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WELCOME

Optimising safety nets is a time-consuming task requiring a systematic process and attention to detail. The Swiss Air Navigation Service Provider 'skyguide' uses an offline system, or TestBed, to validate their work prior to implementation, and now they have developed a time-saving tool that helps them analyse the results. Find out more about their experience on page 3.

Also in this issue we report on the conclusions from a well-attended workshop to discuss the future of RA Downlink – read more in the front page article, and please visit our website to download the workshop materials.

While at the website you might like to take a look at the first in a series of short films profiled on the back page of this issue of NETALERT, as well as the updated Awareness Package mentioned in the *In Brief* column.

NETALERT, is the safety nets newsletter for people working in airlines, air traffic control centres, and the organisations that support them. It is distributed in hard copy and is also available in pdf softcopy format on our website.

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Displaying ACAS Resolution Advisory (RA) information at the controller working position has the potential operational benefits of improved situational awareness and reduced possibility of contradictory clearances being issued to an aircraft involved in an RA encounter. Some implementations of this technology have taken place, its operational use is being evaluated by others, but for many ANSPs in Europe questions remain about the principles, procedures and practice of implementing RA Downlink.

Finding common ground on RA Downlink was the reason for over 60 experts from around the world to meet at a workshop hosted by DFS and EUROCONTROL in Berlin on 27 October 2009. The proceedings of that workshop have formed the basis of this article summarising the current status of RA Downlink.

Why downlink RAs?

The procedures to be followed by pilots and controllers in the event of an RA are laid out in ICAO PANS-ATM and ICAO PANS-OPS. In summary, the flight crew should follow the RA given by ACAS and, as soon as cockpit workload permits, report the RA to the controller by radio if the RA requires a deviation from the current ATC clearance. 'Clear of conflict' should also be reported once the RA is over. Between these two reports the controller should not attempt to modify the aircraft flight path.

Studies have found that over 40% of RAs are either never reported to the controller or reported late. There can be good reasons for this

such as the high cockpit workload associated with following the RA, the sometimes short duration of the RA, or different operating procedures. However, if the controller is unaware that the flight crew is responding to an RA, s/he will assume ATC is still responsible for separating that aircraft and potentially issue an instruction that contradicts the ACAS RA. This, along with improved situational awareness, is the rationale for displaying RAs to the controller.

Is downlinking RAs feasible?

In 2006 FARADS (the EUROCONTROL Feasibility of ACAS RA Downlink Study) concluded that RA Downlink was technically feasible and provided net operational and safety benefits. The study also recommended further specific investigations. In the interim, monitoring studies have provided a much better understanding of RA frequency and distribution. However, a number of open questions and issues remain. These are broadly summarised in the yellow tinted panel overleaf.

What is the consensus on implementation?

There are different views on the operational use of RA Downlink and the benefits of implementing depend on the specific air traffic and airspace environment. Some, such as the



RA Downlink will it come to a screen near you?

continued

RA Downlink open issues

Latency: in a Mode S environment, studies show that controllers would be aware of 95% of RAs within 8.3 seconds (today's average with radio reporting is 30 seconds). However, given that some RAs only last 5 seconds, is 8.3 seconds too slow? Some have suggested that RAs should be downlinked within 2 seconds.

Display of RAs: whether it is useful to display to the controller information such as the type of RA or its sense still needs to be determined. Not only should the amount of information to be displayed be considered but also its accuracy, as an RA can change its strength (i.e. to become more or less restrictive) or even reverse its sense.

ICAO procedures: ICAO procedures do not currently contain a provision for the operational use of RA Downlink.

ANSPs of the Czech Republic, Hungary, Luxembourg, Japan and Australia, see benefits in their airspace and have implemented or are in the process of doing so. Some, including Belgocontrol and DFS, are evaluating the possibility of implementing. Some, such as the FAA and NATS, have no plans to do so at the present time and/or see no clear operational requirement. Others are awaiting the outcome

Controller responsibilities and legal issues: for example, what should be the actions for the controller if an RA is displayed but no voice report is received from the cockpit? Taking a worst case scenario, what are the legal implications if an incident occurs because the controller assumes (incorrectly) that the RA is being followed by the flight crew because it is displayed on his/her screen?

Empty RAs: studies in Europe show that approximately 96% of RAs are "empty" (i.e. do not correspond to RAs triggered onboard aircraft). These need to be filtered to avoid the controller becoming overloaded with false RAs and potentially missing a real RA. Filtering the empty RAs is technically feasible and straightforward.

of the SESAR RA Downlink work area led by DFS.

Both the International Federation of Air Traffic Controllers Associations (IFATCA) and the European Cockpit Association (ECA) have positions on RA Downlink. IFATCA is opposed to RA downlink, but recognises that in some cases it may provide benefits (e.g. increased situational awareness). It also recognises the

strong pressures to implement in some States and has developed a set of criteria to be met in the case of implementation. The International Federation of Airline Pilots' Associations (IFALPA), of which the ECA is a member, "supports the concept that display of 'RA status' at controller stations may enhance the awareness of ground ATC personnel..."

