

**CLEAN SKY**  
**1st INTERIM EVALUATION**  
  
**PANEL REPORT**

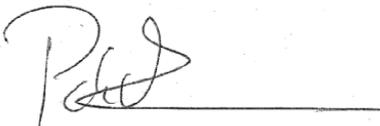
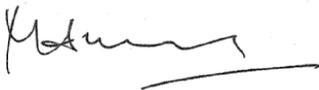
*15 December 2010*

## Table of Contents

Signatures .....	iii
Executive summary .....	iv
1 Introduction .....	1
2 Clean Sky - Overall progress and effectiveness .....	3
2.1 A slower than anticipated start .....	3
2.2 A new robust work plan .....	3
2.3 Overall programme effectiveness: Need to focus activities on demonstrators .....	4
2.4 Targeting of Grant Agreements for Partners .....	4
2.5 Progress towards environmental targets.....	5
2.6 Clean Sky response to previous evaluations .....	5
2.7 Clean Sky response to changing industrial strategies and research needs .....	5
2.8 Effectiveness of the work plan beyond 2015 .....	6
2.9 Clean Sky budgetary effectiveness .....	6
2.10 Clean Sky as a contributor to European aeronautics development.....	6
2.10.1 Effectiveness in promoting participation.....	6
2.10.2 Coordination with FP7, SESAR and National Programmes .....	6
3 Clean Sky Joint Undertaking - Organization and efficiency .....	8
3.1 Appropriateness of the CS legal framework .....	8
3.2 Appropriateness of the JU internal rules .....	8
3.3 Efficiency of the JU Executive Team organisation and procedures.....	9
3.4 Efficiency of ITD organizations and procedures.....	9
3.5 Efficiency of communication .....	10
3.5.1 Internal communication.....	10
3.5.2 External communication.....	10
4 Quality .....	11
4.1 Quality of activities.....	11
4.2 Members' and Partners' quality.....	11
4.3 Quality of Calls for Proposals .....	11
5 Clean Sky ITDs and Technology Evaluator - Progress and effectiveness .....	13
5.1 Smart Fixed Wing Aircraft (SFWA-ITD).....	13
5.2 Green Regional Aircraft (GRA-ITD).....	13
5.3 Green Rotorcraft (GRC-ITD) .....	15
5.4 Systems for Green Operations (SGO-ITD).....	15
5.5 Sustainable and Green Engine (SAGE-ITD).....	16
5.6 EcoDesign (ED-ITD) .....	18
5.7 Technology Evaluator (TE).....	19
6 List of recommendations.....	20
7 Annexes.....	I
7.1 Composition of the 1 <sup>st</sup> Interim Evaluation Panel.....	I
7.2 Interviews and sources of information.....	II
7.2.1 JU Executive Team participants to interviews .....	II
7.2.2 ITD participants to interviews .....	II
7.2.3 Interaction with the Chairman of the Governing Board.....	II
7.2.4 Reference documents used in the 1st Interim Evaluation: .....	III
7.3 List of acronyms .....	V

## Signatures

### Panel Members

 <b>Enzo BERTOLINI</b>	 <b>Dietrich ECKARDT</b>
 <b>Peter HECKER (Rapporteur)</b>	 <b>Ivonne HERRERA</b>
 <b>Manfred HORVAT</b>	 <b>Michel HUGUET (Chairman)</b>

## Executive summary

The document presents the results of the 1<sup>st</sup> Interim Evaluation of the Clean Sky Joint Undertaking (CSJU) performed at the end of 2010. The CSJU has been set up in 2008 implementing a Joint Technology Initiative (JTI) in accordance with Article 187 of the “Treaty on the Functioning of the European Union” (ex Article 171 TEC). The CSJU is planned to end in 2017.

The CSJU is focused on demonstrating innovative, environmentally-friendly technologies in all segments of civil air transport in order to contribute to the high level goals set in the Strategic Research Agenda (SRA) developed by the Advisory Council for Aeronautics Research in Europe (ACARE). It includes large commercial aircraft, regional aircraft, helicopters, and technologies such as engines, systems and materials’ life cycle. The overall value of the contributions within CSJU reaches EUR 1,600 million.

In line with Council Regulation 071/2008, the 1<sup>st</sup> Interim Evaluation has assessed the quality and efficiency of the CSJU and the progress towards the objectives set. The evaluation was performed by a Panel of six independent experts according to the Terms of Reference, developed by the Directorate General for Research of the European Commission.

The Panel finds the concept of the CSJU appropriate for its objectives and recognises a number of achievements:

- Setting up the CSJU as an entirely new Public Private Partnership (PPP) organization has been a significant success on its own.
- The initial ‘top-down’ work plan has been complemented by a detailed ‘bottom-up’ work plan. The corresponding schedule foresees achieving key demonstrator targets within the Clean Sky (CS) time frame. Furthermore, the CS timing for demonstrators seems well-synchronized with industrial deployment strategies.
- The CSJU is successfully stimulating developments towards environmental targets. Technical progress has been identified. It is noted that the gains achieved so far are difficult to quantify at this early stage of the programme.
- The CSJU has been highly successful in attracting a high level and wide participation from all EU key industries and a large number of SMEs. CS has led to new collaborations and the participation of new organisations is thus enhancing European integration.
- The coordination with EC Framework Programme and the SESAR Joint Undertaking appears to be organised in an effective manner.

However, significant delays as compared to the initial plans have accumulated because of difficulties in establishing the CSJU internal procedures and regulations as well as building up the teams. In particular, the definition and implementation of processes setting up and running a PPP under the rules of a Community Body was highly challenging.

Further delays of technical nature have been identified by the ‘bottom-up’ work plan in June 2010; for some demonstrators those delays are in excess of 2 years.

The Panel notes that the slow start of the CSJU can to a great extent be imputed to the lack of preparedness, both administrative and technical, when starting the Joint Undertaking.

Regarding the setup of potential future PPPs the Panel recommends the following measures:

- The Panel sees clear requirements for special provisions for the implementation and the specific operating needs of Joint Undertakings for Joint Technology Initiatives such as Clean Sky and for developing a specific framework regulation for PPPs as foreseen by Article 185 of the Financial Regulation<sup>1</sup>. It supports the recommendations of the Sherpa

---

<sup>1</sup> Council Regulation (EC, Euratom) 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities.

Group's report<sup>2</sup> “that the current legal framework be streamlined to fit the purposes of setting up and implementing future JTIs”. In this respect, the current ‘Community Body’ status of JTIs should be reviewed to enable a more efficient partnership between public and private players.

- For future Joint Technology Initiatives, a clear separation should be made between formal establishment and formal start of technical activities. The Commission should ensure that prior to the formal start of technical activities, the resources and administrative tools are essentially available and that an in-depth review of the technical programme is carried out.
- The European Commission should ensure that a sound balance is maintained between highly integrated programmes aiming at short-term industrial applications and more fundamental research initiatives targeting innovative concepts. To this end, the European Commission should define a clear strategy utilizing the different funding instruments.

A full set of detailed recommendations is listed at the end of this report (see section 6). According to the panel, the most important recommendations are the following:

- Due to the expected change in aircraft replacement strategy, the ACARE targets could no longer be achieved in the original 2020 timeframe. This change heightens the relevance of regulatory measures to accelerate the introduction of new ‘green’ technologies demonstrated in CS.
- Top priority and prime objective of CS is to achieve demonstrator targets within the CS time frame. The Panel recommends streamlining programme activities giving an overriding priority to advanced technology demonstration. This implies diverting some resources from fundamental technology development to advanced technology demonstration. The Panel recommends an adapted budget planning so that e.g. engine flight testing can be covered from the Clean Sky budget.
- Means to actively recover delays and mitigate future delays should be implemented within and across the six main activities of the programme. Some measures are recommended in the main report.
- Some areas of CS are addressing operations, which are highly affected by particular interests of stakeholder groups. An early and close interaction with airlines, air navigation service providers, airports, etc. is recommended to ensure successful deployment.
- The envisaged developments involve safety-critical systems and operations. Consequently, certification issues need to be considered at early design and development stages already.
- In order to facilitate the CSJU management process, the Panel recommends the Governing Board to focus on strategic decisions and to increase the level of delegation of routine management issues to the Executive Director. The executive power of the Executive Director has to be strengthened towards managing all programme activities. Responsibility for the implementation of the agreed executive team maximum budget should be fully given to the Executive Director.
- The resources required for integration and interface activities should be specifically identified in each of the individual work plans. In addition, there is an urgent need for a matrix of interconnected time schedules and deliverables.
- A detailed roadmap of technical progress should be established in order to compare achievements against the plan. This roadmap should include key decision-making points and technological milestones.
- The role of the Technology Evaluator (TE) in providing guidance to Integrated Technology Demonstrators (ITDs) should be emphasized. Therefore, the TE should be given a more

---

<sup>2</sup> "Designing together the 'ideal house' for public-private partnerships in European research", January 2010

pro-active responsibility in its interactions with ITDs. The Panel remarks that the current limitation in interactions between TE and ITDs could be significantly mitigated should demonstrator and TE activities be carried out beyond the current deadline of end 2015.

- In a development programme like CS, the availability of a contingency budget is necessary to cover unforeseen developments.
- CS should improve its visibility to the general public.

The Panel assesses the CSJU as an ambitious European initiative with the potential to become a new model of a public-private-partnership. The CSJU should be continued with special attention towards adhering to the main objectives and the work plans.

# 1 Introduction

Clean Sky (CS) aims at reducing the impact of aviation on the environment while at the same time safeguarding competitiveness as well as economic growth of the aeronautical sector in Europe. The decision on FP7<sup>3</sup> underlined the particular relevance of European Technology Platforms (ETP) for industrial research. In a very limited number of cases, the scope of RTD objectives and the scale of required resources justified setting up industry-driven long term Public Private Partnerships (PPP) in the form of Joint Technology Initiatives (JTI) as a result of the work of ETPs.

In the decision concerning the FP7 ‘Cooperation’ specific programme, certain aspects of the research agenda in aeronautics and air transport were identified as requiring a Joint Technology Initiative<sup>4</sup> and resulted in establishing the Clean Sky Joint Undertaking (CSJU). CSJU is a PPP between the European Commission and aeronautical industry established as a Community Body by Council Regulation (EC) 071/2008<sup>5</sup> on the basis of Article 187 of the TFEU<sup>6</sup> and in accordance with the Financial Regulation<sup>7</sup>.

