VALUE IMPROVEMENT THROUGH A VIRTUAL AERONAUTICAL COLLABORATIVE ENTERPRISE

# FORUM 2

# "DESIGN TOGETHER, GAIN TOGETHER"

  

**THE FORUM STORYBOARD**

We consider the VIVACE project as responding to a generic Business Situation where there is a requirement for a new aeronautical product to be developed – be it a complete aircraft, engine, other major system, or component. The business operating environment is where many companies work together in a virtual way to meet the end customer's need and there is a wide and deep Supply Chain. In essence we find VIVACE operating as an overall Virtual Enterprise Consortium but having what may be termed a Sub-Virtual Enterprise (engine) Consortium also operating within it.

The VIVACE Project will deliver a Virtual Product Design and Validation Platform based on a distributed concurrent engineering methodology supporting the Virtual Aeronautical Enterprise. The key methodology used in this platform is simulation. This platform integrates capabilities that can be used, at least partially, during all steps of the concept and development process of such an aeronautical product from the response to a Request for Proposal (RFP) to the serial manufacture and associated maintenance.

Forum 2 intends to illustrate the advanced concepts developed by VIVACE through a guided tour based on the real Business Situation. The tour is structured like a play:

At the very beginning, we have received a request from a customer that wants to buy a newly developed aeronautical product.

The "actors" will be a loose consortium of generic aeronautical companies working together in extended enterprise mode – based on the virtual enterprise paradigm – in order to answer the request from the customer. Among the actors we have an aircraft company, an engine company, a helicopter company, several system providers, supply chain members, etc.

Acts and scenes of this storyboard or play will illustrate important moments and parts of the development process and the tools and methods supporting this process. As with any play, there are many threads between the acts and scenes.

## Act 1 - Commercial and Technical Feasibility (length 260 minutes)

The consortium companies analyse the commercial and technical feasibility of the RFP using VIVACE tools and processes.

### Scene 1 - The consortium considers the commercial situation

***"VIVACE Interactive Business Environment Simulator (VIBES)" by University of Nottingham***

In order to simulate the environment in which the customer's request sits and to assure itself that the aircraft/product solution is viable in the long term, the consortium business planning department uses its future business environment simulator. The principles behind this simulator, being generic, could also be used in other industrial sectors.

  

## Scene 2 - Concept design process and optimisation

***"Preliminary and unconventional design (Prelude) Workflow Management" by University of Cranfield***

The consortium carries out a conceptual design loop for the new product in its Future Projects department to assure technical feasibility and differentiation from the competition. New design methods are required having increased focus on aircraft handling qualities. In order to integrate these methods, the consortium plans the calculation workflow for its conceptual design process using a workflow management device (WMD). This device is object oriented and incorporates functions for rapid composition of design computational workflows, including identification of strongly connected components, solvers and visualisation methods. The WMD operates within a multi-disciplinary design optimisation (MDO) framework.

***"Prelude multi-criteria optimisation calculation engine for trade-off analysis" by University of Cranfield***

The optimum size and structure of the product needs to take account of aerodynamics, weight and cost to find the best compromise. The Prelude calculation engine allows for the correct formulation of the trade-off (multi-objective optimisation) problem, the search for and representation of the entire trade-off space and the identification of areas of interest for the decision maker (e.g. the stable design regions).

## Scene 3 – Pre-design activities

The consortium companies have developed many tools and simulation methods to aid feasibility studies preparatory to submitting proposals to a typical customer. These comprise:-

***"Building general helicopter architecture" by Eurocopter***

This will demonstrate how to allow for the pre-design brainstorming shared between all the pre-design team and how to deploy processes and tools to capitalize on their experience.

***"Design to market" by Eurocopter***

This is one of the main parts of pre-design activity. It supports a design to market approach for complex subsystems design thereby improving decision quality throughout the whole helicopter pre-design activities.

***"Life cycle cost optimisation" by Eurocopter and NLR***

This will demonstrate new and innovative methods and tools allowing decision makers to better handle the cost aspects of various design choices during the pre-design phase for the total life cycle costs of the helicopter.

***"Visualisation and selection methods" by Eurocopter***

These will allow the decision maker to access better design views and to better and faster handle different candidate solutions in the pre-design phase.

