Concordia University - Montreal, Canada: Stndardization of sensors for implementation of fly-by-wire

BASIC INFORMATION

Project Classification:

Sponsoring CANEUS Work Program Board:

Tracking Number:

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PROJECT DESCRIPTION

Problem Statement: The implementation of fly by wire require usage of large number of sensors (mainly position) to detect the control commands given by the pilot. Given the fact that most of the angular position sensors used in aerospace are high power inductive based sensors, they are bulky and heavy. A fully qualified product of a simple concept based angular position sensor to perform with 99.99999% reliability, with small mass, reduced consumption and reduced volume, MEMS based would be of interest to all integrators.

Approach/Solution: An integration concept is planned. A systematic analysis of the available sensors used for angular position detection in the cockpit and along the control loop will indicate the optimal geometry of the sensor. An analysis of the potential solutions for the measurement principle that will suit the application will be carried out through multi-physics simulations. Solutions such as electromagnetic, electrostatic, optical, or combination will be considered in the models. he best solution will be concluded from the study and discussed with the users. A family of prototypes will be fabricated and tested by the customer. After refinement cycles, the final design will be taken up for production and qualifications by an interested company (the one working on the development of the prototype that is operating in Canada and the US).

Required Technologies/Facilities: The facilities available at Concordia University and their collaborators are sufficient to accomplish the proposed project.

Affected Applications: Fly-by-wire implementation, the strategy to move from wire data transmission towards bus transmission, the modern aviation equipment. The product should be conceived as a high reliability sensor.

Required Stake Holders/Experts: The team at Concordia University and the collaborators.
Interested party form the integration aircraft business
A sensor manufacturer - already identified

BACKGROUND

Milestone	TRL	Risk	Measure of Success	TRL Date
Study of the available sensors used for FBY	3	Low	A report and a study to gather the fundamental needs for the new sensor	6 months
Modeling of few type of sensors based on various principle	3	Low	Results pointing towards one or two optimal solutions	1 year
Selection and hardware development of a sensor to satisfy the above findings	3	Medium	Realization of a family of prototypes	1.5 years
Test of the sensors in test flight while mounted as redundant to the existing equipment	3	Medium	Data analysis and interpretation from the flight test, design refinment and meaningful results	2 years

Deliverables: A set of prototypes for various applications - of the pre-established sizes and fixture but same output signal, same sensitivity and same low mass.

Outreach/Organizational Interfaces: The work will be carried out in collaboration with the interested party as the needs are specifically known by them only. The sensor integration company could see a business opportunity in this venture.

Academic Contribution/Work Force Needs: 1 PDF, 2 students, 1/2 technician for 2 years time

Business Development and Regulatory Compliance: Qualification of a new product intended to fly is mandatory. It si foreseen a great deal of resources being necessary in this process, once the proposed project will be completed.

PROJECT EXECUTION

ROM Cost

2009	2010				TOTAL
150,000	350,000	0	0	0	500,000

Team Members and Roles: The team members will collaborate to come up with a solution to satisfy the majority of needs in FBY applications. The university team will interact with the sensor developer (already identified, with collaborative track) to come up with the best possible design. The aircraft team will provide the researchers with the main specifications used for the FBY position sensors and will assist the team during the entire process. The test on the aircraft will be carried out by the aircraft team but the research team will be present during the entire period of tests. Data will be processed by the university team and discussed with the other two groups. Conclusions towards the improvement of the design will be drafted such that the sensor integrator may commence the qualification process/

Potential Funding Sources: If the Canadian based company who sees interest can cover up to 50% of the expenditure in cash and in-kind, the federal government has a program to match up to 50%.

Business Case: The present position (mainly rotational position) are heavy, bulky and consume a significant amount of energy. They are not data bus compatible. The available products have not been intended for this application and they would match a very limited number of applications. The cost of the sensor is targeted to represent in long term a fraction of teh present cost.

Business Impact: Lighter, more reliable controls in the aircraft. The sensors will become available for all aircraft integrators but special agreement with the sensor integrator for non-sale to the third party can be set in place.