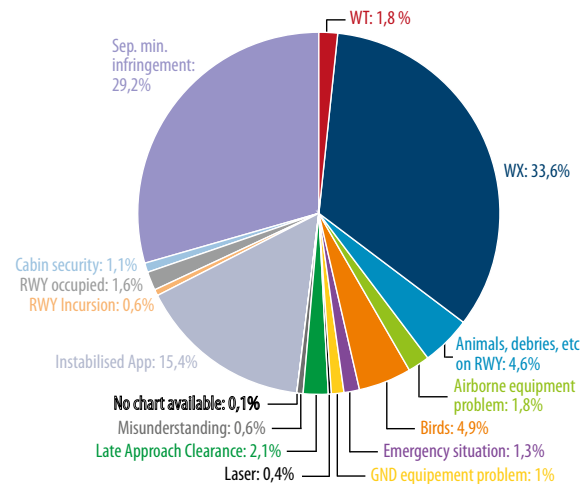


**Figure 6**  
**Missed approach-Go-around 2008-2011**



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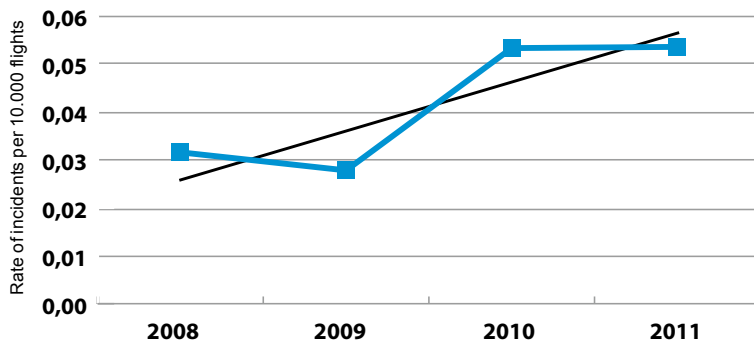
**Figure 7**  
**Go-around reports 2008-2011**



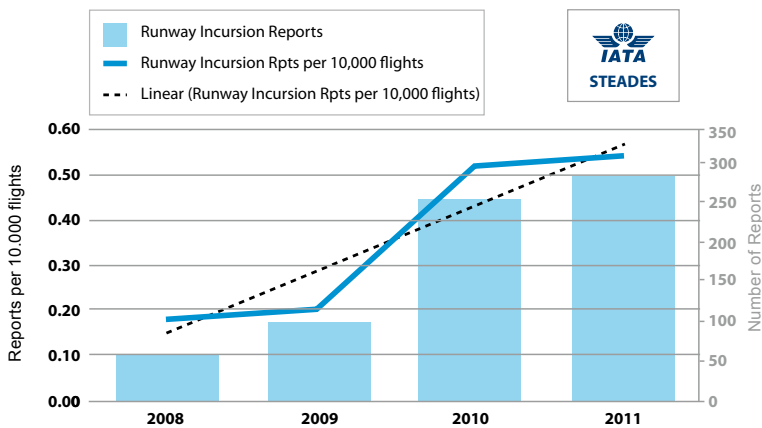
## RUNWAY INCURSIONS

Comparing the number of reported 'Runway Incursion' occurrences for the period 2008-2011 with the other types of ATM events like, 'Go-around' and 'ACAS' it could be concluded that 'Runway Incursion' does not warrant high attention. However, the risk of a serious incident or accident for 'Runway Incursion', as identified by the ATC experts, is much higher than for example 'Go-Around' or

'ACAS RAs'. In addition, for the period 2008-2011 the 'Runway Incursion' trend line shows a constant increase. The IATA STEADES database shows a similar pattern (Figures 9 and 10). It is encouraging to see, however, that in both databases the trend increase in 2011 was lower when comparing it with 2009.

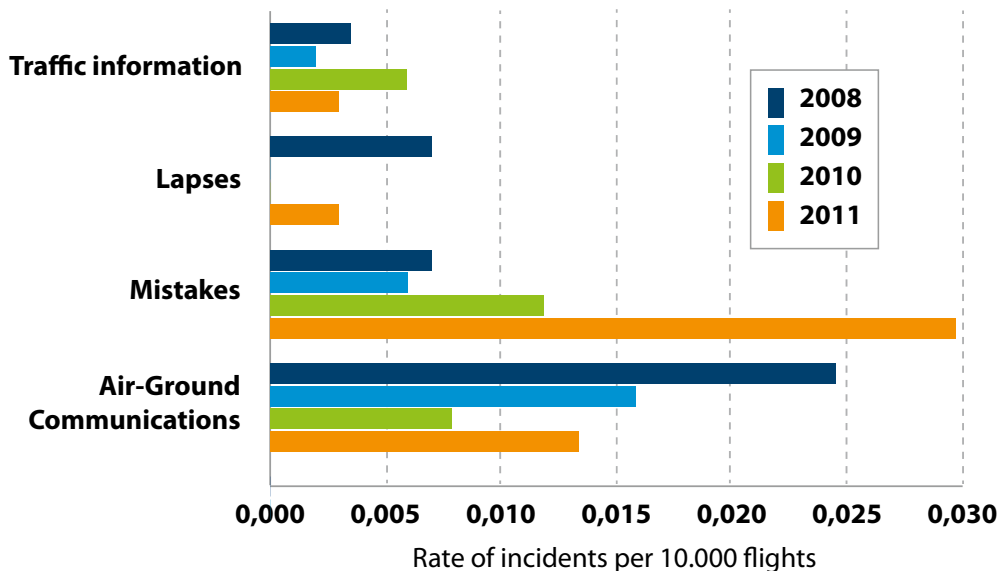


**Figure 9**  
Runway Incursion 2008-2011



**Figure 10**  
Runway Incursion Reports 2008-2011

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**Figure 11**  
Runway Incursions main contributors 2008 -2011

The data shows that in 90% of cases other aircraft were still on the ground; in 4% there was the vehicle and in 1% it was a person while the remaining 5 % is covered by other issues such as objects, animals, etc. 'Runway Incursions' were recorded at 50 different locations across Europe and involved more than 20 different airlines.

The main ATM issues which contributed to the 'Runway Incursions' as recorded by EVAIR and presented on the figure 11 are:

- 'Air-Ground Communication' including 'spoken and operational' communication which include: 'Hearback omitted'; 'Use of non-standard phraseology'; 'Bad handling or radio communication; e.g. 'Stuck microphone' within the operational room; 'Poor or lack of coordination with pilots'; and 'Pilots' lack of situational awareness'.

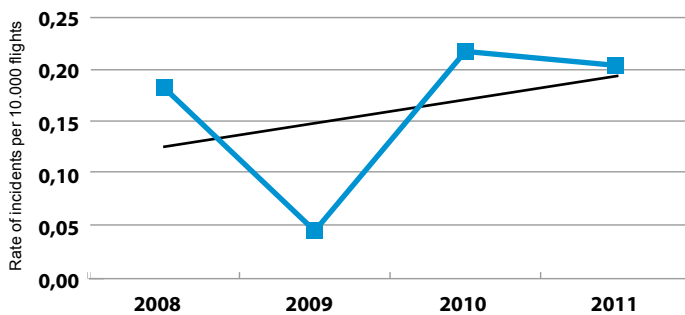
- 'Mistakes' which includes: 'controllers' failure to monitor the traffic situation'; 'Wrongly associated information'; 'Bad judgment of the traffic situation'; and 'Poor or bad planning and violations of the rules'.
- 'Late Traffic Information'.
- 'Poor or no conflict detection'; 'Loss of awareness of the conflict'; 'Misunderstanding'; and 'Bad perception of the information'.

Additionally, indirect causes are mainly related to the equipment e.g. 'Stuck microphone in the cockpit'; 'Landing without clearance'; 'Poor or wrong procedures'; 'Pilots' distraction with other issues in the cockpit or outside cockpit'; 'Traffic load'; and 'Traffic complexity'.

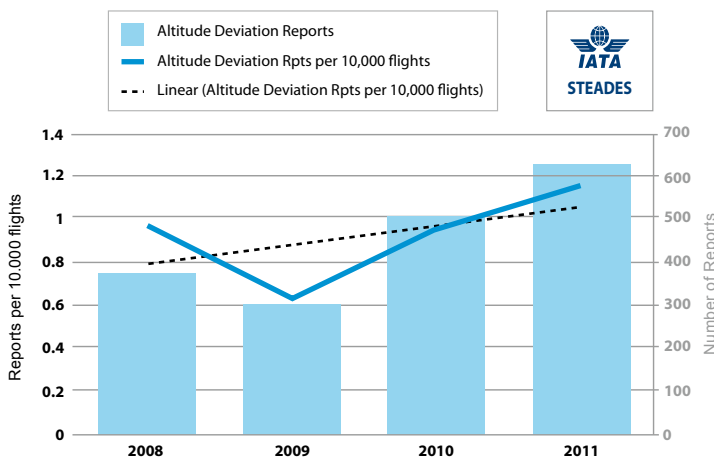
## LEVEL BUST

‘Level Bust’ reports account for approximately 5% of total recorded events in the EVAIR database. The trend line (Figure 12) for the period 2008-2011 continues to show an increase as it does in the IATA STEADES data. However, for the year 2011, EVAIR recorded a slight decrease in the number of reported ‘Level Bust’ events.

The largest number of ‘Level Busts’ (59%) occurred during the en-route phase, 28% occurred during approach and 13% during the take-off/climb phases. It is interesting that ‘Level Busts’ occurred at more than 120 different locations across Europe and that more than 40 different airlines were affected. It is important to recognise that in 16% of the ‘Level Bust’ cases ‘Avoiding Action’ was initiated either by pilots or air traffic controllers. In 8% of cases TCAS RAs were triggered and followed by pilots.

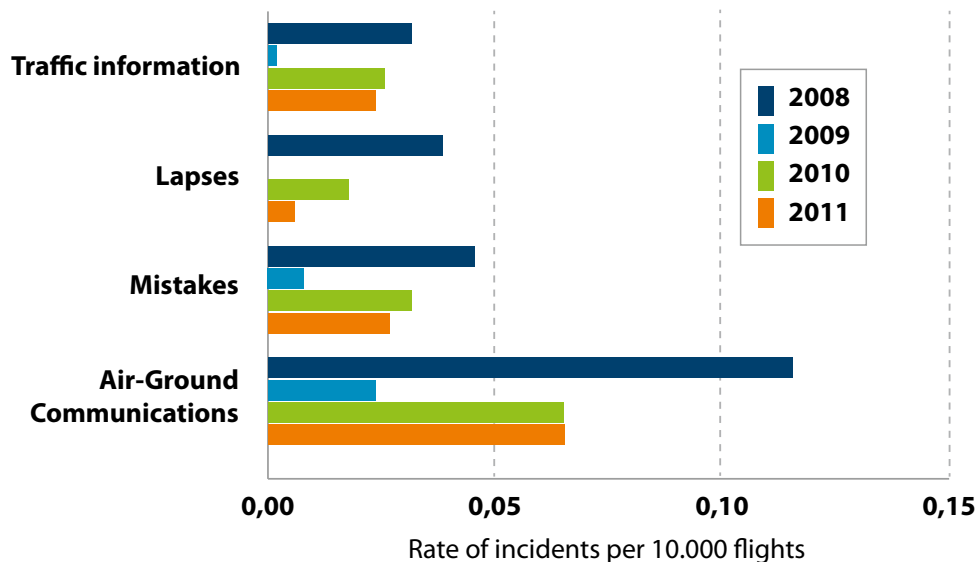


**Figure 12**  
Level Bust 2008-2011



**Figure 13:**  
Altitude Deviation reports 2008-2011

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**Figure 14**  
**Level Bust contributors 2008-2011**

Figure 14 shows the top 4 contributors to 'Level Busts'; however, by counting the sub-set of the top 4 the number of contributors is much larger. Within the period 2008-2011, 'Air-Ground communication' accounted for 23% of the contributions, 'Mistakes' 15%, 'Lack or Late traffic Information' 12%, 'Traffic and Airspace problems' 12%, 'Lapses' 8%, 'Air traffic services' and 'Airspaces' 6%, and 'Coordination issues' 4%.

