Airborne Conflict Safety Forum
10, 11 June 2014
Brussels:

Findings and Conclusions

Released Issue V1.0 ***Issued: 18 July 2014***

CONTENTS

Executive Summary

This report describes the background, objectives, and outcomes of the Airborne Conflict Safety Forum, initiated by the Flight Safety Foundation, The European Regions Airline Association and EUROCONTROL that took place on 10 and 11 of June 2014 in EUROCONTROL Brussels.

The Forum discussed in-depth the issues related to level bust, airborne conflict safety nets and airspace built in safety and outlined number of findings. Considering the findings the Forum formulated a series of conclusions to respond to the following fifteen safety improvement strategies:

- **S1** Support risk management by improving the integrity and use of potential and actual airborne conflict safety data.
- **S2** Improve the likelihood of the ACAS corrective RA pilot response being compatible with the system design assumptions.
- **S3** Address the equipage and airspace access requirements for all users to ensure that the effectiveness of the ACAS RA Safety Net is not compromised.
- **S4** Improve the ATC awareness of corrective ACAS RA action.
- **S5** Resolve the aircraft airworthiness and operational issues which can compromise the effectiveness of the ACAS RA Safety Net.
- **S6** Find and use ways to improve the detection and resolution of controller and pilot errors which may lead to loss of separation.
- **S7** Raise the recognition of the importance of 'See and Avoid' where it is the primary collision avoidance 'safety barrier'.
- **S8** Distinguish the implications of airspace class designation for airborne conflict risk and threat management solutions.
- **S9** Improve STCA capability.
- **S10** Standardise the pilot action sequence when responding to new vertical or lateral clearances received by multi crew aircraft.
- **S11** Understand the risk/impact of changing the transition altitude at a sufficiently high level as beneficial to the prevention of level busts**.**
- **S12** Adopt a total system approach when developing an airspace concept. This should include the relationship between human, procedures and technology.
- **S13** Improve the discipline/techniques used during Air/Ground communications and adopt a pro-active call sign similarity risk reduction regime.
- **S14** Contribute to the design and standardisation process of ACAS X, so it brings sufficient safety and operational benefits for the European network.
- **S15** Communicate airborne conflict safety issues to operational stakeholders.

Chapter 1
Introduction

1.1 What is the purpose of this report?

Documenting and communicating.

This report describes the background, objectives, and outcomes of the Airborne Conflict Forum, initiated by the Flight Safety Foundation, The European Regions Airline Association and EUROCONTROL. The Forum took place on 10 and 11 of June 2014 in EUROCONTROL Brussels and was held in partnership with ICAO, IFATCA, UK CAA, UK NATS, IATA, ECA and DGAC (France).

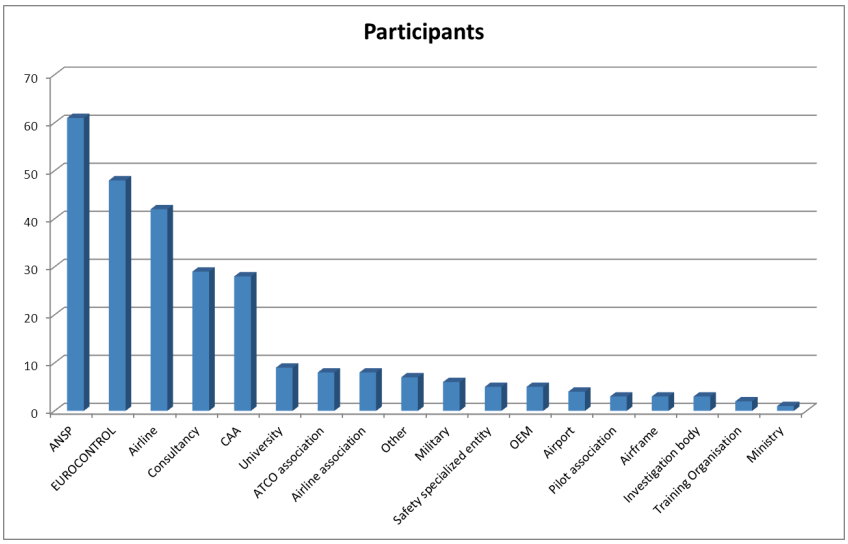
1.2 The objectives of the Airborne Conflict Forum

One Day, One Issue, One Co-ordinated Outcome Event.

