

C-S/N

COMSOFT SAFETY NETS

HIGHLIGHTS

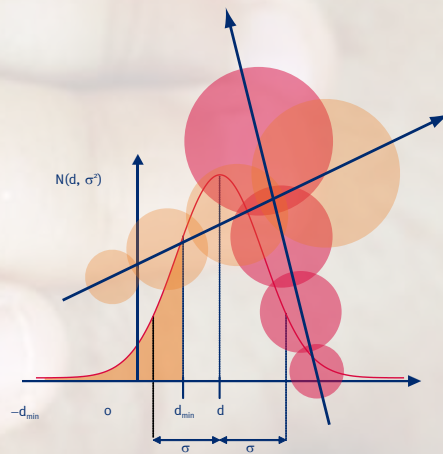
- Integrated predictive Safety Net Solution with STCA, MSAW including APM, APW
- Situational Safety Net Functions RAM and CLAM
- Innovative probabilistic approach for conflict prediction
- Optimal trade-off between in-time conflict prediction and nuisance alert rate
- Extensively site-configurable, supporting all operational ATC environments
- Support for different region types and detailed airspace profiles
- Open interfaces supporting the integration into the operational environment
- Extensive information about nature, severity and probability of conflicts

COMSOFT





COMSOFT's ground based Safety Nets C-S/N are attentive supporters of Air Traffic Controllers. Usually unnoticeable, C-S/N continuously assess the air situation in order to identify potential infringements of air traffic safety. Critical situations are faithfully identified and reported to the ATCO well in advance to allow the implementation of countermeasures and to resolve potential safety threats.

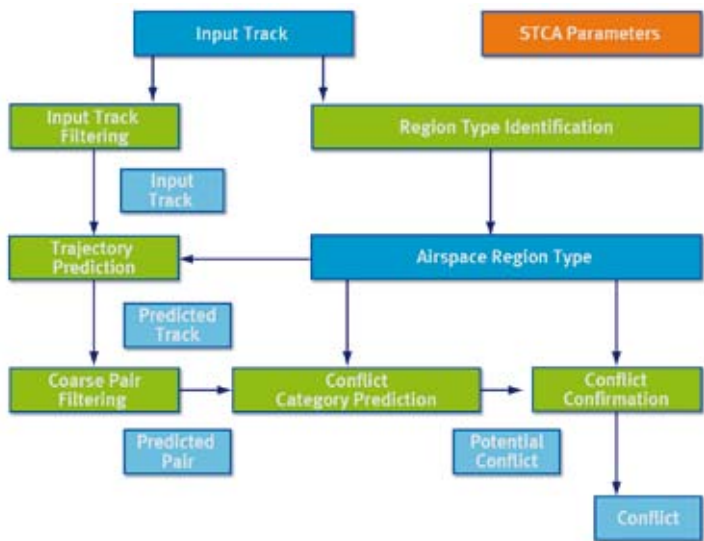


Short-term trajectory prediction and situation assessment based on surveillance data are fundamental subjects underlying the safety nets. Actually, C-S/N are introducing a novel stochastic approach modelling the uncertainty of trajectory and situation assessment. This stochastic approach has proven to provide the optimal trade-off between in-time conflict prediction and nuisance alert rate.

C-S/N features an extraordinary flexibility and can be optimally integrated and most favourably tuned for the use in all ATC environments. Using different parameter sets for individual parts of the air space, C-S/N support even heterogeneous airspaces with mixed profiles. As an integrated solution, they serve different applications simultaneously.

TECHNOLOGY

The C-S/N modules receive track data from an SDPS and report alarms to a connected Controller Display. C-S/N establishes interfaces to receive meteorological data as well as flight plan details, which are taken into consideration for trajectory prediction and situation assessment.



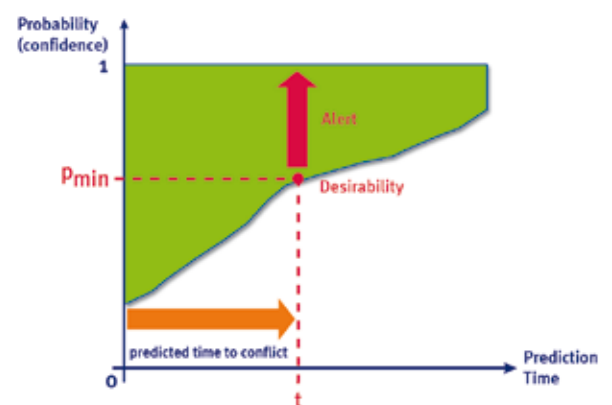
System Architecture

All received information contributes in real-time to a probabilistic model for trajectory prediction, in which the uncertainty of the predicted aircraft location is represented as a function of the prediction time. The predicted trajectory is then used to identify potential infringements of separation margins, either between aircraft or terrain and aircraft. All critical situations are categorized according to severity, probability and geometry.

