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EUROCONTROL

NETALERT Newsletter
Stay tuned

Ensuring the effectiveness of Safety Nets

WELCOME

Welcome to another issue of NET*ALERT*. SPIN finished 2011 by holding its 25th meeting as guests of the Air Navigation Services of the Czech Republic (ANS CR) in Prague. One of the topics discussed was incompatibilities between STCA and TCAS, and this is the subject of our NET*ALERT* cover article. In the field of TCAS, we also summarise the safety improvements incorporated into the new version, TCAS version 7.1, and the associated European mandate expected in the near future.

Alongside the SPIN meeting, ANS CR provided delegates with a tour of their facilities. So in this newsletter we can report on the new safety nets that they plan to implement, including a summary of their planned controller training.

Much of the support that EUROCONTROL provides to other ANSPs involves identifying and addressing sources of nuisance alerts. On pages 5 and 6, we summarise an article written for the latest Hindsight magazine, identifying the common sources of nuisance alerts and some potential solutions to reduce them. And on page 7, we share the findings of research conducted into the experiences of four European ANSPs who implemented MSAW.

Finally we've an update on recent activity in SESAR safety nets related projects.

Best wishes for 2012.

STCA and TCAS
compatible safety nets?

STCA and TCAS were developed independently by different organisations. Whilst TCAS was and is subject to rigorous standardisation and certification, STCA was not. TCAS and STCA should also be compatible with one another, to ensure that they complement each other rather than interfere - however some incompatibilities do exist today. In this article we explore those incompatibilities, what causes them and how the associated risks they create might be mitigated.

Differences between STCA and TCAS

The independent operation of STCA and TCAS is an important characteristic. It provides redundancy and minimises single points of failure, but at the same time it results in differences that in turn cause some incompatibilities (see table). These incompatibilities mean that the combined behaviour of STCA and TCAS is not always predictable and well understood.

	STCA	TCAS
Performance	Ground-based surveillance has a 5 to 10 second update rate and good azimuth resolution	TCAS surveillance function has a 1 second update rate and poor azimuth resolution
Operation	STCA detects imminent or actual (significant) loss of minimum separation but provides no resolution advice	TCAS assumes collision and provides resolution advice to ensure sufficient vertical separation at the Closest Point of Approach (CPA)
Predictability	STCA is not standardised but optimised for the operational environment to varying degrees	TCAS is fully standardised
Communication	Complete by providing instructions subject to read-back/hear-back	Limited (pilot reporting not always possible in a timely manner)
Effectiveness	Only when the controller immediately assesses the situation, issues an appropriate instruction to the pilot and the pilot follows the instruction	Only when pilot promptly and correctly follows the Resolution Advisory (RA)

Differences between STCA and TCAS

Consequences of incompatibilities between STCA and TCAS

What are the real-world consequences of these incompatibilities? Whilst the desired behaviour is that STCA alerts at least 30 seconds before the first TCAS Resolution Advisory (RA), STCA can and sometimes will trigger significantly later (sometimes even after the RA). The example on the next page illustrates the potential effects of a late STCA alert.

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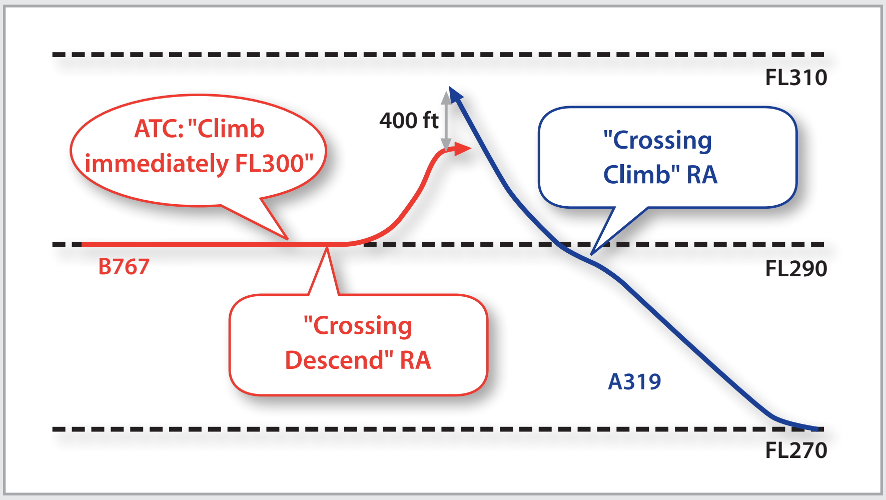
STCA and TCAS - compatible safety nets?

