HASTAC

High Stability Altimeter System for Air Data Computers

**Funding:** European (6th RTD Framework Programme)
**Duration:** Jan 2005 - Mar 2008
**Status:** Complete with results
**Total project cost:** €3,060,428
**EU contribution:** €1,585,714

**Call for proposal:** FP6-2003-AERO-1
**CORDIS RCN:** 74774

**Background & policy context:**

The project responded to the challenge of ensuring that, irrespective of the growth of air traffic, air transportation would be safer. HASTAC contributed to one of the major challenges identified on the Strategic Research Agenda for European aeronautics. Referring to incidents such as, 11 September, the SAS plane in Milan Airport and the in-air crash at Bodensee, the European avionics industry focused on development programmes to improve this type of safety.

HASTAC contributed to improving safety in different flight situations, such as:

- On-board technologies for prevention of controlled flight into terrain;
- Technologies enabling a full and permanent automatic approach and landing in all weather;
- On-board technologies for in-flight and on-ground collision avoidance novel concepts;
- Techniques enabling the development of improved aviation safety metrics.

**Objectives:**

The main project strategic objective was to increase the safety in all in-flight situations, particularly in low visibility situations, by improving the transducers used in Air Data Computers (ADC) for aircraft applications. The results proved relevant to flying on autopilot in the reduced vertical separation minima of 1 000ft, as well as to demanding manual flying situations in darkness and low visibility. In transponder applications, the project gave a significantly increased reliability in altitude information for manual and automated Air Traffic Control systems. Aircraft Traffic Collision Avoidance Systems would also benefit from more accurate and reliable altitude information, which would allow the automated avoidance instructions to be more accurate and effective.

The project developed a new generation of air data computers (ADC), suitable for fixed wing and rotary wing applications, which would significantly improve altitude accuracy capabilities over those available today. Aircraft flight-testing performed in the project demonstrated the effectiveness of the performance improvement. A new generation of transducers with a new microsensor (absolute pressure sensing element) as the key component, would also be available for other application areas, such as transponders.

**Methodology:**

The work was divided into five Work Packages.

- Work Package 1: Sensing element: Development of an absolute pressure-sensing element in silicon (MEMS) with a minimal number of unidentified error sources featuring excellent long-term stability and high repeatability in aerospace applications.
- Work Package 2: Pressure sensor package: Development of a new hermetic pressure sensor
package that minimised transfer of unwanted forces to the silicon-sensing element developed in Work Package 1.

- Work Package 3: Transducer: Development of an optimised digital altimeter transducer based on the packaged sensor with a long-term stability specification better than 0.01%FS/year.

- Work Package 4: Air-Data Computer Unit: Development of a new digital air data computer unit that utilised the improved accuracy in altimeter barometric measurements from the developed transducer.

- Work Package 5: Aircraft flight test: Demonstration of the improved safety performance by real helicopter flight tests.

**Parent Programmes:**
FP6-AERO-1.1 - Strengthening competitiveness

**Institute type:** Public institution

**Institute name:** European Commission

**Funding type:** Public (EU)

### Lead Organisation:

**Sintef**

**Address:**
Strindveien 4
7034 TRONDHEIM
Norway

**Organisation Website:**
http://www.sintef.no

**EU Contribution:** €0

### Partner Organisations:

**Memscap As**

**Address:**
Langmyra, 9
3185 Horten
Norway

**Organisation Website:**
http://www.memscap.com

**EU Contribution:** €0

**Curtiss-Wright Controls (Uk) Ltd.**

**Address:**
1 Airfield Road
CHRISTCHURCH, DORSET
United Kingdom

**Organisation Website:**
http://www.cwcontrols.com

**EU Contribution:** €0

**Mcalpine Helicopters Ltd.**

**Address:**
Oxford Airport, Kidlington
OXFORDSHIRE
Key Results:

The HASTAC project developed more than 800 sensors in 40 different versions to identify the potential causes for drift mechanisms. The knowledge established was used to make the ideal design for the new SP83 pressure sensor, which is the key element in the TP4000 transducer.

In addition, the HASTAC project resulted in major know-how and competence in the MEMS pressure sensor field of the industry. Examples of this were as follows:

1. Increased knowledge within all the HASTAC project partners of silicon MEMS structures for avionic use;
2. The basic silicon sensing structures could be used in, or modified to, other demanding aerospace applications;
3. The new MEMSCAP SP83/TP4000 barometric pressure sensor generated more business and gave aircrafts better accuracy in altitude monitoring;
4. SINTEF became an alternative source for avionic grade MEMS wafers;
5. MicroElectronica in Romania became an alternative source for assembly of aerospacegrade sensors;
6. The TP4000 transducer would be a better alternative than current available state-of-the-art units;
7. Penny & Giles Air Data Computer is one of the most accurate in the market.

Technical Implications

The HASTAC project had a significant impact on the avionic industry.

This project allowed manufacturers of Altimetry equipment, Air Data Computers, Auto Pilot systems and Encoding Altimeter Transponders to achieve better accuracy and stability in their final system products. The ADS-B3 automated Air Traffic Control system that would be implemented in the near future would also benefit from the results from the HASTAC project.

It is highly likely that parts and technology developed in this project will be embedded in the next generation airliners, regional aircrafts and in general aviation.

Policy implications
Research in further enhancement of silicon MEMS structures for altimetry systems will take place. The FP7 project HISVESTA will continue on the research path from HASTAC, to improve functionality even more, and also exploit the usage of the technology in other segments in Aeronautics and Transport in general.

Documents:

- Publishable Final Activity Report HASTAC.pdf (Final report)

**STRIA Roadmaps:**
Cooperative, connected and automated transport, Vehicle design and manufacturing, Network and traffic management systems

**Transport mode:** Air transport

**Transport sectors:** Passenger transport, Freight transport

**Transport policies:** Safety/Security

**Geo-spatial type:** Infrastructure Node