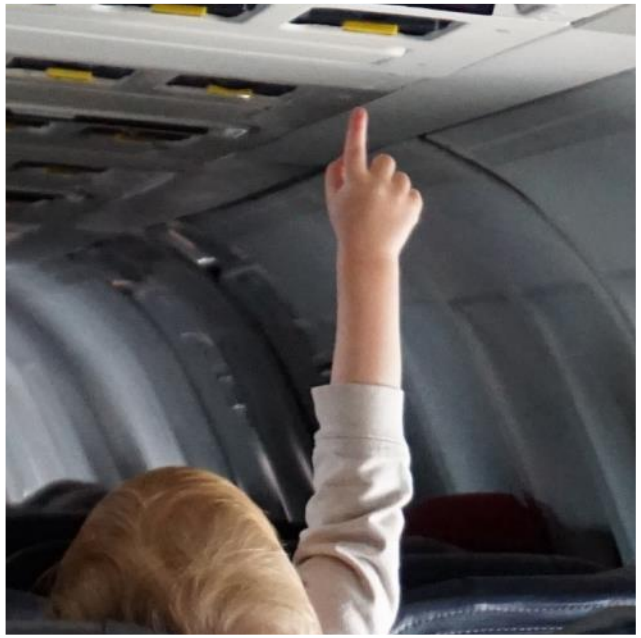
EASA SAFE Conference



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IATA

Performance assessment of pilot compliance to TCAS RAs using FDM

Dragos Munteanu
IATA – Assistant Director; Safety and Flight Operations, Europe

Stan Drozdowski
EUROCONTROL – Senior ACAS Expert

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TCAS II - safety net against mid-air collisions

- Implementation driven by mid-air collisions.
- The better the level of pilot compliance with RAs the greater the reduction in risk.
- Hard and anecdotal evidence suggests that pilots sometimes do not comply with RAs.
- Reasons behind non-compliance must be understood and non-compliance addressed.

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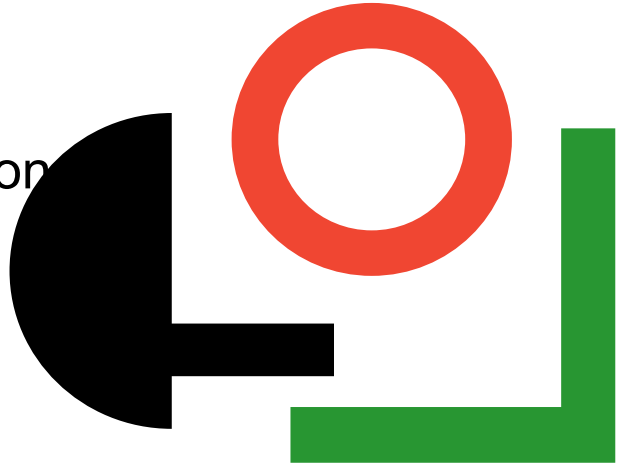
TCAS & Flight Data Monitoring (FDM)

- IATA and EUROCONTROL teamed up following an IATA Safety Group action item to prepare a guidance document on the subject of using flight data monitoring (FDM) to monitor and address response non-compliance with airborne collision resolution advice issued by Traffic Alert and Collision Avoidance System II (TCAS II).
- One of the drivers for this paper is the study conducted by EUROCONTROL, including the online survey carried out by IATA that elicited 3,800 responses from flight crew in 90 countries.
- The results show that while 37 percent of respondents experienced an RA in the last 5 years, 15 percent of them did not follow the RA.
- Operational experience has shown that the correct response by flight crew is dependent on the effectiveness of the initial and recurrent training in TCAS procedures.