In 47% of the Level Bust events, there was no ATM contribution. However in 29% of cases ATM had a direct involvement, while in 24% had an indirect involvement.

Within the 'Air-Ground communication' contributor, 'Misunderstanding/Misinterpretation' with 27% and 'Hearback omitted' with 26% were the main contributors. They are followed by 'Call Sign Confusion' with 9%, 'Situational awareness' 7% and 'Phraseology' with 5%. The rest of the 'Air-Ground communication' contributors belong to the 'Coordination issues', 'High R/T workload', 'Noise interference' etc.

Within 'Lapses and Mistakes' more than 70% of events were caused by a lack of 'Detection' 25%, 'Judgement' 17%, 'Misunderstanding' 15% and 'Information wrongly associated' 14%. The rest are 'Workload issues', 'Loss of awareness', 'Forgetting', 'Perception of information', 'Receipt of information', 'Failure to monitor' and 'Experience'.

It is important to highlight that within the 'Level Bust' analysis in the 'Lapses' and 'Mistakes' categories there is a large percentage of the events which were reported by pilots as 'Level Bust' but which according to the strict definition of Level Bust could have been coded as 'Separation Minima Infringement' caused by poor air traffic controller planning.

## EVAIR SUPPORT TO CALL SIGN SIMILARITY IMPLEMENTATION PROJECT

Previous EVAIR Safety Bulletins have featured the monitoring activity involving the EUROCONTROL Call Sign Similarity (CSS) Project. This project aims to reduce the incidence of Call Sign Similarity/Confusion by establishing pan-European Call Sign Similarity solutions centred on a coordinated Call Sign Similarity Service and Tool provided by the Call Sign Management Cell (CSMC) established in EUROCONTROL's Directorate Network Management.

### **Call Sign Similarity (CSS) Service - Start of Service Level 1 Operations**

The formal start of Service Level 1 operations (i.e. the detection and de-confliction of Call Sign Similarities within a single aircraft operator's schedule) follows the successful trials of the initial CSS Tool software last winter and the release of revised software in late March 2012.

### **Call Sign Similarity Access**

The CSS Service, and access to the CSS Tool, is via a special NOP Portal URL and requires a secured access (token). To begin the CSS Service registration process, prospective users should in the first instance complete a 'Service Request' form which can be found at:

[http://www.cfm.eurocontrol.int/cfmu/public/standard\\_page/cfmu\\_forms\\_of13\\_access\\_merged.html](http://www.cfm.eurocontrol.int/cfmu/public/standard_page/cfmu_forms_of13_access_merged.html)

Please type "CSS Tool" in the 'Optional Information' box to help facilitate the request.

### **Call Sign Similarity Users**

Several aircraft operators have already used this service to de-conflict their Summer 2012 schedules and others are already looking ahead to the Winter 2012/13 season. Moreover, since the release of the latest CSS Tool version, a number of new aircraft operators have come forward to ask for more information and it is hoped that others will follow.

### **Call Sign Similarity Help**

In addition to get from our experts in the CSMC, CSS Service users can now receive online CSS Tool 'Help' from the NOP Portal at: <https://www.public.cfm.eurocontrol.int/PUBPORTAL/gateway/spec/index.html>

To see the 'CSS Tool Help', first click on the 'Help' tab and then from the 'Table of Contents' list click on the 'Portlets from A – Z' tab. From here you can select two CSS Tool Case Studies: 'Loading a SSIM Schedule' and 'Using Call Sign Maps'.

### **Call Sign Similarity Improvements - CSS Tool Automatic**

#### **De-confliction**

Further development of CSS Service will be undertaken during the coming months with the intent of providing a first automatic de-confliction version of the CSS Tool in the autumn 2012. This functionality will significantly increase the utility of the service and it also paves the way for potential multi-AO de-confliction of similarities for those AOs using the service in the future.

### **Call Sign Similarity User Group**

The new capability was demonstrated at the recent Call Sign Similarity User Group Meeting held in EUROCONTROL Brussels HQ on 18 September 2012. Aircraft operators who wish to join the 50+ airlines who are currently part of the User Group should see the contact details below.

### **Using EVAIR to monitor Call Sign Similarity Service Effectiveness**

To help monitor the effectiveness of the CSS Service, ANSPs have been asked to report instances of Call Sign Similarity involving all aircraft. EVAIR who has the list of the airlines using the CSS Tool will monitor the situation. It has been agreed that the existing EVAIR communications channels should be used for the transmission of Call sign Similarity/Confusion reports to EUROCONTROL. As with other air safety reports, these can be sent to mailbox, [Dragica.stankovic@eurocontrol.int](mailto:Dragica.stankovic@eurocontrol.int). So far, very few have been received involving AOs using the CSS Tool.

On the other hand, a growing number of ANSPs are forwarding Call Sign Similarity events to EVAIR/CSMC involving airlines that are not using the CSS Tool. Whilst it is not always possible for aircraft operators to make changes mid-season, many 'ad hoc' changes to call signs have been made by airlines to resolve the reported similarities. Whilst this is good news for safety, the CSS Service and Tool provides a more systematic means for aircraft operators to reduce the number of similarities embedded in their

schedules. The introduction of further automation and the potential time-saving this will bring will hopefully persuade more airlines to sign up to use the CSS Service and Tool in the future.

For those AOs and ANSPs who are already submitting CSS data to EVAIR, we thank you. For those of you who are not, there is an open invitation to begin sending us such data now.

**Important Reporting Note:** It is requested that **ALL** reports sent to EVAIR use the **ATC Callsign or operational Flight Identification** rather than the Commercial Flight Number (CFN) (unless they are the same) as this helps the EVAIR staff process the data more easily and efficiently.

### Learn More About Callsign 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](mailto:richard.lawrence@eurocontrol.int) or via [callsign.similarity@eurocontrol.int](mailto:callsign.similarity@eurocontrol.int)

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

And find more information on the Call Sign Similarity Project please at:

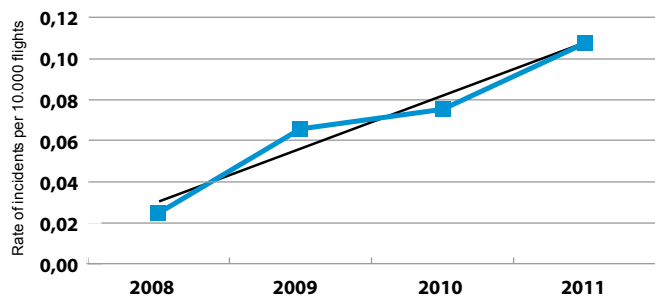
[http://www.eurocontrol.int/safety/public/standard\\_page/Callsign\\_Similarity\\_project.html](http://www.eurocontrol.int/safety/public/standard_page/Callsign_Similarity_project.html)

The latest data reported to EVAIR and the comparison with IATA STEADES data is shown below.

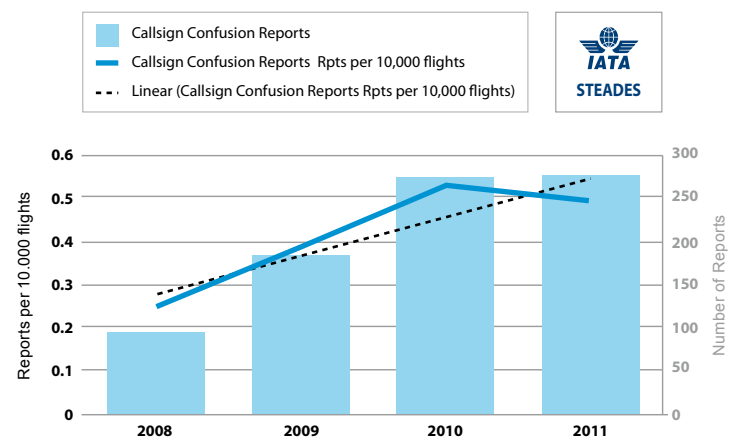
**Figure 16**  
**Callsign Confusion 2008-2011**

## CALL SIGN CONFUSION 2008 - 2011 TRENDS

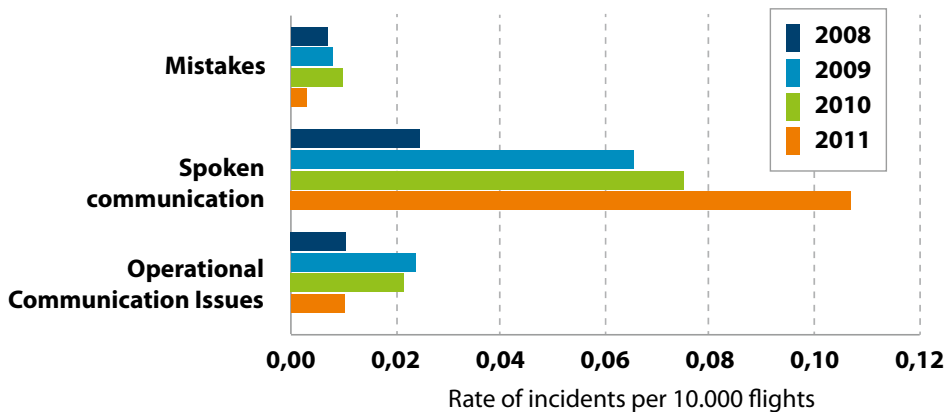
Airlines' 'Call Sign Confusion' trends in EVAIR and IATA STEADES global 'Callsign Confusion' are increasing through 2008-2011. In 2011 a slight difference was observed between EVAIR and IATA STEADES. Namely the increase in the EVAIR database is much higher than in the IATA STEADES database. One of the reasons behind this could be increased awareness of some of the airlines flying to/from Europe and while also being engaged in the EUROCONTROL CSS Project. Besides the airlines, some European ANSPs have started providing regular 'Call Sign Similarity/Confusion' data to EVAIR. Airlines and ANSPs recognise the benefits of identifying Call Sign Similarities and correcting them quickly through the EUROCONTROL mechanism. Using the established feedback mechanism, individual airlines have made amendments to their own schedules and airlines have also been put in contact with each other to resolve reported similarities. These actions are actively reducing the risk of having 'Call Sign Confusion' incidents.