continued

Real-life example of a late STCA alert



A B767 was maintaining FL290 heading west. An A319, heading south-east, was at FL270 on a converging track. The aircraft were controlled by two different ATC units (the vertical boundary was FL285). The A319's pilot requested a higher cruising level. Due to a coordination error between the two ATC units, the A319 was cleared to climb to FL290 putting it in conflict with the B767. STCA alerts were triggered in both ATC units and the B767 was instructed to climb immediately to FL300 and the A319 to expedite its descent to FL270. However, almost at the same time, each aircraft received a coordinated RA opposite to the ATC instruction. The B767 received a "Crossing Descend" RA - the pilot disregarded the RA and followed the ATC instruction to climb. The A319 received a "Crossing Climb" RA - the pilot correctly reacted to the RA by increasing the rate of climb. Because of the B767 pilot's opposite manoeuvre to the RA, the very small vertical separation between the aircraft did not increase. Consequently, the A319 received an "Increase Climb" RA and the pilot increased the rate of climb to 5000 ft/min. The B767 pilot eventually recognised the "Descend" RA and stopped the climb just before the "Clear of Conflict". Despite the large vertical deviation of the A319 (3000 ft), when the aircraft passed they were separated by only 0.3 NM horizontally and 400 feet vertically.

As can be seen from the above example, the occurrence of an RA fundamentally changes the pilot and controller tasks: without an RA the controller's task is to ensure separation of traffic and the pilot is required to follow ATC instructions. With the RA, the controller should no longer actively try to ensure separation of the affected aircraft – the pilot is required to follow the RA and disregard any ATC clearances. However, controllers can only become aware of an RA if they are informed by the pilot. This often happens late or not at all, often due to good reasons such as the high workload in the cockpit following the RA. However, this leads to the risk that the controller may unknowingly provide a contradictory instruction.

'Compatibility' with normal operations

Solely addressing the interactions between STCA and TCAS will not produce desirable alerting behaviour in all situations. The 'compatibility' of STCA and TCAS with the airspace in which they operate is also important. For example, unwanted safety net alerts can occur for both STCA and TCAS in situations when aircraft maintain high vertical rates until levelling off at the cleared flight level. Apart from being disruptive this can lead to desensitised controllers and pilots.

Such compatibilities will become more important as new concepts and airspace environments are implemented in the future.

Possible mitigations

The risks associated with incompatibility can be mitigated in several ways:

- **Harmonisation:** STCA systems are necessarily optimised for their local environments. However, harmonisation of STCA helps to make the overall system-of-systems behaviour more predictable. This has been a focus of SPIN through its development of an STCA specification and supporting guidance material.

- **Improvement of TCAS operations:** Monitoring TCAS RAs can help identify "hot spots" where frequent RAs occur. These can then be eliminated by adjusting airspace design and procedures. Technical solutions are also being researched, for example SESAR is investigating coupling TCAS with the flight guidance system to automate vertical speed reduction before an RA is triggered.

- **Display of TCAS RAs to controllers:** The functionality to downlink and display TCAS RAs on controller working positions is standard in a number of commercial systems and is being used by an increasing number of early adopters in Europe and beyond. This has given added impetus to research and development projects to develop and validate an operational concept for the display of RAs to controllers.

- **Co-ordinated development of future STCA/TCAS:** Recent research conducted by the EUROCONTROL PASS project has demonstrated the feasibility of a more holistic approach to system development using extended encounter modelling time horizons. Such models can provide the required insight into the combined behaviour of STCA and TCAS.

What next?

In the last 10 years significant progress has been made in increasing our understanding of safety nets and how they interact – but much remains to be done. In Europe, SESAR holds the reins of current and future R&D work, whilst globally, ICAO will need to consider safety nets as part of its "Global Aviation System Blocks Upgrades" (see the panel on the following page).