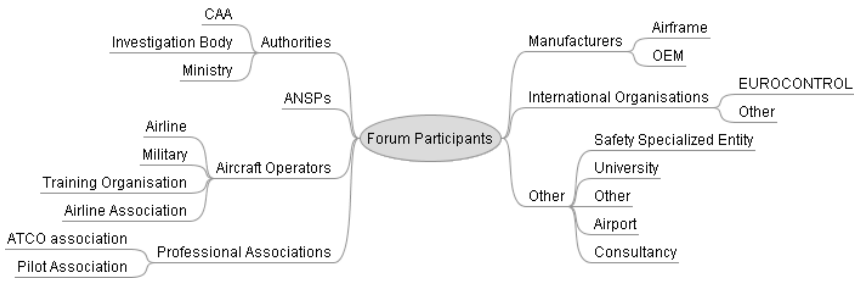
The Airborne Conflict Safety Forum (ACSF) targeted operational and safety professionals with the intention to hold a one-day event, with a clear focus on airborne conflict safety aspects and to result in the creation of an event report and supporting awareness material.

1.3 Participants

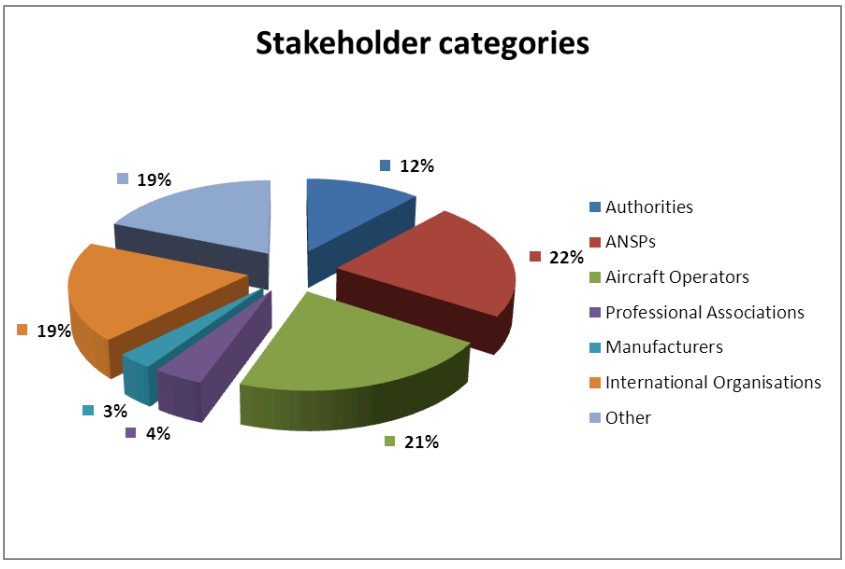
Airborne Conflict Safety Forum The Airborne Conflict Safety Forum attracted attention of 272 aviation professionals representing various stakeholders.



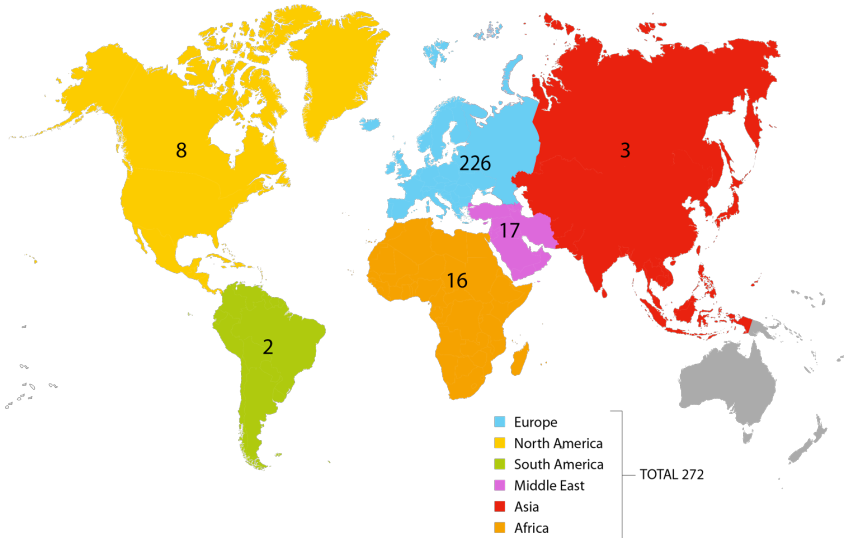
The participants were mapped into categories using the following map.



