EUROCONTROL

EVAIR Bulletin No 22

Years 2015 - 2019

SUPPORTING EUROPEAN AVIATION

FOUNDING MEMBER SESAR JOINT UNDERTAKING

NETWORK MANAGER

EVAIR BULLETIN

No 22

Years
2015-2019

CONTENTS

EVAIR FUNCTION MANAGER'S PERSPECTIVE

Dear readers,
In this EVAIR Bulletin, we cover the period 2015-2019. The trends shown are still upward or downward as the traffic remained unaffected by COVID-19. Traditionally, we have always combined European EVAIR and global IATA findings. The reason behind this is to offer ATM experts the possibility of comparing the European and global pictures.

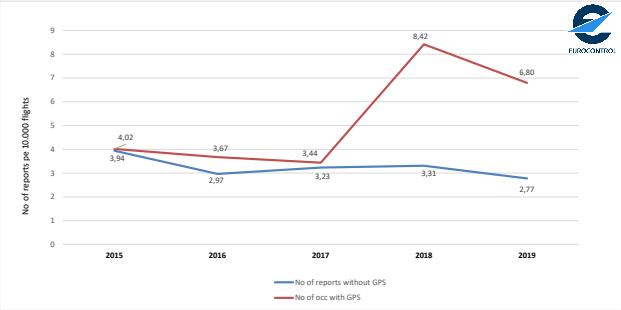

***Figure 1**: ATM occurrence trends in the period 2015-2019*

Data collection

Between 2015 and 2019, aircraft operators and ANSPs provided EVAIR with some 12,700 ATM reports, more than 8,600 GPS reports, and about 8,000 call sign similarity/confusion reports for the monitoring of the efficiency of the Call Sign Similarity De-Confliction Tool (CSST). In total, EVAIR collected about 29,300 reports in all data collection fields.

For the mentioned period, more than 350 aircraft operators (AOs) flying to/from Europe provided their reports to EVAIR. For the five-year period analysed, these airlines executed 39.3 million flights. All European ANSPs including some of the ANSPs from the Middle East, North Africa and the former Soviet Union including the Russian Federation participated in the incident data provision and the provision of feedback.

Feedback – reporting motivator and support for quick fixes

The feedback process, supported by the rich list of ANSP and AO contacts and facilitated by the EVAIR team, is the most important instrument in enabling the exchange of ATM occurrence information and SMS investigation results between AOs and ANSPs. In addition, the feedback process and SMS investigation results received with information about actions taken is the most important motivator for stakeholders to provide EVAIR with their occurrence reports. Early identification of problems through the handling of low level severity occurrences and provision of feedback enables a pro-active approach to safety, and ensures that identified problems can be fixed quickly or at least mitigated.
One of the indicators for the efficiency of the feedback process, but also for SMS investigations, is the timeframe needed to carry out investigations and prepare feedback on the occurrence reports submitted. For the period 2015-2019, it took on average 28 days to obtain the feedback. The best result was achieved in 2017 when the provision of the feedback took only 11 days. Good results were also achieved in 2018, when it took 18 days, and in 2019, when it took 16 days (Figure 2). Feedback, which is the product of SMS investigations by the AOs and ANSPs, makes the EVAIR database more complete.

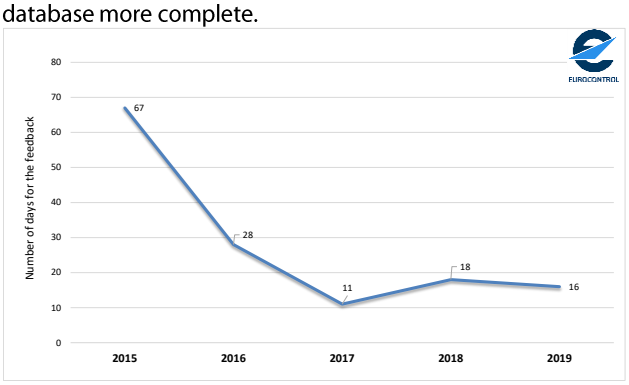

***Figure 2**: Timeframe for the provision of feedback in the period 2015-2019*

Main events

In this short summary, we discuss the trends in the various events which we regularly monitor in our Bulletin.

RPAS/drones – drop in 2019

After a significant increase in 2018, EVAIR recorded a drop in the number of drone events in 2019. The majority of drone events were reported by AOs during good visibility conditions. The approach phase continued to be the most affected, although there were some reports at much higher altitudes/levels (up to FL350). EVAIR does not conduct severity assessments of occurrence reports; however, according to the severity assessments conducted by airlines, 15% of RPAS/drone encounters were assessed as airproxes (i.e. serious incidents).

GPS outages – small drop in 2019

The total number of GPS reports in the EVAIR database expressed as a percentage grew from a few percent in 2015 to 60% in 2018 and 59% in 2019. Analysis of the geographical spread of GPS outages reports indicates that there is a very close connection between GPS outage/interference and politically disputed areas. From 2013, when EVAIR started GPS monitoring, to 2019, the traffic flows most affected remained the same: Middle East-Europe, South-East Mediterranean-Europe, and Middle East-North America/Canada via the North Pole. States which issued NOTAMs about potential GPS outages were Turkey and Cyprus, although the areas affected were much larger and encompass dozens of States.

ACAS RA occurrences – the lowest level in the last 10 years

In 2019, EVAIR recorded 0.39 ACAS RAs per 10,000 flights, which is the lowest level in the last ten years. The low number of ACAS RAs in 2019 could partly be linked to the overall reduction in the number ATM occurrences in 2019 compared with 2018 in the EVAIR database. However, the main facilitators for the continuous improvement are the number of actions and the studies, guidance documents, ACAS bulletins etc. produced. Over the entire monitored period, the en-route phase was the most affected, while among ACAS RAs, the instructions 'Level off, level off' increased in 2019.

Laser interference

In the five-year period (2015-2019), laser interferences made up 6.7% of the total EVAIR data. However, in 2019, EVAIR recorded a significant decrease in this percentage, with laser reports making up 2.4% of total EVAIR reports. Over a long period, the approach phase and low level altitudes were the most affected. Some 6% of laser threats occurred above FL300, which leads to the conclusion that these events were triggered by very powerful laser devices.

Call sign confusion

EVAIR uses two data sources to monitor the efficiency of the Call Sign Similarity De-Confliction Tool (CSST). One source is from airlines and the other from ANSPs. Reports from the airlines relate mainly to confusions, while those from the ANSPs concern similarities and confusions. 96 AOs provided their CSC reports to EVAIR. The reports provided made up 5.2% of the total number of ATM reports for 2015-2019. With regard to ANSPs and their CSS/C reports, for the period 2015-2019, EVAIR received more than 8,000 call sign similarity/confusion reports from 24 ANSPs.

Contributors to incidents

In 2019, "air-ground communication" accounted for almost 50% of the top seven contributors to ATM occurrences identified in the EVAIR database. Spoken communication, which encompasses CSC, language/accent, misunderstanding/interpretation, high R/T workload, etc., is a much bigger contributor than operational communication, which encompasses phraseology, hear back omitted, transfer of communication, handling of radio communication and R/T monitoring sector.

Stakeholder corner

IATA

As part of the ATM safety cooperation with EUROCONTROL, the International Air Transport Association (IATA) conducted full-year analyses of selected topics. These analyses allow high-level comparisons to be made between global and European ATM trends on selected topics.

The analysis was conducted using the datasets of IATA's GADM programs – Incident Data Exchange (IDX) and Flight Data Exchange (FDX) – which collect and collate multiple forms of aviation safety, operational and flight data. These databases are comprised of de-identified safety incident reports (ASRs) from over 200 and flight data from over 70 participating airlines throughout the world.

Moreover, the data is quality checked to assure reliable analysis results.

The scope of this analysis included research of ASRs and flight data for the years 2018 and 2019. During this time period, a total of 178,672 reports were submitted and collated into the GADM Incident Database. The airlines participating and submitting data to the GADM Incident Database represented a total of 11,457,510 flights from 2018 to 2019. This is equivalent to an average of 13% of the world's flights during this period.

For the same period, a total of 3,257,113 flights were collected in the Flight Data Exchange program (FDX).

Security and confidentiality

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

EVAIR suggestions/improvements

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

SUPPORT FOR THE MONITORING OF THE EUROPEAN SAFETY ACTION PLANS

EUROCONTROL and IATA regularly provide European and global ATM statistics for agreed areas, including ACAS RAs, call sign confusion, level busts, and runway incursions. Some of these areas also fall under Regulation (EU) No 376/2014 and Commission Implementing Regulation (EU) No 1018/2015.

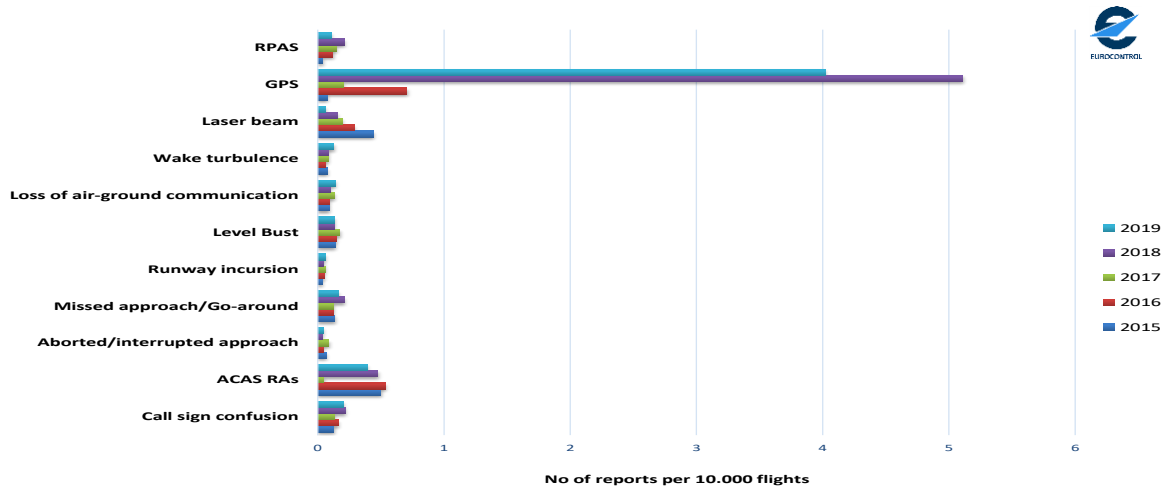

Figure 3: *European ATM events in the period 2015-2019*

The trends for 2019 in both the EVAIR and IATA global databases were quite similar. Four out of seven monitored areas showed the same trends in 2019 (call sign similarity/confusion, ACAS RA, loss of communication and level bust/altitude deviation), whilst three of them had opposite trends (go-around, runway incursion, and wake turbulence). However, when comparing IATA European airline trends with those of EVAIR, there are practically no trend differences in any of the monitored areas.

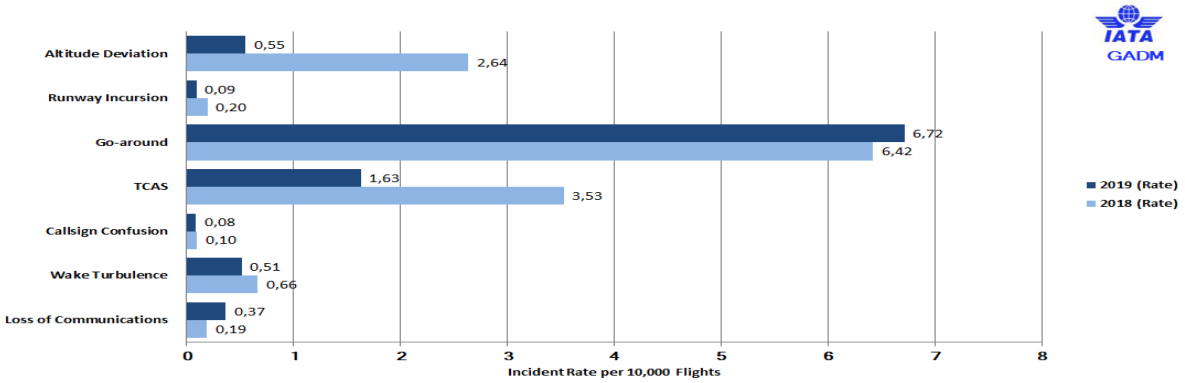

Figure 4*: IATA ATM events in the period 2018-2019*

To find out more about each of the event types, go to SKYbrary: (http://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Level_Bust; http://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Runway_Incursions; http://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Runway_Excursions_(EAPPRE).

To learn more about IATA GADM, go to: https://www.iata.org/en/services/statistics/gadm/

CONTRIBUTORS TO ATM OCCURRENCES IN THE PERIOD 2015-2019

Thanks to use of a taxonomy compatible with ICAO's ADREP 2000 and EUROCONTROL's HEIDI for those areas where ICAO's ADREP is insufficient, EVAIR is capable of identifying in the analysis various levels of causal factors for different types of event.

Figure 5 shows annual trends for various contributors existing in most of the different types of occurrence, especially those presented in Figure 3.

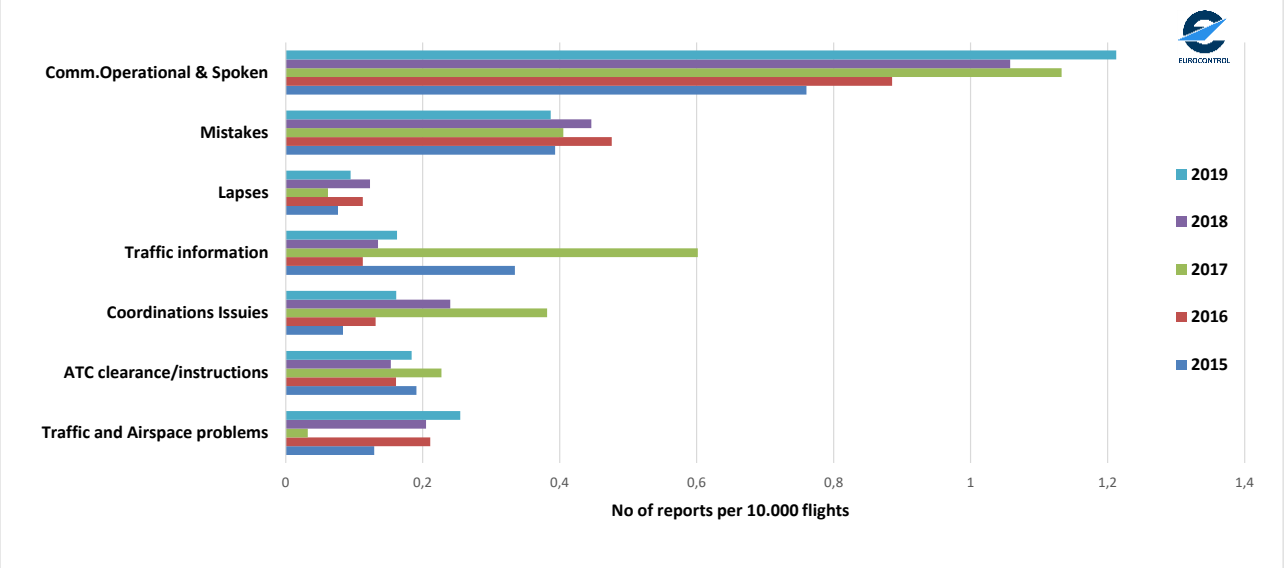

Figure 5: *Contributors to ATM occurrences in the period 2015-2019*

Throughout the entire monitored period, the number of reports concerning air-ground communication, which consisted of operational and spoken communication, was higher than for other monitored areas of concern. In 2019, operational and spoken communication recorded an increase of 14% compared with 2018.
Besides operational and spoken communication, the provision of "traffic information", "ATC clearance/instructions" and "traffic and airspace problems" recorded an increase in 2019 compared with 2018.

