

JIF2LAND

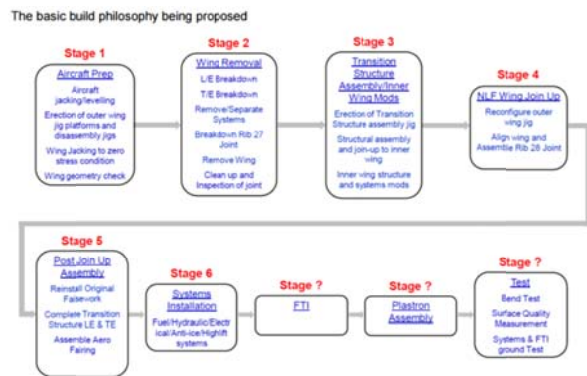
PUBLISHABLE SUMMARY

State of the art – Background

The objective of was to conduct the development, design, manufacture and installation of platform work and all jigs needed in the different stages or work process for removing the outer wing section of a A340-300 and assembly the SFWA laminar flow flight test demonstrator wings.

The JIF2LAND project is in continuation of JIF4FLIGHT project and addresses specifically the final stages of Stage 4 and 5.

The basic build philosophy was:



Objectives

In order to carry out the final objective, several main objectives were proposed:

- How to remove the original outer wing at Rib 27.
- The best solution for the assembly jigs for the transition structure to take into account geometrical differences between standard and new outer wing.
- How to assembly the new outer wing.

Description of work

The work was divided into 5 major milestones (Stage), determined by the defined work process:

- 1- Stage 1: Platforms and Aircraft position.
- 2- Stage 2: Wing Removal.
- 3- Stage 3: Transition Structure Assembly.
- 4- Stage 4: Wing Join up. (Included in JIF2LAND)
- 5- Stage 5 : Auxiliary assembly. (Included in JIF2LAND)

4- Stage 4: Wing Join Up

Working with the AIRBUS specifications for the new product, the necessary tools were defined and designed to assembly the new wings from the RIB 27.

For this process of assembly of the wing the following tools were realized:

- A) Tables of positioning: These tools served to support the Jacks and make the final movement for the union of the new wing with the transition structure.
- B) JACKS: The jacks were used to hold the new product.
- C) Drilling Templates.

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All of the drilling templates were made necessary to realize the union of the new wing with the transition structure and with the new components of the wing.

Once fabricated, assembled and measured in Aritex were taken to TARBES, the first step was to mark the positions of the assembly tables on the platforms. After verifying the positioning of the tables, the jacks were assembled.

Once the jacks were mounted on the table-moving trolleys, the wing assembly was performed. The new wing was raised on the jacks and fixed to the fixing points defined for the assembly.

Once the wing was fixed on the assembly table, it was proceeded to approach and final coupling of the new wing with the transition structure.

After the positioning of the wings the drilling work was started to realize the union of the wings with the transition structure.

Stage 3 ready to host Stage 4



Stage 4 Assembly ready to host the new wing



Stage 4 receiving the wing



Stage 4 ready for assembly new win with Transition Structure



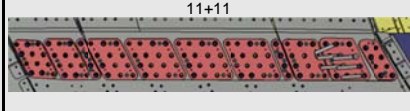
New wing in final assembly position with transition Structure

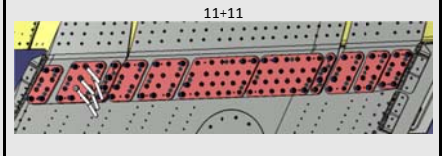
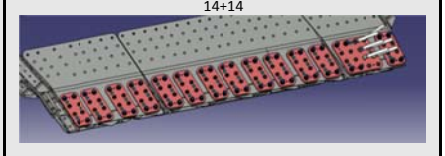
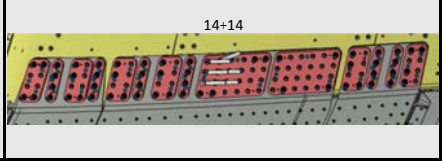


After the final positioning of the wing with the Transition Structure proceeded to perform the process of drilling the parts. For the drilling process it was necessary to manufacture approximately 120 drilling templates on this Stage

An important milestone to highlight was the quantity (60+60) and quality of drilling templates needed to complete the entire assembly process, these templates were made for different drilling processes.

