



**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**

**European Commission**  
Research Directorates



# **Call for Proposals:**

## **CLEAN SKY RESEARCH and TECHNOLOGY DEVELOPMENT PROJECTS (CS-RTD Projects):**

### **Call Text**

Call Identifier  
**SP1-JTI-CS-2010-02**

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## Document track changes

<i>Page/topic</i>	<i>Original</i>	<i>Correction or modification</i>



## Clean Sky Joint Undertaking Call SP1-JTI-CS-2010-02

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### Introduction

Via the Calls for Proposal, Clean Sky aims to incorporate Partners to address very specific tasks which fit into the overall technical Work Programme and time schedule.

Due to the nature of these tasks, the Call is not set up using a set of themes, but it is conceived as a collection of very detailed Topics. The Call text therefore consists of a set of topic fiches, attached here.

Each Topic fiche addresses the following points:

- Topic manager (not to be published)
- Indicative start and Indicative End Dates of the activity
- Description of the task
- Indicative length of the proposal (where applicable)
- Specific skills required from the applicant
- Major deliverables and schedule
- Maximum Topic Budget value
- Remarks (where applicable)

**The maximum allowed Topic budget relates to the total scope of work. A Maximum funding is also indicated.**

Depending on the nature of the participant, the funding will be between 50% and 75% of the Topic maximum budget indicated. It has to be noted that the Topic budget excludes VAT, as this is not eligible within the frame of Clean Sky.

### Eligibility criteria

All applicants are requested to verify their actual status of "**affiliate**" with respect to the members of the relevant ITD for whose topic(s) they wish to submit a proposal. Applicants who are affiliated to any leader or associate of an ITD will be declared not eligible for the topics of that ITD.

Refer to art.12 of the Statute (*Council Regulation (EC) No 71/2007 of 20 December 2007 setting up the Clean Sky Joint Undertaking*) and to page 8 of the Guidelines.



The Topics proposed by the ITDs are listed in the next table.

Identification	ITD - AREA - TOPIC	topics	VALUE	MAX FUND
JTI-CS-ECO	Clean Sky - EcoDesign	0	0	0
JTI-CS-GRA	Clean Sky - Green Regional Aircraft	0	0	0
JTI-CS-GRC	Clean Sky - Green Rotorcraft	0	0	0
JTI-CS-SAGE	Clean Sky - Sustainable and Green Engines	0	0	0
JTI-CS-SFWA	Clean Sky - Smart Fixed Wing Aircraft	4	5.900.000	4.425.000
JTI-CS-SFWA-01	Area01 – Smart Wing Technology		1.400.000	
JTI-CS-2010-2-SFWA-01-021	MEMS accelerometer for wing behaviour measurement		600.000	
JTI-CS-2010-2-SFWA-01-022	MEMS gyrometer for wing behaviour measurement		800.000	
JTI-CS-SFWA-02	Area02 – New Configuration		0	
JTI-CS-SFWA-03	Area03 – Flight Demonstrators		4.500.000	
JTI-CS-2010-2-SFWA-03-002	Starboard leading edge and upper cover design and manufacturing		3.700.000	
JTI-CS-2010-2-SFWA-03-003	Krueger Flaps Design and Manufacture		800.000	
JTI-CS-SGO	Clean Sky - Systems for Green Operations	0	0	0
JTI-CS-TEV	Clean Sky - Technology Evaluator	0		
		topics	VALUE	FUND
		<b>totals (€)</b>	<b>4</b>	<b>5.900.000</b>
				<b>4.425.000</b>

### Thresholds:

As indicated in section 4.6 of the *"Rules for Participation and Rules for Submission of Proposals and the related Evaluation, Selection and Award Procedures"*, each proposal will be evaluated on 6 criteria.

