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THIRD TIER SUPPLIERS REQUIREMENTS

by

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Abstract:

This document describes the identified needs, views and requirements of third tier aeronautical suppliers with respect to the research themes of the VIVACE project. Methods used and task logic are described, as structured into five phases:

- Identification of operation areas likely to affect the behaviour of suppliers and guiding their approach to the research subjects of VIVACE;
- Development and application of a profiling mechanism, capable of supporting the identification of common attitudes and behaviours (suppliers' profile) towards the proposed research themes;
- Preliminary Identification of requirements, based on results from previous RTD projects, and initialisation of a suppliers community interested in the discussion of suppliers' expectations from and constraints on the VIVACE research;
- Coordination of open workshops for the collection of suppliers' comments and activation of a specific site devoted to the suppliers requirements, in order to improve and refine the formulation of suppliers needs relevant to the VIVACE project;
- Analysis of questionnaires compiled by invited 3rd Tier Suppliers, evaluation of findings against deliverables by other VIVACE tasks, and participation to Forum 2 of VIVACE project (October 2006) to collect additional comments and information.

Contents of this paper are aligned with the final version of the official project deliverable; the document is published as a dissemination mechanism and in view of soliciting feedback and additional suggestions by 3rd tier and smaller suppliers in the aeronautic value chain.

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1. DEFINITIONS

Third tier suppliers in the aeronautical supply chain are identified as companies that:

- Have a smaller size, typically in the range of SMEs and in any case below 1000 employees;
- Most often do not participate in the sharing of programme risks;
- Offer products and services at lower levels of the reference aircraft work breakdown structure (level 3 or below).

The following figure 2.1 illustrates the suppliers' hierarchy.

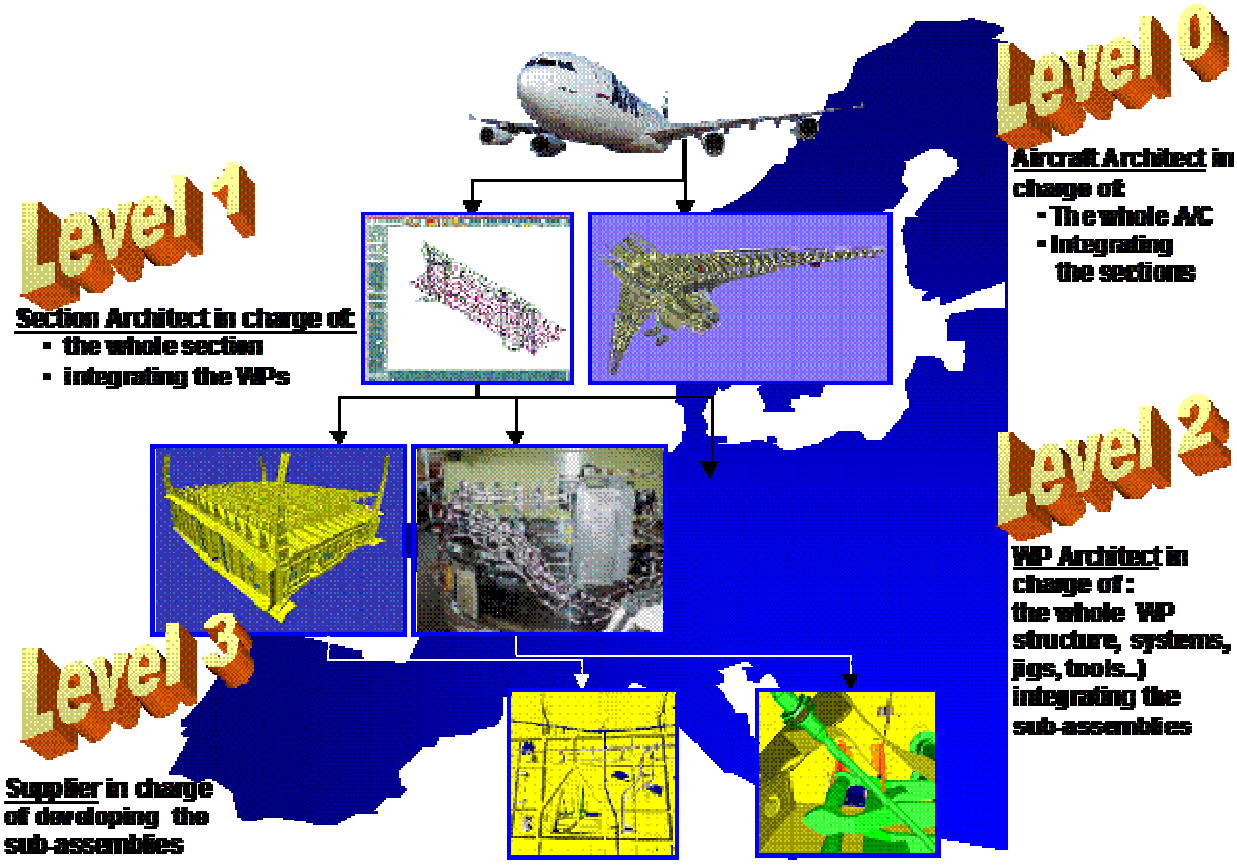

Fig. 2.1 - Aeronautical Supply Chain Hierarchy

Third tier suppliers companies are impacted by the innovative approach taken for the supply chain as a whole, while often are not given the possibility to interact with larger players to evidence their needs and views on relevant research subjects.

2. REQUIREMENTS ELICITATION LOGIC

Needs and views, and consequently applicable requirements depend strongly on the characteristics of individual suppliers.

The capability of grouping smaller suppliers according to reference profiles, defined in accordance with specific ranges in the characteristics considered, is expected to offer a significant help in the elicitation of requirements to be discussed with the direct involvement of 3rd tier suppliers.

The identification of needs and requirements which are relevant to VIVACE research themes was therefore based on (fig. 1):

- The analysis of the project research themes
- The identification of business process areas which are expected to be impacted by supply chain concept evolution and consequently to influence the attitude and needs of companies towards supply chain oriented research
- The identification of reference classes of companies according to their characteristics relevant to their attitude towards innovation

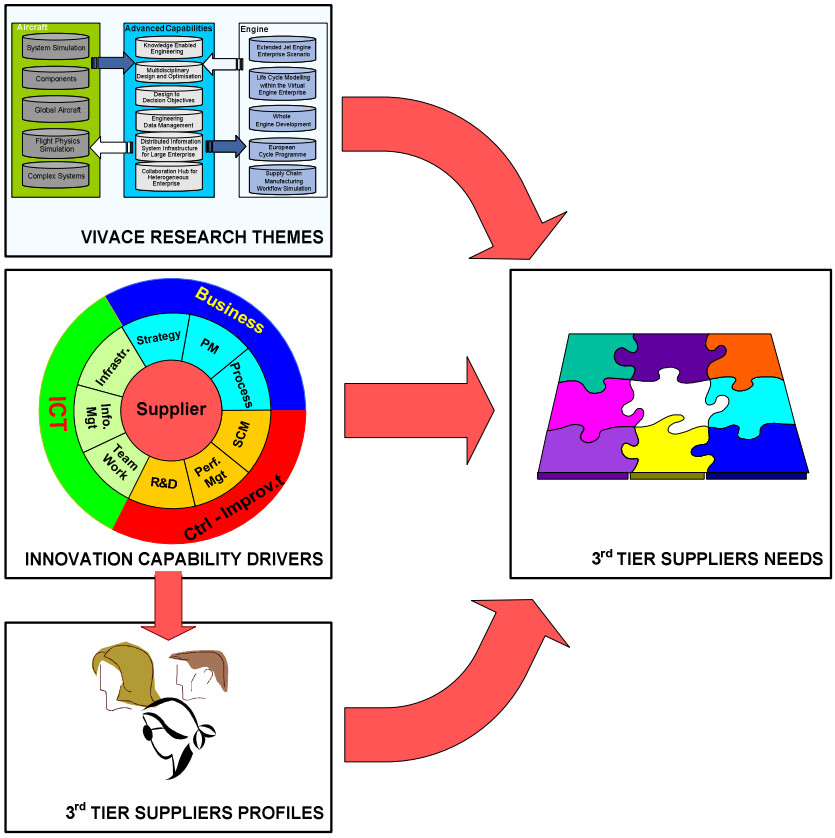

Fig. 3.1 – Third Tier Suppliers' needs and requirements elicitation logic

The initial elicitation of requirements constituted the basis to start a collective 3rd tier suppliers' initiative to deepen the understanding of needs and views and to update the set of requirements to be transferred to research Work Packages.

3. NEEDS AND VIEWS DRIVERS

The approach taken for the task is based on the development of taxonomy capable of supporting the structuring of requirements according to business and technology areas, which may in turn be mapped to the individual research themes.

The taxonomy is not built to ensure orthogonality, and some overlapping is present.

The structure is founded on three main subjects:

- Business, covering issues in the strategic and tactical areas, focusing on operational aspects
- Enabling ICT, devoted to infrastructural and operational issues in the ICT environment for the integration into the aeronautical value chain
- Control and improvement, covering control aspects in the conduction and evolution of supplier' business.

