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EUROCONTROL

NET*ALERT* Newsletter
Stay tuned

Ensuring the effectiveness of Safety Nets

WELCOME

This latest issue of NET*ALERT* has a new look but the same editorial purpose. We hope that reading it will help you 'stay tuned' to the latest developments in the constantly evolving world of safety nets.

In this edition we provide some practical tips on how to reduce nuisance alerts with STCA; we share news of Polish ANSP PANSA's new ATC system and how we collaborated to ensure safety nets are effective from the moment the system goes live; we also look at the recently launched SESAR safety nets projects and share news of an early contribution by SPIN.

Finally, we feature a number of new EUROCONTROL initiatives to help ANSPs find answers to safety nets questions, share their own expertise and participate in dialogue and debate with fellow professionals online.

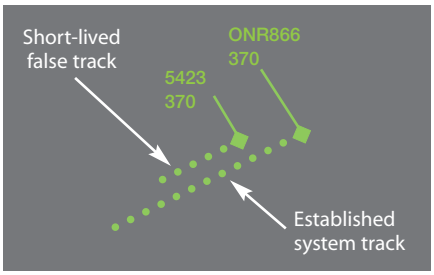
Your feedback is always welcome. Our contact details are on the back page - or you could post a message on Linkedin!

Dealing with split tracks in STCA

All safety nets perform best when the number of nuisance and false alerts are reduced to a minimum. One significant source of false alerts for STCA is 'split tracks'. Rod Howell of QinetiQ has investigated split tracks for several ANSPs and explains here why they cause false STCA alerts and how they can be virtually eliminated by an effective 'split track logic'.

Split tracks – one aircraft, two tracks

The surveillance tracking function in the ATC system usually forms an aircraft system track from several radars. A split track occurs when the tracking function generates two surveillance tracks for a single aircraft. In most cases the controller will see the original surveillance track, with a false track appearing alongside it (typically less than 1NM away) for a few track updates.



A typical split track

What causes split tracks?

In an ATC system, the surveillance tracking function needs to determine, on a regular basis, which surveillance plots belong to which existing system tracks, and also whether unassociated plots should form a brand new system track.

Surveillance plot reports that fall too far from the expected position, or have an incorrect SSR (Mode 3/A) code, may provoke a new system track to be initiated. Split tracks occur when the surveillance tracking system fails to associate all the input surveillance plot reports to an established system track. Although it is possible to tune surveillance trackers to reduce the number of false tracks, it is impossible to eliminate them altogether.

The most common type of split track is due to position errors in the plot data. In these cases the false system track will have the same SSR code as the original system track, and are easily identified as the false track suddenly appears alongside an established system track.

Less common are split tracks that result from corruption or garbling of the Mode A code. In these cases the false system track is likely to have a different SSR code to the original system track. A garbled SSR code however, usually only differs from the actual SSR code by a few bits (e.g. 5423 instead of 5623), so these split tracks are still easily identifiable on a track display.

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Dealing with split tracks in STCA

Continued

STCA alerts from split tracks

The occurrence of a split track in itself may not alarm the controller. However, a STCA system will interpret the split tracks as two 'aircraft' separated by less than 1NM and alert the controller.

A typical Controller Working Position (CWP) updates every 4 seconds and the false track can remain for a few updates, the false STCA alert could therefore typically last for between 12 and 30 seconds or even longer (see example below). Ultimately there is a risk that a false alert of this duration could distract the controller from a genuine alert or another important task, or even undermine controller confidence in genuine STCA alerts.

Surveillance tracker tuning

One way to reduce the number of split tracks appearing on the controller's display may be to tune the plot-to-track association parameters in the surveillance tracker. The plot–to-track association function matches radar plots to existing tracks by checking that the plots fall within a 'gate' based upon known position error parameters (plot noise, track noise and an aircraft manoeuvring component) and the SSR code. The 'spare', or unassociated, plots that fall outside of the 'gate' are then candidates for initiating a brand new track.