Clean Sky works towards objectives and targets defined in the Strategic Research Agenda (SRA) of the ETP ACARE<sup>8</sup> and its updates.

According to the ACARE SRA, reducing the environmental impact of aviation has high priority and, accordingly, the CSJU works towards ambitious objectives with aims of achieving substantial technological changes by 2020 (with reference to year 2000):

- 50% reduction of CO<sub>2</sub> emissions through drastic reduction of fuel consumption,
- 80% reduction of NO<sub>x</sub> (nitrogen oxide) emissions,
- 50% reduction of external noise,
- ensuring a ‘green’ product life cycle, making substantial progress in reducing the impact of manufacturing, maintenance and disposal of aircraft and related products on the environment.

The CSJU addresses the implementation of innovative, environmentally friendly technologies in all segments of civil air transport, including large commercial aircraft, regional aircraft, helicopters, and in all supporting technologies such as engines, systems and materials’ life cycle.

The Founding Members of the CSJU are the European Union, represented by the European Commission (EC), and 12 Integrated Technology Demonstrator (ITD) leaders and their Associates<sup>9</sup>. The Founding Members and Associates of Clean Sky in addition to the European Union represent 86 organisations in 16 countries, among which 54 industries, including 20 SMEs, 15 Research Centres, and 17 Universities.

The EC will make a financial contribution up to an amount of EUR 800 million and the other Members of the CSJU shall provide resources in kind equal to this contribution. EUR 400 million

---

<sup>3</sup> Decision No 1982/2006/EC of the European Parliament and of the Council of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013). OJ L412/1-41, 30.12.2006. pp. 1, 8, 9, 38, 41

<sup>4</sup> Council Decision of 19 December 2006 concerning the specific programme “Cooperation” implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013). OJ L 54/30-80, 22.2.2007. pp. 61 and 78

<sup>5</sup> COUNCIL REGULATION (EC) No 71/2007 of 20 December 2007 setting up the Clean Sky Joint Undertaking. OJ L 30/1-20, 4.2.2008;

see: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:030:0001:0020:EN:PDF>

<sup>6</sup> TFEU: Treaty on the Functioning of the European Union; Article 187 (ex-Article 171 of the EC Treaty): The Union may set up joint undertakings or any other structure necessary for the efficient execution of Union research, technological development and demonstration programmes.

<sup>7</sup> Council Regulation (EC, Euratom) 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities.

<sup>8</sup> <http://www.acare4europe.com/>

<sup>9</sup> See Council Regulation, pp. 17-20

of the EC contribution shall be allocated to the leaders of Integrated Technology Demonstrators (ITDs) and EUR 200 million to Associates. EUR 200 million shall be allocated to Partners selected by way of competitive Calls for Proposals (CfP).

The CSJU activities are organised in six technology areas – ‘Integrated Technology Demonstrators (ITDs)’<sup>10</sup>:

Vehicle ITDs:

- Smart Fixed Wing Aircraft (SFWA) – 24% of the EC contribution,
- Green Regional Aircraft (GRA) – 11% of the EC contribution,
- Green Rotorcraft (GRC) – 10% of the EC contribution.

Transverse ITDs:

- Systems for Green Operations (SGO) – 19% of the EC contribution,
- Sustainable and Green Engine (SAGE) – 27% of the EC contribution, and an ITD that is transverse to all ITDs:
- EcoDesign (ED) - 7% of the EC contribution.

Technology Evaluator (TE):

- In addition, 2% of the EC contribution will be devoted to the Technology Evaluator with the aim of assessing environmental impact and benefits of technologies arising from individual ITDs.

Most of the research, technological development and demonstration activities will be carried out by the Members of Clean Sky. The Members’ activities are formally covered by Grant Agreements for Members (GAM). There is one amendment to the GAM per year and per ITD which specifies work plan, resources and budget. Subcontractors are selected by Members through Calls for Tender.

A part of the Clean Sky programme using 25% of the EC contribution will be performed by Partners selected through Calls for Proposals. There are about four CfPs per year with in the average 35 topics per call, about 400 k€ and 1.7 Partners per proposal. Successful CfPs lead to the signature of Grant Agreement for Partners (GAP). The average GAP duration is 20 months.

The ITD and TE activities are coordinated and integrated by an Executive Team led by the Executive Director (ExD). The CSJU supervisory body is the Governing Board (GB) with representatives from the European Commission, ITD leaders and one Associate per ITD. The GB receives technical advice from the Scientific and Technical Advisory Board (STAB). For each ITD, a Steering Committee is in charge of supervision and monitoring of the activities. The General Forum provides the platform for involving all participants of CS’ Members and Partners.

---

<sup>10</sup> The percentages of the Community contribution are preliminary numbers as set in the CSJU Council Regulation.

## 2 Clean Sky - Overall progress and effectiveness

### 2.1 A slower than anticipated start

The CSJU was set up in February 2008 under the legal framework of Article 185 of the EC Treaty and had to follow the provisions for a 'Community Body' as defined under the EU Financial Regulation. The procedures required a Commission proposal, decision by the Council and an opinion of the European Parliament. These formal procedures did not allow the balanced involvement of all Partners in this part of the process.

The start of the CSJU activities was slow as compared to initial plans due to the time needed to establish and implement the rules of procedures and the time required to build up the working teams for both ITDs and the Joint Undertaking Executive Team. In the case of the Executive Team, the ExD was appointed only in April 2009 and took office in late September 2009. The Joint Undertaking (JU) became administratively autonomous in November 2009 and the Executive Team became fully operational during the first half of 2010.

Thus, some of the essential tools and resources for the CSJU to operate efficiently have become available only late in 2009.

Ramping up of technical activities was also slow. In some ITDs, delays were experienced in relation to the selection of relevant technologies. Many technical options were considered initially and had to be reviewed and evaluated before a down-selection process could be initiated and the resources better focused on the selected technologies. The 1<sup>st</sup> CfP was issued in July 2009 when the rules for participation and the operating procedures, and in particular the role of industry in the evaluation process, could be agreed.

***Recommendation R2.1:*** *Noting that the slow start of the CSJU can to a great extent be imputed to the lack of preparedness, both administrative and technical, when establishing the JU, the Panel recommends that for future Joint Technology Initiatives, a clear separation should be made between formal establishment and formal start of technical activities. The Commission should ensure that prior to the formal start of technical activities, the resources and administrative tools are essentially available and that an in-depth review of the technical programme is carried out.*

### 2.2 A new robust work plan

Due to initial delays, the need for a thorough re-examination of the demonstrator programme became clear in 2009. A refined bottom-up, task by task analysis of the demonstrator work plan has been carried out by the engineering teams of the Members and has resulted in a new, more realistic and more robust schedule. The results of this analysis are described in a document entitled 'CS programme strategy, Status at May 2010' which was approved by the GB in June 2010 only.

The task by task analysis has revealed delays for demonstrators at TRL 5-6 (Technology Readiness Level) ranging from a few months to over 2 years as compared to initial plans.

The Panel is concerned about some large demonstrator delays and expects that recovery of the rate of progress will become visible already in 2010.

The Panel notes that in spite of delays, the JU claims that most CS objectives remain achievable within the CS time frame and the general schedule situation appears acceptable, especially if the whole year 2016 is kept as a reserve. Nevertheless, the Panel warns that future delays should be expected in a development programme such as CS.

***R2.2:*** *The Panel recommends that means to actively recover delays and mitigate future delays should be identified within and across ITDs as a risk mitigation strategy. This could include design reviews, aiming at less risky and less time-consuming technical solutions, early down-selection of technologies and focus of resources on these technologies, reallocation of resources to allow parallelising of activities, overtime work and shift work.*

### 2.3 Overall programme effectiveness: Need to focus activities on demonstrators

Although a down-selection process has been implemented already, the Panel feels that some ITDs are still overloaded with too many low TRL activities in view of the demonstrators' main target of TRL 5-6 and above.

**R2.3:** *Top priority and prime objective of CS is to achieve demonstrator targets within the CS timeframe. It is still necessary for CS to focus more strongly its efforts on this priority. A review of activities should therefore be carried out with the following objectives:*

1. *Streamlining of ITD activities towards achieving demonstrators. The focus on demonstrators should result in improvements of some test programmes.*
2. *Selecting a few promising, lower TRL activities to be pursued without impacting demonstrators' timing and resources.*
3. *The two approaches - lower TRL improvements and advanced technology demonstration - should be clearly separated to improve programme management effectiveness.*

**R2.4:** *Considering the range of TRLs covered by CS, the Panel proposes the Commission to define a clear strategy of using the different funding instruments from upstream research to highly integrated demonstrator programme for the setup of future PPPs.*

The Panel underlines that streamlining of activities was already one of the key recommendations of the 2008 review<sup>11</sup>.

These recommendations imply that a number of lower priority activities will have to be discontinued. The Panel considers this as necessary for the success of CS.

### 2.4 Targeting of Grant Agreements for Partners

An increase in work output is expected from GAPs. However, the Panel is concerned about the amount of resources required for CfPs, the supervision of GAPs and the evaluation and integration of GAP results. Without adequate resources in the JU Executive Team and ITDs, the work load associated with CfPs and GAPs is likely to become a bottleneck. This remark is all the more important since at the time of the 1<sup>st</sup> Interim Evaluation, only 17% of the Partners' budget has been committed and only 8% has been paid. The bulk of GAP-related activities remains therefore to be committed and more than 90% of expected GAP results remain to be evaluated and integrated. Remarking further that about 150 GAPs have already been signed or are under negotiation, the Panel is concerned of an uncontrolled situation with a too large number of CfPs and associated GAPs.

The Panel understands that the large number of GAPs is justified by the Commission's strategy for wider participation, in particular involving SMEs. However, the Panel wishes to reiterate that the top priority of CS must remain demonstrators and in achieving progress in high TRL activities as required for demonstrators.

**R2.5:** *The Panel recommends a review of the activities which remain to be covered by GAPs. This review should be carried out jointly by the JU Executive Team and the ITDs. It should lead to a demonstrator-focused plan for future GAPs, which should be resource-loaded to cover both ITD and JU Executive Team activities, taking into account the administrative load and the requirements for technical supervision and integration. This review and the streamlining review of ITD activities have the same objectives and should be carried out jointly.*

Progress reporting on GAPs tends to be focused on the achievement of deadlines. This should be complemented by a qualitative assessment of reported results, or in other words, an assessment of the contributions of GAP results towards CS objectives.

