EUROCONTROL

EVAIR Bulletin No 23

Summer periods 2016 - 2020

SUPPORTING EUROPEAN AVIATION

FOUNDING MEMBER OF sesar JOINT UNDERTAKING

NETWORK MANAGER

Contents

EVAIR FUNCTION MANAGER'S PERSPECTIVE

Dear readers,
In this EVAIR Bulletin, we cover the summer periods from 2016 to 2020. The year 2020 was marked by the beginning of the COVID-19 pandemic and drastic measures, one of which related to restrictions in air traffic, which resulted in a sharp drop in the number of flights. Consequently, in EVAIR we received in absolute figures many less reports than in 2019 (1,473 reports in 2019 compared with 255 reports in 2020). However, in relative figures, we did not see such a drastic drop in the trend (Figure 1). On the contrary, in summer 2020, EVAIR recorded an upward trend in reports of ATM events without GPS outages and a very slight drop in reports of ATM occurrences with GPS outages (red line in Figure 1).
In this Bulletin, as in the previous one, we present global IATA findings, giving our readers the possibility to compare the European situation with the global picture.

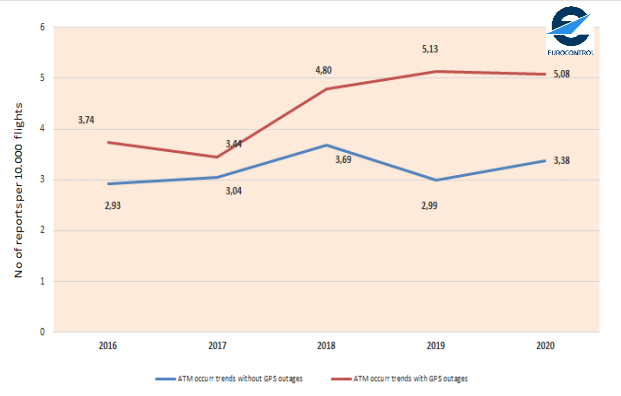


***Figure 1**: ATM occurrence trends in the summer periods 2016-2020*

Data collection

Between the summers of 2016 and 2020, aircraft operators and ANSPs provided EVAIR with some 5,600 ATM reports, more than 3,600 GPS reports, and just over 3,800 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 13,000 reports in all data collection fields.

For the above-mentioned period, more than 320 aircraft operators (AOs) flying to/from Europe provided their reports to EVAIR. In the summers over the five-year period, these airlines performed about 18 million flights. Our main data providers, as for the previous periods, were the European ANSPs including some of the ANSPs from the Middle East, North Africa and the former Soviet Union, including the Russian Federation.

Main events

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

Feedback – reporting motivator and support for quick fixes

The feedback process continues to be one of the most principal EVAIR instruments in enabling the exchange of ATM occurrence information and SMS investigation results between AOs and ANSPs. EVAIR makes such an exchange possible thanks to the rich and regularly updated list of ANSP and AO contacts and by facilitating contact between AOs and ANSPs. AOs and ANSPs who conduct SMS investigations also play a major role; through the EVAIR facilitation process, they provide their SMS investigation results to the originator of the initial report. The feedback process supported by EVAIR is part of a preventive and proactive approach to ATM safety. It enables early identification of low-level severity occurrences and their quick resolution or mitigation.
One of the indicators for the efficiency of the feedback process, and also of SMS investigations, is the time frame needed to carry out investigations and prepare feedback on the occurrence reports submitted. It is interesting to note that in spite of the high traffic decrease, EVAIR recorded that for the 2016-2020 summer periods, it took on average 41.90 days to obtain the feedback. This is much higher than the time frame recorded in summer 2019 (17.75). At the moment, it is very difficult to conclude why the time frame for the provision of the feedback increased significantly in summer 2020.

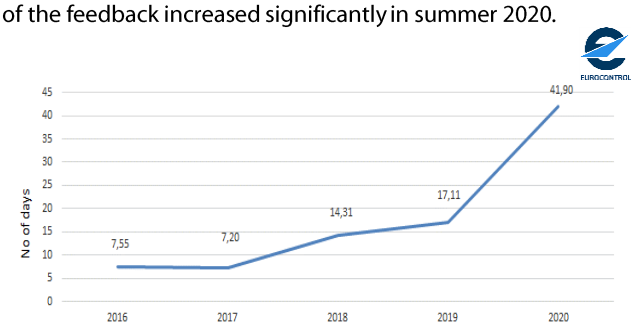


***Figure 2**: Timeframe for the provision of feedback in the summer period 2016-2020*

RPAS/drones – slight drop in summer 2020

After a significant increase in summer 2018, EVAIR recorded a drop in the number of drone events in summer 2019 as well as a slight drop in summer 2020. The majority of drone events reported by AOs occurred during the approach phase. A few drones were reported by AOs at very high altitudes/levels (up to FL350).

GPS outages – drop in summer 2020

In summer 2020, EVAIR recorded a significant decrease in the number of GPS outages. One of the reasons is AOs' reorganisation owing to the impact of the COVID-19 crisis. As a result of these processes, EVAIR lost a number of the AOs, among them some of the best reporters. The majority of GPS outages were located within the geographical regions as already identified in previous editions of the EVAIR Bulletin (South East Mediterranean, Black Sea-Caspian Sea axes).

ACAS RA occurrences – decreasing trend

In summer 2020, EVAIR recorded the lowest ACAS RA occurrence level in the last five years: 0.45 ACAS RAs per 10,000 flights. ACAS RAs make up about 19% of all types of occurrence reports within the EVAIR database. Over the entire monitored period, the en-route phase was the most affected, whilst among ACAS RAs, the instructions 'Climb RA' recorded an increase in summer 2020.

Laser interference

In the summers over the five-year period (2016-2020), laser threats accounted for 5.5% of the total EVAIR data. After recording a significant decrease in summer 2019, EVAIR recorded a considerable reverse trend in summer 2020. As in the previous years, the approach phase and low-level altitudes were the most affected.

Call sign confusion

Call sign confusion reports provided by AOs made up 6% of the total number of ATM reports for the 2016-2020 summer periods. During the last three summer seasons, EVAIR recorded an increase in call sign confusion reports. Call sign similarity/confusion reports provided by ANSPs support EVAIR in monitoring the efficiency of the Call Sign Similarity De-Confliction Tool. In summer 2020, EVAIR recorded an increase in calls sign similarities among AO tool users. More in-depth analysis should allow us to understand what is behind this increase.

Contributors to incidents

In summer 2020, "air-ground communication" accounted for only 27.6% of the top seven contributors to ATM occurrences identified in the EVAIR database, much lower than in 2019 when the figure was almost 50%. At the same time, in spite of the significant reduction in traffic due to the COVID-19 pandemic, the typical air traffic controller areas of provision of "traffic information" and "coordination issues" recorded a considerable increase in summer 2020 compared with summer 2019. "Traffic information" accounted for 24.5% of the top seven contributors to ATM occurrences, increasing from 7.5%, and "coordination issues" accounted for 25.7%, increasing from 8%.

Stakeholder corner

IATA

As part of the ATM safety cooperation with EUROCONTROL, the International Air Transport Association (IATA) conducted analyses of selected ATM topics for the summer season 2018-2020. Availability of IATA and EVAIR analyses allow for high-level comparisons between global and European ATM trends.

IATA analyses are based on 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. The GADM programs comprise de-identified safety incident reports (ASRs) from over 80 and flight data from over 100 participating AOs throughout the world.

The scope of analysis included research of air safety reports (ASRs) and flight data for the summer seasons 2018-2020. For the analysed period, the IATA IDX dataset represented 12% of the world's flights and the FDX dataset represented 4.8% and 5.8% of the world's flights in 2019 and 2020, respectively.
There were some limitations to the preparation of the data. North American operators were not included in the IDX for the summer 2019 and 2020, while FDX did not include CIS operators for summer 2019. All events that do not comply with IATA data quality standards were divested.

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

A principal function of the EUROCONTROL-IATA cooperation is to regularly provide European and global statistics relating to ATM events in selected areas, including ACAS RAs, call sign confusion, level busts, and runway incursions. These areas are monitored because they fall within the framework of different European action plans as well as part of Regulation (EU) No 376/2014 and Commission Implementing Regulation (EU) No 1018/2015.

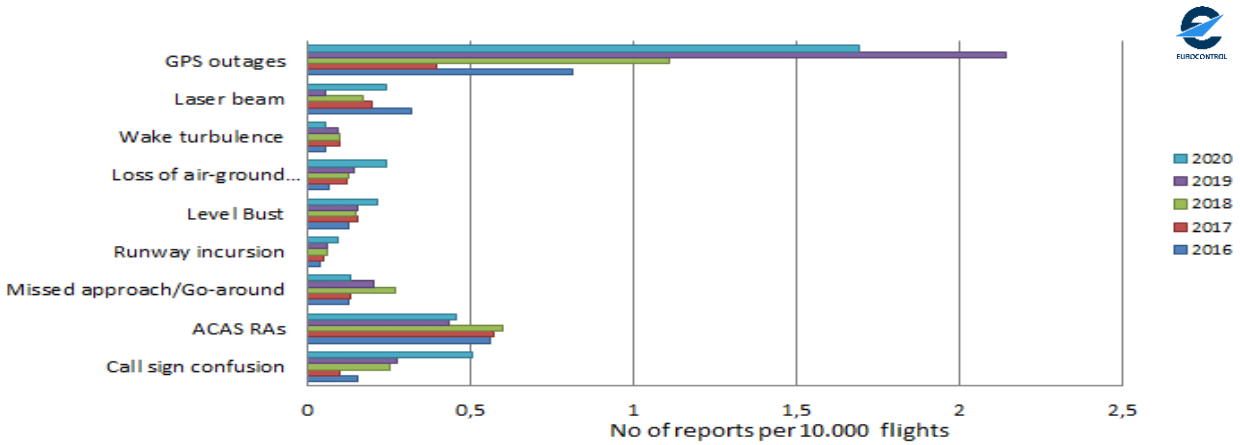


Figure 3: *European ATM events in the 2016-2020 summer periods*

When looking at the trends in different areas, it is necessary to bear in mind that there was a significant decrease in traffic in 2020 owing to the COVID-19 measures. Within European airspace, the traffic drop in summer 2020 was not always followed by a downward trend in the number of incidents in the areas monitored. Indeed, with the exception of a few of these areas (missed approach/go around, wake turbulence and GPS outages), all other areas recorded an increase. However, on a global level, within the IATA database, all monitored areas recorded a decrease. In some areas, like go around, the drop was dramatic.

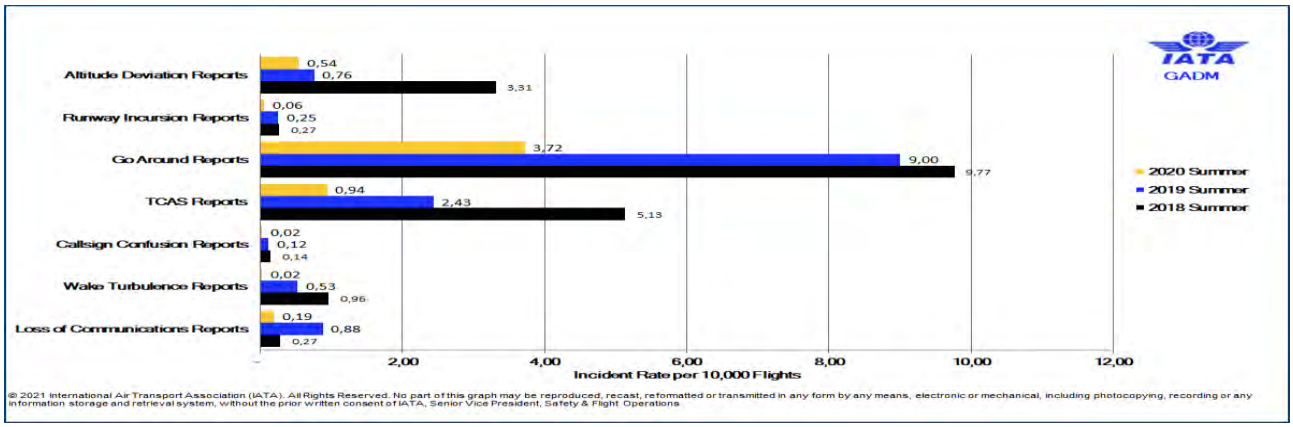


Figure 4*: IATA ATM events in the 2018-2020 summer periods*

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 2016-2020 SUMMER PERIODS

EVAIR is capable of identifying various levels of causal factors for different types of event for those areas where ICAO's ADREP is insufficient thanks to a TOKAI tool (built around the ICAO's ADREP 2000 taxonomy and EUROCONTROL's HEIDI) various levels of causal factors for different types of events.

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

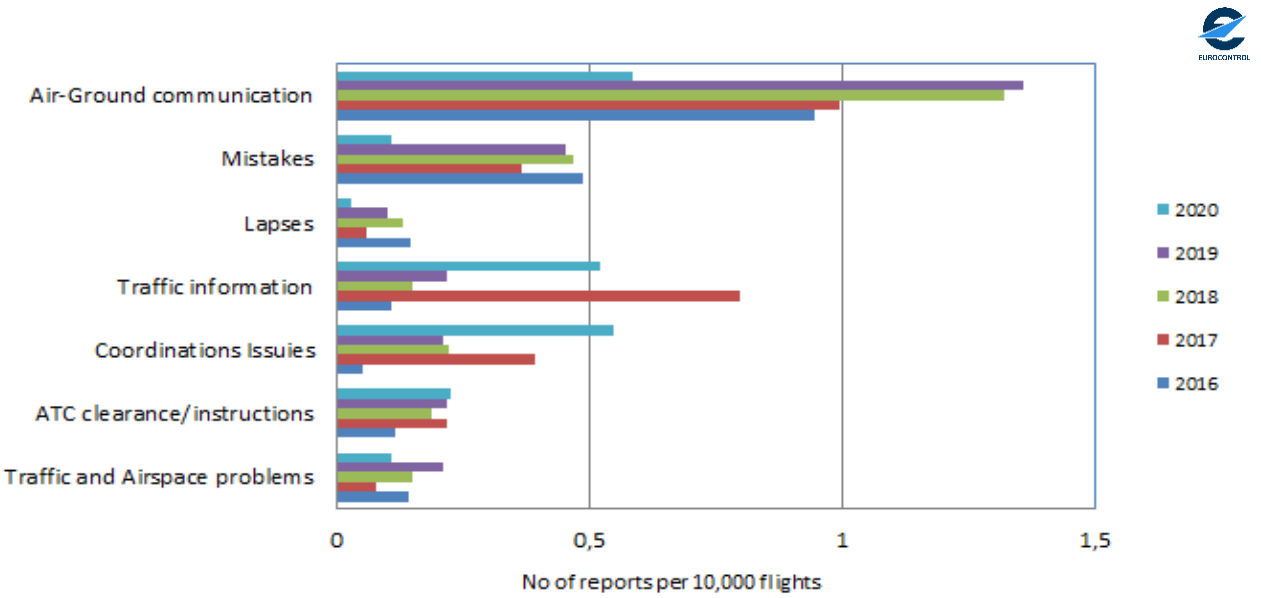


***Figure 5**: Contributors to ATM occurrences in the 2016-2020 summer periods*

The significant traffic reduction in summer 2020 was not followed by a corresponding significant drop in all monitored contributory factors. On the contrary, some contributory factors like "coordination issues" and "traffic information" recorded a considerable increase. It is hard to say for sure why this occurred, but one of the possible reasons could be reduced ATCOs' attention due to low traffic.