However, tuning position error parameters will rarely completely remove split tracks and in some instances can even have a detrimental effect on tracking performance. For example, expanding the plot-to-track association gates (via parameter changes) will reduce the number of unassociated plots and therefore the number of split tracks, but this may also prevent a new track from initiating if a genuine aircraft track starts in close proximity to an established track.

Split track suppression logic

A much more effective solution to deal with false STCA alerts from split tracks is for the STCA itself to have a split track 'suppression logic'. While not always a standard function, the suppression logic detects split tracks and prevents false alerts appearing on the controller's display. The most basic split track algorithms work simply by suppressing STCA alerts if the two SSR codes for a pair of tracks are identical. This eradicates most, but not all of the split track alerts. A small risk could exist that a genuine STCA alert is suppressed if two aircraft happen to be using the same SSR code.

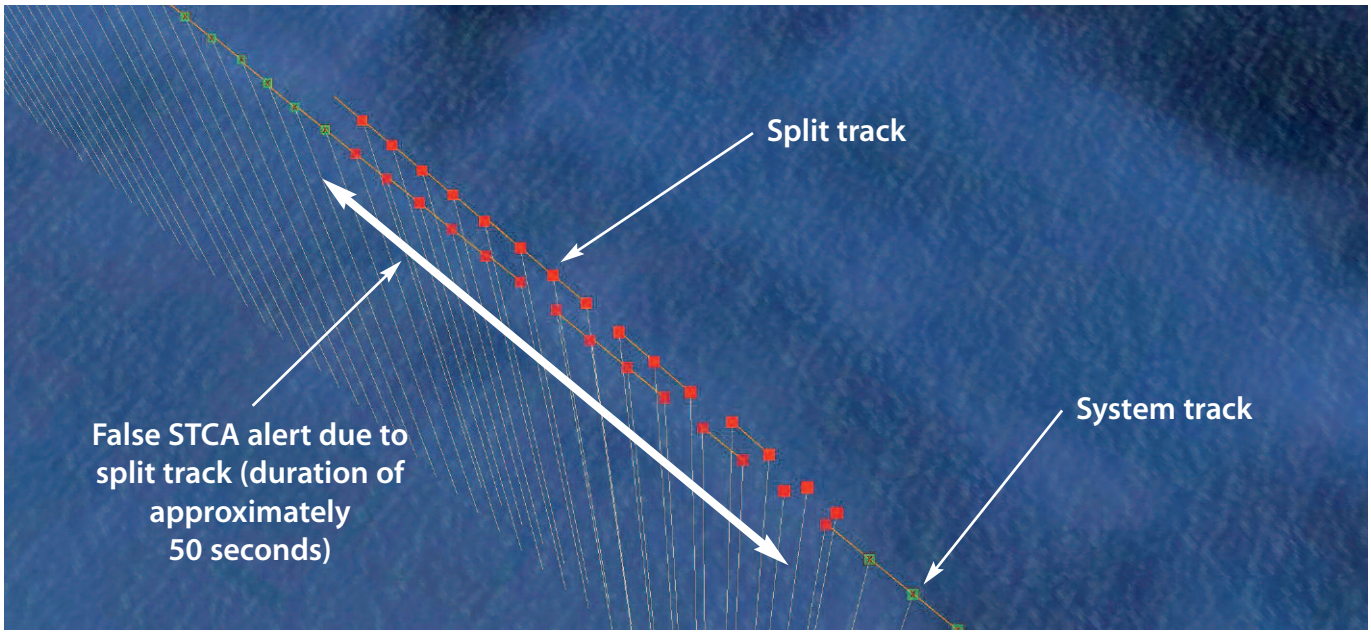
A much more effective split track suppression algorithm is one that takes the relative position of the system tracks into account, as well as allowing the SSR codes of the two tracks to differ slightly. The false track nearly always starts in very close proximity to the original track. Conversely, a track that starts a long way from the other track (say several nautical miles away) in an STCA encounter is almost certainly not a split track, even if the SSR codes are similar.

