

GRACE GNSS ATC INTERFACE

From its long lasting experience either in GNSS and ATC domains, Selex ES designed and produced the GNSS ATC Interface (GRACE).

GRACE is a user-friendly workstation suitable for the ATC controller and the ground operators, monitoring and predicting the GNSS performances (e.g. GPS, EGNOS, Glonass, Galileo, etc.) over the airways of the controlled airspace.

GENERAL FEATURES

GRACE is a flexible and modular system which is able to integrate the Satellite Navigation in the ATC world providing the monitoring and the prediction of the GNSS performance over the National Air Space, and visualizing the related information through an efficient and user friendly human machine interface.

GRACE provides information for the generation of GNSS NOTAM compliant with ICAO and EUROCONTROL Standard.

GRACE: MAIN COMPONENTS AND FUNCTIONALITIES

GRACE may be suited for the specific needs of the Air

Traffic Controllers (e.g. radar, planner assistant, operational supervisor).

MONITORING

GRACE provides real time monitoring of GNSS performance in terms of integrity and accuracy of the Signal In Space (GPS, SBAS) to provide to the Tower Controller the status of the Satellite Navigation around the airport in order to improve the safety level during the approach/landing phase of flight.

PREDICTION

GRACE provides the prediction of the GNSS performance (VPL, Vertical Protection Level, and HPL, Horizontal Protection Level) over a specified ATC zone.

The output of the prediction module are in terms of HPL and VPL compared to the protection level thresholds.

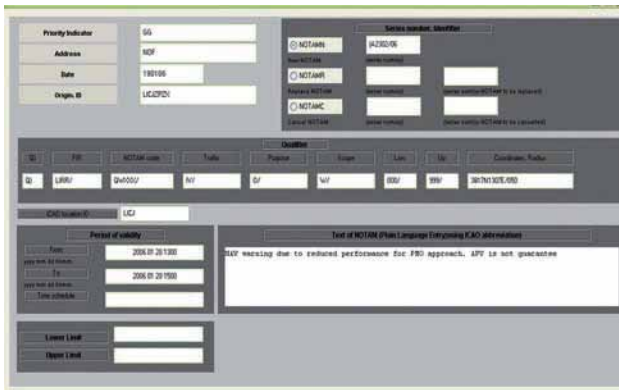
When the predicted value exceeds the applicable thresholds for the specified flight procedure, a NOTAM is provided, validated and sent to the NOTAM Authority Office for distribution.

The prediction service works both autonomously and, as an option, on demand. The default prediction works autonomously, i.e. it works without any request by an external input. It is sufficient to set the configuration parameters and the ATC sector interested. The on-demand prediction works on a specified request from the GNSS operator.

GNSS NOTAM

The GNSS NOTAM system acquires the prediction from the GNSS predictor comparing it with the needs to accomplish the procedure scheduled e.g. for an approach in a selectable airport. In the event of a failure an alert is activated with an appropriate NOTAM issued. The NOTAM are issued for approach/landing procedure when an outages of GNSS system occurs for this procedure. The GNSS NOTAM provides FIR NOTAM each time that an outage affects a larger area.

Through GRACE is possible to set the protection thresholds, defining and managing the interface with the local NOTAM Authority Office.



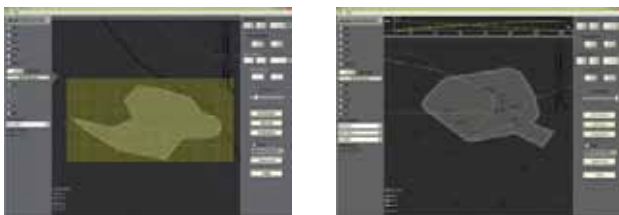
EN ROUTE SCENARIO

GRACE can be provided for the en route flight phase optimizing the air traffic flow, providing information about the GNSS performance within the national airspace.

GRACE provides a high support where the radar coverage is not provided. GRACE predictor connected to the flow management units allows to estimate GNSS availability along planned routes.

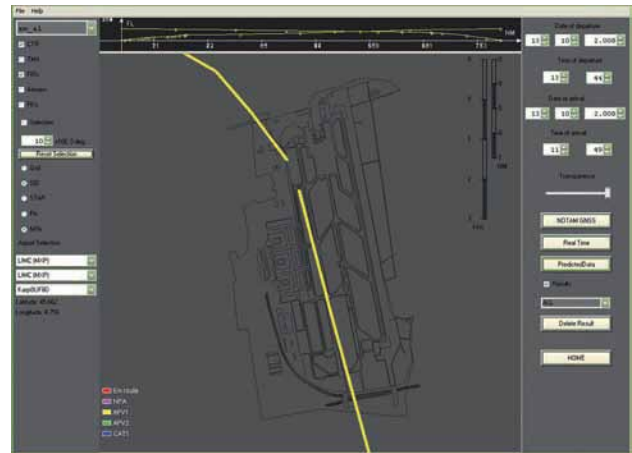
APPROACH SCENARIO

For the approach flight phase, GRACE allows the integration of the satellite navigation within the ATC, providing the RNP values mapped over the flight descend path.



AIRPORT SCENARIO

For the airport operational scenario, the application product is focused on innovation in the field of satellite navigation and its applications.



SUPERVISOR OPERATOR

GRACE predicts the performance of the GNSS system in terms of integrity parameters, displaying also the User Differential Ranging Error and the Ionosphere Grid, Vertical Error parameter, the average local error, the user fix scattering and other parameters.

SYSTEM STANDARD

- [1] ICAO - Annex 10, Vol. I. 5th Edition of Volume I, July 1996 and Amendments.
- [2] RTCA - MOPS for GPS/WAAS for the airborne equipment, RTCA/DO229D
- [3] FARRE, EGNOS ICD for ATC interface, 2001