Three out of the seven main contributors monitored, i.e. "mistakes", "lapses" and "coordination problems", showed a decrease.

"Mistakes" cover areas such as judgment, planning, decision-making, knowledge, experience, failure to monitor, misreads or insufficiently learned information, etc. Of these, "planning" and "judgment" traditionally have the highest trends.
"Traffic information" covers three areas: incorrect and late information and no information provided.

"ATC clearance/instructions" covers the following areas: wrong runway, runway excursion, closed runway, occupied runway, turn direction, rate of climb/descent, assigned or specific speed, assigned or specific track/heading, climb/descent conditional clearance, approach clearance, etc.

"Lapses" covers detection, destruction, forgetting, identification of information, loss of awareness, monitoring, perception of information, receipt of information, timing, etc.

"Coordination problems" covers external coordination, internal coordination, and special coordination procedures with positions within the ATC suite and with sectors in the same unit.

"Traffic and airspace" covers airspace problems, pilot problems, traffic load/complexity and weather problems.

GO-AROUNDS IN THE PERIOD 2015-2019

"Go-around" is a normal phase of flight, yet at the same time, it is one of the last safety barriers. Pilots are invited to execute it whenever necessary. The reason that EVAIR and IATA STEADES monitor go-around is to identify safety problems associated with "go-arounds".

For the period 2015-2019, go-around reports made up 6.5% of the total ATM reports in the EVAIR database. More than 80 different airlines provided reports of go-arounds occurring in the European airspace. For the same period, EVAIR recorded go-around events associated with ATM safety problems in 52 States and 161 location across Europe. The number of States and locations where go-around occurred proves that this is a problem with a pan-European dimension.

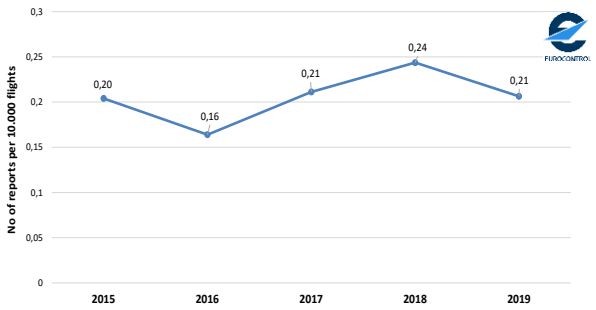

***Figure 6**: European go-arounds in the period 2015-2019*

For the period 2015-2019, EVAIR recorded relatively stable trends. A small drop was recorded in 2016 and a slight increase in 2018.

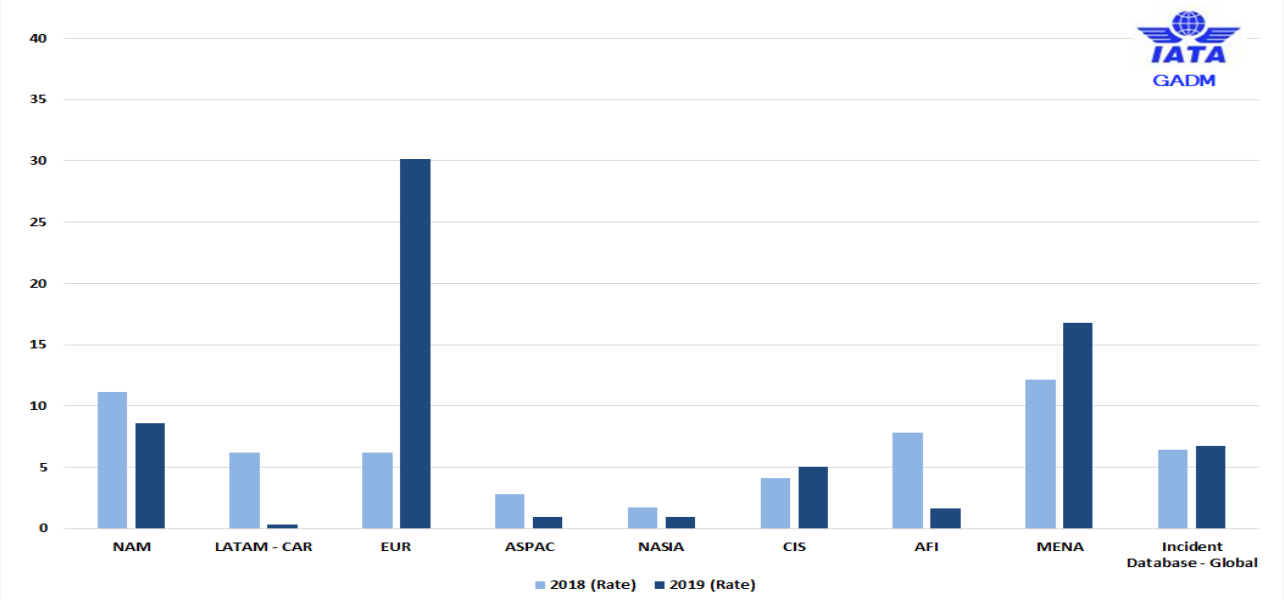

***Figure 7**: IATA global go-arounds in the period 2015-2019*

As in the previous EVAIR bulletin, IATA's new GADM database provided more detailed information. Indeed, in addition to identifying global trends it also identified trends across operators from eight IATA regions. Given that IATA launched the new GADM database in 2018, trends are provided for two years only.

At the global level, IATA recorded a very slight increase in go-around events in 2019; however, the European region recorded a very high increase.
Another two regions, CIS and MENA, recorded a slight increase in 2019, while the other five regions out of the seven monitored regions, recorded a decrease in go-around reports.

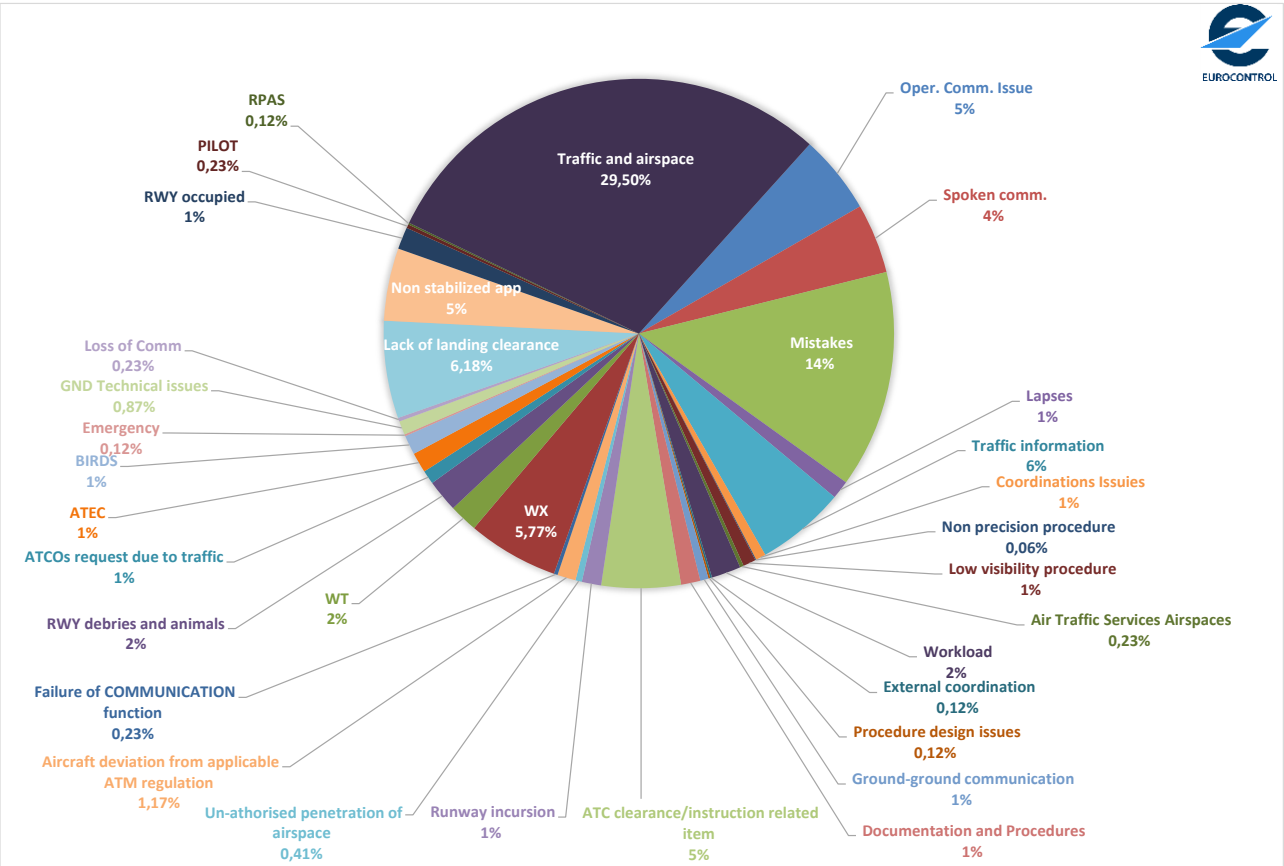

***Figure 8**: Go-around contributors in the period 2015-2019*

For the monitored period, the EVAIR team conducted different searches in the EVAIR go-around database. The outcome of these searches was the identification of 34 different safety problems associated with go-around (Figure 8). The majority of the safety problems associated with go-around which are presented above could be broken down further; however, for the sake of graph readability we kept the search at this level.

Some of the problems associated with go-around over a longer period occupy high positions in the long list of identified go-around causes. Among the causes with the highest percentage are: traffic and airspace, which include pilot familiarity with the airspace, traffic and airspace complexity; mistakes with planning, judgment, decision-making, failure to monitor and workload issues; air-ground communication, which includes operational and spoken communication; late or incorrect traffic information; ATC clearance, which incorporates speed and route assignments as well as approach climb and descent instructions; weather, which encompasses low visibility and wind; lack of landing clearance; and non-stabilised approach.

RUNWAY INCURSIONS IN THE PERIOD 2015-2019

For the period 2015-2019, runway incursions (RIs) made up 1.6% of the total number of occurrences in the EVAIR database. From the point of view of the number of occurrences, this percentage is not very high; however, given that runway incursions belong to the high-risk area and are part of the European Action Plan, EVAIR conducts regular monitoring.

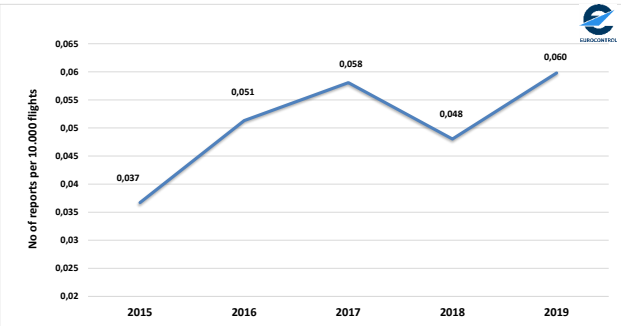

***Figure 9**: Runway incursions for the period 2015-2019*

The highest number of RI reports in the five-year period was reached in 2019.

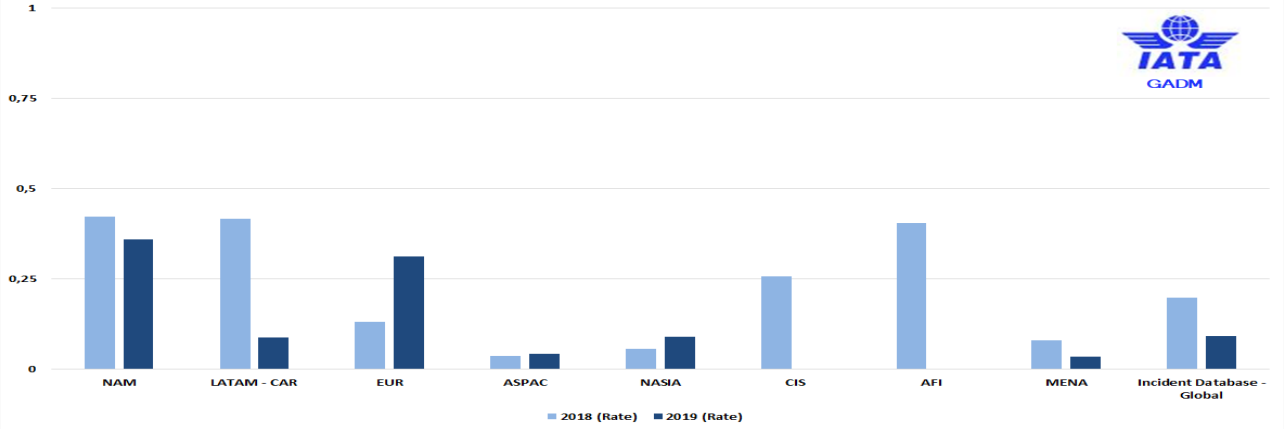

***Figure 10**: IATA global runway incursions in the period 2015-2019*

European operators reporting within the IATA GADM mechanism recorded an increase in RIs in 2019. In addition to European airlines, ASPAC and NASIA operators reporting to IATA GADM recorded an increase in 2019. It is interesting that CIS and AFI airlines reporting to IATA GADM did not record any RIs in 2019; this most certainly had an impact on the IATA global situation, which recorded fewer RIs in 2019 than in 2018.