Avoiding a proliferation of concepts

Given the range of opinions there is concern about different concepts emerging. Workshop co-Chair Andreas Krebber of DFS explains: "While some participants had different views on implementation aspects of RA Downlink, the consensus was clear – a harmonised approach is needed to avoid the proliferation of concepts."

Successful monitoring

One strong area of consensus is on the value of monitoring RAs. Monitoring activities in Europe, the United States and Japan have provided a better knowledge of frequency of RAs, types of RAs, flight levels at which they occur, types of aircraft involved etc. Of particular use has been the identification of 'RA hotspots' which can be alleviated through airspace changes.

The conclusions and the way forward

EUROCONTROL co-Chair Martin Griffin summarised the workshop: "The ACAS and RA Downlink monitoring activities and offline analyses have provided valuable insight into ACAS behaviour in European airspace and beyond. This insight provides opportunities for general safety improvements in areas such as airspace design, flight manuals and pilot training. Furthermore, there is a need to create awareness of the open issues, in particular amongst early adopters of this usage of RA Downlink. This is now being pursued by the SPIN Sub-Group in close cooperation with the Air Traffic Management Procedures Development Sub-Group (APDSG), and in full coordination with SESAR."

EUROCONTROL thanks all those who participated in the Berlin workshop. Workshop material can be downloaded from the EUROCONTROL website: www.eurocontrol.int/ra-downlink



Tuning and monitoring STCA in Switzerland

Tuning your STCA system to your specific environment is a vital step in successful STCA operation. When you change a safety net parameter there is a high risk of unexpected side effects. Whether you are installing a new system or modifying a single parameter you will find it helpful to evaluate any changes using a fast time offline system or 'TestBed' that has the same behaviour and parameters as the operational system. In this article skyguide reports on how their TestBed has helped them implement Enhanced Short-Term Conflict Alert (E-STCA).

STCA TestBed

Jean-Philippe Shepherd is skyguide's STCA engineer and worked on the implementation of E-STCA: "We developed our TestBed internally,

We use radar data, as with real traffic you are sure to cover all the relevant traffic patterns

initially with help from QinetiQ. To use it we feed in 3 months of radar track data, typically containing

about 1,000,000 potential encounters (two radar tracks passing within 10NM laterally / 5,000 feet vertically). Rather than using a complicated simulated scenario, we use radar data, as with

real traffic you are sure to cover all the relevant traffic patterns, even those you are not aware of, as well as radar tracking problems that can cause nuisance alerts. Only one parameter is changed per run and its effect is analysed by making an alert-by-alert comparison with the previous run using our automated analysis tool CASTA (Comparison, Analysis and Statistics Tool for Alerts)."

"The amount of time required to set the parameters for a new STCA should not be underestimated. For example, to tune the E-STCA for the Geneva

area over 70 parameter changes were investigated and it takes our TestBed 5 to 10 hours to process

3 months of track data per parameter change. You then need to make the alert-by-alert-comparison, which can take a very long time if the process is not automated."

"To be absolutely sure that the E-STCA would behave as expected when installed in the operations room we also fed a day of identical radar tracks through both the TestBed and an offline version of the E-STCA hosted on a

validation platform. An alert-by-alert comparison showed that both systems produced exactly the same results which confirmed the ability of the TestBed to accurately predict the effect of any parameter change."

As Isa Alkalay, Chairman of skyguide's Safety Net Task Force, explains, the effort was more than worthwhile: "The offline E-STCA was tuned with the TestBed to reduce the number of nuisance alerts (see graphs below) while increasing the warning time for some encounter profiles. Most importantly, during its first 10 months of operations the E-STCA has behaved as the Test-Bed predicted, ensuring both a smooth transition from the previous system and that our controllers received the system we promised them."