The categories.



Participants to the Airborne Conflict Safety Forum came from all over the world.



1.4 Outline of the Forum results

Findings, Strategies and Conclusions

The Forum results were summarised in a series of Findings and fifteen Strategies were developed to help structure the response to the Findings into Conclusions. These Conclusions were grouped according to their predominant relevance for a particular audience and addressed to the Industry in general, to Aircraft Operators, ANSPs, Aircraft Manufacturers and Regulatory Authorities.

Chapter 2
Findings

REF	FINDINGS
F1	*In European airspace with prescribed separation minima, there are approximately 150 losses of separation per million flights.*
F2	*Since each flight receives on average 15 executive instructions in the en route environment, this is equivalent to 1 loss of separation per 100,000 instructions.*
F3	*These data also indicate that the primary origin of the occurrence was Aircraft Management 60%, Air Traffic Control 30% and both sources 10%.*
F4	*IATA safety data shows 0.25 pilot level bust reports per 1000 flights with 41% of these occurring during descent. Other data suggests that approximately 15% of Level Busts may subsequently result in a loss of separation in busy airspace.*
F5	*Useful data on the airborne conflict risk outside controlled airspace is sparse.*
F6	*There is confusion between the quantitative data needed to demonstrate and track the extent of the airborne conflict risk (SPIs) and the qualitative data essential to understand and prioritise the mitigation of this risk.*
F7	*There is clear need to distinguish between the two types of data needed for risk tracking and risk prioritisation and mitigation and avoid needless duplication of analysis.*
F8	*Data sharing should reflect need. ANSPs and Aircraft Operators at the front line must encourage reporting culture and must work together to establish the complete facts of an event together and their contribution to the causes internally.* *Both should be prepared to then share their findings rather than the raw data with their Regulator.*

F9	***Qualitative data must progress beyond databases of reports which see the "facts" from just one perspective and Quantitative data is more easily captured by ANSPs than Aircraft Operators***
F10	***Implementation of enhanced Mode S downlink capability across Europe should be encouraged.***
F11	***Airborne Conflict in Controlled Airspace must be addressed by maximising the ability of controllers to identify errors made by both pilots and themselves before Safety Nets are activated. To this end, the provision of effective tools utilising Mode S DAPs should be maximised.***
F12	***For situations where intervention prior to a loss of separation is not successful, the effectiveness of STCA should be maximised. Standardisation of both conflict detection criteria and conflict alerting thresholds should be considered. DAP feed to STCA is essential.***
F13	***Pilot familiarity with the implications of operation in different classes of airspace is inadequate.***
F14	***"Misunderstanding" by pilots of both lateral or vertical clearances can lead to airborne conflict. The SOP involved may be insufficiently precise.***
F15	***Airborne Conflict risk must be addressed in relation to airspace classification.***
F16	***It is useful to consider airborne conflict risk management according to the separation requirements in different classes of airspace.***
F17	***In fully controlled airspace, the ACAS Safety Net must be reliable. This means moving to automated corrective RA responses with credible training for manual response on the legacy fleet. Aircraft airworthiness requirements for access to this airspace must support this reliability requirement, See & Avoid is not viable. Appropriate pilot training is crucial. Timely ATC awareness of ACAS RA is vital.***
F18	***In uncontrolled airspace, ATC and ACAS may be able to help reduce airborne conflict risk but the primary "Safety Barrier" is "See & Avoid". This fact needs more recognition by both commercial operators and by leisure flyers.***
F19	***Class D/E airspace invites a blend of these two approaches with pilot awareness and training to match.***
F20	***ACAS training is not standardised and regulations are vague on requirements for ACAS training.*** ***There is no requirement for ACAS recurrent training.***
F21	***ACAS procedures are not always followed (RAs are not followed; reports are late/absent, standard phraseology not used).***
F22	***Airspace users are not always aware of available safety nets (both airborne and ground).*** ***Available industry material is not being used extensively.***
F23	***RA cockpit displays are not always intuitive and vary between implementations.***
F24	***There is no compatibility between various safety nets and their interactions are not always understood and appreciated.***
F25	***The FAA initiated extensive work on the development of new ACAS – X, a family of collision avoidance systems. Action is required to ensure ACAS X compatibility with European operations.***