**Figure 15**  
**Callsign Confusion 2008-2011**



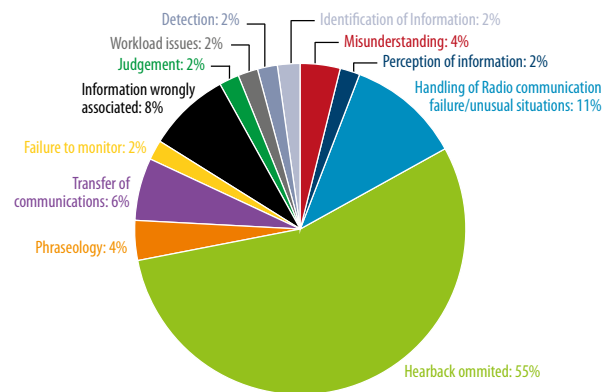
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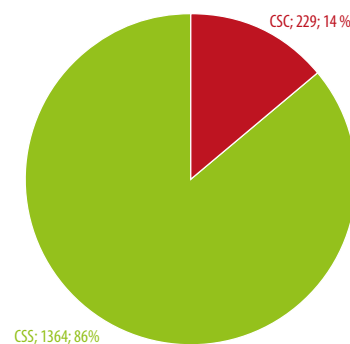
**Figure 17**  
Call Sign Confusion ATM Contributors Summer seasons 2008 - 2011

The largest number of 'Call Sign Confusions' recorded by EVAIR occurred within the 'En-route' phase (73%) and 'Approach phase' (20%). The remaining were during take-off and landing. We want to highlight that in 65% of airline reported cases the confusion occurred between 2 (or more) aircraft from the same company and the remaining of 35% between different companies. According to the airlines' reports, 'Call Sign Confusion' occurred at 65 different locations across Europe and involved approximately 40 different airlines. The statistics from the ANSPs' data provided to EVAIR are slightly different. These data show that 48% of the Call Sign Similarities occurred within the same company and 52% between different airlines. These reports identified 74 airlines having 'Call Sign Confusions' and 181 airlines having problems with the Call Sign Similarities. All these data confirm that this is a European wide issue and that further work is needed to achieve more improvements. Good reporting, data collection and analysis are essential elements necessary to start the work on the improvements.

The top three high level contributors to 'Call Sign Confusions' are 'Spoken', 'Operational communication' and 'Mistakes' (Fig 17). A drill down through these three areas and in addition through 'Lapses' (Figure 18), shows that for the period 2008-2011 'Hear back omitted' is on top with 56%; 'Handling of radio comm. failure/unusual situation' accounts for 10%; 'Information wrongly associated' 8%; and 'Transfer of communications' 6%. The EVAIR database shows that within 'Call Sign Confusions' in 48% of cases ATM had a direct involvement, in 25% an indirect involvement and in 31% there was no ATM involvement. In more than 10% of the 'Call Sign Confusion' cases resulted in a 'Level Bust' and in about 5% an ACAS RA was triggered and followed by pilots.



**Figure 18**  
Call Sign Confusion ATM Contributors 2008 - 2011

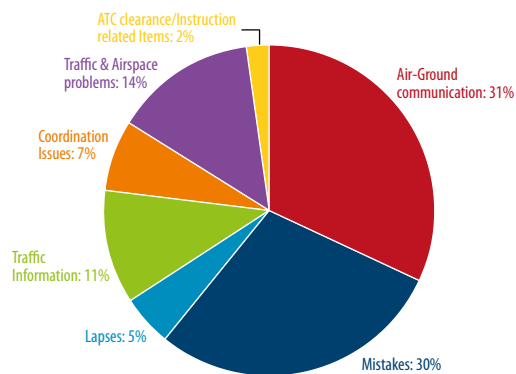


**Figure 19**  
ANSPs Call Sign Confusion and Call sign similarity reports 2008 - Aug 2012

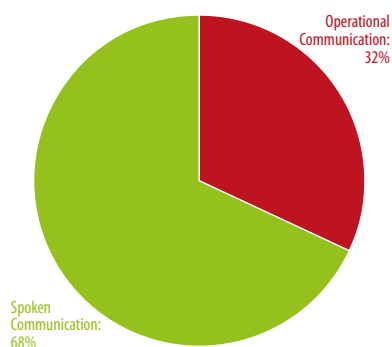
In this Bulletin for the first time EVAIR presents data on the 'Call Sign Similarity' and 'Call Sign Confusion' events provided by eleven European ANSPs.

For the period 2008 - Aug 2012, the ANSPs provided 1593 CSS/C reports. Of these, 14% were Call Sign Confusions and 86% were similarities.

## AIR-GROUND COMMUNICATION



**Figure 20**  
Contributors to ATM Incidents cumulative figures 2006 - 2011



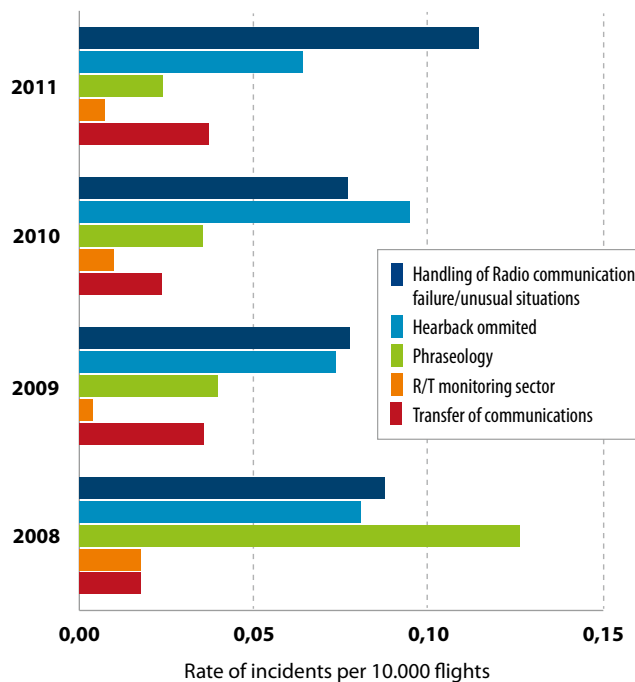
**Figure 21**  
Air-Ground communication cumulative figures 2006 - 2011

'Air-Ground communication' according to the HEIDI taxonomy consists of two main areas: 'Spoken' and 'Operational' communication. In this Safety Bulletin we present the situation on the 'Air-Ground communication' field for the seasons 2006 – 2011. Figure 20 shows that among the seven highest contributors, 'Air-Ground communication' recorded the highest percentage (32%), which is the same like for the 2011. 'Air-Ground communication' also contributes to a large number of different types of events some of which are presented in EVAIR Safety Bulletins, namely Runway Incursion, Level Bust, Call Sign Similarity/Confusion, ACAS TCAS RAs and Missed approach/Go-around). Figure 21 shows that in the area of 'Air-Ground communication' it is interesting to note that the percentage within this area for 'Spoken' and 'Operational' communication is the same as for the summer season. 'Spoken communication' with 68% is more than two times larger than 'Operational communication', which is 32%. 'Spoken communication' covers 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. Spoken 'Air-Ground communication' refers also 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'.

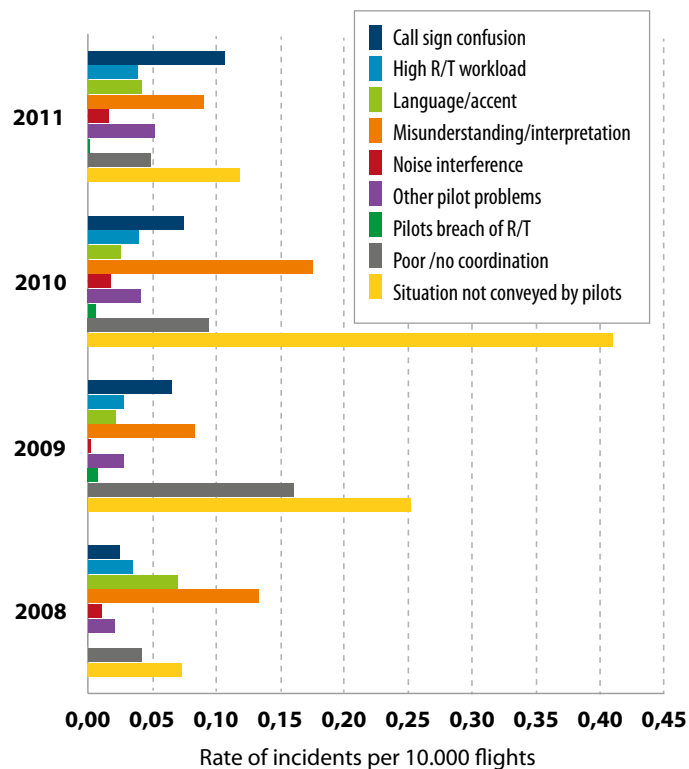
The fact that 'Air-Ground communication' contributes to a lot of different types of events leads us to propose that more attention should be given to all type of the English language training for Air Traffic Controllers and pilots.

The most frequent 'Air-Ground communication' problems as identified by EVAIR are shown in Figures 22 and 23. Within 'Spoken', 9 different contributors have been identified. 'Situation not conveyed by pilots', which is closely linked with the lack of situational awareness, has the highest trend - 30%; one percent less than during summer seasons. A drill down through the 'Situation not conveyed by pilots' contributor shows that use of two languages (i.e. English and a national language) on the operational frequency contributes to a lack of situational awareness. Mitigation of this problem through the use of only one language on the operational frequency within international airspace and at international airports would bring improvements. Within EUROCONTROL the discussion is on going and we hope that in spite of political problems there will be positive moves in the future. It is encouraging to see that some ANSPs are preparing the first steps to make the use of English language the only one within en-route and TMA's. We will be monitoring the situation and will inform you about the progress. The key point is that at the operational level the support is equally needed by air traffic controllers and pilots.

Concerning 'Operational Communication', among the five identified contributors three of them have a very similar percentage: 'Hear-back omitted' - 29%; 'Handling of radio communication Failure/unusual situations' 30%; and 'Phraseology' 25%. It is interesting that 'Failure/unusual situations' which involve frequency interferences, wrong frequency selection, stuck microphone etc are one percent higher than during the summer season. As for the 'Spoken communication' our message would be the same, i.e. better training of pilots and controllers in this area is a potential remedy.