As it is formulated, the taxonomy has apparently a wider scope than the one strictly required to address the project research themes; nonetheless the VIVACE research is likely to span a number of areas which are outside the core themes, and the availability of a more general taxonomy is expected to allow for addressing the whole set of requirements areas that could be touched by the subprojects.

Individual areas at the highest identified level of detail are described within the document in terms of associated issues, as much as possible in relation with specific themes treated in the VIVACE subprojects.

Linking the taxonomy with the suppliers' profiles that will be evaluated as most relevant to the future value chain in European aeronautics shall provide guidance in the identification of suppliers' requirements to be made evident to researchers and practitioners within the project, and against which final results from VIVACE should be validated in terms of viability and supportability.

Taxonomy for Requirements Driver areas

The taxonomy of requirements areas (fig. 2) was structured according to three main themes:

- The business strategy and the operational environment for the execution of normal company activities;
  the business area includes all items that define the way a supplier is operating in the market and is therefore addressing the industrial view of the Company, including its policies and its operational environment.
- The enabling ICT environment to support company operations in accordance with the stakeholders' expectations;
  within the vision of the new aeronautical supply chain, ICT plays a major role, through its relevance for the efficient deployment of advanced interactions and working methods;
- The business process control mechanisms and the management of its evolution;
  with an increasing focus on knowledge and on supply chain integration, control on and evolution of the business approach and environment are necessary to the continued competitiveness of suppliers.

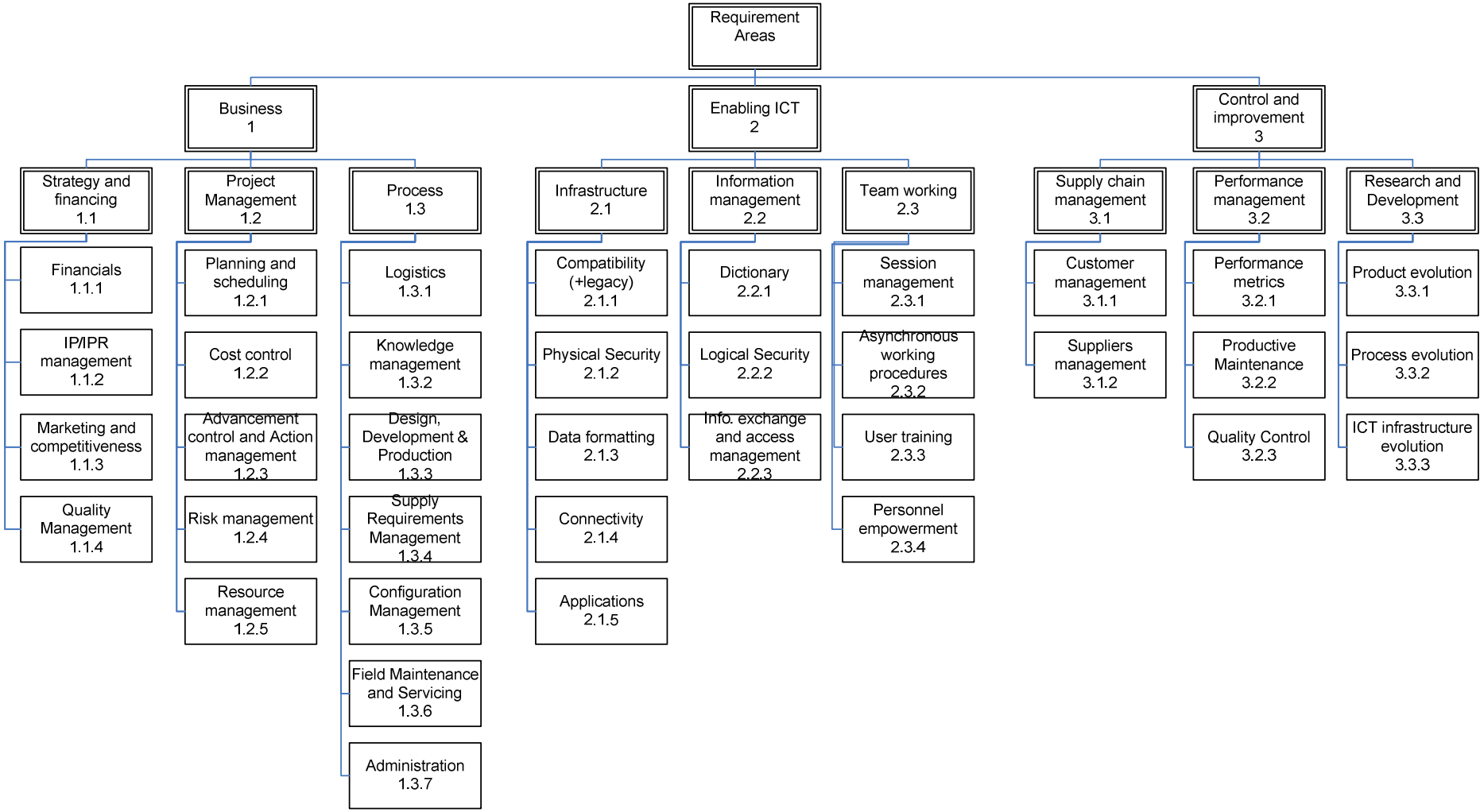

Fig. 4.2 – Reference taxonomy for 3rd Tier suppliers' requirements areas

3.1. BUSINESS AREA

3.1.1. Strategy and financing

Financials

Description The area addresses the company aspects related to the financial sustainability of the supplier company, with respect to its capacity of generating return on investments and on owned assets.

Specific subjects for investigation include:

- Margins
- Financial risks and exposures
- Market stability and programme guarantees
- Cost based competitiveness

Rationale Depending on the dimension and on the target markets, suppliers follow different strategies for acquiring a due return from participating to the aeronautical chains. Alignment of business to financial return criteria increases the commitment of top management and their sponsoring of innovation devoted to the improvement of company performances

IP/IPR management

Description The area addresses the requirements for identifying, protecting and exploiting intellectual property owned by the suppliers. It includes principles for accessing, using, exploiting and protecting suppliers' IP.

Rationale As Intellectual property is an asset for differentiating from competitors, protection of know-how is of utmost importance for suppliers.

On the other hand, access to qualified information from customers at upper tiers may provide highest capability to tailor and develop offering and delivery structure, to maintain a competitive edge in the market.

Marketing and competitiveness

Description Issues related to the management of multi-sector markets, as well as the alignment of competitiveness means among markets that have similar relevance to the company business, are considered here.

Rationale The building of a closed competition environment has often been a restrictive factor causing decline in the global competitiveness of the value chains, furthering stability at the expense to innovation and chain dynamics. Balancing the need for stability of long lasting aeronautical programmes with the efficiency of "open" supply chains requires the contribution of lower tiers views and a careful evaluation of impacts from evolution of procurement strategies.

Quality Management

Description The area includes all requirements related to the harmonisation/alignment of quality management policies and processes. It is in particular related to the specifics of the aeronautical environment, including compliance with aeronautical bodies' rules, and formal standards.

Rationale Quality policy and approach at suppliers' is particularly significant for the

overall value chain, both in terms of efficiency and of effectiveness. Harmonised approaches along the chain call for tailoring of requirements in accordance with the features of individual suppliers, in order to avoid duplication of efforts while ensuring full coverage of areas to avoid expensive non-compliances.

3.1.2. Project Management

Planning and scheduling

Description The area addresses the activities related to allocation of time and resources to the project, and to the setting of milestones and yardsticks along the project route. Specific attention is paid to requirements associated to alignment to and visibility of master plan, i.e. the global planning for time frame of the product life cycle which is relevant to individual suppliers.

Rationale Integrated planning for the value chain requires a harmonised vision of phases and dependencies, possibly through the establishment of a reference Life-cycle endorsed by players at different breakdown levels; optimisation of joint projects furthermore calls for the adoption of a collaborative approach to scheduling for cross-chain resource optimisation and smooth/harmonised contingency planning.

This needs to be supported by common methods and IT tools where possible to enable project management integration across the supply chain.

Cost control

Description Area includes the cost accounting procedures and related process characteristics (frequency, validation, etc.), together with external visibility/reporting principles.

Rationale Costing and control over expenditures is an important challenge for complex supply chains, as delay in acknowledging over-expenditures and taking adequate actions may lead to substantial propagation of budget overruns. Mechanisms to monitor actual spending through the chain are on the other hand a sensitive subject, as they impact commercial behaviour and call for the adoption of new approaches in the contracting.

Progress control & Action management

Description Addressed requirements are related to the progress control process (i.e management of the progression of tasks) and to the management of actions taken to prevent or correct deviations from plan. This area addresses specific characteristics for the process and visibility/reporting principles.

Rationale Integrated cost and technical advancement control relies on the correctness of data from suppliers, and requires that reference metrics for progress estimates are established, together with harmonised procedures for agreeing, accommodating and notifying actions taken for recovery. Communication mechanisms and clear understanding of propagation mechanisms allow for correct management of requests for action by suppliers impacted by contingencies originated elsewhere.