F26	***Input of useful DAP parameters can improve the effectiveness of STCA and other safety nets/tools.*** ***Use of RA downlink is not wide-spread and remains controversial.***
F27	***STCA/RA occurrence reports are not standardised and not always required. That limits the possibility to analyse, share and learn lessons from past events.*** ***The data available to inform risk management of airborne conflict and level busts that may lead to it is poor and improving its quality is essential if it is to serve this purpose.***
F28	***In airspace where not all traffic is transponder equipped 'see and avoid' becomes a de facto safety barrier.***
F29	***Transponder is a single point of failure for safety nets (lack of it as well as partial or total malfunction), for large part of the surveillance and most of the ATC support tools.*** ***Aircraft operating without a serviceable transponder, with one generating erroneous output, or having switched off the transponder is prejudicial to both controller and pilot awareness of airborne conflict risk.***
F30	***Poor automation handling and lack of monitoring can lead to crew selection errors. Expectations of how the Autopilot will perform can affect a pilot's judgement. Late re-clearances by ATC which are unachievable can be a factor in level busts.***
F31	***Conflicts can be difficult to detect, especially in a holding pattern situation.***
F32	***A complex airspace structure can be confusing for pilots who are not familiar with procedures such as stepped climb SIDs, conflicting SIDs and STARs and different transition altitudes.***
F33	***There is a short window of opportunity to correct separation infringements and complex airspace can reduce this timescale further.***
F34	***Incorrect pressure settings are one of the top causes of level busts in some airspace.***
F35	***Limited awareness of airspace class (and responsibilities of ATC) may lead to limited look-out by flight crew. It is difficult to quantify risk to commercial operations in uncontrolled airspace. Dynamic airspace design and classification leads to increased complexity.***
F36	***Procedures are designed safe, but hazards remain, due to adapted personal behaviour of one or more of the actors involved.*** ***Non-compliant with final approach procedures increases the risk of non-stabilised approaches; can lead to go-arounds and can be a pre-cursor to Controlled Flight Into Terrain or Runway Excursion.*** ***Occurrences of non-compliance with the final approach procedures can be recorded and analysed, with the help of operational experts.***
F37	***The complexity of aircraft operations is changing with mixed technology, mixed aircraft performance, mixed routes, mixed ATC tools. Managing the risk in such an environment is a challenge. Often 'piece-meal' approach to technological improvements is taken.***
F38	***Air-ground communications issues, in particular those often associated with Call Sign Similarity, continue to be a prime cause of level busts.***

Chapter 3
Strategies for Airspace Conflict Risk Reduction

3.1 Common Strategies

Strategy 1	Support risk management by improving the integrity and use of potential and actual airborne conflict safety data.
Strategy 12	Adopt a total system approach when developing an airspace concept. This should include the relationship between human, procedures and technology.
Strategy 15	Communicate airborne conflict safety issues to operational stakeholders.

3.2 Specific Strategies to reduce the airborne conflict risk

Strategy 2.	Improve the likelihood of the ACAS corrective RA pilot response being compatible with the system design assumptions.
Strategy 3.	Address the equipage and airspace access requirements for all users to ensure that the effectiveness of the ACAS RA Safety Net is not compromised.
Strategy 4.	Improve the ATC awareness of corrective ACAS RA action.
Strategy 5.	Resolve the aircraft airworthiness and operational issues which can compromise the effectiveness of the ACAS RA Safety Net.
Strategy 6.	Find and use ways to improve the detection and resolution of controller and pilot errors which may lead to loss of separation.
Strategy 7.	Raise the recognition of the importance of 'See and Avoid' where it is the primary collision avoidance 'safety barrier'.
Strategy 8.	Distinguish the implications of airspace class designation for airborne conflict risk and threat management solutions.
Strategy 9.	Improve STCA capability.
Strategy 10.	Standardise the pilot action sequence when responding to new vertical or lateral clearances received by multi crew aircraft.
Strategy 11.	Understand the risk/impact of changing the transition altitude at a sufficiently high level as beneficial to the prevention of level busts.
Strategy 13.	Improve the discipline/techniques used during Air/Ground communications and adopt a pro-active call sign similarity risk reduction regime.
Strategy 14.	Contribute to the design and standardisation process of ACAS X, so it brings sufficient safety and operational benefits for the European network.

