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NET*ALERT* - the Safety Nets newsletter

WELCOME

This issue of NET*ALERT* takes a more detailed look at two hot topics in safety nets: ACAS X, the likely long-term replacement for TCAS is our lead article and Split Tracks, a known cause of false STCA alerts, features in two further articles. On pages 5-7 we recap the causes of split tracks and also provide practical guidance on the various options for solving them.

If you were in any doubt about the potential consequences of split tracks, the near-miss incident described on pages 7-8 will underline the importance of taking action to reduce their occurrence as much as possible.

Finally, for readers following SESAR developments, you can catch up on safety nets projects on page 10; and please take a look at the workshop invitation from our SESAR colleagues on page 9. This should be of real interest to many safety professionals, particularly those involved in the monitoring of ACAS.

ACAS X – the future of airborne collision avoidance

ACAS X, the FAA-funded research and development program of a new approach to airborne collision avoidance has been ongoing since 2008. This new approach takes advantage of recent advances in computational techniques (which were not available when TCAS was first developed) to generate optimised resolution advisories. It is the intention that ACAS X will eventually replace TCAS.

Proof-of-concept flight tests are planned in 2013 with the operational use of ACAS X likely to begin early in the next decade. This article provides an overview of the FAA's current concept for ACAS X as well as some issues to address for operations in European airspace.

Why develop ACAS X?

TCAS II has been in operation for many years and has demonstrated its value in preventing mid-air collisions on numerous occasions. In Europe it is estimated to have reduced the risk of a mid-air collision by a factor of about 5. However there is always room for improvement, particularly to keep pace with planned future operational concepts and advances in technology. In particular:

- **'Unnecessary' advisories:** TCAS II is an effective system operating as designed, but it can issue alerts in situations where aircraft will remain safely separated. For example, in Europe a high proportion of RAs are generated due to aircraft having high vertical rates before level-off.

- **Future operational concepts:** Both SESAR and NextGen plan to implement new

CONTENTS

ACAS X - the future of airborne collision avoidance

continued

operational concepts which will reduce the spacing between aircraft. TCAS II in its current form is not compatible with such concepts and would alert too frequently to be useful.

- **Extending collision avoidance to other classes of aircraft:** To ensure advisories can be followed, TCAS II is restricted to categories of aircraft capable of achieving specified performance criteria (e.g. minimum rate of climb of 2,500 feet per minute), which excludes the likes of General Aviation (GA) and Unmanned Aircraft Systems (UAS).

- **Future surveillance environment:** Both SESAR and NextGen make extensive use of new surveillance sources, especially satellite-based navigation and advanced ADS-B functionality. TCAS however relies solely on transponders on-board aircraft which will limit its flexibility to incorporate these advances.

A number of solutions (such as hybrid surveillance) have recently been introduced to TCAS to begin addressing some of the above. But adapting TCAS to the requirements of the future ATM system is likely to involve a complete and costly overhaul. Instead, the FAA has chosen to develop ACAS X.

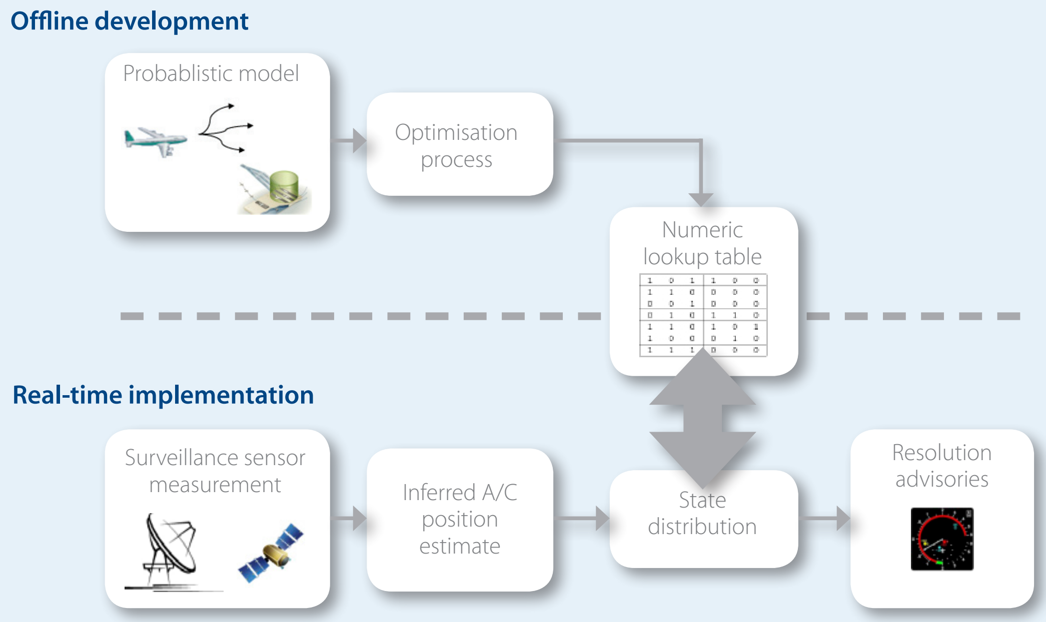
How is ACAS X planned to differ from TCAS II?