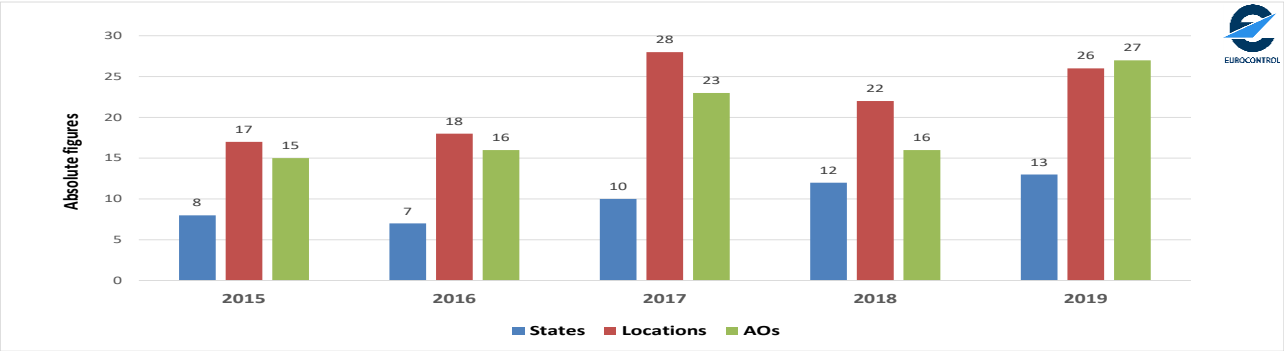

***Figure 11**: Number of States, locations and AOs reporting runway incursions in the period 2015-2019*

For the monitored period, EVAIR recorded in total 21 States and 70 different locations where RIs occurred. The number of States and locations is a clear indicator that RI is Europe-wide problem. In 2019, EVAIR recorded the highest number of States and aircraft operators experiencing RIs.

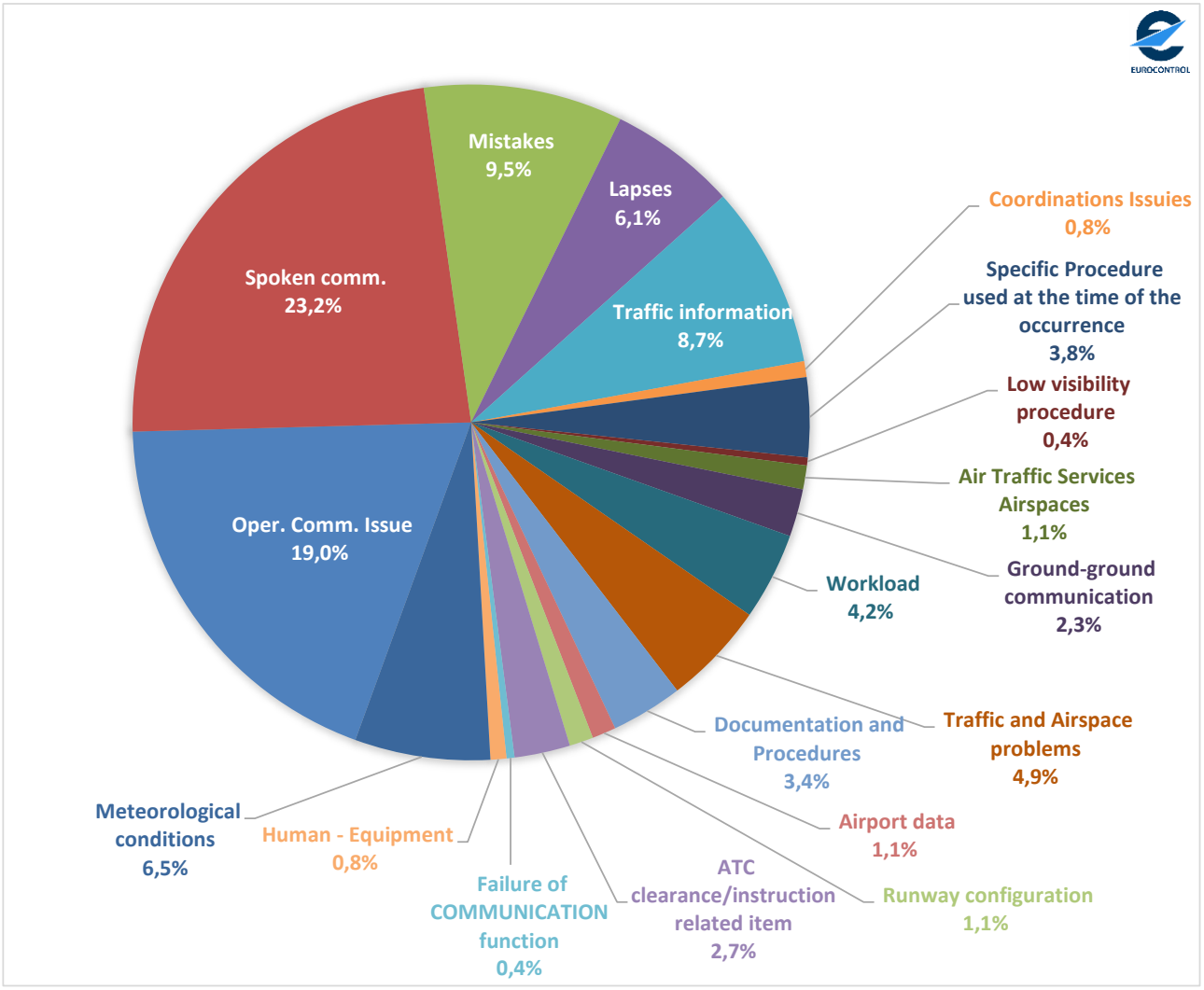

***Figure 12**: Contributory factors to runway incursions in the period 2015-2019*

An overview of the main causes of RIs shows that for many years, communication, which includes operational and spoken communication, has been the top cause. The same is true for the period 2015-2019. Besides communication, a few other causes like mistakes, traffic information and meteorological problems are significant contributors. The causes listed make up more than 70% of the overall RI contributors.
RIs could be associated with other types of ATM events. Go-around is the most frequent. For the monitored period, 10% of runway incursions were followed by go-around. This is a few percentage points less than in the previous five-year period. 71% of the go-arounds associated with RIs occurred due to aircraft on the runway.

More information about RI contributory factors, mitigating measures and recommendations can be found in the European Action Plans for the Prevention of Runway Incursions (and Excursions).
https://www.skybrary.aero/bookshelf/books/4093.pdf

LEVEL BUSTS IN THE PERIOD 2015-2019

Level bust occurrences accounted for 4.5% of all EVAIR reports for the period 2015-2019; this is the same percentage as for the 2014-2018 period. For the monitored period, TCAS RA played its role as a last barrier in 10.4% of "level bust" events. ATM contributed directly to level bust in 27% of cases while in 51% of cases, ATM was not involved. In the remaining 22%, ATM had an indirect contribution. A very slight level bust decrease was recorded in the EVAIR database in 2019 compared with 2018 (Figure 13).

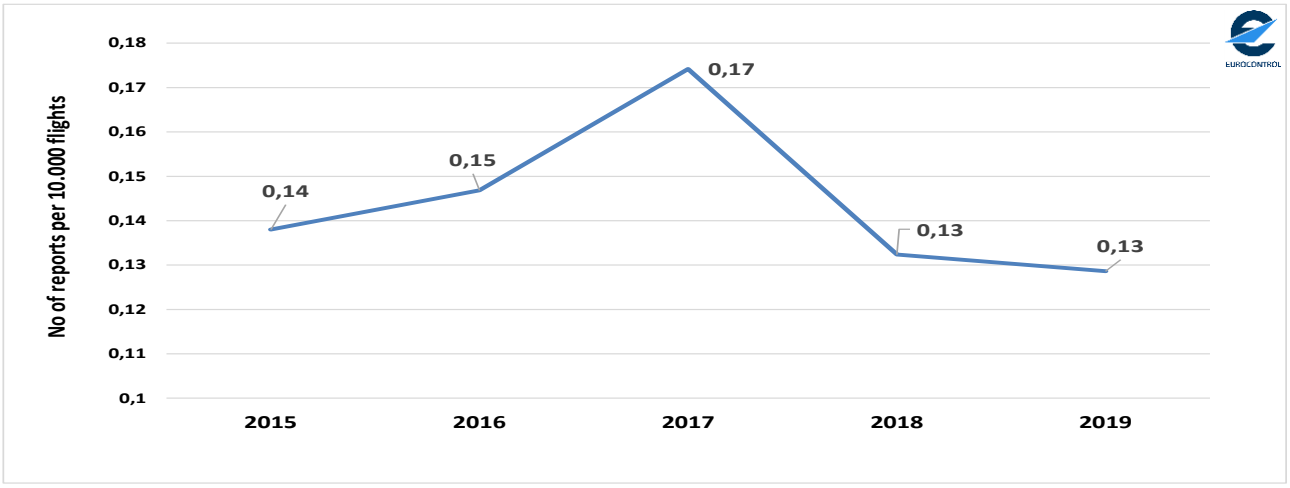

***Figure 13**: Level bust in the period 2015-2019*

In 2019, a significant level bust decrease was recorded at global level in the IATA GADM. On the other hand, European AOs recorded a slight increase (Figure 14).

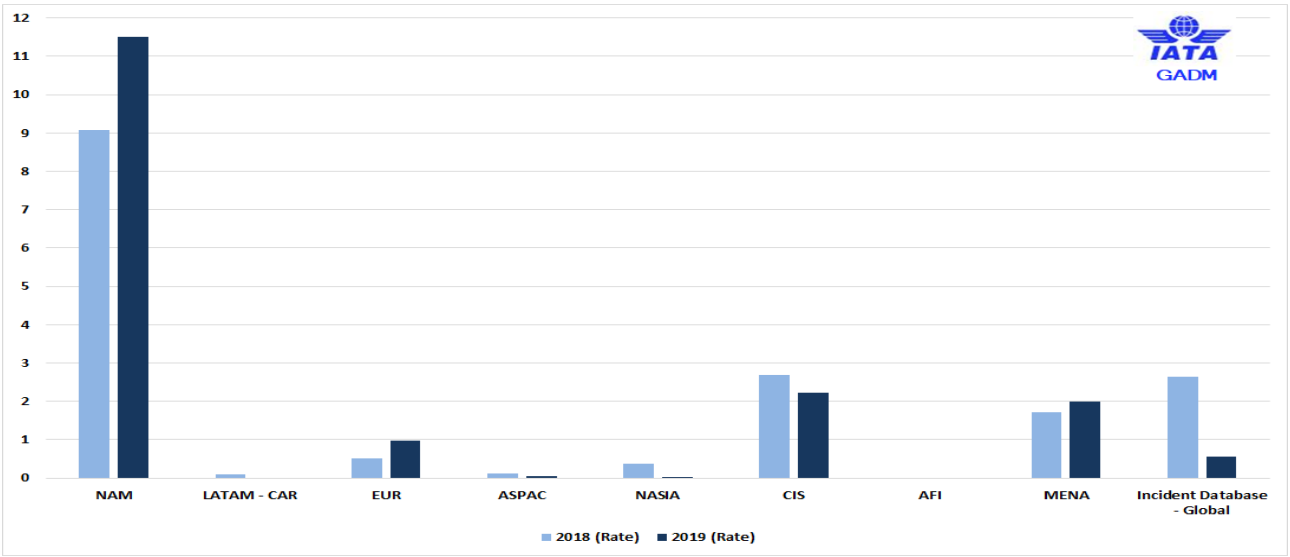

***Figure 14**: IATA global level bust in the period 2015-2019*

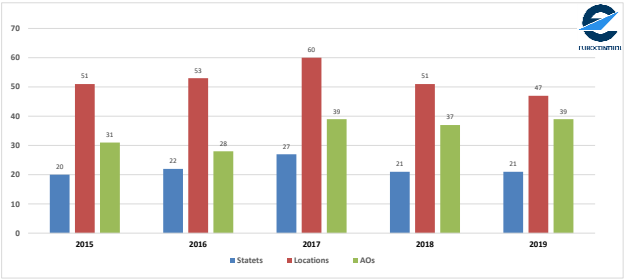

***Figure 15**: Number of States, locations and aircraft operators reporting level bust in the period 2015-2019*

Level bust is a Europe-wide problem. For the five-year period, level bust occurred in 48 different States and 135 locations. A slight fall in the number of locations but a slight growth of the number of AOs (39) reporting level bust events were recorded in 2019.

Over a long period, air-ground communication, encompassing hear back omitted, misunderstanding/misinterpretation, phraseology, call sign confusion, language/accent, poor/no coordination were the main causes of level bust (45%). In addition to air-ground communication, mistakes and traffic information had higher percentages over this period

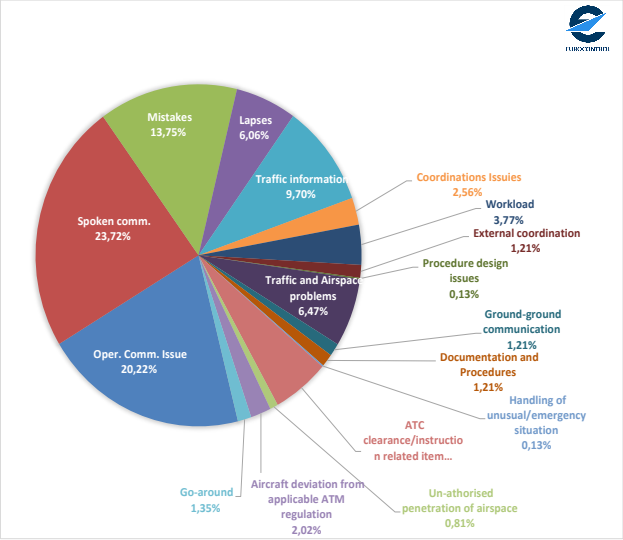

***Figure 16**: Level bust contributors in the period 2015-2019*

EVAIR SUPPORT FOR THE EUROCONTROL CALL SIGN SIMILARITY PROJECT

Following the request from the Call Sign Similarity User Group some years ago, EVAIR regularly monitors the effectiveness of the EUROCONTROL Call Sign Similarity De-Confliction Tool (CSST) and the associated CSS Service Level 1 (i.e. single aircraft operator de-confliction). The main objective of the monitoring is to record and, to a certain degree, analyse the call sign similarity and confusion (CSS/C) reports received from ANSPs and aircraft operators. There is a particular emphasis on data involving CSST user airlines, although the reports received of CSS/C events involving aircraft from non-CSST user airlines are also useful as they help provide a performance comparison between the two sets of operators. More importantly though, the information is also used to facilitate ad hoc mid-season changes to conflicting call signs, thus providing an ongoing safety benefit. Moreover, this activity does not concern only similarities within one airline's schedule but also works across airlines (irrespective of their CSST use status) and so provides a multi-AO dimension to the proceedings. EVAIR monitoring results are also used, inter alia, for CSST safety assessment and as a decision-making element to precede with Service Level 2.

EVAIR uses two data sources to monitor "call sign similarities" and "confusions"; one is from airlines and the other from ANSPs. The reports from the airlines relate mainly to confusions, while those from the ANSPs concern similarities and confusions.

