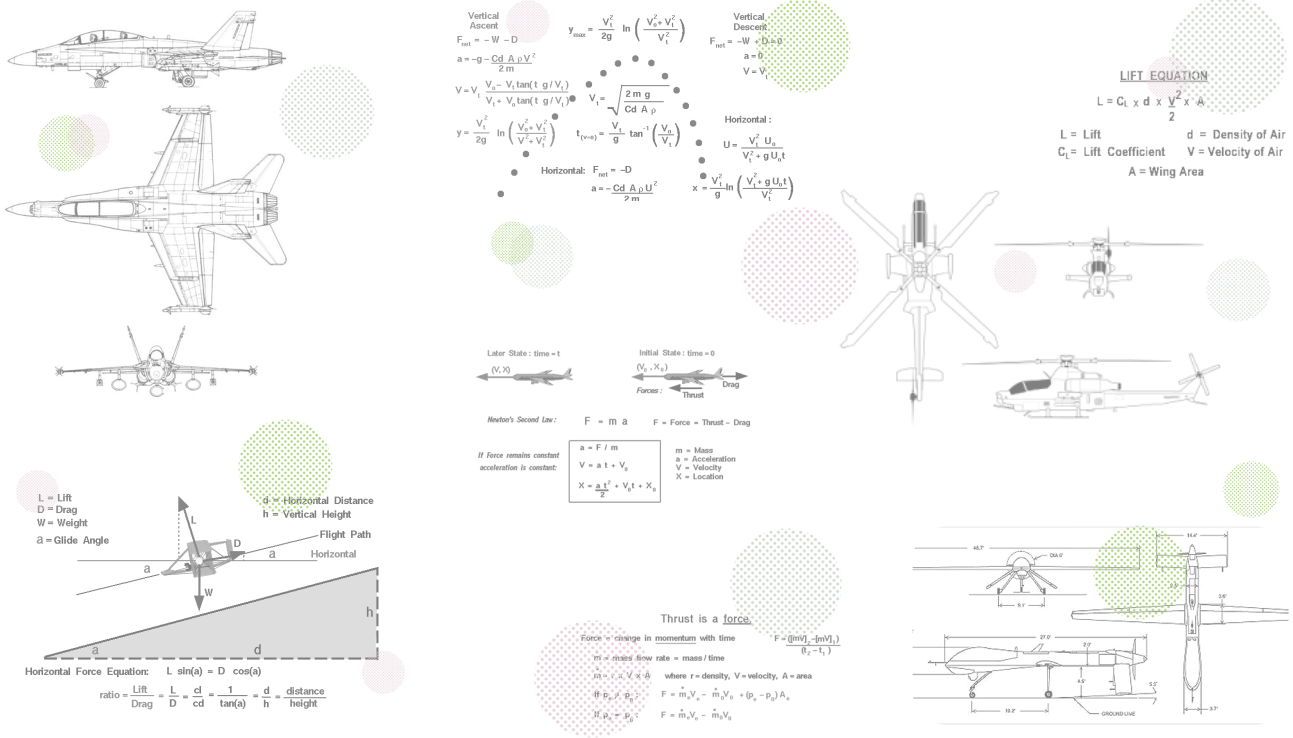
catalyft
Business Improvement & Advisory Services

AEROSPACE EXPERIENCE CASE | Concurrent Engineering



INTEGRATED PRODUCT DEVELOPMENT PROCESS (IPDP) BUILT FOR HIGH SPEED, CROSS-FUNCTIONAL COLLABORATION, AND QUALITY OUTPUT

AEROSPACE EXPERIENCE CASE | Concurrent Engineering

Better, Faster Integrated Product Development Process (IPDP)

Processing Re-Engineering with Engineers

In many interesting ways, Engineers are a consulting team's ideal partners. Both share similar educational backgrounds, an appreciation for letting data shape next steps, and problem-solving mindsets missing an OFF button. Most Engineers we've had the joy of working with incessantly ask, "could it be otherwise?"...and yet are respectful of process standardization, tend to be steeped in academics...and still well-grounded in utilitarian applications, intellectually curious...but also understand the immense value in rigorous tests disproving favored theories drawn from said curiosity. Our Engineer partners tend to be respectfully collaborative contributors...and, additionally, very vocal when they see a performance out of whack or a way to do something better. Needless to say, our Catalyft team was very enthusiastic about partnering with this featured aerospace firm when they asked us to help them build up their concurrent engineering capabilities.