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

GO-AROUNDS IN THE 2016-2020 SUMMER PERIODS

"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. EVAIR and IATA GADM monitor go-around to identify safety problems associated with or leading to "go-arounds".

For the 2016-2020 summer periods, go-around reports made up 5.8% of the total ATM reports in the EVAIR database. About 60 different AOs 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 39 States and 115 locations across Europe. 70% of go-around events occurred within the airspace of seven States and 30% of events occurred within five main European hubs.

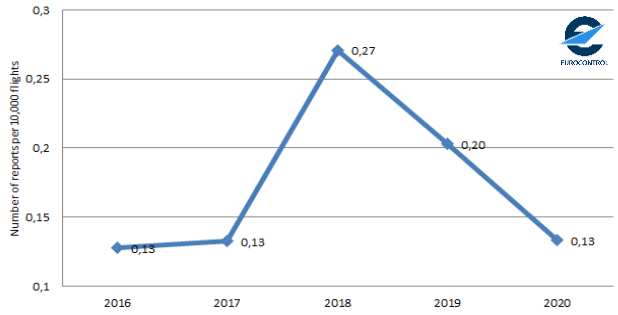


***Figure 6**: European go-arounds in the 2016-2020 summer periods*

In summer 2020, EVAIR recorded 0.13 go-around events per 10,000 flights. These are the same figures as those recorded by EVAIR in the 2016 and 2017 summer periods.

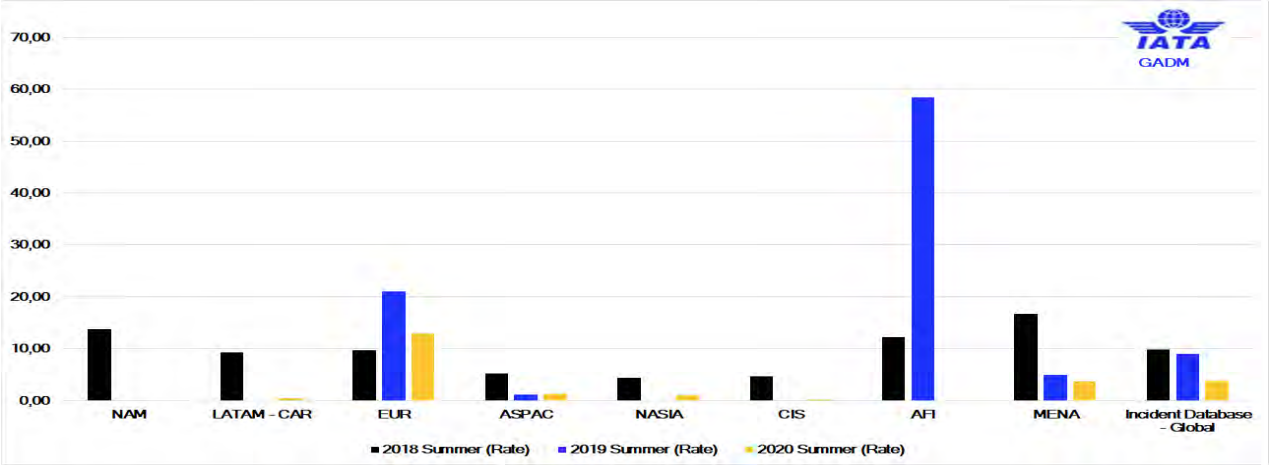


***Figure 7**: IATA global go-arounds in the 2018-2020 summer periods*

The IATA GADM graph identifies trends across operators from eight IATA regions. Given that IATA launched the new GADM database in 2018, trends are provided for only three summer seasons.

In summer 2020, at the global level, IATA recorded a decrease across all monitored regions. Within the NAM and AFI regions, contrary to the previous two years, no recorded go-around events were recorded in summer 2020. The regional traffic figures during the COVID-19 lockdown explain why this was the case.

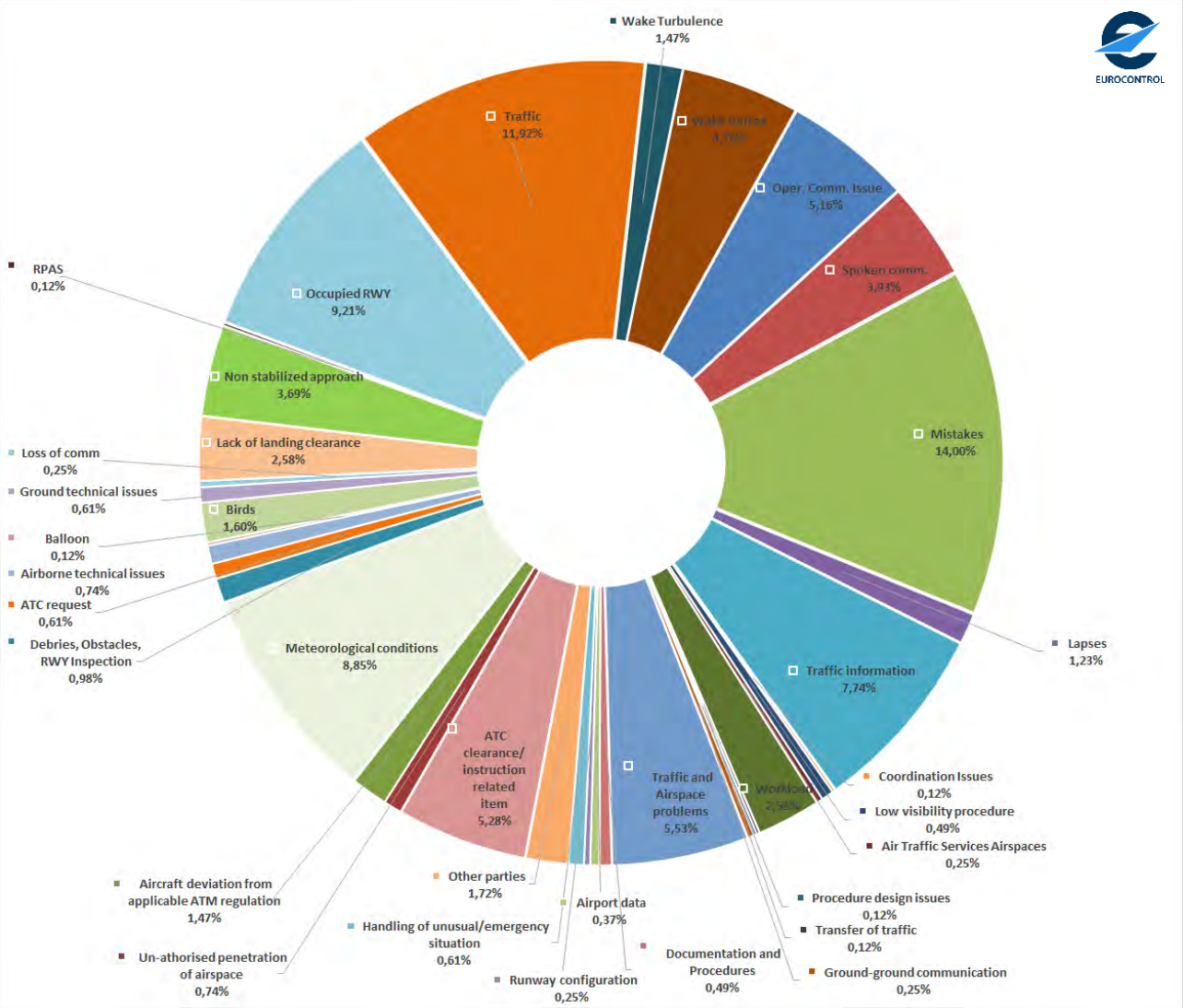


***Figure 8**: Go-around contributors in the 2016-2020 summer periods*

Searches through the EVAIR go-around database allowed for the identification of 36 different safety problems associated with go-around (Figure 8). Some of the safety problems associated with go-around that are presented above could be broken down further, which means that we could present even more contributors. However, for the sake of graph readability we kept the search at higher level.

Traditionally, a certain number of contributors associated with go-around over a longer period occupy high positions in the long list of identified go-around causes. Among them are:

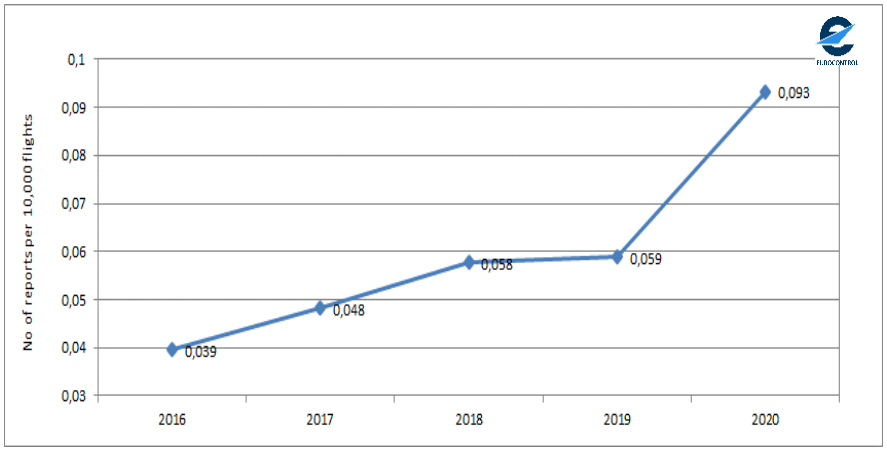
traffic information, traffic and airspace, which include pilot familiarity with the airspace, traffic and airspace complexity; mistakes relating to planning, judgment, decision-making and air-ground communication, which includes operational and spoken communication; late or incorrect traffic information; 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.

In the last few years, we started recording RPASs as a cause of go-around. The contribution rate of RPASs to go-around is still not particularly high, however, with the increase in RPAS operations, a corresponding increase in RPAS-induced go-around could be expected.

RUNWAY INCURSIONS IN THE 2016-2020 SUMMER PERIODS

In the 2016-2020 summer periods, runway incursions (RIs) made up 1.7% of the total number of occurrences in the EVAIR database.

In spite of the significant traffic decrease in 2020 owing to the COVID-19 pandemic, 2020 saw the highest number of RI reports in the last eight years. This information calls for a more detailed analysis in order to identify the problems which caused this increase. Given the significant traffic decrease, we would have expected to see a reduction in RIs.



Considering that runway incursions constitute a high-risk area, further monitoring and identification of the causes is be especially important

***Figure 9**: Runway incursions for the 2016-2020 summer periods*

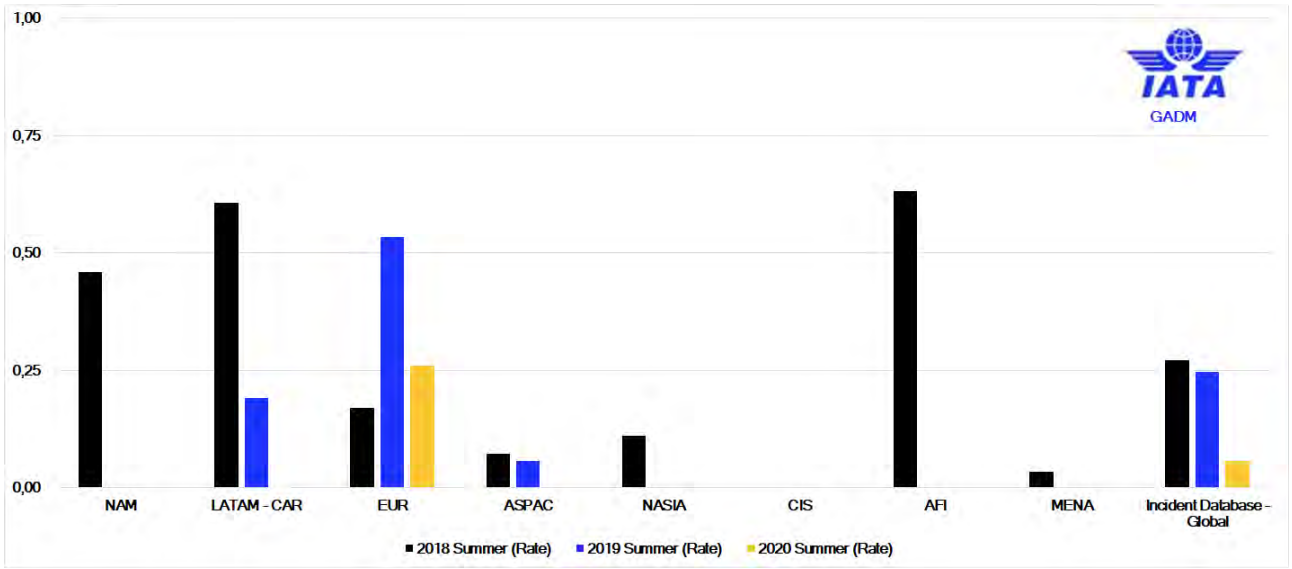


***Figure 10**: IATA global runway incursions in the 2018-2020 summer periods*

European operators reporting through the IATA GADM mechanism were the only ones that recorded RIs in summer 2020. One of the possible reasons for this picture could be that during the COVID-19 pandemic, the airlines from other regions decreased their number of operations much more than European carriers. It could be also linked to the reporting culture among airlines from other IATA regions.

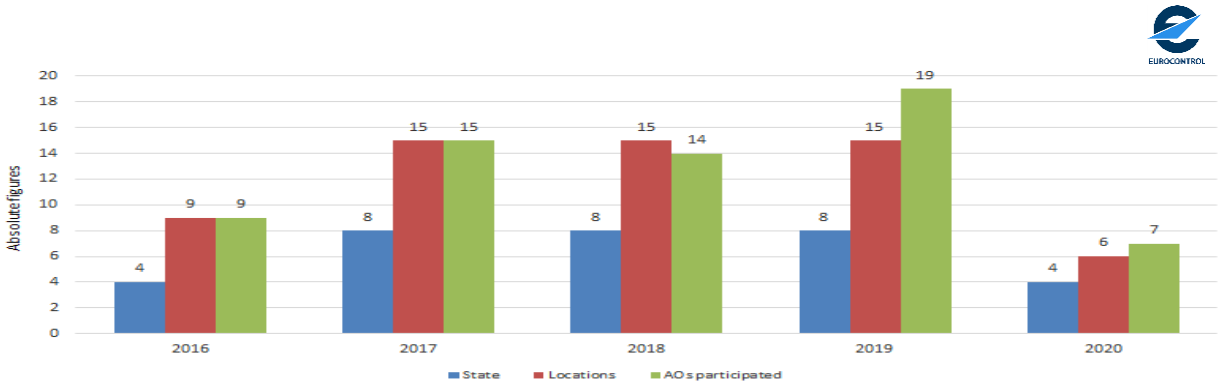


***Figure 11**: Number of States, locations and AOs reporting runway incursions in the 2016-2020 summer periods*

For the 2016-2020 summer periods, a total of 16 States and 41 different locations reported RIs. These figures are lower than for the 2015-2019 summer periods. The COVID-19 pandemic is a major reason for these much lower figures. A comparison between summer 2019 and 2020 in Figure 11 best illustrates this.