***"Mastering uncertainty by design to decision methods" by Eurocopter and EADS CRC***

This offers decision support by application of probabilistic methods in the early concept phase of helicopter development.

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*The consortium decides to go ahead and notifies the customer that it will respond to the Request for Proposal. Meanwhile the Engine members of the consortium develop their proposal for the overall customer requirement.*

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## Act 2 - The New Engine Preparation (length 265 minutes)

The Engine company has developed ways to quickly prepare a full business proposal to meet the customer's request. In this act, we see how such a proposal is generated focussing on the information the consortium needs to respond to the (aircraft) customer.

### Scene 1 - The engine company prepares its proposal to the consortium

***"The 7 day proposal" supported by "Knowledge Management in the 7 day proposal process" and by "Life Cycle Cost Modelling" by Volvo Aero, MTU and Lulea University***

To put together a proposal for the Client, the Engine company works with its Virtual enterprise using the "7 day proposal process", i.e. a fast, comprehensive and structured quotation process which is facilitated by a support system of information and tools. To ensure all appropriate costs are included, the Engine company addresses the complete engine lifecycle and includes life-cycle cost modelling aspects.

***"Value chain modelling" by University of Nottingham***

Before the business model to be operated by the virtual enterprise can be agreed, alternatives are tested using the Value Chain Model, which explores how the partners will be affected by issues arising during the lifespan of the engine programme. Agent-based methods replicate the dynamic behaviour of all parties, showing cash flows and yielding programme performance indicators such as payback time and maximum cash negative under a variety of engine use and service plan scenarios.

### Scene 2 - The engine company models aspects of its supply chain

***"Evaluating alternative systems of logistic control" by University of Nottingham***

The Engine company wishes to optimise the design and operation of its extensive supply chain. Here we see as an example, simulated detailed planning, scheduling and control of a focused factory. This example provides general principles that can be applied in a wider supply chain simulation context.

***"Ideal workflow and process chain planning concept for the product development phase" by MTU***

The Engine company partner develops and shows an improved methodology for planning of workflow and process chains for the early phases of product development.

  

**Scene 3 - The engine value chain – service support system**

***"Simulation of a service support system" by University of Manchester***

The Engine company's virtual enterprise has many further partners and suppliers. In order to fully understand how its value chain will operate over the proposed long service lifespan of 30 years, it simulates the sensitivity of the service system to different support regimes and resource levels for each activity on the functionality of the system. Service system cost and critical elements are explored with a view to determine how the existing service system can be improved.

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*However, because the customer has some concerns about the consortium's virtual enterprise capabilities, he requests the consortium to demonstrate an information sharing environment for the product development process.*

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## Act 3 – Sharing information in the virtual enterprise (full length 365 minutes)

*The design phase of the aeronautical product will gather a large number of engineering teams (including several disciplines using their own tools) collectively producing technical data. To prepare the launch of this phase, the consortium companies set-up an information sharing environment enabling both designers and analysts involved in these teams to work in a controlled way. This involves retrieving/sharing/storing design models, simulation models and related documents in a consistent and secured way, optimising parallel team working and enabling the monitoring of virtual product maturity. Here we see several demonstrations of the IS infrastructure being used across a plethora of partners who are sharing early design information.*

**Scene 1 - The collaborative information system infrastructure**

***"The Virtual Enterprise and the Virtual Enterprise Collaboration Hub overview" by Volvo Aero***

The consortium has multiple teams working together, drawn from its virtual enterprise and its individual partner's Supply Chains. These are based throughout the world and as an imperative, need to have at all times, the availability of a common shared view on design/manufacture information in a secure, fast, accurate manner ensuring that intellectual property is preserved and acknowledged. It has developed the Virtual Enterprise Collaborative Hub (VEC-HUB) as the IS infrastructure to facilitate this need. Several "VEC-Hub" collaboration environments are deployed to show this IS infrastructure in operation.

This infrastructure can be used generically in various industrial sectors. The example provided here is engine sector oriented, where an improved engine is required to satisfy the customer's needs.

***"Demonstration of Collaborative Engineering – Distributed Whole Engine-Design Process" by Rolls-Royce Deutschland, NLR, MTU, Avio, Eurostep, Engineous***

  

An automated distributed design process in a collaborative engineering environment including the involvement of different participating companies in different locations by using a collaboration hub is demonstrated. Such capability is currently unique in distributing processes and using advanced capabilities for multi-disciplinary design optimisation and robust design in a collaborative environment.