Some Drilling templates.

035AF000203F 035AF000204F	Inboard Upper Joint- strap drilling- PORT & STBD	Quackenbush Drill jigs x 11 Plus associated bushes, pins etc Holes drilled from outer face	
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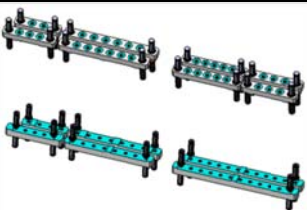


035AF000211F 035AF000212F	Inboard Lower Joint- strap drilling- PORT & STBD	Quackenbush Drill jigs x 10 Plus associated bushes, pins etc Holes drilled from outer face	
035AF000219F 035AF000220F	Outboard Upper Joint- strap drilling- PORT & STBD	Quackenbush Drill jigs x 14 Plus associated bushes, pins etc Holes drilled from outer face	
035AF000227F 035AF000228F	Outboard Lower Joint- strap drilling- PORT & STBD	Quackenbush Drill jigs x 14 Plus associated bushes, pins etc Holes drilled from outer face	

The total number of items supplied for Stage 4 is as follows.

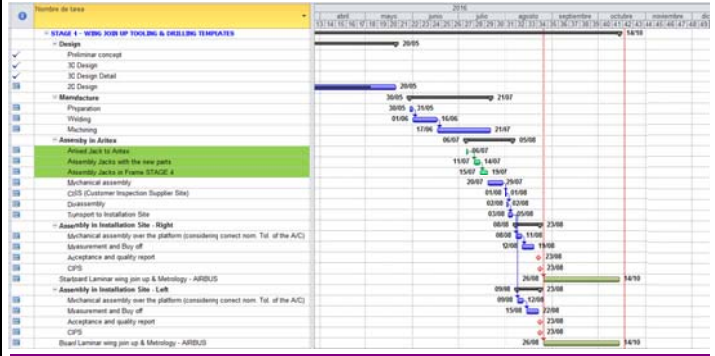
STAGE	TDF NUMBER	DRAWN TOOLING DESCRIPTION	TYPE	S.I. NO. AND BUILD PHILOSOPHY STEP	BUILD PHIL. ISSUE
4	051AF00024F	Outer Wing Support Jig - Base Unit - STBD - (Position 2)	Jig	Multiple	F57RP1271891-2.0
4	051AF00023F	Outer Wing Support Jig - Base Unit - PORT - (Position 2)	Jig	Multiple	F57RP1271891-2.0
4	051AF000200F	NLF Wing Support Jig - STBD	Jig	H57SU000049 (STEP 1)	F57RP1271891-2.0
4	051AF000199F	NLF Wing Support Jig - PORT	Jig	H57SU000049 (STEP 1)	F57RP1271891-2.0
4	520AF000354F	Dummy Rear spar joint-plate tool - Stbd	Jig	H57SU000049 (STEP 5.17)	F57RP1264041-1.0
4	520AF000353F	Dummy Rear spar joint-plate tool - Port	Jig	H57SU000049 (STEP 5.17)	F57RP1264041-1.0
4	035AF000236F	Upper crown fittings to stringer blade drill jigs - STBD	Drill Jig	H57SU000049 (STEP 5.10)	F57RP1264041-1.0
4	035AF000235F	Upper crown fittings to stringer blade drill jigs - PORT	Drill Jig	H57SU000049 (STEP 5.10)	F57RP1264041-1.0
4	035AF000244F	Lower crown fittings to stringer blade drill jigs - STBD	Drill Jig	H57SU000049 (STEP 5.10)	F57RP1264041-1.0
4	035AF000243F	Lower crown fittings to stringer blade drill jigs - PORT	Drill Jig	H57SU000049 (STEP 5.10)	F57RP1264041-1.0
4	040AF000347F	Crown fitting to Rib 28 interface Drill Bush Kit	Drill Bushes	H57SU000049 (STEP 5.5)	F57RP1264041-1.0