Risk management

Description This area includes the methods, activities and processes deployed to manage project risks, with specific reference to the management of

interfaces (risk propagation mechanisms) and to vulnerability (effect of external contingencies); a further subject is the related to risk status reporting and visibility, for both customer and supplier side.

Rationale Strictly related to the identification of product and process interfaces for individual suppliers, the tasks being undertaken, risk management is a process that has high criticality not only on all project development areas, but also on the total cost optimisation, as the requirements for procedures and criteria to be deployed by individual suppliers may result in undue overspending. Correct anticipation of event mitigation procedures strongly contributes to the correct propagation of information to externally impacted organisations.

Resource management

Description The area of resource management addresses requirements related to the personnel (availability of specific skills through the value chain, collaborative attitude and related solicitation, etc.) and to material, in relation to specific procurements for the execution of tasks (planning, delivery, lead time control, delays, etc.)

Rationale Attention to the subject arises from the need of some degree of harmonisation through the chain, in order to improve the effectiveness of cross-organisation teams. On the material side, the integrated management of resources may lead to substantial savings both in costs and in time.

3.1.3. Process

Logistics

Description The logistics area addresses the issues related to the Integrated Logistic Support (ILS) approach along the supply chain, including subjects like Reliability, Maintainability, Availability and Supportability requirements apportionment criteria and visibility, strategy visibility at different indenture levels, optimisation of data requests along the chain, participation of lower tiers to the global CALS/logistics documentation and models, and the plans and delivery processes associated with logistics.

Rationale Logistic processes are increasingly becoming a major source of competitiveness, due to their impact on air servicing parameters that are highly valued by air carriers. These processes are also drivers to the product design, and the field maintenance and service scheduling, providing Life cycle costs benefits and differentiators in the market place.

Knowledge management

Description Knowledge management issues are related to the formulation and control (capture, valuing, qualification, maintenance, updating, removal, etc.) of knowledge, as well as to its sharing, transfer and capitalisation along the chain.

Rationale The increasing rate of outsourcing is posing a growing demand on the capability for capitalising the know-how across the supply chain. Once IPR issues are solved, usability of knowledge can be an issue for different organisations. Harmonised approaches may lead to win-win situations by favouring the optimal overlapping of know-how along the product/service breakdown structure (resulting in better decision-making processes at each level).

Design, development and production

Description Within this area there is the coverage of issues related to engineering work methods along the product delivery cycle. Processes addressed are specific to the virtual and physical product development, with a specific focus on collaborative processes and on specific disciplines.

Rationale Within the framework of virtual product technologies, processes by individual entities need to be aligned and possibly harmonised throughout the life cycle, in order to achieve maximum benefits from emerging technologies. Alignment of processes allows for additional benefits related to the rapid estimate of efforts and to the improvement of selection of data/information to be exchanged.

Supply Requirements management

Description The area is addressing the management of product requirements at the product breakdown level of 3rd tier suppliers; it includes the issues related to the interfacing with upper and lower product breakdown levels, and is focused on harmonisation of procedures among different companies.

Rationale The management of requirements related to the contribution by individual suppliers is subject to a complex process understanding, acceptance, apportionment, implementation, verification and validation, with significant impact on the overall product life-cycle. The alignment of requirements and the prompt evaluation of viability for proposed changes constitute an important source of life-cycle improvement.

Configuration Management

Description The area deals with the processes and procedures in place for configuration management at suppliers'. In particular, process harmonisation issues associated to the use of advanced PDM/PLM systems shall be addressed

Rationale The adoption of common rules for configuration management along the chain simplifies the baselining process, while ensuring optimal use of part/component naming across the chain and correct tracking and control of changes along the product structure.

Field Maintenance and Servicing

Description Within the Field maintenance and servicing area process addressed are the ones related to the product support during its operating life, and include spares support, shop and line maintenance, overhauling, retrofitting etc. These in turn are related to the processes defined in applying ILS.

Rationale Suppliers processes for field maintenance and services, as well as related data/information can impact the capability of delivering optimal life-cycle support to customers.

Administration

Description Administrative requirements address issues related to invoicing, alignment of back-office processes with advanced procurements systems of the evolving aeronautic supply chain and mechanisms suitable to improve the efficiency of administrative tasks at customers and suppliers' side.

Rationale Administrative processes, including the changes enabling computer supported procurement, are often used as main source of metrics for the setting up of company strategies, so to potentially impact the final

performance of the value chain. The capability to respond to challenges of new procurement processes at upper tiers constitutes a significant challenge to several smaller entities.

3.2. ENABLING ICT AREA

3.2.1. Infrastructure

Compatibility

Description Compatibility area covers the aspects of infrastructure harmonisation for ensuring an adequate capability of data processing across chain platforms and between new chain-specific systems and legacy systems at individual suppliers.

Rationale When implementing new processes that are strongly dependent on an adequate level of support by the company ICT infrastructure, it is important to take into account issues related to the rate of technological change imposed and planned within the evolving supply chain. Compatibility requirements, which include legacy assets management issues, address the sustainability of choices performed at supply chain level, while properly addressing the stability of new environments.

Physical Security

Description Requirements in the physical security area include both computer / communication hardware related security (e.g. the shielding of computers from visibility from external places), and the methods and equipments for ensuring the controlled access to machines that allow for access to sensitive information.

Rationale By adopting distributed/remote computing schemes, the criticality of access control increases, as remotely connected terminals from suppliers and partners constitute a threat which is not under direct control of the information owners. The balance between additional software based protection on server side and improved physical access control on client side require the agreement between the companies in the supply chain, based on related capabilities and capacities.

Data formatting

Description Requirements associated to the data formatting area address the theme of physical media for data transfer and storage, and of capability of processing information independently of specific platform in use at the information owner's site.

Rationale Physical and logical structuring of data is a potential source of misunderstanding and of limitation in the processing capability of shared information. The use of emerging standards as an alternative to proprietary/legacy solutions raises concerns in the sustainability and in the associated investment requirements. Data formats in distributed data storage raise additional concern on interoperability for historical information

Connectivity

Description Connectivity area is devoted to the requirements associated to the establishment of bandwidth for communication across the supply chain; specific themes are associated to guaranteed bandwidth in one-to-one and

one-to-many interfaces, as well as to special requirements for advanced tools.

Rationale The performance capability of digital communication lines is rapidly increasing, offering the opportunity of enhancing non-core functions offering to users. Finding the best balance between actual cost and efficiency on one hand, and effectiveness in functional capability on the other hand entail the understanding of needs and connectivity exploitation capabilities of smaller industrial entities.

Applications

Description Main themes in the applications area concern the establishment of harmonised user interfaces (to improve user familiarity across applications that are resident at different companies) and the definition of commonly agreed data processing rules and algorithms, in order to increase confidence in results from external calculations. Constraints addressed in the area are related to the existence of well established solutions at individual suppliers, and to the organisational impact from the introduction of new/modified ones.

Rationale Moving toward new applications, suitable to improve the overall performance of the value chain, may impact on organisational aspects and is influenced by the general change capability of companies. Applications strategies, including the principles for selecting / upgrading the solutions available for the internal work environment are subject to a wide variety of factors.

3.2.2. Information management

Dictionary

Description Data dictionary area covers the requirements for the establishment of a common view and understanding of data meaning and use. Specific themes are strictly linked with the skill issues, in relation to the needs of aligning data requests to the skills and processes in use by individual suppliers.

Rationale Even within the disciplines where international standards are available and selected for use in the programmes, data meaning is a frequent subject of discussion. In some cases, data meaning clarification requires the specification of algorithms/processes to be deployed for their evaluation.

Logical Security

Description Requirements associated to the logical security area cover the processes and tools dedicated to protect data from internal and external threats, i.e. both in relation with malicious access, use and modification and for the prevention and correction of events of data loss or corruption.

Rationale Information that is stored and processed locally at the suppliers' may include sensitive data, protected formally through non-disclosure agreements. Acceptability of procedures and technological solutions deployed to protect those data is not often fully specified, in particular for the civil environment, and may impact significantly the overhead costs for participating to the new integrated work environment of the aeronautical supply chain.

Information Exchange and Access management

Description The area covers the aspects of control on information transfer across organisations and on management of access to data. Specific themes address the definition of data use requirements, the assurance of information delivery (exclusion of repudiation), and the optimisation of information flow so to ensure that all (completeness) and only (no data overflow) relevant data reach individual users, at the right time

Rationale A huge amount of information is generated and used in large programmes; the need for avoiding information overflow may lead to users not receiving some significant information. The reduction of lead times requires the exploitation of digital communication and adequate mechanisms to ensure information delivery for rapid action.

3.2.3. Team working

Session management

Description Themes considered under session management concern the session preparation and conduction, in relation with skills and attitude of attendees. Specific aspects are related to criticalities in the interfacing, to be aligned to the objectives of individual sessions and managed in accordance with agreed inter-organisational collaboration rules

Rationale Digital collaborative sessions offer a significantly poorer interface with respect to physical co-location. Managing a collaborative session requires co-ordination skills, adequate preparation by and a correct attitude of all participants.

