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EUROCONTROL

NETALERT Newsletter
Stay tuned

Ensuring the effectiveness of Safety Nets

WELCOME

Once every ten years the ICAO Air Navigation Conference convenes in Montréal. The latest one took place at the end of 2012 with the purpose of formulating recommendations to achieve a harmonised global ATM system. Our lead article examines how this conference is expected to influence the direction of safety nets developments.

Closer to day-to-day operations, research sponsored by the EUROCONTROL Experimental Centre, has drawn on the experiences of four European ANSPs when implementing MSAW in six Air Traffic Control Centres. It identifies how different ANSPs develop their safety net capabilities and highlights the common challenges they overcame. Read the main findings on page 7.

We also continue our theme of reviewing serious incidents which underline the importance of operating effective safety nets. In this issue the case studies involve STCA and MSAW.

Finally we provide our usual update on safety nets activities in SESAR.

Feedback: Safety nets at the 12th ICAO Air Navigation Conference

ICAO Air Navigation Conferences take place about once every ten years. The latest one took place in Montréal last November and involved over 1,100 delegates from more than 130 nations. Safety nets were on the agenda and we summarise for you here the main conclusions which are expected to influence the direction of safety nets developments.

ICAO's approach to ATM development is based around 'block upgrades'. This is a systems engineering planning and implementation framework split into four target implementation times, called Blocks.

Activities and recommendations are allocated across different blocks, with implementation targets of up to 2018 (Block 0), 2018 up to 2023 (Block 1) and 2023 up to 2028 (Block 2). Anything beyond 2028 falls into Block 3. The proposed block upgrades for safety nets are shown in the panel overleaf.

Proposals relating to safety nets were received from Europe, the United States (FAA), IFATCA and ICAO itself. In making its recommendations, the conference endorsed many of the proposals relating to both airborne and ground-based safety nets, but

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Feedback: Safety nets at the 12th ICAO Air Navigation Conference

continued

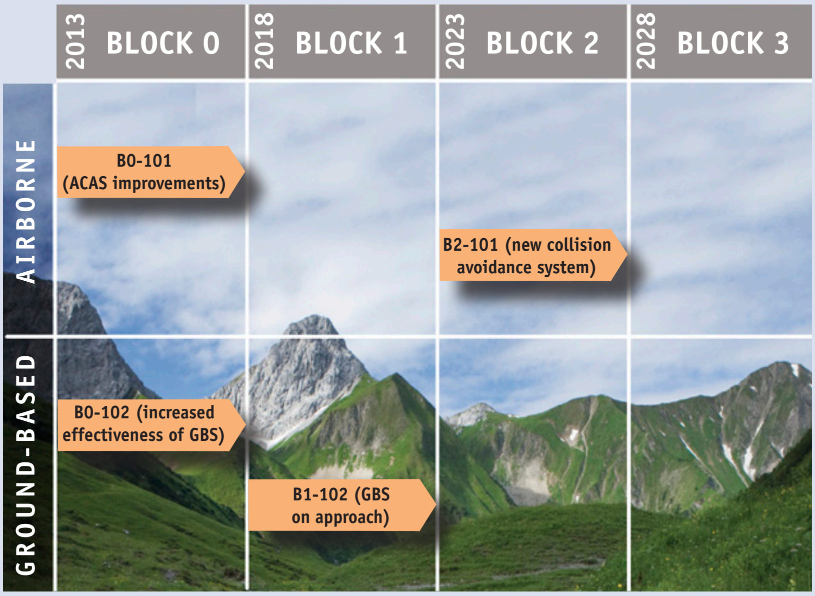
Safety net block upgrades

For airborne safety nets:

- B0-101 (ACAS improvements) describes potential improvements to the existing ACAS capability during Block 0.
- B2-101 (new collision avoidance system) describes the development of a future replacement system during Block 2.

For ground-based safety nets:

- B0-102 (increased effectiveness of ground-based safety nets) which aims to implement a baseline set of ground-based safety (APW, MSAW and STCA) during Block 0.
- B1-102 (ground-based safety nets on approach) which intends to add APM to the baseline of safety nets in B0-102 during Block 1.



in reaching the necessary compromises, some questions have emerged.

Ground–based safety nets

The conference recommended that States should implement Block 0 safety nets: STCA, MSAW and APW, according to their operational needs.

It also endorsed the inclusion of ground-based safety nets on approach (i.e. APM) in Block 1. This implies that ICAO regards APM as needing further development but it is not clear at this stage what further developments are foreseen.

Several actions were recommended and accepted for ICAO. Firstly, that ICAO should produce a Manual for Ground-based Safety Nets. This should give further impetus to harmonisation to help the overall system-of-systems behaviour become more predictable. The conference also went a step further and called for the manual to include provision for tools for validating and certifying those safety nets.

Secondly, ICAO was asked to adopt a coordinated approach to reviewing and developing Standards and Recommended Practices (SARPs), Procedures for Air Navigation Services (PANS) and guidance material relating to safety nets. This should address potential ambiguities and omissions in the current documents. However, changes to ICAO SARPS and PANS-ATM can take many years.