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*To be able to manage the huge quantity of heterogeneous data (including design data, simulation data, requirements, verification/validation data) produced during the design phase, the consortium companies set-up a common data management approach based on shared aeronautical information meta-models and shared information meta-processes. Thanks to this common approach, all disciplines and teams involved in the design process will use/produce data in a configured and controlled way, and the aircraft programme manager will monitor virtual aircraft maturity in real-time.*

## Scene 2 - Virtual enterprise infrastructure

***"Access control architecture and security policy" by IRIT and CERFACS***

All previous scene demonstrations are possible thanks to a distributed infrastructure shown providing the required base services in the "Virtual Enterprise" context: data access services, security services, interoperability services and collaboration services. Today's Information and Communication Technologies (ICTs), including n-tier architectures, internet technologies and service-oriented architectures, allow the set-up of this infrastructure with the expected Quality of Service (QoS).

## Scene 3 - Engineering Data Management for virtual collaborative enterprise

***"Engineering Data Management for Virtual Aircraft" by EADS CRC, MSC Software, Avio, Airbus, Snecma***

A collaboration example is shown, demonstrating the IT environment that the engine company partner operates within and its link to the aircraft company. It starts by carrying out the stochastic analysis for engine blade and disk, then whole engine optimisation and aircraft integration, followed by showing the link between the design and simulation worlds and the management of product and process information in this context. Commercial off- the-shelf tools will be demonstrated as an integrated suite but having a specific user interface and framework for Engineering Data Management.

## Scene 4 - Context management

***"COMPASS – Structure simulation context management" by Airbus***

The demonstration shows the capabilities of mature product context management that supports the multi-disciplined design process. This is based on the Common aircraft multi-disciplinary integration backbone for structure engineering simulation (COMPASS) and the EDM information model concept.

  

## Act 4 – Design, Performance, Testing and Simulation Validation (length 305 minutes for run 1 and 345 minutes for run 2)

*The consortium companies have developed methods and tools to shorten the development lead time and improve the accuracy and fidelity of their design and analysis models.*

### Scene 1 - Engine performance: integrating the components

*One engine architecture has been chosen to fulfil the customer requirements in terms of thrust, fuel consumption, mass, noise. Many engine partners are contributing to the design, the manufacture and the tests of each engine component. The performance of each of these components must be modelled and pulled together with the other components to build the whole engine performance model. They use a common platform, PRopulsion Object Oriented SImulation Software (PROOSIS), to model, integrate and deliver the engine performance requirements for the customer.*

***"PROOSIS Suite" by Snecma, National Technical University of Athens, Cranfield University, University of Stuttgart, NLR, Empresarios Agrupados Intl, Centre de Recherche en Aéronautique – ASBL/CENAERO.***

The Engine integrator will define the global engine architecture and integrate components developed by other partners. In order to refine the engine modelling, a secondary air system dedicated to turbine cooling will be added and optimised. Zooming and distributed calculation will be used to refine the compressor modelling. At the end of the process, a customer deck will be generated and delivered to the airframer.

### Scene 2 - Rapid engine modelling and analysis

***"Rapid modelling and analysis of 3D engine components in preliminary design" by Queen's University***

The Engine company uses a fast approach for the rapid modelling of its future product by identifying thin sheets in solid models automatically, integrating local complex details into global models and then transforming solid geometry to appropriate mixed dimensional finite element models.

### Scene 3 - Validation of engine simulations

***"Whole engine model validation process" by Rolls-Royce, Volvo Aero, Leuven Measurements Systems International, Imperial College***

The Engine company uses harmonised methods for simulation validation. This will link together advanced tools for modelling and simulation with test strategy, correlation, model updating and physical testing. The end result is a process for faster achievement of detailed, high quality whole engine models over a collaborative partnership, supported by high performance computing and advanced physical testing. It is complementary to the "Demonstration of Collaborative Engineering – Distributed Whole Engine-Design Process" shown in Act 3 Scene 1.

  

### Scene 4 – Complex mechanical system design

*The consortium partners have developed a toolbox that assists the designers and analysts on various aspects of the engineering of a complex mechanical system. This toolbox contains:-*

***"Helicopter rotor: Hub pre-dimensioning" by Eurocopter***

This tool allows the dimensioning of the "elastomeric bearings" parts of current rotor architectures.