Asynchronous working procedures

Description Asynchronous collaboration area covers the theme of management of work flow and the day-by-day team work procedures for remotely located participants, addressing principles for establishing agreed procedures in planning, allocating and controlling team work.

Rationale Conditions of inter-organisational team working are similar to the ones in a project conducted in a functionally structured organisation, where conflicting objectives by hierarchical structures different from that of the project may lead to sub-optimal performance of the working team. This is particularly true when team members are not full-time allocated to the working team.

User training

Description Training requirements are related to the specific characteristics of inter-organisational team working, with respect to the behavioural mechanisms and to the challenge of representing own company towards external entities.

Rationale Technical personnel are not necessarily communication or relationship experts; when hierarchical barriers to (or protection from) external direct interface fail, persons are exposed to new relational challenges that are not mitigated by belonging to a unique organisation and to the sharing of exactly the same objectives. Communication training is not often considered by companies as a must for operational personnel with limited coordination responsibilities.

Personnel empowerment

Description Personnel empowerment for team working covers the issues associated to

the identification of decision making limits to the company's personnel participating in joint teams with other entities, as well as the development of procedures for facing decisions that lay outside the area of empowerment of team members.

Rationale Within team working, decision-making is performed at team level, with shared responsibility by all participants. This is theoretically possible in every situation only in optimal conditions, where an individual member would be allowed to take decisions over the full scope of team work and on impacted areas. In real conditions, the escalation procedures for individual companies may lead to significant reductions in the effectiveness of team work, and require that adequate procedures be deployed for correcting time consuming processes.

3.3. CONTROL AND IMPROVEMENT

3.3.1. Supply chain management

Customer management

Description Customer management requirements address the themes of information openness for the different subjects in the work collaboration, of relationships management in the area of contract execution and changes and of setting and controlling criteria for customer satisfaction, and customer interaction or account management.

Rationale Customer focus is a must for companies that operate at lower tiers of complex supply chains and the capability of responding to customers' expectation is a big added value for programmes that span long periods

Suppliers management

Description The requirements belonging to this area concern the interaction mechanisms with suppliers and in particular the acquisition and forwarding of programme-relevant information. Further areas of attention include the transferring of customer's information requirements to the suppliers.

Rationale As the tier level progresses downwards, main contractors tend to lose monitoring and control capability, which is mandated to intermediate suppliers acting as integrators/coordinators of lower tiers. The overall capacity of programme control can be impaired by lack of control over critical suppliers belonging to lower tiers.

3.3.2. Performance management

Performance metrics

Description The performance metrics area covers issues associated to the translation of project requirements or global supply chain requirements into performance criteria and associated measurements, as well as the metrics reporting mechanisms and the criticalities on that theme.

Rationale Search for competitiveness in the whole aeronautical supply chain is performed by addressing the improvement of performances of individual chain elements. In order to substantiate the control over such improvement there is a need to establish metrics capable of providing a clear view of progress, in order to maintain the confidence in the positive evolution of the whole chain.

Productive Maintenance

Description Productive maintenance issues are related to the processes and procedures used by suppliers to ensure the quality and availability of means in use for the delivery of their supplies. Specification and reporting issues are particularly significant, due to their relevance to the effective and timely management of the global chain

Rationale The evolution of work environment deriving from the introduction of advanced tools and methods raises additional requirements to ensure the availability of the increasing number of work instruments.

Quality control

Description Quality control area includes the requirements related to the acceptability of suppliers' control activities, as well as the harmonisation of test/validation/verification methods across the relevant elements of the supply chain

Rationale For all activities which are not formally included within applicable standards, control of quality for the delivery is subject to ad hoc requirements specified by the customer. Alignment of customer's and supplier's quality control procedures and processes may result in significant savings deriving from the removal of overlapping control activities.

3.3.3. Research and Development

Product evolution

Description Product evolution area covers the issues associated to the change of supplier offerings, due to the innovation of product. Innovation strategies and constraints constitute the main focus for the associated requirements.

Rationale Product evolution is a recognised mechanism for increasing a company's competitiveness using the latest technologies and innovation. Nonetheless, the long life-cycle of aircraft and the complexity of interactions among equipment units and among services may lead to constraints that cannot be waived without the consensus of customers.

Process evolution

Description The area covers requirements and criteria for process evolution at suppliers', both for imposed and for internally originated innovation actions. Specific attention is paid to the optimisation of processes deriving from imposed changes.

Rationale Like product/service evolution, innovation of processes is a strong competitiveness source, for the resulting improvements in quality, technology, cost and delivery time. Alignment with the global supply chain processes is nonetheless a must.

ICT infrastructure evolution

Description The area covers requirements and criteria for suppliers' deciding the evolution of their ICT infrastructure.

Rationale Changes in ICT infrastructure imply investment costs and potentially long periods showing a reduction in supply performance; as such, they must be agreed upon within the frame of the global programme plan.

4. SUPPLIERS' PROFILING AND CONTRIBUTIONS

In order to perform such profiling, a questionnaire (Annex A) has been developed, to be compiled by 3rd tier suppliers belonging to the supply chains of some VIVACE partners (mainly Airbus and Alenia Aeronautica), covering France, Germany, Italy, Spain and the United Kingdom.

The questionnaire is structured in such way to address characteristics relevant to the areas of the taxonomy described in previous chapter.

Compiled questionnaires in raw form were exclusively processed by ESOCE Net, in order to preserve the confidentiality of related information, and shall be used exclusively to identify the reference suppliers' profiles.

The questionnaire was delivered to suppliers with an accompanying recommendation letter by their reference aeronautic customer, and with an invitation to participate to relevant events.

The total number of companies directly targeted was 148.

4.1. COMPILED QUESTIONNAIRE STATISTICS

The questionnaire has been supplied in its full version to 148 companies, and 7 replies have been received, 5 from Italian companies, 1 from France and 1 from UK. The substantially larger participation of Italian suppliers (more than 15% of invited companies) is considered to be due to the active sponsoring by Alenia Aeronautica.

A simplified questionnaire has been developed, and proposed to 13 Aerospace dedicated local enterprise associations throughout Europe for promotion among members, and some additional 3 answers were received from aeronautical SMEs in Spain.

This was supported by summaries of information from meetings with associations in the UK on the state of the industry associated with smaller suppliers.

All evaluations are based on the sample of 10 companies.

4.2. SUPPLY AREAS

Despite the limited number of companies responding, yet the coverage of areas of supply (with reference to Airbus' classes of supplies) is quite extensive (see following table).

Nr. of suppliers	*Supply category*
2	**Aerostructures**
5	Assembly
2	Composite
2	Interiors
2	Electrical
4	Detailed parts
2	**Equipment Systems**
4	Landing gear and braking systems

Nr. of suppliers	*Supply category*
2	Fuel Systems
2	Avionics (Modular, LRU's)
2	Com-Nav, Maintenance, Warning
2	Navigation and Flight Management Sys.
1	Air systems
4	Hydraulic systems
2	Electrical systems
4	Flight controls, Flight Guidance
	Auxiliary power units
2	Cabin systems (I.F.E., Seats, Galleys)
1	Cargo Loading Systems
1	Water/Waste Systems
3	Cockpit display systems and units
	Propulsion Systems
4	Engines
3	Nacelle
	IT & Telecom
	IT/IS Hardware Procurement
	IT/IS Software Procurement
1	IT/IS Services
	Telecom Network Procurement
	Materials
	Aluminium and special alloys
	Titanium, forgings and castings
	Fasteners
	Hardware
	Composites and consumables
	Enterprise Consumables and Services Procurement
	Marketing & Public Relation Services
	Transportation and Logistics
	Office Supplies and Furniture
1	Facility Management
	Consumables
1	Consultants
1	Personnel Services
1	Special Services
1	**Product Related Service Procurement**
6	Engineering Services
5	Industrialisation and Manufacturing
3	Consultants
5	System Engineering services
3	Technical Documentation
1	Mechanical Services
2	Special Services
	Capital Equipment & Facilities

Nr. of suppliers	*Supply category*
	Building & Construction
	Machine Tools
1	Jigs, Fixtures & Assembly Tools
	Cutting & Power Tools
2	Measuring & Test Equipment

When considering the type of supply, half of responding companies have a product oriented supply (products/services ratio over 1).

4.3. BUSINESS

4.3.1. Dimension and financials

The range of company dimension ranges, in terms of personnel, between 70 and 8.000 people, even though 90% of companies have less than 500 employees.

50% of companies have no significant participation of large enterprises.

EBIT is often well below 5% of revenues.

Rate of productive to total personnel ranges between 60 and 90%, with higher rates in service companies.

Growth rate ranges between 0 and 26 %, with an apparently important negative correlation with dimension.

The small dimension of profit, particularly for suppliers that do not show a capital participation of large enterprises is considered to be an important source of risk for the whole chain, as the strategies of large companies pushing for committing larger project responsibility to lower tiers may call for significant investments, which cannot be sustained by actual profits.