It is worth mentioning that 2 out of 16 States in which RIs were reported in the 2016-2020 summer periods account for 55% of the RIs recorded.

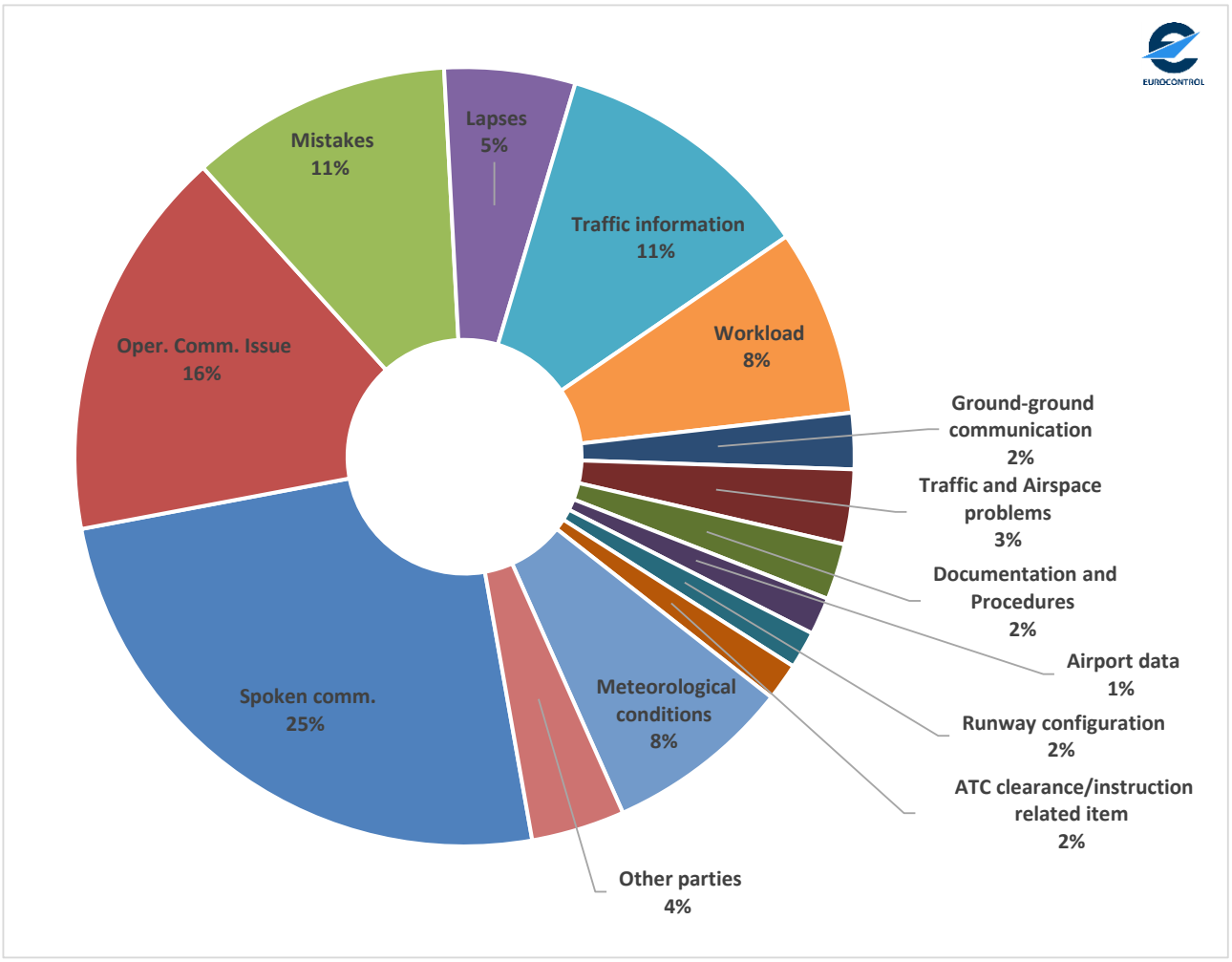


***Figure 12**: Contributory factors to runway incursions in the 2016-2020 summer periods*

The top cause of RIs for many years has been communication, which includes operational and spoken communication. Some of the communication problems in the period in question were related to call sign confusion and loss of communication.

A few other causes, including mistakes, traffic information, workload and meteorological problems, have been always identified in EVAIR statistics.
RIs were also associated with other types of ATM events, of which go-around was the most frequent. For the monitored period, 11.5% of runway incursions were followed by go-around.

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 2016-2020 SUMMER PERIODS

Level bust occurrences accounted for 4.7% of all EVAIR reports for the 2016-2020 summer periods. For the monitored period, TCAS RA played its role as a last barrier in 13.2% of level bust events. One percent of "level busts" were linked with "airspace infringement" and one percent were generated by executed "go-around procedures". ATM contributed directly to level bust in 28% of cases whilst in 47% of cases, ATM was not involved. In the remaining 25%, ATM had an indirect contribution. In spite of a dramatic traffic decrease, level bust recorded an increase in summer 2020 versus 2019, when traffic was at its highest level (Figure 13).

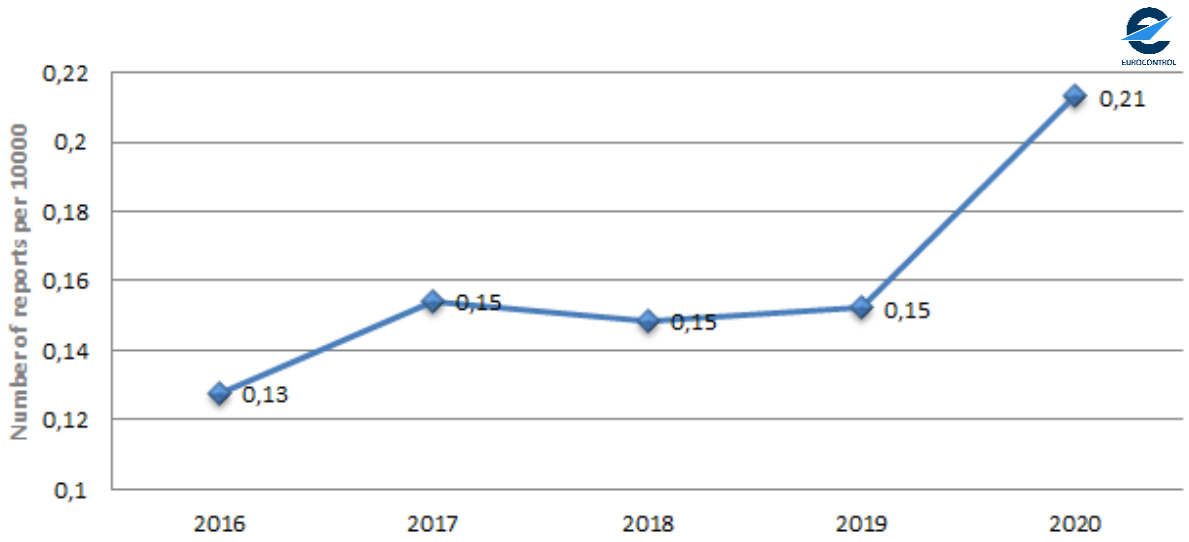


Figure 13: Level bust in the 2016-2020 summer periods

In the summer 2020, IATA recorded different level bust trends (Figure 14). A significant increase was recorded by Latin American and Caribbean AOs, a slight decrease among European carriers and a decrease on the global level compared with summer 2020.

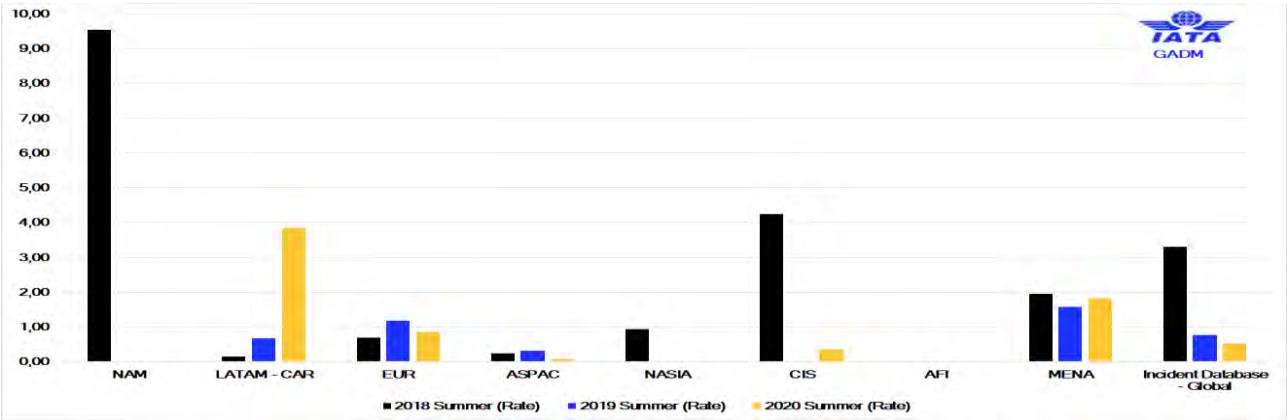


Figure 14: IATA global level bust (altitude deviation) in the 2018-2020 summer periods

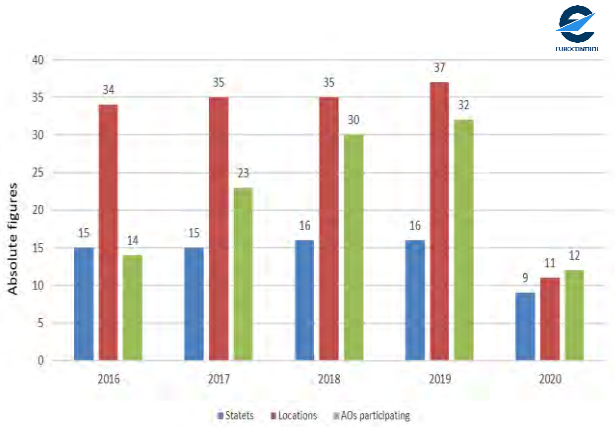


***Figure 15**: Number of States, locations and aircraft operators reporting level bust in the 2016-2020 summer periods*

In the summers over the five-year period, level busts occurred in 31 different States and 81 locations. Seven locations, in which ten to twenty four level busts occurred, accounted for almost 40% of the total level busts recorded for the 2016-2020 summer periods.

Air-ground communication, which includes hear back omitted, misunderstanding/misinterpretation, phraseology, call sign confusion, language/accent and poor/no coordination, continues to be the main cause of level bust (43.8%).

The second cause is, mistakes (18.6%), which encompass judgment, planning, workload, decision-making and information wrongly associated, is the area which contributes most to level busts. Together, air-ground communication and mistakes make up more than 60% of level bust contributors.

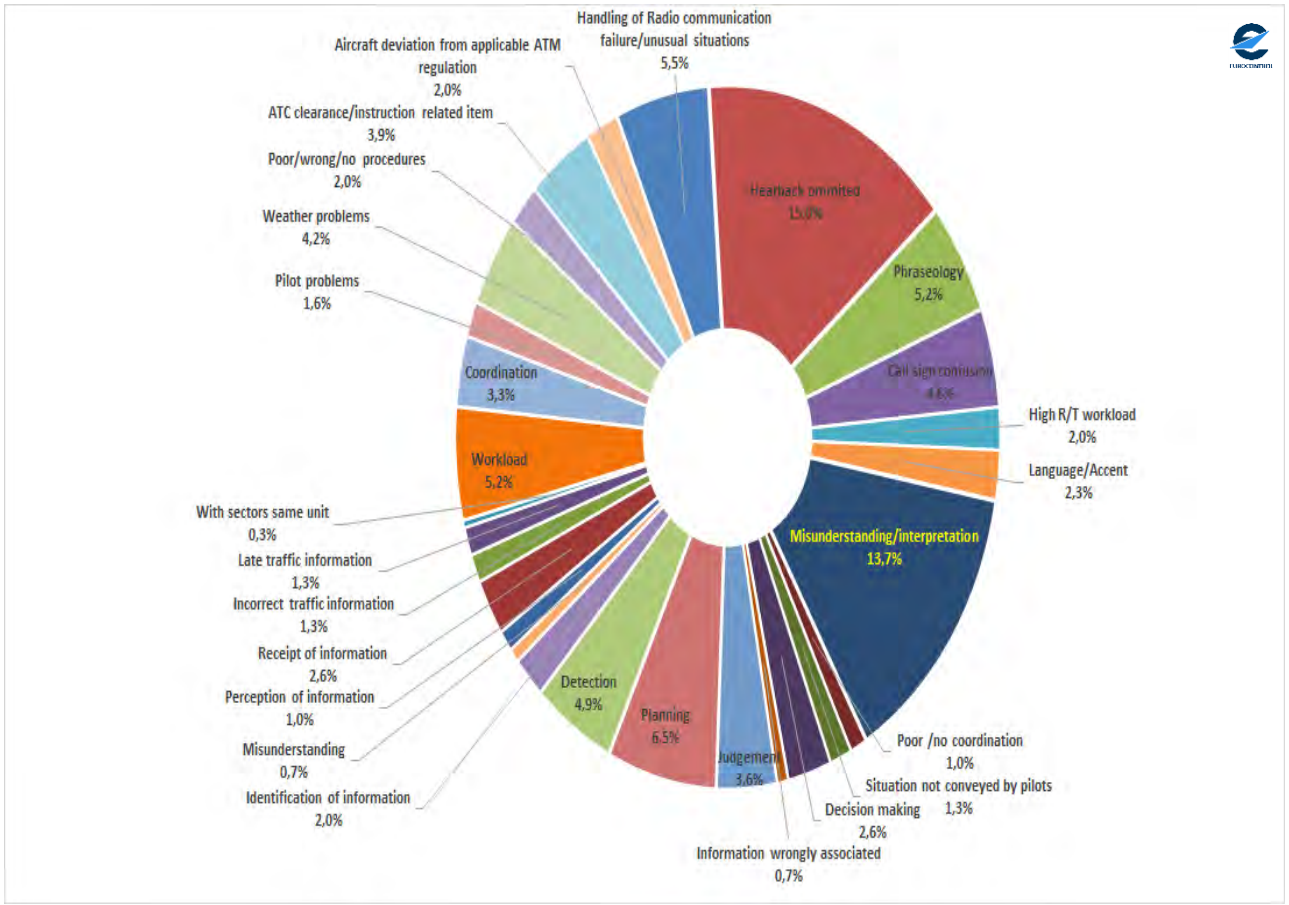


***Figure 16**: Level bust contributors in the 2016-2020 summer periods*

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 proceed with Service Level 2.