**R2.6:** *The Panel recommends that GAP progress reporting should monitor success in achieving the objectives. GAP assessments must include clear conclusions regarding the use to be made of the results and the necessary interactions within ITDs and possibly also across ITDs.*

---

<sup>11</sup> Clean Sky technical assessment – May 2008

The Panel underlines that CfPs and GAPs cover tasks, but do not guarantee technical success. Failure to deliver may cause significant schedule slips.

**R2.7:** *The Panel recommends that the CSJU as well as the ITD management include the risks related to GAPs into the overall risk assessment.*

## 2.5 Progress towards environmental targets

At the time of the 1<sup>st</sup> Interim Evaluation, there is evidence that the ITDs have achieved technical progress. However, it is too early to quantify progress towards overall environmental targets. The tools required for such an evaluation, i.e., the TE models will not be available, even in a preliminary form, before mid 2011. However, the Panel notes that CS has carried out a redefinition of environmental objectives<sup>12</sup>. These new objectives are still fully in line with initial plans, but provide a more detailed and specific breakdown of environmental targets.

## 2.6 Clean Sky response to previous evaluations

The Panel notes the sound recommendations of the 2006 study<sup>13</sup> and 2008 review such as: streamlining of ITD activities towards high TRL technologies, definition of common managerial tools and management structures for the ITD, definition of interface tables between ITD etc. Many of these actions have either been ignored or insufficiently implemented at the start of the CSJU.

The Panel acknowledges that the situation has partially improved in the meantime: the status of follow-up actions in relation to the recommendations of the 2008 review is recorded. Some recommendations have now been implemented or are in progress.

**R2.8:** *The Panel regrets that the implementation of many of the 2008 review recommendations has been delayed too long. The Panel recommends that the ExD should be responsible for the follow-up of review recommendations for both JU and ITDs.*

## 2.7 Clean Sky response to changing industrial strategies and research needs

The Panel is informed that some changes in aircraft fleet replacement strategy are under consideration by Airbus and probably Boeing. In 2007, when the CS objectives, key demonstrators and relevant schedules were defined, the fleet replacement for 'single aisle' aircraft was scheduled for 2018-2020. Due to the current workload of aircraft manufacturers and the market situation, the introduction of advanced, environmentally improved products is likely to be postponed to 2025 and beyond.

This observation is not new. In the past 40 years, several approaches to introduce new, fuel-saving technologies in aviation have been interrupted or prevented, not the least by fuel price fluctuations and a lack of sustainable target setting in industrial planning.

In addition, recent engineering difficulties of aircraft and engine Original Equipment Manufacturers will hamper the introduction of all-new technologies in the future. As a consequence, the Panel recognises that without short-term alternative product strategies, the achievement of the ACARE targets in 2020 will become questionable.

For the delayed, new generation of aircraft to be in service in 2025, development should start in about 2018 when CS results on engines, both Open Rotor and turbofan types, and on laminar wings should be available. The Panel notes that the updated CS schedule with demonstrator completions in 2015-2016 seems in this respect well-synchronised with the expected new fleet replacement requirements.

**R2.9:** *The Panel points to the fact that, due to the expected change in aircraft replacement strategy, the ACARE targets could no longer be achieved in the original 2020 timeframe. This change*

---

<sup>12</sup> Updated ITD environmental targets and 2010 initial results, issued 24<sup>th</sup> September 2010 by TE

<sup>13</sup> "Study on the proposed Aeronautics JTI structure and rules of participation", 25 June 2006, Bertolini, Huguet

*heightens the relevance of regulatory measures to accelerate the introduction of new 'green' technologies demonstrated in CS.*

**R2.10:** *In addition to reacting to market forces, the GB should carry out regular reviews of research needs and policy priorities. This could be achieved by involving external stakeholders from science, industry and policy on a consultancy basis through the STAB so as to support the identification of such needs and shape the priorities.*

## 2.8 Effectiveness of the work plan beyond 2015

CS is established until end December 2017, but the CSJU policy so far is to consider 2016 as slack for unexpected problems and 2017 as 'non-operational' to allow an orderly winding up of the programme. Thus, the deadline for completing demonstrator activities including flight tests is end 2015. Although the Panel understands and supports the use of challenging deadlines, it is concerned that too demanding targets may prevent otherwise useful activities. For example, TE should be tested and applied in 2016/17 and should provide feedback to ITDs.

**R2.11:** *The Panel recommends a task by task review of the necessary slack for safeguarding completion and of the time for winding up. It recommends making a fuller use of the CS programme until 2017 where appropriate. This applies especially to the TE, as it would provide an opportunity for feeding back to the ITDs beyond demonstrators.*

## 2.9 Clean Sky budgetary effectiveness

The Panel notes that the CS budget is fully contained within FP7 and that all FP7 commitments must be made before the end of 2013. In the case of CS, this means that the draft budget covering the 2013-2017 period must be prepared in January 2012 and, following negotiations with the EC, the detailed budget breakdown among ITDs should be adopted by the GB at the end of 2012, i.e., 5 years before the end of CS. In practical terms, this means that commitment appropriations for GAMs have to be fixed before the end of 2012 to cover the period until 2017.

The 2013-2017 period entails high risk with manufacturing and testing activities for demonstrators. Provisions must be made allowing necessary actions to cover, e.g. for modifications or repair of prototype components, modifications or repair of test equipment and any changes in test plans.

**R2.12:** *The Panel considers that in a development programme like CS, the availability of a contingency budget is necessary to cover unforeseen developments.*

## 2.10 Clean Sky as a contributor to European aeronautics development

### 2.10.1 Effectiveness in promoting participation

The Panel is impressed by the high quality participation in CS. CS is clearly achieving its goal of grouping the top stakeholders in aeronautics around a project of common European interest in a PPP. CS Members include the 12 Founding Members, about 30 Members' Affiliates and about 80 Associates, some of which are grouped in clusters. CS has clearly led to new collaborations and the participation in projects of new organisations and thus has enhanced European integration.

The CfP process has been successful in attracting a wide participation. There are currently about 270 CS Partners. The share in funding of SMEs is particularly high at 42%. The remaining 58% is equally shared between large industries and research institutions/academia.

### 2.10.2 Coordination with FP7, SESAR and National Programmes

The coordination between CS and FP7 is implemented by the Commission and the CSJU. When a CfP is prepared and topic descriptions are proposed by the CS ITDs, the Commission checks for possible complementarity, overlap or duplication with ongoing projects in FP7. The reverse check is done when an FP7 call is to be launched. The check has to take into account the TRL proposed and the breadth of scope, which can be different for topics covering the same field.

**R2.13:** *The coordination between CS and FP7 relies largely on CSJU and EC staff to identify possible complementarity, overlap or duplication between CS and FP7 activities. This is appropriate in view of the technical knowledge that is required to assess these activities. However, the Panel recommends implementing a formal process coordinating FP7 work programme and CS between the EC and the CSJU.*

Specific coordination is reported between CS and the Single European Sky Air Traffic Management Research Joint Undertaking (SESAR JU). While SESAR is focused on research and development in the Air Traffic Management (ATM) domain, CS is essentially developing vehicle technologies. However, SGO within CS is investigating Mission and Trajectory Management for the future environmentally-friendly aircraft with internal links to GRA and SFWA. On the other hand, SESAR is performing R&D for today's aircraft to be compliant to future concepts of operation. Consequently, both activities need to be aligned. An instrument for coordination has been implemented by connecting the SGO steering committee to the airborne systems section of SESAR ('Systems Liaison Office') and connecting the TE Steering Committee to the airframe section of SESAR ('Evaluation Liaison Office').

**R2.14:** *An adequate instrument for coordinating the respective sections of CS and SESAR has been established. However, the effectiveness of this measure should be reviewed within the annual reviews of SGO and TE in order to achieve a maximum level of coherence.*

In addition, CS has links with national programmes through the National States Representative Group (NSRG). The NSRG has an advisory role to CS in particular about interfaces to relevant national research programmes and the identification of potential areas of cooperation. In this context, the CSJU has initiated a process of identifying areas of common funding and of selecting common research topics. This is achieved through thematic meetings which are being organized throughout Europe. It is, however, still too early to evaluate the leveraging effect of CS on national programmes.

**R2.15:** *The Panel notes that the coordination with national programmes through the NSRG appears to be organized in an effective manner. However the Panel found it difficult to quantify the effectiveness of the coordination with national programmes at this early stage. The Panel recommends strengthening national programmes, thus providing additional complementary value.*

### 3 Clean Sky Joint Undertaking - Organization and efficiency

#### 3.1 Appropriateness of the CS legal framework

The Panel considers the JU legal framework as set out in its Statutes<sup>14</sup> to be appropriate, since it provides all the necessary instruments for a PPP. However, the setting up of the CSJU as a ‘Community Body’ under the current EU Financial Regulation<sup>15</sup> implied a cumbersome process, excluding a balanced involvement of the private partners in the process.

**R3.1:** *The Panel supports the recommendations of the Sherpa Group<sup>16</sup> “that the current legal framework should be streamlined to fit the purposes of setting up and implementing future JTIs. In this respect, the current ‘Community Body’ status of JTIs should be reviewed in terms of the degree to which it enables balanced and trust-based partnerships with private players to be set up” and supports the ‘special body’ option also favoured by the Sherpa Group. The Panel sees clear requirements for special provisions for the implementation and the specific operating needs of Joint Undertakings for Joint Technology Initiatives such as Clean Sky and for developing a specific framework regulation for PPPs as foreseen by Article 185 of the Financial Regulation.*

To the Panel, the CSJU infrastructure appears well-suited to achieve the CS objectives. The Panel notes, however, that improvements in JU internal rules and procedures (as already proposed within the 2006 study and the 2008 review) are required to enable CS to achieve its full potential. Further recommendations are provided in the next section.

#### 3.2 Appropriateness of the JU internal rules

The current Community Body status of the CSJU entails that it follows rules and uses procedures not common to industrial practice. These rules and procedures are constraining and they tend to inhibit achieving the CS objectives. The Panel considers that more flexibility in the JU internal rules and procedures could enhance the CS efficiency and reduce the risk of future delays. Consequently, the Panel recommends a number of measures as indicated below:

- 1) Amendments to the GAMs are negotiated every year, even though activities covered by GAMs are multi-annual. The annual budget process introduces undesirable boundaries and rigidity in the CS multi-annual work plan. This rigidity is worsened by the fact that the annual budget tends to become frozen well before the start of the year.

