

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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EUROPEAN AUTONOMOUS FLIGHT TERMINATION SYSTEMS BASED IN SMART AVIONICS

Abstract

Safety regulations identify the mission abort when the nominal flight envelope is potentially violated, resulting in unacceptable human risk levels. A traditional flight termination architecture ensures independency from the vehicle functional chain using a radar and telecommunication networks with human intervention in the decision-making process. This means: (i) considerable budget share for infrastructure and operations, (ii) limited flexibility (radar network needed), (iii) vehicle monitoring restricted to LOS conditions and (iv) delay inherent to communications and human reaction.

Thanks to the maturation of several technologies, it is possible to overcome those limitations by targeting autonomous concepts to move the termination decision on-board: 1. Improvement in GNSS technology and hybridization techniques. 2. Increase of computational capabilities to implement complex algorithms on-board. 3. Utilization of an efficient avionics SW execution platform based on emerging standards (e.g., NASA CFS) to isolate SW safety critical applications.

Within Europe, there is no clear standard on the design nor operation of an AFTS. The critical part of this type of standards is related to the management idiosyncrasy of the flight regulation in each country. The definition of non-flight areas and corridor is a task performed by range safety officer which should guarantee that a faulty launch could not endanger human lives. These tasks are obviously closely related own country regulations, making it difficult to have a common standard in Europe. It is proposed a highly configurable unit, in which the range safety officer could even include proprietary software for the termination logic.

The paper describes the general problem and the proposed solution for a European Autonomous Flight Termination System highly configurable by the user, which make is suitable for a broad range of launchers and countries. Sener is developing an AFTU demonstrator in the frame of the RD EC Horizon Europe programme.