EVAIR uses two data sources, ANSPs and AOs to monitor "call sign similarities" and "confusions". 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 2016-2020 SUMMER PERIODS

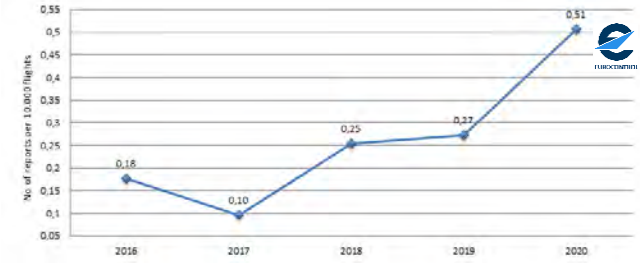


***Figure 17**: European call sign confusion reported by AOs in the 2016-2020 summer periods*

For the 2016-2020 summer periods, call sign confusion reports made up 6% of the total number of ATM reports provided by AOs and ANSPs. For the same period, 58 AOs provided their call sign confusion reports to EVAIR.
Regarding CSC trends, in spite of the traffic drop owing to the COVID-19 pandemic, EVAIR recorded an increase in CSC reports during summer 2020.

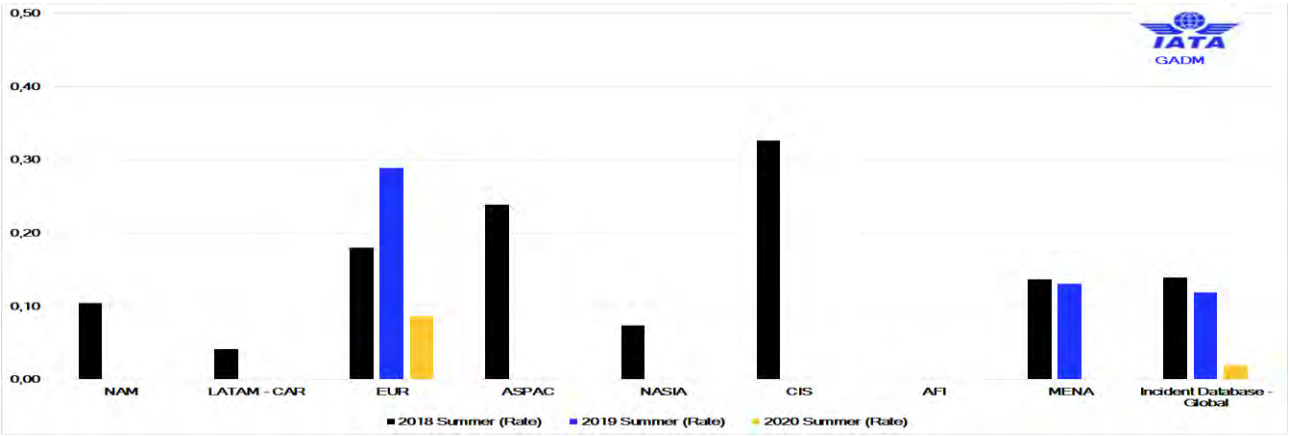


***Figure 18**: Global call sign confusion in the 2018-2020 summer periods*

In 2020, IATA global data recorded CSCs only among European carriers. This is somewhat strange considering that in 2018 carriers from almost all geographical regions reported CSC.

In the meantime, there have not been significant regional actions or different technologies implemented for the de-confliction of CSS.

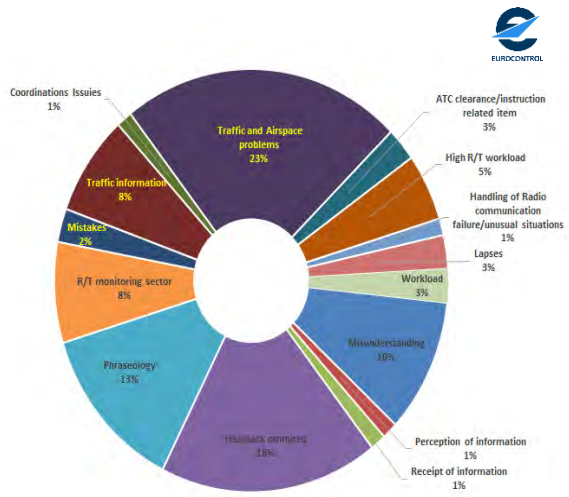


***Figure 19**: Call sign ATM contributors in the 2016-2020 summer periods*

For the 2016-2020 summer periods, direct ATM system contributions was 29%, which is a bit higher than for the period 2015-2019, when it was 27%. The ATM system was indirectly involved in 44% of CSCs, whilst in 27% of cases there was no ATM system involvement. For both, direct and indirect ATM contributions, there has been an upward trend in the last three to five-year periods.

EVAIR recorded a reduction in the number of States, locations and AOs involved in CSC compared with the previous 2015-2019 summer periods. CSC occurred in 30 States and 74 different locations.

Among the CSC contributors, "traffic and airspace problems", at 24%, exceeded "hear back omitted" (18%), which traditionally represents a higher percentage than the other contributors.

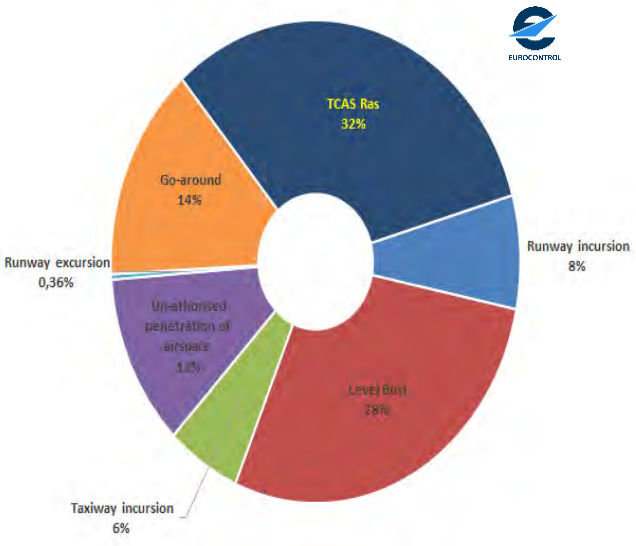


***Figure 20**: Events associated with call sign confusion in the 2016-2020 summer periods*

"TCAS RAs" associated with CSC (32%), recorded a higher percentage than "level bust" (28%), which traditionally has a higher percentage than other events associated with CSC.
Besides the two types of events associated with CSC mentioned above, "go-around" and "un-authorised penetration of airspace" recorded slightly higher percentages.

Higher risk events linked with CSC were runway incursions, at 8%.

AIR NAVIGATION SERVICE PROVIDERS' CALL SIGN SIMILARITY AND CONFUSION DATA

2016-2020 SUMMER PERIODS

In the 2016-2020 summer periods, EVAIR received almost 4,000 CSS/C reports from around 30 European ANSPs. It is important to reiterate and highlight that EUROCONTROL's CSS/C 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 which do not need such assistance provide their data on a monthly basis. The EUROCONTROL Call Sign Management Cell Services continues to provide support and help 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.

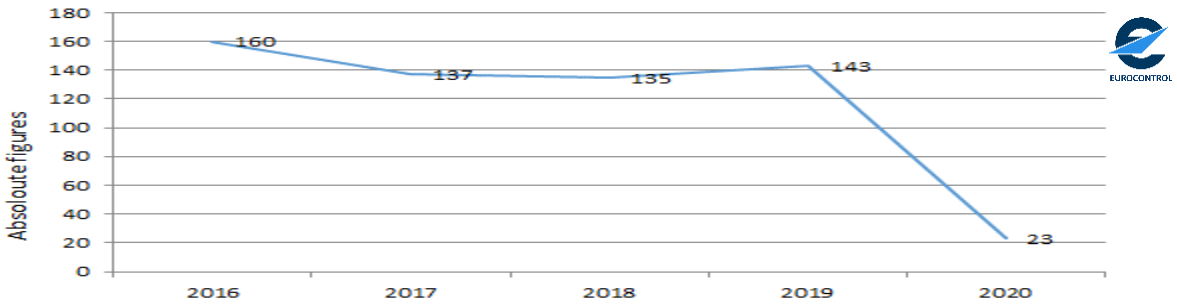


***Figure 21**: Number of AOs with CSS/C as identified by ANSPs in the summer period 2016-2020*

Figure 21 shows the number of AOs that experienced a problem with "call sign similarities and confusions". The impact of COVID-19 is obvious. Drastic drop in traffic led to a drastic drop in the number of AOs affected by call sign similarity/confusion. Thanks to the support which the EUROCONTROL CSS/C project receives from various airline associations – firstly from IATA as the biggest association, followed by ERAA and others – as well as the excellent cooperation with them, EUROCONTROL is in a position to assist with the resolution of the problems identified. In addition, airline associations fully support and promote together with EUROCONTROL the use of the Call Sign Similarity De-Confliction Tool (CSST), as the most efficient tool to prevent many CSS/C before the start of the summer or winter season. Besides European carriers that are the most frequent users of the tool, a number of AOs from other regions, especially the Middle East, is quite high.

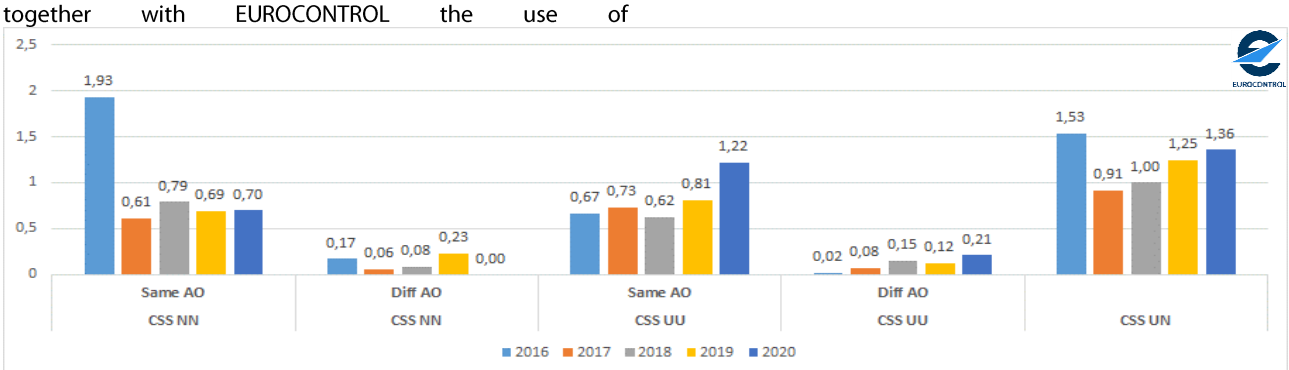


***Figure 22**: Call sign similarity among non-tool users and tool users in the 2016-2020 summer periods*

Call sign similarity statistics and EVAIR monitoring show that since the beginning of the monitoring, the problem in the majority of cases lies with a single AO, whether a tool user or a non-tool user.
In the last two years, the trend in similarities occurring among tool users is slightly higher than among those who do not use the tool. Drilling down through the database showed that 16 airlines out of 48 tool users reported similarities. Two airlines out of 16 accounted for 51% of the similarities. Further work with the EUROCONTROL experts in the CSST could help to further identify the problem and potentially reduce the number of similarities.

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

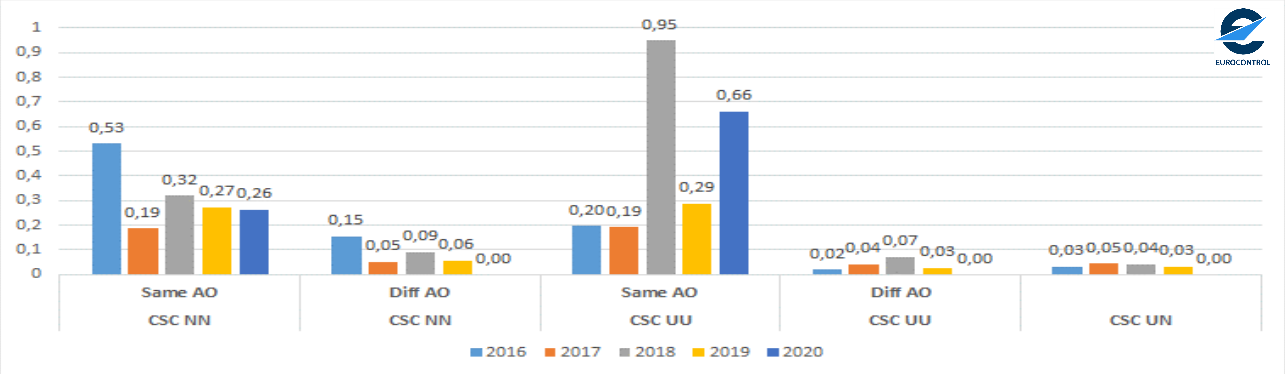


Figure 23: Call sign confusion among non-tool users and tool users in the 2016-2020 summer periods

CSC trends show that single AO tool users recorded more confusion problems compared with non-tool users in summer 2020. Drilling down through the data base showed that out 48 AO tool users, 18 reported confusions. Interestingly, one of these AO tool uses accounted for 70% of confusions reported. As explained for the CSSs, further work with the EUROCONTROL colleagues responsible for the use of the CSST should help to identify the reason for this problem among tool users. Investigation of the jump in the number of confusions among single AO tool users in summer 2018 showed, as explained in the previous EVAIR bulletin, that this 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 the ICAO three letter designator. After a meeting with the safety officers of this specific AO initiated by EUROCONTROL, it was agreed that some measures needed to be taken to prevent 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 this specific AO recorded a significant decrease in the number of confusions among single AO tool users in summer 2019 and 2020.

CSST access and additional tokens

A prerequisite for using the CSST is possession of 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 EUR 200. This is a small price to pay compared with the time saved through use of the 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 enter 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 2016-2020 SUMMER PERIODS

EVAIR bulletins concerning "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 36 and 37).**

For the 2006-2020 summer periods, "air-ground communication" accounted for 42% of the top seven contributors to ATM occurrences identified in the EVAIR database. This was lower than in the previous five years. Especially in 2020, because of the traffic drop down caused by the COVID-19 pandemic,"air-ground communication" recorded a significant decrease. Spoken communication, which encompasses CSC, language/accent, misunderstanding/interpretation, high R/T workload, etc., is in general 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.

Over a longer period monitored by EVAIR, "air-ground communication" has been the most frequent and largest contributor (percentage wise) to "runway and taxiway incursions". "Air-ground communication" also contributes regularly although slightly less (percentage wise) to "level busts", "ACAS RAs" and "go-around".

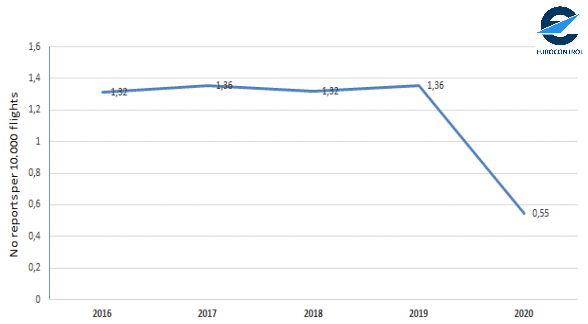


***Figure 24**: Air-ground communication in the 2016-2020 summer periods*

Owing to a significant traffic reduction in summer 2020, "air-ground communication" also recorded a significant drop compared with summer 2019.