**R3.2:** *The suggestion from the ExD to negotiate multi-annual GAMs is supported by the Panel. The Panel notes that a multi-annual budget is likely to be implemented after 2013 due to the absence of new commitments beyond FP7. The Panel recommends implementing multi-annual budgets as soon as possible in advance of 2013.*

- 2) There is a need for more flexibility in the management of GAMs, in particular in allowing some amendments. The related budget transfers should be initiated, negotiated and implemented by the ExD. This would remove the constraint of synchronization with GB meetings and speed up the implementation of necessary decisions.

**R3.3:** *The Panel recommends reviewing the level and type of GAM-related decisions which could be delegated to the JU Executive Director.*

- 3) **R3.4:** *In order to facilitate the CS management process, the Panel recommends the GB to focus on strategic decisions and to increase the level of delegation of routine management issues to the ExD. The executive power of ExD has to be strengthened towards ITDs.*

---

<sup>14</sup> Annex I of Council Regulation (EC) 71/2008 of 20 December 2007 setting up the Clean Sky Joint Undertaking

<sup>15</sup> Council Regulation (EC, Euratom) 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities.

<sup>16</sup> JTI Sherpas’ Group: Designing together the „ideal house“ for Public Private Partnerships in European research. Final report. January 2010

- 4) **R3.5:** *Responsibility for the implementation of the agreed executive team maximum budget should be given fully to the ExD.*

The Panel wishes to point out that the above recommendations are in the spirit of the already mentioned report of the JTI Sherpa Group.

### 3.3 Efficiency of the JU Executive Team organisation and procedures

The Panel considers the structure of the JU Executive Team to be adequate to fulfil its objectives. However, the Panel criticises that a systematic programme management process with graphic control tools ('dashboard') was not yet implemented at the time of the present evaluation. This fact alone is important in view of the financial exposure of this programme. A Management Manual describing internal rules and procedures has now been adopted and full implementation is announced.

Systematic in-depth progress monitoring is through ITD Steering Committees which meet every 2 months. The CS Executive Team Project Officers (POs) have an important coordinating role across ITDs. Their monitoring function within ITDs is exercised mostly for annual work plan and report preparation. POs follow work progress, but are not involved in the close supervision of work at Members' or Partners' facilities according to the description of PO's role. Supervision of field work is fully delegated to the ITDs themselves. This is judged acceptable by the Panel since ITDs have a vested interest in and are committed to achieve the CS goals.

The Panel recognises the heavy work load of the JU Executive Team by JU management tasks, CfPs, grant agreements, reviews, and ITD monitoring. It is concerned that the JU Executive Team could become a bottleneck to CS progress.

**R3.6:** *The Panel considers staff numbers as being too limited and recommends a review by the Governing Board of staff requirements to ensure that the Executive Team can exercise in full its coordinating and monitoring functions.*

The Panel notes the procedure used to verify that Members' in-kind contributions to CS match the cash contribution from the Commission. The verification is carried out at 3 levels, by audits inside the Members' organizations, by a CS audit on the basis of the documents provided and by an ex-post audit of Members' expenses against the specified GAM activities. These verifications tend to be purely monetary while the assessment of the technical value of the Members' in-kind contribution is implicitly covered by the work of POs.

The Panel considers the general principles of the verification procedure to be acceptable, but notes that detailed rules have not been presented yet to the Governing Board.

### 3.4 Efficiency of ITD organizations and procedures

ITD work breakdown structures have been developed and the role of participants has been assigned. Information provided by ITD co-leaders fostered the general impression that ITDs have achieved a good control of their activities.

However, the management processes and tools differ from ITD to ITD. There is no evidence of harmonized management approaches, including resource allocations, milestone achievements, deliverable measurements and budget spending. In case of interconnected ITD developments, correlated time schedules and deliverables should be available including critical paths.

**R3.7:** *The Panel recommends setting up a coherent risk management at JU level, broken down per ITD. This would allow checking the work plans for consistency within and throughout the ITDs. In addition, a more formalised reporting methodology within the annual reviews is suggested in order to allow a more systematic and comparable assessment of achievements against objectives.*

Supervision and integration of the work inside ITDs of a large number of Members and a still increasing number of Partners will require substantial staff resources. Resolution of interfaces is another area which is notoriously time- and resource-consuming. Unless properly anticipated, these integration and interface activities could lead to further schedule slips.

**R3.8:** *The Panel recommends that the resources required for integration and interface activities be specifically identified in each of the ITDs' work plans. In addition, there is an urgent need for a matrix of ITD interconnected time schedules and deliverables.*

Some Members are organised via clusters. On one hand clusters maximise synergies and facilitate participation of several Members. On the other hand, clusters increase the complexity and administrative work of CS.

**R3.9:** *The Panel recommends carrying out a review by the cluster members to analyse if the current cluster and individual representation in parallel is suitable for an efficient work. A recommendation for future PPPs is expected to follow.*

### 3.5 Efficiency of communication

#### 3.5.1 Internal communication

Communication between and inside the JU Executive Team and ITDs appears to be quite satisfactory. Apart from structural channels, in particular ITD Steering Committees, there is a good day to day direct link between ITD Leaders and JU POs which is of prime importance for the early identification of issues and interfaces. The effectiveness of this direct link is made possible by and relies on the technical competence of JU POs.

General communication with all stakeholders is achieved through the General Forum. The General Forum is particularly useful for Partners without a direct access to ITD Steering Committees. However, attendance to the 1<sup>st</sup> Forum in June 2010 was disappointingly low.

The JU is now considering reshaping the General Forum with workshops and working groups on specific topics to attract more Partners and in particular SMEs. The Panel supports this approach.

**R3.10:** *The Panel encourages the ITDs to maximise the use of teleconferences in addition to face-to-face meetings to facilitate communication. In addition, internal e-learning tools to accommodate new participants to CS like implemented e.g. in SESAR are proposed.*

#### 3.5.2 External communication

The document 'CSJU communication and dissemination strategy - Action plan 2010' presented to and adopted by the GB in June 2010 describes the related task in detail.

In general, the Panel commends the JU Executive Team for an effective implementation of the communication and dissemination strategy. However, the extensive JU communication plan is going to prove a burden for the JU and in particular for a single Communication Officer in the JU Executive Team.

**R3.11:** *Some Members' Public Relation Officers may temporarily be seconded to the JU for special communication actions. Communication to the technical community is apparently good, but could be improved by increased CSJU participation in conferences. In view of the limited capacity of the JU Executive Team, a policy regarding the CSJU representation at conferences by Members and Partners should be agreed.*

**R3.12:** *The Panel recommends that any publication prepared and published in the frame of the CSJU clearly acknowledges the relations to and the funding from the CSJU. The CS Executive Team should prepare a standard format for such acknowledgements which should also become part of the contractual obligations as defined in the GAMs and GAPS.*

**R3.13:** *CS should improve its visibility to the general public. CS Members and Partners should promote CS visibility, especially through interviews at facilities where achievements can be shown.*

## 4 Quality

### 4.1 Quality of activities

No in-depth assessment of the overall quality of the activities was attempted by the Panel. Specific technical examples on each ITD were presented. These examples provided evidence of the high quality of CS activities.

In general, CS activities have a significant originality in introducing innovative 'green' technologies. The work builds on previous research and brings the research a step forward. CS demonstrators and deliverables are intended to be closer to the final product, thus reducing the gap between research and industrialisation. Close relation to certification authorities is essential.

Deliverable quality is specified in ITD quality plans and controlled by ITDs. The JU Executive Team has insufficient resources for comprehensive quality checks. Therefore, ITDs set and verify their own quality standards. This is the usual situation for development programmes within a single organisation.

**R4.1:** *The Panel considers that the use of public funding makes it mandatory for the CSJU to carry out sample quality audits of ITD deliverables through independent reviewers or expert organizations. The audits should cover quality, maturity, integration towards demonstrators and compliance against the objectives.*

**R4.2:** *The Panel recommends establishing a detailed roadmap of technical progress in order to compare achievements against the plan. It should include key decision points, technological milestones and a schedule of TRL achievements. In addition, the Panel notes that TRL definitions are provided in several documents, but TRL understandings might differ. Therefore, a consistent use of TRL should be achieved.*

### 4.2 Members' and Partners' quality

CS Members and Partners represent a high level aeronautical competence. Partners are selected through a comprehensive CfP process which ensures that the required technical and management expertise are available.

### 4.3 Quality of Calls for Proposals

The CfP process has proved effective by initiating technological activities and promoting a wide involvement of SMEs and universities. So far, only 14% of CfPs have remained without accepted proposals; a good score in the opinion of the Panel.

Four CfP cycles were observed by Independent Observers, who delivered detailed reports on their work. In the first two CfP cycles, confidentiality and conflict of interest issues were identified, but have been sorted out successfully. However, continuous attention has to be paid to this issue also in the future, especially on interaction between ITD topic managers and evaluators from industry.

Independent observers and some Partners have remarked that CfPs sometimes lacked clarity in the work descriptions and that there were significant variations in the level of completeness. Difficulties were also encountered due to late changes in the topic descriptions from ITDs.

Excessive PO time is absorbed by the preparation of CfPs, in managing the evaluation of submitted proposals and negotiations of GAPS. These issues are being addressed by the JU Executive Team.

A first measure implemented by the CSJU is to better screen and select topics which should be handled via subcontracts rather than via CfPs. A second important measure is to improve the clarity, specificity and accuracy of Descriptions of Work and ensure stability of these descriptions. A checklist exists in the CSJU Management Manual and is to be used both by the ITD topic manager and the CSJU POs to check the quality and consistency of the topic description. Checks to eliminate duplications across ITDs are also necessary.

The Panel supports the measures taken by the CSJU Executive Team towards improving the efficiency of the CfP procedures and notes that improvements in CfP quality have been acknowledged also by Partners. The Panel welcomes the involvement of Independent Observers and recommends their regular change.

From the Partners' viewpoint, the time needed between submission of proposals and project kick-off meeting is sometimes too long. Further administrative delays may also occur between the kick-off meeting and the signature of the GAP.