The impact of profit and the ability to invest in the future is seen as significant in the assessment of smaller businesses in the Aerospace industry.

4.3.2. Markets and Marketing strategy

Most frequent role is the stand-alone supplier, though several companies are looking for taking responsibility over integration of supply chain segments, or possibly through mutual partnerships where synergies exist. In particular, evolution in offering is expected by most manufacturing companies to be focused on the capability of achieving a more complete/integrated supply. This is sometimes seen as an internal technical capability evolution, and more often as the opportunity of widening own capacity through the creation and efficient management of a specific own supply chain.

The attitude to prefer leveraging own supply chain to the widening of own internal capacity and capability might be caused by a perceived high risk-to-profit condition for lower tier suppliers.

From the point of view of internationalisation, most companies are strongly focused on domestic market, with only one exception, declaring a 50% foreign market.

Most companies have a strong dominance of aeronautical market in their target, with 60% over 80% in revenues, and several ones with a single dominant customer; market

differentiation is typically increasing with dimension; larger companies tend to address different markets or to show a significant rate of internationalisation.

Changes in customer and supplier base for aeronautics are apparently negligible. This may be a factor of the sample size, which may not reflect the impact of globalization, and is becoming an increasingly significant factor for third tier suppliers, as they must face two effects which tend to balance the positive return of a globally growing market:

- the increasing availability of qualified suppliers from low manpower cost Countries;
- the growth of new aeronautic markets in developing Countries is often associated to offset agreements for technical, production, and support work to be undertaken within the country acquiring the aircraft.

When combining the low dynamics of chain and the strong focus on aeronautic market, the risk could be identified as creating in the suppliers a reduced appetite and capability to evaluate and exploit technological and scientific advancements created within markets other than aeronautics.

A stable and consolidated chain may on the other hand offer a better environment to promote inter-company knowledge sharing, mostly in the interface areas of suppliers, even though from a chain management point of view the promotion of improved links among suppliers might reduce the governance capability of procurement entities.

Rate of yearly investments for research and innovation ranges between 3% and 10%, with some exceptions associated to companies strongly seeking for offer innovation, mainly in the “new technologies” area.

4.3.3. Process and project management

Organisation is typically functional, and tends to move toward the matrix or project oriented when increasing the relevance of services, with typically project oriented structure for consulting companies. This is well in line with solutions adopted in other markets.

Processes are typically well formalised for all, but process dynamics, as witnessed by the yearly rate of change in procedures varies substantially, from as low as 5% to 40-50%.

Decisions are rarely managed by boards, and top management tends to play a very important role.

At this level Project Management is often partial and not formalized, with relevant procedures imposed by customers. More formalized processes are often used where businesses develop, or where the products and services are more complex.

4.4. TECHNOLOGICAL ENVIRONMENT

Technological environment tend to be a mix of popular systems for office activities, and customer driven for technical areas. Legacy tools have a very limited presence.

Reuse of non-administrative tools is apparently low, with specific consequences on the ease for single market companies to open up new markets, and increased relevance of tools cost on price of supply.

The rate of change for Hardware is in line with common practices.

4.5. PERSONNEL MANAGEMENT

4.5.1. Skill structure

Personnel average experience ranges between 4-5 years and 15.

Where for production companies the number of graduates can be as low as 10%, services and software companies range between 60 and 90% of graduates.

4.5.2. Personnel motivation

Motivation is searched through monetary rewarding, responsibility and hierarchical/technical growth opportunities.

Most companies show a very low yearly turnover for personnel, with figures well below 5%, which is compatible with a frequent condition of a “one company for life” attitude for employees.

The overall high average experience and the very low rate of personnel turnover might lead to personnel attitude to overprotect own know-how as positioning and hierarchical growth mechanism.

That may prevent a positive attitude to the sharing of own knowledge with colleagues, and in particular to the formalisation of know how.

5. THIRD TIER SUPPLIERS REQUIREMENTS

Needs and requirements have been updated throughout the work, reaching a final number of 184.

Upon an analysis performed on deliverables from project Work Packages when a complete visibility on expected scope of results was consolidated, the applicability of requirements to WPs was reviewed, and a more precise allocation could be performed.

Several needs and requirements were not identified as directly relevant to the focus of project research tasks, but they are nevertheless kept in the list, so to offer a more general view of existing issues, for re-use and upgrading in future projects.

5.1. STRUCTURE OF REQUIREMENTS

An initial set of general requirements relevant to 3rd tier suppliers has been identified on the basis of results from previous European aeronautics-specific RTD projects (mainly the CEPRA and CASH projects), from European RTD projects addressing smaller companies in supply chains and in Virtual enterprises (VIVE, ARICON), and from the public results of the SCRIA (Supply Chain Relationships in Action) initiative by SBAC (The Society of British Aerospace Companies).

Requirements have been associated to the taxonomy areas previously described, and are reported in the following chapters in accordance to that classification.

5.2. BUSINESS NEEDS

Strategy and financing

1. Suppliers commitments over the product life cycle (development, prototyping, series, specials, spares) should be clearly identified in long-term agreements
2. The overall strategic vision of the supply chain should be documented, as well as visible and known to all
3. The technology roadmap from 1st tiers should be developed with key suppliers at the various supply chain levels and propagated along the supply chain

Financial area

4. Suppliers' strategies must be aligned and/or understood. Supplier's business strategy and decisions may affect the purchaser's programme.
5. Information on likely changes in market conditions should be disseminated through the supply chain.
6. Negotiations should be entered with the intention of achieving a result that is of benefit to all parties.
7. Collaboration along the chain should be based on mutual benefit
8. Financial constraints of smaller suppliers should be taken into account in the definition of financial strategies by larger customers in the supply chain, and in particular cash flow
9. Reasonable payment terms should be agreed, which are to the benefit of everyone in the supply chain, and then strictly adhere to the mutually agreed terms

10. It is necessary to discuss all potential investment decisions associated with the programme and ensure returns are respected once commitments have been made
11. Benefit sharing of cost reduction activities should be agreed by all parties and documented.
12. Procedures for cost control along the chain should not allow for imposing margins by upper tier, which could work against expected evolution of capabilities and capacities of suppliers.
13. Reverse e-Auctions should be used as appropriate to support the supplier selection process and should be agreed through a commercial agreement or contract. To apply this though the scope of work or products required have to be well defined, complete and unambiguous
14. Constraints on suppliers' business models should be identified and communicated by upper tiers

IP/IPR management

15. Offering customers with access to owned know-how may constitute a source of loss of contractual power; adequate methods to protect knowledge, applicable to know-how that is complex and costly to patent should be identified
16. Intellectual property rights, copyrights, patents and trademarks of all in the supply chain should be honoured
17. IPR management policy should be clearly identified for all players in the supply chain and respected against the contract placed
18. Product liability issues should be better addressed in the supply chain

Marketing and competitiveness

19. An understanding of the purchaser's business aspirations, technology needs and long term procurement strategy. Future business forecasts should be communicated throughout the supply chain.
20. Suppliers should be given full understanding of the most competitive supply options
21. Measures for improved competitiveness should be agreed
22. Supply chain components should work together to produce joint continuous improvement plans and integrated business process improvements
23. Confidentiality of information on effort and cost for individual suppliers should be ensured, both towards external entities and towards other companies participating to the project
24. Localised capability development strategy should be driven by upper tiers and coordinated through their supervision
25. Contractual agreements should be capable to preserve trust among partners
26. The process for choosing partners and suppliers should take into account both "soft" issues such as technical and management capability and attitude, the social implications caused by off-shoring / outsourcing on local or long term capability, as well as the "hard" issues such as costs and lead time
27. There is a need to find tools to integrate companies offering intangible products into a risk and revenue sharing partnership

28. There is a need to enhance existing “pools” of geographically related or technology area to face-up to higher tiers and to investigate the opportunity of creating new ones.
29. The condition of conflicts in operating/reporting for a supplier active in several enterprises should be properly addressed
30. The introduction of a supply chain entry barrier due to the use of advanced mock up capabilities should be properly taken into account

Quality Management

31. Commit to the continual development of products, services, people, business processes and IT infrastructure
32. Acceptance of standard assessment of a company's business management system should be promoted
33. Specific assessments of supplier processes should be carried out only where no accepted standard approval or other acceptable customer assessments already exists
34. Standardise supplier assessment criteria and quality approvals across the sector to the maximum extent possible
35. Adoption of common Environmental ad Health and Safety Standards should be promoted through the supply chain

Project Management

Planning and scheduling

36. Suppliers should be involved in the purchaser's project planning process which should be communicated throughout the supply chain
37. Notification to suppliers of changes to characteristics, boundaries and scheduling of tasks relevant to the supplier itself should be performed with minimum delay with respect to actual occurrence of change
38. Programme’s tasks and activities impacting tasks allocated to individual supplier should be clearly identified, together with related dependencies; status of actions and advancement/scheduling for such tasks should be available to suppliers
39. Suppliers should have procedures available for executing and logging negotiations on changes to project
40. It should be possible for supplier to access information on advancement of project with respect to supplier’s relevant tasks
41. Project Management needs to be fully comprehensive, coordinated full breakdown of goals, milestones, etc. through the supply chain
42. Changes and in particular backward actions should be minimised

Cost control

43. Collaborative work procedures through the supply chain should be implemented to achieve product and service improvements and total cost minimisation

Advancement control and Action management

44. Make full use of agreed performance measures on schedule adherence, product quality and overall through life cost

45. Information on any potential supply problems and action plans should be delivered. Consistency of communication is required with clear points of contact defined

46. Regular and timely business reviews should be executed with performance management against agreed metrics by cross-functional business teams

47. There is a need to tailor status reporting requirements in accordance with characteristics of individual suppliers, or comparable groups of suppliers as a means of creating efficiencies.