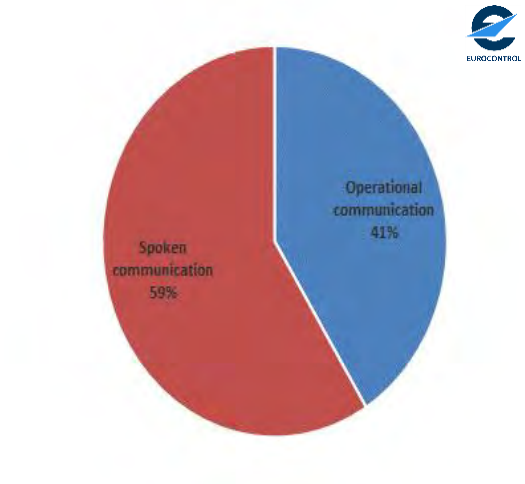


***Figure 25**: Spoken and operational communication in the 2016-2020 summer periods*

The percentage breakdown between "spoken" and "operational communication" within "air-ground communication" is in the long term in favour of spoken communication.

It is interesting to note that for the 2016-2020 and 2015-2019 summer periods, the percentage relation between "spoken communication" and "operational communication" was the same. Even drastic reduction in the traffic in summer 2020 did not affect the relation between these two areas.

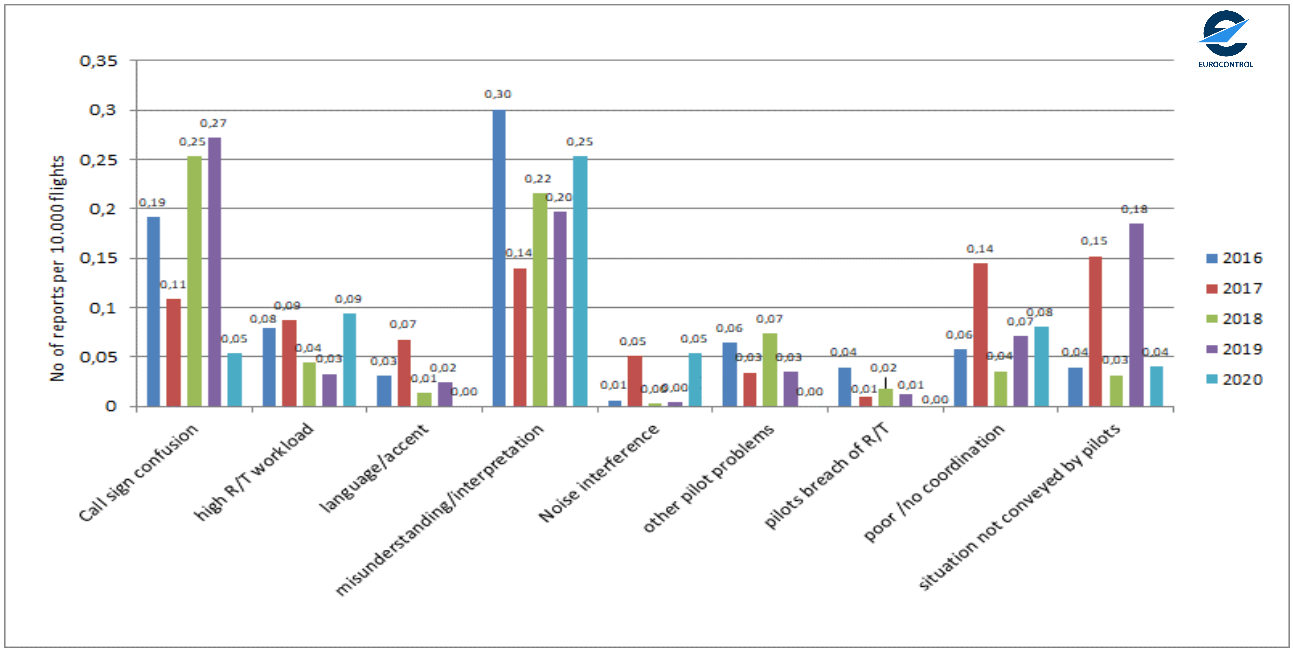


Figure 26: Spoken communication in the 2016-2020 summer periods

In summer 2020, regardless of the significant traffic decrease, the number of "misunderstanding/interpretation" reports was higher than in summer 2019. On the other hand, CSC reports, which have always seen higher trends than other "spoken communication" contributors, recorded a significant decrease in summer 2020. Besides "misunderstanding/interpretation" reports, "high R/T workload", "noise interference" and "poor/no coordination" reports saw an increase in summer 2020. More in-depth analysis would be required to identify the reasons behind these trends.

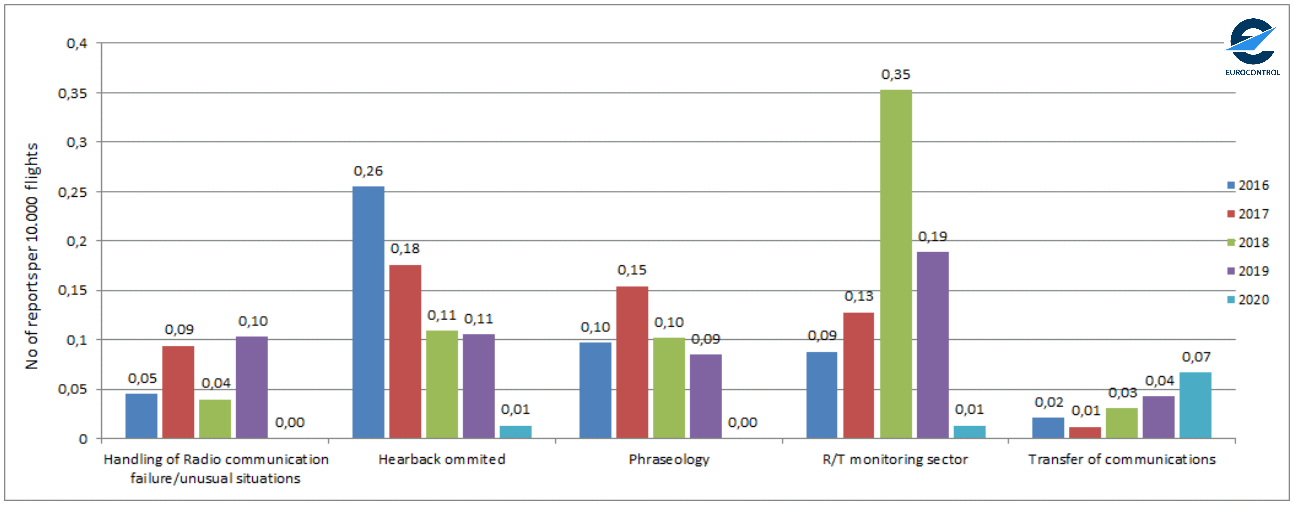


Figure 27: Operational communication in the 2016-2020 summer periods

In summer 2020, "operational communication" reports, contrary to "spoken communication" reports, manifested a decrease across almost all monitored areas. The only increase was recorded in "transfer of communication" reports. In some areas like "phraseology" and "handling or radio communication failure/unusual situations", EVAIR did not record any reports.

LOSS OF COMMUNICATION IN THE 2016-2020 SUMMER PERIODS

EVAIR (at European level) and IATA GADM (at global level) carry out analyses in support of EUROCONTROL's loss of communication project.

For the summer period 2016-2020, loss of communication reports made up 4% of the total number of ATM reports in the EVAIR database. For the five years of summer periods monitored, loss of communication occurred in 40 different States across Europe and at 75 different locations. For the same period, the ATM system had a direct impact on loss of communication events in 14% of cases and an indirect impact in 15% of cases. In 71% of cases, the ATM system was not involved.

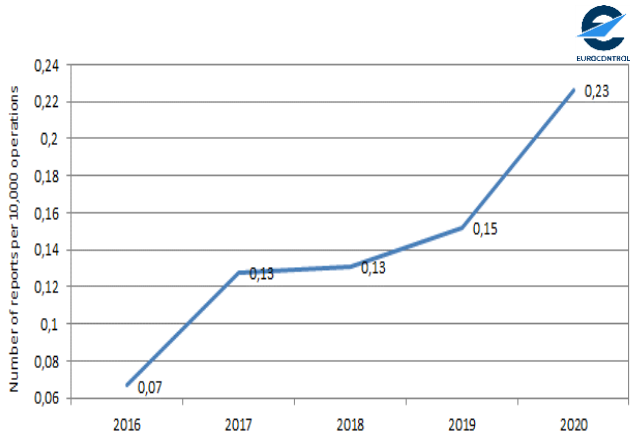


Figure 28: Loss of communication at European level in the 2016-2020 summer periods

Since summer 2018, there has been an increasing trend in loss of communication. In summer 2020, despite a substantial decrease in traffic, EVAIR recorded the highest trend for the last ten years (Figure 28).

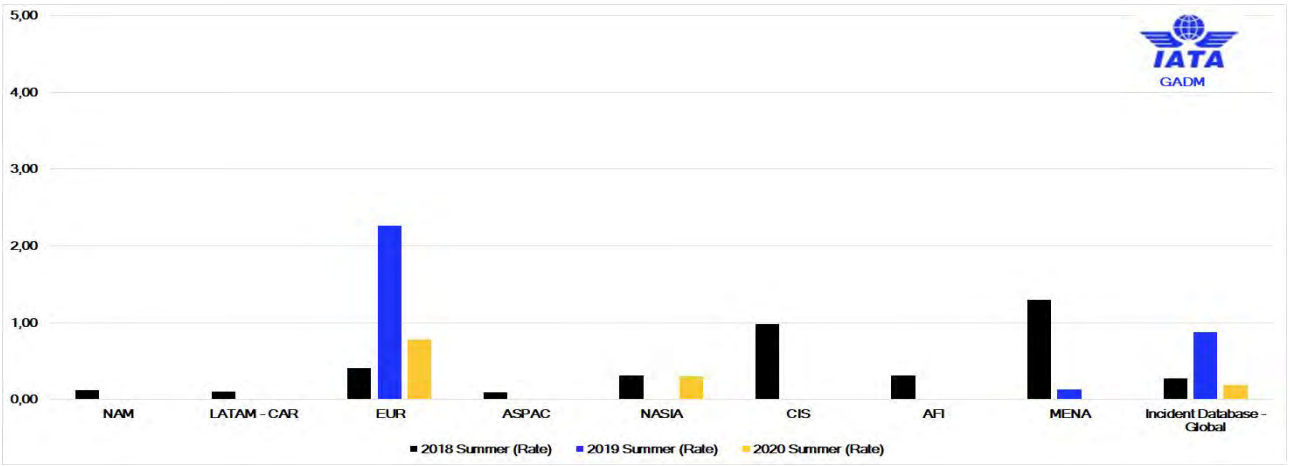
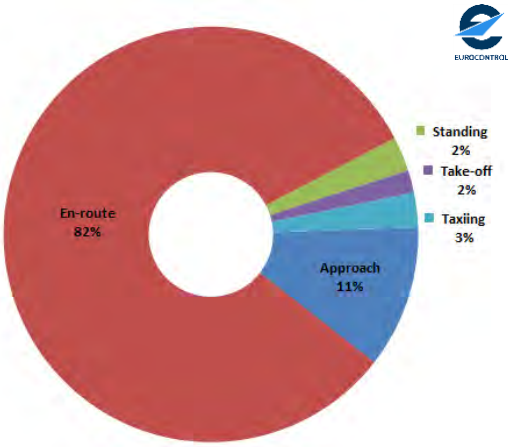


Figure 29: IATA global loss of communication in the 2018-2020 summer periods

In summer 2020, at global level, IATA GADM recorded a significant decrease in loss of communication events amongst the European airlines flying across the world.

In fact, only airlines in the European and north Asia region reported loss of communication events in summer 2020 (Figure 29).



Generally, most loss of communication occurred in the en-route phase (82% of the loss of communication reports). The most frequent problems identified were handling of radio communications or in the R/T monitoring sector.
From the risk point of view, events occurring in the approach phase carry a higher degree of risk. About 5% of loss of communication occurring in the approach phase ended with go-arounds.

***Figure 30**: Loss of communication by phase of flight in the 2016-2020 summer periods*

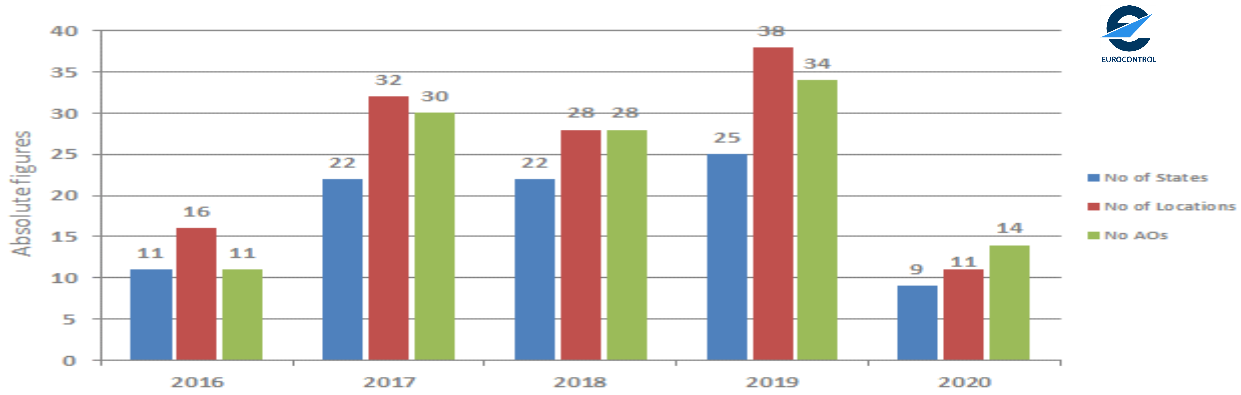


***Figure 31**: Number of States, locations and AOs reporting loss of communication in the 2016-2020 summer periods*

The substantial decrease in in summer 2020 was accompanied by a decrease of the number of States, Locations and AOs affected by loss of communication.