Finally, ICAO undertook to include details of the planned block upgrade modules in the Appendices to the draft Fourth Edition of the Global Air Navigation Plan. This should be achieved by the end of 2013.

Airborne safety nets

The main airborne safety net considered by the conference was ACAS (Airborne Collision Avoidance System). The latest implementation of this is TCAS II version 7.1, which has been mandatory in Europe since March 2012 for new aircraft and will be required in other applicable aircraft by December 2015. This is part of Block 0, which was approved by the conference.

Some further developments to TCAS II have been validated by SESAR, and these developments are also included in Block 0:

- Coupling TCAS and the auto-pilot/flight director (AP/FD) to ensure accurate responses to RAs either automatically or manually.
- Introducing a new altitude capture laws to improve TCAS compatibility with ATM (TCAS alert prevention (TCAP)).

These developments are now being standardised by EUROCAE.

Looking further ahead, research has shown that while there are benefits from incrementally developing the current ACAS in Europe, the same is not true in the United States. Furthermore, research has also shown that the current ACAS will not support some future procedures, in particular any future 3NM en-route separation. There would also be a need for an airborne collision avoidance system which can incorporate, amongst others, UAS and ADS-B surveillance, something not readily supported by the current ACAS.

The conference indicated that addressing these future needs is most likely to be achieved through a coordinated approach to the development of a new type of ACAS known as ACAS X (see panel on the next page). Research and development on ACAS X is already underway with the first flight tests planned for this year, and it looks like this will

Feedback: Safety nets at the 12th ICAO Air Navigation Conference

continued

be the focus of future development efforts. The FAA and SESAR are now collaborating on ACAS X, and with the additional coordination efforts of ICAO it is hoped that ACAS X will deliver a new generation globally interoperable airborne safety net.

RA Downlink

The conference concluded that further analysis of RA Downlink is needed before recommending it. In particular it wanted to see evaluations and validations of safety and human factors aspects. These issues will also need to be considered as part of ACAS X development.

Our view

Speaking after the conference, EUROCONTROL safety nets expert and SPIN Chairman Stanislaw Drozdowski commented *"Many of Europe's recommendations have been accepted and endorsed by the conference, which is good news for future harmonisation of safety nets. The challenge now is to be proactive and focussed in our collaboration efforts. The SPIN Sub-Group has an important role to play in providing input to the ICAO Manual for Ground-based Safety Nets and PANS-ATM. SPIN also provides the European ATM perspective that will be essential to the global development of ACAS X."*

ACAS X

The FAA has funded research and development of a new approach to airborne collision avoidance (provisionally known as ACAS X) since 2008. This new approach takes advantage of recent advances in 'dynamic programming' and other computer science techniques (which were not available when TCAS was first developed) to generate alerts using an off-line optimisation of resolution advisories. It is the intention that ACAS X will eventually replace TCAS.

It is envisaged that ACAS X will provide an improvement in safety while reducing the unnecessary alert rate. ACAS X will use the same interfaces as the current TCAS II system and the same range of available RAs. Consequently, pilots and controllers would perceive no change with the transition to the new system, which will be fully compatible with current TCAS II systems.

As well as the standard ACAS X (known as ACAS X_A) variants are under consideration to extend collision avoidance protection to situations and user classes that currently do not benefit from ACAS II:

- ACAS X_A – The general purpose ACAS X that makes active interrogations to establish the range of intruders. The successor to TCAS II.
- ACAS X_P – 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 (that are not currently required to fit TCAS II).
- ACAS X_O – A mode of operation of ACAS X designed for particular operations for which ACAS X_A is unsuitable and might generate an unacceptable number of nuisance alerts (e.g. procedures with reduced separation, such as closely spaced parallel approaches).
- ACAS X_U – designed for Unmanned Aircraft Systems (UAS).

A flight test of the ACAS X threat resolution logic is planned for 2013. It is envisaged that ACAS X MOPS (Minimum Operational Performance Standards) would be developed by 2018 and ACAS X may become operational before 2025.

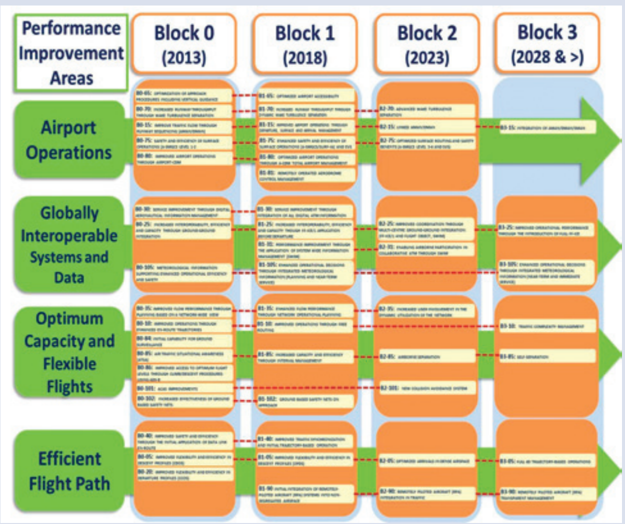
Conference documents

The individual papers presented at the conference and a full list of recommendations relating to safety nets can be found on the ICAO website (www.icao.int/meetings/anconf12/pages/default.aspx).