STCA needs to be able to identify those pairs of tracks that are definitely not split tracks, and then never let them become declared as split even when the aircraft come close together. This requires the STCA system to store split track information about each track pairing between the STCA processing cycles.

It is important to develop a specially designed suppression logic rather than modify existing STCA alerting parameters; as doing the latter could degrade the alerting performance for real alerts.

While every STCA and surveillance tracking system is different, without some form of suppression logic approximately 10-30% of STCA alerts may result from split tracks. The inclusion of a highly effective suppression logic can improve alerting performance significantly by virtually eliminating false alerts caused by split tracks, whilst minimising the risk that a genuine STCA alert would be suppressed by the logic.

A split track starting at approx. 0.2NM distance and ending at approx. 0.5NM distance during level flight at FL380



PANSA hosts SPIN
and showcases Pegasus_21 system

The Polish Air Navigation Services Agency (PANSA) hosted the 7th meeting of the SPIN sub-group in Gdańsk during May. The meeting provided an opportunity for EUROCONTROL's Stanisław Drozdowski, a former PANSA controller, Jan Łuczkiewicz, an active Gdańsk APP controller and Robert Parys, the Pegasus_21 project manager, to speak to NET*ALERT* about the safety nets in the new ATM system and the technical support provided by the EUROCONTROL Safety Nets team.

PANSA is in the final stages of implementing its INDRA developed Pegasus_21 (Polish Enhanced Generation ATC System for Unified Solutions of 21st Century) ATM system in the Warsaw ACC. The system will operate the safety nets Short-Term Conflict Alert (STCA), Area Proximity Warning (APW) and Minimum Safe Altitude Warning (MSAW), which will also be used as an Approach Path Monitor. Pegasus is due to become operational in the Warsaw ACC towards the end of 2011, however, an early version of the system is in operation at the Gdańsk and Kraków APPs.

Work underway installing the Pegasus_21 system at Warsaw (photograph courtesy of Sebastian Elijasz)

After holding an initial information sharing seminar with PANSA, EUROCONTROL's Safety Nets team made an independent assessment of Pegasus' safety nets and came up with some technical recommendations for improvements. The EUROCONTROL team became involved again when PANSA was tuning its offline system in the Warsaw ACC. They particularly looked at addressing false STCA alerts from split tracks (see earlier article) and optimising MSAW surfaces using the EUROCONTROL's PolyGen tool (see NET*ALERT* issue 7).

The tuning of the MSAW surfaces takes account of the unique way Pegasus deals with Standard Instrument Departure (SID) routes and Standard Instrument Arrival (STAR) routes. In the majority of MSAW systems, the polygons forming the MSAW surface need to be constructed in a way that avoids nuisance alerts from aircraft in the final stages of approach or shortly after take-off. In Pegasus, corridors are defined in terms of latitude/longitude and minimum/maximum altitude to account for the geometry of the approach and departure profiles. As long as an aircraft remains within these corridors, MSAW alerts remain suppressed. So this is one instance where the tuning process is simpler than normal!

Robert Parys is pleased with the progress being made: *"The cooperation between PANSA, INDRA and EUROCONTROL has been invaluable, not only in terms of the widespread technical knowledge brought from EUROCONTROL's safety nets experience across ECAC, but also from being able to use a tool such as PolyGen which we would have otherwise had to spend considerable time and effort developing internally".*

SPIN-7 highlights

SPIN-7 was the largest SPIN meeting to date with 35 attendees, including representatives from 11 European ANSPs (shown in the photograph below). PANSA provided a briefing on the safety nets in the INDRA system currently installed in the Gdańsk APP and took SPIN members on a site visit of the APP facilities. Other key agenda items focussed on: future working arrangements, including SESAR (see article on page 7) and RA Downlink; briefings on operational and human factors evaluations in Prague and Budapest; latest developments in the PASS project; and RA monitoring activities in the USA, presented by the MIT Lincoln Laboratory.