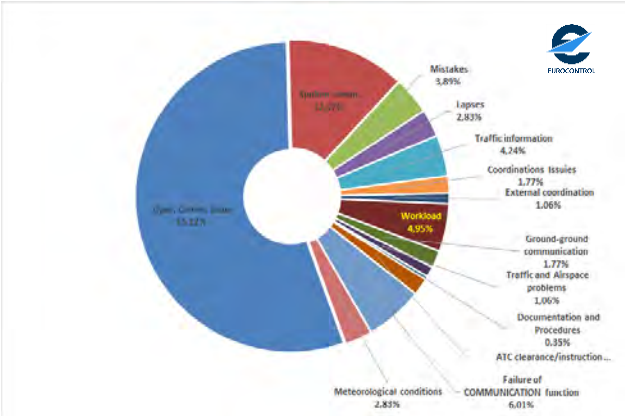
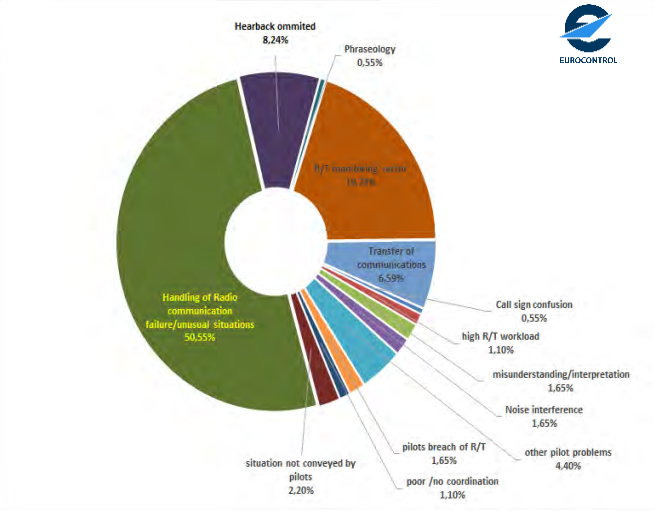


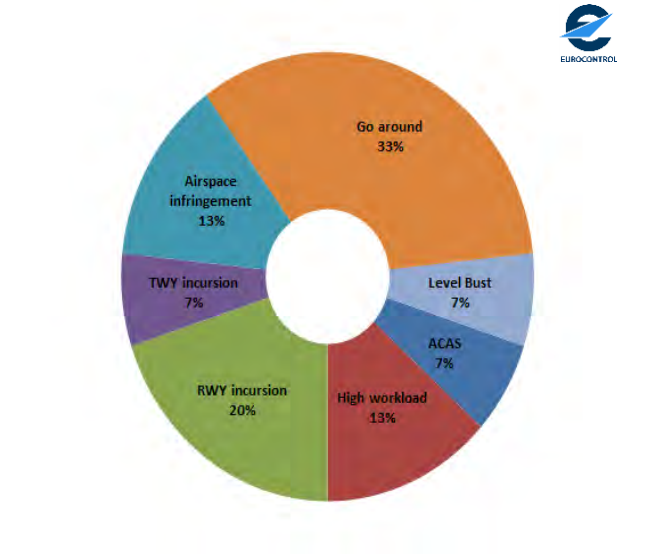
***Figure 32**: Loss of communication contributors in the 2016-2020 summer periods*

Air-ground communication, consisting of operational and spoken communication, has been recording higher percentages of loss of communication over a longer period (Figure 32).



A drill down of loss of communication in air-ground communication (one of the main contributors to loss of communication) shows that, as in the previous seasons, "handling of radio communication failure/unusual situations", is the main reason (50%) "Handling of radio communication failure/unusual situations" includes wrong frequency selection, forgetting to change the frequency, lack of ATC instruction to change the frequency, etc.

***Figure 33**: Drill-down of loss of communication in air-ground communication in the 2016-2020 summer periods*



For a lengthy period, especially in the approach phase, loss of communication events have most often been associated with go-arounds (33%). However, the most risky events were those linked to runway incursions (20%).

***Figure 34**: Events associated with loss of communication in the 2016-2020 summer periods*

SPECIFIC EVENTS

LASER THREATS ACROSS EUROPE IN THE 2016-2020 SUMMER PERIODS

Laser threats accounted for 5.5% of the total number of EVAIR ATM occurrences recorded for the 2016-2020 summer periods. The most frequently reported occurrences involved green lasers, although from time to time we also recorded occurrences involving blue lasers. Laser attacks have been showing a steady decrease over a lengthy period. However, in summer 2020, despite the decrease in traffic because of COVID-19, laser interference increased. This increase was still 5½ times lower than the highest level, recorded in 2010.

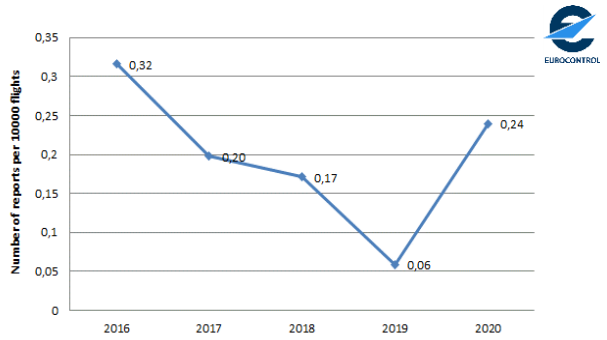


Figure 35: Laser interference in the 2016-2020 summer periods

It was noted that pilots and controllers have continued to follow recommended laser reporting procedures. Namely, interference is reported to the local police. From time to time, we see in reports that local police have interviewed pilots and asked for additional information. However, getting the feedback is not an easy task, and it is very often missing. This could be one of the reasons for the reduction in reporting, and in that connection the lower trends in reported incidents last a few years.

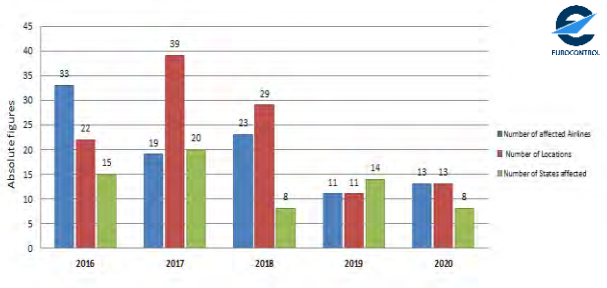


Figure 36: Number of States, locations and AOs reporting laser interference in the period 2016-2020

In summer 2020, there was a slight increase in the number of AOs and locations affected compared with summer 2019. Those most affected were the big hubs and the approach phases of airports located on the cost.

The phase of flight most affected was the approach phase (77%). It is worth pointing out that around 4% of laser interference incidents recorded occurred above FL 300. This most probably means that these were very powerful laser devices.

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

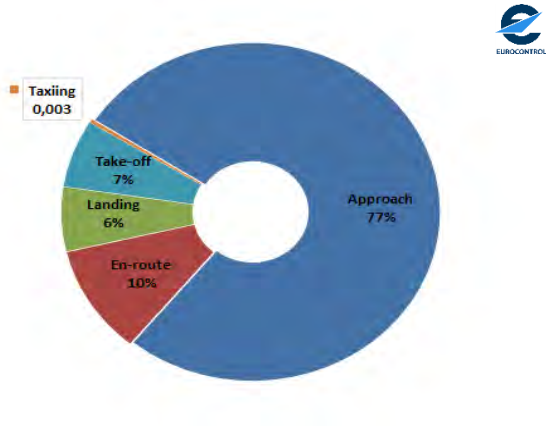


Figure 37: Phases of flight affected by laser interference in the period 2016-2020

REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)/DRONES IN THE 2016-2020 SUMMER PERIODS

The RPAS/drone statistics produced by the EUROCONTROL Voluntary ATM Incident Reporting (EVAIR) mechanism are based on ATM incident data provided by commercial AOs and European ANSPs, including a few air navigation service providers from neighbouring regions. A clear majority of reports come from AOs.

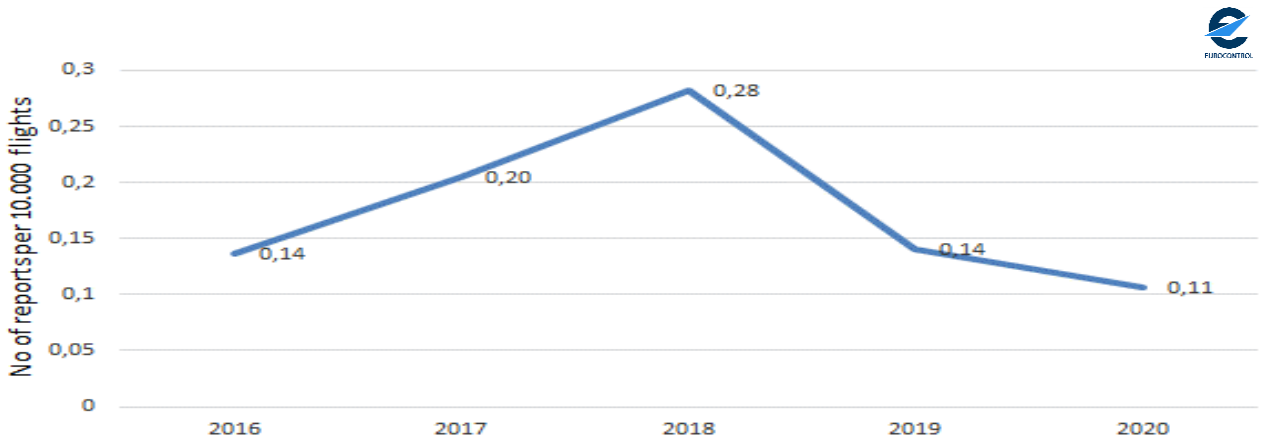


***Figure 38**: RPAS trends in the 2016-2020 summer periods*

As can be seen from Figure 38, RPAS reports showed a slight decrease in summer 2020 compared with summer 2019. However, if we look at RPAS occurrences in the EVAIR database as whole, RPAS reports account for 5.7% of all those which EVAIR collected for the 2016-2020 summers. This figure is almost 50% higher than that for the previous five years (the 2015-2019 summer periods).

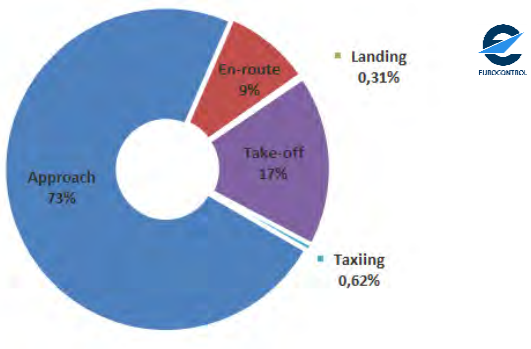


***Figure 39**: RPAS phases of flight in the 2016-2020 summer periods*

The majority of RPAS/drone reports in the EVAIR database were recorded at low altitudes. A smaller number of drones were observed and reported to EVAIR at higher altitudes. It is interesting to note that in summer 2020, EVAIR did not record any drones on high altitudes. In good weather conditions, pilots were able to provide very detailed descriptions of the drones observed.

Number of States and locations reporting RPAS/drones

The substantial reduction in traffic, and hence in drone reports, resulted in a substantial reduction in the number of States and locations where RPS/drones were reported.

In summer 2020, the airspace most affected by drones/RPAS was that of the core European hubs.

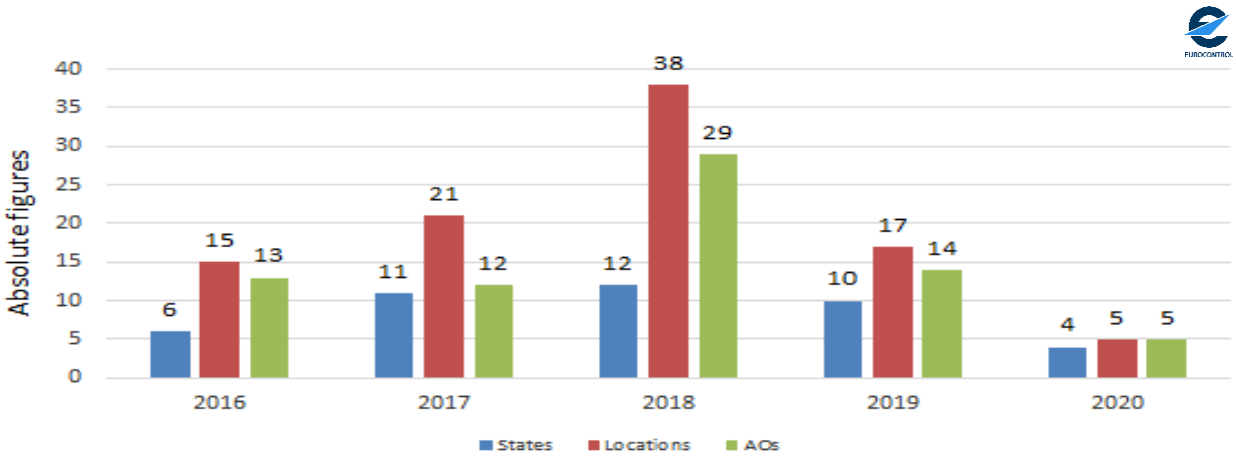


Figure 40 *Drone spread across European States in the 2016-2020 summer periods*

For all of the summer periods between 2016 and 2020, EVAIR recorded drone/RPAS encounters at 53 different locations, which is 20 less than the figure for the summer periods between 2015 and 2019.

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 RPAS/UAS. **You can read more about EUROCONTROL's 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 2016-2020 SUMMER PERIODS

EVAIR is one of the first data collection mechanisms that sounded the alarm about the problem with GPS outages. The first reports being recorded in 2013. Since then, EVAIR regularly provides information about problems and the main areas of concern reported in GPS reports. The main cooperation is with AOs and their associations, primarily IATA. EVAIR's main stakeholders additionally include ANSPs, EASA and ICAO.

EVAIR is part of the wider EUROCONTROL team dealing with GPS problems, made up of navigation and surveillance experts.

The COVID-19 crisis affected the business of the majority of AOs, including those who have been excellent and regular reporters to EVAIR. Owing to the crisis, AOs were forced to reorganise their businesses. Amongst the many changes, these reorganisations included staff cuts. As a result of these reorganisations, and especially the staff cuts, we have seen the loss of some AOs who were amongst the best EVAIR reporters. The final outcome is fewer reports in general but also fewer GPS reports. In fact, the final outcome is a reduced ability to identify the problem at an early phase and to monitor it.

For the 2016-2020 summer periods, EVAIR received reports from 75 different AOs. The total number of GPS reports in the EVAIR database, expressed as a percentage, dropped from almost 60% in the summers of 2018 and 2019 to 33% in summer 2020. In our experience, this is not because GPS problems reduced significantly but rather, as stated above, because EVAIR lost some of its best reporters.

The main geographical areas affected by GPS outages are still those where political tensions exist. These are the south-east Mediterranean and the Black Sea/Caspian Sea axes.

As in the 2015-2019 summer periods, more GPS problems were reported navigation in the 2016-2020 summer periods in PBN airspace and airports where SID/STAR procedures are based on satellite.

Raising awareness amongst aircraft operators and ANSPs regarding a potential loss of GPS signal is an ongoing and important task. Notwithstanding the efforts of IATA, EUROCONTROL, EASA and ICAO, States need to be more proactive in this regard, especially with the issuing of NOTAMs on GPS outages in order to prepare pilots to switch to other types of navigation.

We would like to take this opportunity to reiterate that in accordance with the ICAO GNSS Manual (Doc 9849), ANSPs which identify GNSS interference must issue an appropriate NOTAM. 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 question of NOTAMs is crucial if aircraft operators are to be properly prepared when flying through the regions affected.