Why was AN-Conf/12 important?

The purpose of the conference was to gain consensus, obtain commitment and formulate recommendations to achieve a harmonized global air navigation system for international civil aviation. In simpler terms it intended to agree a new ICAO Global Air Navigation Plan (GANP) comprising several Aviation System Block Upgrades (ASBUs) which describe the operational and technical components of the plan. Safety nets account for four of the fifty or so ASBUs that make up the GANP.

The conference itself is very much the culmination of thinking and discussions around the world in the preceding years.



ICAO Global Air Navigation Plan

The effort here is not insubstantial, for example the work to coordinate a European safety nets paper started more than a year ahead of the conference.

The conference is conducted via various agenda items and sessions in a two week period, at the end of which it adopts various recommendations to ICAO and States. After the conference ICAO reviews the recommendations, updates the Global Air Navigation Plan and incorporates actions into the work programmes of the different Panels. This process is expected to be completed and adopted by the Assembly during its 38th session (September 2013).

MSAW proves its worth at Lyon

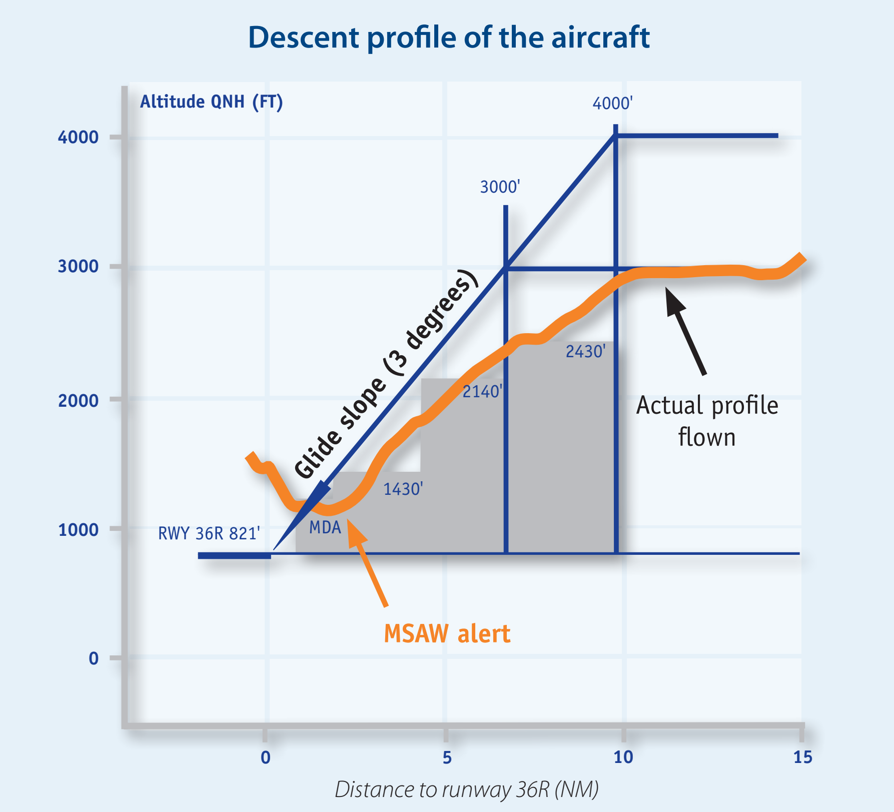
In 2010 an incident took place at Lyon airport. Although the investigation report cited a number of contributory factors, it is clear that MSAW alerting provided a timely warning that avoided the situation deteriorating further.

Also in 2010, an incident took place at a secondary airport in Japan that did not operate an MSAW system (see text box). Both incidents show that ground-based and airborne safety nets are complementary, and that the highest level of protection is achieved when both are implemented and the associated terrain models, including obstacles, are kept up to date.

The account and analysis of the incident in Lyon is based upon a report published by the Bureau d'Enquêtes et d'Analyses (BEA), the French government agency responsible for technical investigations of civil aviation accidents and incidents.

A Boeing 737 was making an approach to runway 36R at Lyon. The Instrument Landing System (ILS) localiser was available to provide lateral guidance, however the glide slope was out of operation due to maintenance work.

The preceding aircraft approaching runway 36R had reported breaking out of cloud at 1,250 feet. The tower relayed this information to the B737 crew but received no acknowledgement. Fifteen seconds later the message was repeated. At the same time an MSAW alert was generated in the tower. The aircraft was immediatly instructed to go-around. The flight crew followed the instruction and subsequently landed the aircraft safely on another runway.



Analysis of radar data after the incident showed that the aircraft had descended to 250 feet AGL (Above Ground Level) when approximately 1.4NM from the runway threshold (see image).

Recordings of the parameters associated with the Enhanced Ground Proximity Warning System (EGPWS) carried by the B737 showed that no alarm was triggered on board the aircraft. Analysis of flight parameters identified that the criteria for triggering the basic GPWS alarms (Modes 1 to 5) were not met during the approach. This analysis was not undertaken for the 'enhanced' functions which are dependent on the digital terrain model used.

