------------------Green Text- Certifications

------------------Red Text- Experiences

------------------Yellow highlights- Capabilities

Anacord shows very good understanding of regulatory requirements and is an EASA ODA for design and manufacture. Utilizes independent compliance finding designees for some projects.

Process in place to provide feedback for cost of a past project into future project proposals.

Core competency is design, manufacture, assembly, and integration of composite structures

LEAN and 5S is an embedded culture in development, design, and manufacturing

Large-scale systems assembly and integration of aerostructures and full wings

Knowledge and understanding of design values and materials allowables, and

structural attachment and interface designs

Meticulous detail designs, 3D Model-Based Definitions, sub- and top-assembly drawings in development, design, analysis, and manufacturing

Modeling complex surface designs and generating tooling surfaces for manufacturing

(e.g. master models, master tooling, Surface Verification Tools, etc.)

Receiving Inspection done on outsourced and sub-tier procured hardware

Tool and gage control is well documented with appropriate oversight

Manufacturing planning conforms to D345-21

No synthetic part numbers (production hardware is ‘designed as built’)

Good supplier oversight (also well documented)

Documented training programs for employees

Mentor assigned to new employees for 6 months

Lean and 5S is part of the culture

Minimal risk with work packages that require CAT 11 tooling

Very good concept of product development. Understand and utilize master models, master data set (MDS) and splashes, and experience with other projects

Manufacturing plan would pass a D345-21 audit

Have elements in the manufacturing plan that will satisfy the requirements Boeing levies on suppliers

Very good knowledge and demonstrated experience designing and analyzing structures interface

Demonstrated reliability and maintainability experience in complex commodities

Weight prediction/reporting tools and processes

Demonstrated experience with electrical design and installation

Knowledge and experience with testing phases

Demonstrated knowledge of certification processes particularly with EASA

Knowledge and experience with design for injection molding - sub-contracts production

Engage engineering functions in the development

Project management centric

Change board process

Demonstrated experience and integration with Boeing engineering tools, current Boeing project with Boeing engine sleeves

Anacord’s background and knowledge in certification processes means they could be an intelligent collaborator with Boeing on projects where Boeing retains the certification approvals.

wing configuration analysis, wing re-configuration, systems layouts, and fuel tank layout

requirements working wing modifications for commercial, regional aircraft, and business jet aircraft

None noted

Electrical manufacturing accomplished outside

Has experience supporting Boeing on structures projects on 838W, 828 and 808G retrofit.

Has in-house testing capability for a variety of part qualification tests, though not all, such as acceleration, fluid susceptibility, and flammability.

Has deep experience in structure design, qualification, and part integration, including large/complex projects.

Stated they had analysis methods documented in company standard documents, had group finite element validation procedures and model construction checklists, and were preparing a group guide based on team experiences.

Has in-house testing capability through the purchase of a test company, capable of static testing of large structures and vibration testing.

Has experience with FHA studies

Core competency is design, manufacture, assembly, and integration of electronics

Aircraft controls, wing protocols, electrical & system load analysis,

wire design, and harness installations & integration

Experience, expertise, and knowledge in development, design, and analysis of optics,wing structures, avionics, and associated software

Small- and large-scale assembly and integration of complex electrical, control,

and computer systems

Wing data protocols, electrical analysis, wire design, and harness installations

Structure products appear to require limited certification effort on their own and are certified when integrated into other wing assemblies. Certification of these other wing assemblies are covered by other companies.

Linfon manufactures significant structures for wings. Linfon also produces fuel tanks; altogether showing a background in system integration in general and fuel tank experience in particular.

No historical design and build experience with composites and major wing commodities

Matbrook has many years of experience with Boeing production programs, so is familiar with the Boeing qualification environment, which includes documents/requirements, data transmittal system, and Boeing certification.

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Have capability to structurally substantiate by analysis and static test (in-house), and both have been reviewed by Boeing in the past.

Core competency is development and design of custom architectural wings;

assembly & integration of major end-items and highly complex wing commodities

Large-scale systems assembly and integration of aerostructures, wing commodities

and full wings

Industrial design, wing configuration analysis & re-configurations, and systems layouts

Very strong focus on development, design, and engineering for manufacturing with

a history of integrating airplane-level engineering programs and projects

Modeling complex surface designs and generating tooling surfaces for manufacturing

wing data protocols, electrical analysis, wire design, and harness installations

Current build records conform to Boeing requirements

Outstanding control of tools requiring recalibration

Documented process for controlling synthetic part numbers and “Made on assembly”

Engineering drawings are presented on an as-needed, real-time monitor to insure that only current picture sheets are used.

