



IDEATHON

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GTD's challenge

Technical card



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Entity providing the challenge: GTD Sistemas de Información

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Title of the challenge: Monitoring and predictive maintenance of on-board reusable systems

Background

The increasing number of space missions has fuelled the deployment of new launch services that focus on reusability as a capability to enable their business models in a competitive scenario, by reducing their operations' cost, making more agile campaigns, and increasing launch rate. Two axes drive that target, first the correct awareness in real-time of the launcher systems' status. Secondly the flight data exploitation towards predictive maintenance on ground of the reusable systems to ready its availability for next flight. That strategy highly contributes to the reusability and hence to cost reductions and agile campaigns.

We might answer the question, what is the real impact of reusability on launch operations' costs and launch service business model? Which strategies and methodologies contribute to optimise the reusability?

Objectives

Your team is charged with the detailed definition of the strategy/methodology for the implementation of reusability system on both phases: an on-board system monitoring the launcher status during the flight (which are the parameters to monitor/collect?) and post-flight data processing strategy/methodology to diagnose on ground the status of the vehicle (the first stage or booster) with the objective of properly plan the operations to prepare the reusable system (what is degraded? What shall be maintained? What has failed?)

Description

The use data exploitation techniques in the domain of predictive maintenance is encouraged (IVHM, integrated vehicle health monitoring, degradation models, supervised models, regression algorithms...), applied to the collected in-flight data (maybe simulated?).

Model the nominal and non-nominal (failure) dynamics of critical parameters involved in the launcher's reusability aiming to implement IHVM and train a predictive maintenance system



Skills required to face the challenge

- Launcher equipment (sensors, actuators, avionics...)
- Launcher reusability concepts and requirements
- Numerical modelling and simulation (Mathworks or similar)
- Data mining (neural networks, machine learning...)

Useful information to face the challenge

<https://www.techtarget.com/searchbusinessanalytics/definition/data-mining>

https://www.researchgate.net/publication/259566416_A_Primer_on_Predictive_Models

<https://support.sas.com/resources/papers/proceedings12/337-2012.pdf>