A full description of the Lyon incident (in French) can be found on the BEA web site (www.bea.aero). A summary of the Asahikawa incident can be found on SKYbrary (www.skybrary.aero).

Size doesn't always matter...

Also in 2010, over 9,000km away at a secondary airport in Japan, another incident took place. A B737 was radar vectored for landing at Asahikawa airport by the Sapporo Area Control Centre (the airport itself is not equipped with a surveillance radar). The vectors took the aircraft towards mountainous terrain and the pilot was issued a clearance to descend to an altitude which was 5,000 feet below the applicable Minimum Vectoring Altitude (MVA) whilst in Instrument Meteorological Conditions (IMC).

Subsequently, two Terrain Avoidance and Warning System (TAWS), another term for EGPWS, 'PULL UP' hard warnings occurred on board the B737 in quick succession. The flight crew responses were as prescribed and the subsequent investigation found that the closest recorded proximity to terrain had been 655 feet. It was established that the controller had 'forgotten' about the MVA.

It was noted in the incident report that only thirteen 'busier' Japanese airports are covered by MSAW.

The importance
of responding promptly

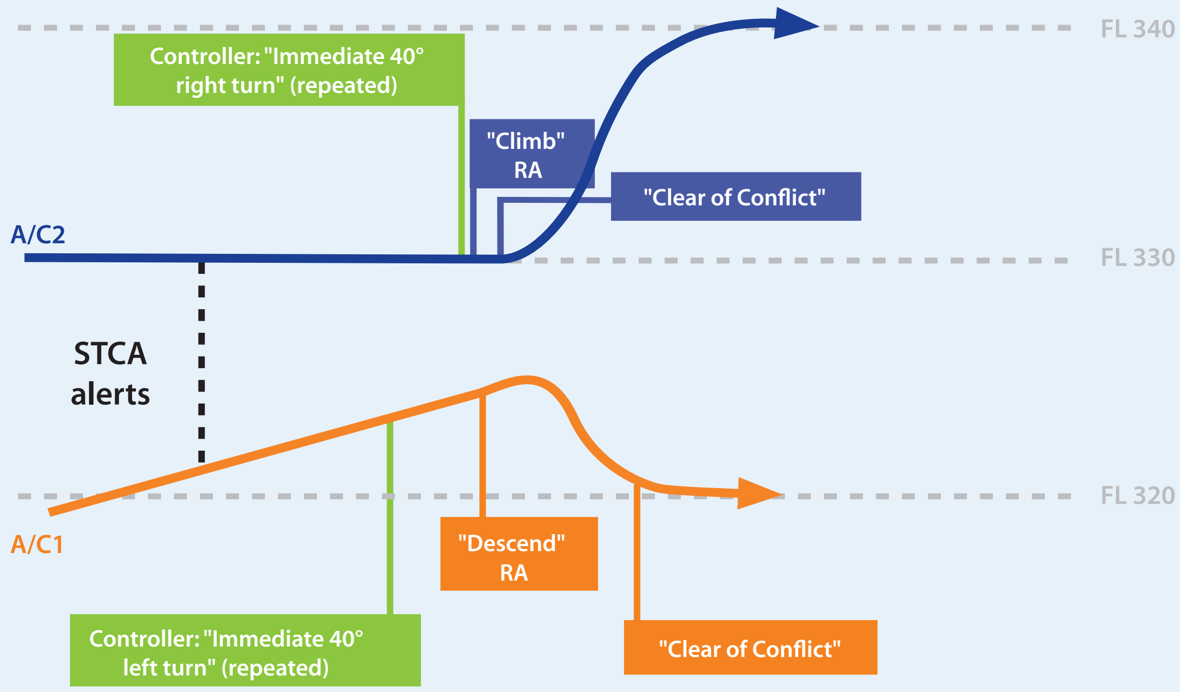
Using a loss of separation incident investigated by the PASS project, this article illustrates the importance of responding without delay to STCA alerts.

An escalating situation

In this incident the risk of collision between the two aircraft was averted by both flight crews promptly following their respective TCAS Resolution Advisories (RAs). The controller received an STCA alert 57 seconds before the TCAS alerted on both aircraft. However the controller did not immediately react to the STCA as he did not believe that there would be a loss of separation. When the controller did react, the pilots of both aircraft did not understand the instructions. Subsequently each aircraft received TCAS RAs.

An overview of the incident is given in the

Overview of the loss of separation



The loss of separation involved two wide bodied commercial flights operating in upper airspace. Aircraft 1 (A/C1) is climbing to FL330 with a heading 220 degrees following a direct routing instruction to the next waypoint. Aircraft 2 (A/C2) is cruising at FL330 with a heading of 140 degrees.

20:24:39 (Time T): STCA triggers. Despite both aircraft converging towards FL330, the controller expects A/C1 to pass behind A/C2 by more than the minimum horizontal separation and takes no action.