PILOTS' REPORTS – CALL SIGN CONFUSION IN THE PERIOD 2015-2019

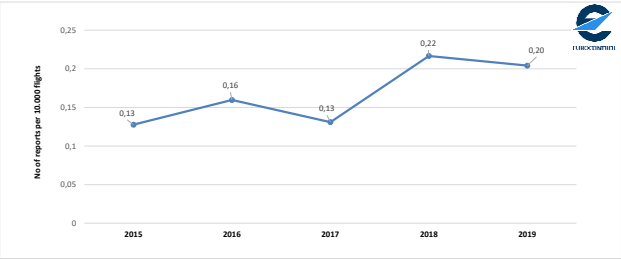

***Figure 17**: European call sign confusion reported by AOs in the period 2015-2019*

For the period 2015-2019, call sign confusion reports made up 5.2% of the total number of reports. For the same period, 96 AOs provided their call sign confusion reports to EVAIR
After three years of stable trends (2015-2017), an increase in CSC reports was recorded in 2018 whilst in 2019, EVAIR recorded a slight decline in CSC reports compared with 2018, but the level was still higher than that recorded in 2017.

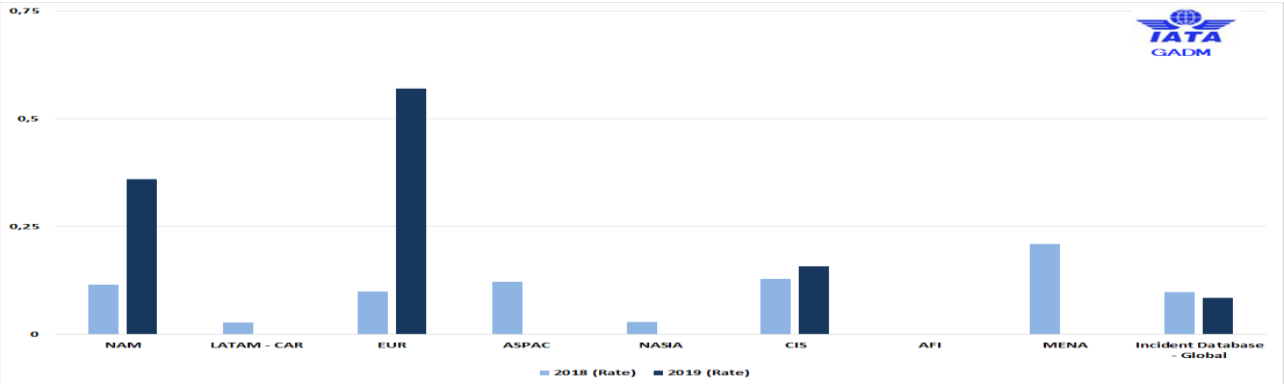

***Figure 18**: Global call sign confusion in the period 2015-2019*

IATA global data recorded a slight decrease in call sign confusion in 2019 compared with 2018, however among European airlines flying across the world, IATA recorded a significant increase in 2019.

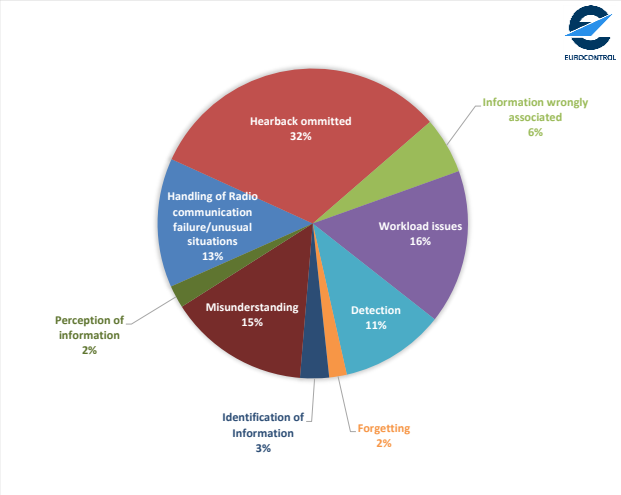

Figure 19: *Call sign ATM contributors in the period 2015-2019*

For the period 2015-2019, the percentage of direct ATM system contributions was 21%, which is higher than for the period 2013-2017, for example, when this was 14%. For the same period, the ATM system was indirectly involved in 33% of CSCs, whilst in 46% of cases there was no ATM system involvement. In 2019, CSC occurred in 43 States and 107 different locations with 96 AOs involved.

Among CSC contributors, hear back omitted traditionally has a high percentage. It is interesting that for this monitored period, EVAIR recorded workload issues as having a high contribution, which was not the case in the past. However, this is in the line with the fact that the highest traffic level was recorded in 2019.

As in the past, level bust is one of the events which is the most frequently linked with CSC and has a higher percentage than other areas of concern. It is interesting that "avoiding action taken by pilots or air traffic controllers" during CSC also has a high percentage (32%). Higher risk events linked with CSC are runway incursions (7%).

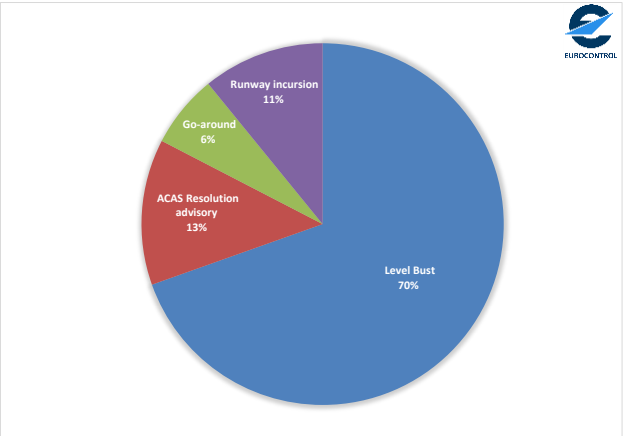

Figure 20: *Events associated with call sign confusion in the period 2015-2019*

AIR NAVIGATION SERVICE PROVIDERS' CALL SIGN SIMILARITY AND CONFUSION DATA 2015-2019

For the period 2015-2019, EVAIR received more than 8,000 call sign similarity/confusion reports from more than 20 European air navigation service providers. Although our stakeholders are aware of this, it is worth of highlighting that EUROCONTROL's call sign similarity/confusion reporting and data collection mechanism makes it possible to take ad hoc measures to resolve similarities. ANSPs wishing to benefit from the support of the EUROCONTROL Call Sign Management Cell Services provide the data on a daily basis; however, those who do not need such assistance provide their data on a monthly basis. The EUROCONTROL Call Sign Management Cell Services help to resolve problems quicker, at least in cases where AOs are willing to change their call signs on an ad hoc basis, before the end of the ongoing season.

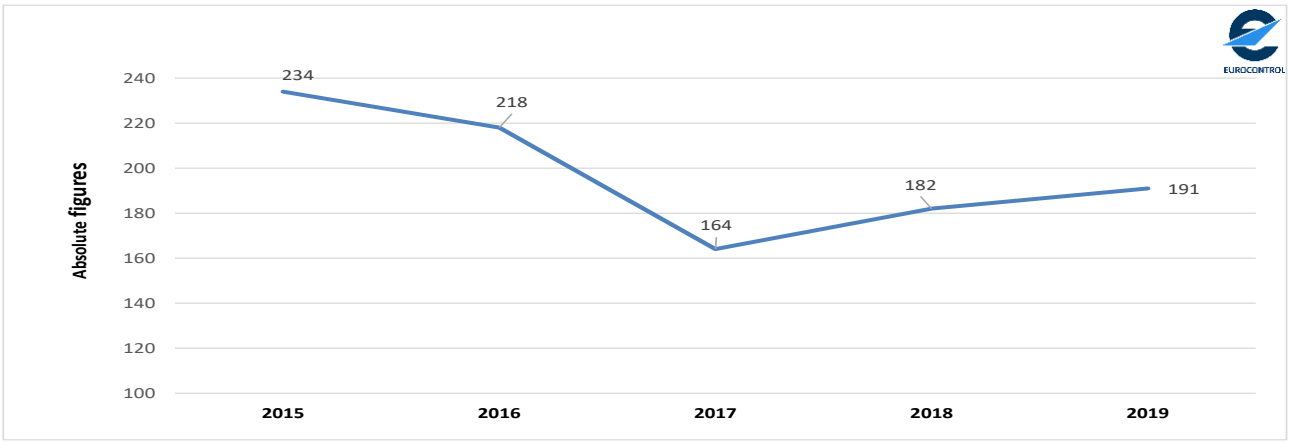

***Figure 21**: Number of AOs with CSS/C as identified by ANSPs in the period 2015-2019*

Figure 21 shows the number of AOs who had a problem with "call sign similarities and confusions". After reaching the lowest level in 2017, EVAIR recorded a slight increase in the number of AOs with "similar call signs" in 2018 and 2019. This could be linked to the traffic increase, especially in 2019, and the increase in the number of ANSPs which report to EVAIR. Various airline associations, above all ERAA and the biggest one, IATA, support EUROCONTROL in promoting call similarity/confusion activities and in that regard the use of the Call Sign Similarity De-Confliction Tool. European carriers are the most frequent users of the tool, however the number of airlines from other regions interested in the tool and application of the CSS de-confliction rules is increasing. Among non-European airlines, those from the Middle East are particularly active.

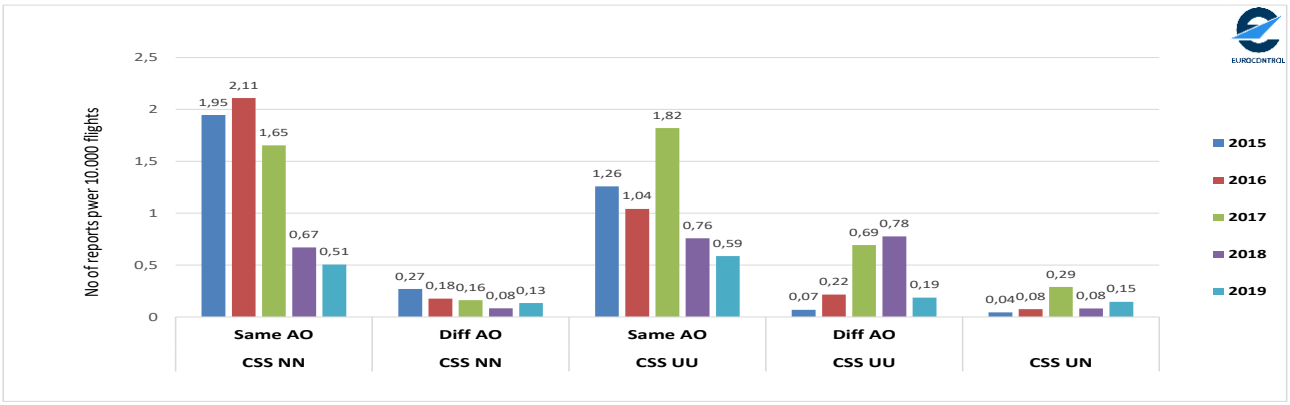

***Figure 22**: Call sign similarity among non-tool users and tool users in the period 2015-2019*

Call sign similarity statistics and EVAIR monitoring show that the problem is always with the single aircraft operator, whether a tool user or a non-tool user.
In the last three years, the trend in similarities occurring among tool users is slightly greater than among those who do not use the tool. Further monitoring and more in-depth analysis will be carried out in the future and we hope that it will be possible to identify a reason for this.

Explanation of abbreviations in Figures 22 and 23

CSS NN – Call sign similarity between airlines not using the tool
CSS UU – Call sign similarity between airlines using the tool
CSS UN – Call sign similarity between users and non-users
CSC NN – Call sign confusion between airlines not using the tool
CSC UU – Call sign confusion between airlines using the tool
CSC UN – Call sign confusion between airlines users and non-users of the tool

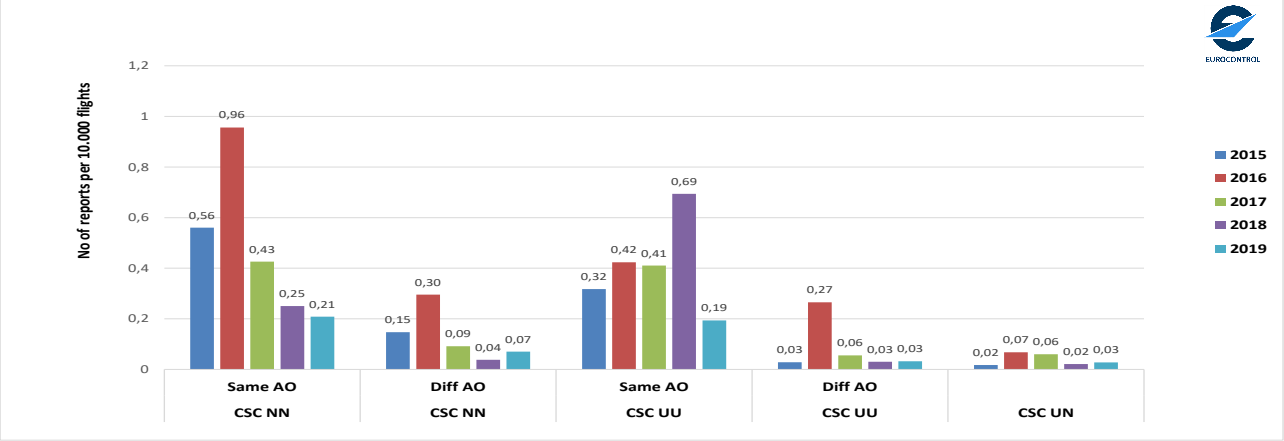

***Figure 23**: Call sign confusion among non-tool users and tool users in the period 2015-2019*

The situation with call sign confusion trends shows that single AO tool users have less confusion problems compared with non-tool users. The exception was in 2018. Deeper digging through the data showed that a high increase in confusions among single AO tool users was the consequence of a decision made by one of the AOs, with quite a high number of daily operations, to keep the ICAO three letter call sign designator but to change the R/T call sign. This created a number of confusions reported by ANSPs and the AO safety department which changed the R/T call sign and kept ICAO three letter designator. After a meeting with this specific AO initiated by EUROCONTROL, it was agreed that some measures needed to be taken to avoid escalation of the problem. The agreement was to change the current R/T call sign to a new one which was closer to the three letter designator, and to disseminate the awareness message to all European ANSPs in addition to the issued NOTAM. Regular monitoring proved that the decision and awareness initiative yielded good results, as in 2019 EVAIR recorded a significant decrease in the number of confusions among single AOs tool users.

CSST access and additional tokens

It has been very pleasing to note that new AOs continue to join the CSST family. A prerequisite for using the CSST is to have an NM token. It is also important to be aware that the service can be added to the existing token or an additional token can be purchased for only €200. This is a small price to pay compared with the time saved by using CSST; once added, CSST access will be guaranteed for the remaining life of the token. The hope is that the fee will not discourage AOs from signing up to use the tool, as it represents good value for money.

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

Please find the application form at http://www.eurocontrol.int/network-operations/access-service-request-form

Call Sign Management Cell (CSMC) support

The CSMC (nm.csmc@eurocontrol.int) is also on hand and can provide limited help to AOs to navigate the application process. The CSMC prepares the CSST for the forthcoming season and is available to discuss AO training requirements. Subject to CSMC staff availability, CSST familiarisation sessions may be provided in Brussels or, if requested, provided on-site at the AO's premises; both may be subject to UPP arrangements.

