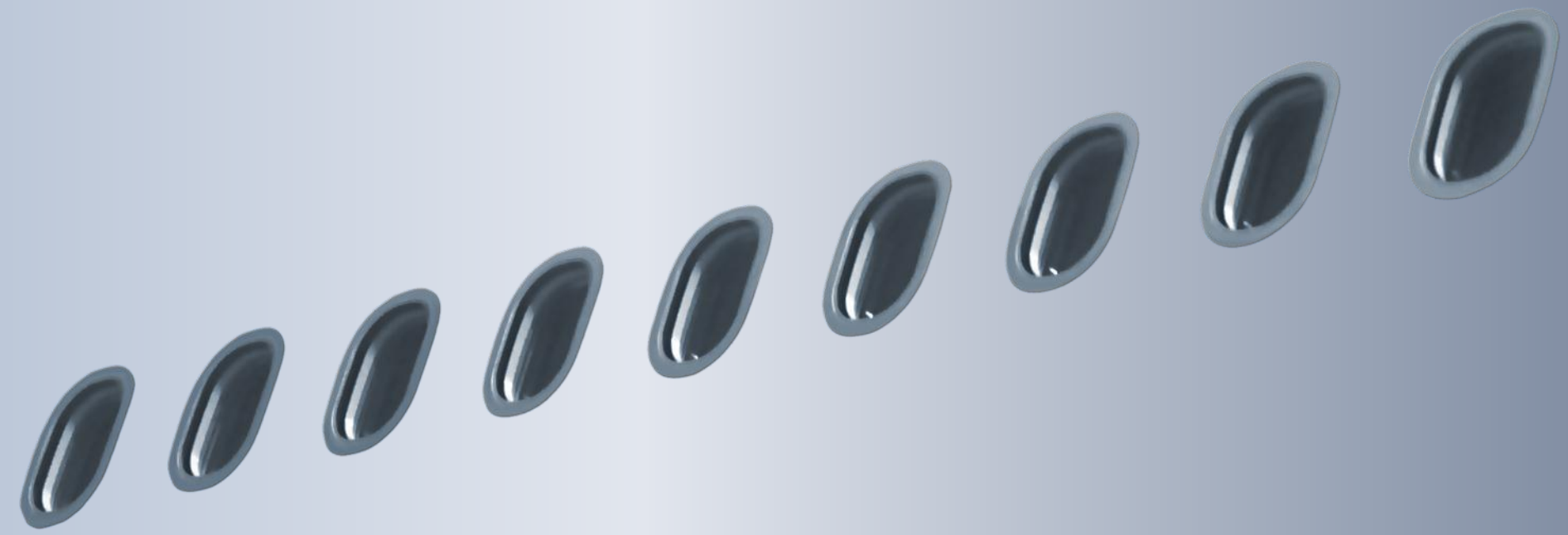


CFP Information Day

Automated Gap Filler Device

JTI-CS-2012-01-SFWA-02-020

Presented by
Jeremy Bradley – Airbus, Materials & Processes Engineer

AIRBUS

Background

- Natural Laminar flow (NLF) has been identified as a key technology to contribute to the reduction of emissions for future short range aircraft.

- Studies have been launched within SFWA to investigate the feasibility of producing such a design. The work will include ground based and flying demonstrators.

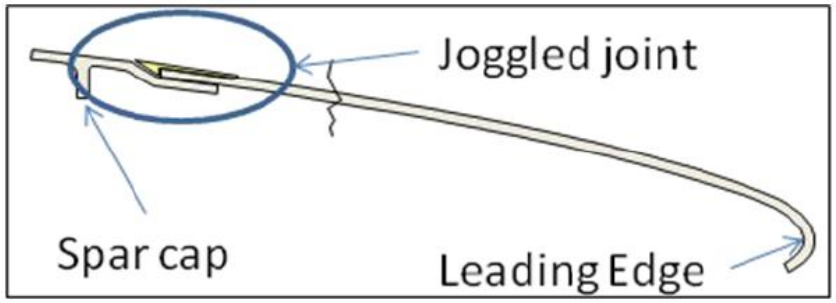
- One potential concept includes a joint between the main wing box and leading edge structure.
  This joint must be filled to the specified surface finish requirements to maintain NLF.