Two of the key differences between TCAS II and the current concept for ACAS X are the collision avoidance logic and the sources of surveillance data.

TCAS relies exclusively on interrogation mechanisms using transponders on-board

Inside ACAS X

ACAS X collision avoidance logic is best explained in two distinct phases, offline development and real-time operation.



Offline development

ACAS X is based on a **probabilistic model** providing a statistical representation of the aircraft position in the future. It also takes into account the safety and operational objectives of the system enabling the logic to be tailored to particular procedures or airspace configurations.

This is fed into an **optimisation process** called dynamic programming to determine the best course of action to follow according to the context of the conflict. This takes account of a rewards versus costs system to determine which action would generate the greatest benefits (i.e. maintain a safe separation while implementing a cost-effective avoidance manoeuvre). Key metrics for operational suitability and pilot acceptability include minimizing the frequency of alerts that result in reversals/intentional intruder altitude crossings or disruptive advisories in noncritical encounters.

Real-time operation

The **lookup table** is used in real-time on-board the aircraft to resolve conflicts. ACAS X collects **surveillance measurements** from an array of sources (approximately every second). Various models are used (e.g. a probabilistic sensor model accounting for sensor error characteristics) to estimate a state distribution, which is a probability distribution over the current positions and velocities of the aircraft. The **state distribution** determines where to look in the **numeric lookup table** to determine the best action to take. If deemed necessary, **resolution advisories** are then issued to pilots.

aircraft to determine the intruder's current and projected future position. If the tracked aircraft is declared a threat and is also TCAS-equipped, the two TCAS II units coordinate complementary advisories. Current TCAS advisory logic issues alerts against a potential threat on the basis of time of closest approach and projected miss distance. This relies on a fixed set of rules, modelling the spectrum of pilots' responses.

Instead of using a set of hard-coded rules, ACAS X alerting logic is based upon a numeric lookup table optimised with respect to a probabilistic model of the airspace and a set of safety and operational considerations. Although primarily intended to provide improved alerting performance, it is also hoped that this approach will help reduce upgrade timescales and costs. As Mykel J. Kochenderfer from the Massachusetts Institute of Technology Lincoln Laboratory explains *"This is a fundamentally different approach to building collision avoidance logic that was simply not possible back when TCAS II was first developed."*

Instead of solely relying on transponder-based surveillance, ACAS X is intended to be compatible with any surveillance source (or a combination of surveillance sources) that meet specified performance criteria. This concept, named **plug-and-play** surveillance, will enable ACAS X to obtain surveillance data from a variety of sources, such as satellite, radar, infrared and electro-optical surveillance systems. The latter sources may be needed to support requirements for UAS to sense and avoid non-transponder equipped aircraft.

Will pilots and controllers see any difference between TCAS II and ACAS X?

Transitioning from TCAS II to ACAS X, commencing early into the next decade, raises two obvious questions: will they operate together; and will pilots and controllers notice a difference from TCAS II? It is planned that **ACAS X will be fully compatible with TCAS II and will have the same look and feel as TCAS II, for both pilots and controllers**, with very few noticeable differences between the systems.

The version of ACAS X intended for large commercial aircraft (ACAS XA) will use the same co-ordination mechanism as TCAS II. This should guarantee seamless interoperability between the two systems. ACAS X will have the same range of available RAs as TCAS and, as with TCAS, will only issue RAs in the vertical plane and not trigger alerts when the aircraft is close to the ground. Furthermore, the same responsibilities will apply between the pilot and controller.

Despite retaining the major characteristics of the old system, ACAS X will introduce some differences (it is noted that these differences relate to the currently planned ACAS X logic which may change over time):

- Some RAs may occur later than with TCAS (i.e. aircraft may come closer together before ACAS X alerts) to reduce the number of unwanted RAs (such as the high number of RAs which are generated due to high vertical rates before level-off);

- It is intended that ACAS X will minimise the number of sequences of complex RAs (e.g. reversal RAs);

- Clear of Conflict can occur before Closest Point of Approach if the predicted aircraft trajectories indicate it is safe to do so.

Anticipated benefits of ACAS X

ACAS X is expected to deliver several advantages over TCAS in its current form.