4	035AF000100F	LE Rib Posts to Rib 28 Drill Jigs - Stbd	Jig	H57SU000049 (STEP *)	
4	035AF000099F	LE Rib Posts to Rib 28 Drill Jigs - Port	Jig	H57SU000049 (STEP *)	
4	035AF000092F	TE Rib Posts to Rib 28 Drill Jigs - Stbd	Jig	H57SU000049 (STEP *)	
4	035AF000091F	TE Rib Posts to Rib 28 Drill Jigs - Port	Jig	H57SU000049 (STEP *)	
4	035AF000276F	F & Rear Spar Joint Plate Drill jig - STBD	Drill Jig	H57SU000049 (STEP 5.11)	F57RP1264041-1.0
4	035AF000275F	F & Rear Spar Joint Plate Drill jig - PORT	Drill Jig	H57SU000049 (STEP 5.11)	F57RP1264041-1.0
4	035AF000204F	Inboard Upper Jointstrap drilling (Rib, Stringers & Corner Fittings)- STBD	Drill Jig	H57SU000049 (STEP 5.9)	F57RP1264041-1.0
4	035AF000203F	Inboard Upper Jointstrap drilling (Rib, Stringers & Corner Fittings)- PORT	Drill Jig	H57SU000049 (STEP 5.9)	F57RP1264041-1.0
4	035AF000212F	Inboard Lower Jointstrap drilling (Rib, Stringers & Corner Fittings)- STBD	Drill Jig	H57SU000049 (STEP 5.9)	F57RP1264041-1.0
4	035AF000211F	Inboard Lower Jointstrap drilling (Rib, Stringers & Corner Fittings)- PORT	Drill Jig	H57SU000049 (STEP 5.9)	F57RP1264041-1.0
4	035AF000220F	Outboard Upper Jointstrap (crown & corner fittings) - STBD	Drill Jig	H57SU000049 (STEP 5.2)	F57RP1264041-1.0
4	035AF000219F	Outboard Upper Jointstrap (crown & corner fittings) - PORT	Drill Jig	H57SU000049 (STEP 5.2)	F57RP1264041-1.0
4	035AF000228F	Outboard Lower Jointstrap (crown & corner fittings) - STBD	Drill Jig	H57SU000049 (STEP 5.2)	F57RP1264041-1.0
4	035AF000227F	Outboard Lower Jointstrap (crown & corner fittings) - PORT	Drill Jig	H57SU000049 (STEP 5.2)	F57RP1264041-1.0
4	051AF000350F	Upper Aerolating Angles setting - STBD	Jig	H57SU000049 (STEP 5.15)	F57RP1264041-1.0
4	051AF000349F	Upper Aerolating Angles setting - PORT	Jig	H57SU000049 (STEP 5.15)	F57RP1264041-1.0
4	051AF000352F	Lower Aerolating Angles setting - STBD	Jig	H57SU000049 (STEP 5.15)	F57RP1264041-1.0
4	051AF000351F	Lower Aerolating Angles setting - PORT	Jig	H57SU000049 (STEP 5.15)	F57RP1264041-1.0

After the drilling and riveting to realize the union of the components, the assembly of the elements with the jigs of the Stage 5.