**Figure 22**  
**Operational communication 2006-2011**

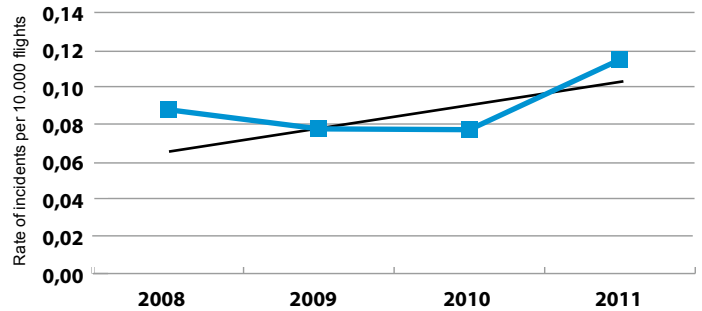


**Figure 23**  
**Spoken communication 2006-2011**

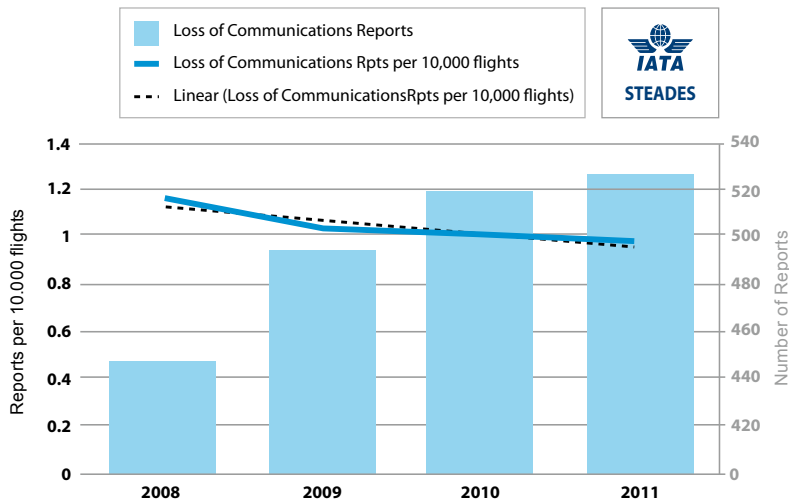
## LOSS OF COMMUNICATION 2008-2011

Following recent events and requests from EVAIR customers, in this Safety Bulletin, we bring for the first time statistics about 'Loss of communication' occurrences. For the period 2008-2011, 204 'Loss of communication' occurrences were recorded. They have been experienced by 28 different airlines.

The trend line on the Figure 24 shows that after a relatively steady situation lasting more or less two years (2009 and 2010) there was the increase from 0.07 in 2010 to 0.11 occurrences per 10.000 operations in 2011.

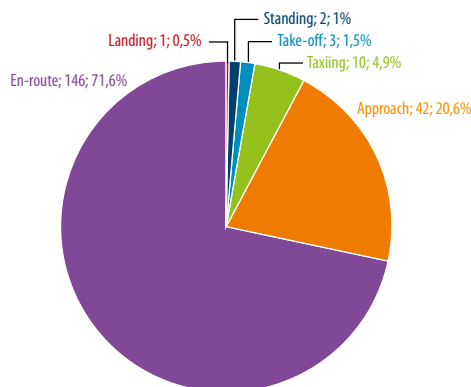


**Figure 24**  
Loss of communication 2008 - 2011



**Figure 25**  
Loss of communication 2008 - 2011

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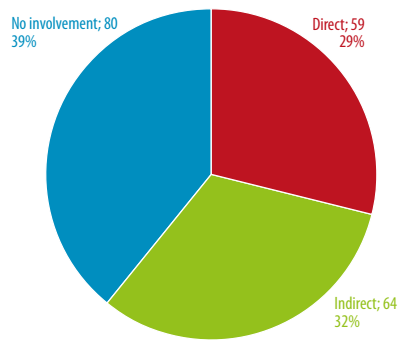


**Figure 26**  
Loss of comm. – phases of flights 2008 - 2011

'Loss of Communication' has been recorded at 64 different locations across Europe. The number of occurrences for the same location varies from 1 to 23.

In 6 cases, according to the pilots' reports, there were military interceptions. In one case an aircraft infringed an active military zone.

Figure 26 shows that the largest number of 'Loss of Communication' occurrences occurred within the En-route (71,6%) and Approach (20,6%) phases of flight.



**Figure 27**  
**Loss of Communication – ATM system contribution 2008 - 2011**

For the period 2008-2011, 'Direct ATM involvement'<sup>3</sup> was present in 29% of the 'Loss of Communication' events. The most frequent causes from the ATM side were: 'Air Traffic Controller forgot to instruct the aircraft to change the frequency'; 'Stuck controller transmitter'; 'High workload'; and 'Provided wrong frequency'.

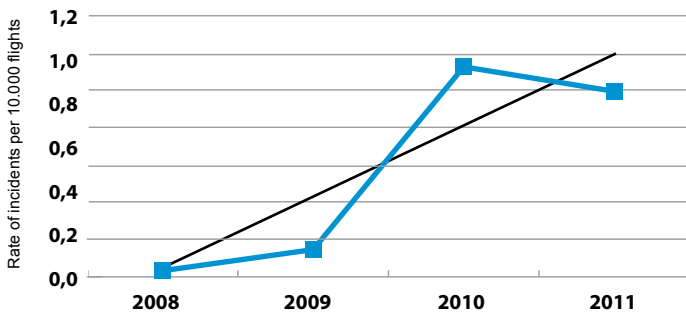
'No ATM involvement' (39%) means that the problem could have come from the pilots' side, different kind of technical problems or the impact of the bad weather conditions. The following are the most frequent causes: 'Stuck cockpit transmitter'; 'Wrong frequency setting'; 'Frequency interferences by the commercial radio stations'; 'Hear-Back Read-Back'; 'Thunderstorm'; 'Lack of Letter of Agreements (LOA) between neighbouring ATC centres'.

Recorded 'Loss of communication' events were also combined with the other types of ATM events such as: 'Call sign confusion', 'Level Bust', 'Runway incursions'; 'Un-authorized penetration of the airspace'.

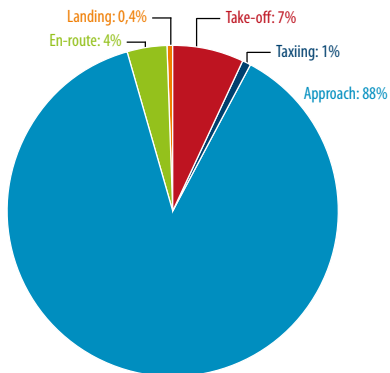
<sup>3</sup> According to the HEIDI taxonomy definition direct involvement is where at least one ATM event or item was judged to be directly in the causal chain of events leading to an accident or incident. Without that ATM event it is considered that the occurrence would not have happened. E.g: System failure or an omission of action – ATCO missing instruction for the frequency change, stuck microphone etc.

## SPECIFIC EVENTS LASERS THREATS ACROSS EUROPE CONTINUE

Laser threats across Europe continue. In absolute figures EVAIR recorded more reports in 2011 than in 2010. However, since in 2011 the traffic was down on 2010, Figure 28 shows a slight decrease in the number of laser incidents in 2011 per 10,000 operations. Unsurprisingly, the most affected phase of the flight is 'Approach' with 88% of all laser interferences.

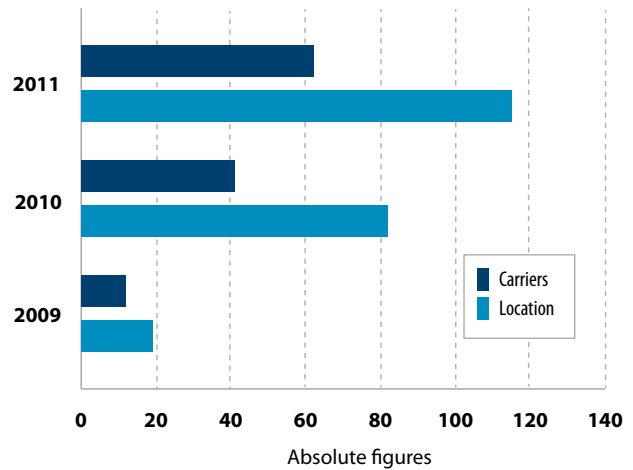


**Figure 28**  
**Laser 2008-2011**



**Figure 29**  
**Laser 2008-2011**

Data recorded by EVAIR show that through 2008 - 2011 the number of locations where aircraft were interfered with rose continue increases as did the number of carriers affected (Figure 30). In total for the period 2008 - 2011 more than 40 States have been affected at approximately 150 different locations. It is interesting that in EVAIR data 90% of the laser events occurred within the territory of 6 states. For the period 2008-2011 more than 80 different airlines were interfered.



**Figure 30**  
**Laser interferences No of locations and No of affected carriers 2008-2011**

Until recently, all EVAIR data concerned green laser interferences: however in summer 2012, we received, for the first time, information about the use of a blue laser. These devices are potentially more powerful and potentially more harmful on the eyes. Luckily the perpetrators were located and arrested!

Besides the number of States that have introduced new regulation, recently EASA, in its role as the European aviation regulator, has taken a more active role in dealing with the laser problems. For example there are ongoing discussions, with industry, related to the new technologies which could be used to protect pilots and ATC tower controllers from the harmful impact of the lasers.

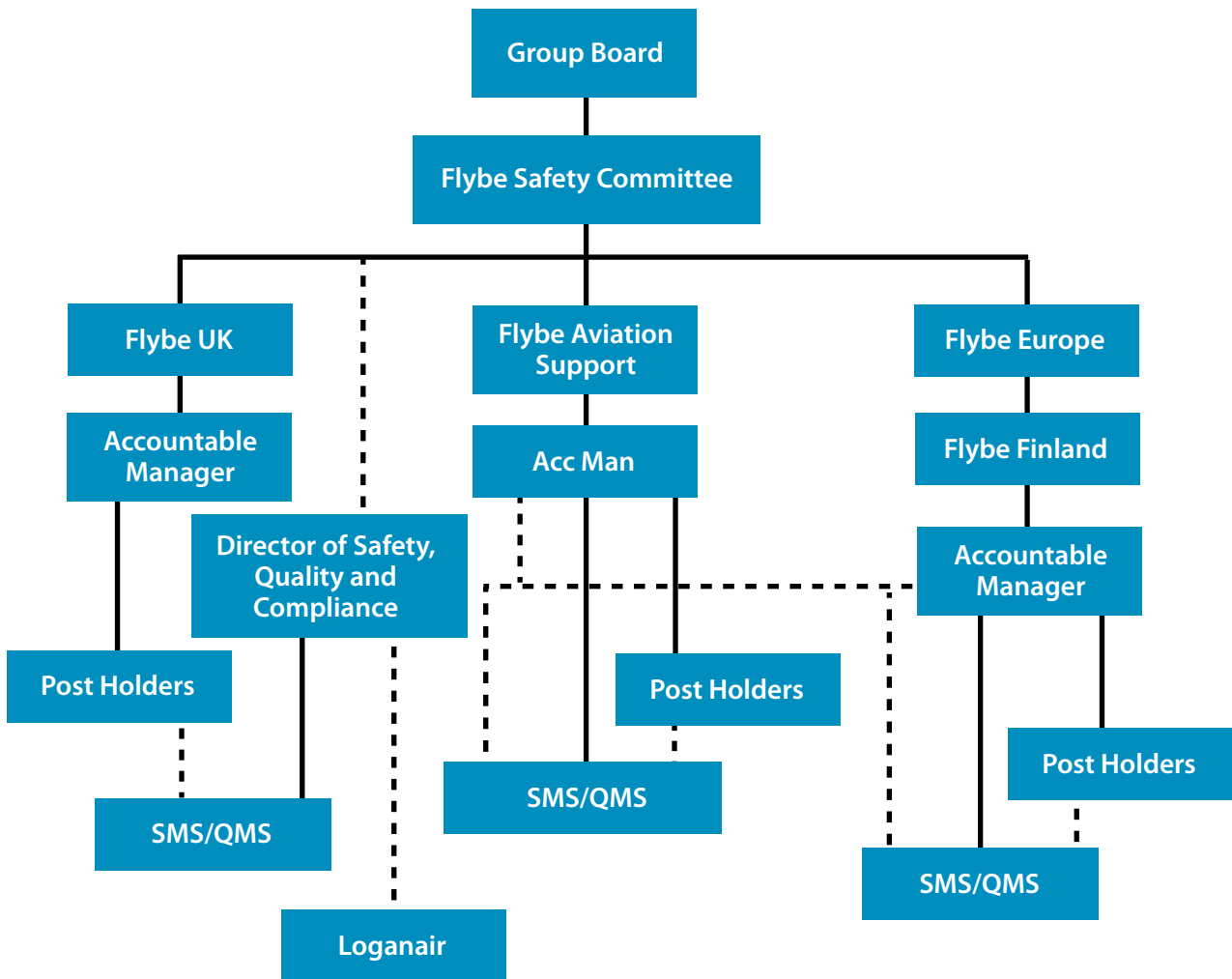
EVAIR will continue to monitor laser interference through the data collection. As for other types of the ATM occurrences, please send your reports to: [Dragica.stankovic@eurocontrol.int](mailto:Dragica.stankovic@eurocontrol.int) Further information about lasers and aviation is available on SKYbrary ([www.skybrary.aero](http://www.skybrary.aero)).