- **Future operational concepts:** The incompatibility of TCAS II with future operations is the main driver behind the development of ACAS X. As mentioned at the start of this article, both SESAR and NextGen plan to implement new operational concepts that will reduce the spacing between aircraft. It is planned that ACAS X will be adaptable to such concepts.

- **Reduction in collision risk and alert rate:** Initial results from ongoing ACAS X tuning exercises conducted in the United States show that compared to TCAS II, ACAS X reduces the risk of collision by approximately 50%. It is noted that these results are based upon the operating environment in the U.S. and include a high proportion of encounters associated with procedures that either do not take place in Europe (e.g. encounters with 500ft vertical separation between VFR and IFR) or are not prevalent (e.g. closely spaced parallel departures and approaches). Therefore, the benefits for operating ACAS X in the U.S. may not reflect the potential benefits of introducing ACAS X in Europe. SESAR has initiated research to evaluate the safety impact in European airspace.

- **Collision avoidance for different classes of aircraft:** As well as the standard ACAS X (ACAS XA), variants are under consideration to extend collision avoidance protection to situations and user classes that currently do not benefit from TCAS. Current proof-of-concept research focuses on large aircraft, while ACAS X versions specifically developed for GA and UAS remain longer term research.

ACAS X variants

- ACAS XA: The general purpose ACAS X that makes active interrogations to establish the range of intruders. The successor to TCAS II.

- ACAS XP: A version of ACAS X that relies solely on passive ADS-B to track intruders and does not make active interrogations. It is intended for general aviation (a class of aircraft not currently required to fit TCAS II).

- ACAS XO: A mode of operation of ACAS X designed for particular operations for which ACAS XA is unsuitable and might generate an unacceptable number of nuisance alerts (e.g. procedures with reduced separation, such as closely spaced parallel approaches).

- ACAS XU: Designed for Unmanned Aircraft Systems (UAS).

- **System updates:** The numerical lookup table approach adopted by ACAS X is expected to facilitate easier and more cost effective system upgrades. It is hoped that, subject to certification, this table can be given to manufacturers of the system and uploaded to the aircraft. It is intended that this will reduce upgrade costs, by reducing the need for a costly and maintenance-heavy hardware upgrades, and shorten development cycles.

Flight trials

Proof-of-concept flight trials of the ACAS X threat logic are planned to take place in 2013. The intention is to evaluate whether the logic functions as designed, demonstrate that the lookup table is a viable method in the operational environment, and assess whether alerting performance (alerts and lack of alerts) is operationally acceptable.

FAA aircraft will be modified to incorporate ACAS X threat resolution logic coupled with current TCAS surveillance and hardware. The flight trials will consist of a series of planned encounters with both TCAS and non-TCAS equipped aircraft. These will include scenarios where alerts are expected and desired. Normal procedures where alerts should not be issued at all, or should be minimally disruptive will also be included in the flight tests.

The flight trials are intended to provide a direct comparison between ACAS X and TCAS, thereby providing concrete evidence of the viability of ACAS X.

ACAS X in Europe

The FAA and SESAR are now collaborating on ACAS X to assess the suitability of the concept in Europe. Several SESAR work packages have now integrated ACAS X within their research work program. For example P4.8.2 is undertaking studies to ensure that ACAS X_A is at least as safe as TCAS II in European airspace and that the RA rate is the same or lower. Collaboration between NextGen and SESAR is also taking place to guarantee ACAS X compatibility with Airbus' TCAP (TCAS alert prevention) and APFD (auto-pilot/flight director) solutions. In terms of standardisation activities, EUROCAE WG-75 and RTCA SC-147 are undertaking joint initiatives to establish a close collaboration between the two committees.

Different priorities between Europe and the United States?

To be successful at a global level, ACAS X will need to provide a response to different operational environments and priorities around the world. Ken Carpenter, Chairman of EUROCAE WG-75 has written about this in a recent article in the EUROCAE newsletter. Three particular points to note are:

- **Differences in TCAS behaviour:** High altitude alerts are more frequent in Europe, while low altitude alerts are more common in the U.S. This could prompt conflicting objectives when optimising the collision avoidance logic.
- **Closely spaced operations:** The FAA is planning to focus the development of ACAS X_O on closely spaced operations (i.e. closely spaced approaches). It remains to be seen how this work will fit with current or planned closely spaced operations in Europe.
- **Interactions between ACAS X and ground based safety nets:** The interactions between ACAS X and ground based safety nets (as well as the display of RAs to controllers) have not been considered by the FAA research program so far.