For an optimal performance a coarse filter is applied to quickly eliminate situations that may not necessarily lead to conflicts within the prediction time frame. A conflict confirmation and repetition mechanisms are introduced in order to take into account erroneous track data or transient track values.

PATENTS

The fundamental and patented innovative concept of C-S/N is the introduction of desirability of an alarm. This novel concept is used to model the ATCO's interest in an alarm, by comparing the probability of a safety threat with the urgency to implement a resolution for the situation. This modelling scheme using a probabilistic approach can be applied to all predictive safety net functions.

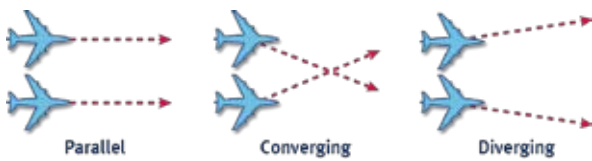


Probability Threshold vs. Prediction Time

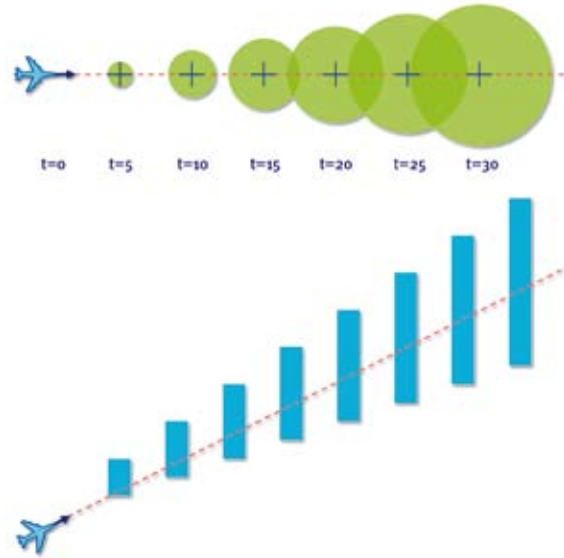


C-STCA

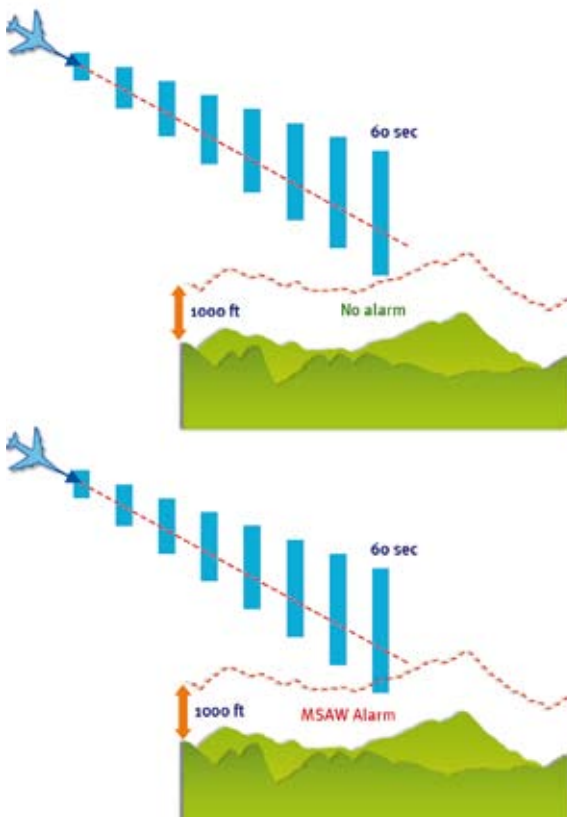
The Short Term Conflict Alert C-STCA identifies traffic situations which possibly lead to the violation of defined separation criteria between two aircraft in a near future. This requires simultaneous assessment of horizontal and vertical manoeuvres of multiple aircraft as well as geometric properties of the potential conflict.



Geometry of Trajectories



Horizontal and Vertical Uncertainty



MSAW Terrain Alarm

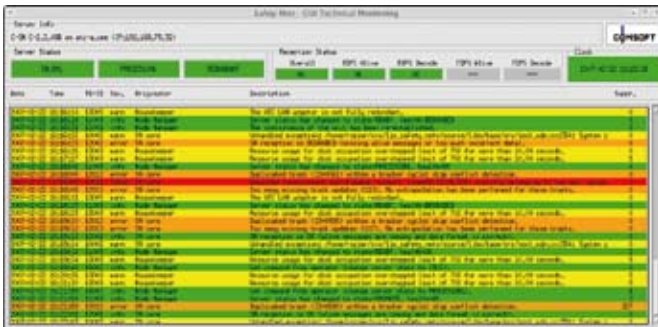
C-MSAW

The Minimum Safe Altitude Warning C-MSAW modules monitor the vertical separation of aircraft and terrain as well as obstacles. For this purpose, MSAW uses digital terrain elevation data (DTED) as well as obstacles definitions. Using meteorological data, C-MSAW automatically adjusts altitude information for QNH and temperature. An integrated Approach Path Monitor (APM) enables C-MSAW to supervise aircraft on designated approach routes and such supporting aircraft in the final phase of a flight.