The next SPIN meeting will be held in Brussels on 24th and 25th November. If you would like to find out more about the work of SPIN, join or become an observer, obtain SPIN meeting material please do contact us: safety-nets@eurocontrol.int

More questions than answers?

On 24th February 2004 a Cessna Citation on a medical flight crashed in mountainous terrain while making a night-time visual approach to Cagliari-Elmas airport in Sardinia, tragically resulting in the loss of 6 lives. Six years later, in March 2010, the controllers on duty at Cagliari airport at the time of the crash were sentenced to two years imprisonment by an Italian court.

The aftermath of the accident raises two questions. Why were the controllers convicted? And could Minimum Safe Altitude Warning (MSAW) have helped prevent the accident?

On MSAW, Dijana Pasic of the EUROCONTROL Safety Nets team explains: *"MSAW is very well suited to warning a controller about increased risk of Controlled Flight Into Terrain (CFIT). However, the fact that the aircraft was performing a visual approach would need to be taken into account. Even if MSAW had been installed and functioning properly, it is common practice in many ANSPs for MSAW alerts to be inhibited for visual approaches".*

With regard to the court ruling on the controllers, Tony Licu, European Safety Programme Manager and Secretary of the EUROCONTROL Safety Data Reporting & Data Flow (SAFREP) task force comments: *"This sentence has been strongly condemned by members of the ATM community, including IFATCA, and further fuels the debate regarding the aviation industry and the administration of justice. We need to promote a Just Culture environment, where individuals are held accountable for wilful violations and gross negligence but not for following procedures. Prosecutions have negative effects on safety improvements. Learning lessons from accidents and incidents is vital for aviation but we know that individuals are less willing to report honest mistakes or other safety problems if they fear retribution. We need to move towards a systemic approach in accident investigation and move away from the focus on individuals".*

Safety Board Findings

The Italian Air Safety Board (ANSV) classified the accident as Controlled Flight Into Terrain (CFIT) and identified a number of possible contributory factors for the incident, including the aircraft not being equipped with ground proximity or terrain awareness warning systems (GPWS and TAWS).

The ANSV report, written in Italian, can be accessed at: http://www.ansv.it/cgi-bin/ita/ANSV%20OE-FAN.pdf.

Dijana Pasic concludes: *"This issue is just as relevant to ground-based safety nets as it is to incident reporting. In the past, controllers have expressed concerns about being judged on the number of alerts occurring on 'their shift'. Safety nets improve safety levels and should not be regarded as a 'snitch' - their misuse or absence can cost lives. The Just Culture concept helps address these concerns. This latest court ruling is a step backwards, and a cause for concern".*

IFATCA press release: http://www.ifatca.org/press/290310.pdf
Just Culture is featured in the Spring 2010 EUROCONTROL Skyway magazine:
http://www.eurocontrol.int/epr/gallery/content/public/docs/skyway_spring_2010/SW53_low.pdf

Safety Net
FAQs online @ www.eurocontrol.int/safety-nets/faq

The Safety Nets website www.eurocontrol.int/safety-nets now features new sections called Frequently Asked Questions (FAQs) and Multimedia. Both pages contain a growing repository of information and practical tips from the Safety nets Performance Improvement Network (SPIN) and the Safety Nets team. In the FAQ section you can find written answers to common safety nets questions and in the Multimedia section you can view 6 short film clips showing the responses of ANSP operational, safety and systems experts to questions like:

- What is the role of the safety net?
- Who should be involved in a safety net project?
- Can you explain more about tuning safety nets?
- What should happen after implementation?
- What's the best way to get operational feedback?
- How important is safety nets training?

Please visit the Safety Nets website to see their answers ... Meanwhile, in this special NET*ALERT* feature, we take the opportunity to share 5 more FAQs and a range of responses from SPIN members.

FAQ: What is the role of simulations and test beds in safety nets tuning?