***R4.3:** The Panel commends the JU for a successful operation of the CfP process. Nevertheless, more efficient procedures are required and it is recommended to optimize the CfP cycle. In addition, a recovery plan is needed accounting for topics with no proposal.*

## 5 Clean Sky ITDs and Technology Evaluator - Progress and effectiveness

### 5.1 Smart Fixed Wing Aircraft (SFWA-ITD)

The **SFWA-ITD** comprises 3 major work packages.

- The objective of **SFWA1** is to mature passive and active flow control technologies into a multidisciplinary smart wing concept by:
  - development of the passive flow and load control technologies,
  - review of multifunctional load control concepts for a laminar wing design,
  - set up/definition of a generic aerodynamic loads model and of a standard reference,
  - the launch of activities to mature sensors, actuators, and related networks.

In a presentation to the Panel, pictures of an impressive 2x2 m test/trial wing panel demonstrated progress in design and manufacturing of a ‘High Speed Demonstrator Passive’ smart wing.

- The objective of **SFWA2** is to integrate these technologies on overall aircraft level by:
  - preparation of ground demonstrators to validate selected key features of the passive laminar wing,
  - continuing feasibility study for the potential integration of Contra Rotating Open Rotor (CROR) engines with respect to external noise, vibration and certification,
  - the launch of a dedicated SFWA technology assessment work package with interface to the Clean Sky Technology Evaluator.
- The objectives of **SFWA3** ‘Flight demonstration’ are large scale flight tests of passive and active flow and load control solutions at high speed, of high lift solutions at low speed and to demonstrate viability of an innovative, full scale engine concept under operational conditions. A few choices for SFWA flying test beds have been made:
  - The ‘High Speed Demonstrator Passive’ smart laminar wing will be flown onboard the Airbus A340-300 test aircraft, passing the Preliminary Design Review in the 3<sup>rd</sup> quarter of 2010. The flight test was rescheduled by 32 months to the end of 2014.
  - A ‘Low Speed Flight Demonstrator’ is planned to be selected.
  - The Airbus A340-600 aircraft has been chosen for the CROR flight tests. The CROR demo flight test, originally timed for early 2013 was shifted 28 months later into mid-2015; this is in line with the slow advancement of CS activities in general.
  - The engine flight testing has been scheduled in the first planning iteration after the CS programme end. Intermediate schedule adaptations brought this date to 2015. However, demonstration preparation (especially the manufacturing and hardware adaptation) phases appear to be too short.
  - Moreover, it was stated that the present CS budget has within the present volume of 1.6 B€ no financial means to carry out the engine flight testing.

*R5.1: The Panel expressed explicitly the position that the accomplishment of the demonstrator targets are of prime importance for the overall CS success. Consequently, the Panel recommends an adapted budget planning so that engine flight testing will be covered from the Clean Sky budget.*

*The SFWA decision for several A340 size demonstration test vehicles should be reviewed and reassessed not only in view of changed Airbus priorities, but also in favour of a cheaper option. Since a delay of advanced product introduction after 2020 would endanger also the ACARE targets, other demonstration opportunities should be evaluated near-term e.g. the use of a typical GRA configuration for suitable engine concept demonstrations.*

### 5.2 Green Regional Aircraft (GRA-ITD)

GRA is addressing technologies and procedures allowing future regional aircraft to achieve weight reduction, better aerodynamics efficiency and a higher level of operative performance with respect

to year 2000 technology level. It consists of five technological domains: Low Weight Configuration (GRA1, LWC), Low Noise Configuration (GRA2, LNC), All Electric Aircraft (GRA3, AEA), Mission & Trajectory Management (GRA4, MTM) and New Configuration (GRA5, NC).

Well recognized stakeholders of the domain are involved in the ITD: airframers, system suppliers and research organisations. In total, 12 Members representing 33 legal entities participate in this ITD with a total budget of approx. 300M€, 85 participants are expected through CfPs.

A clear rationale for the importance of this specific market segment in achieving the ACARE SRA2 goals was presented convincingly. Besides significant environmental contributions, a strong stimulation for the European competitiveness is expected.

The Panel recognises a clear strategic approach towards the ACARE 2020 goals as stated in the SRA2. Good evidence is provided that environmental targets have been progressed according to the technical progress of GRA so far.

The underlying work programme defines clear paths towards demonstrators. However, the individual pillars are progressing at different speeds and some significant delays are observed. The ITD management identifies the CfP process, the non-availability of data due to intellectual property right issues and impacts from other ITDs as some reasons for the delays. As a consequence, a substantial number of deliverables is delayed. In addition, some activities are on the critical path like e.g. the activities related to the open rotor, flight tests, aircraft modifications and fatigue tests.

A mitigation strategy is proposed by the ITD management. Today, GRA has a high level of confidence that all the demonstration goals and initial objectives are achievable in the timeframe till 2015, in accordance with the original schedule. However, the GRA annual review report 2009 raises concerns that the mitigation strategy is not completely convincing as it does not fully aim at an early catch-up of the delays.

**R5.2:** *The Panel recommends to carefully analyse the current status and the related mitigation strategies, reiterating the recommendations received during the annual GRA review 2009 on the high level of interaction between the various ITDs.*

Adequate coordination processes between GRA and FP7 are reported. However, the alignment strategies to national R&D are not yet implemented. The CfP procedure was reported to have caused some initial delay as it was underestimated in duration. Now a revised planning has anticipated the duration on CfP processes. However, the GRA management would welcome quicker processes.

Strong interactions with other ITDs exist. Consequently, a strong coordination is required to achieve the envisaged exchange of results. In addition, the risk of transferring delays from one to another ITD is immanent. This has occurred already in some Work Packages (WPs). Pending decisions and low levels of maturity regarding the open rotor technology investigated within SAGE is causing delay, driving GRA activities towards the critical path.

The interface between GRA and SGO is reported to be still under negotiation. In addition, the efficiency of some highly distributed and dependent activities like SGO-MAE vs. GRA-AEA and SGO MTM vs. GRA MTM is questioned.

**R5.3:** *The Panel recognises a significant level of dependencies between GRA and other ITDs. The related interfaces are considered to be clearly defined. However, the efficiency vs. the related level of required coordination should be subject to a further review, leading potentially to leaner processes.*

The Panel identifies a large TRL gap to be bridged through GRA activities. A significant number of low TRL technologies are investigated and considered within GRA. The same comment applies to SGO and SFWA. In addition, the understanding of TRLs seems to need more coherence within and across ITDs.

On the other hand, the GRA management team addresses its concern that, within CS as well as at European level, more opportunities for more innovative research and for a wider participation of SMEs, research organisations and universities is required.

***R5.4:** The Panel recognises the concern of a potentially growing, unbalanced situation between high TRL programmes versus upstream research initiatives enabling innovation. The Panel draws the attention of the EC to this concern.*

### 5.3 Green Rotorcraft (GRC-ITD)

GRC focuses on the integration of technologies and demonstration of rotorcraft platforms. Its contribution to ACARE targets relates to the reduction of noise, fuel consumption, CO<sub>2</sub> and NO<sub>x</sub> emissions. The first phase of activity was dedicated to consolidate the work plan, a major task due to the ITD complexity and size. This phase took longer than expected for most of the sub-projects. Considerable efforts have been made to overcome the delays. In the meantime, delays have been reduced and it is appreciated that all active sub-projects present technical developments towards the main objective and demonstrators. The Panel refers to Recommendation **R3.8**.

It is positive that GRC builds on and integrates results from previous Framework Programme projects, but it is noted that delay on deliveries from FRIENDCOPTER had an impact. Concerning participation, GRC gathers helicopter manufacturers, systems suppliers and research institutes. Significant activities have been subject to CfPs. The Panel observed a high number of ineligible proposals. In addition, the process from topic specification to kick-off meeting was considered being too long. The Panel refers to Recommendation **R4.3**.

The Panel recognizes the added value of technical reviews. Recommendations from previous reviews have been analysed and partially implemented. An action list has been prepared and followed for these recommendations. Moreover, the reason for not implementing a recommendation is documented. The ITD has adapted a risk management strategy. The Panel could not identify mechanisms in place to identify changes in research and policy priorities that may have an impact on GRC.

GRC has implemented adequate management structures and procedures. Coordination within and across the ITDs is reported to be satisfactory.

A quality process has been established in GRC. In addition, there is strong involvement from the Project Officer to ensure that the required quality is achieved. Moreover, independent annual technical reviews support further improvements in specific areas. The Panel refers to Recommendation **R4.1**.

Still, there are technologies that have low TRL. In view of budget and time constraints, the ITD should consider focusing on technologies with higher TRL and select only few technologies with low TRL or alternative solutions. The Panel refers to Recommendation **R4.2**.

The topic descriptions of CfPs are very specific and attract SMEs. On the other hand, these specific descriptions leave less room for innovation beyond what is already planned within the ITD.

In conclusion, GRC is a strong ITD to achieve ambitious objectives toward the green rotorcraft demonstrator. The team manages to respond to changing conditions. During the assessment, evidence has been provided of good technical progress. More attention should be given to dissemination activities.

### 5.4 Systems for Green Operations (SGO-ITD)

SGO is addressing two different areas of technology: Management of Aircraft Energy (MAE) and Management of Trajectory and Mission (MTM). Both areas are organized via independent project pillars.

MAE focuses on the development of all-electric equipment system architectures, allowing a more fuel-efficient use of secondary power. In addition, the generation of electrical energy and its distribution to electrical aircraft systems is investigated.

MTM aims at developing technologies and procedures to reduce fuel consumption, emissions and noise by management of trajectories. The work is focused on two different flight phases: the in-flight trajectories including overall missions' profiles and taxiing operations.

The Panel recognises a clear strategic approach towards the ACARE 2020 targets, as stated in the SRA2. Good evidence is provided that environmental targets have been progressed in line with the technical progress of SGO so far.

Well-recognised stakeholders of the domain are involved in the ITD: Airframers, system suppliers and research organisations. In total, 15 Members representing 35 legal entities participate in this ITD with a total budget of approx. 300M€

***R5.5:** The Panel recognizes an impressive set of Partners and Associates involved in the ITD. However, the ITD is addressing an area of operation which is highly affected by particular interests of stakeholder groups like airlines, air navigation service providers, airports, etc. An early and close involvement of these groups is proposed to ensure successful deployment.*

*In addition, the envisaged developments will lead to safety critical systems and operations. Consequently, certification issues need to be considered at early design and development stages already. Therefore, it is recommended to involve certification authorities early and to assess the certifiability of envisaged solutions as early as possible.*

The ITD is highly interconnected with other ITDs. Interfaces exist to GRC, GRA, ED, SFWA and TE. The interaction of the ITDs is designed in such a way that SGO develops technologies and building blocks at lower TRLs in a centralised manner before handing them over to vehicle ITDs. This was the rationale for the initial breakdown between transverse ITDs and vehicle ITDs. Consequently, SGO has no global demonstrator, and each technology is managed individually.

