SPACE PROPULSION SYMPOSIUM (C4)
Propulsion System (2) (2)

Author: Dr. Sabine Saint Martin
SME - Safran, France

Mrs. Flavie Bruni
SME - Safran, France
Mrs. Christine Marraud
SME - Safran, France
Mr. Philippe Cloutet
SME - Safran, France
Dr. Eric Robert
Centre National d'Etudes Spatiales (CNES), France
Mr. Amauric Jarry
Centre National d'Etudes Spatiales (CNES), France
Dr. Sylvain Guédron
ESA - APT, France

TWIN SCREW PROCESS DEMONSTRATION TECHNOLOGY ACTIVITIES FOR SOLID PROPULSION IN NEW GENERATION LAUNCHER APPLICATIONS

Abstract

Significant studies have been carried out to prepare future solid propulsion technologies needed for New Generation Launcher (NGL). Among these technologies, continuous mixing process for composite propellant has been identified as a technological breakthrough enabling the manufacture of large solid rocket motors (SRM), such as a P180 SRM that would be used as the first stage of an Ariane 6 NGL. This technology would participate to production cost reduction and hazard limitation.

Since mid-2010, with CNES support, SME has engaged an ambitious demonstration program aimed at bringing continuous mixing and casting process to the TRL (Technology Readiness Level) required to start a development program. Main objectives of this program are to define and validate the various technological building blocks necessary to design what would be the equipment for a full scale plant able to produce large quantity of solid propellant.

This demonstration program comprises three phases. The first one consists in demonstrating the stability of the process for a period of few dozen hours, representative of the duration expected to cast an entire P180 motor, with solid propellant samples being casted regularly during the run for mechanical properties and ballistic performance characterizations. The second phase will be aimed at upgrading the existing pilot facility, especially by supplying it with automatic refilling systems and by increasing the global flow rate capacity. An active run of a dozen hours is planned to demonstrate the reliability and the reproducibility of the process. The third phase will consist in running representative continuous production cycles to show the robustness of the process and to provide the technical data necessary to define a full-scale facility. For validation purposes, it is planned to manufacture a P180 2/11th subscale motor.

Activities are also conducted to undertake an incremental approach in order to satisfy the following objectives : elimination of the identified existing stumbling blocks for a full scale implementation of a production facility, and definition of the characteristics of the various subcomponents required for such a

full scale facility as for instance feeders systems, in-line control technology, and validation of operational numerical simulation tools to predict the full scale process parameters.

The paper will present a global overview of this ongoing demonstration program, with illustrations of the main results already obtained after first demonstrator milestone.