For a Proposal to be considered for funding, it needs to pass the following thresholds:

- **Minimum 3/5** score for each of the 6 criteria,  
**AND**
- **Minimum 20/30** total score

**Only one Grant Agreement (GA) shall be awarded per Topic.**

### Calendar of events:

- **Call Launch: 30 March 2010**
- **Call close: 30 June 2010, 17:00**
- Evaluations (indicative): 15-16 July 2010
- Start of negotiations (indicative): 01 August 2010
- Final date for signature of GA by Partner: 15 October 2010
- Final date for signature of GA by Clean Sky JU: 15 November 2010



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### **Contacts:**

All questions regarding the topics published in this Call can be addressed to:

**[info-call-2010-02@cleansky.eu](mailto:info-call-2010-02@cleansky.eu)**

All questions received until end of May 2010 will be answered.

Questions having a general value, either on procedural aspects or specific technical clarifications concerning the call topics, when judged worth being disseminated, will be published in a specific section of the web site ([www.cleansky.eu](http://www.cleansky.eu)).

All interested applicants are suggested to consult periodically this section, to be updated on explanations being provided on the call content.

**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**  
**Eco Design**

## Clean Sky - EcoDesign

Identification	ITD - AREA - TOPIC	topics
JTI-CS-ECO	Clean Sky - EcoDesign	<b>0</b>

No topics from EcoDesign are included in this call.

**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**  
**Green Regional Aircraft**

**Clean Sky - Green Regional Aircraft**

Identification	ITD - AREA - TOPIC	topics
JTI-CS-GRA	Clean Sky - Green Regional Aircraft	<b>0</b>

No topics from Green Regional Aircraft are included in this call.

**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**  
**Green Rotorcraft**

**Clean Sky - Green Rotorcraft**

Identification	ITD - AREA - TOPIC	topics
JTI-CS-GRC	Clean Sky - Green Rotorcraft	<b>0</b>

No topics from Green Rotorcraft are included in this call.



**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**  
**SAGE**

## **Clean Sky - Sustainable and Green Engines**

<b>Identification</b>	<b>ITD - AREA - TOPIC</b>	<b>topics</b>
JTI-CS-TEV	Clean Sky - Sustainable and Green Engines	<b>0</b>

No topics from Sustainable and Green Engines are included in this call.



**Clean Sky Joint Undertaking**  
**JTI-CS-2010-02**  
**Smart Fixed Wing Aircraft**

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## Clean Sky - Smart Fixed Wing Aircraft

Identification	ITD - AREA - TOPIC	topics	VALUE	MAX FUND
JTI-CS-SFWA	Clean Sky - Smart Fixed Wing Aircraft	4	5.900.000	4.425.000
JTI-CS-SFWA-01	Area01 – Smart Wing Technology		1.400.000	
JTI-CS-2010-2-SFWA-01-021	MEMS accelerometer for wing behaviour measurement		600.000	
JTI-CS-2010-2-SFWA-01-022	MEMS gyrometer for wing behaviour measurement		800.000	
JTI-CS-SFWA-02	Area02 – New Configuration		0	
JTI-CS-SFWA-03	Area03 – Flight Demonstrators		4.500.000	
JTI-CS-2010-2-SFWA-03-002	Starboard leading edge and upper cover design and manufacturing		3.700.000	
JTI-CS-2010-2-SFWA-03-003	Krueger Flaps Design and Manufacture		800.000	
		<b>topics</b>	<b>VALUE</b>	<b>FUND</b>
		<b>totals (€)</b>	<b>4</b>	<b>5.900.000</b>
				<b>4.425.000</b>



## Description Sheet SFWA-01-016

CfP Nr.	Title	Start Date	End Date
JTI-CS-2010-2-SFWA-01-016	<b>MEMS accelerometer for wing behavior measurement</b>	01.07.2010	28.06.2012

### 1. CfP Description

The subject of this CfP is the design of a MEMS accelerometer for SFWA purpose.

Accelerometers are to be installed on the wing structure, and, associated with gyros, to offer very promising measurement capabilities, in terms of wing bend and torsion measurements, both in static and dynamic modes. This allows for a large bandwidth measurement of the wings' eigenmodes and a real time active control, and can also be used for health monitoring purposes.