The Firm's Impetus for Change

Emerging from modest beginnings of a few employees working out of a single hangar, the firm was now an inspiration and growing with conviction—especially over the past 10 years due to a series of 12 acquisitions. In the midst of this growth, the firm's current internal processes were trudging along consistently but were not keeping up with proliferating business demands and heightened expectations. In particular, their disparate product development component, referred to here as their integrated product development process (IPDP), was especially creaky. Essentially, IPDP is shorthand for the collective process workflows, information systems, operational & financial metrics, and day-to-day employee actions needed to turn government proposals into properly-spec'ed products delivered on time and on the money. This crucial workflow system tends to be important for most clients—whether working with governments or other commercial customers—but is of paramount importance for aerospace & defense firms.

We'd had the good fortune of collaborating with this aerospace firm on three prior projects beforehand (focused primarily on operational excellence, supply chain optimization, and talent management and training programs). This time, we were collaborating across functional groups–paired up with executives and managers in Sales, Engineering & Product Design, Production, and Procurement & Materials Management. The firm had made strides in winning larger, more complex orders but needed to make sure

Aerospace

Case Synopsis

- Re-designing, building up, and accelerating concurrent engineering capabilities across the integrated product development process (IPDP) in an aerospace product development center

Client Profile

- $1 Billion 3,500-person electronic systems provider and systems integrator specializing in microsatellites, telemedicine, and commercial orbital transportation services
- U.S.-based with 3 international business divisions
- Privately owned

Financial Benefits

- Accelerated revenue growth from reduced time to market
- Reduced expense leakage points (labor, rework staffing, materials issues)

Operational Benefits

- Streamlined, flexible product development process with reduced IPDP turnaround times
- More collaborative functional departments and supply chain partnerships
- Robust IPDP metrics and dashboards supporting actions and decisions

Organizational Benefits

- Agile organizational design structure and clear roles & responsibilities assignments
- Enhanced quality control application and continuous improvement impact
- Reduced Sales, Engineering, and Production frustration from misinformation, redundant work, and communication gaps
- New computer-based training system
- Upgraded knowledge management system, processes, and procedures

their IPDP process grew up into a faster, well-coordinated capability by leveraging prior product intelligence for future builds, working from clear engineering drawings, and moving from concept to delivery within tight timelines and even tighter specifications.

A Finer Point on Those Growing Pains

As more complex bids were won, several trying constraints popped up. Worrisome problems included Product Design Engineers not being as attuned to product costs and vendor capabilities as needed, Manufacturing Engineers not leveraging the drawing trees and other accessible knowledge components as efficiently and effectively as possible, thus, slowing down getting signed-off designs to Production on time, therefore, adding challenges to build quality.

All this "building from scratch" required more precious time from Engineering and Production, already working at full capacity. The U.S. government was most concerned with receiving only the highest product quality within the agreed-upon delivery timeline. No revelation here; our client was also heavily focused on the right quality with an on-time delivery, too. But, internally, they also worried about overextending their Product Design and Engineering teams, missing deadlines due to vendor mishaps, and aggregating fragmented knowledge pools to have some base to build upon and common frame of reference. With all these risks in play, this firm partnered with us to:

- Increase speed to market
- Reduce product development steps and bottlenecks
- Reorganize the management structure to ensure support for Engineers and Product Designers
- Design, develop, and test a faster IPDP program
- Reduce the multitude of ad-hoc drawing reviews and inefficient release sequencing
- Excise discrepancies in bill of materials (BOM) and Engineering drawings
- Build up internal knowledge management systems enabling the firm to benefit from standard filing conventions, better cost point accuracy, reusable Engineering templates, standardized purchase order requirements, and practical proposal material artifacts
- Integrate project management tools and eliminate homegrown versions outside the system for better progress tracking and forewarning of issues
- Convert IPDP training content from classroom-based to computer-based training (CBT)