At 20:25:21 (T+42 seconds): After 42 seconds the controller initiates horizontal avoiding manoeuvres to both aircraft using avoiding action "immediately turn...." A/C1 is instructed to make an immediate 40° left turn. At the request of the pilot this is repeated, however the pilot misunderstands and acknowledges a 4° turn. During this time the controller is advised by an adjacent sector that they have also received the STCA alert.

At 20:25:35 (T+56 seconds): A/C2 is instructed to make an immediate 40° right turn. When this is not acknowledged by the crew the controller repeats the instruction.

At 20:25:36 (T+57 seconds): A TCAS RA triggers on board A/C2. Seconds later an RA triggers on A/C1. Both crews respond to the RAs promptly.

At 20:25:45 (T+66 seconds): The crew of A/C2 inform the controller that they are following an RA.

At 20:25:47 (T+68 seconds): Loss of separation occurs and lasts for four seconds.

The Closest Point of Approach between the two aircraft was 0.8NM laterally and 1,080 feet vertically.

Note: The Clear of Conflict message for A/C2 occurred only 6 seconds after the RA was triggered and despite both aircraft still converging. This is permitted by a particular feature of the TCAS II Collision Avoidance logic, called "Early Clear of Conflict", which evaluates if the aircraft will pass with a sufficient horizontal distance. The TCAS II of A/C1 did not issue an "Early Clear of Conflict". This highlights the non-symmetrical view of the encounter by the two TCAS.

The importance of responding promptly
continued

text box on page 5 and different aspects discussed in the following paragraphs.

Late response to the STCA

As described above, the controller detected the STCA alert, but decided not to take immediate action to resolve it, as he thought there was sufficient separation for A/C1 to pass behind A/C2. In not responding promptly to the alert the controller cut the time available for resolving the conflict by 74%, leaving only 15 seconds between the first avoidance instruction and the RAs triggering. This is illustrated in the event chronology in the panel on the right.

Phraseology

Phraseology issues experienced between the controller and the pilots created an additional delay in responding to the STCA. Upon realising the potential for a loss of separation the controller employed avoiding action phraseology ("immediate turn..."). However both pilots did not understand the ATC instructions.

The resulting repetition of the instructions generated lengthy R/T messages (13 seconds and 14 seconds for A/C1 and A/C2 respectively).

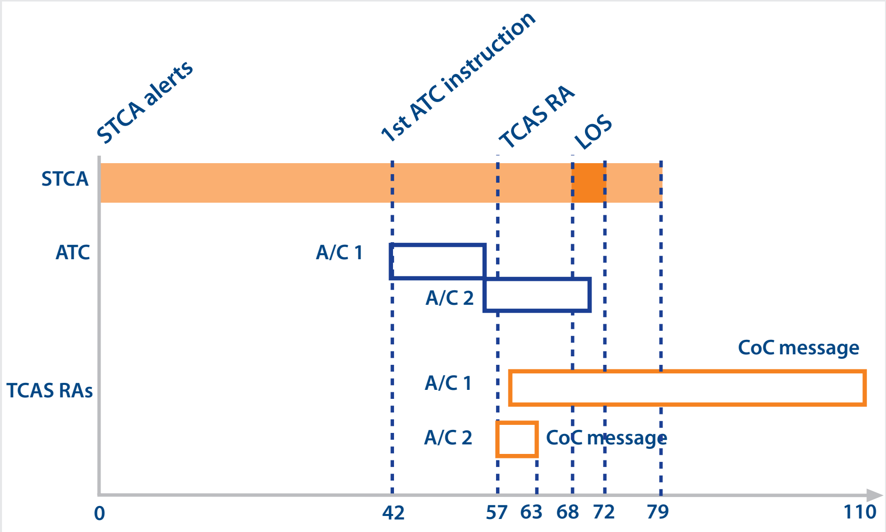
Horizontal avoidance manoeuvres

Despite the pressure of an escalating situation, the controller reacted sensibly by initiating horizontal avoidance manoeuvres. As TCAS RAs are in the vertical plane ATC horizontal avoiding instructions will not normally adversely affect any TCAS RA and may help to reduce the risk of a collision.

However, the delayed instructions combined with the high speed and low turn rate of the aircraft significantly reduced the effectiveness of the horizontal avoidance manoeuvres. On the other hand, as the ATC instructions and RAs occurred roughly at the same time, the pilots might have neglected the former and concentrated on the RA.

Once informed about the RAs, the controller took the correct action and stopped delivering instructions to both aircraft.

Event chronology



Elapsed time after STCA alerts (seconds)

Lessons learnt

EUROCONTROL safety nets expert Stanislaw Drozdowski comments: *"This incident demonstrates the importance of following established operational procedures. Had the controller acted upon the STCA alert promptly, the TCAS RA would almost certainly have been avoided. However, the controller did sensibly initiate horizontal avoidance manoeuvres, which will not normally adversely affect any TCAS RA, and stopped issuing instructions once informed about the RA."*

What does PANS-ATM say?