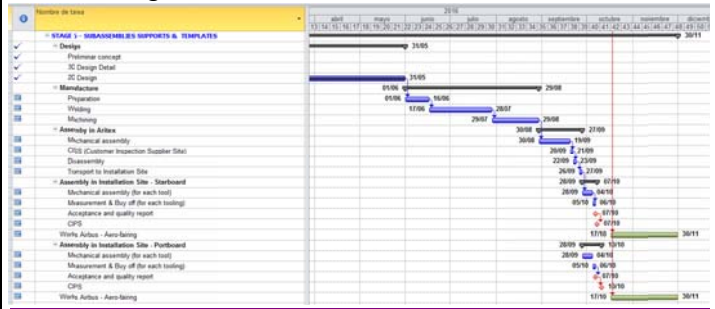
For Stage 5 a series of jigs and drilling templates were manufactured to complete assembly of the wing elements.

Nº REF	DESCRIPTION	Qty	
035AF000267F 035AF000268F	Buttstrap drill templates -- PORT& STBD	Manual Drilling Preferred	14+14 
505AF000361F 505AF000362F	Lifting and handling TE -- PORT& STBD		1+1 
520AF000363F 520AF000364F	Lower Aero Fairing Support Jig- PORT& STBD	Support frame and positioning tool-ing for lower centre fairing Section. - To carry the weight of the part, set the part correctly and hold in position during the drilling of the cover attachment angles and frame 3 & 7	1+1 

Schedule Stage 4



Schedule Stage 5



The following table also includes the jigs for Stage 5

STAGE	TDF NUMBER	DRAWN TOOLING DESCRIPTION	TYPE	S.I. NO. AND BUILD PHILOSOPHY STEP	BUILD PHIL. ISSUE
5	520AF000303F	Transition Structure Trailing Edge Support Jig - Port	Holding Fixture	H57SU000051-A (STEP 1)	F57RP1258460-3.0
5	520AF000304F	Transition Structure Trailing Edge Support Jig - Stbd	Holding Fixture	H57SU000051-A (STEP 1)	F57RP1258460-3.0
5	520AF000362F	Transition Structure Trailing Edge Sling - Stbd	Sling	H57SU000051-A (STEP 1)	F57RP1258460-3.0
5	520AF000361F	Transition Structure Trailing Edge Sling - Port	Sling	H57SU000051-A (STEP 1)	F57RP1258460-3.0
5	035AF000268F	Buttstrap drill templates - Stbd	Drill Jig	H57SU000051-A (STEP 3)	F57RP1258460-3.0
5	035AF000267F	Buttstrap drill templates - Port	Drill Jig	H57SU000051-A (STEP 3)	F57RP1258460-3.0
5	035AF000284F	Fairing Block Mirror Template Drill Jig - Stbd	Drill Jig	H57SU000050 (4.3 STEP 1)	F57RP1259642-2.0
5	035AF000283F	Fairing Block Mirror Template Drill Jig - Port	Drill Jig	H57SU000050 (4.3 STEP 1)	F57RP1259642-2.0
5	035AF000292F	Slant Rib Drill Jig - Stbd	Drill Jig	H57SU000050 (4.4.9 STEP 2)	F57RP1259642-1.0
5	035AF000291F	Slant Rib Drill Jig - Port	Drill Jig	H57SU000050 (4.4.9 STEP 2)	F57RP1259642-1.0
5	051AF000288F	3mm Spacers around LE - Stbd	Jig	H57SU000050 (4.4.5.2 STEP 2)	F57RP1259642-1.0
5	051AF000287F	3mm Spacers around LE - Port	Jig	H57SU000050 (4.4.5.2 STEP 2)	F57RP1259642-1.0
5	520AF000280F	Sub Assembly holding Fixture - Stbd	Jig	MULTIPLE STEPS	F57RP1259642-2.0
5	520AF000279F	Sub Assembly holding Fixture - Port	Jig	MULTIPLE STEPS	F57RP1259642-2.0
5	520AF000364F	Lower Aero Fairing Support Jig	Holding Fixture	4.2.1.1	F57RP1262998-4.0
5	520AF000363F	Lower Aero Fairing Support Jig	Holding Fixture	4.2.1.1	F57RP1262998-4.0
5	520AF000366F	Aft Aero Fairing Support Jig	Holding Fixture	4.2.3.1.1	
5	520AF000365F	Aft Aero Fairing Support Jig	Holding Fixture	4.2.3.1.1	
5	040AF000367F	Z Crest Hole Finding Tools	Drill Bush	TBC, NEW ADDITIONS TO TOOLING MATRIX	

After the manufacture and assembly of the equipment for the Stage 5, these were measured and put to the point in Aritex, they were sent to Tarbes where Airbus made use of them.