CSST operations update

No recent major updates have been made to the CSST.

Learn more about call sign similarity

Please contact the Call Sign Management Cell (CSMC) at nm.csmc@eurocontrol.int
You can find more information on the Call Sign Similarity Project at:
http://www.eurocontrol.int/services/call-sign-similarity-css-service

AIR-GROUND COMMUNICATION IN THE PERIOD 2015-2019

EVAIR bulletins within "air–ground communication" cover two main areas: "spoken" and "operational" communication. Both areas are part of and defined by the EUROCONTROL HEIDI taxonomy (**see definitions on page 40).**

In 2019, "air-ground communication" accounted for almost 50% of the top seven contributors to ATM occurrences identified in the EVAIR database, 5% higher than in 2018. Spoken communication, which encompasses CSC, language/accent, misunderstanding/interpretation, high R/T workload, etc., is a much bigger contributor than operational communication, which covers handling of radio communication, hear back omitted, phraseology, R/T monitoring sector and transfer of communication.

"Air-ground communication" continues to be the most frequent contributor to: "runway and taxiway incursions", "level busts", "ACAS RAs" and "go-around".

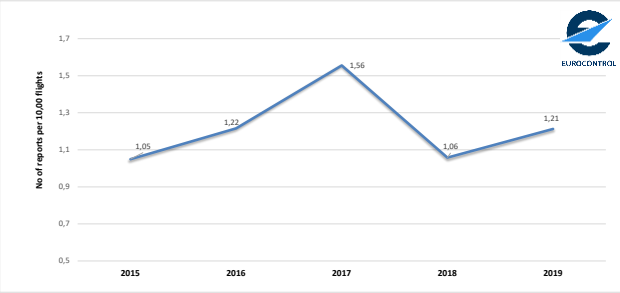

***Figure 24**: Air-ground communication in the period 2015-2019*

After the drop in 2018, air-ground communication in terms of the number of occurrences per 10,000 increased in 2019, almost reaching the level of 2016, which was second highest in the last five years.

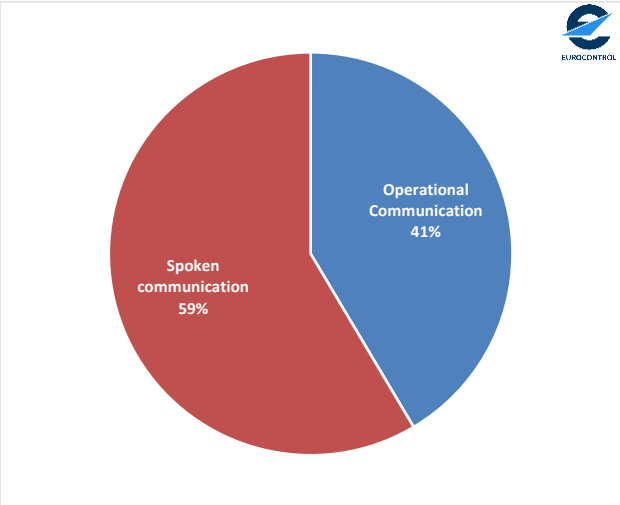

***Figure 25**: Spoken and operational communication in the period 2015-2019*

The percentage breakdown between "spoken" and "operational" communication within "air-ground" communication is in the long term in favour of spoken communication, which is very much related to knowledge of the English language, understanding and interpretation of the communication. In 2019, spoken communication recorded an increase compared with 2018, while operational communication recorded a lower trend than in 2018.

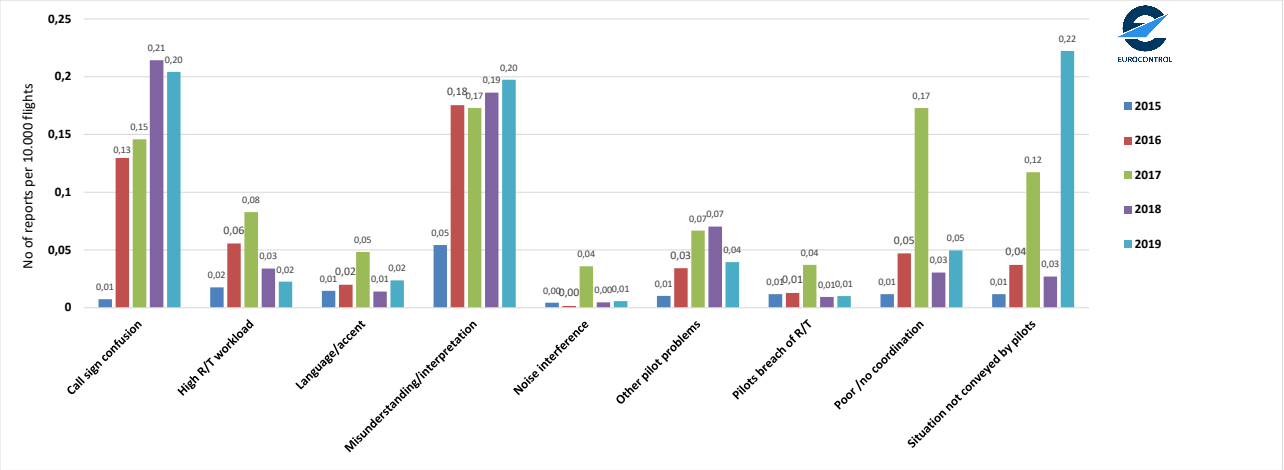

Figure 26: Spoken communication in the period 2015-2019

Within "spoken communication", "misunderstanding/interpretation" is the area which in general has higher trends. In the last two years, this area recorded an increase. Call sign confusion is also an area within spoken communication. CSC was at its highest in 2018. It is interesting that "situation not conveyed by pilots" recorded a significant increase in 2019. More analysis is needed to identify the reasons behind this.

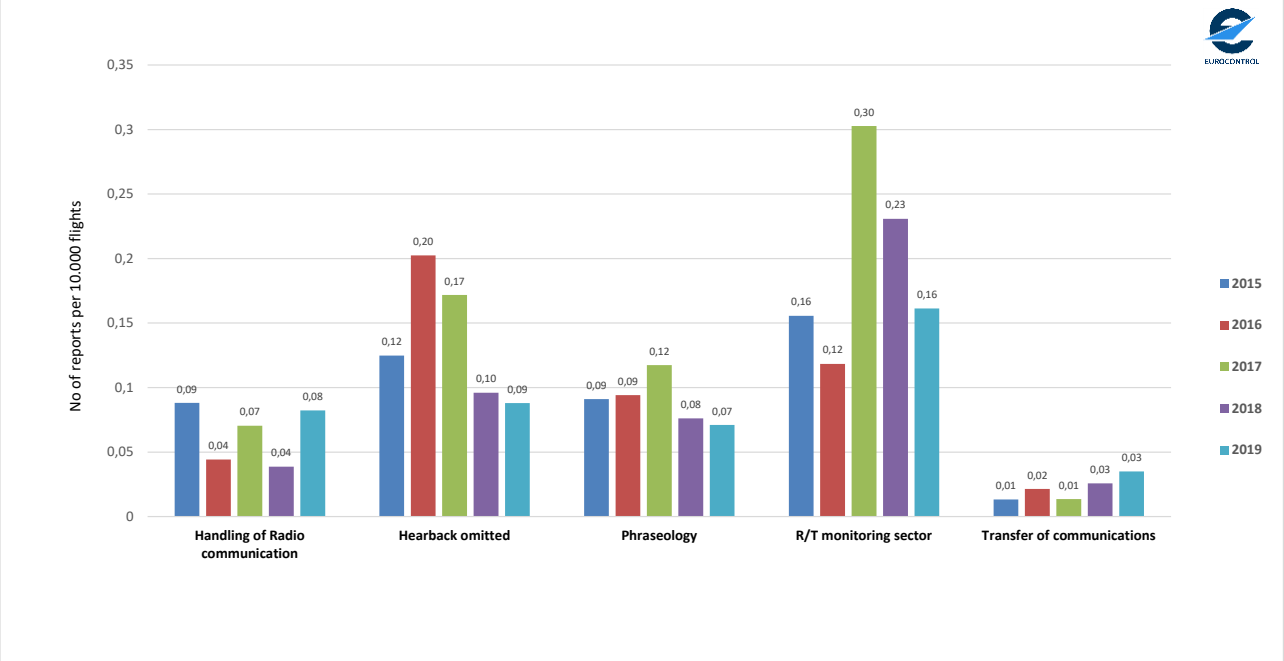

Figure 27: Operational communication in the seasons 2015-2019

Within operational communication, out of the five monitored areas only two recorded a slight increase in 2019: handling of radio communication and transfer of communications. All other areas recorded a decreasing trend in 2019 (Figure 27).

LOSS OF COMMUNICATION IN THE PERIOD 2015-2019

Both EVAIR (at European level) and IATA GADM (at global level) perform analyses in support of EUROCONTROL's project on the loss of communication.

For the period 2015-2019, loss of communication reports made up 3.6% of the total number of ATM reports in the EVAIR database. For the monitored five-year period, loss of communication occurred in 51 different States across Europe and 112 different locations. For the same period, the ATM system had a direct impact on loss of communication events in 12% of cases and had an indirect impact in 14% of cases. In 74% of cases, the ATM system was not involved.

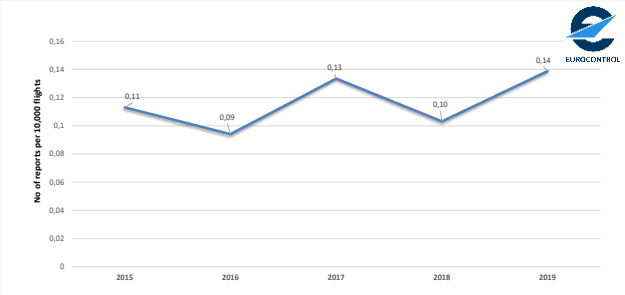

***Figure 28**: Loss of communication at European level in the period 2015-2019*

In 2019, EVAIR recorded the highest trend in the last ten years (Figure 28). At the global level, in 2019, IATA GADM recorded a significant increase in loss of communication events among the European airlines flying across the world. It is necessary to bear in mind that European airlines conducted the majority of their operations within European airspace .

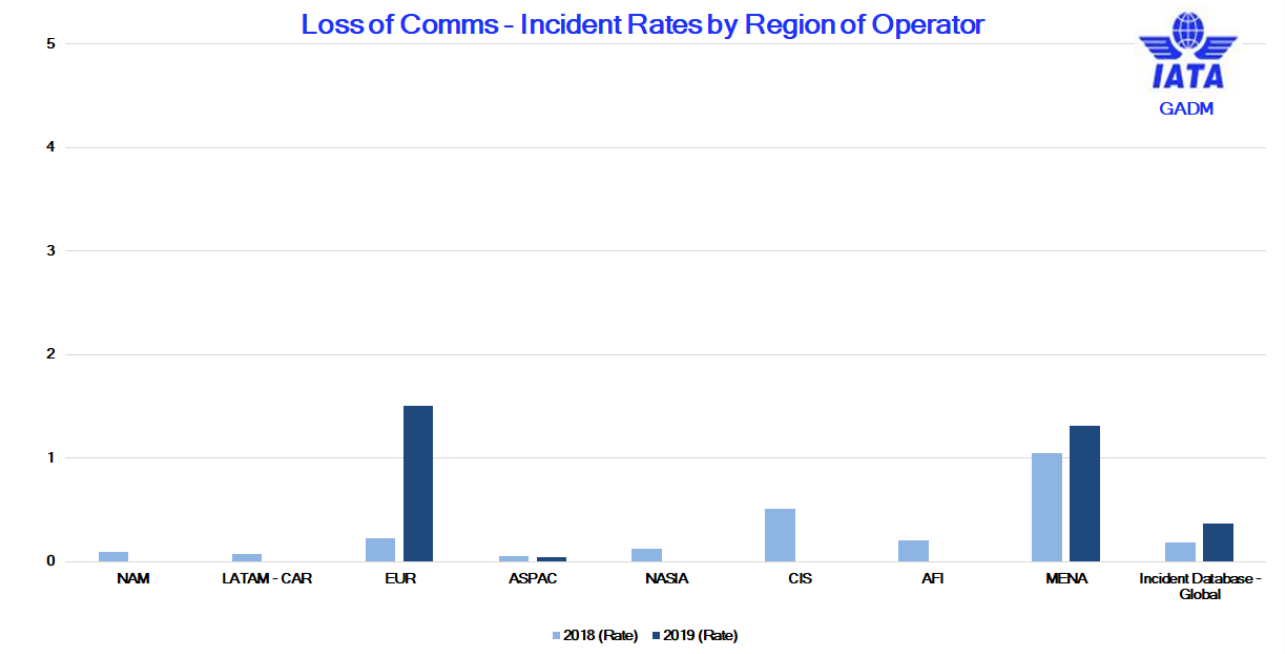

***Figure 29**: IATA global loss of communication in the period 2018-2019*

IATA GADM also recorded an increase in loss of communication events at the global level, but not as high as among the European member airlines (Figure 29). This leads us to think that within the IATA GADM database too, a high number of loss of communication events could have occurred within European airspace.

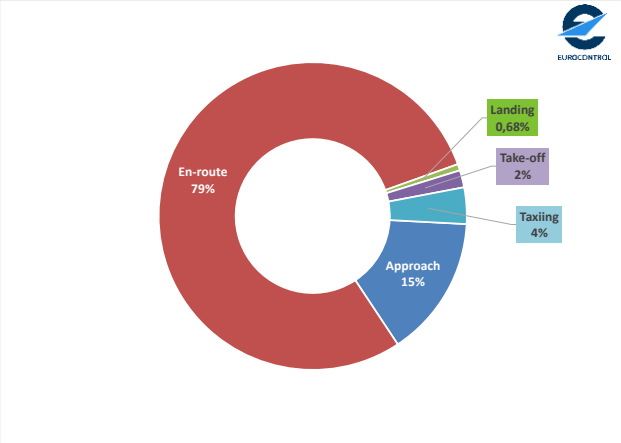

Figure 30: *Loss of communication according to phase of flight in the period 2015-2019*

Over a long period of time, most loss of communication occurred in the en-route phase of the flight. However, from the risk point of view, loss of communication events occurring in the approach phase usually carry a higher degree of risk. In the en-route phase of flight, the most frequent problems linked with loss of communication were handling of radio communication.

