AFLoNext
2ND GENERATION ACTIVE WING

NEWSLETTER N°7

March 2018

Welcome to the seventh newsletter from the AFLoNext project!

AFLoNext gathers forty European partners from fifteen countries for a period of five years, until May 2018. Our fundamental goal was to mature highly promising flow control technologies and to show their potentials for advanced eco-efficient aircraft design.

Our public newsletters have kept you up-to-date on the progress made within AFLoNext and given a possibility to discover how the consortium partners cooperated to achieve the project objectives.

We now invite you to our final conference that will be held at ILA Berlin 2018.

A WORD FROM THE COORDINATOR

"Goals are dreams with a deadline".

The AFLoNext partners have strived for five years to achieve the objectives of our project and to show that flow control is a key technolgy for future aircraft drag reduction. Now, our AFLoNext undertaking is coming to an end. The consortium partners are currently performing the last flight test activities.

We are also preparing an inventory of the achievements and lessons learnt in view of the final conference of the project during ILA Berlin 2018. We hope to meet you at this conference to present our results and exchange with you on the benefits that AFLoNext has generated for the European aviation.

In this seventh issue of our newsletter, you will find out the latest activities performed by the project partners. We also take the opportunity to present the final conference.

We wish you all a good reading!

Dipl.-Ing. Martin Wahlich
Flight Physics Research and Technology
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News & Events

The AFLoNext consortium partners are organising the final conference of the project at ILA Berlin 2018 on 26-27 April. The conference programme is already available.

Read more

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This project is supported by the European Community's Seventh Framework Programme for research, technological development and demonstration, under grant agreement n°604013.

WORK PROGRESS WITHIN THE PROJECT

HYBRID LAMINAR FLOW CONTROL

HLFC on Vertical Tail Plane

After a sequence of very successful deliveries and milestones such as the assembly of the HLFC leading–edge, the working party at the ATRA and final testing of HLFC system and Flight Test Instrumentation (FTI), a HQ and check-out flight was conducted on 22nd of November 2017. During the 2-hour flight the entire HLFC system and all FTI worked properly providing the transition delay as intended. Unfortunately, due to some unexpected vibration of the Horizontal Tail Plane (HTP), probably caused by unsteady flow features at the IR-camera fairings, the flight test campaign could not follow as scheduled. A technical solution has been developed in the meantime and will be available to continue the flight testing in March 2018.

HLFC on wing

The design and manufacture of the HLFC wing ground based demonstrator (GBD) is close to completion. The GBD represents the nose section of a large commercial aircraft with a dummy wing box and flap. Applying HLFC to a wing, rather than the VTP being developed in WP1.2, introduces an extra challenge. The need for a deployable high lift device, known as a Krueger flap, which leaves an open cavity on the lower surface of the wing means that the internal structure of the suction system has to be adapted.

The components of the GBD have been designed and manufactured by SONACA, INCAS, TAI, ASCO and INVENT with support from DLR and Airbus. The motorised deployment of the Krueger flap was tested by DLR. Assembly and initial air system testing was done by INCAS (Romania) and completed by the end of February 2018.

The de-icing system of the GBD will be tested in the CIRA icing wind tunnel (Italy). The aim of this test is to demonstrate that the combined suction and anti-ice air system operates efficiently.

The final activity will be a bird strike test by VZLU in the Czech Republic. The bird strike will test the structural integrity of the GBD.

Results from both these tests will be used in future HLFC design activities.

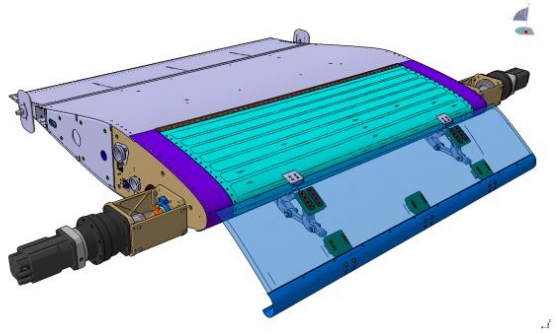

Figure 1: Digital mock-up of ground based demonstrator with Krueger flap external motors attached.