As Ken Carpenter explains *"ACAS X must operate effectively and acceptably in Europe. This can be guaranteed only if Europe takes part in its development, at least validating its performance for European operations. It is good that SESAR has picked up that challenge. While it would probably be possible to develop alternative versions of ACAS, one for the U.S. and another for Europe, it would be very awkward operationally and for certification. The best course is to develop a single internationally standardised system."*

Further reading

This article is primarily based upon two sources:

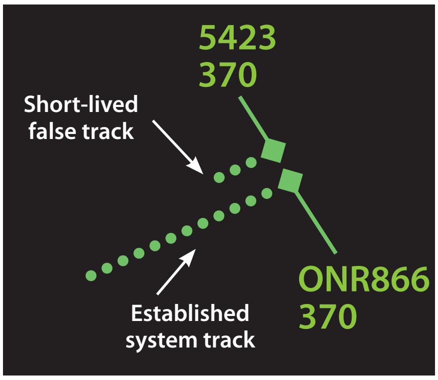
- Next-Generation Airborne Collision Avoidance System, Mykel J. Kochenderfer, Jessica E. Holland, and James P. Chryssanthacopoulos. The full paper can be found at (http://www.ll.mit.edu/publications/journal/pdf/vol19_no1/19_1_1_Kochenderfer.pdf).
- Development of Future Collision Avoidance Systems, Ken Carpenter, Chairman of EUROCAE WG-75 TCAS, EUROCAE Newsletter April 2013 (http://www.eurocae.net/images/stories/NEWSLETTER/Newsletter_April_2013.pdf).

Split Tracks
– when one solution won't do

Rod Howell of QinetiQ Ltd has investigated split tracks for several ANSPs. In this article he explains why split tracks occur, examines the likely effectiveness of different solutions, and explains why multiple solutions are required to significantly reduce split tracks and false STCA alerts.

What is a split track?

A split track is an occurrence of two surveillance tracks for only one aircraft. Typically, a genuine track will have been in existence for some time; a false track appears very close alongside the original track for a short period of time (often less than 30 seconds).



A typical split track

Split tracks are a nuisance not only because they appear on the controller's display as two tracks, but because they can generate false STCA alerts. In the very worst case they can contribute to a collision or a near miss between aircraft (see article on page 7).

There are a number of underlying causes of split tracks, these are explained in issue 9 of NET*ALERT* (July 2010). In the most basic terms, they are caused by a failure of the Surveillance Data Processing System (SDPS) to associate all the plots that should be associated to an already existing system track. Normally, one or two unassociated plots are sufficient to initiate a new system track.

The surveillance data processing chain

It is worth considering split tracks in relation to the surveillance data processing chain and the safety nets system to understand where the root cause of the split track lies, and where potential solutions may be applied.

In the SSR environment, the transponder on-board the aircraft responds to radar interrogations (either Mode A/C or Mode S).

A number of replies are usually received at the radar. The radar plot extractor decodes these replies into a single radar 'plot' comprising amongst others: data, position information, Mode A, and Mode C barometric altitude. The radar plots are presented to the Surveillance Data Processing System, which in many ATC systems not only provides the fundamental picture for the controller display, but also provides inputs to safety nets and other controller tools.

The Surveillance Data Processing System (SDPS)

The SDPS (also known as a multi-radar tracker) takes incoming radar plots, and from these forms a system track picture for the controller. The SDPS establishes and maintains tracks, and also initiates new tracks when radar plots are not associated to an already existing track. Identifying that a plot belongs to an already existing track is normally straightforward; a match is made using the expected and the actual position of the plot as well as the Mode A code (and possibly other information). However, if the information in a radar plot is in error (i.e. the position is in error, or the Mode A code is not correct), then the plot may not be associated to the existing track, and it will be left over as an 'unassociated' plot. A couple of unassociated plots may result in a new system track – a false track – often close to the original system track.

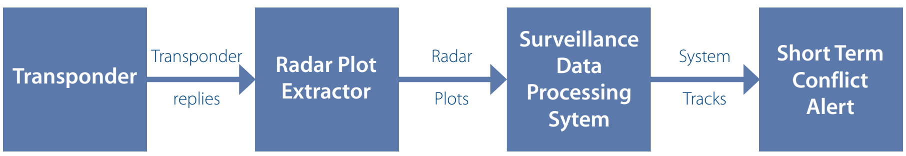
Some effort can be invested in optimising the SDPS plot-to-track association algorithm. However, it is rare for this tuning to significantly reduce the number of split tracks before a host of other unforeseen side-effects become apparent.

The root causes of error – transponders and radar plot extractors

Whilst it is the SDPS that generates the split track, the root cause of the problem lies, most frequently, with the plot extracted radar data. There are a number of errors that can be made at the radar which, in the SDPS, make the plot harder to associate to the existing system track. These errors include:

- poor position measurement (either in range or azimuth), generally worse at long range from the radar;
- poorly extracted Mode A;
- poorly extracted Mode C;
- split plots (two radar plots where only one should exist).