## STAKEHOLDERS CORNER



In recent years Flybe has emerged to become Europe's largest regional airline and the UK's number one domestic carrier. Symptomatic of Flybe's growth has been the successful partnership and commercial arrangements that have been forged with leading European airline groups. Flybe has also been a major contributor of ATC related flight safety information to EVAIR and is an ardent supporter of the EVAIR principle to learn lessons and make quick fixes to identified problems before they can escalate further.

### Flybe SMS Structure



Safety Management System Accountability Structure & Executive Responsibility 2011/12

## Safety and Reporting Culture

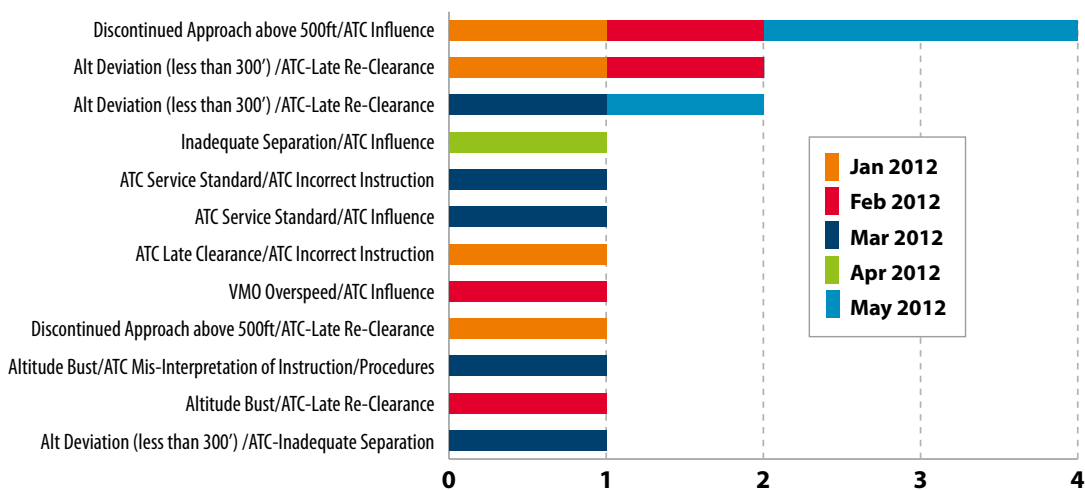
Flybe has a robust and successful reporting culture which continues to strengthen Flybe reputation as an airline with a very good safety record. The Preface of the Flybe Operations Manual focuses on the importance of having a 'safer operation' and encourages the Pilot community to report high and low level severity incidents to enable us to learn possible lessons from these incidents to help avoid recurrence.

"All employees are urged to help provide the highest levels of Safety in the industry, and so are encouraged to report any information which may affect flight or ground safety. To promote a free flow of information the Company will not normally take disciplinary action against any employee reporting an incident affecting Safety. The only possible exception may be where someone has acted recklessly or maliciously or omitted to take action, in a way that is not in keeping with their training, responsibilities or experience. In such cases, the fact that a person has made a report will be taken into account in their favour.

The Company will take very seriously, however, occasions where an incident is discovered that has not been reported. Not reporting anything which could affect flight or ground Safety is considered 'serious misconduct'."

Flybe has a very positive approach to Safety and a strong ability to identify, articulate and mitigate risk.

Air Safety Reporting System - Flybe Pilots are required to submit an Air Safety Report for any occurrence they regard as hazardous or potentially hazardous, using online safety reporting system. The Flight Safety department manage and investigate the Air Safety Reports and co-ordinate the communications within the system, between Air Traffic Control and external organisations.



**Figure 31**  
Flybe ATC root cause incidents Jan-May 2012

Other current identified Air Traffic Safety issues:

- Large quantities of Air Traffic Information being transmitted at a busy/critical phase of flight. ATC will endeavour to not issue more than 2 instructions per transmission. Most controllers abide by this but on occasions crew will report hearing 3 instructions per transmission. When this is solely numerical information in one transmission e.g. Heading, Flight Level and Frequency change, the crew can easily be confused, resulting in increased pilot workload.
- The high level of traffic and RT transmissions on many sectors may also prevent a crew clarifying an instruction or the controller may be planning ahead and miss an incorrect readback.
- In times of increased RT traffic, crews often find it difficult to get a transmission in due to the uninterrupted string of transmission between the controller and other A/C. In circumstances where an urgent heading change would be required, such as approaching a Thunder Storm, Pilots would have little alternative but to declare an emergency if they were unable to obtain a weather avoidance clearance from ATC.
- Short ILS vectoring resulting in minimum time for speed reduction.
- Late re-clearance's (also seen above).

### **Call Sign De-confliction Tool** **Nick Rhodes- Flybe Flight Support Manager**

Flybe operates high frequency rotations along some key axis both with UK airspace and mainland Europe. As a result, for many years we have seen company call sign confliction events above the National and European average per 100,000 movements.

Working initially with NATS External Safety in 2007, Flybe along with other key UK aircraft operators, started work upon a Call Sign de-confliction tool for use within UK airspace. This work delivered significant success as we saw Call Sign events drop dramatically, but not completely eradicated.

As a result of this collaborative work, Flybe became aware of the EUROCONTROL Call Sign Similarity Tool (CSST) project and given already established links with EVAIR was keen to take an active role in the development of the solution.

For the winter 2011/2 IATA season, Flybe offered to run the beta version of the tool (which in its first release was aimed at de-confliction within own airline and required 'semi automated' inputs within the live environment. Flybe reported directly back to the CSST team and EVAIR throughout the season to identify any occasions where call signs had been confused or in conflict. Working closely with the CSS project Manager, Sid Lawrence and the Call Sign Management Cell, Phil Shevlin, Flybe went through the entire season without any ANSP reported Call Sign confliction events, clearly demonstrating the value of the work carried out by the CSST project team and enhancing the safety of our operation.

Flybe continues to work closely with both the CSST team and EVAIR, and looks forward to the subsequent releases that will deliver a more automated solution and ultimately to de-conflicting Call Signs between all airspace users, with the aspiration to make Call Sign Confusion a thing of the past.

<sup>4</sup> **Editorial note:** Recently EUROCONTROL developed the Stabilised approach toolkit addressing among other issues the one highlighted in this text. The toolkit is aimed at providing the awareness to Air Traffic Controllers on the subject of Stabilised approach. This aid was developed jointly by the Civil Air Navigation Services Organization (CANSO), the Flight Safety Foundation, EUROCONTROL and Cotswold Airport. [http://www.skybrary.aero/index.php/Solutions:Stabilised\\_Approach\\_Awareness\\_Toolkit\\_for\\_ATC](http://www.skybrary.aero/index.php/Solutions:Stabilised_Approach_Awareness_Toolkit_for_ATC)

## ACAS REPORTING

EVAIR ACAS monitoring aims to ensure the continued safe and effective operation of ACAS by identifying and measuring issues associated with Resolution Advisories (RAs) and their trends and taking preventive measures where necessary.

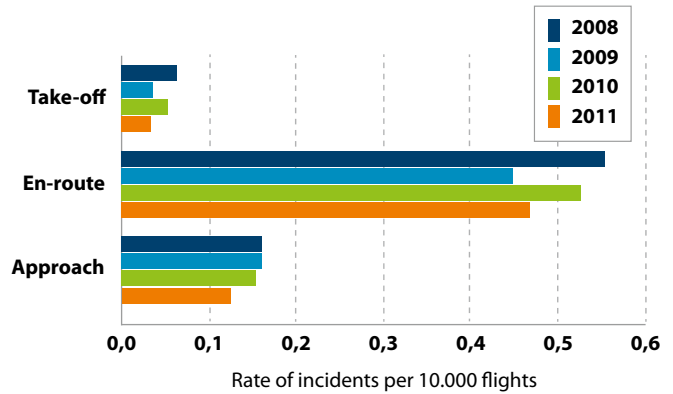
ACAS is the generic term for Airborne Collision Avoidance Systems, of which TCAS II is the only example of implementation so far. ACAS is intended to improve air safety by acting as a 'last-resort' method of preventing mid-air collisions or near collisions between aircraft. Although ACAS II implementation was completed in 2005, ACAS monitoring continues to improve safety by identifying technical and procedural deficiencies.

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

**It should be noted that ACAS/TCAS statistics from manual reporting rely on pilots' and air traffic controllers' perceptions and memories of the events rather than measured or calculated values. 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 give emphasis to more significant events and insights into perception of the ACAS II system.**

We would like to highlight that until 2009 EVAIR was receiving automatic ACAS RA data from only one radar station. For this Safety Bulletin we prepared the data collected automatically from 13 radar stations, which belong to two Air Navigation Service Providers.

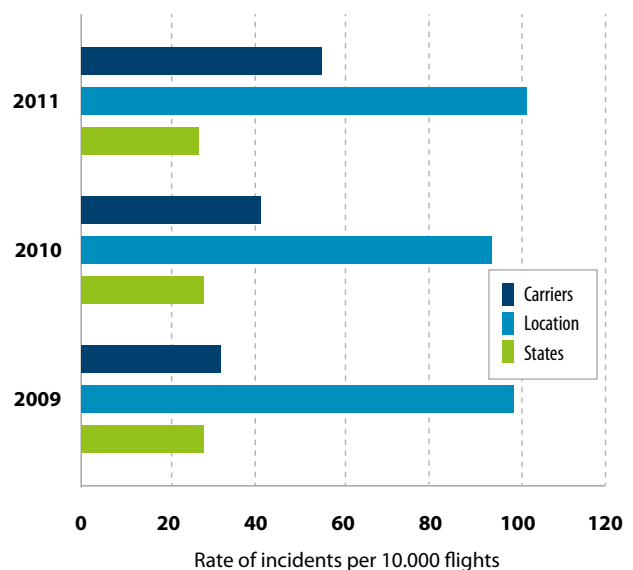
## MANUAL ACAS REPORTING



**Figure 32**  
Manually reported ACAS incidents by phase of flights 2008-2011

For the period 2008 – 2011 TCAS RA reports make 17,2% of the EVAIR data. For that period TCAS RAs occurred within 30 different states and on more than 200 different locations. More than 80 airlines provided TCAS RA reports to EVAIR through the manual reporting.