Promoting the importance of compatibility - recent EUROCONTROL activity

RTCA

In October, the EUROCONTROL Safety Nets team presented a paper titled "Risks of Divergence in Future Collision Avoidance Systems" to a joint RTCA/EUROCAE meeting. Given that RA downlink has become a reality the paper recommended that appropriate actions be taken to address related technical issues, specifically increasing the frequency of RA broadcast messages to not less than 1 Hz and resolving ambiguities concerning RA downlink message formats. It also recommended a more holistic approach towards TCAS evolution, for example by using extended encounter modelling time horizons, to offer opportunities for the coordinated development of future collision avoidance systems.

64th International Air Safety Seminar (IASS)

A paper jointly authored by EUROCONTROL and Helios ("TCAS RA downlink - from R&D concept to operational implementation in Europe") was presented by Nick McFarlane at the Flight Safety Foundation's 64th IASS in November. The paper explained how the necessarily independent operation of TCAS and STCA leads to a degree of incompatibility and how displaying RAs to controllers is a partial mitigation of this incompatibility. This paper also shared experiences of early RA downlink adopters in Europe.

SPIN input to the 12th ICAO Air Navigation Conference (ANC/12)

The EUROCONTROL Safety Team tasked SPIN to develop a paper on compatibility of safety nets for ICAO ANC/12, outlining the opportunities for reducing incompatibilities – this fits with the aim of the conference to achieve consensus and commitment for a harmonised global air navigation system. Two safety nets items are being considered for inclusion in the "Global Aviation System Blocks Upgrades" - improved effectiveness and compatibility of safety nets (deployable after 2018), and new collision avoidance systems (deployable after 2023).

A new European mandate is expected in the near future. It is envisaged that it will require all new aircraft (above 5,700 kg Maximum Take-off Mass or with a passenger seating capacity above 19) to have TCAS II Version 7.1 from 1st March 2012, and all existing installations to be upgraded to the new version by 1st December 2015.

Version 7.1 offers two specific safety improvements which have been welcomed by the aviation community: the replacement of the "Adjust Vertical Speed, Adjust" Resolution Advisory (RA) with a new more intuitive aural advisory: "Level off, level off"; and improvements to the reversal logic enabling Version 7.1 to detect those situations when aircraft continue to converge vertically despite RAs being issued.

Studies found that the "Adjust Vertical Speed, Adjust" RA sometimes resulted in pilots increasing their vertical speed, rather than reducing it. The "Level off, level off" RA removes the potential for confusion and requires a reduction of vertical rate to 0 ft/min (unlike the "Adjust Vertical Speed, Adjust" RA which required reductions in climb/descent rates to 2000, 1000, 500 or 0 ft/min). The level off is to be achieved promptly, not at the next flight level.

Improvements in RA reversal logic will address those instances where Version 7.0 failed to reverse an RA when two converging aircraft remained within 100 ft; either because one aircraft was not following the RA, or because it was not TCAS II equipped and was following ATC or a visual avoidance manoeuvre.

When the mandate is released, the changes will be explained in detail in ACAS Bulletin (number 14) and accompanying training materials for pilots and controllers. These will be available at www.eurocontrol.int/acas.

ANS Czech Republic
PROPHET approaches

Air Navigation Services of the Czech Republic (ANS CR) hosted the 25th meeting of SPIN at its Integrated Air Traffic Control Centre (IATCC) in October. This gave Milan Soukup and Milan Korab of the Planning & Development and Operational divisions a chance to talk about the new safety nets ANS CR will be implementing in the near future.

PROPHET

Executive controllers at the Prague ACC and APP positions currently operate the safety nets STCA, MSAW and DAIW/APW from the centre's EUROCAT 2000 system. During 2012, planner controllers in the ACC and controllers at three regional airports will have access to these safety nets, plus APM, for the first time through a package called PROPHET, which has been been developed by a local company in accordance with EUROCONTROL Level 2 requirements.