Note the important difference between split plots, which are generated by the radar plot extractor, and split tracks generated by the SDPS which may or may not be caused by split plots. With a variable amount of success, some SDPS are able to identify split plots, thereby reducing the number of split tracks generated by split plots.



A simplified schematic of the surveillance data processing chain from transponder reply to potential STCA alert.

Split Tracks - when one solution won't do

continued

	Cause	Potential solution(s)	Effectiveness
Transponder	Faulty or out-of-spec transponders.	Identify the problem transponders and have them taken out of service.	Very effective if the aircraft operator is cooperative.
Radar Plot Extractor	The most common causes are position errors, Mode A code errors and split plots.	Upgrade to Mode S radar.	Will reduce the number of radar errors, but will not eliminate them altogether.
Surveillance Data Processing System	SDPS rarely produces split tracks of its own accord, although some systems generate split tracks on Mode A code changes. The root cause of split tracks is erroneous radar data.	Upgrade to another SDPS. Modify the tracker algorithms. Optimise the tracker algorithms.	All of these solutions are likely to only be partially effective. Tuning the tracker algorithms can introduce unforeseen side-effects. Other options may cost a lot in time and money.
STCA	STCA is not a source of track data.	Introduce a high-quality split track algorithm. Note that the quality of STCA split track suppression algorithm varies.	The best algorithms will identify split tracks and remove a very high percentage of false alerts.

Causes of split tracks and their solutions

Plot extractor errors (i.e. poorly extracted Mode A or Mode C) have reduced since the introduction of Mode S radar. In particular, the occurrence of garbling (where two transponder replies from different aircraft arrive at the radar at the same time) is very much reduced. This has had a positive effect in reducing the number of split tracks. However, the introduction of Mode S has not been the panacea that some might have anticipated. All the radar errors listed above still occur in the Mode S environment, just less frequently than before. It is unlikely that tuning of the plot extractor itself would provide a benefit without other side-effects becoming apparent. The radar plot extractor has no data source for comparison, and therefore is inherently poorer than the SDPS for identifying data errors.

An additional source of erroneous data may come from a faulty or out-of-spec transponder. These tend to be a rarer source of error, but when transponder-related errors do occur the resulting split tracks tend to be persistent and may last for many minutes. A typical transponder-related error that leads to split tracks manifests as a sequence of radar plots with an incorrect Mode A code, often completely unrelated to the genuine Mode A code. A sequence of plots with a persistently erroneous Mode A code can be very difficult to handle correctly in the SDPS, and again it is in the SDPS where the split track is generated.

The lesson here is that wherever a faulty or out-of-spec transponder is observed, it should be of paramount importance to inform the operator of the aircraft, and insist that the transponder is taken out of service.

What can be done in STCA?

STCA is provided with tracks from the SDPS – STCA will interpret a split track as two aircraft in close proximity to one another and produce a false alert. A high number of split tracks is consequently likely to lead to a high number of false STCA alerts. Whilst a split track detection algorithm in STCA cannot remove split tracks from the controller's display, it can have a positive effect in reducing the number of false STCA alerts.

Some STCA systems have split track detection logic, and the majority of these identify a split track on the basis of the pair of tracks having an identical Mode A code. These crude algorithms will only remove a portion of STCA alerts, and furthermore could suppress an alert for two genuine aircraft that happened to have the same Mode A codes assigned.

	Start Position with no fixes	Fix All Faulty Transponders	Upgrade to Mode S	Improve SDPS system	STCA Split Track Logic (based upon identical Mode A)	STCA Split Track Suppression (includes allowance for garbled Mode A)
Estimated % of false tracks / alerts removed by each solution		10%	85%	60%	80%	97%
Estimated effectiveness of each solution	20 split tracks per day	18 split tracks per day	3 split tracks per day	8 split tracks per day	4 false STCA alerts per day	1 false STCA alert every 2 days
Estimated cumulative effectiveness	20 split tracks per day	18 split tracks per day	3 split tracks per day	1 split track per day	1 false STCA alert every 4 days	1 false STCA alert per month

Estimated effectiveness of different solutions

Split Tracks - when one solution won't do

continued

On the other hand, the best split track detection algorithms take account of the fact that the Mode A code could be garbled, and therefore allow for the Mode A codes to be slightly different; in addition these algorithms measure the proximity of the tracks to ensure that only real split tracks are suppressed in STCA. The best split track algorithms can reduce the number of false STCA alerts significantly.

The table at the top of page 6 summarises the causes of split tracks, and indicates how the split track / false STCA alert problem can be addressed at each point in the data processing chain.

Which solutions are the most effective?