***R5.6:** A significant number of low TRL technologies are addressed in SGO. These technologies are developed from TRL 2 or 3 up to TRL 6 before being transferred to vehicle ITDs. Here, the Panel questions the concept of transversal ITDs, bridging such significant gaps in TRLs. It is proposed to set a clear focus towards high TRL technologies feeding the demonstrators.*

A very intense relation of MTM to SESAR is obvious. MTM is developing technologies and procedures for future 'green' aircraft. Consequently, these must be in line with the future European ATM strategy. Instruments for coordination between SESAR and SGO have been implemented and are starting to be used.

***R5.7:** The foreseen level of coordination is considered appropriate. However, it is recommended to align the complete spectrum of related activities to each other including scenarios, tools, validation strategies and means in order to obtain a common validation baseline and to allow comparable analysis of achievements. It is proposed to consider, at EC level, if an independent supervisory body outside the JUs could improve the coordination of PPPs in closely related domains.*

Good progress towards the definition and development of the demonstrators has been observed. Having planned the ITD 'top-down' in 2008, the ITD management spent significant effort in complementing this planning with a 'bottom-up' approach. This activity resulted in a new planning baseline. Significant achievements have been reported. On the other hand, the first annual SGO review had already identified delays. A process of risk management is implemented at WP level, reporting to the Steering Committee level, but a full risk assessment at ITD level or beyond is not yet fully implemented. The Panel refers to Recommendation **R3.7**.

## 5.5 Sustainable and Green Engine (SAGE-ITD)

The engine demonstrators are:

- SAGE1, Geared Contra-Rotating Open Rotor Demonstrator,
- SAGE2, Geared Contra-Rotating Open Rotor Demonstrator,
- SAGE3, Large 3-Shaft Light-Weight Turbofan Demonstrator,
- SAGE4, Geared Turbofan Demonstrator,
- SAGE5, Turboshaft Demonstrator.

SAGE1 and SAGE2 are led by different industrial organisations. So far, emphasis has been largely on studying various concepts and preparing for the technical work in future years. In addition to the on-going work on three demonstrators launched in 2008, the large 3-shaft demonstrator (SAGE3) and turboshaft demonstrator (SAGE5) were launched in the meantime, while SAGE partnership extension was successfully managed via the Clean Sky CfP no. 1.

#### SAGE1 – Geared Contra-Rotating Open Rotor Demonstrator

The focus for SAGE1 has been on further refinement of demonstrator requirements, developing more detailed understanding of the issues involved in demonstrating open rotor engines and progressing and selecting concepts for the demonstrator. The demonstrator project has progressed in three work streams, i.e. open rotor assembly, core engine and integration and test.

#### SAGE2 – Geared Contra-Rotating Open Rotor Demonstrator

SAGE2 activities resulted in a recent concept change from direct-drive to a geared version, which represents a partial restart and implies additional concerns with respect to the potential duplication of work with public funding.

- With respect to technical activities, the demonstrator requirements' specification was prosecuted and promising concepts at engine level and at engine sub-systems level were screened.
- As a result of the mentioned concept change, SAGE1 and SAGE2 have essential concept technologies in common. In the interviews carried out by the Panel, it was argued that the implied risks in any CROR development justify a certain competitive duplication of activities.

#### SAGE3 – Large 3-shaft Light-Weight Turbofan Demonstrator

The SAGE3 project was launched in January 2009 with the initial aim of identifying candidate technologies for demonstration and application in next generation of medium and large turbofans. Baseline studies of existing technologies were performed by the consortium at the installed engine level and for sub-systems, including the low pressure turbine, the fan system, engine structures, installations and externals, combustors and controls system. Finally, an engine demonstration project was developed for system technologies that could together deliver the environmental performance required for future engine generations.

#### SAGE4 - Geared Turbofan Demonstrator

Activities for SAGE4 continued with study work to define size and operating conditions of a demonstrator vehicle that is supporting future product strategy at its best, - but was also considerably hampered by changing single aisle aircraft market requirements. Consequently, the technical work of the Geared Turbo Fan (GTF) Demonstrator programme deviates from the planned progress, which is also reflected in the resources used. But for all that, technology evaluation has been started and thermodynamic cycle analysis led to a preliminary concept of the engine with a geared turbofan design. The relevant plan of the programme has been established. At present SAGE4 GTF represents together with SAGE3 and SAGE5 one of the few advanced propulsor configurations with firm industrial commitment to be transferred in a commercial product near-term.

#### SAGE5 - Turboshaft Engine Demonstrator

The preliminary designs of all modules of the SAGE5 demonstrator have been initiated with a validation of the architecture and all preliminary designs, especially of the core engine through thermal, mechanical and aerodynamic analysis. Moreover, the validation of the preliminary design of the whole engine study and of the choice of the architecture was carried out in order to verify the promising scope of the specification. In addition, some progress has been made on defining the engine development planning and the partial rig test planning.

***R5.8:*** *The fact that certain demonstrator engine configurations have already been committed to become an industrial commercial product near-term has to be positively acknowledged; however, the Panel recommends careful monitoring of the demonstration contents to prevent a public post-*

*funding of activities which would have happened anyhow out of commercial necessity and commitment.*

**R5.9:** *For a comparative assessment of the various SAGE ground and flight demonstrators, agreement has to be reached amongst the key contributing Members and those responsible for the Technical Evaluator, on what can and should be measured in the tests and how the data evaluation should be carried out to be widely accepted.*

## 5.6 EcoDesign (ED-ITD)

ED concentrates on ‘green’ design, production, use, maintenance, withdrawal and recycling of aircraft, fully in line with goals stated in the ACARE SRA 2; it is broken down into two areas: Eco-Design for Airframe (EDA) and Eco-Design for Systems (EDS, small aircraft).

There is evidence that ED-EDA and ED-EDS are making good technical progress towards the ACARE goals. The consortium has reviewed more than 150 candidate technologies originally; the Panel considers that this number was too high and notes its considerable reduction in the meantime. The progress for both ED-EDA and ED-EDS is not in line with the overall schedule and delays are identified. The ED team revised the schedule without changing the milestones for the demonstrators to mitigate these delays. The plan includes slack on critical path activities. Still, the following issues require further considerations:

- No clear indication of dependencies within and across ITD. It is not possible to assess the effect of combined contributions to the different delays reported.
- No overall view of deliverables for ED-EDA in the activity report including delivery date planned, actual or forecast delivery.

The Panel refers to Recommendation **R2.2**.

ED brings together strong expertise from airframers, system suppliers, R&D research centres and Clusters. The Panel refers to Recommendation **R3.9** with regards to Clusters.

Recommendations from previous evaluations have been considered for both EDA and EDS. A risk management strategy is implemented in a systematic way at work-package level. However, it was not possible to identify mechanisms in place for changes in research and policy priorities that may have an impact on ED.

Significant efforts have been invested to achieve the ED consolidation. A management and quality plan including communication rules, reporting practices and an internal collaborative website have been developed. Nevertheless, the management and structural organizations of the ITDs differ, leading to challenges to identify duplication of work or synergies. A matrix has been introduced, allowing identification of interdependencies within the ITD and across the ITDs. Between SFWA-ITD and ED-ITD synergies have been analysed and changes have been made to eliminate work duplication with SFWA and achieve better results for ED.

In relation to communication, besides personal meetings, there is no evidence of utilization of state-of-the-art tools like web-conference meetings and ED training tools for new project participants. More efforts should be dedicated to transmit information about ED to a wider audience. The Panel refers to Recommendations **R3.10**.

For the Call for Proposals, the participants are subjected to the evaluation process which verifies the adequacy, quality, capabilities and track record of participants. On one side, the proposal is perceived as very specific and it facilitates participation. On the other side, it leaves less room for alternative ideas, limiting the innovative potential of the ITD. The strong participation of industry and SMEs is highly appreciated. However, an unbalanced participation regarding representation of R&D institutions and the participants’ geographical distribution is identified.

In conclusion, ED achieved to bring key expertise together under a common ambitious goal. It is acknowledged that significant efforts have been invested to consolidate the ITD and produce results. However, there is concern regarding the identified delays and their consequences.

## 5.7 Technology Evaluator (TE)

TE has the strategic role in the CS programme of evaluating at three different and independent levels the environmental achievements. In addition, TE is important for the communication strategy of the CSJU including its public image. It has to be pointed out that the TE activities are not carried out in its own right, but serve the monitoring and steering of the CS activities towards the ACARE Strategic Research Agenda.

The start of TE activities was slow, with a kick-off meeting in December 2008. Due also to the time to prepare TE models, the first full assessment of CS is planned by the end of 2011, albeit with a limited set of models. A second assessment will be carried out in a final demonstration by the end of 2015.

In addition to the two main assessments, trade-off studies based on specific requests from the ITD are performed (see below).

The main results achieved by the TE so far are the definition of the TE general requirements and the development of the simulation framework mock up for the GRC case study, to be performed in late 2010.

**R5.10:** *The Panel recognises the information that the TE has recovered from the delays it faced at the end of 2009 and that the internal work can be kept on schedule, meaning that the TE System will be ready for the first assessment in 2011. The Panel recommends monitoring TE progress closely.*

The TE methodology is to establish a ‘reference scenario’ first, corresponding to the Air Transport System of the year 2000 (WP2) and then derive a forecast of its evolution to year 2020. This forecast will consider two cases, a case with and a case without CS environmental benefits in order to clearly identify the CS impact.

Communication between ITDs and TE is critical and some insufficient and late exchanges have been identified regarding ITDs’ inputs to TE. Nevertheless, the late start of the TE causes also delays on other activities beyond TE. It is noticed that interfaces between ITDs and TE are demanding. For example, significant work is invested to clarify interaction between GRC-ITD and TE, causing delays and modifications of the initial plan for GRC.

The Panel emphasizes the need for ITDs to deliver their inputs to TE in strict accordance to the agreed schedule. The Panel appreciates that the JU Executive Team is monitoring these actions closely.