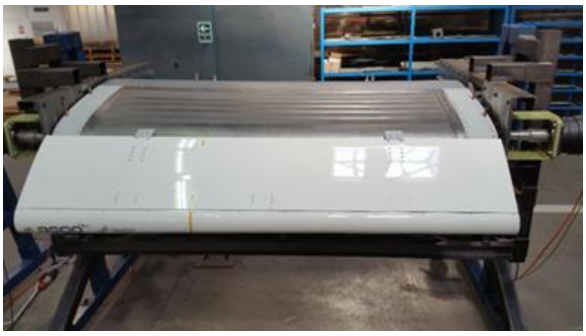

Figure 2: Ground based demonstrator during assembly process.

ACTIVE FLOW CONTROL ON AIRFRAME

During the past years, the work package dedicated to active flow control on airframe concentrated on the preparation of multiple tests for assessing the maturity of active flow control hardware. Now, at the end of the project, our biggest aim was the demonstration of active flow control on full aircraft scale. For this, we designed by numerical methods a wind tunnel experiment, built a corresponding large wind tunnel model (3m chord, approx. 5.5m span), and finally performed the corresponding wind tunnel tests in September 2017 at the Russian research institute TsAGI in the biggest European wind tunnel, the T-101 facility with a test cross section of 24m x 14m (Figure 3 below). The measurements clearly verified the suitability of the designed active flow control devices and setup to be able to prevent flow separation at very high angles of attack.

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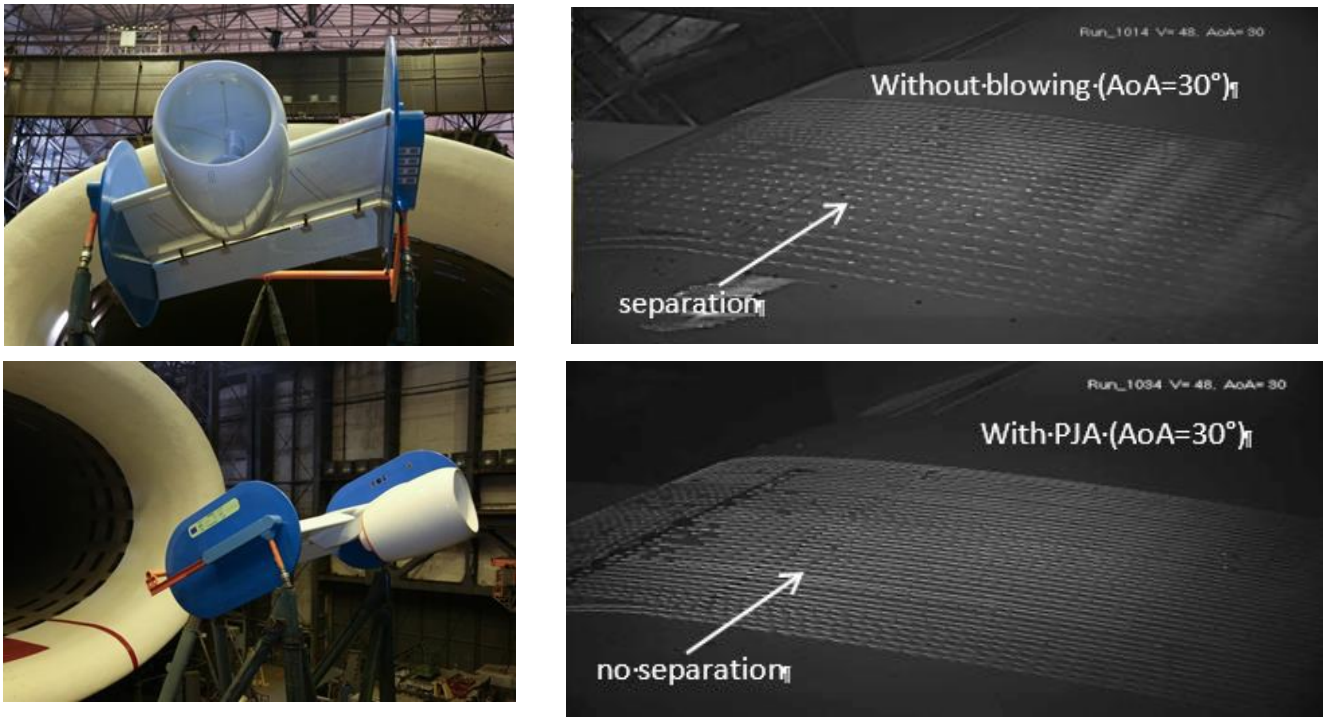