The effectiveness of each of the solutions can be difficult to gauge. For example, in some environments, the number of faulty or out-of-spec transponders may be higher than elsewhere. Furthermore, the efficacy of improving an SDPS depends on how well the SDPS currently performs.

Nevertheless, some good estimates can help to give a useful indication of the most effective strategy for reducing split tracks and the resulting false STCA alerts. The table at the bottom of page 6 indicates the estimated reduction in the split track / false alert rate by implementing each of the suggested solutions. In the first instance the effectiveness of each solution is considered alone. Then, on the final row of the table, the cumulative effect is presented as each solution is implemented (from left to right) in turn.

As can be seen, one solution alone does not really solve the problem. Instead, the estimates suggest that a holistic approach would be best, where the problem is addressed in a number of different places in the surveillance data processing chain, including in the STCA system itself.

Split Tracks
contribute to near miss

An incident took place between two passenger aircraft in 2011, which illustrates the potential dangers of split tracks. Just as in the well-known 'Swiss cheese' safety model, a series of errors (system and human) combined to produce a dangerous situation - in this case averted by TCAS.

Two Boeing 757s were carrying passengers towards some winter sunshine. We pick up the incident when both aircraft are in cruise - Aircraft 1 is flying at FL390 above Aircraft 2 at FL370.

Aircraft 2 requests descent and is told by the air traffic controller to stand by. At the same time, on the controller's screen the label for Aircraft 2 disappears and reappears at FL405; 5 seconds later a further radar label (with a transponder code rather than the flight number) appears at FL370 (a 'split track'). A further 5 seconds later the label for Aircraft 2 disappears again and is replaced with the same transponder code as the track at FL370 (i.e. the label for Aircraft 2 has now been replaced by two tracks with the same transponder code, one at FL370 and one at FL405).

The controller does not observe the split track and wrongly assumes that Aircraft 2 is at FL405. At the same time as the label for Aircraft 2 disappears he instructs Aircraft 1 to descend to FL250. Approximately one minute later Aircraft 2 is instructed to descend to FL390. Aircraft 2 responds immediately saying that they are at FL370 and is told to stand by.

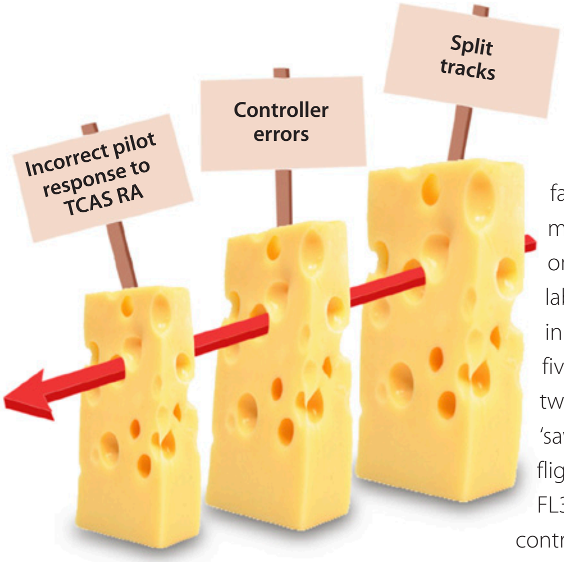
While the controller is talking to Aircraft 2, both aircraft receive TCAS advisories. Aircraft 1 receives an 'Adjust vertical speed, adjust' RA (in this case requiring a level off) – followed just a second later by a 'Climb' RA . However, Aircraft 1 continues its descent.

Aircraft 2 receives a Traffic Advisory, shortly

Split Tracks
contributes to near miss
continued

followed by a 'Descend' RA. It responds correctly to its RA, but, with Aircraft 1 descending rather than following the 'Climb RA', this means that the aircraft are continuing to converge vertically. Subsequently Aircraft 1 descends below Aircraft 2.

TCAS reacts by reversing the RAs: Aircraft 1 is advised to 'Maintain vertical speed' (i.e. to continue its descent) and Aircraft 2 is advised to 'Climb, climb NOW'. 6 seconds later, both aircraft are clear of conflict.



The above alert lasted for approximately 19 seconds with a closest point of approach of 0.7 NM horizontally and 100 feet vertically.

The holes in the cheese

The incident report identified several contributory factors in this incident.

- Split tracks that made it possible first, for the label on the radar display for Aircraft 2 to show that it was flying at FL405, and second, for the radar label of Aircraft 2 to be subsequently replaced by two tracks with the same transponder code – one at FL370 and the other at FL405.

- The controller's failure to detect the fault that existed with the labels. He missed three clues: i) initially when only one label at FL405 was showing, that label was suspect because aircraft flying in cruise have flight levels ending in '0' ii) five seconds later the screen displayed two labels for the same aircraft, he only 'saw' FL405 iii) he did not notice that the flight progress strip for Aircraft 2 stated FL370. These strips are a useful tool for the controller to maintain situational awareness, particularly when taking over a duty, and to detect potential conflicts.