Results

a) Timeline & main milestones

The activities covered by JIF4FLIGHT & JIF2LAND were initially scheduled to finish end of 2013. However the challenges arising from the BLADE led to revisit the initial plan to accommodate with the delays encountered by the overall programme. Specifically, the complexity of the work led to limit the activities within JIF4FLIGHT to the first 3 Stages, the Stage 4 & 5 being addressed by JIF2LAND project.

The final planning of JIF2LAND is depicted below. Design and manufacturing activities resp. for Stage 4 & 5 culminated in the delivery and assembly on-site resp. in December 2016

b) Environmental benefits

Our direct contribution has been based on creating a productive process for short series jigs with an efficient cost. A process of disassembly and assembly for short production and very specific that has given us new ideas and concepts for this type of operations, which will imply an effective final cost and solutions that contribute to the sustainability of the environment.

The jigs made are 100% recyclable materials and in the final stage of the project will seek their re-use in other applications. The main environmental impact of the project does not lie in our contribution to it, but the final result of the project, the final objective, is the step to test the laminar flow in the wings. This Blade test will give a wide spectrum in energy saving and environmental care and will be a clear and palpable example of the objectives achieved.

c) Dissemination / exploitation of results

The dissemination will be effective when the full contribution of JIF4FLIGHT and JIF2LAND to BLADE will be known i.e. after completion of the aircraft assembly. As such a specific dissemination will be made by end 2017. The results and development of the project will be widely disseminated throughout the aeronautical community, as well as other potential sectors. The technical results and knowledge acquired are already being used by our technicians in other aeronautical market projects.

d) Communication

The dissemination of the expected results of the project will be carried out when the full contribution of both JIF4FLIGHT & JIF2LAND will be known by end 2017.

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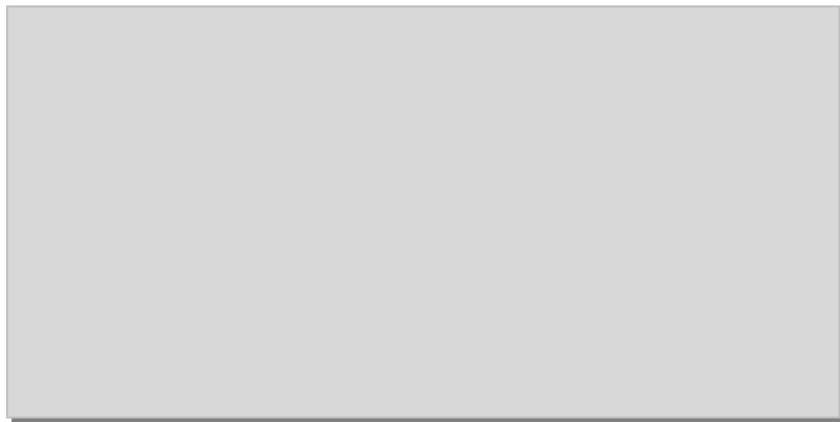


Figure nbr: Title

Project Summary

Acronym: JIF2LAND

Name of proposal: Final Assembly Line Assembly Jigs and Fixtures for flight test demonstrator

Involved ITD Smart Fixed Wing Aircraft ITD

Grant Agreement: 641543 // CS-GA-2013-641543

Instrument: Clean Sky

Total Cost: 516.737,80-€

Clean Sky contribution:

Call: SP1-JTI-CS-2013-03

Starting date: 01/09/2014

Ending date: 31/12/2016

Duration: 28 months

Coordinator contact details: Alex Mateu
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Participating members ARITEX/EURECAT