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ROBUST LAUNCH OF NEW AIRCRAFT PROGRAMMES

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1 Introduction

The Paper reports on a large engineering-processes improvement-project at Airbus, called 'Robust Launch'. The Robust Launch Project is part of a larger business improvement programme called 'Route 06', which targets to improve Airbus' competitiveness with specific focus on the year 2006. In this programme, a part "Faster Development of New Programmes" is aiming to reduce rework and non-quality during aircraft development by 30%. By a broad and systematic approach in the early design phases during the launch of new aircraft programmes, 'Robust Launch' shall contribute to a dramatic reduction of design iterations and waste. It is general experience in engineering design, that sub-optimal ways of working in the early design phases lead to failure and thus result in quality, cost and time problems in the later product development [1]. 'Robust Launch' aims to implement modern product development and project management methods for improving the collaborative design work in the early project phases. Due to the authorisation to offer (ATO) of Airbus' the new long-range Aircraft A350, the project 'Robust Launch' gains a specific importance and accordingly management attention. In this paper, the objectives, the analysis methods, the solution approach and the main results of 'Robust Launch' are introduced and discussed.

Figure 1. The new A350 – the example for a 'robust launch' of a new aircraft programme

2 Project targets, organisation and methodology

The project targets of "Robust Launch" are in particular:

- to improve communication with airlines and key suppliers from the very beginning
- to provide clear and validated objectives for aircraft design
- to manage technical risks and master aircraft configuration evolutions
- to promote a global aircraft approach for a better optimisation
- to promote collaborative ways of working
- to provide early inputs ("quick hits") to current developments (A400M, 380F)
- to provide improved processes and tools to future programmes (A350,…)

As a typical improvement project, Robust Launch is organized by work-packages, addressing the above mentioned areas. Each work-package is lead by a work-package manager, heading a team of about 10 colleagues from different fields. Figure 2 shows the project organisation, as it had been already established when the author took over the project management.

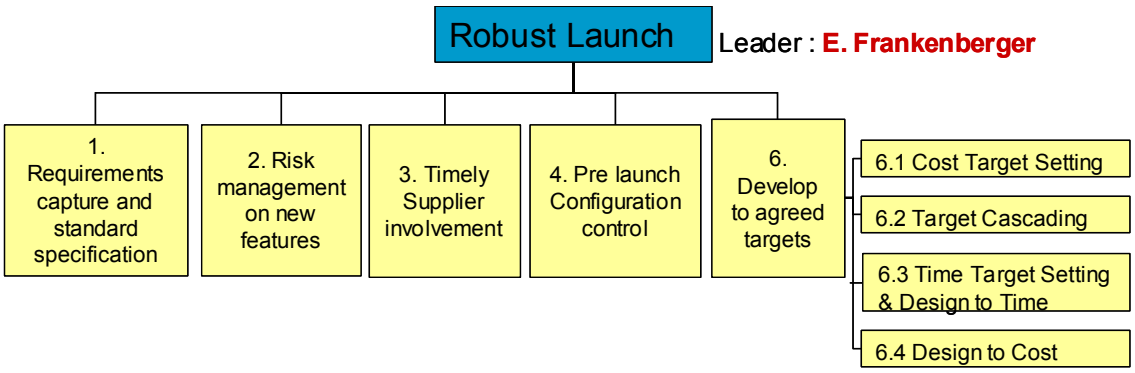

Figure 2. Robust Launch project organisation by work-packages in the first phases

The objectives of the work-packages are summarized in Table 1.

Table 1. Overview of work-package objectives

WP name	WP Objectives
Requirements capture and standard specification	• Earlier and more effective freeze of product requirements & specifications ➢ Improve the capture, formalisation and traceability of Aircraft internal and external requirements ➢ Improve the contents of the standard specification and get an early validation with "launch customers" ➢ Improve the "Top Level Aircraft Requirements" (TLAR) contents, reinforce link with the "standard specification", and get an early agreement with the functions
Risk management on new features	• Secure embodiment of new features before launch ➢ Improve the new features (material and systems) evaluation and deployment, involving all required functions ➢ Ensure that the risk is properly tackled and required actions are made before launch

Timely Supplier involvement	• Involve major suppliers in a better way and earlier in the design phase to improve the robustness of Airbus products, generate benefits and minimize commercial risks ➢ Refine the process of supplier involvement ➢ Change mindset and working practices accordingly (Supplier, Engineering, Procurement)
Pre launch Configuration control	• Ensure that product configuration and associated documentation and tools are effectively controlled all along the pre launch phase • Ensure that all actors work with the common, up to date reference • Ensure smooth transition to development phase
Develop to agreed targets	• Set up agreed top level targets in term of cost and time • Cascade agreed targets (cost, time, technical) in consistency with top level objectives • Manage and monitor activities to reach above targets (Design to Cost and Design to Time)

A specific methodology is crucial for improvement projects. As for any project, a *project management method* is needed to put deliverables under control in terms of Quality, Time and Cost. Robust Launch project management was based on existing Airbus Methods, with planning and timing of deliverables, risk-, financial- and resource-management, project reviews and validation processes [2]. Improvement projects don't deliver any product, but changes in processes, behaviours, and competencies that rely on people. Therefore, Robust Launch was also based on a *change management method* with specific milestones, called 'Lifecycle for Business Improvement Projects' (LBIP) [3].