Preliminary key features are : MEMS device for sake of cost and reliability, pendulous closed loop as a proven concept, some self-test functionalities, measurement range up to 10 g's with a bias stability of 1,5 mg (composite 1 year) and 1500 ppm SF(composite 1 year), bandwidth no lower than 200 Hz, vibration rectification below 25  $\mu\text{g/g}^2$ , noise lower than 2  $\mu\text{g}/\sqrt{\text{Hz}}$ , digital output, Warm Up transient lower than 10  $\mu\text{g}/\text{mn}$  under 0,5°C/mn after initial turn on short term transient.

### 2. Special Skills, certification or equipment expected from the applicant

- The applicant has to have a full ISO 9001 & 14001 certification
- The applicant should have a proven background in building sensors and/or components for aeronautics
- The applicant should have a proven background in MEMS technology and accelerometer system design and qualification
- Industrial production infrastructure : proven manufacturing track records is expected

### 3. Major Deliverables and schedule

Del. Ref. Nr.	Title	Description (if applicable)	Due date
01	Architecture Report	Description of technical sensor concept with key features (measurement concept, electronics principle, MEMS design)	01.01.2011
02	Feasibility Report	Functional evaluation of 5 demonstrators	01.07.2011
03	Evaluation methodology	Evaluation methodology report	01.01.2012
04	Test report of demonstrator	Test report of demonstrator	01.03.2012
05	Test report of 10 sensors	Test report of 10 tested and qualified sensors within specification given in CfP description	28.06.2012
06	Data sheet	Performance assessment of developed sensor	28.06.2012



## Clean Sky Joint Undertaking JTI-CS-2010-2-SFWA-01-016

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### 4. Value of CfP workpackage

The total value of biddings for this work package shall not exceed

**€ 600 000**  
**[six hundred thousands euro]**

Please note that VAT is not applicable in the frame of the CleanSky program

### 5. Remarks

*Internal SFWA reference: D1.3.6-01*

**Micro-Electro-Mechanical Systems (MEMS)** is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology.



**Description Sheet SFWA-01-017**

CfP Nr.	Title	Start Date	End Date
JTI-CS-2010-2-SFWA-01-017	<b>MEMS gyrometer for wing behavior measurement</b>	01.07.2010	01.04.2012

**1. CfP Description**

The subject of this CfP is the evaluation of the potential of MEMS gyro technologies issued from industrial application for SFWA purpose.

Gyrometers are to be installed on the wing structure, and, associated with accelerometers, to offer very promising measurement capabilities, in terms of wing bend and torsion measurements, both in static and dynamic modes. This allows for a large bandwidth measurement of the wings' eigenmodes and a real time active control, and can also be used for health monitoring purposes.

The activities shall include:

- Evaluation of applicant's MEMS gyrometer technology on a significant number (10) of selected device issued from their best state of the art design, with reference to requirement specifications:
  - Long term stability including thermal modelling residue < 100°/h
  - Short term stability on 2 mn including thermal modelling residue < 10°/h
  - Noise < 0.1 °/s RMS, 0 to 100 Hz
- Definition of working plan to improve current design and target the required performance. Classical targeted drift value is 100 °/h. This work will be analysed in connection with the specifications in progress (provided at the end of the previous task),
- Preliminary design work: design improvement, like mechanical and/or electronic evolution, and process improvement, like cherry picking,
- Data sheet of the expected MEMS gyro according to the preliminary studies.