Main Objective

‘To develop an automated device that is capable of filling panel gaps to the required tolerance in a high rate production environment.’

Main Objective

- The joggle joint shown below will include a gap between the panels to allow application of a filler material. The gap dimensions are of the order of 3mm wide by 4.5mm deep.

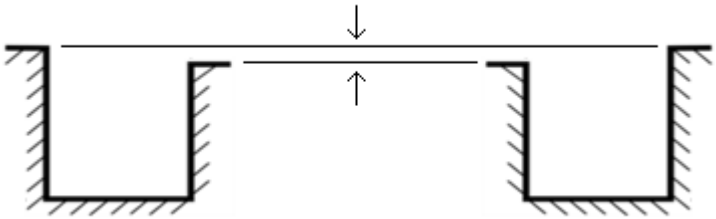


- The surface finish requirements will include:
  - Misalignment tolerance on the panels to be joined.
  - Variation caused by sealant expansion or contraction.
  - Isolated roughness requirements on the filler surface.

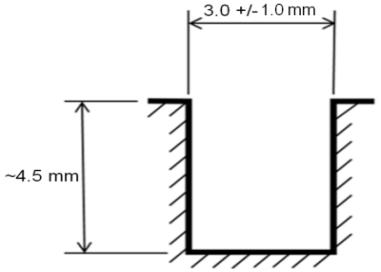
(Full details of the surface finish will be made to successful applicants)

Main Objective

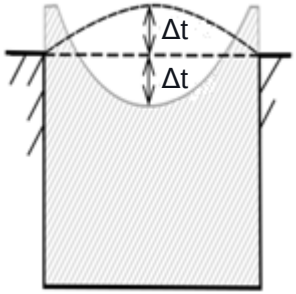
- Panel misalignment may be up to ±0.3mm



- Gap geometry will be carefully controlled.



- Filler tolerance is likely to be in the order of ±0.1mm



Main Objective

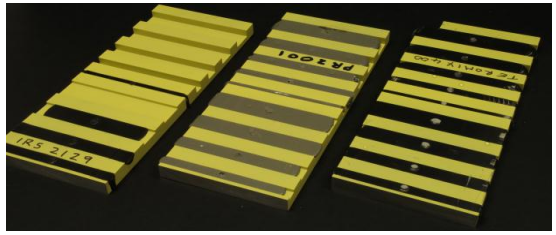
- The total length of the joint to be filled will be between 4 and 15 metres and may go across chord wise joints.
- This means that the minimum uninterrupted length to be filled is approximately 4 metres.
- To achieve rate, this process should be able to fill a 30 metre length in less than 3 hours.

Main Objective

- As shown on the A320 wing below, a typical span wise joint exhibits some double curvature.
- A suitable filler device should be able to operate in a fully 3D environment.
- Surfaces either side of the joint may be painted or unpainted and may be dissimilar.
- It would be beneficial but not essential for the device to be able to fill chord wise joints, countersinks and minor in service defects.

Materials Information

- Current baseline filler material is based upon standard polysulphide sealant technology.
  - \+ Long proven track record
  - \+ Good adhesion, flexibility, fluid resistance, temperature stability
  - – Known shrinkage issues



- Toughened epoxy fillers are under investigation.
  - \+ Much lower shrinkage
  - \+ Improved surface finish
  - – Unknown long term performance
- UV cureable sealant technologies are currently under development and should be available for evaluation.
  - \+ Tack free times measured in seconds
  - \+ An enabler for automation
  - – Materials still under development
- Airbus will be able to supply filler materials with agreement of relevant suppliers.
- Successful candidates will be expected to have some materials background and seek innovation in this area.

Work Programme

- The successful applicant shall develop a prototype device capable of filling the panel gap on the ground based demonstrator (See original topic description).
- The work programme is constrained to 12 calendar months.
- The body of work shall include:
  - A background study on filling techniques and devices
  - Benchtop prototype development
  - A method of evaluating the performance of the device, including test coupon production.

  Mid-Term
  - Technical drawings of the device
  - Submission of a final prototype for further evaluation
  - A detailed final technical report

  End of Project

Scope for innovation

- Degree of automation
- Novel Materials (Photosensitive, thixotropy)
- Multiple operations (single or multi-pass)
  - Gap analysis
  - Secondary finishing
  - Post application metrology
- ???

Any Questions?