EUROCONTROL activities based on EVAIR reports about GPS problems

The EUROCONTROL GPS analysis team collects the reports and focuses on each area that has had a relevant number of total reports. GPS constellation health and solar activity levels are verified in order to determine radio frequency interference (RFI) as a probable cause. In these RFI areas, the available surveillance and terrestrial navigation infrastructure is assessed in order to determine whether the outages result in unacceptable operational risk. This information is coordinated with EASA and affected ANSPs. Furthermore, the EUROCONTROL Network Manager has written to the International Telecommunications Union (ITU), in order to make the radio regulatory organisations aware of the significant levels of interference which have been experienced for several years now in some regions of the European network and its adjacent areas.

Individual reports giving details of avionics problems are also analysed and coordinated with the appropriate entities. The most significant risk has been identified as false ground proximity alerts. Aircraft manufacturers have been made aware of these cases and are working on solutions to resolve this problem. Another matter which has been raised is the need for the GPS receiver to return to normal operations when no longer subject to RFI. Here also, manufacturers are working on improving the avionics, and specific new requirements on interference robustness are being introduced in next-generation GNSS equipment standards.

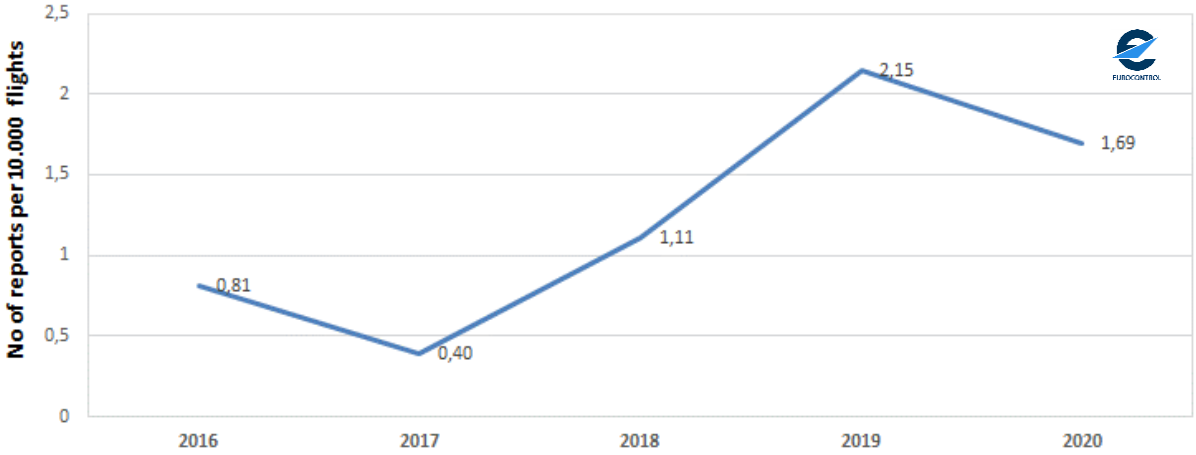


Figure 41: GPS outages in the 2016-2020 summer periods

In the 2016-2020 summer periods, EVAIR identified 65 FIRs in which there had been GPS outages. More than 35% of reports were in the Black Sea/Middle-East axes, 20% occurred in the south-eastern and southern Mediterranean and about 7% in the Black Sea/Caspian Sea axes. About one third of reports did not contain information about the location of the occurrence.

Owing to the magnitude of the problem, requests by AOs to ANSPs to reconsider their plans to decommission ground navigational aids remain in force.
After cross-checks of the different data related to GPS outages, the common conclusion is that one of the main causes of GPS outages in politically disputed regions could be interference with the satellite signal.

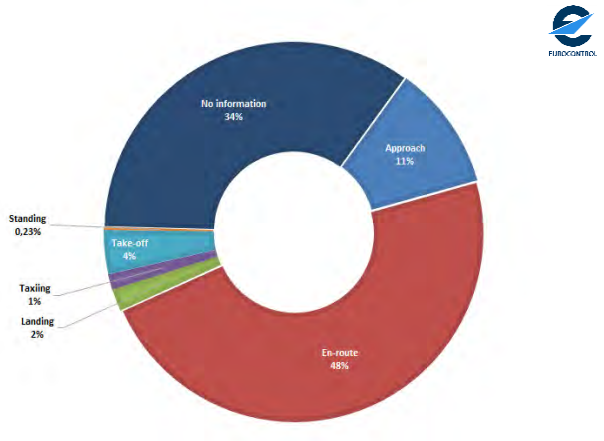


Figure 42: GPS outages by phase of flight in the 2016-2020 summer periods

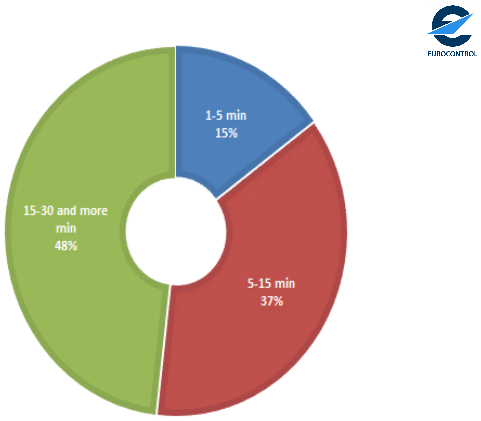


Figure 43: Duration of GPS outages in the 2016-2020 summer periods

All the analysis carried out to date indicates that the phase of flight most affected by GPS outages is the en-route phase (Figure 42).

For the analysis of the duration of GPS outages, we set the time spans for lost signals at 1-5 minutes, 5-15 minutes, and 15-30 minutes or more (see Figure 43).

As can be seen from Figure 43, of the three time spans defined for loss of signal, the span 15-30 minutes or more accounted for 48% of reports, which is a little higher than the figure for the 2015-2019 summer periods. The time span 1-5 minutes accounted for 37% of reports and the time span 1-5 minutes for 15%. If we look at both the time span for loss of signal and the aircraft most frequently flown in the affected regions, we see that when the GPS signal is lost, a number of FIRs are affected at the same time.

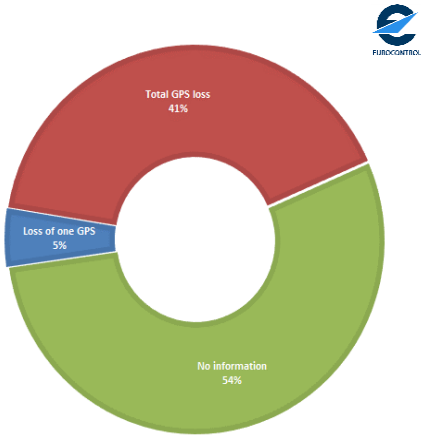


***Figure 44**: GPS loss in the 2016-2020 summer periods*

EVAIR identified two types of GPS loss on board, namely total loss and loss of one GPS. Unfortunately, this information was not provided in 54% of reports. When it was provided, total loss was reported in 41% of events.

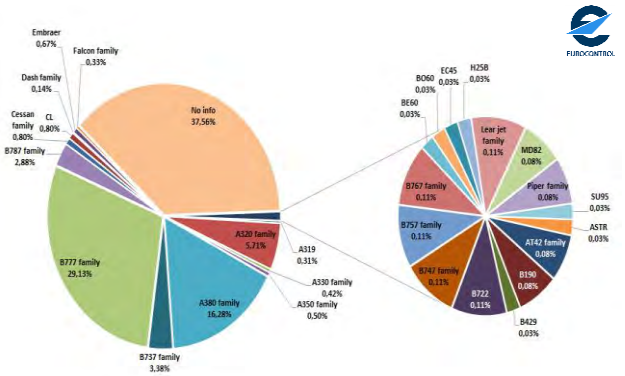


***Figure 45**: Type of aircraft affected by GPS failure in the 2016-2020 summer periods*

The types of aircraft most affected by GPS outages are also those which are most frequently flown in affected regions, Namely the B777 family and the A380 family (Figure 45).

In addition the problems presented in the graphs above, other problems identified in GPS reports include the following: discrepancies between GPS positions and NAV FMSs; terrain warnings, sometimes with pull-up requests (In the majority of cases pull-up warnings were disregarded by pilots or the function was switched off.); inability to fly RNP and pilots requesting radar vectoring; in a few cases, lack of situational awareness and requests for the assistance of radar vectoring to reach the destination; incorrect display of wind and ground speed; loss of ADS-B L/R, wind shear, terrain and surface functionalities; failure of L or R or both aircraft clocks or their starting to count backwards; EICAS transponder L/R.

ACAS REPORTING IN THE 2016-2020 SUMMER PERIODS

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 problems 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 in European Union airspace on all civil aircraft with an MTOW of over 5,700 kg MTOW or more than 19 passenger seats as from 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 AOs and ANSPs.

We wish to point out that some of the ACAS/TCAS reports which 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 ACAS RA reports are supported by ANSP feedback based on operational investigations, including radar and voice records.

AIRLINE ACAS REPORTING IN THE 2016-2020 SUMMER PERIODS

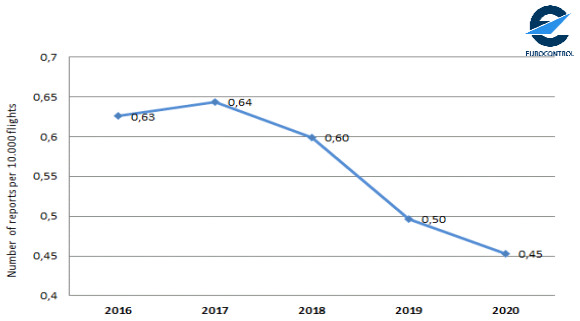


***Figure 46**: Airline ACAS incidents in the 2016-2020 summer periods*

ACAS RA reports make up about 19% of all types of occurrence report provided to EVAIR.

In summer 2020, EVAIR recorded 0.45 ACAS RAs per 10,000 flights. This is the third year in a row that ACAS RAs have shown a reduction. In general, the decreasing RA trend recorded not only over the last five but also over the last ten years is the outcome of various different actions taken by the main stakeholders, namely the ANSPs, CAAs, AOs, and IATA, but also EUROCONTROL. These actions include a number of different 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)

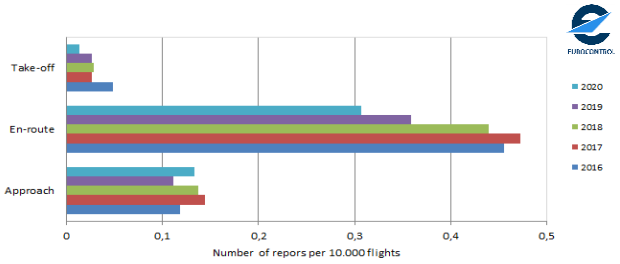


***Figure 47**: Airline ACAS RAs by phase of flight for the 2016-2020 summer periods*

The en-route phase at pan-European level has always accounted for more reports than other flight phases. In summer 2020, a reduction was recorded in this phase, whereas an increase was recorded in the number of ACAS RA reports in the approach phase, despite an overall reduction in the number of ACAS RA reports, and more importantly a general decrease in traffic. This is a very interesting situation, which requires more analysis in order to understand the background behind this trend.

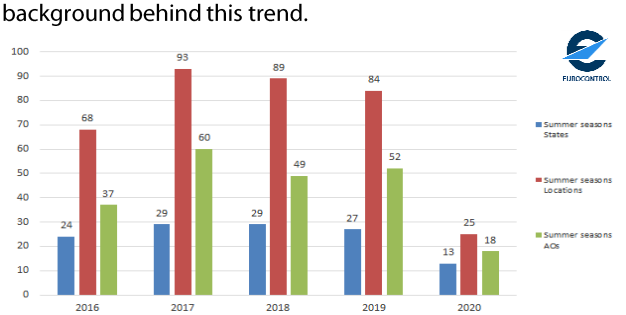


***Figure 48**: Number of States, locations and AOs reporting ACAS RAs in the 2016-2020 summer periods*

The absolute figures for ACAS RAs, showing the number of AOs which experienced ACAS RAs and also the number of States and locations where ACAS RAs occurred (Figure 48), indicate that in summer 2020, EVAIR recorded a significant reduction in all parameters. Bearing in mind the significant drop in traffic due to COVID-19, this is understandable.

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 which cannot be classified because of insufficient data.

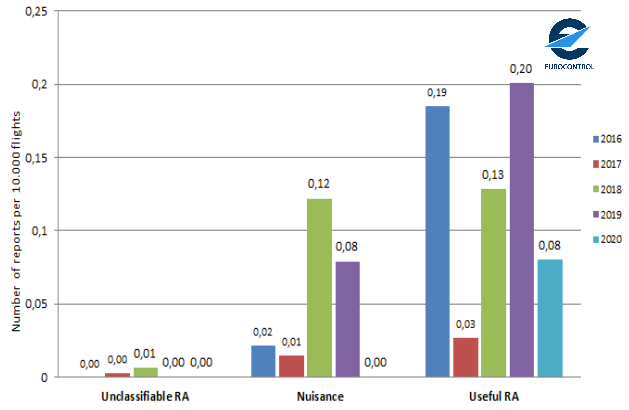


Figure 49: ACAS RA classification in the 2016-2020 summer periods

The trend in ACAS RAs for summer 2020 reveals a very remarkable situation, which has been recorded in EVAIR for the first time, namely that all ACAS RAs reported in summer 2020 were classified by pilots as "Useful RAs". As we understand it, these reports indicate pilots' full confidence in ACAS resolution advice.

ACAS RA INSTRUCTIONS IN THE 2016 – 2020 SUMMER PERIODS

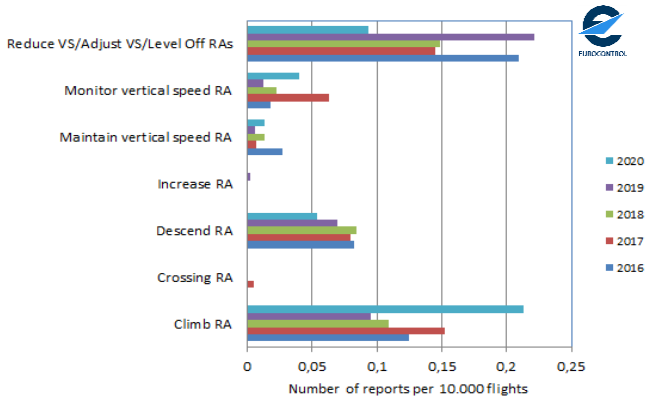


Figure 50: ACAS RA instructions in the 2016-2020 summer periods

Of the seven types of ACAS RA monitored, in very specific COVID-19 circumstances, and with an associated substantial reduction in traffic, three showed an increase in summer 2020, namely "Climb RA", "Monitor vertical speed RA" and "Maintain vertical speed RA". It is worth mentioning that the number of "Climb RAs" did not show any increase in absolute figures, but on the contrary a reduction was recorded. However, owing to the very low traffic figures, the exposure values for "Climb RA" were higher than in summer 2019.