***"Rotor Kinematics" by Eurocopter***

Kinematics analyses are mandatory when designing new helicopter rotors in order to determine the motion range of specific components and to check that no interference occurs throughout the whole flight spectrum.

***"Maintainability" by Eurocopter***

During the whole design, including early phases, the maintainability concepts have to be taken into account. This tool allows all the design team to share the requested information.

***"Tolerancing" by EADS CRC***

The tolerance feature is part of the design, used in manufacturing as well. This presentation shows how to handle this concept in a non-conformance management situation.

## Act 5 – Aircraft systems simulation (length 150 minutes)

*The Aircraft company partners simulate various aspects of the aircraft systems design.*

### Scene 1 – Simulation augmented development process for aircraft systems

***"Hydraulic System" by Airbus***

***"Right sized multi domain simulation for Electrical System" by DLR***

***"Substitution of IMO-Tests for the derivative of an aircraft" by the Technical University of Hamburg-Harburg***

***"Virtual Aircraft for Systems" by Airbus and EADS CRC***

The systems team, composed of different contributing companies, is proposing a new way of developing aircraft systems. They will show major improvements, based on a set of innovations in Modelling & Simulation technologies, a collaboration capability and re-engineered development processes. From this new way of working, they will obtain a reduction of costs and lead time, ensuring a high level of systems maturity at the same time.

## Act 6 – Design optimisation methods (length 185 minutes)

*The Consortium uses various design optimisation methods, within single engineering disciplines or between multiple disciplines, or extending across multiple partners and sites. In addition, early in the collaborative design process, the supportability aspects of the aircraft (when in-service) need to be considered.*

**Scene 1 – Optimisation of components and systems**

Here we have several application examples of single and multi-disciplinary design optimisation (MDO), where specific methods and tools have been used on particular components.

***"Applying optimisation to a multi-disciplinary aircraft wing design case" by NLR***

Based upon a consistent multi-disciplinary wing analysis capability a wing design space is explored. Within this design space a response surface is fitted to the analysis results. On this response surface single and multi-objective optimisation is performed.

***"Multi-disciplinary and aerodynamic optimisation of an engine power plant" by Airbus and Onera***

The aircraft company proposes a multidisciplinary optimisation process that could give benefits in weight/drag trade-off studies. The optimisation is based on a bi-level approach. First, independent mono-discipline variables are addressed by mono-disciplinary optimisation (refined aerodynamic shapes and structural thicknesses). This is done for a set of configurations defined by a Design of Experiments (DoE). Then response surfaces are built from the DoE and they are combined to perform a multidisciplinary optimisation of the configuration (considering engine position and pylon width).

***"Multi-disciplinary optimisation of an assembly" by Rolls-Royce Deutschland***

Usually, single components will be designed by different suppliers and subsequently are assembled by an engine integrator. How to manage the optimisation process for an assembly will be presented.

***"Advanced computational structure mechanics optimisation" by SAMTECH***

The aircraft company needs to perform the detailed optimisation of composite stiffened panels for the fuselage structure. Sensitivity analysis for non-linear finite element responses for gradient-based optimization will be presented.

**Scene 2 – Supportability Considerations**

***"Maintenance optimisation model" by Airbus***

The aircraft company integrates supportability needs with its collaborative design methods. It consistently uses quantitative assessment and global supportability performance criteria for aircraft manufacturer and system / equipment supplier. The model & tool is integrated in their current supportability process within the current supply chain (for concept & data sharing).

***"Maintenance programme evolution" by EADS CRC and Airbus.***

This demonstration shows the introduction of mathematical and analogical models in the maintenance programme evolution process, mainly based on engineering judgement and qualitative in-service experience.

## Act 7 – Knowledge management and sharing and decision support (length 190 minutes)

*During the design phase all people involved (from the design domain as well from the analysis domain) will have to apply procedures and other discipline-specific rules and knowledge. Moreover, complex decisions will have to be made, requiring a good assessment of decision impacts on various aspects of the product (e.g. impact on cost, impact on related sub-systems) as well as programme impacts (e.g. planned tasks and resources). To increase the performance of this process, while* *reducing lead times and controlling product criteria (such as product cost), the consortium companies set-up a distributed knowledge-sharing environment and a distributed design-to-decision environment.*

**Scene 1 - Knowledge management and sharing**

***"Context-based knowledge engineering platform" by Avio, Lulea University and EADS CRC***

The consortium has developed methods and solutions that enable the better use of engineering knowledge. The knowledge enabled solution platform is a self-learning software system that enables the "pushing" of applicable knowledge to users depending on their engineering context.