48. The tendency to mistrust suppliers should be countered through adequate methods preventing the "padding" of quoted lead times and minimising safety stocks. Mutually beneficial methods should be applied through the contracting process to encourage efficiency and trust.

Risk management

49. Agree a joint and open approach to risk management and problem resolution. Share the risk and the rewards so as to benefit both parties. Common repeatable processes should be applied for efficiency, consistency and knowledge growth.

50. Participation of suppliers to decisions and to risk management should be supported by the client through adequate means for impact analysis and simulation; responsibility on evaluation algorithms should stay with the client

51. There is a need to identify and communicate a strategy for spreading long-term risks over the chain

Resource management

52. The supplier should be given the possibility and the technological support to specify levels of responsibility for personnel allocated to project, and procedures should be made available to team members for accessing higher hierarchical levels whenever required to take programme decisions during collaborative working sessions

53. Resources should be optimised through the supply chain

Process

54. Optimisation of processes should be performed by taking into account the whole supply chain and acknowledging inefficiencies imposed locally

55. Alignment of practices should be limited to the minimum necessary to improve interfacing capability, so to minimise impact along the chain, but ensuring that the processes applied are within safety, certification or other Aerospace critical standards. These should be agreed on a case by case basis between the client and supplier based on their relationship, and the most effective and efficient means of operation.

56. Design of collaborative processes should be driven by information needs, and local processes should be driven by business requirements

Logistics

57. There is a crucial need for an appropriate ILS standard specifically applicable to suppliers. Most of the present standards are oriented to large companies and appear difficult for suppliers, requiring considerable tailoring, and assistance in achieving this.

58. The methods and algorithms used to process data provided by suppliers should be clear and made available to evaluate best logistic support improvement opportunities associated to changes in the supplied products/services

59. Organisational improvements at upper tiers should not impose additional organisational loads to lower tier suppliers. Lean processes need to include supply chain operations to optimise the process as a whole, not just within the primes.

Knowledge management

60. Confidentiality agreements must exist to protect suppliers identities and any information disclosed
61. Commercial discussions should be respected, and any information given or received should be treated as strictly confidential
62. Upper tiers should support lower tiers in the task of managing changes towards a collaborative supply chain. Where appropriate these could extend to joint processes for lessons learned, training, and usage of expert capability.
63. New information technologies should be implemented to improve information integration along the supply chain
64. The integration of processes should cover the definition of expected information and knowledge to be shared, together with related tools and methods
65. Knowledge of management should address and include management of individual know-how through personnel management based techniques

Design, Development & Production

66. Work closely together to improve inter-company and intra-company relations and behaviours
67. Knowledge must be shared through the value chain. Schedules, targets and any likely product change should be forwarded.
68. Suppliers should be involved in the development of products and services at the earliest possible stage and work should be performed closely with suppliers throughout the life cycle and on any subsequent changes
69. Integrated Product/Project Teams should be set up. Cross functional, cross company, empowered teams will have a major impact on performance in the value chain
70. There should be joint lean thinking initiatives to develop JIT/TQM processes along the supply chain with shared benefits
71. The integrated process for the collaborative supply chain should be formalised

Supply Requirements Management

72. Notification to suppliers of changes to characteristics and boundaries for items/services to be supplied should be performed with minimum delay with respect to actual occurrence of change
73. The link between requirements and design should be improved, possibly through the proper documentation of the rationale, or structured common processes for requirements engineering and the input to design

Configuration Management

74. Early advise throughout the supply chain where design change could reduce the life cycle cost of the product or enhance customer satisfaction
75. Suppliers should take an active part to the change control process

76. The configuration change requests should be notified to the suppliers whenever
- related to documents and parts belonging to the boundary of supplier's task
- developed in tasks and activities that are relevant to supplier's tasks

77. There is a need to integrate version and status cultures over the chain

78. Change procedures should be made faster and more secure over the chain

Field Maintenance and Servicing

79. The parameters influencing the overall field maintenance and servicing offering should be made clear to the suppliers and treated as performance indicators for individual contributions

80. Collected Field data and feedback be should be made available to suppliers whenever relevant to individual and global technical and commercial performance

Administration

81. Purchasers and suppliers must understand and agree the rules of engagement before participating in reverse e-Auctions. Participants must fully understand the nature of the bid, the whole process involved and their respective responsibilities and commitments

82. An e-Business strategy and implementation plan should be developed, from major suppliers, and representatives of smaller businesses to define a common set of policies, and processes.

5.3. ENABLING ICT REQUIREMENTS

Infrastructure

Compatibility

83. Suppliers should have available tools for interfacing legacy systems with the collaborative project management environment

84. Incompatibility among upper and lower tiers ICT infrastructures should be avoided

85. Solutions must be efficient, flexible, scaleable, affordable and compatible with each company's in-house IT policies.

86. The infrastructure needed for collaborative sessions shall be compatible with existing information systems at the Suppliers'

87. ICT based collaboration processes shall be compatible with existing processes at the Suppliers

88. Use of standard and widespread S/W & H/W platforms should be pursued

89. The issue of legacy information systems management should be included in all innovation initiatives

90. There should be a clear approach to coordinate the updating of infrastructures

91. Capital investment on infrastructure by smaller suppliers should be minimised

92. There is a need to improve the tracking of requirements on Hardware

Physical Security

93. Requirements on physical security should be aligned with global security requirements applicable to suppliers

94. Standardised physical security requirements should be available throughout the European aeronautical industry

Data formatting

95. Information relevant to the processing of data (e.g. for parametric functions of CAD or for FEM imposed meshing characteristics) should be treated as integral part of data elements
96. The transfer of data to a supplier should be performed according to formats that ensure the capability of the receiver to process them according to requirements of the applicable Statement-Of-Work
97. Formats for data exchange should be as much as possible neutral (non-proprietary), in order to accommodate for SMEs to operate through different market sectors and clients without duplicating interface mechanisms
98. Top tiers should associate their leadership on choices for networking and interoperability with actions in support to small suppliers taking-up

Connectivity

99. Bandwidth requirements should be tailored to the actual availability and efficiency (ratio between cost and performances) of digital communication means at suppliers' locations
100. The upgrading of communications means to most efficient available technology should be part of the business plan of individual suppliers

Applications

101. Access for suppliers to project management systems should be achieved through Internet connections and standard browsers. Additional plug-in costs should be limited
102. It should be possible for suppliers to directly update project information that are under their responsibility
103. Tooling for sector-specific and client-specific data exchange requirements should be under the responsibility of clients
104. Special (non-standard, like e.g. viewing) data processing tools should be offered for use through the access sessions. Use of reference data processing tools should be possible at client's (e.g., reference CFD tools)
105. Solutions must be acceptable to both large and small companies
106. The user interface end needs to be OPEN to allow flexible use
107. There is a need for Common Software development environments, including CASE tool, languages, debuggers, SW configuration management tools, integration tools, testing tools
108. There should be a common configuration management environment for information
109. Smaller suppliers need support in the configuration of their enterprise systems for optimal collaboration in their partnership network
110. Common practices in model creation should be shared through the supply chain. NB These will need to considered against the most common CAD systems as applied in Aerospace, e.g CATIA, UG etc.
111. Use of commercial supply chain infrastructures might be beyond the investment capability of smaller suppliers. Can more cost effective methods to use these portals

be applied to allow smaller companies to use them, or comparable systems that can be interfaced to them.