Relative figures show the reduction of TCAS RAs per all phases of flights in 2011. Interestingly, still within the manual reporting, the highest number of RAs was recorded within En-route airspace, which contrasts to the data collected automatically, which shows that the highest number of RAs occurred within TMA's.

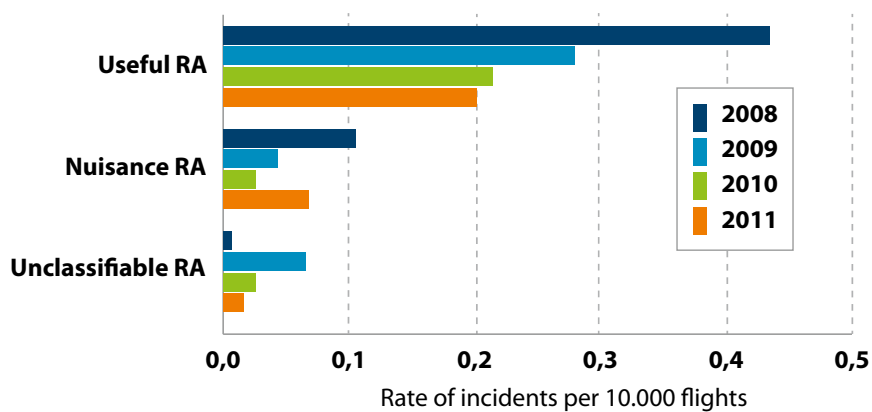


**Figure 33**  
Manually reported ACAS incidents per states, locations & carriers

ICAO ADREP definitions of types of RAs are shown below.

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

It is worth mentioning that the vast majority of ACAS RAs were deemed as 'Useful RAs' and followed by flight crew. However, last four years the number of useful RAs has continuously reduced, which has not been the case with Nuisance RAs, which in 2011 had quite high increase versus 2010 and 2009. While it is challenging to find causal factors and potential reasons for the increase of Nuisance RAs, a in depth study will be conducted to further explore their nature.



**Figure 34**  
**ACAS RA Classification 2008 - 2011**

## RA INSTRUCTIONS 2008 -2011

In 2011 EVAIR recorded the decrease of all types of the ACAS RA instructions. The decrease has been directly linked with the decrease of the number of reported ACAS RAs in general. Important to note is that for the last four years 'Reduce/Adjust RA' is the instruction with the highest frequency. This indicates that in a lot of events ACAS RA was triggered after a correct ATC clearance but due to high climb/descent rate.

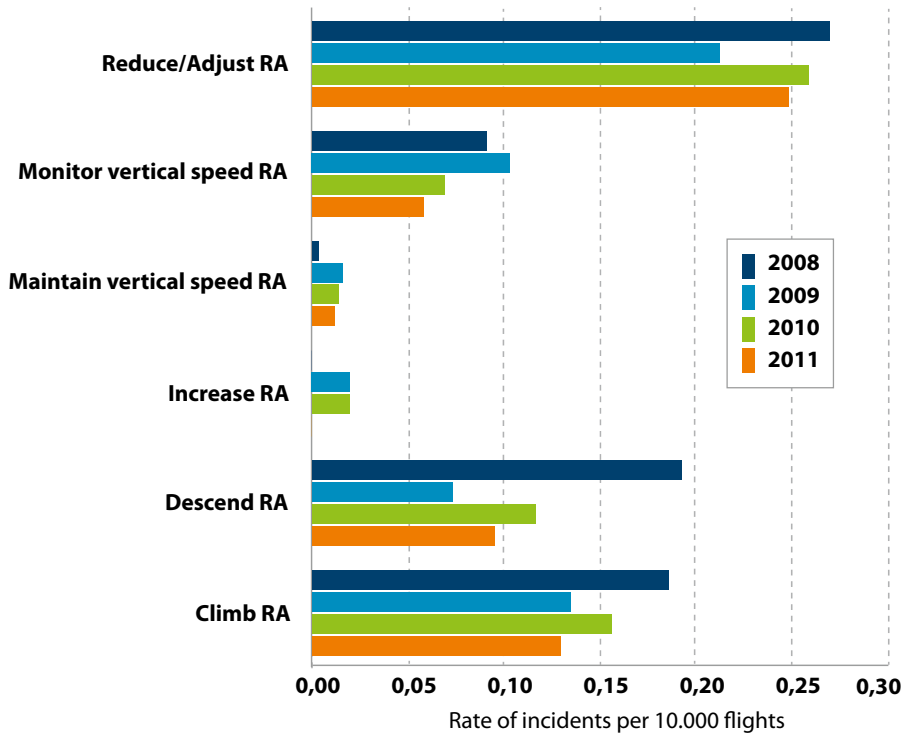


Figure 35  
ACAS RA Instructions 2008-2011

## ACAS FL DISTRIBUTION

Between 2008 – 2011 (absolute figures) the ACAS RAs are distributed in three main clusters. FLs between 100 - 150; 200 – 250; and 300 - 370. Some FLs like FL110, FL200, FL290, FL330 and FL370 recorded an increase in the number of incidents.

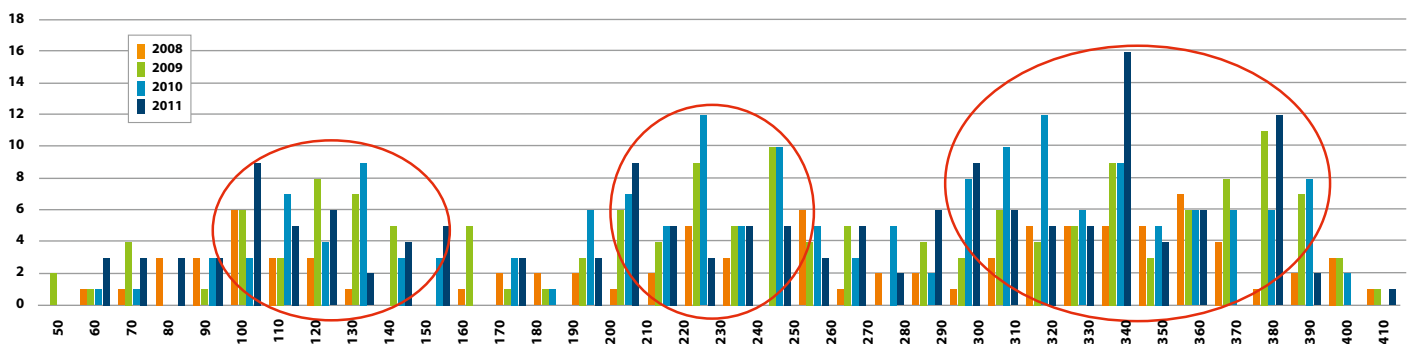


Figure 36  
ACAS Flight Level Distribution 2008-2011 absolute

## ACAS RAs COLLECTED AUTOMATICALLY FROM MODE S RADAR STATIONS

Automatic monitoring of ACAS RA downlink messages has been expanded in the last 12 months to cover larger numbers of radars in Europe. This is the reason that in this EVAIR safety Bulletin we cover the period 2010 – 2011. The procedures for monitoring have been changed by using the Automated Safety Monitoring Tool (ASMT) to monitor Radar LAN recordings rather than being connected on line. Standard radar LAN recordings are transferred to ASMT on a daily basis and the detection process in ASMT is run once for each Mode S radar source storing detected events in a dedicated radar community database. This process is now used by two ANSP's and the radar coverage being monitored extends beyond the FIR boundaries.

The total numbers of RA downlink events recorded by ASMT attached to 13 radars in Europe is shown below. These are events recorded and do not represent the numbers of RAs which occurred.

### All radars

Year	Events with valid RA	Events with Erroneous RA messages	Complex RA events	Totals
2010	8152	18589	203	26944
2011	5547	21496	113	27156

*Events with valid RA messages = RA downlink messages with a valid RA downlink code.*

*Events with erroneous RA messages = RA downlink messages which are empty or contain only a stop bit.*

*Complex RA events = Events where more than two different RAs are detected for one aircraft during the encounter.*

*Note: many of the events including erroneous messages are seen by up to 7 radars and this can result in multiple recordings.*

Although there are many erroneous downlink messages these appear to be generated by a small number of aircraft fitted with Honeywell TCAS units and Honeywell Enhanced Mode S transponders that continuously report RAs. These messages can be easily recognised as erroneous by ground systems and excluded from processing. With the addition of a new ANSP providing data, a new group of airframes has been detected exhibiting the same phenomena. There is a much larger group of aircraft that generate a downlink message with only the RA stop bit set. With these aircraft there is a set of three erroneous messages sent once or twice per flight and we have not yet found a common factor.

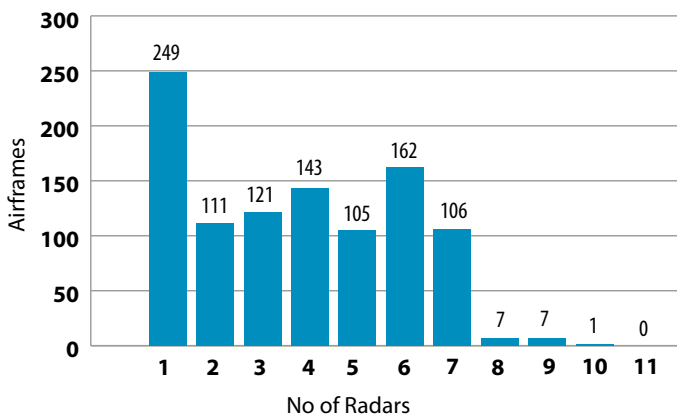
Detection and correction of RA downlink anomalies is now being handled by the Mode S monitoring team.

### Downlink anomalies

**In summary, a small number of aircraft are non-compliant with the SARPS and 'pollute' the RF environment. Corrective action is underway with the operators and manufacturers concerned however any corrective action taken has not affected the avionics installed on the affected aircraft therefore more work has to be done with all main stakeholders to achieve satisfactory results.**

### Aircraft reporting RAs

For the 13 radars the graph below indicates the number of aircraft reporting RA downlink to one or more radars. Some military actually flew through the coverage of more than one radar and reported RAs in different geographic locations and possibly on different days see Figure 37. The numbers here are filtered using Mode S code and therefore represent a clearer picture of total events but still include duplicate counts for coordinated events.