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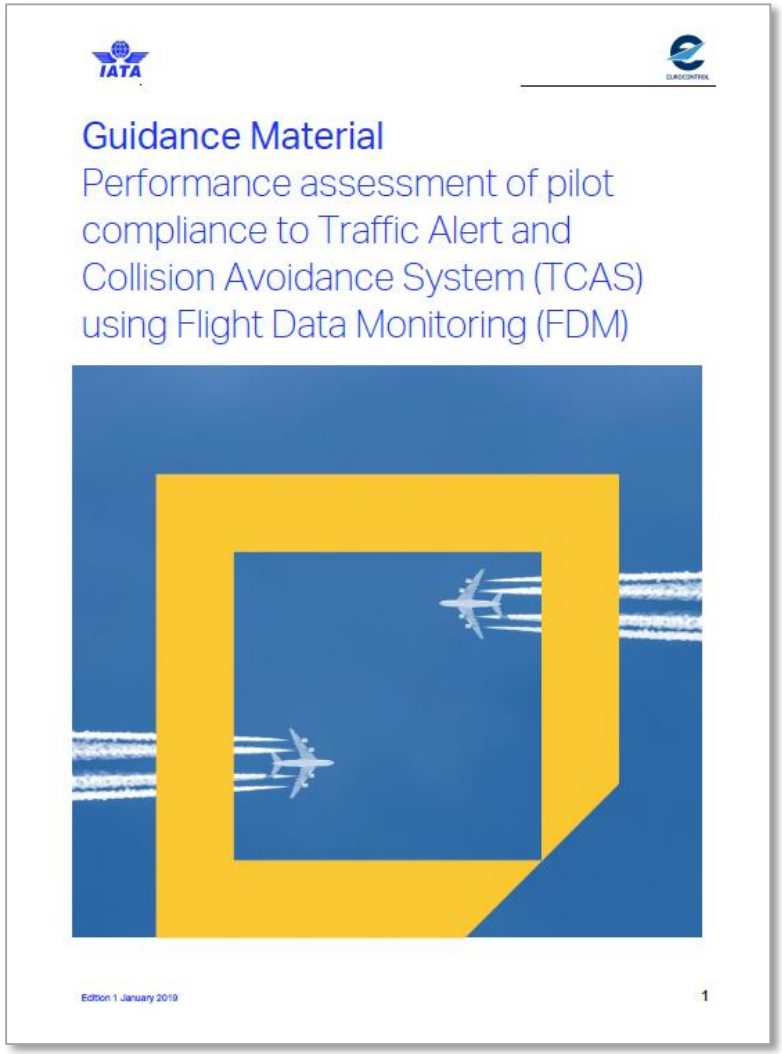
Guidance Material

- Pilot compliance assessment should be systematic and follow the same principles.

- **To assist aircraft operators, IATA and EUROCONTROL jointly developed and published (January 2019) the Guidance Material.**

- The Guidance Material is available to all Stakeholders (via IATA, EUROCONTROL and SKYbrary websites).



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Monitoring Operational Safety Issues

- Most of FDM systems have the ability to record TCAS RAs.
- The data can then depict an indication of whether a TCAS RA was issued, its duration and the type of the RA (e.g. Climb, Descend, Level Off, etc.).
  - FDM Systems receive TCAS warnings and the maneuvers from the TCAS computer,
  - TCAS computer stores the information, including the traffic intruder, and their vertical and horizontal distances.
  - Exporting this data to FDM Systems would enable the operator to collect, analyze, identify and discover underlying issues that have the potential to negatively affect aviation safety and to enable operators to take appropriate action to mitigate.

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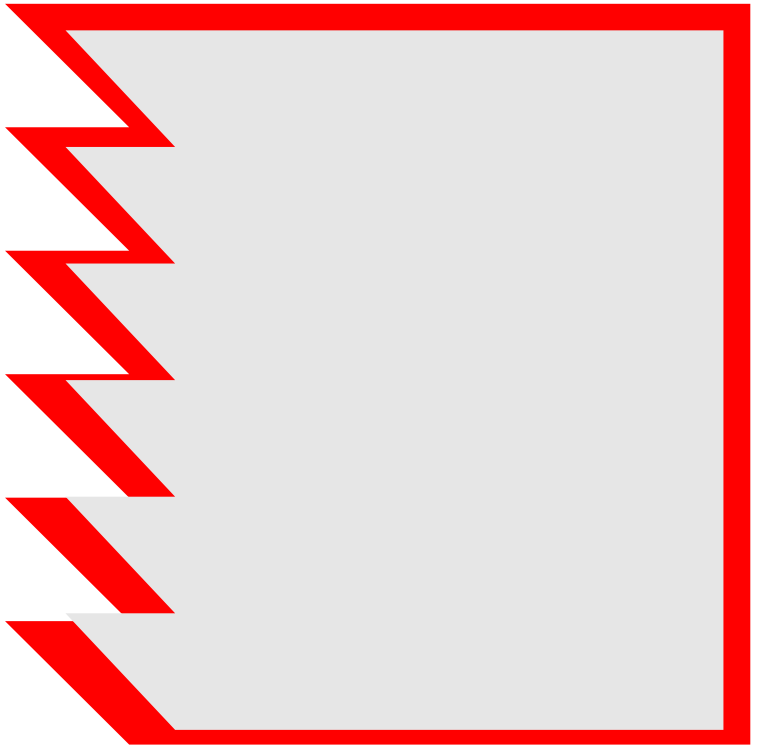
Flight Data Monitoring (FDM) Capabilities

- Alert detection thresholds are set to generate events when the value of the parameter exceeds a predetermined level or threshold.
- As specific operating scenarios. For example, an action taken by the pilot in response to the TCAS RA. Typically, most of the operator requires the pilots to disengage the Auto-Pilot (AP) and follow the instruction of the TCAS RA while informing the ATC. The operator can easily cross check if the action taken by the flight crew is in compliance with their manuals or deviates from aircraft flight manual limits and standard operating procedures.