15.7.2.2 *"In the event an STCA is generated in respect of controlled flights, the controller shall without delay assess the situation and, if necessary, take action to ensure that the applicable separation minimum will not be infringed or will be restored".*

12.4.1.8 for avoiding action:
"TRAFFIC (number) O'CLOCK (distance) (direction of flight) [any other pertinent information].

- *TURN LEFT (or RIGHT) IMMEDIATELY HEADING (three digits) TO AVOID [UNIDENTIFIED] TRAFFIC (bearing by clock-reference and distance);*
- *TURN LEFT (or RIGHT) (number of degrees) DEGREES IMMEDIATELY TO AVOID [UNIDENTIFIED] TRAFFIC AT (bearing by clock-reference and distance)".*

15.7.3.2 *"When a pilot reports an ACAS resolution advisory (RA), the controller shall not attempt to modify the aircraft flight path until the pilot reports "Clear of Conflict"."*

Developing a safety net capability
– from Ops room to senior management

To successfully implement and operate ground-based safety nets, ANSPs will need to develop certain skills and capabilities. Research funded by the EUROCONTROL Experimental Centre has shown that this is not only about developing technical skills and capabilities amongst the controllers and engineers working with safety nets on a daily basis. It also extends to developing certain organisational and managerial capabilities, such as a commitment from senior management to continually improve the performance of safety nets and provide the necessary resources to do so.

The research is based upon experiences with Minimum Safe Altitude Warning (MSAW) in both Europe and the United States. The European research was based upon interviews with controllers, supervisors, managers, R&D directors and safety experts from four ANSPs who had implemented MSAW at six Air Traffic Control Centres (ACCs). The author of the research, Simone Rozzi, a Human Factors Researcher and PhD candidate at Middlesex University in London, explains below how different ANSPs have developed their safety net capability, the common challenges that need to be overcome and the typical traits displayed by those ANSPs regarded as having a 'best in class' capability.

Building a safety nets capability

How do ANSPs develop the necessary skills and capabilities to implement and operate safety nets? Firstly, they are not developed overnight. Secondly, ANSPs might take different paths to accumulate the necessary knowledge and do so at different points in time. This is particularly relevant when considering the standardization of safety nets performance across several States. Our research identified three approaches:

- **Pioneering:** One large ANSP pioneered the development of an MSAW system through a combination of in-house R&D and co-development with a manufacturer. Although a high rate of nuisance alerts was incurred with the first implementation, lessons were learnt and applied to subsequent implementations, thereby developing skills and capabilities through 'learning by doing'. This ultimately led to a MSAW implementation which was judged to be amongst the 'best in class' at the time of the study.

- **Imitating:** ANSPs might opt for an imitation strategy by focusing on integrating into their organization expertise that has already been developed elsewhere (i.e purchasing a system from a manufacturer and recruiting safety nets experts into the ANSP). Again, our research identified a medium-sized ANSP that adopted this strategy and achieved an MSAW implementation judged to be 'best in class'.

- **Relying on the manufacturer:** Where the resources do not exist for the two strategies above, some ANSPs rely entirely on the manufacturer to implement MSAW. However, this strategy tends to be less than optimal, with one ANSP in the research taking MSAW out of service and another engaging external support from EUROCONTROL to optimize its system.

Impediments to building a safety net capability

There are common pitfalls in achieving the necessary organizational skills and capabilities to implement and operate safety nets. Our research identified three impediments:

1. **Viewing the implementation of safety nets as being just about the execution of a plan.** Experience has shown that the successful introduction of safety nets into the operation goes beyond their physical installation into the existing software infrastructure. It is also a learning process, where the ANSP develops focused capabilities to address the level of nuisance alerts and other challenges accompanying their introduction. Ultimately, the complexity of safety nets needs to be matched by appropriate skills and capabilities in the ANSP, and this takes time to develop.

2. **Leaving implementation entirely to the manufacturer.** Developing a safety nets capability can be compromised when purchasing safety nets as built-in components of a larger ATM system purchase, especially if the implementation is left entirely to the manufacturer. When this occurs, if requirements are not specified before purchasing the system, control over quality of the implementation and the tuning process can shift entirely to the manufacturer. This brings the risk that ultimately the final implementation reflects more the manufacturer viewpoint than that of the ANSP, potentially resulting in a less than optimal implementation. Equally, by adopting an approach that allows little or no specific expertise and skills about safety nets to be absorbed from the manufacturer, the ANSP has little opportunity to subsequently optimise the safety nets itself.

3. **Underestimating the complexity of safety nets and the amount of involvement required from controllers.** As we have already established, safety nets are often considered as relatively simple and unproblematic, from both an operational and implementation

Developing a safety net capability

– from Ops room to senior management

continued

perspective. This might lead the ANSP to see implementation solely as an engineering task, only to find out that the alert disrupts controllers' practices once operational. Engineers alone do not possess all the necessary knowledge to achieve an optimal degree of fit between the safety nets and controllers. Input from controllers is therefore needed as they have critical knowledge about how the alert interacts with their tasks. As operational expertise is an important component of any safety net capability, succesful ANSPs have organized procedures to capture and structure operational knowledge from controllers to ensure it feeds into implementation and optimization processes.