112. There is a need for minimising cost of SW maintenance, possibly through the use of common application Software

Information management

Dictionary

113. Product data must be clearly structured and visible
114. Information should be formulated in accordance to syntactic and semantic rules that are shared and commonly agreed upon
115. Data should be associated to a clear description of related contents, format and processing methods/objectives
116. Whenever improving the capability of reusing suppliers' existing/consolidated processes and procedures, the supply of data alternative to the ones best suited to clients' tools should be considered
117. The criticality in data sharing should be solved, which derives from the need of partners to interpret data in a common data space, or supply contextual inform

Logical Security

118. Notification of events should be ensured, and effective delivery should be certified; a non-repudiation control system should be in place for communication from suppliers to clients
119. Communication actions (e.g. the notice of new data) should be logged and checked for successful delivery and non-repudiation issues
120. Responsibility on data and on related applicability in time should stay with the associated owner. Change of ownership of data should be adequately managed and notified to all users
121. All collaborative sessions shall be secured at a high level, in order to avoid external intervention
122. There is a need for an industrial common standard [agreement] on security, providing reference secure environment requirements and operating procedures
123. Security issues should be managed harmoniously with commercial risks and benefits

Information exchange and access management

124. The type and content of data to be exchanged/shared should be the subject of a formal list, providing also the description of users and of related use
125. Data requests to suppliers should not assume the availability of capabilities different from the ones normally used in suppliers' activities
126. Due to the cost of systems for managing and controlling external access to own data, the mechanisms to be made available by suppliers to client for direct access to suppliers data should be very simple and limited to non-critical data
127. The transfer of data between independent suppliers should be managed by the client
128. The availability of a new revision (release) of data should be notified to accessing users

129. Suppliers need to know the organisation of the technical data supported by the customers in order to be able to access it
130. Data accessed, exchanged and used should be put under version control, and related access/use sessions should be logged
131. Upper tiers should identify requirements that are likely to change, map them against "design parameters" and ensure communication on criticalities through the supply chain
132. The issue of information flooding toward lower tiers requires the identification of the information relevant to each process task, in order to provide just the needed information (no overflow)
133. OEM moving responsibility down the supply chain requires more powerful information management backed by associated processes.
134. Information management should include the processes for transferring knowledge from OEM/high level tiers suppliers to lower ones
135. There is a need to improve interfaces among Companies in order to bring knowledge into design process
136. Adopted information standards should be as much as possible internationally accepted and not under proprietary ownership of a Prime

Team working

137. Methods and tools adopted by "primes" should be as much as possible the same
138. There is a need for developing mechanisms to identify and measure contributions to virtual teams, to be reflected into contractual agreements
139. Team working should be based on the proper acknowledgement and acceptance of separated legal and hierarchical structures, and reflected in common contractual policies applied across the industry, to protect organisations as far as possible within the EC legal regulations and freedom of individuals.
140. There is a need to fully address the issue of tacit knowledge, transfer of which can hardly be formally treated in agreements (Knowledge management is considered within VIVACE, and a scenario is in place to consider the supply chain, which this requirement needs to be evaluated against.)

Session management

141. Collaborative working should be supported through the availability of what-if analysis tools, in order to evaluate potential impact of decisions to be taken, and to validate actual empowerment required to participants to decisions
142. Collaboration sessions environments shall ensure an adequate quality of service
143. Synchronous, real-time communication (e.g. distributed simulation for validation purposes, video conferencing, shared applications…) must take care of criteria such as performance and security
144. The issue related to differences in companies engineering cultures should deserve proper attention and guidance

Asynchronous working procedures

145. For asynchronous communication two modes must be taken into account: Push mode (e.g. e-mail, asynchronous database replication) and Pull mode (e.g. FTP, mobile agents).

146. Each process based on asynchronous procedures should be specified in terms of acceptable delays in delivery and response
147. Whenever synchronous communication means are hypothesised, there should be the possibility for accommodating the process through backup asynchronous means to cope with part-time personnel allocation to programme

User training

148. To avoid difficulties of sharing information with customers and suppliers, there must be an agreement on parametric design rules
149. The collaboration processes and methods shall be documented in order to facilitate training and appropriation by workers
150. Users training at the suppliers' should include general training on processes and procedures associated to the use of shared applications

Personnel empowerment

151. Limit of liability in the decision by team personnel should be formalised by individual companies (customer and supplier) and made clear to all team components
152. Procedures should be available to provide team components with sufficient confidence on effectiveness of decisions taken at team level and to start fast escalation procedures whenever required for rapid go-ahead on critical tasks
153. There should be a continuous involvement of all suppliers, with methods to ensure constructive feedback and efficient application of common practices

5.4. CONTROL AND IMPROVEMENT REQUIREMENTS

Supply chain management

154. The choice between pure customer/supplier relationship and vertical integration/partnership should be the result of a trade off in terms of engineering and manufacturing efficiency
155. Integration of planning should be pursued to avoid cascade effects which impact on efficiency
156. There should be dedicated supply chain managing personnel, working with suppliers in development activities
157. Management of the supply chain should be based on the principle of value stream, with clear understanding of requirements by internal and external customers

Customer management

158. Customer should avoid to request information which is not strictly necessary to programme and which might be used to acquire advantages in the relationships with the suppliers
159. Offering of information to the customer on the status of supply should be the best possible, providing for compatibility with commercial interests and knowledge protection provisions

Suppliers management

160. Use of Memorandums of Understanding (MOU's) to clarify and describe working intentions and relationships should be considered

161. Particular customer contractual requirements which need flowing down the supply chain should be identified and treated accordingly

162. Contracts should be as much as possible standardised and simplified

Performance management

Performance metrics

163. Performance metrics related to the participation of suppliers to the aeronautical chain should be agreed at contractual level and aligned with the metrics used by individual suppliers to control the achievement of their own strategic objectives

164. Performance metrics associated to the evolution of suppliers' capability should be reflected into medium and long-term partnering programmes

165. The identification and evolution of metrics for the supply chain should be derived from a consensus process involving all partners

166. Performance measurements should be harmonised with contractual arrangements and mutually beneficial as far as possible to reflect supply chain collaboration needs and virtual environments.

167. Performance metrics for suppliers should be:

- realistic
- visible
- achievable
- aligned to business goals/objectives

168. There is a need to find mechanisms to monitor and improve performance of both the whole chain and individual partners

Productive Maintenance

169. Targets for productive maintenance should be aligned with the production readiness performance required by the chain leader and the final customer(s)

Quality Control

170. Besides the compliance with applicable quality standards, quality improvement programmes by suppliers should be harmonised with the competitiveness driven targets of the whole supply chain

171. The transfer of best practices acquired by suppliers through their activities to market sectors different from aeronautics should be promoted and hunted for by upper tiers

Research and Development

172. Foresight studies should be shared down the chain, in order to increase the capability of whole supply chain to jointly respond to anticipated changes

173. Customer companies should enact mechanisms for promoting and supporting suppliers' creativity and RTD initiatives in view of chain competitiveness

Product evolution

174. The parameters that are most valued for the global competitiveness of the aeronautical supply chain should be propagated to lower tiers in such way to provide guidance in suppliers efforts to improve own supply

175. Impact of new technologies on supplied product/service should be notified by suppliers to their customers, whenever technical performance is affected (both positively and negatively)
176. The supply chain knowledge network should be strengthened to increase speed of knowledge growth

Process evolution

177. Constraints on Suppliers' process evolution, as deriving from customer's approach to management of own processes, should be the subject of periodic formal specifications made available to the suppliers
178. Participation of suppliers in the assessment of impact of new customer's processes should be rewarded
179. Requirements for process evolutions deriving from customers should be harmonised with the global competitive strategy of individual suppliers
180. Strategic and innovation goals should be the subject of consensus building actions
181. Supply chain collaborative environment should include and area for open exchange of ideas
182. Innovation by smaller companies should be kept in line with actual human capital resources

ICT infrastructure evolution

183. Requests to supplier for evolving their ICT infrastructure should take into account the timing and the costs for suppliers to perform transition
184. Customers should provide suppliers with support in the management of changes associated to imposed evolutions of the ICT infrastructure

6. CONCLUSIONS

The paper takes a wide ranging view of the businesses requirements and constraints that exist for organisations in the Aeronautics supply chain, and focuses in the specifics for smaller/3rd tier suppliers.

The report has been compiled from a sample of businesses and information made available from workshops with supply chain managers, as well as from individual companies in the European aeronautical supply chains. Further information has been made available from some of the regional associations in Europe. This has been supported by experience gained from other EC Projects undertaken in the last few years and the experience of key personnel in the VIVACE project, and their understanding of the Aeronautics sector.

The paper defines many of the issues faced by smaller suppliers in Europe, caused by; increased competition, cost effectiveness, the increased use of low cost suppliers and the overall impact of the global economy in the marketplace and the constraints this brings. Critically this has a significant impact on the future development of businesses, their ability to invest in the future, and the need for more integrated approaches to business and business development and growth in the sector.

A range of requirements were highlighted, that should be progressed, which supports the collaborative virtual enterprise that the VIVACE project research has defined. The requirements are in three major areas; the business context that supports the operational infrastructure, the ICT environment, and the operational and management context which enables the functions to be performed.

The importance of 3rd tier suppliers, impacting for more than 20% of final aeronautic product cost, and more and more owning significant parts of business relevant knowledge, do deserve in future special actions to build mechanisms effectively capable of ensuring their wider involvement in research actions relevant to application of principles for virtual enterprising to the aeronautical sector.