**2. Special Skills, certification or equipment expected from the applicant**

- The applicant has to have a full ISO 9001 & 14001 certification,
- The applicant should have a proven background in MEMS technology, design and qualification,
- The applicant should have a proven background in designing and manufacturing sensors and/or components for industrial applications,
- The applicant should have a strong background in supplying MEMS sensors to safety critical applications (eg. automotive, medical, avionics),
- The applicant should have a history in supplying MEMS sensors to aeronautics industry.
- Industrial production infrastructure : proven volume manufacturing track records is expected



### 3. Major Deliverables and schedule

Del. Ref. Nr.	Title	Description (if applicable)	Due date
01	Data sheet step 1	Data sheet of current design according to the key requirement for the application	01.07.2010
02	Assessment of 10 selected sensors	Test data of 10 tested and qualified sensors based on current design.	01.02.2010
03	Assessment Report	Detailed assessment report of current technology	01.03.2011
04	Working plan	How to improve current design	01.04.2011
05	Preliminary design report	Studies results, preliminary design of the modified sensor	01.10.2011
06	Data sheet step 2	Detailed performance specification of planned sensor	01.04.2012

### 4. Value of CfP workpackage

The total value of biddings for this work package shall not exceed

**€ 800 000**  
[eight hundred thousands euro]

Depending on the content of applications, this amount could be shared between two partners.

Please note that VAT is not applicable in the frame of the CleanSky program

### 5. Remarks

*Internal SFWA reference: D1.3.6-03*

**Micro-Electro-Mechanical Systems (MEMS)** is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology.

As a general guide, it is foreseen that the length of proposals **for this topic** will be approximately 15 pages (depending on the applicant's need to adequately explain the proposal). In this context, please note also the instructions on minimum font and margin sizes and other matters in the document "*Rules for Participation and Rules for Submission of Proposals and the related Evaluation, Selection and Award procedures*".



## Description Sheet SFWA-03-002

CfP topic number	Title	Start Date	End Date
JTI-CS-2010-2-SFWA-03-002	Starboard leading edge and upper cover design and manufacturing	01.07.2010	01.12.2013

### 1. Topic Description

#### Introduction

Natural Laminar Flow [NLF] is one of the key technologies to reduce Aircraft drag and fuel consumption. However, its application on commercial aircraft requires achieving very good surface quality. Any defect (waviness, steps, gaps...) could trigger the transition of the boundary layer to turbulent conditions.

This CfP is about the design and manufacturing of the starboard leading edge and the upper cover of a NLF wing.

The current baseline is that the leading edge should be metallic and the upper cover should be composite.

The flight test demonstrator aims to validate that a 2-piece wing concept (leading edge + upper cover) can lead to the required level of aerodynamic surface quality to achieve laminar flow.

This CfP is therefore a crucial contributor to the success of the flight test demonstration.

External shape, loads, materials and interfaces will be provided after the selection process.

In order to keep a laminar boundary layer, this part will have to meet demanding requirements on surface quality and assembling tolerances. These tolerances will also be specified at a later stage.

#### Wing geometry:

Total span is around 8,5 meters for a chord (leading edge+ upper cover) between 2 meters and 4 meters.



## Description

This CFP includes the detailed design and manufacturing of the following outer wing parts:

- Upper skin (composite)
- Stringers (composite)
- Rib feet (composite)
- Spar cap (composite)
- D-nose (metallic)
- LE ribs (metallic)
- Sub-spar (tbc) (metallic)
- Joint/attachment brackets (metallic)

1 - It includes, for design:

- Upper covers and LE Ribs FE-Models, to be delivered to Airbus for validation and integration in an overall outer wing and A/C FEM
- Design (drawings and models) up to "DFM".
- Stress analysis and results.
- Inputs to DMU (.CATPart files + .CATProduct, CATIA V5 R18 format), to be delivered to Airbus Configuration Manager for integration in the overall outer wing and A/C DMU.
- Liaising with Partners in charge of components in interface.
- Liaising with Airbus for FTI integration
- Contribution to Flight Clearance dossier (inc. V&V applied to manufactured parts)

**Note:** The selected partner will be provided with A-scheme. Any other proposed innovative concept will need to reach TRL3 (Technology Readiness Level 3) to demonstrate it is mature enough to be applied on the flight demonstrator.