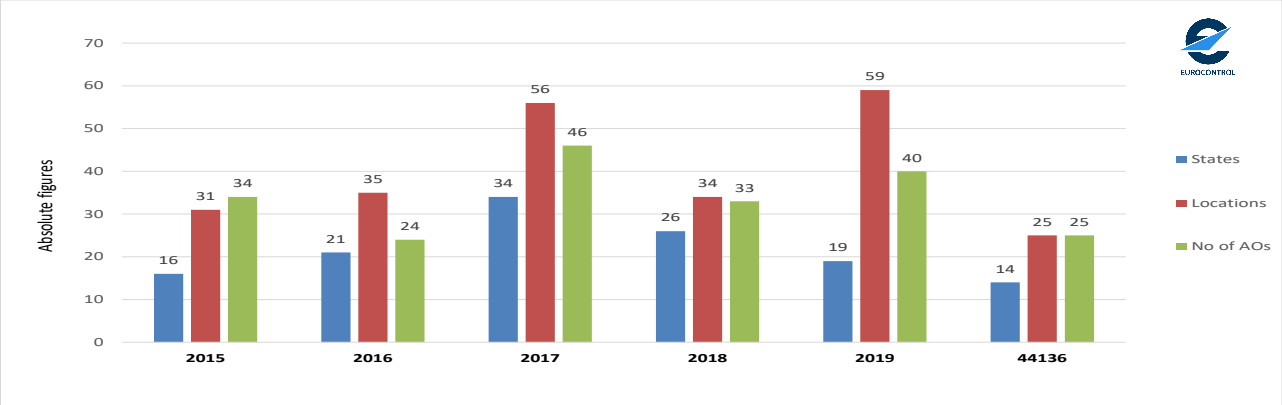

Figure 31: *Number of States, locations and AOs reporting loss of communication in the period 2015-2019*

Within the five-year period, EVAIR recorded the highest number of locations affected by loss of communication in 2019. The increase was more than 70% compared with 2018.

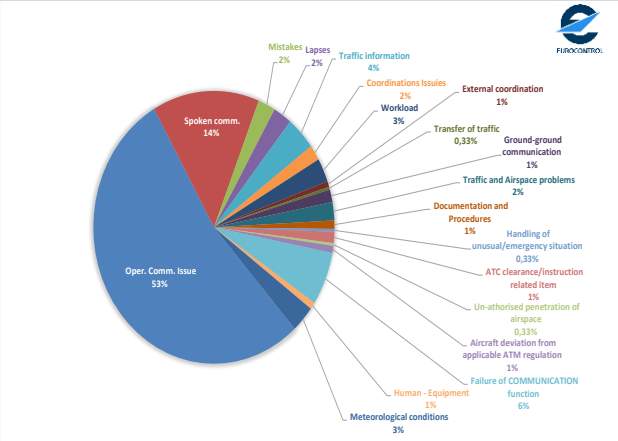

Figure 32: *Loss of communication contributors 2015-2019*

Over a long period, air-ground communication, consisting of operational and spoken communication, have recorded high percentages as loss of communication contributors. Figure 33 shows the breakdown of operational communication contributors.

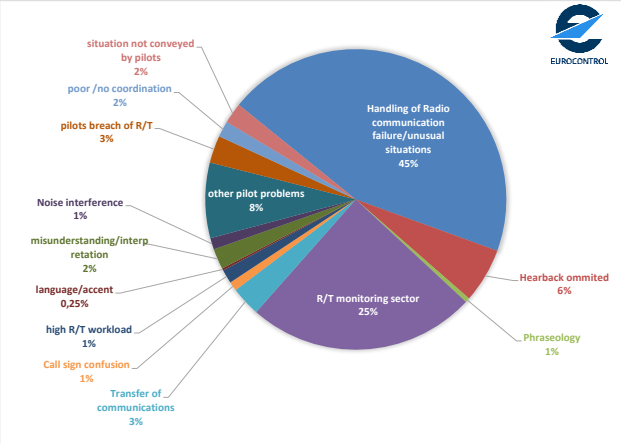

***Figure 33**: Loss of communication contributors in the period 2015-2019*

As in the previous seasons, the main contributor to "loss of communication" is "handling of radio communication failure/unusual situations", which accounted for almost 45% of cases. "Handling of radio communication failure/unusual situations" encompasses wrong frequency selection, forgetting to change the frequency, lack of ATC instruction to change the frequency, etc.

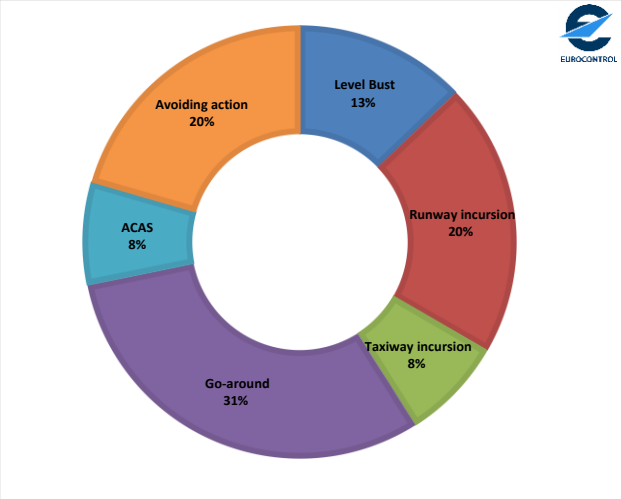

***Figure 34**: Events associated with loss of communication in the period 2015-2019*

Most often, loss of communication events were associated with go-around; however according to the reports, the most risky loss of communication events were those linked with runway incursions.

SPECIFIC EVENTS
LASER THREATS ACROSS EUROPE IN THE PERIOD 2015-2019

Laser threats account for 6.7% of the total number of EVAIR ATM occurrences recorded for the period 2015-2019.
From laser reports we see that the main players, pilots and air traffic controllers, act in accordance with agreed procedures, which is the key to mitigating possible consequences. A look at a ten-year rather than only a five-year trend shows that "laser threats" recorded a significant decreasing trend from 0.96 in 2010 to 0.06 laser threats per 10,000 flights in 2019.

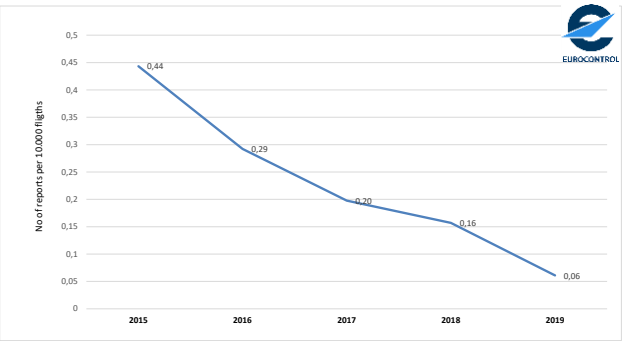

***Figure 35**: Laser interference in the period 2015-2019*

Over a long period, the most affected phase of flight was approach with a rate of 82%. This is understandable bearing in mind that lasers, which can be easily found on the market, are not very powerful. However, it is important to highlight that in the database, we found that more than 6% of laser threats occurred above FL 300, which leads us to conclude that these were very powerful laser devices. In some reports, pilots highlighted that some interferences were highly accurate and lasted a few minutes. In the database, high level laser attacks cannot be linked with a specific region. They are spread across the whole of Europe.

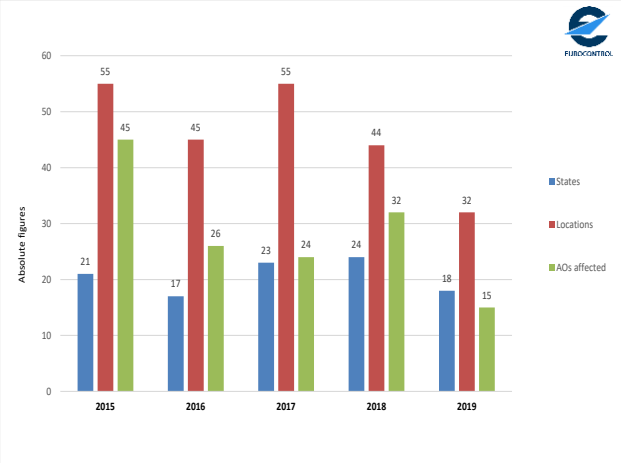

***Figure 36**: Number of States, locations and AOs reporting laser interference in the period 2015-2019*

In line with the decreasing trends for laser threats, the yearly number of States, locations and aircraft affected by laser interferences decreased in 2019. In the long term, big hubs are the most affected, although there were increasing trends in a few regions which are at the periphery of ECAC States.

Reports can be sent to:
dragica.stankovic@eurocontrol.int
More information about lasers is available on SKYbrary (www.skybrary.aero).

RPAS – REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)/DRONES IN THE PERIOD 2015-2019

EUROCONTROL Voluntary ATM Incident Reporting (EVAIR) RPAS/drone statistics are based on ATM incident data provided by commercial aircraft operators (AOs) and European air navigation service providers (ANSPs), including a few air navigation providers from neighbouring regions. The clear majority of reports come from aircraft operators.
RPAS occurrences account for 3.9% of the total EVAIR reports in 2015-2019.

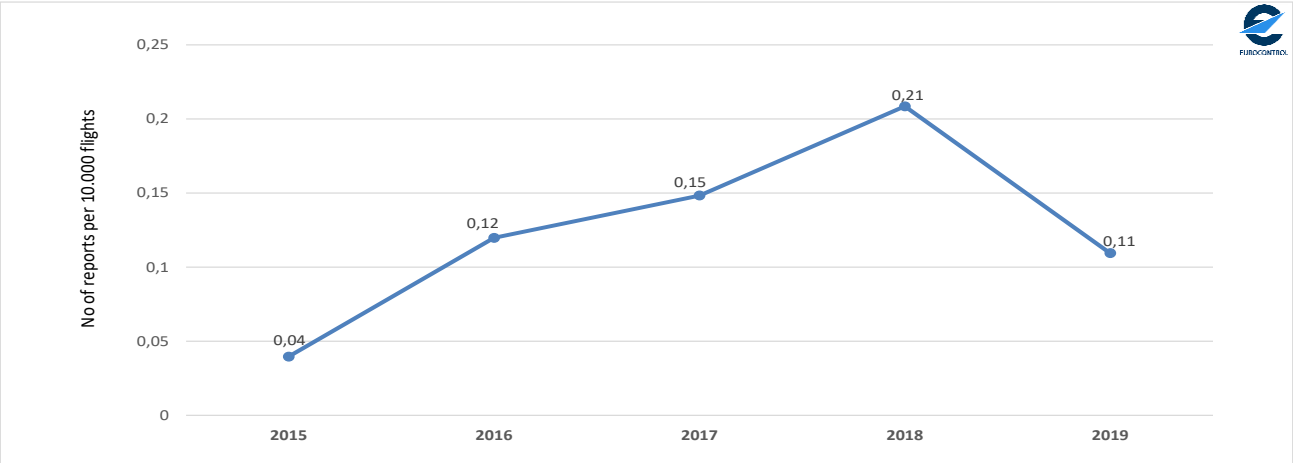

***Figure 37**: RPAS trends in the period 2015-2019*

Over a long period, RPAS/drones were recorded at low altitudes. However, a few events within each year of the tracked period were recorded at higher altitudes, up to FL350. During good weather and thus good visibility conditions, pilots were able to describe in detail the shape, size and colour of drones, indicating horizontal and vertical distances from the aircraft, which in some cases could be literally a few meters vertically or horizontally. Like with laser interferences, pilots report drone encounters to ATC and, vice versa, ATC warns pilots about potential problems with drones on their route. In a few reports, when safety was compromised, we saw that ATC temporarily stopped arrivals and departures due to unknown and uncontrolled drones in the approach area.

EVAIR does not conduct severity assessments of occurrence reports; however, according to the severity assessments carried out by airlines, 15% of RPAS/drone encounters were assessed as airproxes. This means that they were treated as very serious occurrences.

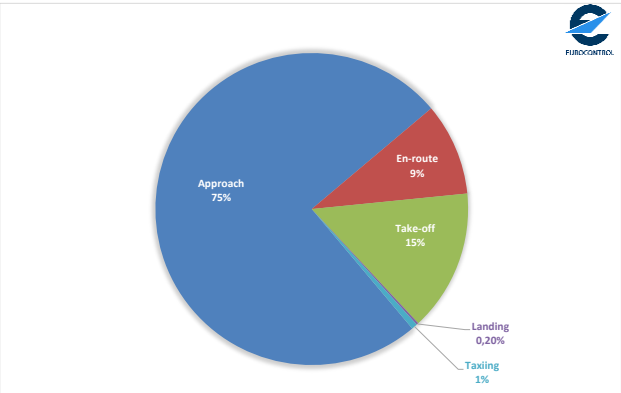

***Figure 38**: RPAS phases of flight in the period 2015-2019*

The largest number of drone occurrences occurred at low altitudes and during the approach phase, either during arrival or departure.
EVAIR recorded 9% of encounters in the en-route phase. It is interesting that some drone encounters at high altitudes occurred in politically disputed areas. This leads us to conclude that these were most probably military drones which were not coordinated with ATC.

Number of States and locations reporting RPAS/drones

In line with the reduced number of RPAS/drone occurrences in 2019, EVAIR recorded a reduction in the number of States and locations reporting RPS/drones occurrences.

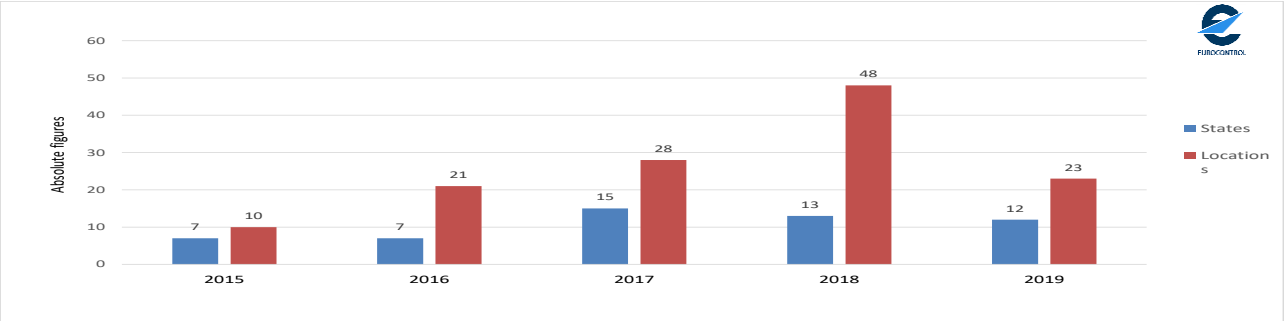

***Figure 39**: Drone spread across European States in the period 2015-2019*

For the entire period 2015-2019, EVAIR recorded drones/RPAS encounters in 73 different locations. Similar to lasers interferences, drone/RPAS encounters are the most numerous during the approach phase of big European hubs.