As Milan Soukup explains: *"The new PROPHET STCA will principally have two new features. Firstly it will account for the Cleared Flight Level (CFL) input by the controller, as will the EUROCAT safety nets, thereby reducing the number of alerts generated as an aircraft approaches its CFL. This is achieved by having a parameter selectable vertical zone around the CFL in which STCA checks if the rate of climb/ descent is decreasing. The CFL will only be taken into account when it is confirmed as being the same as the aircraft's Selected Flight Level (SFL) which is downlinked via Mode S radars. Secondly, the STCA will limit the number of alerts in close vicinity of the Prague FIR boundary due to an unknown RVSM status, for example due to uncorrelated tracks or a change of squawk on the FIR boundary".*

The PROPHET safety nets are currently undergoing parameter tuning and testing. Testing is primarily focussed comparing the alerting performance of the EUROCAT and PROPHET safety nets. Both sets of safety nets are being run in parallel with any differences being reviewed in detail using radar replays.

Safety nets training

Prior to implementation planner and regional airport controllers will be given training on the safety nets as Milan Korab explains: *"In terms of what the controller sees on the HMI, the EUROCAT and PROPHET safety nets will be identical. Therefore at the Prague ACC, training will only focus on the algorithms used by each group of safety nets. At the regional airports, where controllers have not previously operated safety nets, the situation is different. Training at these locations will be more substantial and cover the principles of safety nets, their algorithms and what the controller will see on the HMI".*

Safety net like functions

ANS CR is also operating or evaluating a number of safety net like functions, these are:

- Uncoupled (uncorrelated) flights warning for the ACC to identify flights which are entering Prague FIR without correlated flight plans.
- Uncoupled (uncorrelated) flights warning for the APP to identify flights which are entering Prague TMA without correlated flight plans. This effectively operates as an APW for uncoupled flights.
- ACID (aircraft identification) warning comparing the downlinked Mode S aircraft identification with the callsign held by ATC.
- Selected Flight Level (SFL) warning which provides a warning when there are differences between the SFL DAP downlinked from the aircraft the CFL input by the controller.
- Barometric Pressure Setting (BPS) warning warns Prague APP controllers of QNH setting errors based on downlinked Mode S data. This function is planned to be operational in mid-2012.

SPIN in Prague

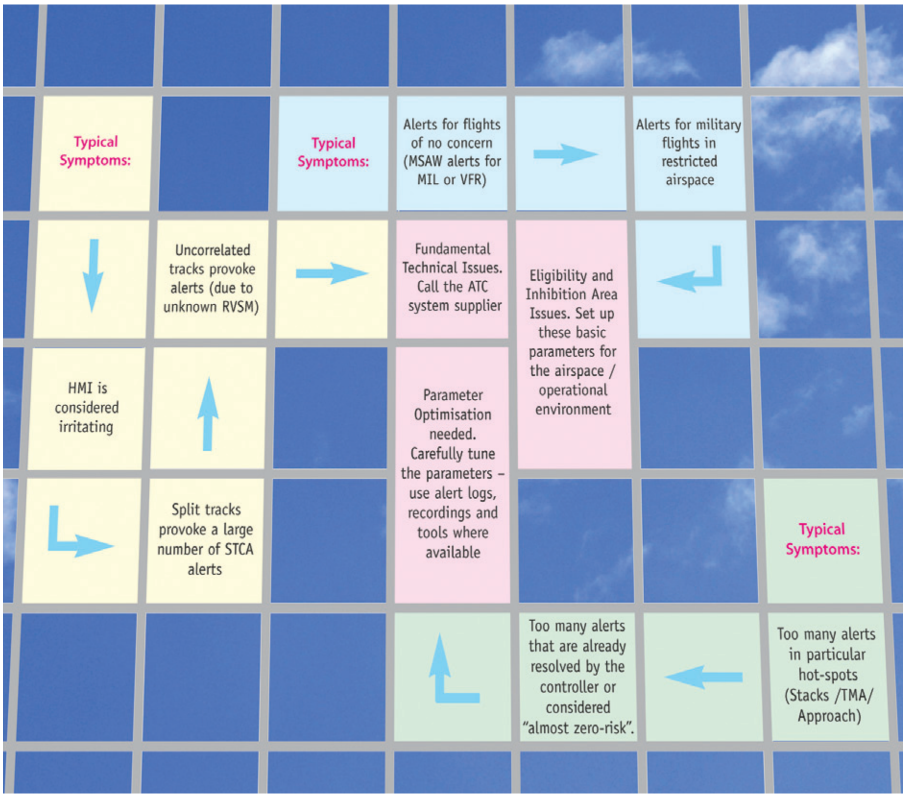
The 25th meeting of SPIN was supported by 22 attendees, including representatives from 10 European ANSPs. ANS CR provided a briefing on the safety nets currently in operation and those soon to be implemented, and provided SPIN members with a tour of the IATCC. Other key agenda items included the compatibility of airborne and ground-based safety nets, the RA downlink operational concept and safety nets tools which included a demonstration of EUROCONTROL Automatic Safety Monitoring Tool (ASMT).