The first TE assessment by the end of 2011 is likely to come too late to impact the definition of demonstrators. Thus, TE will not provide guidance for decision making regarding demonstrators and will merely assess the demonstrators’ integrated environmental impacts towards the end of CS. The Panel concludes that any feedback from TE on ITD activities is, therefore, expected to address trade-off paper studies which are at this stage still undefined.

**R5.11:** *The Panel understands that the feedback role of TE on ITD activities is limited due to the timing of TE assessments. Nevertheless, the role of TE in providing guidance to ITDs should be emphasized. Therefore, TE should be given a more pro-active responsibility in its interactions with ITDs. The Panel remarks that the current limitation in interactions between TE and ITDs could be significantly mitigated, should demonstrator and TE activities be carried out beyond the current deadline of end 2015. This point and the related recommendations are also covered in the section on the work plan beyond 2015.*

## 6 List of recommendations

This section contains the full list of recommendations. The recommendations are numbered according to the chapter, where they have been raised for the first time. The final columns indicate to whom the specific recommendation is mainly addressed to.

Number	Recommendation	JU	GB	EC	Future PPPs
2.1	<i>Noting that the slow start of the CSJU can to a great extent be imputed to the lack of preparedness, both administrative and technical, when establishing the JU, the Panel recommends that for future Joint Technology Initiatives, a clear separation should be made between formal establishment and formal start of technical activities. The Commission should ensure that prior to the formal start of technical activities, the resources and administrative tools are essentially available and that an in-depth review of the technical programme is carried out.</i>				X
2.2	<i>The Panel recommends that means to actively recover delays and mitigate future delays should be identified within and across ITDs as a risk mitigation strategy. This could include design reviews, aiming at less risky and less time-consuming technical solutions, early down-selection of technologies and focus of resources on these technologies, reallocation of resources to allow parallelising of activities, overtime work and shift work.</i>	X			
2.3	<i>Top priority and prime objective of CS is to achieve demonstrator targets within the CS timeframe. It is still necessary for CS to more strongly focus its efforts on this priority. A review of activities should therefore be carried out with the following objectives:</i>  <i>1. Streamlining of ITD activities towards achieving demonstrators. The focus on demonstrators should result in improvements of some test programmes.</i>  <i>2. Selecting a few promising, lower TRL activities to be pursued without impacting demonstrators' timing and resources.</i>  <i>3. The two approaches - lower TRL improvements and advanced technology demonstration - should be clearly separated to improve programme management effectiveness.</i>	X			
2.4	<i>Considering the range of TRLs covered by CS, the Panel proposes the commission to define a clear strategy of utilizing the different funding instruments from upstream research to highly integrated demonstrator programme for the setup of future PPPs.</i>				X
2.5	<i>The Panel recommends a review of the activities which remain to be covered by GAPS. This review should be carried out jointly by the JU Executive Team and the ITDs. It should lead to a demonstrator-focused plan for future GAPS, which should be resource-loaded to cover both ITD and JU Executive Team activities, taking into account the administrative load and the requirements for technical supervision and integration. This review and the streamlining review of ITD activities have the same objectives and should be carried out jointly.</i>	X			

Number	Recommendation	JU	GB	EC	Future PPPs
2.6	<i>The Panel recommends that GAP progress reporting should monitor success in achieving the objectives. GAP assessments must include clear conclusions regarding the use to be made of the results and the necessary interactions within ITDs and possibly also across ITDs.</i>	X			
2.7	<i>The Panel recommends that the CSJU as well as the ITD management include the risks related to GAPs into the overall risk assessment.</i>	X			
2.8	<i>The Panel regrets that the implementation of many of the 2008 review recommendations has been delayed too long. The Panel recommends that the ExD should be responsible for the follow-up of review recommendations for both JU and ITDs.</i>	X			
2.9	<i>The Panel points to the fact that, due to the expected change in aircraft replacement strategy, the ACARE targets could no longer be achieved in the original 2020 timeframe. This change heightens the relevance of regulatory measures to accelerate the introduction of new 'green' technologies demonstrated in CS.</i>			X	
2.10	<i>In addition to reacting to market forces, the GB should carry out regular reviews of research needs and policy priorities. This could be achieved by involving external stakeholders from science, industry and policy on a consultancy basis through the STAB so as to support the identification of such needs and shape the priorities.</i>		X		
2.11	<i>The Panel recommends a task by task review of the necessary slack for safeguarding completion and of the time for winding up. It recommends making a fuller use of the CS programme until 2017 where appropriate. This applies especially to the TE as it would provide an opportunity for feeding back to the ITDs beyond demonstrators.</i>	X			
2.12	<i>The Panel considers that in a development programme like CS, the availability of a contingency budget is necessary to cover unforeseen developments.</i>	X	X		
2.13	<i>The coordination between CS and FP7 relies largely on CSJU and EC staff to identify possible complementarity, overlap or duplication between CS and FP7 activities. This is appropriate in view of the technical knowledge that is required to assess these activities. However, the Panel recommends implementing a formal process coordinating FP7 work programme and CS between the EC and the CSJU.</i>	X		X	
2.14	<i>An adequate instrument for coordinating the respective sections of CS and SESAR has been established. However, the effectiveness of this measure should be reviewed within the annual reviews of SGO and TE in order to achieve a maximum level of coherence.</i>	X			
2.15	<i>The Panel notes that the coordination with national programmes through the NSRG appears to be organized in an effective manner. However, the Panel found it difficult to quantify the effectiveness of the coordination with national programmes at this early stage. The Panel recommends strengthening national programmes, thus providing additional complementary value.</i>			X	

Number	Recommendation	JU	GB	EC	Future PPPs
3.1	<i>The Panel supports the recommendations of the Sherpa Group “that the current legal framework should be streamlined to fit the purposes of setting up and implementing future JTIs. In this respect, the current ‘Community Body’ status of JTIs should be reviewed in terms of the degree to which it enables balanced and trust-based partnerships with private players to be set up” and supports the ‘special body’ option also favoured by the Sherpa Group. The Panel sees clear requirements for special provisions for the implementation and the specific operating needs of Joint Undertakings for Joint Technology Initiatives such as Clean Sky and for developing a specific framework regulation for PPPs as foreseen by Article 185 of the Financial Regulation.</i>		X	X	
3.2	<i>The suggestion from the ExD to negotiate multi-annual GAMs is supported by the Panel. The Panel notes that a multi-annual budget is likely to be implemented after 2013 due to the absence of new commitments beyond FP7. The Panel recommends implementing multi-annual budgets as soon as possible in advance of 2013.</i>		X		
3.3	<i>The Panel recommends reviewing the level and type of GAM-related decisions which could be delegated to the JU Executive Director.</i>	X	X		
3.4	<i>In order to facilitate the CS management process, the Panel recommends the GB to focus on strategic decisions and to increase the level of delegation of routine management issues to the ExD. The executive power of ExD has to be strengthened towards ITDs.</i>	X	X		
3.5	<i>Responsibility for the implementation of the agreed executive team maximum budget should be given fully to the ExD.</i>	X	X		
3.6	<i>The Panel considers staff numbers as being too limited and recommends a review by the Governing Board of staff requirements to ensure that the Executive Team can exercise in full its coordinating and monitoring functions.</i>	X	X		
3.7	<i>The Panel recommends setting up a coherent risk management at JU level, broken down per ITD. This would allow checking the work plans for consistency within and throughout the ITDs. In addition, a more formalised reporting methodology within the annual reviews is suggested in order to allow a more systematic and comparable assessment of achievements against objectives.</i>	X			
3.8	<i>The Panel recommends that the resources required for integration and interface activities be specifically identified in each of the ITDs’ work plans. In addition, there is an urgent need for a matrix of ITD interconnected time schedules and deliverables.</i>	X			
3.9	<i>The Panel recommends carrying out a review by the cluster members to analyse if the current cluster and individual representation in parallel is suitable for an efficient work. A recommendation for future PPPs is expected to follow.</i>	X			X
3.10	<i>The Panel encourages the ITDs to maximise the use of teleconferences in addition to face-to-face meetings to facilitate communication. In addition, internal e-learning tools to accommodate new participants to CS like</i>	X			

Number	Recommendation	JU	GB	EC	Future PPPs
	<i>implemented e.g. in SESAR are proposed.</i>				
3.11	<i>Some Members' Public Relation Officers may temporarily be seconded to the JU for special communication actions. Communication to the technical community is apparently good, but could be improved by increased CSJU participation in conferences. In view of the limited capacity of the JU Executive Team, a policy regarding the CSJU representation at conferences by Members and Partners should be agreed.</i>	X			
3.12	<i>The Panel recommends that any publication prepared and published in the frame of the CSJU clearly acknowledges the relations to and the funding from the CSJU. The CS Executive Team should prepare a standard format for such acknowledgements which should also become part of the contractual obligations as defined in the GAMs and GAPS.</i>	X			
3.13	<i>CS should improve its visibility to the general public. CS Members and Partners should promote CS visibility, especially through interviews at facilities where achievements can be shown.</i>	X			
4.1	<i>The Panel considers that the use of public funding makes it mandatory for the CSJU to carry out sample quality audits of ITD deliverables through independent reviewers or expert organizations. The audits should cover quality, maturity, integration towards demonstrators and compliance against the objectives.</i>	X			
4.2	<i>The Panel recommends establishing a detailed roadmap of technical progress in order to compare achievements against the plan. It should include key decision points, technological milestones and a schedule of TRL achievements. In addition, the Panel notes that TRL definitions are provided in several documents, but TRL understandings might differ. Therefore, a consistent use of TRL should be achieved.</i>	X			
4.3	<i>The Panel commends the JU for a successful operation of the CfP process. Nevertheless, more efficient procedures are required and it is recommended to optimize the CfP cycle. In addition, a recovery plan is needed accounting for topics with no proposal.</i>	X			
5.1	<i>The Panel expressed explicitly the position that the accomplishment of the demonstrator targets are of prime importance for the overall CS success. Consequently, the Panel recommends an adapted budget planning so that engine flight testing will be covered from the Clean Sky budget. The SFWA decision for several A340 size demonstration test vehicles should be reviewed and reassessed not only in view of changed Airbus priorities, but also in favour of a cheaper option. Since a delay of advanced product introduction after 2020 would endanger also the ACARE targets, other demonstration opportunities should be evaluated near-term e.g. the use of a typical GRA configuration for suitable engine concept demonstrations.</i>	X			
5.2	<i>The Panel recommends to carefully analyse the current status and the related mitigation strategies, reiterating the recommendations received during the annual GRA review 2009 on the high level of interaction between the various ITDs.</i>	X			