Collaboration Overview

Collaborating with firm's COO, VP of Engineering & Product Development Champion, VP of Production & Product Development Champion, and EVP, we conducted a Trapped Value Analysis

Catalyft Team's Collective Aerospace Engagements

25+
Aerospace Engagements

7
Collaborations With This Featured Client

5
Average Workstreams Per Engagement

$700 Million
Average Client Revenue Size

4
Average Worksites Per Engagement

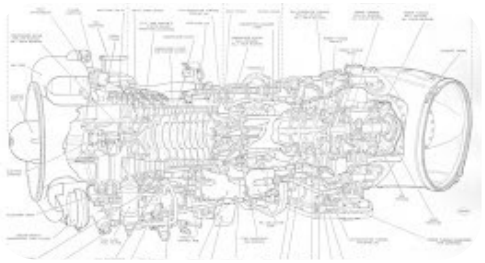
(TVA) to understand the areas of opportunity in the current IPDP track. We applied several information gathering and analysis methods in this stage including:

- **Value Stream Mapping**—analysis of current product development processes, systems, metrics, and responsibilities, building up an initial redesigned model of future IPDP and supporting systems.
- **Data Analysis**—quantification of IPDP turnaround times, departmental coordination efforts, supply chain logistics, and in-house engineering capacities. Stage-gate metrics evaluation, efficiency studies surfacing information breaks, and time constraint paretos were deployed, too.
- **Diagnostic Surveys**—focused primarily on employee-reported frustrations, potential solution suggestions, and an assessment of overarching organizational change readiness. A small sampling of supply partners' perception of the firm was also administered to round out the IPDP perspective.
- **Supply Chain Integration Points**—assessment of Procurement practices, "make vs. buy" decision-making, purchase order processes, inventory and warehousing habits, and on-time delivery track records by product.
- **Role & Responsibilities Charting**—exercise to understand the current roles in IPDP across Sales, Engineering, Procurement & Materials Management, and Production.
- **Knowledge Management Systems Assessment**—qualitative scoring of the firm's information systems utilized to store and share technical and proprietary information (such as Engineering drawing trees, prototype templates, project artifacts, procedures, and training content).

Once constraints slowing the team down were surfaced and a more promising concurrent engineering design was formulated, we co-developed an Implementation Roadmap to build up the new capabilities needed to fix the process and information systems gaps. This particular Implementation Roadmap included specific phases for project communication, concurrent engineering process design & development, a 4-week pilot program, two implementation phases, and a staggered maturity phase to ensure changes were truly in place.

Interesting Wrinkles with This Client

Given the fact that our client's end-customer was primarily the United States government with awarded contracts based on industry practice of "Cost Plus" pricing, the team was most interested in accelerating IPDP turnaround times, reinforcing high quality standards, and delivering highly-specialized, high-quality products on time. Cost controls were important and needed to be to built into the new capability, but cost was not top priority.



Key Challenges:

- ⇒ Heavy Reliance On Government Sales
- ⇒ Highly Regulated By Governments and Policies
- ⇒ Safety and Product Quality Are Paramount
- ⇒ Cyclical In Nature and Tied To Global Economic Conditions
- ⇒ Complex Supply Chains With Unique Raw Materials Requirements
- ⇒ Data Analytics & Visualization Timeliness and Usability
- ⇒ Fragmented Bidding Processes
- ⇒ Leveraging Firm's Collective Knowledge and Wisdom
- ⇒ Continuous Improvement

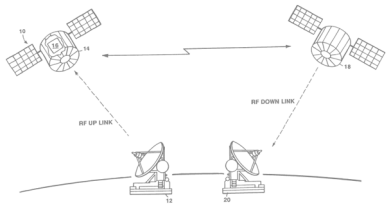
This firm was and is a well-respected, seasoned aerospace and defense provider winning large bids based on its unique designs, excellent relationship management, deep in-house talents, and a 60-year track record of safety. However, they do not have the bottomless financial resources of some of their multi-billion-dollar global competitors. So, product development agility and specification customization strengths were key to winning competitive bids, rather than a big name or negotiation might.