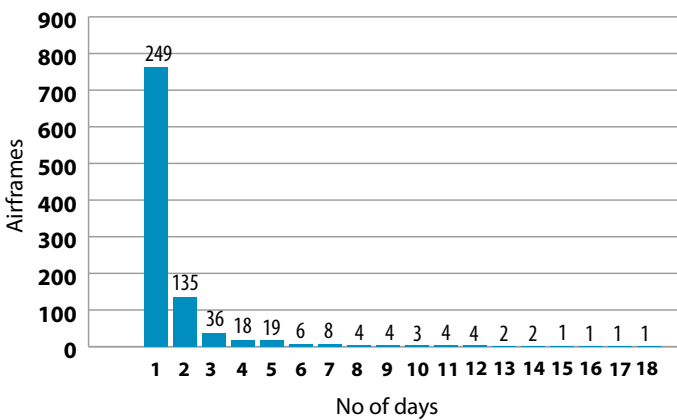


**Figure 37**  
**Radars Detecting RAs**

### Aircraft reporting days

For this task year 2011 was analysed. Some aircraft were detected as reporting a valid RA on more than one occasion. The Mode S address was looked at for those reporting on multiple days. The data shows that all reports on 4 or more days were identified as military aircraft. It appears that it is very unlikely commercial airframes will get more than one RA in a year.

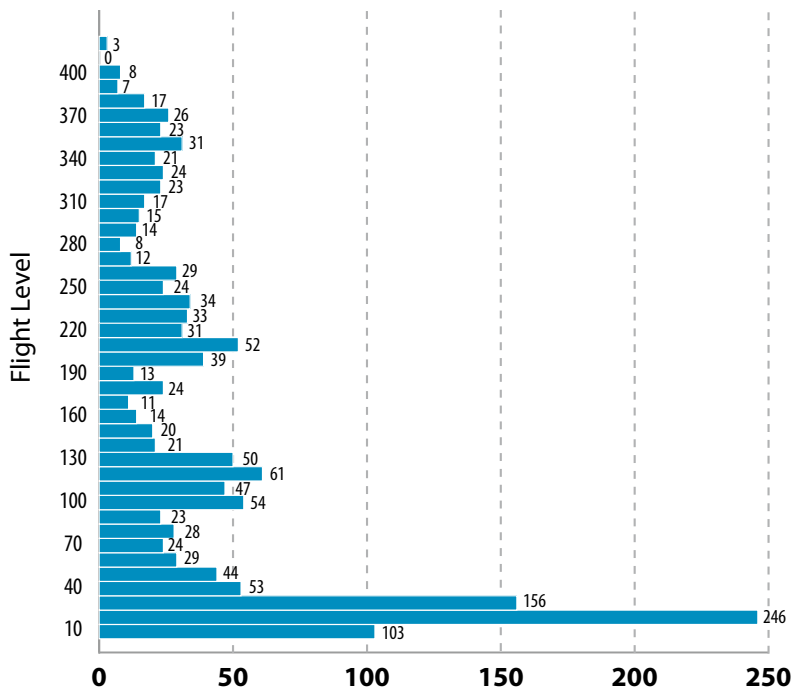
Figure 38 provides a graphic presentation of the number of times an airframe automatically reports an RA to the ground radar.



**Figure 38**  
**'Days reporting by airframe'**

## RA distribution by flight levels

Figure 39 Advisories by Flight Level below shows the number of RAs by Flight Level. The data has been merged from all 13 Radars for 2011. To obtain the statistics presented below all RA downlink messages from all Radars were merged into a single table and sorted on date and modes. These were then filtered to eliminate duplication of advisories by selecting only the first message from a series collected from the same Mode S address.



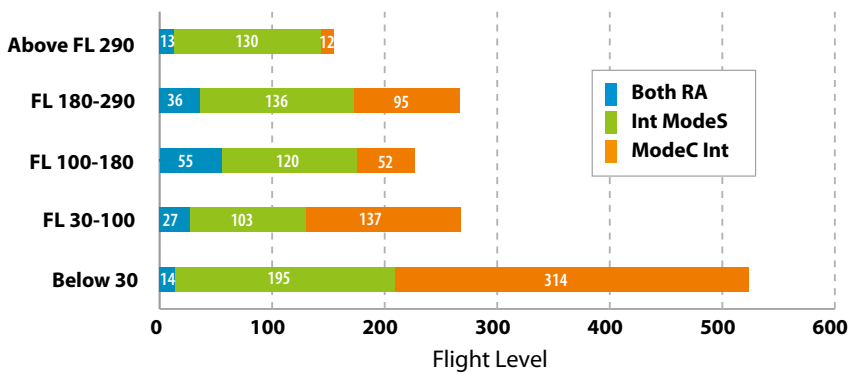
**Figure 39**  
**Advisories by Flight Level**

There is a large proportion of RAs between FL10 and 30 (33%). They are mostly against VFR traffic below controlled airspace. (Figure 40) ACAS equipage in Encounters shows the high number of Mode C Intruders at these levels.

### Intruder equipage by flight bands

The diagram below shows the number of RA events recorded on both aircraft and the number of events where only one aircraft reported an RA.

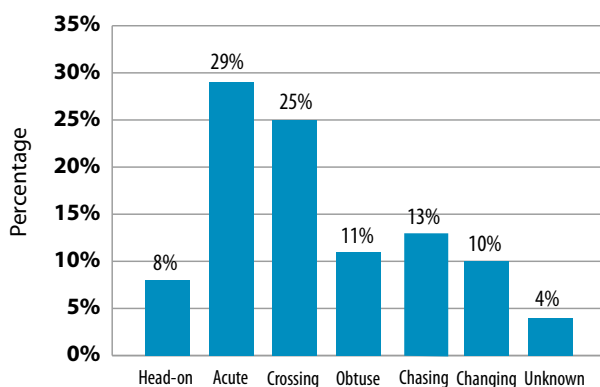
Events shown as an RA with a Mode S intruder are to a very large extent ACAS equipped. ACAS does not symmetrically generate RAs. There are many events where only one aircraft receives an RA, even though both are ACAS equipped. In 2011 both aircraft reported an RA in 10% of the recorded events however in the flight band FL100-FL180 both aircraft reported an RA in 24% of recorded events. RA with intruder Mode C are confirmed as Mode C intruders by the Own RA downlink. Below 3000ft 60% of recorded events were identified as Mode C and 37% percent identified as Mode S intruders. The reduction in Mode C intruders, may be due to the increase in the number of General Aviation aircraft fitting Mode S transponders.



**Figure 40**  
ACAS equipage in Encounters

At lower flight levels, the majority of RAs are against Mode C intruders, whereas at higher levels, most RAs are against intruders with Mode S or are coordinated ACAS encounters. A significant reduction of level off RAs in upper flight levels is possibly due to the increased use of 25ft reporting Mode S transponders.

### Horizontal geometry



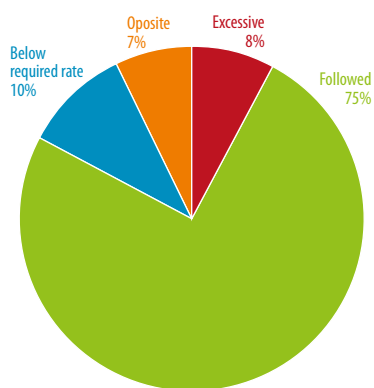
**Figure 41**  
Horizontal Geometry

Definitions of geometry are included in Annex 2.

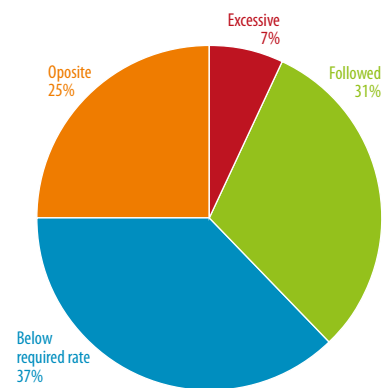
As expected this shows that the majority of RAs occur with acute and crossing tracks with 54% of events in this bends. The low number of head on geometry could be due to the fact that head on traffic is not normally climbing or descending, to within 1000ft in close proximity, when on the same airway in opposite directions. However it is usual to have aircraft aiming for 1000ft separation at airway crossing points. The unknown geometry occurs when ASMT cannot identify the intruder (i.e in cases where the intruder is below radar coverage).

## Pilot response 2011

For an RA that does not change for at least 2 radar cycles, i.e. 10 seconds, ASMT automatically calculates compliance with the RA. We see that 85% of pilots have at least adequately responded to the RA. There were 75% achieving the requested vertical rate and 8% exceeding the requested rate. 17% of responses were not satisfactory from a safety perspective with 10% either having a slow response or failing to achieve the requested rate and 7% were calculated to have made opposite responses. These are similar numbers to 2010 where analysis was for one radar. The numbers here are for all RAs from the 13 radars and include those from Military training and transport aircraft. Most of the military will fall in the Short RA sample in the diagrams below.



**Figure 42**  
Response to Standard RAs



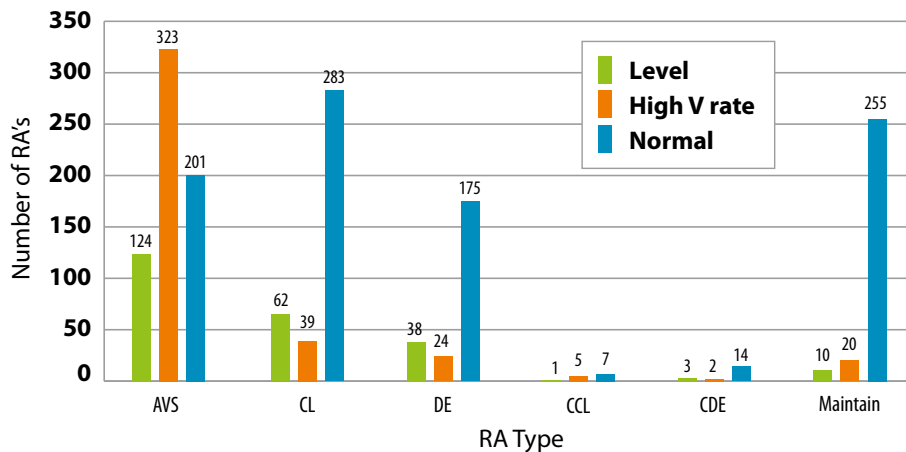
**Figure 43**  
Response to short RAs

For short RAs (540 events - 42%), where the RA is observed to change after one radar cycle (changes in less than 10 seconds), compliance with the RA is not as good, even though ACAS expects a quicker response from pilots. The ACAS logic expects an initial response to an RA in 5 seconds and only if the RA exists for less than 6 seconds do the responses here appear to be reasonable.

**The high level of opposite responses to changing RAs is a cause for concern and re-emphasizes the need for pilots to be trained to follow the full sequence of RAs that they receive.**

## Vertical rates at the time of the RA

The graph below shows how high vertical rates are predominant in the Adjust vertical speed advisories. This highlights the importance of the PANS-OPS change in 2008.



**Figure 44**  
**Own vertical Rates**

On 20th November 2008 PANS-OPS was changed to include the following recommendation:

*“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.”*

At the time of the first RA reports, 2011 analysis shows 26% of aircraft had a vertical rate exceeding 1500fpm. This is similar to 2010.