The next SPIN meeting will be held on the 18th and 19th April 2012. If you would like to find out more about the work of SPIN, join, become an observer, or obtain SPIN meeting material please do contact us: safety-nets@eurocontrol.int.

Nuisance alerts - more than just a numbers game

In the last three decades, safety nets have progressed from a novel concept to become more-or-less standard components of the ATM system. Yet, despite these decades of operational use, certain aspects of safety nets operation still remain a concern – not least of which is the frequency of nuisance alerts.

The EUROCONTROL specifications for each of the safety nets define a nuisance alert as: an alert which is correctly generated according to the rule set but is considered operationally inappropriate. In this article, Rod Howell of QinetiQ identifies the common sources of nuisance alerts and some potential solutions to reduce them.



Whilst a modest number of nuisance alerts can often be tolerated by controllers, too many nuisance alerts can have deep and far reaching consequences. It has been known for too many annoying alerts to cause controllers to turn down the volume of speakers, and tape up flashing lights! In the more extreme cases, safety nets are intentionally partially disabled (e.g. in the TMA or below a particular flight level) or switched off completely.

Controllers and pilots need time to respond to and resolve a safety nets alert and therefore alerts of very short duration (i.e. just a few seconds) are generally considered a nuisance. However, because there are such a wide variety of operational environments a simple mathematical formula cannot be applied to determine whether or not a particular alert was a 'nuisance'.

Common types of nuisance alert

A number of common types of nuisance alerts exist:

- Obnoxious alerts - those that are louder, brighter, and / or longer than necessary.
- Alerts which are not related to a real situation (e.g. due to surveillance errors).
- Alerts which only involve flights that are not of concern to ATC (e.g. military exercises, formation flights, mid-air refuelling).
- Alerts due to unknown RVSM status to which STCA applies an inappropriate vertical separation threshold.
- Alerts which may appear on the display too late to be useful or annunciate intermittently due to poor set-up/tuning.
- Alerts caused by aircraft converging rapidly (though still safely cleared).

Performance measurement

There are a number of measurements that could be made to quantify how well a safety net is performing - the number of alerts per day, the number of alerts per sector per day, the ratio of nuisance (unwanted) to necessary (wanted) alerts, etc.

Whilst these measures might be useful to check that the performance of a safety net has been maintained over a long time period (months or years), they will not help to resolve any underlying issues. Furthermore, none of these measures on its own can be used as a

Ground-based safety nets - a brief recap

Short Term Conflict Alert (STCA) – Intended to assist the controller in ***preventing a collision between aircraft*** by generating, in a timely manner, an alert of any potential or actual infringement of separation minima.

Minimum Safe Altitude Warning (MSAW) – Intended to warn the controller about ***increased risk of controlled flight into terrain*** accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles.

Area Proximity Warning (APW) – Intended to warn the controller about ***unauthorised penetration of an airspace volume*** by generating, in a timely manner, an alert of a potential or actual infringement of the required spacing to that airspace volume.