***"Guidelines for sharing knowledge within an Extended Enterprise" by Airbus and BAE SYSTEMS***

The use of innovative IT software solutions is also supported by a practical methodology, whereby guidance is given to a Supply Chain involved in Product Design, allowing capture of experience, combined with understanding and managing of relationships that are critical to successful knowledge sharing.

**Scene 2 - Design reviews**

***"Design to Decision Objectives (DtDO) framework" by EADS CRC.***

In order to provide better quality of information for design reviews and trade-off analysis, the aircraft company has developed sophisticated decision support processes and methods.

***"Aircraft Change Impacts Analysis" by Airbus and CIMPA***

Engineering changes occur throughout different phases of the aircraft development life-cycle. It is important to be able to assess the impact (consequences) of change from different points of view e.g. requirements, physical or functional product architecture, organisation, programme. The aircraft company is developing and testing methods to enable the dependencies that exist within & between these different viewpoints to be modelled, and analysed.

**3rd TIER SUPPLIERS SESSION (overall length 120 mins)**

Here we present those aspects of the VIVACE developments in the storyboard that are most relevant to third tier suppliers as supporting supply chain members.

***"3rd tier and smaller companies in the Aerospace supply chain" by ESOCE***

***"VIVACE for smaller companies – key issues, ways of working" by Assystem UK***

***"Virtual Hub operations, portals for supply chains of the future" by Volvo Aero***

***"IT Security for smaller businesses" by IRIT***

***"Application of the VIVACE technologies, some examples based upon VIVACE storyboard, with the emphasis on the role and Impact of smaller/3tier suppliers" by Assystem UK***

  

**OTHER RELATED PROJECTS SESSION (overall length 90 minutes)**

***"SimSac Project" by CERFACS***
This will describe an EC Framework 6 project devoted to Simulating Aircraft S&C Characteristics for Use in Conceptual Design

***"AeroSME Project" by the AeroSpace and Defence Industries Association of Europe***
This will present the activities of this EC funded initiative which provides practical assistance for European SMEs in Aeronautics

**FINAL PLENARY SESSION**

***The Forum will conclude with a session on the afternoon of 26th October in the Amazon room covering:***

***"The Transatlantic Secure Collaboration Program and VIVACE" by TSCP and VIVACE representatives***
This will describe how VIVACE will communicate with this project.

***"The Integrated View of VIVACE products" by EADS CRC and Volvo Aero***
This will be a presentation by the VIVACE Integration Technical Committee (VITC) Team demonstrating the integrated view of VIVACE products.

VIVACE has developed a genuine approach (the VIVACE 8-layer model) to integrate engineering items at several levels, using 8 layers from business-oriented layers down to implementation layers. This allows the linkage of core VIVACE-developed capabilities on one hand with the business context and, on the other hand, the IT environment. This approach enables a better assessment of business benefits (based on use cases and scenarios) and will be a vehicle to facilitate the future exploitation of VIVACE capabilities.

***"VIVACE future plans" by Airbus***
The latest situation on VIVACE and what is expected to be demonstrated at the Final Forum 3, planned to be held in Toulouse, 16th – 18th October 2007.

***Closure by the European Commission***

# Cast List

**Plenary 1 (Leader - Philippe Homsi, Airbus)**

Welcome
*Speaker: Philippe Homsi, Airbus*

Keynote address
*Speaker: Dr B.Oskam, NLR, the Netherlands*

VIVACE project outline and logic
*Speaker: Philippe Homsi, Airbus*

Forum 2 Storyboard and timetable
*Speaker: Bob Moore, University of Warwick, UK*

**Act 1 (Leader - Michel Sellier, Eurocopter, France)**

Scene 1

"VIVACE Interactive Business Environment Simulator (VIBES)"

*Actor: Richard Farr, University of Nottingham, UK.*

Scene 2

"Preliminary and unconventional design (Prelude) Workflow Management"