Figure 3: (left) large full scale wind tunnel model of generic wing/pylon/engine wing section during testing at the TsAGI T-101 wind tunnel; (right) tuft visualization of region behind nacelle showing effectivity of active flow control technology.

As the work within this work package is now concluded, we took the opportunity to showcase the results of Active Flow Control at the 6th CEAS 2017 Air & Space Conference held in Bucharest, Romania, from 16th to 20th October 2017. Three special sessions were arranged to present the achievements of both work packages to a wider scientific audience. In total, 13 presentations gave an overview on the work performed. Presentations are available on the AFLoNext website.

CONTROL MEANS FOR VIBRATION AND AEROELASTIC COUPLING

Activities during the last months were dominated by the preparation for the AFLoNext flight test campaign with the DLR ATRA A320 as the flight test aircraft.

The Flight Test Instrumentation has been frozen, the flight test matrix defined, the documentation completed and signed, and the flight test aircraft has been instrumented accordingly in the undercarriage area, i.e. the nose (NLG) and main landing gear (MLG) doors and bays (see Figure 4). The FTI has been tested during the check-out flight and it worked as expected.

In parallel, further progress was made for the monolithic nose landing gear door (NLGD). This progress includes inspections, assembly and further successful testing (such as gear swing tests) of the monolithic door installed on the DLR ATRA A320 aircraft.

Furthermore, the devices (aero and structural) to reduce the vibration levels on the aircraft's main landing gear doors have been completed (design, manufacturing and documentation). Vortex generators (VG's) installed on the MLG doors (see Figure 4), previously selected as such an aerodynamic device, have been tested during the check-out flight (1st flight). Further devices will be flight tested in the future.

During a ferry flight of the test aircraft (2nd flight), sensor signals on the MLG doors in clean condition (i.e. without devices, reference condition) have been measured. The test data of these two flights are analyzed and they are used to calibrate and validate the numerical models. In addition, they will be compared to evaluate the effectiveness of the VG's to reduce vibration levels on the MLGD's.

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Figure 4: FTI on left hand MLG door (left) and VG's installed on MLG door (right) on DLR ATRA A320. Courtesy of DLR.

NOISE CONTROL ON AIRFRAME

SAFRAN and DLR achieved good progress on the preparation of landing gear related noise reduction technology. While brake covers were completely manufactured, the final step to be conducted at the torque link fairing is the mesh attachment which was scheduled to take place in February 2018. Based on the achievements, all proposed noise reduction technologies will be flight tested in 2018.

GET-TOGETHER

SAVE THE DATE!

We have the pleasure to invite you to the final conference of the AFLoNext project that will take plave on 26-27 April 2018 during ILA Berlin.

The event aims to offer a forum for presentation of the final results of the project to wider public.

AFLoNext project final conference

Thursday 26 April 2018 from 14:00 to 18:00

and Friday 27 April 2018 from 9:00 to 13:00

Berlin ExpoCenter Airport

Conference room: ALFA

Programme and schedule of the conference are available on the **ILA website**. You can also find there the **travel information** and **buy tickets** (choose "day ticket congress & trade fair").

We hope to see you in Berlin!

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