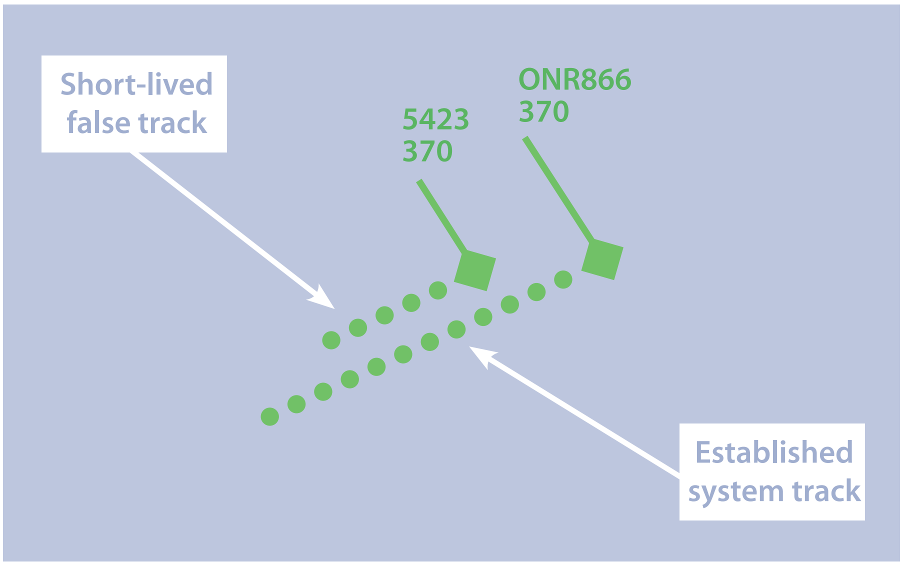
Approach Path Monitor (APM) – Intended to warn the controller about ***increased risk of controlled flight into terrain*** by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles during final approach.

Nuisance alerts

continued

basis for safety net performance targets that can be applied across all types of airspace. Whilst in the core area of Europe, ANSPs have worked hard to decrease the ratio of unwanted to wanted alerts, the absolute number of alerts per day is still relatively high. On the other hand, in the least busy airspace, a safety net might generate a low number of alerts per day, but a large proportion of these may still be unwanted or nuisance alerts.

Far more important than the bare statistics, is to analyse and understand what types of alerts are occurring; only with this knowledge can effective action be taken to reduce the number of nuisance alerts to a level that is acceptable.



A typical split track

Forming a team

A multi-disciplinary safety nets team within the ANSP organisation (or within each major control centre) must be charged with tuning and maintaining the safety nets. This team should comprise an experienced engineer, en-route and TMA controllers and safety staff. Communication is paramount - it is of fundamental importance that controllers and engineers share an understanding of the safety nets' technical limitations and operational issues (for further information see the next article).

In addition, many ATM systems automatically record safety nets log files. The safety nets team therefore has access to information regarding the numbers of alerts, and with analysis can reveal what types of nuisance alerts are occurring. These log files should be used to inform the engineer where and in what circumstances the safety nets problems occur so that they can be resolved.

Potential engineering solutions

Experience built up over many years of examining safety nets performance in various countries has shown that problems tend to fall into one of three categories:

- Problems that require a change or improvement to the software.
- Problems that require a change to basic safety nets parameters.
- Problems that require a careful tuning of the alerting thresholds.

The nuisance alerts that lead us to the first path include the obnoxious alerts mentioned previously (too loud, too bright, too long), those due to split tracks (surveillance errors), and those caused by STCA applying an inappropriate vertical separation threshold when no RVSM status information is available for a specific flight. All these will normally require a fix from the system supplier.

The second category of nuisance alerts is caused when the basic eligibility and inhibition parameters have not been set up for the specific operational environment. No two operational environments are the same, so these parameters must be set by either the system supplier or the ANSP (preferably both, working together) - this should ideally be done during site acceptance testing of the ATM system, and certainly before it goes into operational service. Typical symptoms of inappropriate basic parameter settings are STCA alerts for pairs of military aircraft undergoing exercises, and MSAW alerts for military or VFR flights.

The final category of nuisance alerts normally requires a deeper analysis of the precise circumstances that are causing them, followed by careful optimisation of the alert thresholds for all safety nets as well as the specific cases of the MSAW alerting surface, APW volumes and the APM approach definitions. Detailed parameter optimisation is most worthwhile when other causes of nuisance alerts have already been resolved. Alert log files, and traffic recordings are invaluable at this stage. If they are available, then specific safety nets optimisation tools can be used as a means of fine tuning.