The following links contain further information on RPAS/drones, published by various international organisations:

ICAO 'Manual on RPAS' (Doc 10019) http://cfapp.icao.int/tools/ikit/rpasikit/story.html;
EC 'Roadmap for the integration of civil RPAS into the European aviation system' www.ec.europa.eu/transport/modes/air/news/2015-03-06-drones_en.htm;

EUROCONTROL is cooperating with all European aviation stakeholders in activities aimed at safely integrating UAS. **You can read more about EUROCONTROL involvement in the RPAS field here:** http://www.eurocontrol.int/uas
EASA 'Concept of operations for drones' https://www.easa.europa.eu/system/files/dfu/204696_EASA_concept_drone_brochure_web.pdf;
https://www.easa.europa.eu/newsroom-and-events/news/partners-step-efforts-address-integration-drones-european-airspace

http://jarus-rpas.org/ - Joint Authorities for Rulemaking on Unmanned Systems

GPS OUTAGES IN THE PERIOD 2015-2019

The history of GPS outages within EVAIR starts in 2013 when first reports of GPS problems were identified and the aviation community was alerted. The cooperation to collect, monitor and analyse GPS outages was established at a very early stage with IATA. Later on, the cooperation was established with EASA and ICAO.

The team which has been dealing with GPS outages at EUROCONTROL is composed of navigation and surveillance experts, in addition to EVAIR experts.

The total number of GPS reports in the EVAIR database expressed as a percentage grew from a few percent in 2015 to 60% in 2018 and 59% in 2019. The increase in GPS outage reports coincides with the EVAIR requests to AOs to provide their GPS reports, the increase in the traffic and the increase in political tensions in the politically disputed regions, South-East Mediterranean and Black and Caspian Sea.

Well-established EVAIR processes for data collection and analysis include, in addition to all European ANSPs, more than 250 AOs which provide their ATM safety reports on a regular bases. So far, approximately half of the total number of AOs which cooperate with EVAIR have provided their reports of GPS problems.

The reports provided are used to publish different types of EVAIR analysis and to share them with the widest aviation community including EASA and ICAO. GPS de-identified reports are also used to provide support with the internal EUROCONTROL activities relating to data, of which GNSS is the most important. At the request of our main stakeholders, AOs, ANSPs but also international organisations, EVAIR conducts GPS customised analysis.

For the period 2015-2019, more GPS problems were reported in PBN airspace and airports where SID/STAR procedures are based on satellite navigation. In this regard, we saw more reports in the South-East Mediterranean airspace. Due to the vulnerability of satellite navigation, aircraft operators repeated their requests to ANSPs to reconsider their plans to decommission ground navigational aids.

Raising awareness among aircraft operators and ANSPs about the potential loss of GPS signal is important in order to prepare pilots to switch to other types of navigation.
In this regard, IATA, EUROCONTROL as well as EASA, as the EU regulator, are very active. In addition, certain aircraft operators have issued internal NOTAMs to their pilots, alerting them to potential problems with GPS signals.

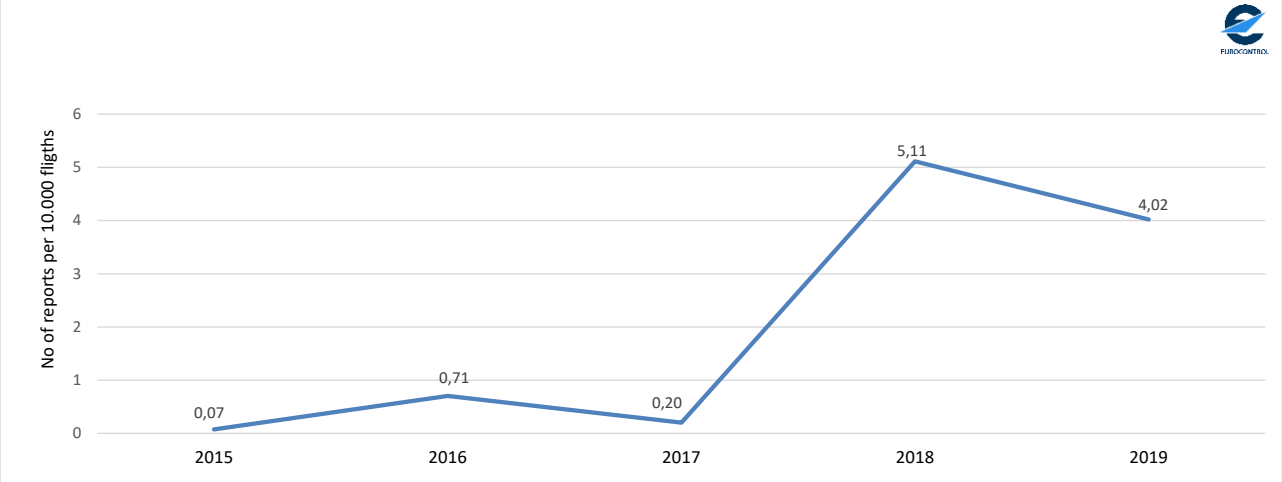

***Figure 40**: GPS outages in the period 2015-2019*

For the period 2015-2019, EVAIR identified more than 50 FIRs where GPS outages were located. By way of comparison, for the period 2013-2017, for example, EVAIR identified 44 affected FIRs. The most affected were FIRs in the South-East Mediterranean and those around the Black and Caspian Sea. In summary, the majority of GPS events were in the airspace which is around politically disputed areas and the areas where drones were used extensively for military purposes. In some of these areas, EVAIR identified more than 3,000 reports in the five-year period.

In cooperation with our NAV and SUR colleagues and certain ANSPs, we came to the conclusion that one of the main causes of GPS outages in politically disputed regions could be interference with satellite signal.

In addition to the mentioned regions, EVAIR identified a smaller number of GPS problems (less than one percent) in the core area of the core European airspace. Besides potential technical problems with the GPS equipment, according to the available information, a potential cause of the GPS jamming/outage could have been so-called personal privacy devices (PPD), which can be easily installed in vehicles. The reason for installing PPDs is to avoid being tracked by satellite. If close to aerodromes and passing by, they can cause the satellite signal to be lost during approach or disable initialisation of GNSS receivers during pre-departure checks when establishing satellite navigation.

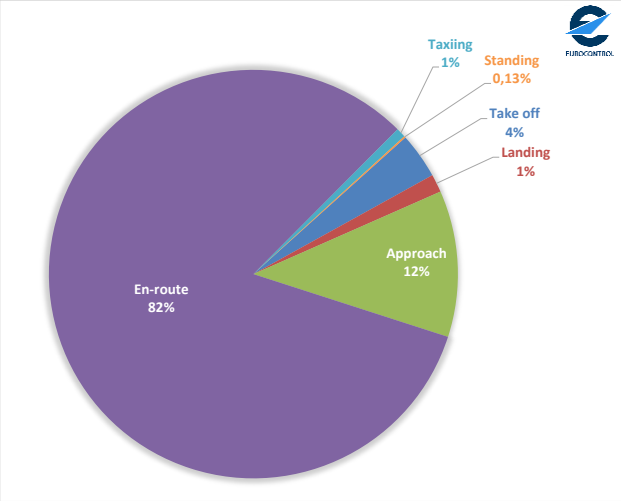

***Figure 41**: GPS outages according to phases of flight in the period 2015-2019*

So far, in all analyses, the phase of flight most affected by GPS outages has been the en-route phase (Figure 41).

EUROCONTROL GNSS and NAV experts have applied an elimination methodology to the reported events in order to identify the likeliest cause of the outage. The elimination methodology for the identification of the GPS outages includes different potential causes such as space weather, receiver problems, military testing and satellite constellation. If there were none of the listed causes, then the most probable cause was Radio Frequency Interference (RFI).

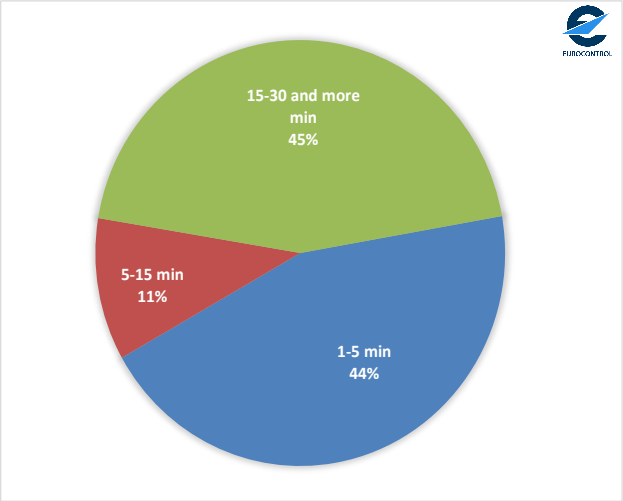

***Figure 42**: Duration of GPS outages in the period 2015-2019*

For the analysis of the duration of GPS outages, we set the time spans for lost signals at 1-5 min, 5-15 min, 15-30 minutes and more (see Figure 42).

As shown in Figure 42, out of the three time spans defined for lost signal, the span 15-30 minutes and more accounted for 45% of reports, followed by 1-5 minutes with 44%. Bearing in mind that the aircraft type most frequently flown in the most affected regions flies on average at a speed of 8 kts per minute, it is possible that when GPS signal is lost, a few FIRs could be affected at the same time.

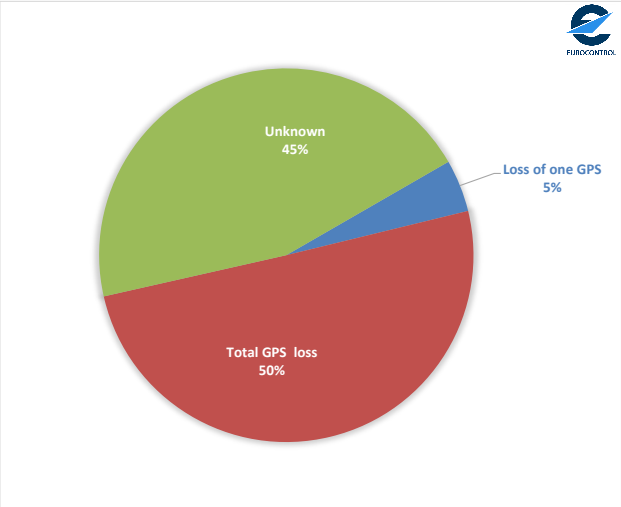

***Figure 43**: GPS loss in the period 2015-2019*

In the period 2015-2019, for 45% of GPS reports, there was no information on whether one or both GPS boxes had failed. 50% of GPS reports indicated that there was a total loss of GPS signal.

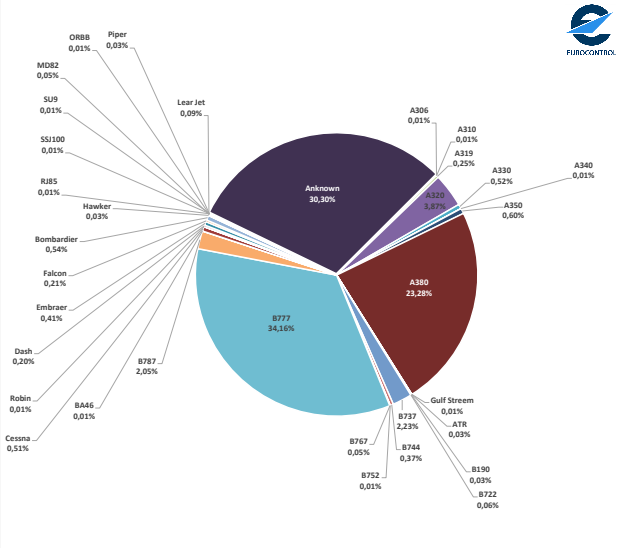

***Figure 44**: Type of aircraft affected by GPS failure in the period 2015-2019*

According to the reports, the types of aircraft most affected were the B777 and A380, which are also the types of aircraft most frequently flown in the affected areas.

The areas most affected by GPS outages are the same as for the previous periods: South-East Mediterranean, Black Sea-Caspian Sea axes and Mid-East-Canada and the USA via the North Pole through Russian airspace.

We take this opportunity to reiterate that in accordance with the ICAO GNSS Manual (Doc 9849), ANSPs which identify GNSS interferences must issue an appropriate NOTAM. However, so far, not all States affected have been issuing NOTMAS. Only a few of them have been doing so even though the areas in question are very wide and many States have been affected. The matter of NOTAMs is crucial if aircraft operators are to be properly prepared when flying through the regions affected.

ACAS REPORTING IN THE PERIOD 2015-2019

In accordance with earlier agreements and requests from our stakeholders, EVAIR monitors the operational, procedural and technical elements of ACAS. The activity forms part of the obligation taken over following the successful implementation of the mandatory carriage of ACAS II. The aim of the monitoring remains unchanged: to support the continued safe and effective operation of ACAS by identifying and measuring trends and issues associated with resolution advisories (RAs).

ACAS is the generic term for Airborne Collision Avoidance Systems, of which TCAS II is the only system implemented to date. The purpose of ACAS is 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 in order to improve safety by identifying technical, procedural and operational deficiencies. TCAS II version 7.1 was made mandatory within European Union airspace on all civil aircraft over 5,700 kg MTOW or 19 passenger seats as of December 2015 and since then EVAIR has been focusing its monitoring on the performance of the new version of TCAS.

ACAS RA statistics are the outcome of the data provided by safety managers at airlines and Air Navigation Service Providers (ANSP).

We wish to point out that some of the ACAS/TCAS reports that were not followed by feedback from the ANSPs rely on pilot and air traffic controller perceptions and memories of the events rather than measured or calculated values. A significant number of the ACAS RA reports are supported by ANSP feedback based on operational investigations, including radar and voice records.

AIRLINES' ACAS REPORTING IN THE PERIOD 2015-2019

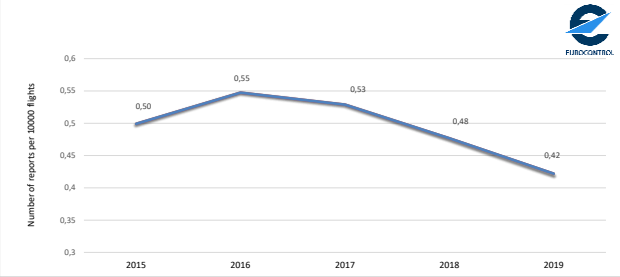

***Figure 45**: Airlines' ACAS incidents in the period 2015-2019*

In 2019, EVAIR recorded 0.39 ACAS RAs per 10,000 flights, which is the lowest level in the last ten years. The low level of ACAS RAs in 2019 could partly be linked to the overall reduction in the number ATM occurrences in 2019 compared with 2018 in the EVAIR database. However, our surveys show that there is a direct link between the reduction in ACAS RAs and different actions taken by main stakeholders including EUROCONTROL, issued documents and studies (ACAS Guide, ACAS training, TCAS RA not followed, ACAS Bulletin, etc.). https://www.skybrary.aero/index.php/Airborne_Collision_Avoidance_System_(ACAS)

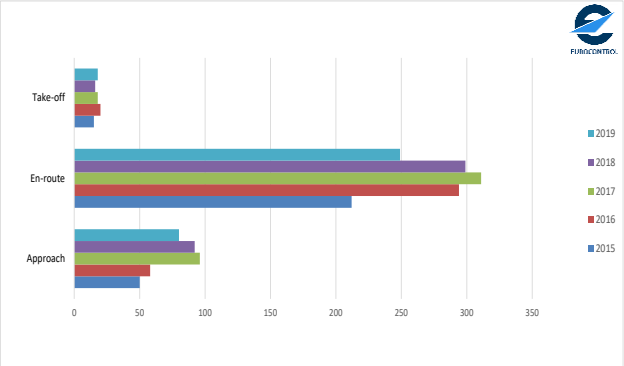

***Figure 46**: Airline ACAS RAs by phase of flight for the period 2015-2019*

Since the beginning of the monitoring of the number of ACAS RAs per phase of flight, the en-route phase at pan-European level has always accounted for more reports than other flight phases. In line with the overall reduction in the number of ACAS RAs, we recorded the same trend during the en-route and approach phase. EVAIR recorded a slight increase in ACAS RAs during the take-off phase in 2019.