Jean-Marc Loscos, DSNA: For implementation the first problem is to tune the safety net to the correct environment. In our case we did offline recordings and replays in front of controllers to assess – "would you have appreciated an alert there or not"... these kinds of questions. And when we implemented the safety net for the TMA, which was a 'first' for us, we used a test bed to verify the performance that was expected from the safety net. We also had an evaluation period of several months in order to ensure that there was no grey area which might be discovered a bit too late. So we had two approaches: the test bed was used plus we undertook some specific case analysis with replays.

Isa Alkalay, skyguide: Any system will require maintenance, whether it is a change in airspace design or fleet mix, or if you're moving from strip to stripless, or perhaps you're acquiring new equipment. Each of these instances will require the re-tuning of safety nets, and also identification of hot spots. Sometimes it means you have to change something in the way your safety nets are designed and developed. It's a continuous process. You need to understand the environment, you need to understand the limitations, you need to understand constraints and where you want to go. And then ideally you have the possibility to simulate all that, to validate, to evaluate and only then to make it operational.

Today most safety nets have been put into operation without test beds. I sincerely hope that that time is over. We've reached the threshold of how far one can go solely on expert opinion. The number of factors that are influencing performance is enormous because the safety net is at the end of the ATM system. So whatever is within the ATM system affects the performance of the safety net. So you must simulate, you should ideally develop a test bed prior to installation of any safety net. Experience shows that this really is the way to go.

FAQ: What sort of training is recommended?

Isa Alkalay, skyguide: What is most important is making sure controllers (and engineers!) understand the role of the safety net in the system. How it performs, where the holes are, where it can help operations, and where it will not provide sufficient protection.

Jean-Marc Loscos, DSNA: The training related to a safety net is quite specific because it is related to ATC contingency procedures, so you cannot do that as an offline simulation just to keep practising. You need to look into specific role playing or workshop sessions. We have found this helpful. And of course, you need to have a safety management system which can debrief any incident and identify improvements. It's a continuous process.

Carlos Santos, NAV Portugal: We explain the performance of the safety nets, the rules in the system that govern the safety net's behaviour and the outcome of that behaviour for controllers. That is key for the training, and key to any implementation. ☞

The safety nets Awareness Package is also helpful as part of general controller training. This can be accessed directly from our website at: http://www.eurocontrol.int/safety-nets

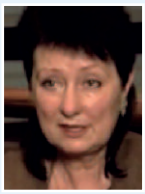
Safety Net

FAQs online

Continued

FAQ: We don't have monitoring tools – what else can we do to assess the performance of our safety net?

Carlos Santos, NAV Portugal: We carried out a controllers' survey and we found out many things. We discovered small gaps in the processing areas and we also found opportunities to enhance the training regarding some particular aspects that were either not taught or not fully understood in the beginning. So surveys can help.



Vera Oleinikova, ORO Navigacija: Our engineers perform this as a routine task. Every day they monitor and investigate log files in the system. They have even created their own software tools to conduct this process, starting from the statistical accounting of the alerts, including false alerts and then going through the replay of the situation.

We have this procedure documented, and in the process of documenting it we checked for any gaps – but found that there was none. It is an intuitive, practical procedure or process that they have applied. And since then we have added an 'umbrella' of the rules covering how to perform the monitoring.

FAQ: How does balancing nuisance alerts and warning time make ground-based safety nets effective?

Luca Save, Deep Blue: The safety net should not fundamentally change the way that the controller works, but it will influence it. So, if you have very short warning times your STCA alerts quite late, then controllers need to have quick reactions, whereas other STCA implementations will have much longer warning times and will trigger a different reaction in the controller.

A very important aspect of the design of the safety net is the need to identify an appropriate balance between nuisance alerts and warning time. So you need sufficient warning time to identify a risk, but you also want to avoid an excessive rate of nuisance alerts. This is a challenging process and there is no solution that fits every ANSP. It comes down to a choice for each service provider, depending on their operational environment.