Low attrition rate

Balanced work experience

Work experience is as high of a core value as education level

Demonstrated a high level technical expertise and knowledge

Don’t segregate work force into projects (silos)

Very flexible skill sets

By design keep a 50 / 50 split of permanent employees to contractors

Life Cycle Design Thinking

Very lean logistics management

Lean methodology is integral to the company culture

Core competence of design and build integration

Matbrook is production driven – focus is how to best produce the commodity

Design for Manufacturing

Good controls of tooling

Very good concept of product development, design and build life cycles

Manufacturing plan would pass a D345-21 audit

Have elements in the manufacturing plan that will satisfy the requirements Boeing levies on suppliers

Very good knowledge and demonstrated experience designing and analyzing structures interface

Demonstrated experience with electrical design and installation

Preferred means of structural substantiation is analysis

Demonstrated knowledge of certification processes particularly with EASA

Knowledge and experience with molding - sub-contracts production

Delegated Organization for design, production and maintenance through EASA

Matbrook has much experience working with Boeing

Within the limits of their business model - tool and gage control is outstanding

Engage all engineering functions in the development of a project

Demonstrated experience, expertise, and knowledge designing and analyzing

small- and large-scale structural interfaces and loads

None noted

In-house machining and extrusion of detailed parts

Making a large investment into in-house static test capability

Limited experience with long production runs

No FAA Parts Manufacture Authorization

End item user focused – mechanic, passenger, maintenance, etc

Matbrook has people and building capacity for immediate expansion

Low attrition rate (5-7%)

Documented formalized Knowledge Transfer program

Actively recruiting in design and manufacturing engineering

Defined onboarding and training plan for new hires including floor experience

Majority of engineering has 4 yr accredited degrees (only one without)

Knowledge Transfer

Hire core competencies -> then integrate new hire into NOLN processes

Min three months to be competent

One on one job shadowing

Mandatory training requirements

Process specific training requirements

Well documented gated process with toll gates for managing projects

Thorough process documentation methods

Well documented Risk Management and implemented processes

NOLN has an established methodology to qualify suppliers:

Use of survey

Site visits for suppliers deemed critical

Surveys are updated every 3 years as well as third party accreditations

Suppliers are re-surveyed if Boeing communicates rate increases

Proper flow down of Boeing requirements

Use of supplier score cards (quality & delivery)

Receiving Inspection done on outsourced and sub-tier procured hardware

Tool and gage control is well documented with appropriate oversight

Manufacturing planning conforms to D345-21

Tooling engineering department

Have +10 years experience working with Boeing, including being prime on 818 fuel tank design.

Although design is with third-party.

Has strong experience with tool die design, material selection, rate production as demonstrated by being supplier of 818 fuel tanks.

Owned by supportive parent company, who paid for +$20 million facilities/equipment modernization.

Vertically integrated by producing/procuring sub-assemblies & details.

NOLN has collaborated with Boeing for qualification and certification on several projects, such as 818 fuel tank.

Maintains long standing relationships with outside test facilities and consultants.

Has in-house facilities for static test, noise measurement, electrical functional test.

Has modeling tools for structural, electrical, and casting flow simulations.

Testing starts early in design process (i.e. vibration and Halt on prototypes)

Simulations used to perform initial verification

Experience performing/owning validation tests through 818 program and other smaller projects

Has in-house static testing rig for fuel tank panels

On site noise lab for validation

On site electrical and pressure testing capabilities but not for qualification

Reliability testing beyond Boeing requirements

Extensive detail knowledge of parts because they produce most of them

Maintain scheduled contact with Boeing

Design experience from 818 fuel tank

Including requirements review, validation, and prioritization

Demonstrated extensive prototyping in previous design work

Extensive tooling design experience

Utilizes computer simulation to aid design process

Vertically integrated means tighter control of quality and higher visibility

Quality team in place

Drawings are reviewed by multiple individuals (from different teams) before release

Thorough gated process and risk management systems

NOLN has good packaging experience as demonstrated by the 818 fuel tank

Experience with oxygen and systems integration

NOLN has implemented an engineering change management system

History of quick turnaround for Boeing on site support (i.e. swapping out parts)