- The lack of response by Aircraft 1 to the climb advisory issued by its TCAS was another contributory factor. The crew continued to descend, bringing the two aircraft closer together.

Learning points

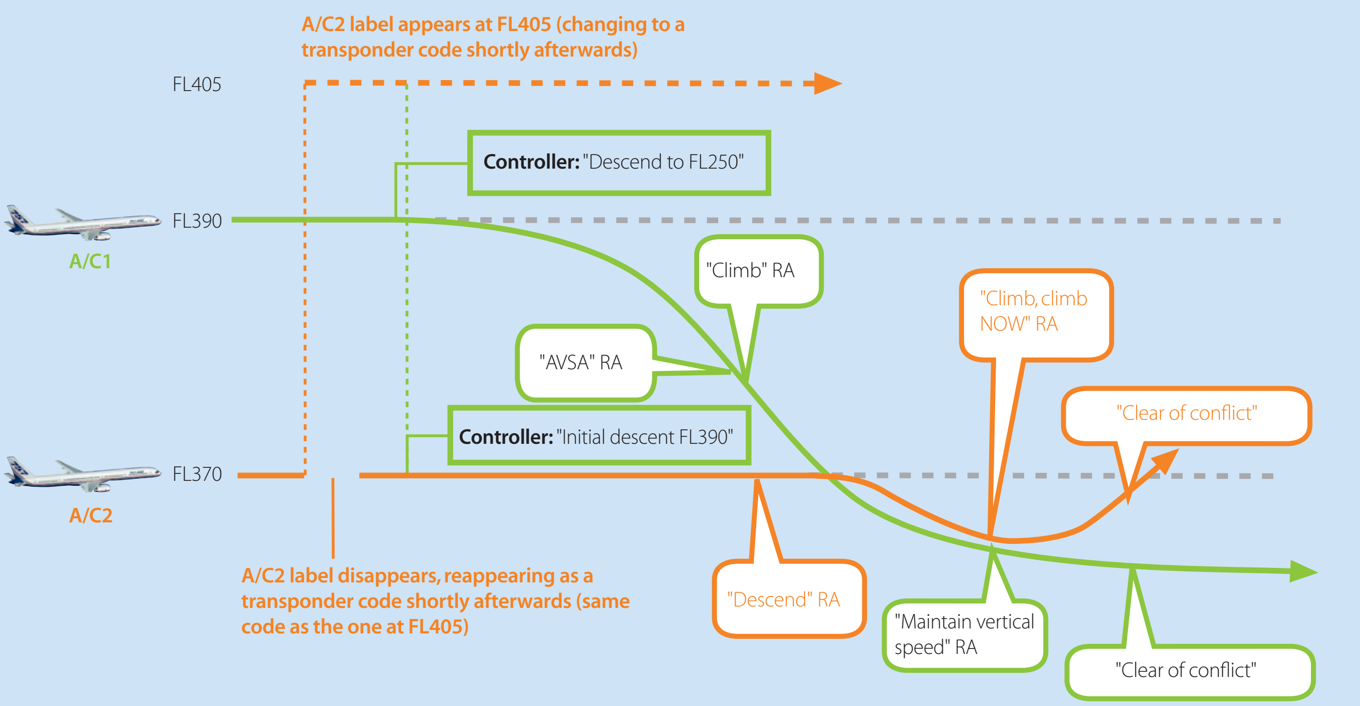
System and human errors combined to create a dangerous airprox situation. The system errors could be alleviated by following some of the potential solutions mentioned on pages 6 - 7.

The human errors could be alleviated by:

- Training controllers in the systems they are using and showing them how they might detect any faults in that system.
- Ensuring TCAS training takes place for all crews and is part of the refresher training programme.

A report on the above incident was published by the Spanish Civil Aviation Accident and Incident Investigation Commission (CIAIAC) and can be found via the following link to their website: http://www.fomento.es/NR/rdonlyres/F6A58EF7-F3B5-4342-A794-41439A8CA996/116914/2011_050_IN_ENG.pdf.

Overview of the incident



ACAS Monitoring Workshop Invitation

10 October 2013

Project 15.04.03

partners (*Thales, DFS, EUROCONTROL and INDRA*) would like to share the results of the project with the wider community in a workshop that will be held on **10 October 2013** at the DFS premises in Langen.

The agenda will include

- ✓ Project background, introduction and overview
- ✓ Introduction to ACAS
- ✓ ACAS Monitoring: System components and architecture
- ✓ ACAS Monitoring: System demo
- ✓ Integration of ACAS Monitoring: Off-line and on-line applications (including real-life examples)
- ✓ Open floor discussion on ACAS monitoring applications

Who should attend?