ACAS RA ATM CONTRIBUTORS IN THE 2016-2020 SUMMER PERIODS

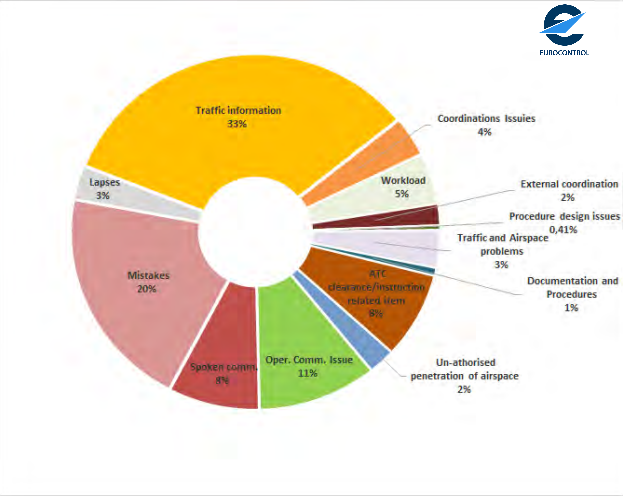


***Figure 51**: TCAS RA ATM contributors in the 2016-2020 summer periods*

The situation as regards TCAS RA ATM contributors in the 2016-2020 summer periods is very similar to that in the previous five summer seasons (2015-2019). There are very slight differences, ranging from 1 to 2% in some of the measured elements.
Provision of "traffic information" by air traffic controllers to pilots (33%) and air traffic controller "mistakes" (20%) were areas for which higher percentages were always recorded than for the others.

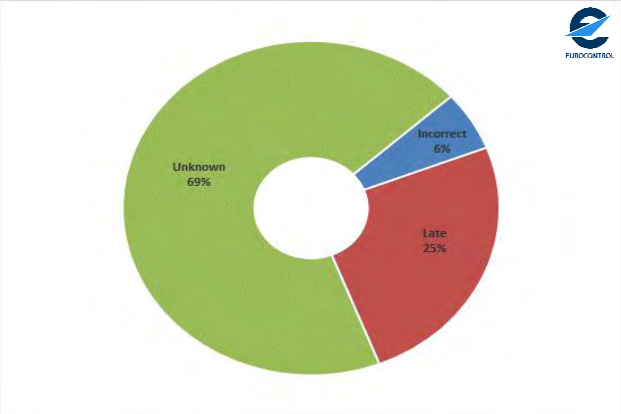


***Figure 52**: Traffic information problems associated with ACAS RAs in the 2016-2020 summer periods*

To better understand the content of the "traffic information" problem (Figure 51), we drilled down through this area of concern (Figure 52). In reports where identification was possible, the main problem was "late" provision of traffic information.

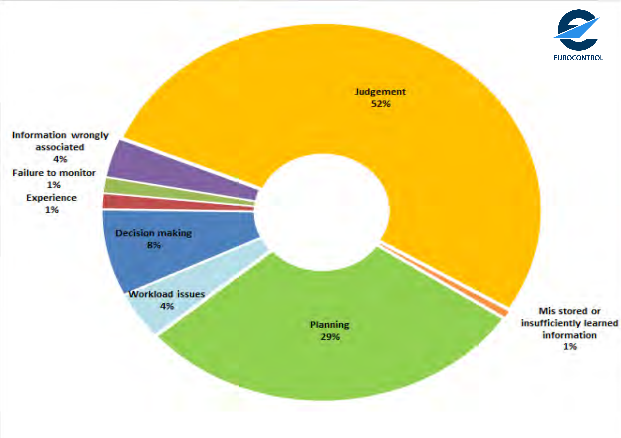


***Figure 53**: Mistakes associated with ACAS RAs in the 2016-2020 summer periods*

In addition to "traffic information", we drilled down through "mistakes" in order to break things down even further. As can be seen from Figure 53, the main problems related to ATCO "judgment" and "planning", which accounted for 81% of mistakes.

WAKE TURBULENCE IN THE 2016-2020 SUMMER PERIODS

EVAIR mechanism have been involved for years in the various internal and external wake turbulence (WT) activities, supporting them with data provided to EVAIR by main data providers, AOs and ANSPs.
Wake turbulence occurrences do not make up a high percentage of the overall number of reports provided to EVAIR, but from the severity point of view they can be treated as very severe. For the 2016-2020 summer periods, wake turbulence occurrences accounted for 2.2% of all reports.

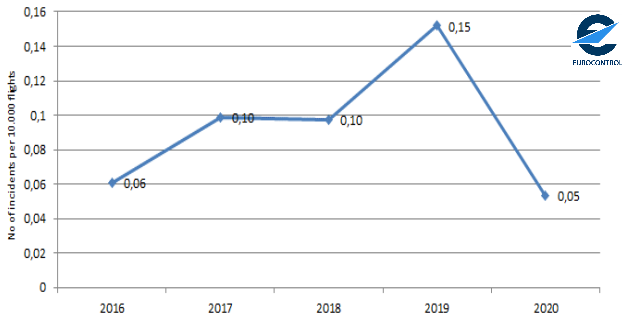


Figure 54: Wake turbulence in the 2016-2020 summer periods

Summer 2019 recorded the highest wake turbulence trend, which in a way followed the overall increase in traffic, which reached its peak in the year 2019. Owing to COVID-19, summer 2020 recorded a dramatic drop in traffic, which was followed by a significant reduction in wake turbulence occurrences. In our experience, wake turbulence belongs to those types of event which are more closely linked to traffic density than other types of ATM safety occurrence. The substantial decrease in traffic in summer 2020 thus in a way contributed to the significant decrease in the number of wake turbulence occurrences.

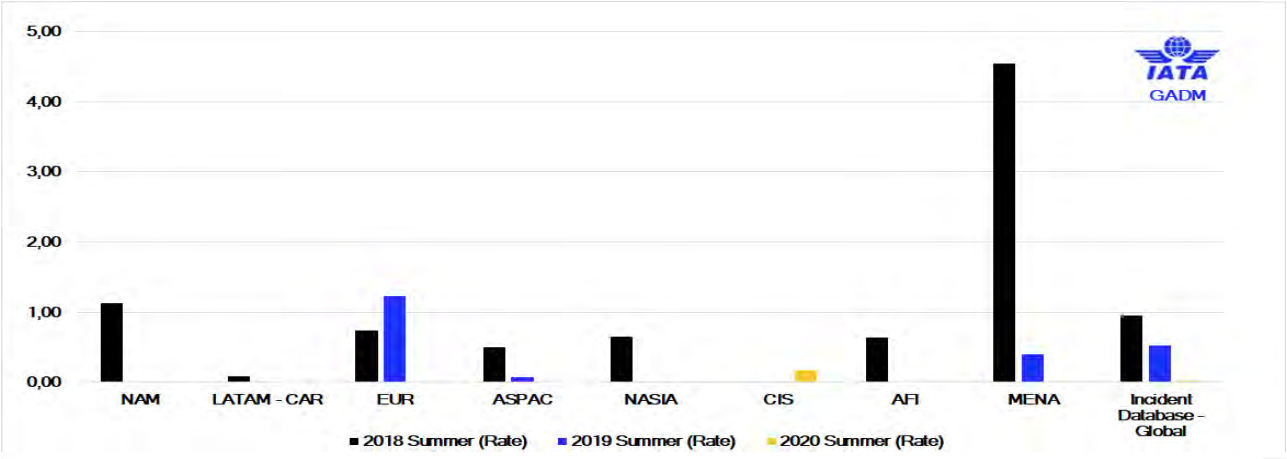


Figure 55: IATA global wake turbulence in the 2016-2020summer periods

The IATA GADM database shows that the only wake turbulence occurrences in summer 2020 were reported by AOs from the CIS states (the former Soviet Union). It is interesting that even in summer 2019, when traffic was reaching its peak, IATA carriers from four regions did not report wake turbulence occurrences. In any event, both the IATA GADM data base and EVAIR recorded very low trends in summer 2020. Future monitoring will show whether this trend will continue. As we said above, this will depend on traffic recovery and if it reaches or comes close to the 2019 level.

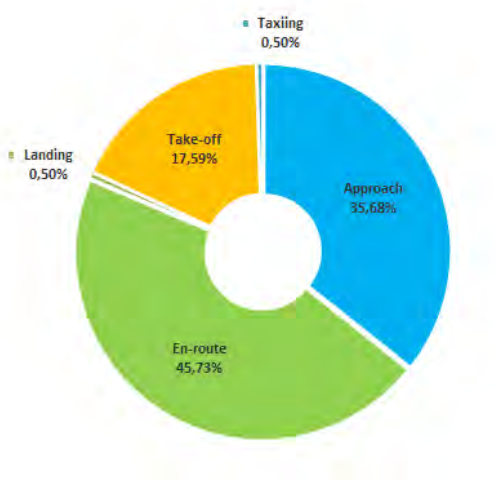


Figure 56 *Wake turbulence by phase of flight in the 2016-2020 summer periods*

The EVAIR cumulative figures show that in the 2016-2020 summer periods, the phases of flight most affected by wake turbulence were the en-route phase (45%) and the approach phase (35%). A higher percentage of wake turbulence reports has been observed by EVAIR in the long term in these two phases of flight.

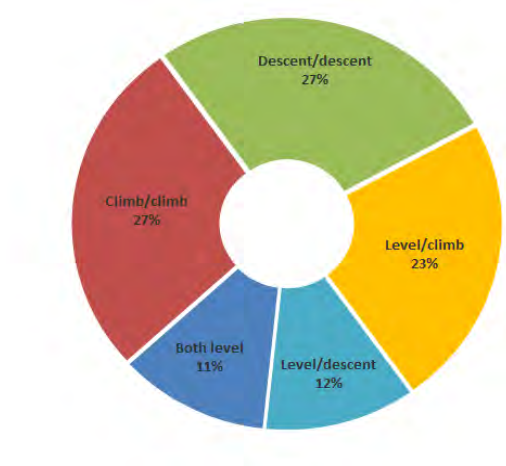


Figure 57 *Wake turbulence by vertical profile in the 2016-2020 summer periods*

Figure 57 shows wake turbulence occurrences involving two aircraft by vertical profile. In this regard, EVAIR recorded a fairly even distribution in the 2016-2020 summer periods between climb/climb, descent/descent and level/climb profiles. A slightly lower trend was recorded between aircraft when both were level and for level/descent.

If we look only at the en-route phase of flight, the vertical profile percentages are slightly different. Level/climb shows the highest percentage (37%) whilst all other types of vertical profile are more or less evenly spread between 15% and 16%.

The situations in the approach and take-off phases are completely different. In the approach phase, the only type of vertical profile recorded by EVAIR is descent-descent, whereas in the take-off phase it is climb/climb

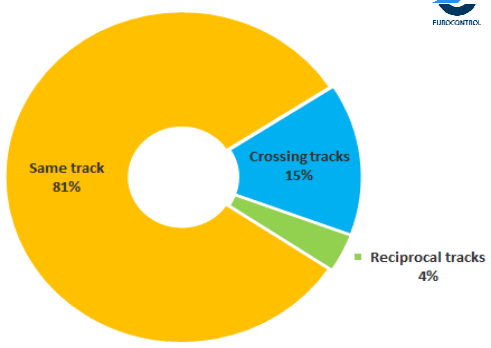


Figure 58 *Wake turbulence by relative horizontal movement in the 2016-2020 summer periods*

As regards relative horizontal movements and wake turbulence occurrences, the majority of such cases (81%) occurred when both aircraft were on the same track (Figure 58).

If we look only at the en-route phase of flight, same track occurrences accounted for the highest percentage (69%), whilst crossing track occurrences showed a much higher percentage (26%) than when we look at all phases of flights.

As can be seen from Figure 58, relative horizontal movements are completely different in the approach and take-off phases of flight than in all other phases of flight. The only types of relative horizontal movement in the approach and take-off phase are same track movements.

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 problems identified in the Runway Incursion and Level Bust Safety Improvement Initiatives and other matters 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 in 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 problem 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 are the result of the combined and sustained efforts of organisations representing all areas of aerodrome operations. The organisations which contributed to this Action Plan are fully committed to enhancing the safety of runway operations by advocating the implementation of the recommendations which 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 EXCURSIONS (EAPPRE)

The 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 (developed inter alia by EUROCONTROL, AOs and the Flight Safety Foundation) 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 Air Traffic Management) is developing 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): In relation 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 expedited 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 absence of or incorrect or late decisions

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

Judgment (HERA): Mainly associated with separation

Lapses (HEIDI): Psychological problems, 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)

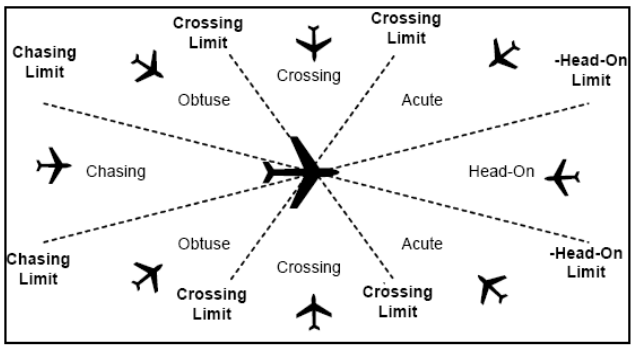
Mental/emotional/personality problems (HERA): These include the following items:

- Mental capacity: loss of picture or safety awareness
- Confidence in self, in others, in information, in equipment, in automation
- Complacency
- Motivation/morale
- Attitudes towards others
- Personality traits: aggressiveness, assertiveness, lack of confidence, risk-taking
- Emotional status: Stress, post-incident stress
- Misstored or insufficiently learned information
- Planning: insufficient, incorrect or failed
- Recall of information: failed, inaccurate, rare information, past information
- Violations: routine, exceptional

Mistakes (HEIDI): Psychological problems, encompassing information wrongly associated, workload problems, 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 omission, 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 communication 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 which 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**, encompassing 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 weather (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 is 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 for other aircraft and about which information has to be provided.

Workload problems (HERA): These concern both minimal and excessive workload.

ANNEX 3 – ABBREVIATIONS AND ACRONYMS

ACAS	Airborne collision avoidance system
ADS-B	Automatic Dependent Surveillance – Broadcast
AFI	Africa
AGC	Air-ground communication
ANSP	Air navigation service provider
AO	Aircraft operator
ASMT	ATM Safety Monitoring Tool
ASPAC	Asia Pacific
ASR	Air safety report
ATC	Air traffic control
ATM	Air traffic management
AUA	ATC unit airspace
CIS	Commonwealth of Independent States
CPDLC	Controller-pilot datalink 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
EICAS	Engine-indicating and crew-alerting system
EUR	Europe
EVAIR	EUROCONTROL Voluntary ATM Incident Reporting
GADM	Global Aviation Data Management (IATA)
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 air traffic management
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
LATAM – CAR	Latin America and the Caribbean
LB	Level bust
L/R	Left/right
MENA	Middle-East and north Africa
NOTAM	Notice to Airmen
NAM	North America
NASIA	North Asia
NM	Network Manager
PBN	Performance-based navigation
RA	Resolution advisory
RFI	Radio Frequency Interference
RNAV	Area navigation
RPAS	Remotely piloted aircraft systems
SID/STAR	Standard instrument departure/standard instrument arrival
STEADES	Safety Trend Evaluation and Data Exchange System
TCAS	Traffic collision avoidance system
TA	Traffic advisory
THR	Threshold

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