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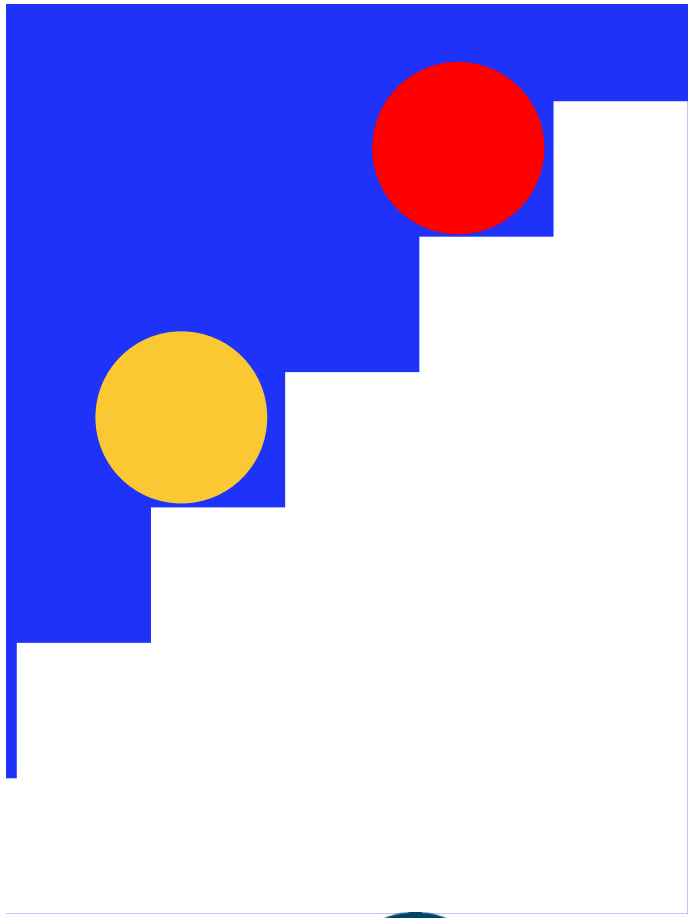
Flight Data Monitoring (FDM) Capabilities

The following elements should be taken into account while assessing pilot's compliance with a TCAS RA:

1. Type of advisory
2. Achieved vertical rate
3. Reaction time
4. RA duration



Pilot responses

Depending on the achieved vs required vertical rates; pilot responses to RAs should be classified as follows:

- **Followed:** when the required vertical rate was achieved (within a margin)
- **Not Followed:** when there was no change to aircraft's vertical rate after the RA or the change was not sufficient to meet the vertical rate required by the RA (expect for the RAs when the change in vertical rate is not required);
- **Opposite:** when the achieved vertical rate was in the opposite vertical sense to the required rate;
- **Excessive:** when the achieved vertical rate exceeded the required rate RA (expect for the RAs when the change in vertical rate is not required).

"Not Followed" and "Opposite" events are the most critical and require particular attention and investigation.

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Follow Up

- Following the compliance assessment, the operator should review and debrief the flight crew, using, when applicable, effective visualization software, including instrument panel graphics, displays of relevant aircraft systems, and graphical depiction of the aircraft and location and gather their feedback on the situation.
- Furthermore, a review of operational risks where pilots maneuvered too weak, excessive or opposite to the issued RA should also be analyzed to understand the underlying causes. The opposite reaction to TCAS RA (e.g. Climb instead of Descend) is of particular concern as it thwarts the effectiveness of TCAS. However, evaluating the magnitude of the reaction is slightly more complicated as every operator and every fleet has different sets of FDM events thresholds.
- An effective FDM tool should be able to provide trend analysis on TCAS RA including flight phases and geographical location.

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Conclusions

- TCAS II RAs must be followed promptly and accurately.
- Operators must ensure that aircraft are equipped with TCAS as required and flight crews received proper training.
- Any non-response or opposite reaction to TCAS RA may have adverse safety effect.
- IATA/EUROCONTROL Guidance Material should be used to evaluate pilot responses and take actions as needed.
- Cooperation of all Stakeholders and data sharing may help to identify training problems and other operational issues.

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Thank you

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