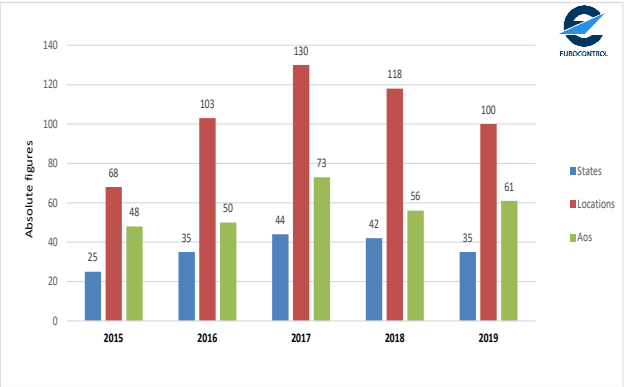

***Figure 47**: Number of States, locations and AOs reporting ACAS RAs in the period 2015-2019*

The absolute figures for ACAS RAs reported by carriers/AOs, States and locations (Figure 47) show that in 2019, the number of States and locations reporting ACAS RAs was lower. Only the number of airlines reporting ACAS RAs increased.

ICAO ADREP definitions of types of RA 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 might have been, a risk of collision between aircraft.

Unnecessary (Nuisance) RA - The ACAS II system generated an advisory in accordance with its technical specifications in a situation where there was not, and could not have been, a risk of collision between aircraft.

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

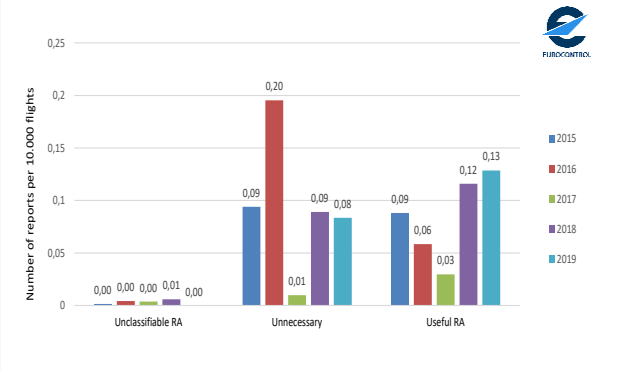

Figure 48: ACAS RA classification in the period 2015-2019

Full-year trends show that over the last two years, EVAIR recorded an increase in "useful RAs" and a slight decrease in "unnecessary RAs" compared with 2018. The increase in the number of useful RAs is encouraging and assures us that pilots have confidence in ACAS RA instructions.

ACAS RA INSTRUCTIONS IN THE PERIOD 2015 - 2019

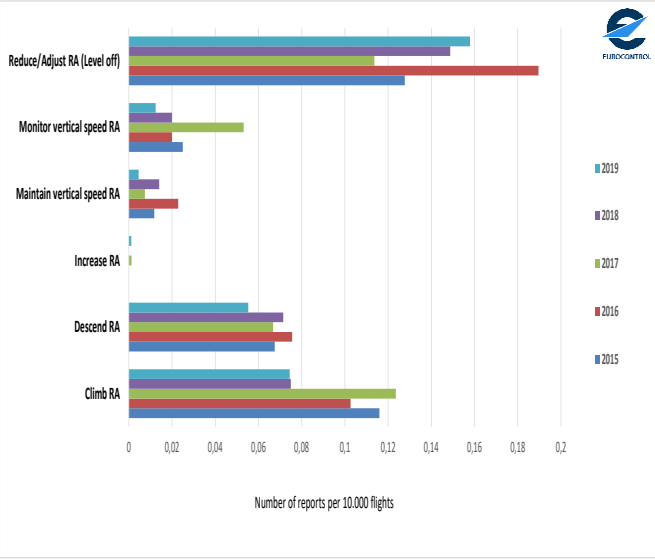

Figure 49: ACAS RA instructions in the period 2015-2019

Out of six monitored areas of ACAS RA instructions, only "Reduce/Adjust RA" (old taxonomy)/"Level off, level off" (new taxonomy) recorded an increase in 2019 compared with 2018. This is also the area which in general records a higher number of reports and is closely linked with high vertical rate, which could be above 1,500 ft/min throughout the last 1,000 ft of climb/descent as recommended by ICAO.

ACAS RA ATM CONTRIBUTORS IN THE PERIOD 2015-2019

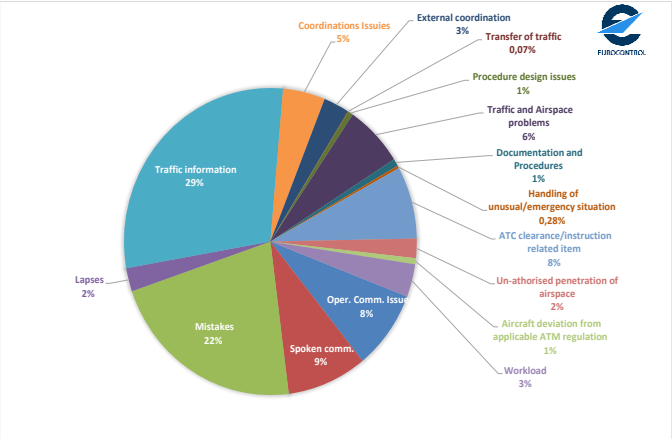

***Figure 50**: TCAS RA ATM contributors in the period 2015-2019*

The situation in 2015-2019 regarding TCAS RA ATM contributors is similar to that in the previous five years (2014-2018). Indeed, provision of "traffic information" by air traffic controllers to pilots (31%) and air traffic controllers' "mistakes" (23%) account for more than 50% of the overall percentage of monitored areas of concern. A further breakdown of these two areas of concern is provided in Figures 51 and 52.

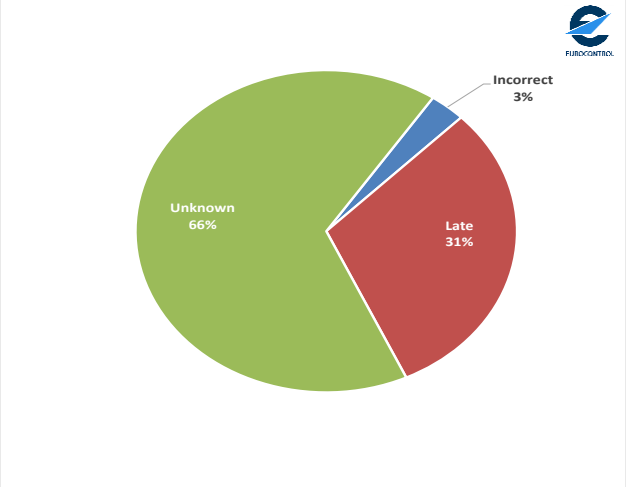

***Figure 51**: Traffic information issues associated with ACAS RA in the period 2015-2019*

In reports where it was possible to identify problems related to "traffic information", the main problem was "late" provision of traffic information

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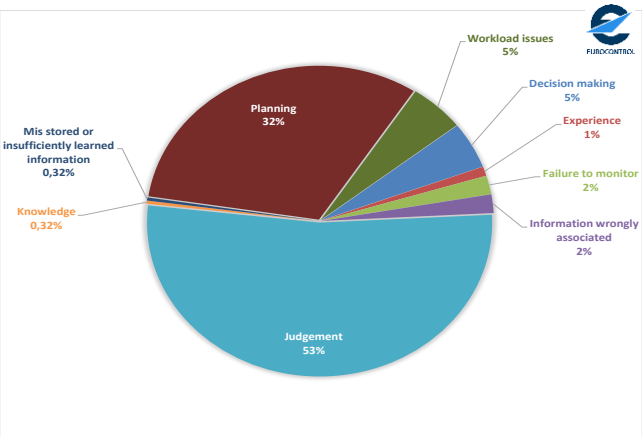


***Figure 52**: Mistakes associated with ACAS RA in the period 2015-2019*

The item relates directly to the controllers' work. Within "mistakes", "judgment" and "planning" contributors related directly to controllers' work account for 85%.

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 addresses communications issues identified in the Runway Incursion and Level Bust Safety Improvement Initiatives as well as other issues of 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 a series of workshops, and established a Level Bust Task Force to define recommendations and to formulate an action plan to reduce level busts.

The Level Bust Action Plan is the outcome 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 is 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.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Level_Bust

THE EUROPEAN ACTION PLAN FOR THE PREVENTION OF RUNWAY INCURSIONS (EAPPRI)

The number of runway incursion reports is rising. Accidents continue to take place on runways. Findings from the 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 (version number?) 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 fully 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.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Runway_Incursions_(EAPPRI)

THE EUROPEAN ACTION PLAN FOR THE PREVENTION OF RUNWAY EXCURSION (EAPRE)

European Action Plan for the Prevention of Runway Excursions (EAPPRE) Edition 1.0, published in January 2013, provides recommendations and guidelines for ANSPs, aerodrome operators, Local Runway Safety Teams, aircraft operators and manufacturers, AIS providers, regulators and EASA.

https://www.skybrary.aero/index.php/European_Action_Plan_for_the_Prevention_of_Runway_Excursions_(EAPPRE)

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 problems. Analysis of events reported by ATC shows that 5% are incidents involving CSS. 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 payback on investment (three years). More importantly, it is calculated that it will eliminate over 80% of CSS incidents and thus improve safety.
http://www.eurocontrol.int/services/call-sign-similarity-css-service

ANNEX 2 – DEFINITIONS

The following definitions are extracted from the HEIDI and/or HERA taxonomies.
HEIDI (Harmonisation of European Incident Definitions Initiative for ATM) is intended 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 types of error and their causal, contributory and compounding factors.
More information can be found at:
HEIDI: http://www.eurocontrol.int/articles/esarr-2-reporting-and-assessment-safety-occurrences-atm
HERA: http://www.eurocontrol.int/services/human-error-atm-hera

DEFINITIONS
ATC clearance/instruction (HEIDI): related to incorrect 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): part of the chain of events or combination of events which has played a role in the occurrence (either by facilitating 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): covers incorrect, late or absence of decisions

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

Judgment (HERA): mainly associated with separation

Lapses (HEIDI): psychological issues encompassing: receipt 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 level other than the cleared level).

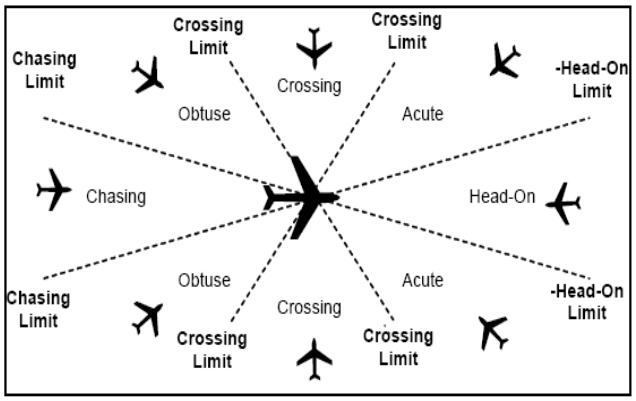
Mental/Emotional/Personality issues (HERA): include the following items:

- 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
- Mis-stored or insufficiently learned information
- Planning: insufficient, incorrect or failed
- Recall of information: failed, 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, judgment, planning, decision-making, assumptions and mind set.

Operational communication (HEIDI): Air-ground, ground-ground and use of equipment for verification testing. Air-ground communication encompasses hear-back omitted, pilot read back, standard phraseology, message construction, R/T monitoring including sector frequency monitoring and emergency frequency monitoring, handling of radio communication failure and unlawful radio communications transmission. Ground-ground communication refers to standard phraseology, speech techniques, message construction, standard use of equipment, radio frequency, telephones, intercoms, etc.

RA geometry between two aircraft (ASMT)



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

Spoken communication (HEIDI): human/human communication encompassing air-ground and ground-ground communications but also call sign confusion, noise interference and other spoken information provided in plain language. Air-ground communication refers to language/accent, situation not conveyed by pilots, pilot's breach of radiotelephony (R/T), workload, misunderstanding/misinterpretation, and other pilot problems. Ground-ground communication refers to misunderstanding/misinterpretation, poor/no coordination.

Taxiway incursion (HEIDI): any unauthorised 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 and airspace problems (HEIDI): there are four sets of causal factors under this heading:

- **traffic load and complexity**, encompassing excessive and fluctuating load, unexpected traffic demand, complex mix of traffic, unusual situations (emergency, high-risk, other), abnormal time pressure, under load and call sign confusion;
- **airspace problems** composed of flights in uncontrolled and controlled airspace, 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 ACRONYMS

ACAS	Airborne Collision Avoidance System
AGC	Air-Ground Communication
ANSP	Air navigation services provider
AO	Aircraft Operator
ASMT	ATM Safety Monitoring Tool
ASR	Air Safety Report
ATC	Air Traffic Control
ATM	Air Traffic Management
AUA	ATC Unit Airspace
CIS	Commonwealth of Independent States
CPDLC	Controller-Pilot Data Link Communications
CSMC	Call Sign Management Cell
CSC	Call Sign Confusion
CSS	Call Sign Similarity
CSST	Call Sign Similarity Tool
CSS UG	Call Sign Similarity User Group
EASA	European Aviation Safety Agency
EC	European Commission
ECAC	European Civil Aviation Conference
EVAIR	EUROCONTROL Voluntary ATM Incident Reporting
FSF	Flight Safety Foundation
GADM	IATA's Global Aviation Data Management
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
EAPRE	European Action Plan for Prevention of Runway Excursions
EAPRI	European Action Plan for Prevention of Runway Incursions
ERAA	European Regional Airlines Association
FL	Flight Level
HEIDI	Harmonisation of European Incident Definitions Initiative for ATM
HERA	Human Error in European Air Traffic Management
ILS	Instrument Landing System
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
LB	Level Bust
MENA	Middle East and North Africa
NM	Network Manager
NOP	Network Operations Portal
RA	Resolution Advisory
RPAS	Remotely Piloted Aircraft Systems
STEADES	Safety Trend Evaluation and Data Exchange System
TCAS	Traffic Collision Avoidance System
TA	Traffic Advisory
THR	Threshold

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