Traits of ANSPs with an established safety nets capability

Our research showed that those ANSPs that overcome the above barriers to become 'best in class' implementers and operators of safety nets tend to display the following traits:

1. **Senior management commitment to continuous safety net improvement.** Senior management accepts that safety nets come with benefits as well as undesirable effects such as nuisance alerts. Appropriate resources are allocated to make sure the safety net delivers the intended benefit in the long term, while their negative consequences are minimized.

2. **Valuing specialized expertise.** There is a commitment to ensure that the best available operational, safety and engineering expertise supports the way safety net related decisions are made and implemented.

3. **Commitment to best practices.** The best risk management (e.g. HAZOP) and system safety engineering practices are applied. Compliance with relevant standards, guidance, regulations and policies is ensured. However, this is not done uncritically, as it is acknowledged that official documentation may be less than perfect in fully exploiting the potential of safety nets.

4. **Establishing a dedicated organizational and technological infrastructure.** A permanent and multidisciplinary team responsible for continuous monitoring and tuning of safety net performance is established. Such a team usually includes a safety net lead, who can interact with senior management and act as a centre of expertise within the organization, and specialized engineers, each responsible for one or a group of safety nets. The engineers have the skills to create and operate the equipment, namely test beds, analytical and replay tools, needed to monitor safety nets performance and parameterize them. The team can also include one or more controller.

5. **Emphasis on frequent controller input.** Controllers are regarded as having the critical know how that is essential for the successful implementation of a safety net. Implementation and tuning are controller and not technology centred. The tuning of safety net parameters involves frequent consultations with controllers about borderline situations as opposed to leaving the process entirely to engineers. Some controllers might even be permanent representatives of air traffic controllers' viewpoints on safety nets matters. A controller centric perspective not only minimizes the occurrence of nuisance alerts, but also helps to ensure controller acceptance of safety nets.

6. **Ensuring optimal collaboration with the manufacturer when deploying a new safety net.** The successful introduction and parameterization of safety nets requires an optimal combination of both development (manufacturer) and operational (ANSP) expertise. The involvement of a dedicated safety net group ensures that appropriate communication occurs with the manufacturer, and that development is driven by the operational requirements of the ANSP.

7. **Training of controllers.** Even the best safety net capability cannot eliminate nuisance alerts and other safety nets issues. Hence, safety nets training for controllers includes both their benefits and limitations.

Traits of ANSPs with an established safety nets capability

Developing a safety net capability

– from Ops room to senior management

continued

Lessons learnt

ANSPs take different approaches to developing their safety net capability. This can be influenced by both the size of the ANSP, available internal resources and the rationale behind implementing safety nets. Our research has proved that different approaches can be equally successful. However, independent of the approach taken, there are a number of common factors that tend to increase the chances of successfully implementing and operating safety nets. These include, organisational commitment to continually improving the performance of safety nets, having the necessary internal expertise and resources to do so, working closely with controllers to gain their feedback and input, working collaboratively with the system manufacturer and not underestimating the complexity of the task or the time it will take.

About the study

The research into experiences of implementing MSAW was undertaken in 2009 by Simone Rozzi as part of a doctoral research programme sponsored by the EUROCONTROL Experimental Centre and supervised by Dr Barry Kirwan, Professor Darren Dalcher, Dr Paola Amaldi and Dr Bob Fields. The three full papers that this article was based upon are listed below and can be obtained by contacting Simone Rozzi (simone.rozzi@gmail.com).

- Rozzi, S. Applying the Resilience Engineering and Management Perspective to Problems of Human Alarm Interaction, in *Proceedings of the Second SESAR Innovation Days Conference* (Braunschweig, Germany, November 2012).

- Rozzi, S. and Amaldi, P. Organizational and Interorganizational Precursors to Problematic Automation in Safety Critical Domains. A Longitudinal Ethnographic Case Study from the Air Traffic Management Domain, in *Proceedings of the ATACCS 12* (London, Uk, May 2012).

- Rozzi, S., Amaldi, P., and Kirwan, B. IT Innovation and its Organizational Conditions in Safety Critical Domains: The Case of the Minimum Safe Altitude Warning System, in *Proceedings of the 5th IET International Conference on System Safety* (Manchester, UK, October 2010).

Further material

Implementing MSAW – lessons learnt: Based on the same research, NET*ALERT* 13 contains an article on lessons learnt from research on implementing MSAW in Europe.

Purchasing safety nets: NET*ALERT* 12 provides a short guide on what to do prior to purchasing and during the testing of new safety nets.

Safety nets at the organizational level: EUROCONTROL have produced the "Safety Nets – Ensuring Effectiveness Guide" explaining how to go about implementing and enhancing safety nets and an online Awareness Package which provides interactive online training geared at air traffic controllers and engineers new to the field. Both can be found on the EUROCONTROL website and provide explanations of the broader activities of ANSPs required in the successful implementation and operation of safety nets.