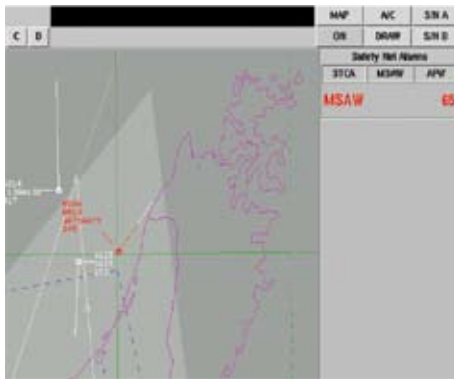
C-APW

The Area Proximity Warning C-APW protects aircraft from entering restricted airspaces. Entry to such airspaces may be sanctioned by the system for aircraft with specific mission codes. Featuring dynamic activation of restricted areas, C-APW supports the flexible use of airspace.

FEATURES



C-S/N Management Console



RDD Output Screen

- Adjustable confidence and confirmation level for conflict declaration, depending on conflict urgency and the configured airspace regions
- Possibility to use aircraft intention information to increase quality of trajectory prediction (e.g. cleared flight levels, from flight plan or controller input)
- Prediction of aircraft manoeuvres based on configured airspace regions
- Split tracks detection
- Conflict categories expressing the severity of conflicts
- Identification of the nature of conflict (major/minor separation infringements) and geometry (crossing and divergence attributes)
- Mode 3/A code and/or callsign selection to restrict the set of aircraft that need to be protected by the safety net function
- Capability to inhibit conflict prediction for specified regions or aircraft
- Capability to activate/deactivate group of regions online
- Conflict confirmation and repetition mechanisms for an optimal stability of the conflict output

SAFE SAFETY NETS

Safety Net Functions form a critical part of today's ATC automation systems and contribute to the safety of air traffic. C-S/N comply to development standards for safety critical systems supporting an ESARR conformant implementation. C-S/N comply to ESARR 4 on system level and ESARR 6 for the software development, and substantially support an ESARR 3 compliant safety process.

EUROCONTROL

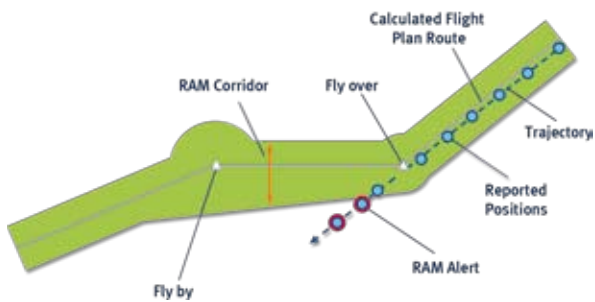
COMSOFT's Safety Nets comply with the following EUROCONTROL specifications:

- EUROCONTROL Specification for Short Term Conflict Alert
- EUROCONTROL Specification for Minimum Safe Altitude Warning
- EUROCONTROL Specification for Area Proximity Warning

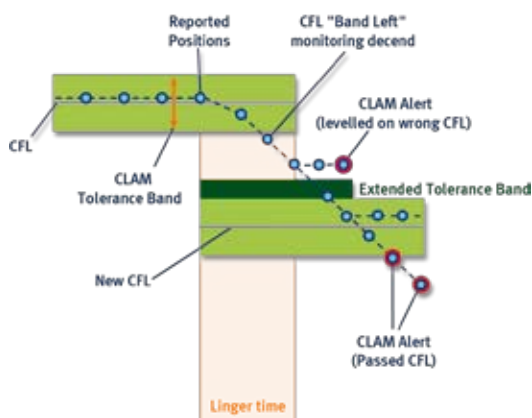
NON PREDICTIVE SAFETY NETS

In addition to the predictive safety net functions, COMSOFT safety net modules support situational safety that monitor aircraft movements as to their adherence to given clearances.

In conjunction with an automated FDPS system, Route Adherence Monitoring and Cleared Level Adherence Monitoring enable the ATCO to immediately detect any divergence from given clearances.



RAM



CLAM

Algorithm

- Probabilistic model for trajectory and conflict prediction
- System configurable desirability of alarms
- Region specific configuration parameters and track/conflict filters
- Coarse filter for quick elimination

Configuration

Definition of up to 1000 different types of airspace regions with own system configuration (TMA, CTR, En-Route, Approach, Departure etc.)

Input

- SDPS tracks, ASTERIX categories 003, 030 and 062 supported
- Further formats upon request
- Optional FDPS and meteorological input

Output

- ASTERIX category 004 conflict and status reporting
- Further formats on request

Available Functions

- Predictive Safety Nets: STCA, MSAW with integrated APM, APW
- Non-Predictive Safety Nets: RAM, CLAM

Supervision

Integrated user interface and SNMP





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