Chapter 4
General Industry Conclusions

REF	Strategy	Finding	CONCLUSION
GEN1	S2, S5	F20	Introduce minimum and recurrent ACAS training requirements. Ensure that ACAS training is taken into account in any future inclusion of a realistic ATC environment in full flight simulators. ECAST should consider the creation of a group to solve this issue.
GEN2	S5, S14, S15	F25	Assess changes coming with ACAS X and their impact in European airspace. Conduct pilot/controller assessment workshop on ACAS X impacts.
GEN3	S1, S15	F27	Improve STCA/RA occurrence report standardisation and information sharing.
GEN4	S12	F37	Investigate approaches for managing risk in an increasing complex mixed mode environment. Consider a total system approach when introducing new technologies, procedures and operations.

Chapter 5
Aircraft Operators' Conclusions

REF	Strategy	Finding	CONCLUSION
AO1	S2, S5	F21	Review and enhance ACAS procedures and training (e.g. include required response time, lessons learnt). Use FDM, collect information and consider response times to check system. Investigate why crews sometimes do not respond correctly to TCAS RAs
AO2	S1, S15	F27	Improve STCA/RA occurrence report standardisation and information sharing.
AO3	S15	F36	Provide awareness to flight crews for the risks, associated with non-compliance with final approach procedures and accepting non-compliant with the procedures approach clearances.
AO4	S3, S7, S8	F13	Provide awareness to increase pilot familiarity with the implications of operation in different classes of airspace.
AO5	S4, S9	F26	Consider acquisition/usage of downlinked airborne parameters relevant to ANSPs.
AO6	S13	F38	Implement policies and procedures for reducing the air ground communications safety risk, e.g. preventing similar call-signs
AO7	S10	F14	Review SOP to standardise the pilot action sequence when responding to new vertical or lateral clearances received by multi crew aircraft.

Chapter 6
ANSP Conclusions

REF	Strategy	Finding	CONCLUSION
ATM1	S4, S6, S9	F26, F22	Consider acquisition/usage of downlinked airborne parameters relevant to ANSPs.
ATM2	S1, S15	F27	Improve STCA/RA occurrence report standardisation and information sharing.
ATM3	S12	F36	Provide awareness to Air Traffic Controllers for the aircraft performance limitations and for the risks, associated with non-compliance with final approach procedures.
ATM4	S8	F11, F13	Review the risk and the implications of airspace class designation for airborne conflict risk.

Chapter 7
Aircraft Manufacturers' Conclusions

REF	Strategy	Finding	CONCLUSION
AM1	S2, S4, S5	F21	Review ACAS training guidance (e.g. include required response time, lessons learnt). Use FDM, collect information and consider response times to check system. Investigate why crews are not responding to RAs.
AM2	S5	F23	Use the opportunity of ACAS developments and future aircraft design to maximize the effectiveness of the ACAS RA response.
AM3	S5	F29	Review aspects of type certification and MMEL which may affect the efficacy of airborne conflict risk management.

Chapter 8
Regulatory Authorities Conclusions

REF	Strategy	Finding	CONCLUSION
REG1	S7, S8, S15	F22	Educate all airspace users (including those who are not mandated to receive training) on available safety nets and mitigations they provide.
REG2	S4, S5	F24	Review safety nets interactions and address incompatibilities. Make sure that users understand the limits and interactions between safety nets.
REG3	S7	F28	Campaign to promote recognition of importance of see and avoid in relevant airspace and provide guidance on effective techniques.
REG4	S3, S8	F15	Review regulatory equipment requirements for access to airspace classes, including resolving issues which can compromise the effectiveness of the ACAS RA Safety Net.
REG5	S12	F36	Review and address the risk of non-compliance with the final approach procedures.
REG6	S8, S12	F35	Review the regulatory policies and practices regarding authorisation of commercial operations in uncontrolled airspace.
REG7	S8, S12	F35	Simplify airspace design and classification to help prevent unauthorised airspace penetration
REG8	S11	F32	Investigate Harmonised Transition Altitude at a sufficiently high level as beneficial to the prevention of level busts