



SESAR Solution

Altitude capture laws improving compatibility with ACAS, & Automatic Responses to ACAS RA

Contextual note

Purpose:

This contextual note is a vehicle to summarize the results stemming from Release delivery activities. It provides a summary of the SESAR Solution in terms of results of the Validation exercises and achievements as well as additional activities to be conducted before or as part of deployment.

This contextual note is part of a package prepared for each SESAR Solution for which exercise results are conclusive and sufficient to support a decision for industrialisation. It complements a technical data pack comprising available deliverables required for further industrialization.

In addition, adequate consideration of the recommendations on the regulatory and standardisation frameworks and the regulatory and certification activities is required. These recommendations are detailed in the 'SESAR Solution Regulatory Overview – Altitude capture laws improving compatibility with ACAS, & Automatic Responses to ACAS RA' included in the technical data pack.

Improvement in ATM Operations

The new altitude capture laws aim to reduce the risk of mid-air or near mid-air collisions between aircraft as a last-resort safety net, by automatically reducing the vertical rate at the approach of the selected flight level (only when a Traffic Advisories-TA occurs), leading to less traffic perturbation, while not increasing flight crew workload.

The new altitude capture laws (EXE 054) can lead to significant improvements:

- AltCapt is very efficient in avoiding operationally undesired Resolution Advisory (RAs);
- It does not affect TCAS safety performance in an adverse manner; and
- It has only a very slight effect on the vertical trajectories and it will not affect ATC operations in an adverse manner.

Applying the automatic responses to Resolution Advisories - RAs (EXE 480), as already implemented on some Airbus aircraft, to all aircraft would lead to a demonstrable improvement in consistency of response to RAs and would deliver a safety improvement over the current manual responses.

Operational Improvement – OI Steps

CM 0803 Use of autoflight systems for enhanced compliance with TCAS II RAs.



Background and validation process

The SESAR Solution has been validated through a model based methodology on simulation platform introducing new altitude capture laws to reduce the unnecessary ACAS (Airborne Collision Avoidance System) alarms.

Two exercises have been carried out in this context:

- EXE-04.08.02-VP-054 on Altitude Capture laws improving compatibility with ACAS, which introduced new altitude capture laws as recommended by ICAO and reduced the number of unnecessary ACAS resolution advisories;
- EXE-04.08.02-VP-480 on Automatic responses to ACAS RA by linking TCAS II to the Auto-Pilot for an automatic response to RAs.

The **purpose** of these exercises was to assess the operational and safety benefits brought by new altitude capture laws (EXE 054) and establishing a link between ACAS and the autopilot for an automatic following of ACAS RA, prompting automatic reactions to ACAS alarms (EXE 480). The objective of EXE 480 is to investigate the impact of linking TCAS to the Auto-Pilot for an automatic response to RAs for all TCAS-equipped aircraft (not only Airbus).

Results and performance achievements

The validation exercise demonstrated that the AltCapt (EXE 054) concept can bring significant operational and safety benefits:

- The assessment of ATC compatibility criteria is positive: safety levels are maintained while the compatibility of ACAS operations with Air Traffic Management is improved; and
- The likelihood to receive an RA during a level-off encounter when equipped with AltCapt is reduced by a factor of 30 (and even 70 with the improved protection against multiple TAs).

The validation exercise for EXE 480 showed that:

- The automatic responses to RAs bring significant additional safety and operational benefits to TCAS II performance, whatever the assumption in terms of equipage and compliance rate to RAs.
- The reduction of TCAS initial RA time threshold associated to a shortened delay of response to RAs brings additional operational benefits, increasing the compatibility with AT.

Additional activities

Airbus has already developed, certified and implemented this solution (AltCap function) including pilot involvement on some aircraft.

Actors involved

Airspace Users

ATC (ATC is not a direct user of the ACAS system, but will receive considerable benefit from both concepts as a result of reduced false alerts, and greater consistence of execution of RAs.



SESAR Solution: Altitude capture laws improving compatibility with ACAS, & Automatic Responses to ACAS RA

Impact on A/C system

The ACAS system would need to be modified:

- For a first step for short term implementation, it is recommended to implement AltCapt in its basic form plus additionally an available design option aiming at improving the protection against multiple TAs. This configuration will result in no safety impact and major operational benefits with few and acceptable downsides;
- For a second step for medium term implementation, it is recommended to implement AltCapt taking into account the altitude of the intruder, still with the improved protection against multiple TAs. A more suitable format of TCAS output is highly recommended at first opportunity.

The aircraft auto-pilot (Flight Director) would need to be modified.

Impact on ground systems

N/A

Consideration of Regulatory Framework

There is no specific topic in the field of the regulatory framework to be considered in deployment, beyond the applicable regulations currently existing.

Consideration of Standardisation Framework

It is foreseen to have a progressive alignment with the future developments in ACAS-X, to ensure future global interoperability.

Consideration of Regulatory Oversight and Certification Activities

No specific topics have been identified affecting the regulatory oversight and certification activities of the Authorities, beyond current ones.

Intellectual property rights (foreground)

The foreground is owned by the SJU.