ANNEX A – SUPPLIERS PROFILING QUESTIONNAIRE

Questionnaire

Company: _____

Location: _____

Contact point Name: _____

Phone: _____

e-mail: _____

BUSINESS

1. What are your main supply areas (product/service) in the aeronautical supply chain? Please describe your current supply situation and provide the scope of your offering

2. How are your supplies classified within the scheme of procurement commodities of your main customers (please select among the list and/or specify additional classes as required)

- ☐ Aerostructures
  - ☐ Assembly
  - ☐ Composite
  - ☐ Interiors
  - ☐ Electrical
  - ☐ Detailed parts
- ☐ Equipment Systems
  - ☐ Landing gear and braking systems
  - ☐ Fuel Systems
  - ☐ Avionics (Modular, LRU's)
  - ☐ Com-Nav, Maintenance, Warning
  - ☐ Navigation and Flight Management Sys.
  - ☐ Air systems
  - ☐ Hydraulic systems
  - ☐ Electrical systems
  - ☐ Flight controls, Flight Guidance
  - ☐ Auxiliary power units
  - ☐ Cabin systems (I.F.E., Seats, Galleys)
  - ☐ Cargo Loading Systems
  - ☐ Water/Waste Systems
  - ☐ Cockpit display systems and units
- ☐ Propulsion Systems
  - ☐ Engines
  - ☐ Nacelle
- ☐ IT & Telecom
  - ☐ IT/IS Hardware Procurement
  - ☐ IT/IS Software Procurement
  - ☐ IT/IS Services
  - ☐ Telecom Network Procurement
- ☐ Materials
  - ☐ Aluminium and special alloys
  - ☐ Titanium, forgings and castings
  - ☐ Fasteners
  - ☐ Hardware
  - ☐ Composites and consumables
- ☐ Enterprise Consumables and Services Procurement
  - ☐ Marketing & Public Relation Services
  - ☐ Transportation and Logistics
  - ☐ Office Supplies and Furniture
  - ☐ Facility Management
  - ☐ Consumables
  - ☐ Consultants
  - ☐ Personnel Services
  - ☐ Special Services
- ☐ Product Related Service Procurement
  - ☐ Engineering Services
  - ☐ Industrialisation and Manufacturing
  - ☐ Consultants
  - ☐ System Engineering services
  - ☐ Technical Documentation
  - ☐ Mechanical Services
  - ☐ Special Services
- ☐ Capital Equipment & Facilities
  - ☐ Building & Construction
  - ☐ Machine Tools
  - ☐ Jigs, Fixtures & Assembly Tools
  - ☐ Cutting & Power Tools
  - ☐ Measuring & Test Equipment

Other:

3. Please provide the ratio between supplied products and supplied services in the last 3 years for aeronautics, based on your revenue data

4. Which are the phases in the aircraft life-cycle where your contribution is highest? Please provide associated product/services ratio

5. Please describe your specific original contributions, i.e. the items/issues/studies within your supply which have or could have a significant impact at upper breakdown level (e.g. validation of/ proposal of new materials, suggestion of new functions, proposals for changes to processes)

6. What are your expectations on the evolution of your offering for aeronautics in next years? (e.g. new products or services, evolving ratio of products/services, increasing/decreasing volume of supplies, widening the customers' base, etc.)

7. Describe your company organisation and the main principles for its design (e.g. functional/ matrix/ projectised/ divisional [business units], lean organisation, teaming principles, etc.)

Dimension

8. What is your shareholding configuration? (main shareholders and percentages)

9. What is the total number of total personnel and what is the number of productive personnel?

10. What is the number of equivalent productive personnel in aeronautical supply?

11. What are the figures on personnel over the last 3 years (global and dedicated to aeronautics)

12. Please provide company revenues over last three years, both global and for aeronautical supply

13. What are Company expectations on the dimension of aeronautical market in the next three years?

Financials [please note that approximate values, ± 10% are acceptable]

14. What is the current ratio of company revenues to assets?

15. What is the EBIT[1] value in the last company balance sheet?

[1] Earnings Before Interest and Tax - includes all profits, operating and non-operating, before deducting interest and income taxes. It is a traditional measurement method that does not include capital costs. Instead of EBIT, also the terms "Operating Profit" and "Operating Earnings" are widely used.

16. What is the EBITDA[2] value in the last company balance sheet?

17. What is the average financial exposure over the year (last consolidated fiscal year), and what is the debt composition (short/mid/long term, bank/project financing, etc.)?

Supply history

18. What are the roles covered by the company within the supply chain in the last three years? (coordination of suppliers at the same tier level, leader of lower level suppliers, stand-alone supplier, etc…)

19. What are the main aeronautical projects participated in the last years and which was the related supply focus?

20. Please describe the changes in your aeronautical customers and suppliers base in the last three years. Please compute for both customers and suppliers the ratio between the number of entities present over the whole period and total number of entities. Please provide the number of new customers and suppliers for each year considered.

[2] EBITDA - Earnings Before Interest, Taxes, Depreciation and Amortisation. With respect to EBIT, it excludes Amortisation, which includes the cost of intangible assets acquired in some earlier period, including goodwill, and Depreciation, which is an indirect and backward-looking measure of capital expenditure

Markets and Marketing strategy

21. Please describe the relevance of aeronautical market in company's strategy and mission

22. What is the ratio of foreign to domestic market for aeronautics in the last three years? (approximate to ± 10%)

23. What is your view on the evolution of aeronautical market over the next three years?

24. What is the percentage of revenues from main aeronautical customers over total revenues from aeronautical market?

25. What is your competitive strategy in the aeronautical supply chain?

26. Who are your main competitors and from where do you expect to derive major competitive threats in the aeronautical market?

27. What is the percentage of investments vs. revenues in the last three years? What are the main areas of investment?

Process and project management

28. To what extent are your processes formalised, that is documented and subject to change control procedures? (Please provide the percentage of formalised processes/procedures

versus the estimated total number of company processes/procedures or an estimate of percentage of process areas that are covered by formalised procedures)

29. What is the degree of change in your processes? (percentage of processes/procedures changed per year)

30. What are your policy and methods for training personnel on process and procedures (e.g. only on-the-job-training, periodic recall on relevant procedures, audit-based re-training, etc.)

31. What are the principles that are followed by your company in the decision making process and in personnel empowerment? (e.g.: centralised top management decisions; decision making boards; decision taken at the immediately upper hierarchical level than the one involved; task driven decision making; work group empowerment on decisions; etc.)

32. Please describe your current project management process, in terms of:
    - alignment between project management organisation and company organisation
    - alignment of cost and technical advancement control

33. Please describe your approach to management of risks, both at company level and at project level.

TECHNOLOGICAL ENVIRONMENT

Use of Technological Means

34. What is the degree of re-use of machines and tools in use for aeronautics over other target markets? (please provide the percentage of machines and tools in use for aeronautics that are common with other markets and the percentage of their value and cost of ownership[3] over the total value/cost of ownership for machines and tools in your company)

35. What is the degree of re-use of ICT HW and SW in use for aeronautics over other target markets (please provide the percentage of machines and SW solutions in use for aeronautics that are common with other markets and the percentage of their value and cost of ownership over the total value/cost of ownership for ICT HW and SW in your company)

Stiffness of ICT infrastructure

[3] Please use for cost of ownership the acquisition cost plus the maintenance, operation and licensing costs over the life-cycle

36. What is the dimension of legacy SW solutions in your company? (Please provide a percentage estimate, assuming as legacy any solution that deviates from standard commercial version by an amount such to prevent smooth transition to new commercial version)

37. What is the solution architecture that is preferred and what is the percentage of solutions in use that conform to that architecture? (e.g. mainframe, client-server, web based)

38. What is the value of ICT (HW and SW) assets over total company revenues?

39. What is the rate of change in ICT HW? Please specify average replacement period per class of HW (servers, work stations, PCs)

ICT solution approach

40. What is the degree of popularity of solutions adopted within your company? (popularity is computed as the percentage of solutions used in the company which are currently market leader like Microsoft Word for document editing)

41. Which principles are adopted in the selection of SW solutions for the company? (e.g.: performance is the main criterion; optimal performance to cost is searched; solutions are mostly customer-driven; etc.)

42. What is the stability of adopted SW solutions? (please provide an estimate of replacement period for main solutions, without considering new commercial versions but including major re-customisations)

PERSONNEL MANAGEMENT

Skills structure

43. Please describe your recruiting principles (e.g.: skill driven recruiting; organisation gap-filling recruiting; competence based recruiting for process optimisation; project driven recruiting; etc.)

44. What is the degree of international exposure for company personnel (percentage of personnel interacting with specialists abroad) and which is the average personnel knowledge of the foreign language most used in their professional activities?

45. What is the percentage of personnel who work concurrently for different functions or markets? Please specify the principles used for resource sharing.

46. What is the average personnel experience (years) and educational level? Are there (and what) recognisable trends in the composition of personnel in terms of experience and educational level?

47. What are the principles used for personnel training? (e.g.: periodic vocational training; entry training; company strategy driven training; etc.)

Personnel motivation

48. What are the most used rewarding and motivation mechanisms at your company? (e.g.: monetary rewarding; responsibility based motivation; hierarchical growth mechanisms; etc.)

49. What is the yearly turnover (percentage of personnel leaving) on personnel, both for global market and aeronautic sector? Are there recognisable trends in the last years?