2 - It includes, for manufacturing:

- Drawing sets to support DFM
- Purchase of material
- Manufacturing processes and tooling description
- Component manufacturing, including support to FTI installation (e.g.: flush mounted sensors, pressures taps, hot films, t° sensors, etc...).
- Assembly of sub-components
- Verification of waviness achievements links with TDD.
- Contribution to Flight Clearance dossier (inc. V&V applied to manufactured parts)

Final surface treatment isn't part of the CFP scope of work.

3 - it includes also logistics aspects:

- Choice of transportation mean(s)
- Any tooling needed for transportation (design/manufacturing/supply)
- Component transportation to assembly site, with, if needed, support from Airbus transportation expertise.
- Accompaniment in component delivery and handling





**Inputs:**

- TDD: Surface Quality Requirements
- FE-Models, including loads
- DBD
- Design principles and stress methods requirements
- Outer wing jig shape
- Material data
- FTI installation requirements
- A-scheme

**Outputs:**

- Drawing sets and inputs for DMU (CATPart files)
- Component FE-Models
- Outer wing components: upper covers and LE
- Transportation to Aernnova assembly site
- Inputs for Flight Clearance dossier
- V&V dossier, including stress justification and verification.

## 2. Special Skills, certification or equipment expected from the applicant

- The applicant shall have a sound industrial background in manufacturing and designing leading edge devices.
- The applicant has to have a full ISO 14001 certification.
- Given the short amount of time available, it is preferable that the applicant comply with Airbus procedures.
- The applicant shall have confidential agreement with Airbus.

## 3. Major Deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
01	B-scheme drawings	.CATpart & .CATProduct & BOM (Maturity B) & Frontier drawings	28/02/2011
02	C-Scheme drawings	.CATpart & .CATProduct & BOM (Maturity B) & Frontier drawings	30/10/2011
03	Finite Element Models		
04	Stress dossier	Stress sheet	
05	Components delivery	Delivery to assembly site	30/04/2012
06	Flight clearance dossier		30/03/2013



## Clean Sky Joint Undertaking JTI-CS-2010-2-SFWA-03-002

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### 4. Topic value (€)

The total value of biddings for this work package shall not exceed

**€ 3 700 000,00**

**[three million seven hundred thousands euro]**

Please note that VAT is not applicable in the frame of the CleanSky program

### 5. Remarks

*Internal SFWA reference: D1.3.6-05*

Acronyms:

DMU: Digital Mock-Up

DFM : Design For Manufacturing

FEM: Finite Element Models

LE : Leading Edge

**NOTE:** The outer wing assembly will be performed by AERNNOVA in their Vitoria facilities in Spain. The partner will have to deliver their components directly there.

As a general guide, it is foreseen that the length of proposals **for this topic** will be approximately 40 pages (depending on the applicant's need to adequately explain the proposal). In this context, please note also the instructions on minimum font and margin sizes and other matters in the document "*Rules for Participation and Rules for Submission of Proposals and the related Evaluation, Selection and Award procedures*".



## Description Sheet SFWA-03-003

CfP topic number	Title	Start Date	End Date
JTI-CS-2010-2-SFWA-03-003	Krueger Flaps Design and Manufacture	01.07.2010	01.12.2013

### 1. Topic Description

#### Introduction

Natural laminar flow [NLF] is one of the key technologies to reduce aircraft drag and fuel consumption. However, its application on commercial aircraft requires a protection of the leading edge against insect contamination during low altitude phases.

**This CfP is about the design and manufacturing of Krueger flaps for the two wings of the Flight Test Demonstrator.**

The flight test demonstrator aims to validate that Krueger flaps are efficient at insect-shielding.

This CfP is therefore a crucial contributor to the success of the flight test demonstration.

External shape, loads, materials and interfaces will be provided after the selection process.

#### Wing geometry:

The total span of the flaps is around 2 meters. They will cover the inner part of the outer wing.