Isa Alkalay, skyguide: What is very important is acceptance on the part of the controller that nuisance is a part of the successful performance of the safety net. They should see that some level of nuisance is inevitable, but not have such a level that it results in a 'cry-wolf' syndrome. So training is a key element for the success of the safety net and for gaining operational buy-in.

FAQ: My new system comes with safety nets built in – why should I worry?

Bosko Rafailovic, SMATSA: Apart from a few ANSPs that have their inner drivers for implementing safety nets, perhaps an operational perspective or drivers from their national authorities, experience suggests that many ANSPs procure and implement safety nets because of some external drivers like ECIP/ESSIP, or the simple fact that safety nets are part of the same box as other automated functions of the data-processing systems they procure.

So for most of the time safety nets tend to sit in the shade. Only after the system is fully deployed, does an ANSP become aware that safety nets are truly involved with operational work - with all its benefits, but also with its drawbacks like nuisance alerts, its reliability, or its capacity for acceptance by controllers, and so on. So often, it is only when the manufacturer has packed its suitcases and gone that the ANSP realises it does not have flexibility in terms of access to system functions on the one hand and on the other hand to the knowledge, the tools, and the capacity to do the remaining implementation process on its own.

The sooner an ANSP has a clear picture of this new and rather complex functionality, the better. The answer is to have a clear operational concept for safety nets, meaning that the ANSP should clearly define for what purpose it needs a safety net and in which way it will use it, based on what procedures and so on.

SESAR Safety Nets projects
execution phase begins
SPIN to be surveyed on DAPs

The initiation phase of SESAR's safety nets projects was completed in April 2010. This means that the hands-on work of the execution phase can now begin. Below, we provide an overview of these projects and explain some early input by the SPIN Sub-Group on Downlinked Aircraft Parameters (DAPs).

SESAR safety net projects

SESAR has three safety nets projects in the en-route operations work package (Work Package 4), which is lead by DSNA. These projects, or 'work areas' to use the correct SESAR terminology, address the evolution of ground-based and airborne safety nets as well as the compatibility between the two. Although assigned to the en-route work package the work will address safety net operations in both the en-route and TMA phases of flight. There is also an ACAS monitoring project in the non-Avionic CNS System work package (Work Package 15), led by Thales.

SPIN co-Chairman Stanisław Drozdowski (EUROCONTROL) comments on the start of the execution phase: *"These important SESAR projects reaching their execution phase will provide the impetus to develop the next generation of ground-based and airborne safety nets ."*

SPIN members to be surveyed on DAPs

Naturally, not every SPIN member can have a hands-on role in these projects as not everyone is part of the SESAR Joint Undertaking; however SPIN has been quick to offer its support. Consequently SPIN members will be surveyed to identify existing plans for using Downlinked Aircraft Parameters (DAPs) in ground-based safety nets. This survey will contribute to SESAR's *'Evolution of Ground-Based Safety Nets'* work area identifying candidate downlink parameters to enhance ground-based safety nets in the TMA and en-route environments.

Stanisław Drozdowski welcomes this contribution: *"SPIN offers SESAR quick and easy access to an unrivalled network of safety nets expert - I'm very pleased that it's being put to early use by SESAR."*

SPIN aligns working arrangements to SESAR

The SPIN rolling work programme has been aligned with the work of SESAR. SPIN has also evolved its working arrangements. Firstly, a representative of the ANSP leading the most active SESAR work area will be invited to act as co-chairperson. In 2010 the most active work area is RA Downlink, so Andreas Krebber of DFS has accepted the role of SPIN co-chairperson. Secondly, rather than meeting only in fora, SPIN will also form ad-hoc groups to meet the needs of the different SESAR projects as required.