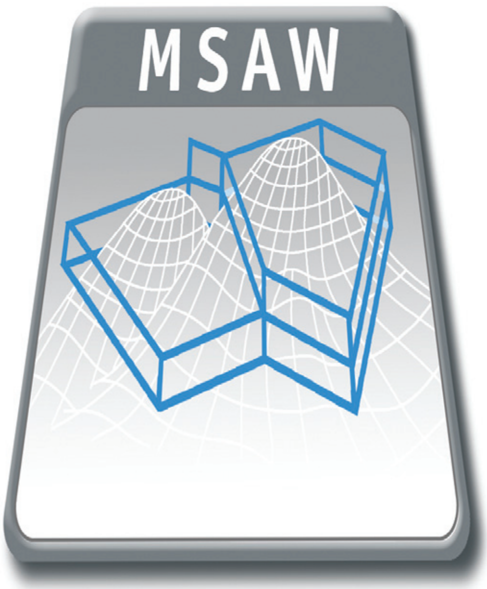
Importantly, the tuning of the parameters should not be left to engineers alone. Controllers should be widely consulted on any borderline wanted/unwanted conflict situations and the consensus view of the appropriate balance between alert rate and warning time should, where possible, be taken into account. Nuisance alerts are not just a numbers game.

This is an edited version of an article produced for Hindsight magazine, issue 14 (December 2011). To read the full version download Hindsight at www.skybrary.aero.

Safety nets implementation
lessons learnt from research on MSAW

Minimum Safe Altitude Warning is a safety net that requires careful implementation and tuning just like any other. Now research sponsored by the EUROCONTROL Experimental Centre throws light on the experiences of four European ANSPs when implementing MSAW in six Air Traffic Control Centres (ACCs).

The research was based on data collected via qualitative interviews with controllers and other safety nets stakeholders over a 10 month period. It highlighted a number of problems associated with any safety critical system implementation, as well as the factors for success, using MSAW as its reference system.



Where do difficulties occur?

Difficulties first occur in the rationale to implement. MSAW was often simply a standard feature in the implementation of a much larger commercial off the shelf product. There was therefore little consideration of why it was being implemented or an understanding of the challenges in doing so. For example, at one ACC it was assumed possible for the manufacturer to implement MSAW with little or no input from the ANSP. In some cases it was found that knowledge of MSAW was limited to understanding the meaning of the acronym. This often led to the operational requirements for MSAW being underspecified and the responsibility for tuning being given to the manufacturer without any local operational input. The result was a system not tuned to meet local requirements and producing too many nuisance alerts.

The relationship between the manufacturer and ANSP was also influential in terms of the ability of the ANSP to request system changes and gain access to MSAW algorithms and parameters. Additionally, the point in the contract at which new or additional requirements were identified played a part. Prior to procurement the upstream contract phase is an open window to negotiate the requirements to be implemented. Once the contract is signed, the flexibility to accommodate them decreases, or they take place at the cost of renegotiated deadlines or extra costs.

Success factors

The experiences of the four ANSPs identified two key success factors. The first was having a mature tuning process consisting of three components:

Real traffic recordings: Use of real traffic recordings instead of generated traffic ensures tuning is based upon more representative and realistic traffic patterns. This increases the probability that tuning will identify all relevant alerts and hotspots.

Test-bed: Having a test-bed capable of replaying traffic data in fast-time simulations and to generate statistics about the performance of MSAW.

Controller input: Involving operational controllers throughout the tuning process provides expert operational judgement to interpret the alerts and statistics generated during the tuning. Controllers can also advise on parameter changes and other factors such as the location of inhibition volumes where MSAW does not alert.

The second success factor was some form of 'safety net governance'. This means that the ANSP has oversight of the life cycle of MSAW (and other safety nets) to enable continuous monitoring and improvement of performance. Again this consisted of three elements, a **focus on controller feedback**, a **dedicated safety nets group** and the use of **dedicated tools** (beyond that of a testbed - such as analytical and replay tools) to allow individual alerts and overall performance to be evaluated.