Figure 3 illustrates the step-by-step process, by which the project lifecycle was structured in phases and gates.

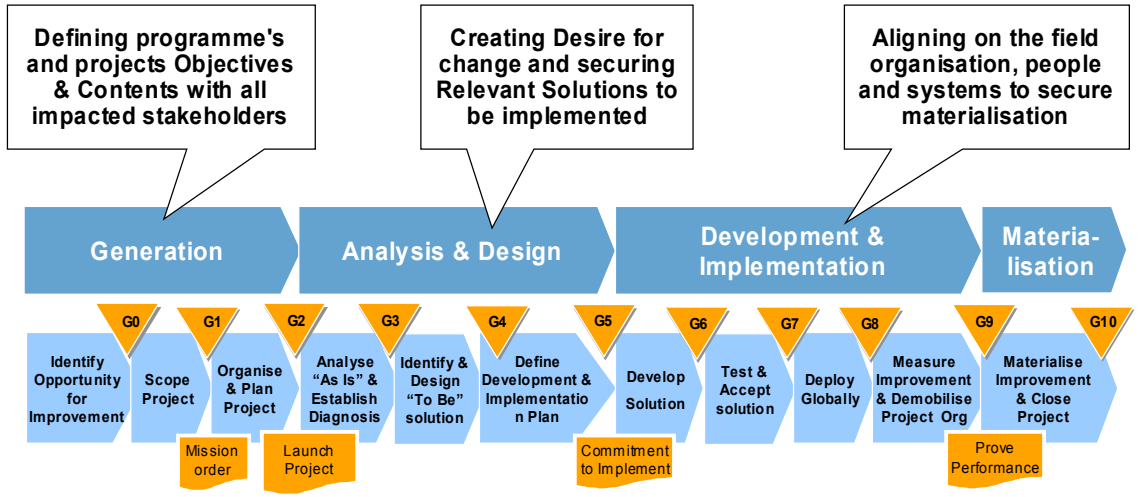

Figure 3. LBIP-Methodology for Robust Launch with Phases and Gates [3]

This paper focuses on the first two phases 'Generation' and 'Analysis and Design' until the milestone G5.

3 Analysis of Weaknesses and Definition of Design of Solutions

The analysis approach per work-package consisted mainly of:

- Customer Interviews
- Benchmarking with competitors and non-competitors
- Interviews with key actors from previous programmes (A330, A340, A380)
- Analysis of project and process documents
- Analysis of the design processes and of the root-causes of major problems

The analysis phase revealed in detail several weaknesses for each work-package, such as the lack of engineering involvement in Customer Focus Groups, incomplete evaluation of new features, the lack of a formal baseline and change process in the early design phases or the lack of methodological skills e.g. regarding design to cost. In the following chapter, some solutions and their benefits are briefly described:

3.1 Requirements Capture

The requirements capture will be supported by an expert organisation and process for a better challenging of customer requests and by a guideline and tracking tool for Customer Focus Groups. The expected benefits are an improved understanding of the market and a better quality and feasibility of aircraft concepts, definition and customisation requirements. Moreover, a leaflet with a list of top level documents shall lead to an increased awareness of major rules, processes and methods.

3.2 Risk Management on New Features

The risk management on new features is focussing on an improved process to deliver mature technologies in due time, with a dedicated multi-functional team in charge of evaluation and help for decision, and key technology reviews at all stages with internal/external experts. The expected benefits are an improved maturity and robustness of candidate technologies and deployment plans considering all requirements for the industrialisation of new technologies.

3.3 Pre-Launch Configuration Control

A progressive baseline and a change process, together with a configuration management method and -tool are the main solutions for the pre-launch configuration control. The benefits shall be less rework thanks to a more shared and controlled product configuration, associated documentation and tools, all along the pre launch phase.

3.4 Design to Agreed Cost Targets

A cost target setting and cascading process (in a first step starting with non recurring costs), will benefit to a more robust Launch Business Case and selection of the Aircraft concept. The design to agreed recurring cost targets will be supported by a “Design to Cost” Process, which shall decrease recurring costs by identification of cost levers, a better target achievement steering and a better knowledge capitalisation.