Implementation Time: Concurrent Engineering

This capability build-up called for several new processes working simultaneously, synchronized information sources, and tighter process control components while retaining effective legacy workflows and information systems as part of what we refer to as their Performance Integrated Management System, or the pithy acronym PIMS. (For better or worse, acronyms are yet another common bond between Consultants and Engineers.) Essentially, PIMS is an overall system comprised of existing components and newly-developed tools designed to aggregate disparate data sources, roll up clean data sets into operational & financial dashboards, and allow cross-functional teams to see their own particular, necessary metric sets to make timely management decisions (across supervisors, as a departmental leader, and within the executive management team). A PIMS elaboration would quickly take over this Experience Case; however, firms tend to have several PIMS components doing most of the heavy lifting. In this firm's case, the key PIMS elements driving the concurrent engineering capability build-up in IPDP included:

Data-To-Information Flow Improvements—one particularly enlightening need surfaced by drawing up a Business Analytics Map, or BAM if you like, summarizing technology platforms, business systems, data hierarchies, metrics flows, and current analysis training for this firm. The BAM directed us to remove several constraints in the way of clean, visible, and timely information. Starting with a data cleansing exercise, the team developed concurrent engineering-related process key performance indicators (KPIs) with IPDP performance dashboards cascading up and across Program Management, Engineering, Production, Procurement & Materials Management, and Quality Assurance. To help interpret this new information wellspring, business decision trees based on KPI control bands were developed and embedded across the functional group leaders. A few examples of novel trend views the firm now had at their collective fingertips included drawing release rates, customized component intensities, revision rates, and cost adherences (procurement and labor), internal & external defect occurrences, and several schedule adherence data slices.

Program Management Package—to get an overall sense of the various IPDP packages flowing along with necessary corresponding documents, the team developed a customized Project Management Office (PMO) linking project management



Team Performance Enablers:

- ⇒ Concurrent Engineering Built Into IPDP
- ⇒ Internal Workflow Redesign
- ⇒ Clean Data Hierarchy Powering Integrated Sales, Engineering, Operations, and Supply Chain Dashboards
- ⇒ Comprehensive Supply Chain Relationship Management
- ⇒ Content-Rich, On-Demand, Computer-Based Training Modules
- ⇒ Robust Knowledge Management System and Customized Project Management Office (PMO)
- ⇒ Cross-Departmental Continuous Improvement Feedback Loop

functions and knowledge management artifacts with the executive team's business strategy. Comprised of project management tools & templates (managing resources, risks, scope, time, and costs), the functional groups working to get the new products designed, developed, sourced, and built now had a central repository of the latest tools, templates, procedures, and lessons learned across all recent IPDP instances. This new repository supported stronger status tracking with timely reviews and, of course, system-generated red flags when a proposal was off the expected timeline. The newly-developed program management package was tested across various IPDP examples to ensure efficacy and ease-of-use. Ultimately, an evolved package was incorporated into the firm's process document library (PDL).

New Stage-Gate Phase Definitions—the *sine qua non* of this collaboration involved some very complex, well-coordinated IPDP re-engineering. This was a ground-up development that included re-establishing a more accurate work breakdown structure (WBS) across all key phases, embedding standardized milestones requirements, and installing clear stage-gates with protocols across influential departments. At a high level, the 4 key phases were described as:

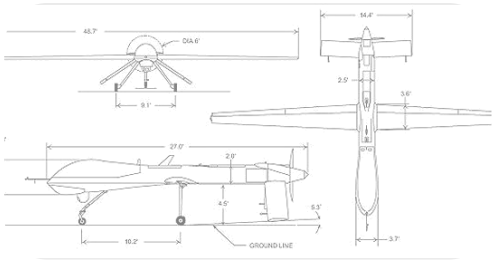
- Phase 1: *Requirements Review* (includes activities such as program maturity identification, minimum standard stage-gate review establishment, stage-gate decision model scoring for new product opportunities, and hand-off alignment across departments).

- Phase 2: *Design Review* (provides engineering drawing guidance and milestones, effective drawing release sequence reviews, and training on new concurrent engineering process).