SESAR update

Our regular review of SESAR safety nets related projects follows…

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

Work continues on Work Area 1, enhanced ground-based safety nets using existing down-link aircraft parameters (DAPs) in TMA and en-route environments. In November 2012 EUROCONTROL organised a Safety and Performance Requirements (SPR) workshop which resulted in the release of a mature draft SPR which is currently being reviewed by the P4.8.1 project members. The final version of the deliverable is expected in early 2013. A draft version of the plan for the next validation of an STCA industrial prototype using DAPs was also delivered to the SJU last October.

In November 2012 the initial Operational Service and Environment Description (OSED) was delivered for enhanced ground-based safety nets adapted for to future TMA and en-route environments with enhanced 3/4D trajectory management (Work Area 2). Work continues on both the initial feasibility study and the V2 validation plan with both expected to be delivered in early 2013. For the validation plan, collaboration efforts are underway with other SESAR projects to collect a comprehensive set of trajectories in preparation for the validation exercise.

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

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

Similar to 4.8.1, planning is underway for the next trial of the STCA industrial prototype in 2013. Over the coming months the work of this project will concentrate on progressing the prototype development and qualification, test plan, verification and test reports, and the performance assessment.

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

Evolution of Airborne Safety Nets (P 4.8.2)

Activities related to the improvement of current TCAS operations are now complete. Consolidated validation reports evaluating the possible adaptations of ACAS to autoflight collision avoidance and the use of trajectory data in ACAS have been delivered. The update of the Operational Service and Environment

SESAR – update

continued

Description (OSED) on modified ACAS has also been delivered.

Project P4.8.2 has submitted a change request to the SJU covering tasks for the evaluation and development of ACAS X for Europe. Technical exchanges on the subject have already started with NEXTGEN.

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

TCAS Evolution (P9.47)

The overall aim of this project is to develop an industrial prototype to be validated by P 4.8.2. The scope of the preliminary system impact assessment of TCAS changes is awaiting revision as a result of proposed changes to P4.8.2 to include work on ACAS X.

The definition of performance objectives and functional requirements for the use of improved hybrid surveillance in Europe is complete and was delivered to the SJU at the end of 2012. In the meantime further activities related to improved hybrid surveillance have begun, with the planning of the industrial prototype development and the Verification & Validation tasks both underway. Both activities are expected to be completed before summer 2013.

Finally, standardisation activities undertaken in collaboration with RTCA and EUROCAE (SC147/WG75) are progressing. The extended hybrid surveillance MOPS (DO-300A/ED-221 draft) is currently being reviewed. The EUROCAE open consultation on these MOPS closed at the end of January.

Partners: Honeywell (leader), AIRBUS, DSNA, 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 to support analysis of the operational benefits of RA downlink.

The work area examining the interactions between STCA and ACAS within the future ATM environment has started. The synchronisation with the work of P4.8.1 and P4.8.2 activities resulted in updated validation plans for Work Area 1. Additionally, P4.8.1 and P4.8.2 have both delivered OSEDs that will be inputs to the ground-airborne safety net compatibility work in Work Area 2.

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

ACAS monitoring (15.4.3)

The implementation, update and test of an improved ACAS monitoring prototype and its supporting tools has taken place. Upcoming P15.4.3 activities related to the ACAS monitoring system will focus on the verification and integration of the system. Both are planned to be completed by mid-2013.

The recording and analysis of RA downlink within German airspace continues with the final data collection and evaluation task planned to end in March this year.

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

Snippets

NATS Contour Mapping Solution for MSAW

NATS has successfully undertaken a 6-month trial to test an enhanced terrain model at Glasgow airport using its Contour Mapping Solution. This is now a permanent feature of the Glasgow MSAW operation.

As an input, NATS engineers used NASA satellite data which provides a three-dimensional map of the terrain around Glasgow airport. The NASA data was then converted into contour maps with approximately 24,000 contour points or 1,340 polygons. NATS now plans to implement its Contour Mapping Solution across other UK airports.

More information can be found on the NATS website: www.nats.co.uk/news/worlds-most-accurate-safety-system-goes-live-at-glasgow-airport/ and further guidance on optimising MSAW surfaces can be found in NET*ALERT* issue 7.

SPIN meets in April 2013

The next meeting of the SPIN Sub-Group will be hosted by EUROCONTROL in Brussels on the 16th and 17th April. The agenda will include a debrief on the recent ICAO Air Navigation Conference (AN-Conf/12) and the possible implications for the SPIN work plan. If you are not on the SPIN distribution but would like to attend, please contact the Safety Nets team (safety-nets@eurocontrol.int).

New ACAS Bulletin available..."Traffic, traffic" TCAS Traffic Advisories

TCAS II issues two types of alerts: Traffic Advisories (TAs) and Resolution Advisories (RAs). The objective of a TA is to aid visual acquisition of an intruder and prepare the crew for a possible RA. Although ICAO provisions state that pilots shall not manoeuvre their aircraft solely in response to a TA, cases have been reported in which pilots have manoeuvred on this basis. Using real-life examples the latest issue of ACAS Bulletin explains why manoeuvres based solely on a TA are not appropriate. ACAS Bulletins can be found at: www.eurocontrol.int/acas.

Contact

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EUROCONTROL

ENSURING THE EFFECTIVENESS OF SAFETY NETS