3.5 Design to Agreed Product and Time Targets

A functional oriented product structure and the functional analysis of design problems, supported by an experts organisation with a method and a tool, shall benefit in a better understanding of requirements by the designer. An information-system link between the tools for the contract related 'Standard Specification' and the engineering oriented 'Top Level Aircraft Requirements' will ensure to a better identification of the impacts between market need fluctuations and design constraints. Moreover, the systems engineering method 'Requirements Based Engineering' (RBE) [4], which will be supported with an experts organisation and the tool DOORS [5], is a major contributor to an increased level of 'right first time' and an improved V&V (validation and verification) strategy. All these solutions shall benefit in a better quality of the design, less rework and in less waste of time and resources.

4 Integration of Levers into Practice

Around the gate G5, in preparation of the 'Development & Implementation' phase, a change of project organisation became necessary. Figure 4 is illustrating the new organisation principle.

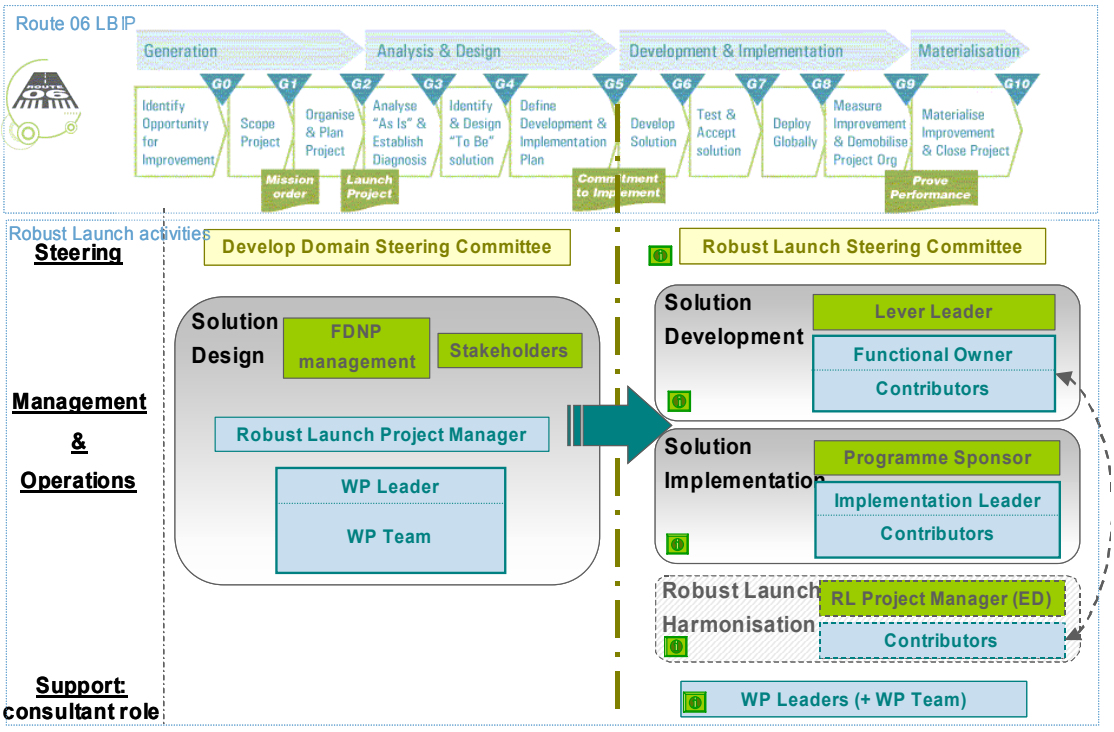

Figure 4. Change of Robust Launch Project Organisation around G5

The assignment of the previous Work-package Leaders ends with the G5 validation during an official G5 review. Further-on, they will support the project in a consultant role. For the following 'Development & Implementation' phase, the accountability for the solution development is given to so called *'Lever Leaders'*, which are heads of the solution-related domains in the Airbus organisation (e.g. the domain "Engineering Methods and Tools" for

solutions related to requirements capture and standard specification). Within his/her organisation, the Lever Leader ensures the full development of the planned solution and nominates a *'Functional Owner'*, who manages the solution development and it's implementation on all relevant Airbus Programmes, and in all relevant Airbus Functions. Moreover, the functional owner will be responsible for the continuous improvement of the solution. On the customer's side e.g. in a new Aircraft Programme, an *'Implementation Leader'* is the counterpart of an Functional Owner. He prepares the solution implementation plan on the Programme, adapting as necessary the generic Implementation Plan proposed with the solution to the Programme Organisation, he estimates and requests the needed workload & resources and manages the solution implementation within the Programme (Performance, Costs, Planning, Risks). Therefore, the Implementation Leader sets-up Key Performance Indicators (KPI's) on the solution, to measure its effectiveness and the achievement of the planned benefits, and takes care of change management and communication aspects of the solution implementation. Moreover, the Implementation Leader prepares the return of experience on the solution implementation, to be presented to the Functional Owner and Lever Leader and the Robust Launch Steering Committee, for continuous improvement objective.