- Phase 3: *Production* (orchestrates the integration of functional groups into the concurrent engineering process, provides program process compliance, and drives concurrent engineering dashboard team reviews and reporting).

- Phase 4: *Post-Production* (supports controlled evolution of concurrent engineering system with clear procedures, knowledge management criteria, decision trees, and ongoing training content). A dynamic approval process with prescribed workflow, data sources, review meetings, and clearly-assigned responsibilities with turnaround time expectations was woven into all phases.

The firm now had a consistent, prescriptive process putting simultaneity into action—easy to follow across phases and functional groups without inordinately tying up all the experts involved with the mass of touchpoints. This re-engineering process was about getting the most efficient and effective artifacts requirements established to support the IPDP process without bogging Engineers down with unnecessary administrative work. Of note, concurrent engineering development wisely involved remote peer reviews from other parts of the organization to ensure



Our Way of Collaborating

Identify
2-4 meetings at no cost

- Discussion of issues
- Alignment around probable causes
- Framing of analysis scope

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Qualify
3-6 weeks at cost

- Qualify opportunities with Trapped Value Analysis (TVA)
- Quantify anticipated results
- Initial engagement design
- Key meetings: Launch, Opportunity Review, Solution Review, and Final Framing of analysis scope

Modify
4-8 months

- Final engagement design
- Execution of engagement design
- Realization & measurement of results
- Ownership & sustainability

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One World Trade Center
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647 725 9662

adoption, scalability, and repeatability.

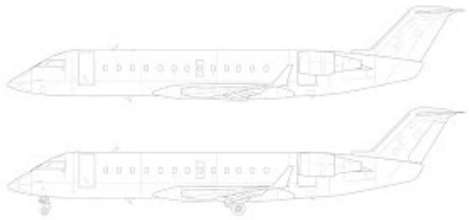
Supply Chain Integrations—Procurement and Materials Management were instrumental to setting up this agile concurrent engineering program, too. They developed "make vs. buy" decision-making heuristics, streamlined request for quote (RFQ) and request for proposal (RFP) processes (assigning new responsibilities, standardizing documentation, and facilitating information flow). To get current and future employees up to speed, the team developed decision trees for the proposal process—incorporating scalable size and complexity parameters as well as standardized purchase order protocols. Materials Management implemented inventory control parameters, parts-specific metrics, and a new BOM application upload into the firm's existing enterprise resource planning (ERP) system to control more accurate product scheduling and move all the relevant artifacts (drawings, specs, timelines, similar product templates, etc.) more expeditiously along the IPDP continuum.

Human Capital Management—in addition to developing and facilitating the concurrent engineering training content to support implementation, the Human Capital workstream moved all IPDP-related training from an instructor-based format to computer-based training (CBT), thus, allowing the team to have the latest training on-demand and easily incorporating future IPDP developments. This team also created CBT Engineering and Production onboarding modules, on-demand training refresher content (both in-class and computer-based distribution methods). Finally, Human Capital was also heavily involved with developing the firm's Concurrent Engineering Maturity Audit (CEMA), a sustainability assurance package including process steps, review meetings, questionaires, necessary checklists, retraining materials, and executive advocacy roles.

Production & Quality Assurance (QA) Testing—QA was intimately involved with co-developing the Engineering release schedule to ensure it lined up with Production, helped put in place more rigorous drawing standards criteria, developed comprehensive testing of drawing adherence to the new standards, and structured a quality-led continuous improvement feedback loop with Sales, Engineering, Procurement, and Materials Management.

Concurrent Engineering Results

The firm's complete IPDP program was implemented across 6 U.S. locations with simultaneity and scalability built in, allowing the in-house team to develop and roll out future iterations as business dictated. Supplanting the firm's former fragmented, time-consuming linear process with an agile, cross-functional IPDP, the team was now empowered to bid, design, and produce high-value, technical products faster—by reducing outmoded workflows, redundant activities, disparate knowledge sources, administrative burdens, and costly mistakes. Every functional group driving IPDP was now humming along in synchronicity. **Better, faster.**



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Business Improvement & Advisory Services

Aerospace Sector

Concurrent Engineering Capability Build-Up

US-Based Collaboration