- Partners from related SESAR projects (e.g. 04.08.x, 10.04.03, 09.47)
- Anybody involved in the design and operations of ACAS
- Anybody interested in monitoring ACAS performance and/or display of RAs to controllers
- Anybody involved in safety monitoring

For more information or to register contact Stanislaw Drozdowski
stanislaw.drozdowski@eurocontrol.int

SESAR JOINT UNDERTAKING

Workshop invitation

Project 15.04.03

SESAR update

Our regular review of SESAR safety nets related projects follows…

Evolution of Ground-Based Safety Nets (P4.8.1)

Work progresses on enhanced ground-based safety nets using existing downlink aircraft parameters (DAPs) in TMA and en-route environments (Work Area 1). Following a review by P4.8.1 project members, the final version of the Safety and Performance Requirements (SPR) was delivered to the SJU in February. In parallel a meeting was held with P16.6.1 which presented an operational & safety assessment methodology taking into account human performance aspects. This approach will be experimented with alongside the validation of an enhanced STCA industrial prototype using DAPs. The V3 validation plan for this exercise is to be delivered shortly.

Also in February, Work Area 2 (enhanced ground-based safety nets adapted to future TMA and en-route environments with enhanced 3/4D trajectory management) delivered its initial feasibility assessment to the SJU. Work continues on the V2 validation plan which is expected to be delivered soon.

Partners: DSNA (leader), NATS, ENAV, SELEX, EUROCONTROL

Safety Nets Adaptation to New Modes of Operation (P10.4.3)

Project 10.4.3 will now provide support to the validation of STCA industrial prototypes developed by each of the industry partners of the project. The enhanced industrial prototype using DAPs is currently under development by SELEX in support to the P4.8.1 V3 operational validation exercise.

The P10.4.3 phase 2 work plan is being restructured to take into account the development and verification of an Indra prototype for RA downlink data processing. This prototype will be used in P4.8.3 for the V3 operational validation exercise.

In the meantime, discussions have started with NORACON to undertake an operational validation of Thales' prototype.

Partners: THALES (leader), DSNA, ENAV, EUROCONTROL, INDRA, SELEX

Evolution of Airborne Safety Nets (P4.8.2)

The change request covering the evaluation and development of ACAS X for Europe has been accepted and implemented by the SJU. Collaboration with the ACAS X team in the United States has also started. A method for integrating ACAS X logic within the existing validation framework has been developed and a qualitative analysis of this new system performed. The results of these studies were discussed with the U.S. ACAS X team in March and during the third ACAS X Technical Interchange Meeting in May.

Workshops took place in February to allow SESAR partners to capture and prioritise a set of initial ACAS X needs for Europe and identify potential hazards.

Upcoming activities will focus on refining the safety assessment and developing validation plans for the V2 exercises to further assess the safety benefits and operational suitability of ACAS X in Europe.

Partners: DSNA (leader), AIRBUS, NATS, EUROCONTROL

TCAS Evolution (P9.47)

The preliminary system impact assessment of TCAS II changes proposed in P4.8.2 is complete and was sanctioned by the release of a deliverable to the SJU.

Following the implementation of the change request by P4.8.2 on the adoption of ACAS X a realigned project plan for P9.47 has been drafted and is being reviewed.

Work continues on the support to standardisation activities resulting from the collaboration between P9.47 and SC147/WG75. The MOPS on extended hybrid surveillance (DO-300A) passed their final review and were published in March 2013. Work on the implementation of extended hybrid surveillance capability into TCAS continues. The related verification and validation plan addressing the use of improved hybrid surveillance in Europe has been written and submitted to the SJU.

Partners: Honeywell (leader), AIRBUS, DSNA, EUROCONTROL

Ground-Airborne Safety Net Compatibility (P4.8.3)

An update to the operational concept on RA display to controllers has been developed and relevant RAs for the V2 validation are being captured. Preparations are taking place for the V3 validation with refinement of the platform architecture, interfaces and RA downlink parameters prototype requirements.

Partners: DSNA (leader), DFS, AENA, INDRA, AIRBUS, EUROCONTROL

ACAS monitoring (15.4.3)

The development of a prototype ACAS monitoring system and its supporting tools is progressing with the completion of the final data collection report.

Work on the system verification report, system evaluation report and integration study is underway. The first draft is currently being reviewed, with handover to the SJU planned for June. As per the invitation on the previous page, Project 15.04.03 is holding a workshop to share the results of the project with the wider community on 10 October 2013.

Partners: THALES (leader), INDRA, EUROCONTROL, DFS

Contact

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