Number	Recommendation	JU	GB	EC	Future PPPs
5.3	<i>The Panel recognises a significant level of dependencies between GRA and other ITDs. The related interfaces are considered to be clearly defined. However, the efficiency vs. the related level of required coordination should be subject to a further review, leading potentially to leaner processes.</i>	X			
5.4	<i>The Panel recognises the concern of a potentially growing, unbalanced situation between high TRL programmes versus upstream research initiatives enabling innovation. The Panel draws the attention of the EC to this concern.</i>			X	
5.5	<i>The Panel recognizes an impressive set of Partners and Associates involved in the ITD. However, the ITD is addressing an area of operation which is highly affected by particular interests of stakeholder groups like airlines, air navigation service providers, airports, etc. An early and close involvement of these groups is proposed to ensure successful deployment.  In addition, the envisaged developments will lead to safety critical systems and operations. Consequently, certification issues need to be considered at early design and development stages already. Therefore, it is recommended to involve certification authorities early and to assess the certifiability of envisaged solutions as early as possible.</i>	X			
5.6	<i>A significant number of low TRL technologies are addressed in SGO. These technologies are developed from TRL 2 or 3 up to TRL 6 before being transferred to vehicle ITDs. Here, the Panel questions the concept of transversal ITDs, bridging such significant gaps in TRLs. It is proposed to set a clear focus towards high TRL technologies feeding the demonstrators.</i>	X			
5.7	<i>The foreseen level of coordination between CS and SESAR is considered appropriate. However, it is recommended to align the complete spectrum of related activities to each other including scenarios, tools, validation strategies and means in order to obtain a common validation baseline and to allow comparable analysis of achievements. It is proposed to consider, at EC level, if an independent supervisory body outside the JUs could improve the coordination of PPPs in closely related domains.</i>	X		X	
5.8	<i>The fact that certain demonstrator engine configurations have already been committed to become an industrial commercial product near-term has to be positively acknowledged; however, the Panel recommends careful monitoring of the demonstration contents to prevent a public post-funding of activities which would have happened anyhow out of commercial necessity and commitment.</i>	X		X	
5.9	<i>For a comparative assessment of the various SAGE ground and flight demonstrators, agreement has to be reached amongst the key contributing Members and those responsible for the Technical Evaluator, on what can and should be measured in the tests and how the data evaluation should be carried out to be widely accepted.</i>	X			

Number	Recommendation	JU	GB	EC	Future PPPs
5.10	<i>The Panel recognises the information that the TE has recovered from the delays it faced at the end of 2009 and that the internal work can be kept on schedule, meaning that the TE System will be ready for the first assessment in 2011. The Panel recommends monitoring TE progress closely.</i>	X			
5.11	<i>The Panel understands that the feedback role of TE on ITD activities is limited due to the timing of TE assessments. Nevertheless, the role of TE in providing guidance to ITDs should be emphasized. Therefore, TE should be given a more pro-active responsibility in its interactions with ITDs. The Panel remarks that the current limitation in interactions between TE and ITDs could be significantly mitigated, should demonstrator and TE activities be carried out beyond the current deadline of end 2015. This point and the related recommendations are also covered in the section on the work plan beyond 2015.</i>	X			

## **7 Annexes**

### 7.1 Composition of the 1<sup>st</sup> Interim Evaluation Panel

BERTOLINI, Enzo

ECKARDT, Dietrich

HECKER, Peter (Rapporteur)

HERRERA, Ivonne

HORVAT, Manfred

HUGUET, Michel (Chairman)

## 7.2 Interviews and sources of information

The Evaluation Report is based on extensive documentation provided by the EC DG RTD and the CSJU itself. The panel acknowledges that responses were timely and well prepared. Additional information was received through interviews in October and November 2010 with the following persons:

### 7.2.1 JU Executive Team participants to interviews

DAUTRIAT, Eric	ExD
GOULAIN, Michel	PO SAGE-ITD
DEN BOER, Ruud	PO SGO-ITD
DITTMANN, Bettina	Internal Audit and Quality Officer
DUBOIS, Sébastien	PO GRC-ITD
LE HUNCHEC, Yan	Project Controller
PAGNANO, Giuseppe	PO TE
PODSADOWSKI, Andrzej	PO GRA-ITD
SCHWARZE, Helmut	PO SFWA-ITD
SELMIN, Vittorio	PO ED-ITD

### 7.2.2 ITD participants to interviews

AMENDOLA, Alessandro	Alenia Aeronautica
BIRLING, Florent	GTD Sistemas de Información (via telephone)
CATROS, Jean-Yves	Thales
FABREGUETTES, Marc	Thales
HERRY, Bertrand	CENAERO
KOENIG, Jens	Airbus
MADRIGAL, Ana M.	Centre Suisse d'Electronique et de Microtechnique SA (via telephone)
Manic Dragan	Centre Suisse d'Electronique et de Microtechnique SA (via telephone)
OLLIVIER Yvon	Dassault Aviation
PACEY, Mark	Rolls-Royce plc
TOULMAY, Francois	Eurocopter
VILLARIÑO, Miguel Angel	GTD Sistemas de Información (via telephone)

### 7.2.3 Interaction with the Chairman of the Governing Board

M. Marc Ventre, Chairman of the Governing Board, was asked to comment on the strategy regarding the 'single aisle' aircraft fleet replacement. A discussion took place on 10 November 2010 at the Safran Headquarters. A letter from M. M. Ventre was received on 18 November 2010.

#### 7.2.4 Reference documents used in the 1st Interim Evaluation:

- **Glossary of abbreviations**
- **Terms of Reference for the 1st Interim Evaluation**
- **Clean Sky setting up**
  - Council Regulation 71/2008
  - Ex-Ante Evaluation of Clean Sky – Impact Assessment 13 June 2007
  - Report on JTI structure and Rules for Participation – 23 June 2006
  - 2008 Technical evaluation of Clean Sky
    - § Cover note to Evaluation Summary Reports
    - § Transversal Comments across ITDs
    - § Summary reports for ED, GRA, GRC, SFWA, SAGE, SGO, TE
- **Clean Sky Bodies**
  - Governing Board
    - § 2008-2010 Minutes of Meeting + adopted documents
  - National States Representative Group
    - § NSRG Rules of Procedure
    - § NSRG Fact Sheet
    - § 2008-2010 Minutes of Meeting
  - Scientific and Technical Advisory Board
    - § STAB Terms of Reference
    - § STAB composition – Press release
- **Clean Sky JU Internal Documents**
  - Clean Sky Policy for SME's
  - Financial Rules of the Clean Sky Joint Undertaking
  - Quality Manual Ed. 9
  - CS Management Manual
    - § CSJU Management Manual V1
    - § CSJU Management Manual Annexes
  - Financing Agreements EC-CS
    - § General Financing Agreement
    - § 2009+2010 Annual Financing Agreements
  - Model Grant Agreements
    - § GAM version 18-03-2010 + Annexes
    - § GAP version 18-03-2010 + Annexes
- **Technical Activities**
  - **Research Programme**
    - § Technical Proposal March 2007
    - § 2008 Work Programmes per ITD
      - Annexes Ia for ED, GRA, GRC, SAGE, SFWA, SGO and TE
    - § 2009 Update of Work Programme per ITD (where applicable)
      - 2009 Annex Ia update for ED, GRA, GRC, SAGE and TE
      - 2009 Annex Ib update for ED and SAGE
  - **Members**
    - § Annual Implementation Plans
      - Adopted AIP 2008-2010
    - § ITD Annual Technical Reports

- 2008 + 2009 Technical activity reports for ED, GRA, GRC, SAGE, SFWA, SGO and TE
  - § Review of 2009 activities per ITD – May 2010
    - Reviews of ED, GRA, GRC, SAGE, SFWA, SGO and TE
- **Partners**
  - § Clean Sky Rules for Participants – Guide for Applicants
  - § 2009 Calls
    - Call fiche SP1-JTI-CS-2009-01
    - Call fiche SP1-JTI-CS-2009-02
  - § 2010 Calls
    - Call fiche SP1-JTI-CS-2010-01
    - Call fiche SP1-JTI-CS-2010-02
    - Call fiche SP1-JTI-CS-2010-03
    - Call fiche SP1-JTI-CS-2010-04
  - § Statistics
    - Results Call 1
    - Results Calls 1-2-3 at end of evaluation
- **Additional documents provided after Kick-Off-Meeting**
  - Presentation KOM Terms of Reference
  - Presentation KOM Panel Meeting 1
  - Presentation Clean Sky coordination with national programmes (NSRG)
  - TE Updated environmental targets and 2010 initial results – 24/09/2010

### 7.3 List of acronyms

ACARE	Advisory Council for Aeronautics Research in Europe
AEA	All Electric Aircraft
ATM	Air Traffic Management
CfP	Call for Proposals
CROR	Contra Rotating Open Rotor
CS	Clean Sky
CSJU	Clean Sky Joint Undertaking
ED	Eco-Design
ExD	Executive Director
EDA	Eco-Design for Airframe
EDS	Eco-Design for Systems
ETP	European Technology Platform
FP6, FP7, ...	Framework Programme 6, 7, ...
GAM	Grant Agreement for Members
GAP	Grant Agreement for Partners
GB	Governing Board
GRA	Green Regional Aircraft
GRC	Green Rotorcraft
GTF	Geared Turbo Fan
ITD	Integrated Technology Demonstrator
JTI	Joint Technology Initiative
JU	Joint Undertaking
LNC	Low Noise Configuration
LWC	Low Weight Configuration
MAE	Management of Aircraft Energy
MTM	Management of Trajectory and Mission
NC	New Configuration
NSRG	National States Representatives Group
PO	Project Officer
PPP	Public Private Partnership
RTD	Research and Technological Development
SAGE	Sustainable and Green Engines
SESAR	Single European Sky ATM Research
SFWA	Smart Fixed Wing Aircraft
SGO	Systems for Green Operations

SME	Small or Medium Sized Enterprise
SRA	Strategic Research Agenda
STAB	Scientific and Technical Advisory Board
TE	Technology Evaluator
TRL	Technology Readiness Level
WP	Work Package