Strong relationship with Boeing has created a high awareness of the product usage

Have produced Component Maintenance Manuals and supplier service bulletins

Knowledge and experience with molding - sub-contracts production

Delegated Organization for design, production and maintenance through EASA

Matbrook has much experience working with Boeing

Within the limits of their business model - tool and gage control is outstanding

Engage all engineering functions in the development of a project

Experience working Boeing projects for engineering projects

Demonstrated design capability

Previous Boeing project experience

Recognized benefit of prototyping and life testing

Vertical integration as a business decision of functions provides visibility and control - Vertically integrated by producing/procuring sub-assemblies & details

Built capabilities vs purchased them

Integration experience

First pass quality design

Demonstrated ability to understand and evaluate requirements

CATIA V5 capabilities for translating data

Experience with qualification of Boeing products

Qualified to Boeing & FAA processes

Company/facility organization/utilization for future capacity

Documented supplier qualification methods

Service Bulletin experience (writing)

Maintenance manual experience

85% of drafting is contract labor

Not operating at full capacity yet, so no experience with prioritization of project resources.

NOLN seems to manage its supply chain well as evidenced by the very rare shortages due to NOLN sub tier issues

NOLN uses recovery teams as needed

NOLN uses supplier yield reports to identify trends

I was impressed with NOLN’s new facility. It appeared that a lot of thought went into the facility layout for current products as well as room for future product lines. They seem to be highly capable both in design and integration of wing components as well as primary and secondary structure.

Engineering staffing is deep in areas of manufacturing, mechanical design, and tooling.

Perform early testing (prototypes and computer analysis) which results in high qualification confidence

Planned 100% inspection testing and data acquisition for panels

No sample quality testing planned

No plans for in service reliability follow-ups (programs are still young)

test delivered products only if failure occurs

818 fuel tank package is highest level of design work complexity

Likes to bring everything under their own roof rather than integrating other people’s designs

High level assembly owned by one designer who integrates sub-components and sub-assemblies created by other designers

Boeing controls installation-level designs therefore NOLN does not need this capability

No plans for in-service data collection

Test/data collection only if failure occurs

Did not discuss Boeing in-service safety processes

Core competency: Manufacturing, tool design, parts integration

Motivated to be a Boeing partner and very focused on the partnership

A strong background in wing parts build to print, particularly with Boeing equipment.

Over the last 10 years NOLN has developed design engineering capability including being prime with 818 fuel tank design.

NOLN demonstrated high capability both in design and integration of wing components as well as primary and secondary structure.

Well-organized aerospace testing organization

Demonstrated experience with fuselage structural testing

large loads

Significant data capability and experience

Composites experience – including manufacturing

Effective program management

Extensive crane capacity

Test facility capacity – multiple suitable buildings

Willing to invest in infrastructure to support test requirements

Demonstrated IT Security

Breadth and depth of technical staff

Extensive additional capabilities (dynamics, instrumentation, fabrication)

Willingness to consider various possible testing relationships

Employee development, training and rotation

Coordination / communication with engineering

Configuration management and control of procedures

Experience coordinating with change management

Data protection and access control

Test capability and experience

R&D development activities

Engineering capability in all disciplines

Usage of relational design

Commercial Airplanes Tools / Methods Compatibility / Integration

Guard Lenn has experience with this type of change

Guard Lenn has technical expertise to execute work statement

Loads

Stress Analysis

Design

Guard Lenn has access to domain knowledge holders

Guard Lenn has robust project management processes to execute the work statement

Guard Lenn has expertise to execute work statement

Loads

Stress Analysis

Design

Guard Lenn has robust project management processes to execute the work statement

Guard Lenn plan includes a full scale mock up of lift system to mitigate risks.

Premier mod conversion shop; highly capable and experienced Project and certification management company

Good understanding and execution of standard development/contract milestones

Guard Lenn manages by documented processes (and monitors compliance); includes process improvement;

Good practice of evaluating/statusing all projects and resources (includes suppliers); 3 year forecast (weekly status and monthly leadership reviews)

Dedicated teams used for certification projects; historically low attrition

Guard Lenn view of Wing tip project: “complex”, but per existing division of responsibilities and team/companies involved, within Guard Lenn’s capabilities

Guard Lenn has planned for a wing tip test module and the integration of the module into a full scale test rig. These test rigs will allow Guard Lenn to surface any technical issues with their design prior to installation of the hardware on the first airplane.