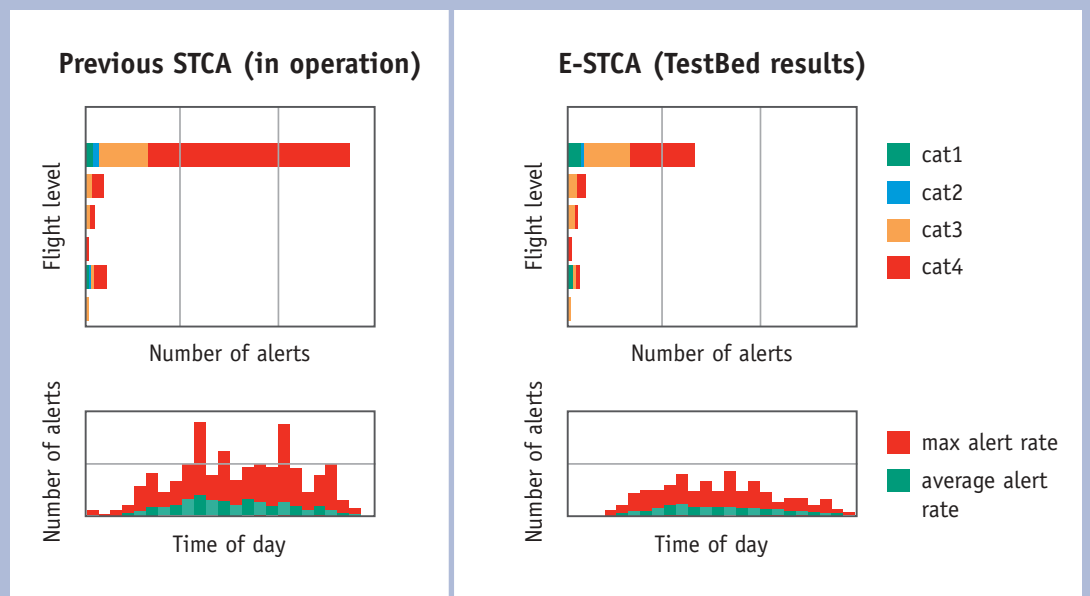
Continuous improvement

Since installing the E-STCA, skyguide has continued to add new functionalities to its TestBed and CASTA. Jean-Philippe explains: "Manual analysis of TestBed data is time consuming – as a general rule one day of Test-Bed data takes one man-day to analyse manually. As well as having a good TestBed it's therefore also important to have the means to efficiently

Test Bed Results

skyguide uses CASTA to categorise STCA alerts into 4 groups ranging from 'must have' (Category 1) to 'nuisance alert' (Category 4).

The images show the number of alerts in each category by flight level for the same 89 days of traffic. The results clearly show that the E-STCA produces fewer nuisance alerts and smooths the daily peaks in alerts.



Tuning and monitoring

STCA in Switzerland *continued*

analyse its outputs. The latest version of CASTA produces statistics from live or TestBed results significantly faster than the previous version – this has genuinely allowed us to spend more time on testing. CASTA can answer specific questions such as ‘where in my airspace do I get STCA alerts? What were the vertical and lateral separations for a specific alert? Where did I get an STCA alert after a TCAS alert? Where did I get TCAS alerts? Are there any TCAS hot-spots?’

“CASTA is also very user friendly allowing non-engineers to access reports and data, or even receive daily e-mail reports, with a click of a mouse. Of course access to CASTA is only given to the appropriate staff and its use is limited to safety and technical analysis rather than

incident investigation.”

Thinking of using such tools?

“There are a number of ways for ANSPs to get advice on how to install and operate a TestBed and supporting analysis tool. You can contact your system supplier or ask your own in-house engineers. It’s of paramount importance to use the knowledge of controllers within your organisation, for example, to help define what is considered to be a good alert and what is considered a nuisance alert. Experience teaches us that it is very costly in terms of time and resources to re-invent things – therefore an excellent source of experience is of course the members of the SPIN Sub-Group, of which skyguide is an active member.”

This article has been produced with the kind support of skyguide. For further information please contact Jean-Philippe Shepherd (Jean-Philippe.Shepherd@skyguide.ch) who used the TestBed and produced CASTA.

Safety nets

sharing lessons learnt

In the last 12 months the Safety Nets team has met with many ANSPs around Europe to discuss safety nets issues and provide implementation support. In the course of these visits we have often been asked to share lessons learnt and best practice tips from other service providers and industry. This feedback has encouraged us to produce some short films, accessible via our website, which can deliver practical experience and expertise on implementing safety nets to a wider audience.



Filming took place during the breaks of the latest regular SPIN meeting. Operational, safety and systems experts from ANSPs and industry were asked a number of questions about their own experience of implementing or enhancing safety nets, and their top tips. The first film is just 4 minutes long and is ready now for viewing.

You can view the film at the EUROCONTROL website at www.eurocontrol.int/safety-nets



Awareness Package Update: We have produced some further updates and modifications to the Safety Nets Awareness Package launched at the end of 2008. Module 1 is now shorter and more focussed on safety nets and their effectiveness. The other two modules have undergone minor refinements. The updated Awareness Package can be viewed on our website, and can also be accessed on the IANS E-learning server. Free CD copies of the package are also available on request.

TCAS and high rates of descent: During September 2009 the UK Airprox board assessed an Airprox between two F16s and an A321. An Airprox is a situation in which, in the opinion of a pilot or a controller, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved was, or may have been, compromised. Readers of NETALERT may find this case interesting as the high rate of descent (over 10,000ft/min) of the non-TCAS equipped F16s was such that neither STCA nor the A321's TCAS tracked the fighters and, consequently, no alerts were generated. The full report may be found at www.airproxboard.org.uk

SPIN in Poland: The next meeting of the SPIN Sub-Group will be hosted by PANSA (Polish Air Navigation Services Agency) in Gdańsk, Poland, on the 5-6 May. Further details will be available from the Safety Nets team closer to the time of the meeting.

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