SESAR safety net projects

SESAR work area	Goals	Partners
Evolution of Ground-Based Safety Nets (P 4.8.1)	To conduct appropriate evolution of ground-based safety nets to ensure that they will continue to play an important role as the last ATC safety layer against the risk of collision during managed trajectory and separation operations.	DSNA (leader), NATS, ENAV, SELEX, EUROCONTROL
Evolution of Airborne Safety Nets (P 4.8.2)	To reduce airborne collision risk whilst enhancing the compatibility with ATM operations, both in current and future traffic environments.	DSNA (leader), NATS, EUROCONTROL
Ground-Airborne Safety Net Compatibility (P 4.8.3)	To ensure that airborne safety nets and ground-based safety nets remain compatible in the changing ATM environment.	DSNA (leader), DFS, AENA, INDRA, AIRBUS, EUROCONTROL
ACAS Monitoring (P 15.4.3)	To enfold the definition and the analysis of the architecture and technical requirements of an ACAS ground monitoring concept as well as its integration into ATC surveillance systems.	THALES (leader), INDRA, EUROCONTROL, DFS

Get Linked in to Safety Nets

Why not join the new 'safety nets for air traffic control' network on the professional networking site Linkedin. The network is a sub-group of the ATC Network of which EUROCONTROL is an official partner and already has a membership of over 500 ATM professionals.

Linkedin is a professional networking site used by over 70 million people worldwide to stay in touch with past and present colleagues. Another common use is to create networks of industry experts that share advice and best practices; this is how the safety nets network will be used. The idea is that the network can be used as an additional forum to promote safety nets, share information and invite feedback and comment on many issues relating to safety nets.

EUROCONTROL's Dijana Pasic, who is managing the saftey nets Linkedin network, explains the rationale for its creation: *"We noticed that ATC professionals are using Linkedin to stimulate discussions on a whole range of topics, and see this as another way to encourage dialogue, feedback and awareness of safety nets issues. Once you have joined our sub-group, Linkedin notifies you whenever a discussion relating to safety nets is taking place, and you have the opportunity to participate, or simply to observe. You can start discussions of your own, post queries or share experience. You can also opt out at any time."*

Chris Wade of the ATC network adds: *"Linkedin is already used by EUROCONTROL for seeding news and press releases. We are pleased to host this sub-group dedicated to the safety nets community and expect that this innovative approach will help increase participation in safety nets issues."*

Interested in joining?

If you would like to join the safety nets for air traffic control network and are new to Linkedin it is very easy to join:

Step 1 visit www.linkedin.com
Step 2 create a profile
Step 3 search for the group
Step 4 submit a request to join the group.

NET*ALERT* goes green

From October we'll be giving existing readers the option of specifying their preferred delivery format (hard or soft copy) for NET*ALERT*. For some readers the option of an electronic copy is attractive, as many of you catch up with industry news on your laptops while travelling (you can already download previous issues of NET*ALERT* at our website). However, there remains a good proportion of other readers who prefer to receive a hard copy - so we will continue to distribute these as well.

We expect that our print run of hard copies will reduce and therefore hope to save a few more trees!

To receive an electronic version of NET*ALERT* please register at www.eurocontrol.int/safety-nets/public/standard_page/NetAlert.html. If you still wish to receive a hard copy you need not do anything.

PASS results dissemination workshop 23rd November 2010, EUROCONTROL, Brussels

The PASS (Performance and safety Aspects of STCA, full Study) project is close to completion. EUROCONTROL will be holding a results dissemination workshop in November to present the findings and recommendations of this study.

Launched in October 2007, PASS has developed performance and safety requirements for STCA and has delivered the foundations for a safe and efficient joint concept of operations for ACAS and STCA. The project has three phases. Phase 1 was a large-scale monitoring study to understand the current operational situation in Europe and defined a typical series of events in STCA and ACAS occurrences. Phases 2 and 3 developed performance and safety requirements for STCA, while Phase 3 has provided the core elements for a consistent overall concept for STCA and ACAS operations

With the evolution of SESAR both Phases 2 and 3 became SESAR projects, so this workshop is an excellent opportunity to gain an insight into the delivery of the first SESAR safety nets work.

Further details of the event will be published on the safety nets website: http://www.eurocontrol.int/safety-nets. Completed PASS project reports are also available at this site.

Contact

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