The flaps shall be fixed and will be bolted on the wing for a few flight test hours. The aim is to verify the Krueger flaps' efficiency in protecting the leading edge from insect contamination during take-off phases



## **Description**

This CFP includes the detailed design and manufacturing of the following outer wing parts:

- Krueger flaps (metallic)
- Interface struts

1- It includes, for design:

- Krueger flaps FE-Models, to be delivered to Airbus for validation and integration in an overall outer wing and A/C FEM
- Design (drawings and models) up to "DFM".
- Stress analysis and results.
- Inputs to DMU (.CATPart files + .CATProduct, CATIA V5 R18 format), to be delivered to Airbus Configuration Manager for integration in the overall outer wing and A/C DMU.
- Liaising with Partners in charge of components in interface.
- Liaising with Airbus for FTI integration
- Contribution to Flight Clearance dossier (inc. V&V applied to manufactured parts)

2- It includes, for manufacturing:

- Drawing sets to support DFM
- Purchase of material
- Manufacturing processes and tooling description
- Component manufacturing, including support to FTI installation
- Assembly of sub-components
- Contribution to Flight Clearance dossier (inc. V&V applied to manufactured parts)

3- it includes also logistics aspects:

- Choice of transportation mean(s)
- Any tooling needed for transportation (design/manufacturing/supply)
- Component transportation to assembly site, with, if needed, support from Airbus transportation expertise.
- Accompaniment in component delivery and handling

Inputs:

- TDD: Surface Quality Requirements
- FE-Models, including loads
- DBD
- Design principles and stress methods requirements
- Krueger flaps shape
- Material data
- FTI installation requirements

Outputs:

- Drawing sets and inputs for DMU (CATPart files)
- Component FE-Models
- Outer wing components: upper covers and LE
- Transportation to Airbus assembly site
- Inputs for Flight Clearance dossier
- V&V dossier, including stress justification and verification.



## 2. Special Skills, certification or equipment expected from the applicant

- The applicant shall have a sound industrial background in manufacturing and designing leading edge devices.
- The applicant has to have a full ISO 14001 certification.
- Given the short amount of time available, it is preferable that the applicant comply with Airbus procedures.
- The applicant shall enter a confidential agreement with Airbus.

## 3. Major deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
01	B-scheme drawings	.CATpart & .CATProduct & BOM (Maturity B) & Frontier drawings	28/02/2011
02	C-Scheme drawings	.CATpart & .CATProduct & BOM (Maturity B) & Frontier drawings	30/10/2011
03	Finite Element Models		
04	Stress dossier	Stress sheet	
05	Krueger flaps delivery		30/12/2012
06	Flight clearance dossier		30/03/2013

## 4. Topic value (€)

The total value of biddings for this work package shall not exceed

**€ 800 000,00**  
**[eight hundred thousands euro]**

Please note that VAT is not applicable in the frame of the *CleanSky* program

## 5. Remarks

*Internal SFWA reference: D1.3.6-09*

### Acronyms:

DMU: Digital Mock-Up  
DFM : Design For Manufacturing  
FEM: Finite Element Models  
LE : Leading Edge

NOTE: The outer wing assembly will be performed by AERNNOVA in their Vitoria facilities in Spain. The partner will have to deliver their components directly there.

As a general guide, it is foreseen that the length of proposals **for this topic** will be approximately 25 pages (depending on the applicant's need to adequately explain the proposal). In this context, please note also the instructions on minimum font and margin sizes and other matters in the document "*Rules for Participation and Rules for Submission of Proposals and the related Evaluation, Selection and Award procedures*".

**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**  
**Systems for Green Operations**

**Clean Sky - Systems for Green Operations**

Identification	ITD - AREA - TOPIC	topics
JTI-CS-SGO	Clean Sky - Systems for Green Operations	<b>0</b>

No topics from Systems for Green Operations are included in this call.

**Clean Sky Joint Undertaking**  
**Call SP1-JTI-CS-2010-02**  
**Technology Evaluator**

## Clean Sky - Technology Evaluator

Identification	ITD - AREA - TOPIC	topics
JTI-CS-TEV	Clean Sky - Technology Evaluator	<b>0</b>

No topics from Technology Evaluator are included in this call.