The first experiences in the A350 Programme with the new organisation of Functional Owners and Implementation Leaders per solution, sponsored by a Lever Leader and a Programme Sponsor, are very positive. This approach provides the necessary commitment and penetration of the programme and a good communication between the solution experts in the functions and the customers in the programme.

During the course of the analysis and design phase, it became more and more obvious, that the initial split of the project into work-packages oriented towards the deeper analysis of well-known problem areas leads to separated and isolated improvements of identified weaknesses with specific methods and tools per work-package. Being not properly interlinked, these "to be" solutions don't support a harmonisation of solutions according the engineers' natural way of working [1, 6]. Thus, especially the ergonomic link between of tools for the support of design steps becomes a major issue for the further development of solutions. Examples from other industries and design science can help to identify the right level of tool integration [7].

In order to support the designers in their work-process in a consistent way and not only in several problem areas with separated methods and tools, we had to change the project organisation for the following development and implementation phase. Figure 5 shows the new project organisation with an example for the relocation of a solution: Requirements Based Engineering (RBE) is becoming part of the lever 'Design to agreed Product & Time targets'.

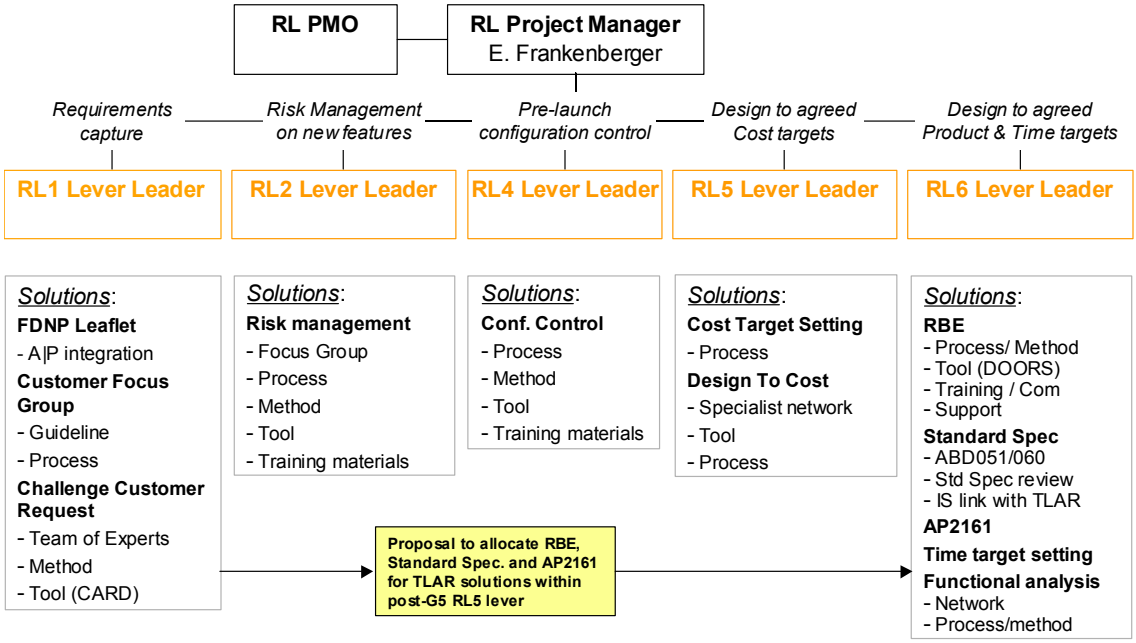

Figure 5. Changed project organisation for the implementation phase with an overview of solutions

5 Conclusion

For a manager in an engineering function with a design science background, leading an engineering process improvement project like 'Robust Launch' is a unique challenge and experience. The organisational set-up of such a large project gives an initial orientation in work-packages, which bears the danger of fragmented solution development. Even if the organisation of Robust Launch was adapted to the new requirements of the solution development and implementation phase, a design process oriented view for an interlinked solution design remains critical and requires a specific effort of the overall project management and the lever leaders. Nevertheless, Robust Launch succeeded not only to integrate best practices in the early design phases, but to establish a step-change in the quality of collaboration before the launch of new aircraft programmes. The recent "Authorisation to Offer" of the new long-range Aircraft A350 provides a first proof of the effectiveness of the developed solutions.

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