

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (1) (3)

Author: Mr. Klas Lindblad

GKN Aerospace Engine Systems, Sweden, klas.lindblad@gknaerospace.com

Mr. Henrik Amnell

GKN Aerospace Engine Systems, Sweden, Henrik.Amnell@gknaerospace.com

Mr. Stefan Persson

GKN Aerospace Engine Systems, Sweden, Stefan.a.Persson@gknaerospace.com

Mrs. Helena Lindblad

GKN Aerospace Engine Systems, Sweden, Helena.Lindblad@gknaerospace.com

Mr. Håkan Olofsson

GKN Aerospace Engine Systems, Sweden, Hakan.j.Olofsson@gknaerospace.com

Mr. Ulf Palmnäs

GKN Aerospace Engine Systems, Sweden, Ulf.Palmnas@gknaerospace.com

Mrs. Lise Brox

GKN Aerospace Engine Systems, Sweden, Lise.Brox@gknaerospace.com

Mr. Martin Velander

GKN Aerospace Engine Systems, Sweden, martin.velander@gknaerospace.com

ETID SANDWICH NOZZLE DEMONSTRATOR FOR UPPER STAGE ENGINES

Abstract

GKN Aerospace has for over a decade continuously developed and verified its patented manufacturing method for actively cooled nozzle extensions, i.e. the “Sandwich” - laser welded channel wall technology. This paper describes the current status of the upper stage sandwich nozzle activities inside the FLPP ETID program including customer benefits and potentials for future launcher applications.

GKN Aerospace has together with our industrial partner Airbus Safran Launchers, Ottobrunn, under ESA contracts, performed Concept key point 2014, Preliminary design key point 2014, and Manufacturing readiness key point 2015, for the ETID sandwich nozzle demonstrator. GKN are currently manufacturing two full-scale sandwich nozzle demonstrator hardware for hot fire tests scheduled to begin 2017.

The paper will report on the following activities:

- Overall GKN objectives for the ETID upper stage sandwich nozzle demonstrator
- ETID nozzle development and manufacturing status
- Sandwich nozzle maturity level and customer benefits for upper stage application

The GKN Aerospace Sandwich nozzle technology has been used in a number of demonstrators in collaboration with several customers to demonstrate its technological maturity as well as cost benefits for 1st- and 2nd-stage rocket engine configurations, such as gas generator, expander and staged combustion engine cycles. Together with Airbus Safran Launchers two demonstration tests have been made the last five years; i.e. the sub-scale SCENE hardware (IAC-11.C4.3.7), and the full-scale test of Vulcain 2+ NE demonstrator (AAAF 2014 SP2014.2968456), and thereby reached TRL5 and TRL6 for those specific materials and applications.

These successes form the foundation to selecting the sandwich technology in today’s nozzle designs for the upper stage demonstrator ETID in the ESA FLPP program, as well as for the Vulcan 2.1 engine for the Ariane 6 launcher.