*Actors: Marin Guenov and Libish, Cranfield University, UK.*

"Prelude multi-criteria optimisation calculation engine for trade-off analysis"

*Actors: Paolo Fantini and Marin Guenov, Cranfield University, UK.*

Scene 3

"Building general helicopter architecture"

*Actor: Marc Greiller, Eurocopter, France.*

"Design to market"

*Actor: Joris Cezard, Eurocopter, France.*

"Life cycle cost optimisation"

*Actors: Jan Floris Boer, NLR, the Netherlands; Cyrille Sevin, Eurocopter, France.*

"Visualisation and selection methods"

*Actor: Marc Greiller, Eurocopter, France.*

"Mastering uncertainty by design to decision methods"

*Actors: Ralph Mauersberger, EADS CRC, Germany; Marc Greiller, Eurocopter, France.*

**Act 2 (Leader - Tobias Larsson, Lulea University, Sweden)**

Scene 1

"The 7 day proposal", supported by "Knowledge Management in the 7 day proposal process" and by "Life Cycle Cost Modelling".

*Actors: Lotta Olofsson and Catarina Bovik, Volvo Aero, Sweden; Christian Johansson, Lulea University, Sweden; Werner Weigert, MTU, Germany.*

"Value chain modelling"

*Actor: David Buxton, University of Nottingham, UK.*

Scene 2

"Evaluating alternative systems of logistic control"

*Actor: Richard Farr, University of Nottingham, UK.*

"Ideal workflow and process chain planning concept for the product development phase"

*Actor: Hans-Uwe Baron, MTU, Germany.*

Scene 3

"Simulation of a service support system"

*Actors: Graham Thompson, Jian-Ping Li, University of Manchester, UK.*

**Act 3 (Leader – Yves Baudier, EADS CRC, France)**

Scene 1

“The Virtual Enterprise and the Virtual Enterprise Collaboration Hub overview”

*Actors: Fredrik Wanman and Mats Lindeblad, Volvo Aero, Sweden.*

“Demonstration of Collaborative Engineering – Distributed Whole Engine-Design Process”

*Actors: Roland Parchem and Bernd Messier, Rolls-Royce Deutschland, Germany, Paul Arendsen, NLR, the Netherlands, Marc Nagel and Johannes Barner, MTU, Germany, Gian Paolo de Poli, Avio,Italy, Staffan Soderberg, Eurostep, Sweden, Holger Wenzel and Olivier Hardy, Engineous, Germany & France.*

Scene 2

“Access control architecture and security policy”

*Actors: Abdelmalek Benzekri, IRIT, France; Pierre-Henri Cros, CERFACS, France.*

Scene 3

“Engineering Data Management for Virtual Aircraft”

*Actors: Frédéric Féru, EADS CRC, France; Olivier Tabaste, MSC Software, France; Gian Paolo De Poli, Avio, Italy; Manfred Harms, Airbus; Thomas Nguyen Van and Arnaud Quernardel (or Bruno Maillé), Snecma, France.*

Scene 4

“COMPASS – Structure simulation context management”

*Actor: Manfred Harms, Airbus.*

**Act 4 (Leader – Marc Doussinault, Snecma, France)**

Scene 1

“PROOSIS Suite”

*Actors: Marc Doussinault, Snecma, France; Alexis Alexiou, National Technical University of Athens, Greece; V Sethi, Cranfield University, UK; B. Benzaf, University of Stuttgart, Germany; Oscar Kogenhop, NLR, the Netherlands; Pedro Cobas, Empresarios Agrupados Intl, Spain; Rajan Coehlo, Centre de Recherche en Aéronautique – ASBL/CENAERO, Belgium.*

Scene 2

“Rapid modelling and analysis of 3D engine components in preliminary design”

*Actors: Mark Gammon, Transcendata, UK, Cecil Armstrong, Queen’s University Belfast, UK.*

Scene 3

“Whole engine model validation process”

*Actors: Graham Harlin, Rolls-Royce plc, UK; Markus Andersson, Volvo Aero, Sweden; Bart Peeters, Leuven Measurements Systems International, Belgium; Christoph Schwingshackl, Imperial College, UK.*

Scene 4

“Helicopter rotor: Hub pre-dimensioning”