Pilots should be reminded of the provision in PANS-OPS shown above.

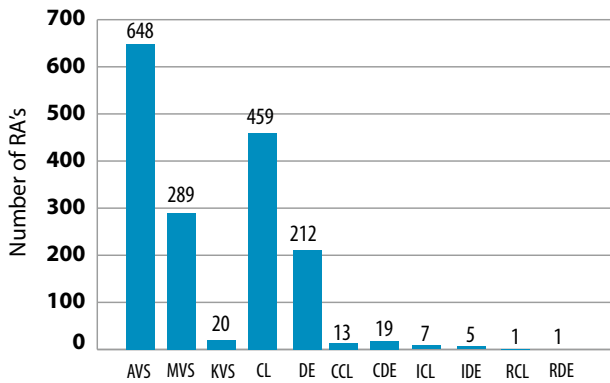
## Advisories issued

The table below shows the breakdown of advisories issued in percentages over 4 years of monitoring one radar and one year monitoring 13 Radars. The main difference is the increase in Climb RAs and decrease in the Monitor Vertical Speed data.

The reduction in the number and percentage of MVS (monitor vertical speed) RAs is probably due to the increased use of Mode S by general aviation aircraft at lower flight levels.

Code	Advisory	2007	2008	2009	2010	2011
AVS	Adjust Vertical Speed	36%	40%	38%	39%	39%
MVS	Monitor Vertical Speed	33%	23%	25%	23%	17%
CL	Climb	17%	21%	23%	20%	27%
DE	Descent	10%	12%	12%	12%	13%
KVS	Maintain Vertical Speed	2%	1%	1%	2%	1%
ICL	Increase Climb	0,6%	0,5%	1,5%	0,5%	0,4%
ICD	Increase Decent	0,6%	0,6%	1,1%	1%	0,3%
RCL	Reversal Climb	0,4%	0,0%	0,7%	0,9%	0,1%
CCL	Crossing Climb	0,0%	0,4%	0,4%	0,6%	0,8%
RDE	Reversal Descent	0,2%	0,3%	0,3%	0,6%	0,1%
CDE	Crossing Descent	0,4%	1,0%	1,0%	1%	1%
MUL	Multiple	0,0%	0,0%	0,1%	0%	0%

The ACAS advisories AVS and MVS do not require deviation from ATC clearance unless ATC requests a specific vertical rate. They correspond to 56% of RAs in 2011a reduction of previous monitoring from one radar.

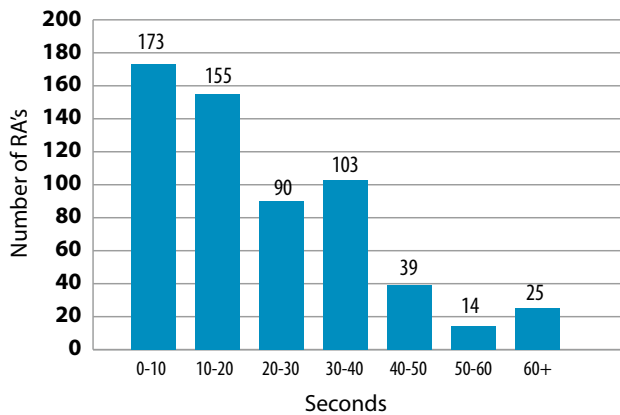


**Figure 45**  
**Distributions by RA Type**

Due to the method of extracting the statistics, the results here represent the number of events rather than the number of RAs covering four years.

**Time of RA downlink before Horizontal CPA- Closest Point of Approach**

Times were extracted for one of the radars to get an estimate of warning time that a controller might expect from RA downlink. The measurement was taken from receipt of first downlink received from the airframe to calculated Horizontal Closest Point of Approach (CPA) and is shown in 10 second bands up to one minute.



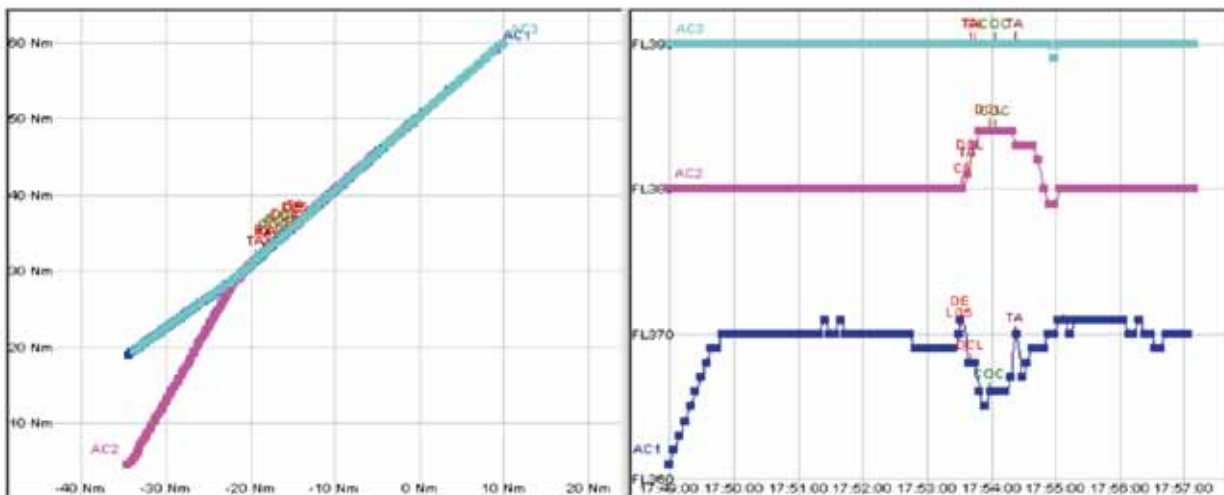
**Figure 46**  
**RA downlink to Horizontal CPA**

Table of times by Flight Band this shows the shorter warning times at lower levels

Band	Below 3000ft	FL 30-100	FL 100-180	FL180-290	Above FL290
0-10	83	34	24	13	19
10-20	88	35	16	11	5
20-30	24	34	16	8	8
30-40	7	20	34	28	14
40-50	6	6	9	14	4
50-60	1	5	2	5	1
60+	2	5	5	10	3

**Example of Three aircraft event.**

TCAS is designed to prevent collisions and is not designed to understand ATC clearances. This example highlights the RA sequence caused when one aircraft is cleared to fly in the opposite direction between two aircraft cleared 2000ft apart. The lower aircraft appears to encounter turbulence after climbing to level ahead of the aircraft 2000ft above.



What can be seen from this event is that for what ever reasons only 2 of the AC responded to TCAS despite all 3 receiving RA's. Also that AC2, in the middle, state in their report that the lower AC 1 was 500ft below yet the reality was that it was the higher AC3 that was 500 above and it may have been "garbling" of the labels on the ACAS display that led to the confusion. This is only conjecture but it highlights the need for Pilots to follow the RA and to advise ATC as soon as practicable. It may also be a case of what the Pilot "expected" to see, that is that because he received a TCAS "Climb" he "Expected " to see the intruder as the closest A/C that being 500' as apposed the true distance of over 1500' below.

Picture of the IVSI from AC2 taken from the InCAS simulator which shows how the misunderstanding could have been happened during the stress of responding to the RA.



#### Sequence of events from simulation

- 17:53:30: AC1 Corrective DCL 500
- 17:53:31: AC1 Corrective DES
- 17:53:32: AC2 Corrective CL
- 17:53:38: AC2 TA
- 17:53:40: AC2 Corrective DCL
- 17:53:40: AC3 TA
- 17:53:41: AC1 Corrective DCL
- 17:53:45: AC3 Corrective CL
- 17:53:58: AC1 COC
- 17:53:58: AC2 Corrective DCL
- 17:54:04: AC2 COC
- 17:54:04: AC3 COC
- 17:54:22: AC1 TA
- 17:54:22: AC3 TA

## 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](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](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](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](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.

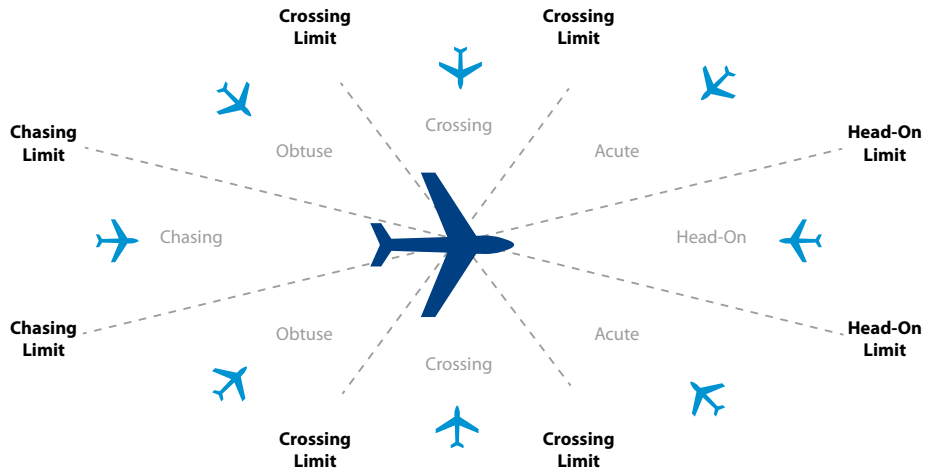
**Mental/Emotional/Personality issues (HERA):** include the following items

- 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/accents, situation not conveyed by pilots, pilot's breach of radio telephony (R/T), workload, misunderstanding/misinterpretation, and other pilot problems. Ground-Ground communication refers to misunderstanding/misinterpretation, poor/no coordination.

**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, low 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 – DEFINITIONS

<b>ACAS</b>	Airborne Collision Avoidance System
<b>ANSP</b>	Air Navigation Services Provider
<b>AO</b>	Aircraft Operator
<b>ASMT</b>	ATM Safety Monitoring Tool
<b>ATC</b>	Air Traffic Control
<b>ATM/CNS</b>	Air Traffic Management/Communication, Navigation, Surveillance
<b>CSS</b>	Call Sign Similarity
<b>ECAC</b>	European Civil Aviation Conference
<b>EVAIR</b>	EUROCONTROL Voluntary ATM Incidents Reporting
<b>FL</b>	Flight Level
<b>HEIDI</b>	Harmonisation of European Incident Definitions Initiative for ATM
<b>HERA</b>	Human Error in European Air Traffic Management
<b>LAN</b>	Local Area Network
<b>Mode C</b>	Altitude Reporting Mode of Secondary Radar (ICAO)
<b>Mode S</b>	SSR selective mode of interrogation
<b>NATS</b>	National Air Traffic Services (UK)
<b>OPS</b>	Operations
<b>PAN-OPS</b>	Procedures for Air Navigation - Operations
<b>RA</b>	Resolution Advisory
<b>RF</b>	Radio Frequency
<b>RWY</b>	Runway
<b>SARPS</b>	Standard And Recommended Practices
<b>SISG</b>	Safety Improvement Sub-Group
<b>SSR</b>	Secondary Surveillance Radar
<b>STEADES</b>	Safety Trend Evaluation and Data Exchange System
<b>TCAS</b>	Traffic Collision Avoidance System



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