PROJECT

ADDSAFE

Advanced fault diagnosis for safer flight guidance and control

Funding: European (7th RTD Framework Programme)
Duration: Jul 2009 - Oct 2012
Status: Complete with results
Total project cost: €3,662,669
EU contribution: €2,608,594

Call for proposal: FP7-AAT-2008-RTD-1
CORDIS RCN : 92071

Background & policy context:

Recent airliner accident and incident statistics show that about 16% of the accidents between 1993 and 2007 can be attributed to Loss of Control In-flight (LOC-I), caused by a piloting mistake, technical malfunctions or unusual upsets due to external disturbances. Loss of flight control remains the second largest accident category after Controlled Flight Into Terrain (CFIT) accounting for 23% of air accidents worldwide.

Loss of Control (LOC) is intrinsically related to the guidance and control (G&C) system of the aircraft, and includes sensors and actuators failures. The state-of-practice for aircraft manufacturers to diagnose these faults and obtain full flight envelope protection is to provide high levels of hardware redundancy in order to perform coherency tests and ensure sufficient available control action.

This hardware-redundancy based Fault Detection and Diagnosis (FDD) approach fits into current aircraft certification processes while ensuring the highest level of safety standards. On the other hand, FDD solutions increase the aircraft weight and complexity and thus its manufacturing and maintenance costs. The FDD approach is becoming increasingly problematic when used in conjunction with the many innovative technical solutions being developed by the aeronautical sector to satisfy the greener and safety imperatives demanded by society like: more affordable, safer, cleaner, quieter. This is increasingly creating a gap between the scientific methods advocated within the academic and research communities and the technological developments required by the aeronautics industry.

This applicability gap has resulted in a de facto "fault diagnosis bottleneck", a technological barrier constraining the full realization of the next generation of air transport due to the need to ensure the current highest levels of aircraft safety when implementing novel green and efficient technologies.

Objectives:

ADDSAFE tries to overcome this technological gap by facing the following two challenges:

- helping the scientific community to develop the best suited FDD (Fault Detection and Diagnosis) methods capable of handling the real-world challenges raised by industry; and
- ensuring acceptance and widespread use of these advanced theoretical methods by the aircraft industry.

The overall aim of the project is to develop and apply model-based FDD methods for civil aircraft in order to increase aircraft safety and reduce development/maintenance costs.

From a technological and scientific perspective the main benefits of the project are:

- identification of a set of guidelines for FDD design and analysis for aircraft G&C;
- improved FDD methods and understanding of their applicability to aircraft FDD;
- a step towards a V&V process for advanced aircraft diagnostic systems;
demonstration of the most promising model-based FDD designs on industrial state-of-art flight simulation platforms.

From the perspective of the benefits to society, ADDSAFE:
- supports greener technical solutions;
- maintains current highest safety standards;
- improves aircraft transport cost & efficiency.

Methodology:
ADDSAFE is divided in 6 work-packages (WP 0 up to WP 5) decomposed into a total of 14 sub-work packages (WP 0.1 up to WP 5.2). The project strives to combine the knowledge and to increase synergies between the scientific and the technological partners at all levels of the project development cycle. Thus, most of the tasks include participation by all partners.

Parent Programmes:
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

Institute type: Public institution
Institute name: The European Commission
Funding type: Public (EU)
Other funding sources: DG RTD

Lead Organisation:

Deimos Space S.L.

Address:
Ronda de Poniente 19, Portal 2, 2a Planta
28760 TRES CANTOS (MADRID)
Spain

Organisation Website:
http://www.deimos-space.com
EU Contribution: €393,376

Partner Organisations:

Airbus Operations Sas

Address:
ROUTE DE BAYONNE 316
31060 TOULOUSE
France

Organisation Website:
http://www.airbus.com
EU Contribution: €240,126

Deutsches Zentrum Fr Luft Und Raumfahrt E.v

Address:
Linder Hhe
12489 KLN
Germany

Organisation Website:
http://www.dlr.de
EU Contribution: €532,556
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Address</th>
<th>EU Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magyar Tudomanyos Akademia Szamitastechnikai Es Automatizalasi Kutatointezet</td>
<td>Kende Utca 13-17, Budapest 1111, Hungary</td>
<td>€245,400</td>
</tr>
<tr>
<td>University Of Greenwich</td>
<td>University of Greenwich, Avery Hill Mansion Site, Bexley Road, London HU6 7RX, United Kingdom</td>
<td>€327,269</td>
</tr>
<tr>
<td>University Of Leicester</td>
<td>University Road, Leicester LE1 7RH, United Kingdom</td>
<td>€313,846</td>
</tr>
<tr>
<td>Centre National De La Recherche Scientifique</td>
<td>3 rue Michel-Ange, 75794 PARIS, France</td>
<td>€259,697</td>
</tr>
<tr>
<td>Technische Universiteit Delft</td>
<td>STEVINWEG 1, 2628 CN DELFT, Netherlands</td>
<td>€296,324</td>
</tr>
</tbody>
</table>

**Technologies:**
- Sensor technologies
- Integrated sensors for structural components

**Development phase:** Research/Invention
Key Results:

Definition of a set of guidelines for aircraft G&C model-based fault detection and diagnosis.

Improved FDD methods and understanding of their applicability to aircraft G&C.

A step towards a V&V process for advanced diagnostic systems.

Innovation aspects

The results will help achieve the European Vision 2020 challenges related to the “greening” of the aircraft, by supporting the application of already developed sustainable solutions, as well as to “safety”, by opening the door to develop new technologies to maintain the current highest aircraft safety levels regardless of the increase in air traffic.

Strategy targets

1. An efficient and integrated mobility system: 1.3 Secure Transport

Readiness

Further research is necessary

Documents: 

ACD2010-proceedings (Project presentation)

STRIA Roadmaps: Vehicle design and manufacturing

Transport mode: Air transport

Transport sectors: Passenger transport

Transport policies: Safety/Security

Geo-spatial type: Other