Supporting European Aviation

Preventing mid-air collision

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If there are no conflicting trajectories there will not be mid-air collisions (and NMACs) – but is this always possible?

1	2	3	4	5	6
Tactical conflict prevention by ATC tactical planning	*Prevention of tactical conflict induced by deviation from clearances or instructions*	*Prevention of tactical conflict induced by airspace infringement*	*Conflict-free ATC clearances and instructions*	*Prevention of tactical conflict induced by military flights in shared airspace*	*Prevention of tactical conflict induced by controlled airspace excursion*

There are 6 major ways to prevent conflicting trajectories (fighting 6 major causes):

1. ATC tactical planning – preventing conflicts between planned routes;
2. Preventing conflicts caused by pilot deviations – e.g. level bust;
3. Preventing conflicts induced by airspace infringements;
4. Conflict-free ATC clearances and instructions;
5. Preventing conflicts induced by military flights in shared airspace;
6. Preventing conflicts induced by controlled airspace excursion;

We are not in the business of just preventing NMAC – we are in the business of preventing mid-air collision. How to prevent mid-air collision?

Barriers to prevent mid-air collision

- Providence: the geometry of a conflict results in a closest point of approach sufficient to avoid the collision.
- Pilot Collision Avoidance: by visual avoiding action, pilot prevents mid-air collision.
- Pilot Collision Avoidance: following RA, pilot prevents mid-air collision.
- ATC Collision Avoidance: ATC prevents separation minima infringements to result in mid-air collision.
- ATC Tactical Separation Assurance: prevent conflicting trajectories to result in separation minima infringement (or inadequate separation).
- Tactical Conflict Prevention: ensure conflict-free flight trajectories;

3

European ATM network Top 5 safety priorities – addressing all the barriers in a most efficient way

3 of the 5 priorities are related to mid-air collision prevention:

- *Flight without transponder or with dysfunctional one*
- *ACAS RA not followed*
- *Controller "Blind spot"*

2 are flight ops related

Risk of operations without transponder or with dysfunctional one

- ***A single threat often removing all the barriers up to 'see and avoid';***
- ***'see and avoid' is often not effective!***
- ***No ATC awareness;***
- ***No STCA;***
- ***No TCAS/ACAS;***

ACAS RA not followed

- ***The associated risk is extremely high;***
- ***No ATC control;***
- ***Often providence is the only remaining barrier;***

Aircraft Surveillance Function Failure

Assumptions that transponder failure in environment of cooperative surveillance only will be detected by the ATCO:

- Challenged by several safety occurrences.
- Challenged by the safety analysis.

Recommendations:

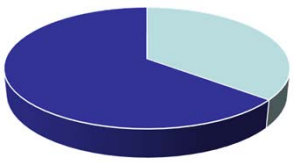
- Transponder failure related flight ops SOPs to be reviewed.
- Effective mechanisms (e.g. through procedure and man-machine interface) shall be available at ATCO Controller Working Position to ensure that system notification of an Aircraft Surveillance Function continuity failure is effectively and without any delay detected by the ATCO.

7

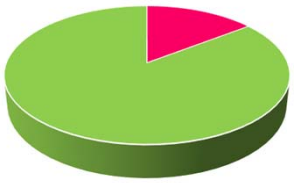
TCAS RA Not Followed – a survey with pilots

- 3800 pilots from 95 countries participated
- Questions grouped in 5 sections:
  - Recalling a TCAS RA - 3 questions
  - TCAS RA followed - 19 questions
  - TCAS RA not followed - 21 questions
  - Demographics - 6 questions
  - TCAS training - 6 questions

37% of respondents experienced an RA in the last 5 years

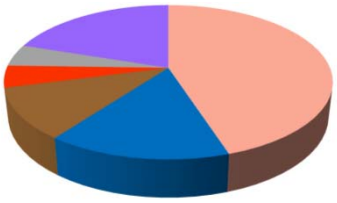


15% of them did not follow the RA



8

Survey: Top reason not to follow RAs

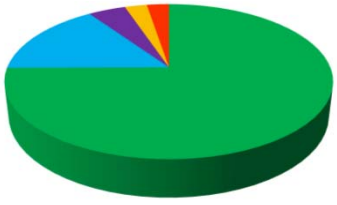


45%	Visual acquisition/avoidance
15%	Short duration RA
11%	Proximity to the ground
5%	Parallel approach
5%	Not trusting TCAS system
19%	Other (14)

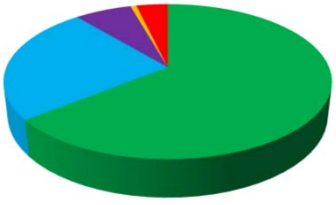
9

Recent TCAS training helps!

RA possible to follow and followed



RA not possible to follow or RA not precisely followed



TCAS training:

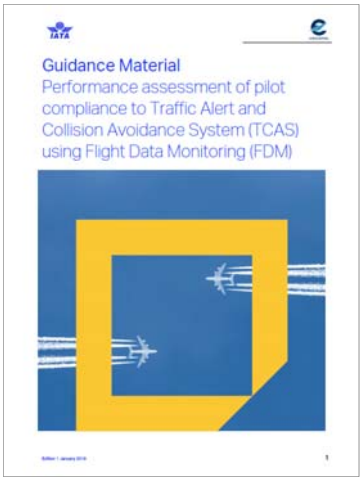
75%	0-6 months	64%
15%	7-12 months	24%
4%	1 to 2 years	7%
3%	2 to 5 years	1%
3%	Over 5 years/never	4%

10

1

EUROCONTROL – IATA Guidance Material

- ***EUROCONTROL – IATA Guidance Material published January 2019***
- ***Purpose: provide guidance to aircraft operators on using flight data monitoring (FDM) to monitor compliance with TCAS RAs***
- ***Understanding reasons for non-compliance will allow aircraft operators to address the underlying causes***



More information – on SKYbrary!

12

3

SKYclips - awareness and training resource

Short animation videos available on SKYbrary:
http://www.skybrary.aero/index.php/Solutions:SKYclips

Stop Bars

Conditional Clearance

Landing Without Clearance

Startle effect

TRAINING RESOURCES FOR DIRECT USE

Questions?