*Actor: Patrice Godiot, Eurocopter, France..*

“Rotor Kinematics”

*Actor: Patrice Godiot, Eurocopter, France..*

“Maintainability”

*Actor: Joris Cezard, Eurocopter, France.*

“Tolerancing”

*Actors: Hugo Falgarone and Benoit Fricero, EADS CRC, France.*

**Act 5 (Leader – Antoine Casta, Airbus)**

Scene 1

“Hydraulic System”

*Actor: Delphine Hertens, Airbus.*

“Right sized multi domain simulation for Electrical System”

*Actors: Martin Kuhn & Martin Otter DLR, Germany.*

“Substitution of IMO-Tests for the derivative of an aircraft”

*Actors: Rainer Sonder, Airbus; Hauke Gulzau, TUHH, Germany.*

“Virtual Aircraft for Systems”

*Actors: Antoine Casta, Airbus; Tim Lochow, EADS CRC, Germany; Sylvie Delprat, EADS CRC, France.*

  

### Act 6 (Leader – Ernst Kesseler, NLR, the Netherlands)

Scene 1

"Applying optimisation to a multi-disciplinary aircraft wing design case"

*Actors: Jos Vankan and Ernst Kesseler, NLR, the Netherlands.*

"Multi-disciplinary and aerodynamic optimisation of an engine power plant"

*Actors: Mathieu Meaux, Airbus; Gerald Carrier, ONERA, France.*

"Multi-disciplinary optimisation of an assembly"

*Actor: Roland Parchem, Rolls-Royce Deutschland, Germany.*

"Advanced computational structure mechanics optimisation"

*Actors: Alain Remouchamps and Benoit Colson, SAMTECH, Belgium.*

Scene 2

"Maintenance optimisation model"

*Actor: Emmanuel Hugues, Airbus.*

"Maintenance programme evolution"

*Actors: Frédéric Viniacourt, EADS CRC, France; Jérôme Neveux, Airbus.*

### Act 7 (Leaders – Peter Coleman, Airbus & Axel Mauritz EADS CRC, Germany)

Scene 1

"Context-based knowledge engineering platform"

*Actors: Daniele Gulmini and Nicola Spiniello, Avio, Italy; Andreas and Tobias Larsson, Lulea University, Sweden; Romaric Redon, EADS CRC, France;*

"Guidelines for sharing knowledge within an extended enterprise

*Actors: Paul Nuzzo, BAE SYSTEMS, UK; Joseph Cloonan, Airbus.*

Scene 2

"Design to Decision Objectives (DtDO) framework"

*Actors: Axel Mauritz, Tobias Schmidt-Schaeffer, Tim Lochow, EADS CRC, Germany.*

"Aircraft Change Impacts Analysis"

*Actors: Peter Coleman and Andre Rutka, Airbus; Andreas Songin, CIMPA, Germany.*

### 3rd Tier Suppliers (Leader – Patrick Williams, Assystem UK, UK)

"3rd tier and smaller companies in the Aerospace supply chain"

*Actor: Bruno Lisanti, ESOCE, Italy.*

"VIVACE for smaller companies – key issues, ways of working"

*Actor: Patrick Williams, Assystem UK, UK.*

"Virtual Hub operations, portals for supply chains of the future"

*Actor: Mats Lindeblad, Volvo Aero, Sweden.*

"IT Security for smaller businesses"

*Actor: Abdelmalek Benzekri, IRIT, France.*

"Application of the VIVACE technologies, some examples based upon VIVACE storyboard, with the emphasis on the role and Impact of smaller companies/3rd Tier Suppliers"

*Actor: Patrick Williams, Assystem UK, UK.*

### Other Projects

SimSac Project
*Speaker: Pierre-Henri Cros, CERFACS, France.*

AeroSME Project
*Speaker: Paula Chiarini, AeroSpace and Defence Industries Association of Europe.*

### Plenary 2 (Leader – Jean-Claude Dunyach, Airbus)

Transatlantic Secure Collaboration Program (TSCP)
*Speakers: TSCP and VIVACE representatives.*

"The Integrated View of VIVACE products"
*Speakers: Representatives from EADS CRC and Volvo Aero.*

Vivace Future Plans
*Speaker: Philippe Homsi.*

Closure
*Speaker: Jose Martin-Hernandez, European Commission.*