First time success not guaranteed

Interestingly all the ANSPs surveyed experienced poor MSAW performance on its first implementation, even those with a mature tuning process and 'safety net governance' in place. However, as a result they gained an awareness of the challenges involved in tuning and operating MSAW, and performance subsequently improved as resources were allocated to address the problems encountered.

Lessons learnt

MSAW is not 'just a black box' waiting to be switched on. A good implementation will consist of a mature tuning process, a feedback and improvement process, a dedicated group of staff and plenty of input from operational controllers from start to finish. The purpose of MSAW needs to be clearly defined and supported by a clear set of operational requirements. If tuning is undertaken by the manufacturer then the ANSP cannot be 'hands off' and must take steps to ensure its involvement. And finally, be prepared for more than one implementation - success is not guaranteed first time around.

The research into experiences of implementing MSAW was undertaken in 2010 by Simone Rozzi as part of a doctorial research programme sponsored by the EUROCONTROL Experimental Centre. A full paper on this study can be found on the EUROCONTROL website (www.eurocontrol.int/safety-nets).

SESAR update

Our regular review of SESAR safety nets related projects follows…

Evolution of Ground-Based Safety Nets (P 4.8.1)

The standalone validation of an STCA industrial prototype developed by P 10.4.3 started in September. This is part of Work Area 5 (Enhanced STCA for TMA specific operations (Release 1)). The main focus of the validation will be to confirm the performance of the multi-hypothesis algorithms. The validation exercise and associated validation report is due to be completed by February 2012.

Similar timescales are in place for evaluating the safety and performance benefits, as well as associated costs, of enhanced ground-based safety nets using existing down-link aircraft parameters (DAPs) in TMA and en-route environments (Work Area 1).

In Work Area 2 an initial Operational Service and Environment Description (OSED) has been delivered. This identifies candidate airborne and ground-based trajectory data to be used by safety nets in a future time and trajectory-based environment.

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

Safety Nets Adaptation to New Modes of Operation (P 10.4.3)

This technical project has delivered the prototype being validated by P 4.8.1 at an industrial site. Several days of realistic traffic data are being processed. Work continues on the definition of a performance evaluation method for safety nets.

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

Evolution of Airborne Safety Nets (P 4.8.2)

The following candidate safety and performance requirements (SPRs) have been completed by a DSNA led team:

- TCAS Alert Prevention (TCAP - the modification of autopilot laws for altitude capture to avoid false alerts during high vertical approaches).

- Auto Pilot/Flight Director (AP/FD - coupling of ACAS to provide automatic compliance with Resolution Advisories (RAs)).

To enable the industrialisation of APFD and TCAP, the SPRs are being used as the basis for discussions with RTCA/EUROCAE on the development of MOPs (Minimum Operational Performance Standards). Coordination with NEXTGEN/SESAR has also been initiated to ensure a common approach to these concepts on both sides of the Atlantic.

For the future trajectory-based environment the project is identifying and evaluating possible modifications to ACAS. These modifications were described by EUROCONTROL in a validation plan and an OSED. DSNA is evaluating reduced ACAS thresholds while EUROCONTROL will assess improvements in collision avoidance between ACAS and non-ACAS equipped aircraft.

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

Ground-Airborne Safety Net Compatibility (P 4.8.3)

DFS continues to analyse RA encounters collected from ACAS monitoring stations and Mode S radars by P 15.4.3 to support analysis of the operational benefits of RA downlink. Meanwhile a Functional Hazard Assessment (FHA) is evaluating the options for the presentation of RAs to controllers. Work has also started on both an initial draft plan and mock-up to prepare for a preliminary validation of the RA downlink operational concept.

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

ACAS Monitoring (P 15.4.3)

The initial data collection and technical evaluation of RA encounters from ACAS monitoring stations and Mode S radars has been successfully completed. Development of a prototype ACAS monitoring system has started and will continue until summer 2012. In the short-term a draft system specification is under review and tests of the base ACAS server, as well as the tools to record and replay RA events, are being undertaken by DFS at Langen.

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

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