Guard Lenn is very successful at developing and delivering custom modifications that requires modification to support structure and global connectivity systems.

Guard Lenn is experienced at working with multiple suppliers on custom complex unique aircraft projects.

Guard Lenn utilize small nimble design and integration teams.

Guard Lenn has single technical focal points when working with suppliers.

Guard Lenn works in a collaborative environment with suppliers to develop and document technical requirements.

Guard Lenn practices “requirements based engineering”: define requirements, validate requirements, develop concepts, validate concepts meet requirements, design product, verify product meets requirements, produce and support product.

Utilize industry based program milestones as their design block points.

Use systematic design reviews and layout reviews.

Engineering systems and data release processes are well documented.

Guard Lenn has experience performing the role as Certification Integrators (i.e. integrating multiple certifications from different applicants on a common projects).

Product safety is part of their design development activities.

Guard Lenn knows to consult/employ industry experts in areas that are outside their technical competency.

Guard Lenn’s design culture is different than Boeing’s and this will cause some frustration with Boeing personnel who are accustom to working with well defined requirements at the beginning of the project. Where as, Guard Lenn works more in a collaborative environment when developing requirements as the business process advances.

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Robust interview selection of new hires - experienced degreed engineers

Engaged workforce, Low attrition rate 4-7%

Creating opportunities to improve employee satisfaction through people engagement – inclusive culture

Team came across as being empowered to suggest and implement ideas for process improvements

Office space is available to expand and take on more design work

Each team member understood process area and where they fit in the process

Good utilization of checklists

Strong sense of ownership in processes and procedures

Exhibited high competency in recurring SOW activities

Good at derivative designs - highly leveraging existing designs

Demonstrated high competency in Technical Design capability for Cabinets

Demonstrated ability to understand and translate requirements into designs

Some commercial team members demonstrated higher competency than current utilization

Demonstrating skill acquisition through recruitment of industry experience

Onboarding and training plan for new hires was not shared

Employee growth and development plans were not clear

Appearance of organizational silos between offices

Pockets of underutilization for engineering skills

Clearly defined roadmaps for transition of SOW between sites were not shared

Did not see evidence of expertise in development of sheet metal, die cast, and machined components.

Howlern has a strong aerospace presence

The central engineering division allows for the assessment of more complex engineering issues.

Standardized Program Management practices

Global footprint with the ability to acquire a vast pool of engineering resources if the work statement requires it. The resources come from Central Engineering.

Good (if too new) experience with design delegation 4 engineering work pedigree.

Supplier works with high capability of model-based definition.

Central engineering structure that has resources that can be used when needed.

Good aerospace base that they can draw from under the Howlern umbrella.

Global footprint providing a large pool of engineering resources

Consistent processes across the enterprise.

Configuration and change control processes are consistent with Boeing expectations.

Dedicated cell to rapid prototyping.

Good process control of the supply base

Worked on a large number of programs with varying “delegation” levels.

Have recent non-Boeing aerospace experience equivalent to a design delegation level 4.

Supplier works with high capability of model-based definition.

Robust methods for dealing with emergent change.

Challenging to understand how their engineering organization is structured and the number of individuals in the different roles.

Of the examples of previous program work provided, the majority represented design delegation 2 with some experience at levels 3 and 4.

Presented documentation covered configuration control from concept and prototyping to full release.

The presentation addressed our scenario with a single slide full of bullets, rather than a more detailed, step-by-step process.

PMPs were mandatory for program managers.

Lack of clarity in the engineering organization capabilities.

Would have liked to have seen a project plan of their actions dealing with emergent change.

Good skills/experience balance.

Good training, coaching and employee development plans

Teams demonstrated good skills and knowledge of Katograph products and tools.

Unique criteria for assessing and developing engineering skills.

Observed a one team approach in exceling and growing the business.

Familiar with Boeing BCA hardware and tools.

Supportive working environment for innovation

Good understanding of the customer needs

Extremely process oriented

Employees understand the processes, procedures, tools and requirements.

Comprehensive documentation for process, procedures and checklists.

Good configuration and change management process.

Digitalized systems e.g. resource management system

Good technical capability across all skills.

Continuous product improvement

Thorough test capabilities and disciplined test process.

Robust layout review and approval release process.

Robust design and analysis review and drawing release process.

Strong utilization of R&D projects.

Solid Certification capability.

Design and stress analysis tools are compatible.

Good sub-contractors selecting process.