

AVIATION WEEK

Program Excellence Awards 2022

November 2, 2022

The Watergate Hotel • Washington, DC

Nomination Form

INTELLECTUAL PROPERTY

(This section must be signed)

Individuals **outside your company**, including the companies listed above and other third parties, potentially including your competitors and others in your industry, may receive and/or review award submissions. All information submitted should address the program's management, leadership, and processes in a manner that you are comfortable sharing with third parties freely and without restriction, and may not include any classified or proprietary information or materials. Do not include any materials marked Confidential or Proprietary or bearing any similar legend. All responses and other submissions, whether in whole or in part ("Submissions"), shall be deemed not to be confidential, proprietary, and/or nonpublic information of any sort for any purpose.

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Thank you for participating,



Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by



Nominee's Signature

P/

May 25th, 2022
Date

Nominee's Name (please print): **Carlos Augusto Fernandes Filho**

Title (please print): Program Director

Company (please print): Embraer S.A.

NOMINATION FORM

Name of Program: E190-E2/E195-E2 Entry Into Service

Name of Program Leader: Carlos Augusto Fernandes Filho

Phone Number: +55 12 98227-8833

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Customer Approved

○ Date: _____

○ Customer Contact (name/title/organization/phone): _____

Supplier Approved (if named in this nomination form)

○ Date: _____

○ Supplier Contact (name/title/organization/phone): _____

PLEASE REFER TO PROGRAM EXCELLENCE DIRECTIONS
AS YOU COMPLETE THIS FORM.

EXECUTIVE SUMMARY: Make the Case for Excellence (Value: 10 pts)

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration?

(12 pt. Times New Roman) LIMIT YOUR NARRATIVE TO THIS PAGE.

E190-E2/E195-E2 ENTRY INTO SERVICE

The development of the E-Jets E2 Program became recognized around the world due to its fast-paced schedule. The first aircraft of the E2 generation (E190-E2) had entered service with development in (ahead of) record time, under budget, and above original specifications, including its entry into service maturity. As a result, it received many awards, such as the PMI Project of the Year Award, Aviation Week Grand Laureate Award, Aviation Week Program Excellence Finalist Award, and the CAPA/ Aviation Week Operational Leadership of the Year Award for its mature Entry into Service.

During the last years, Embraer has faced enormous challenges that created the need to enhance its leading products to guarantee profitability in a more competitive environment. Product modifications had the industrial capacity and resource restrictions in this new scenario.

Embraer started the entry into service of the E195-E2 in 2019. It is the second aircraft of its generation and perhaps the most awaited by the market, with over 150 sales commitments to launch. Through knowledge and skills obtained during the development of the E190-E2 and applying many lessons learned, we were able to reach an initial product operation within higher superior maturity/quality standards, never seen before, and reach positive financial results.

Development to Series Transition.

Reaching the end of the development phase, it was essential to quickly reallocate the resources to the projects mapped for the aircraft serialization phase. During this process, additional attention was given to building and sharing the Knowledge Assets before the reallocation, ensuring knowledge retention during the product serialization phase and entry into service support.

Portfolio Management Equilibrium

With more than 1000 projects running simultaneously, program management created a strategy to categorize and prioritize the projects into strategic objective groups: direct impact over sales campaign, longevity, and competitiveness; Scheduled Reliability (SR); Cost of Goods Sold (COGS); Direct Maintenance Cost (DMC); and interior reconfiguration processes. In addition, it aimed to select a portfolio of projects created in collaboration with our customers since the first E190-E2 aircraft delivery. This initiative created a transparent level of priorities, lead times, and requirements that would support their needs. In addition, this process gave them a perception of the product's maturity level to the highest standards.

Ramp up production with a hybrid line

The EMBRAER's initial plan was to introduce the E2 generation in the market and gradually substitute the E1 generation completely. However, after a few market and organizational changes, it was decided to keep manufacturing both generations simultaneously. As a result, the manufacturing line experienced with 15-years-running E-jets E1 efficiently absorbed a different line of products through disruptive methods and complete adherence of our team to the company's strategic goals.

VALUE CREATION (Value: 15 pts)

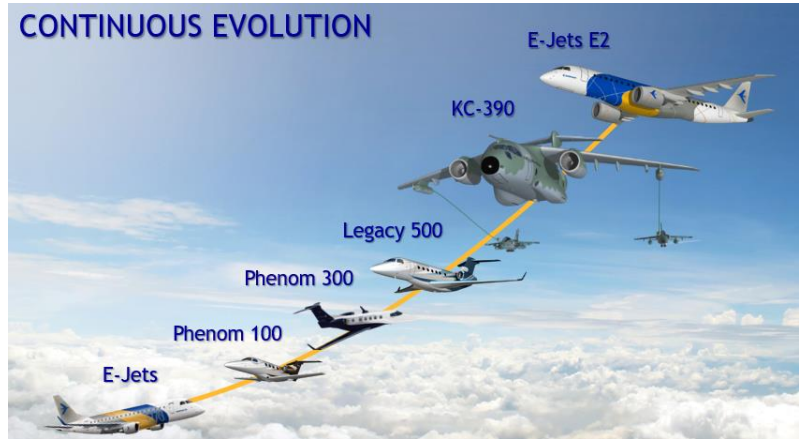
Please respond to the following prompt:

- Clearly define the value of this program/project for the corporation
- Clearly define the value of this program/project to your customer
- Clearly define the value of this program/project to members of your team
- Clearly define the contribution of this program/project to the greater good (society, security, etc.)

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Value to EMBRAER

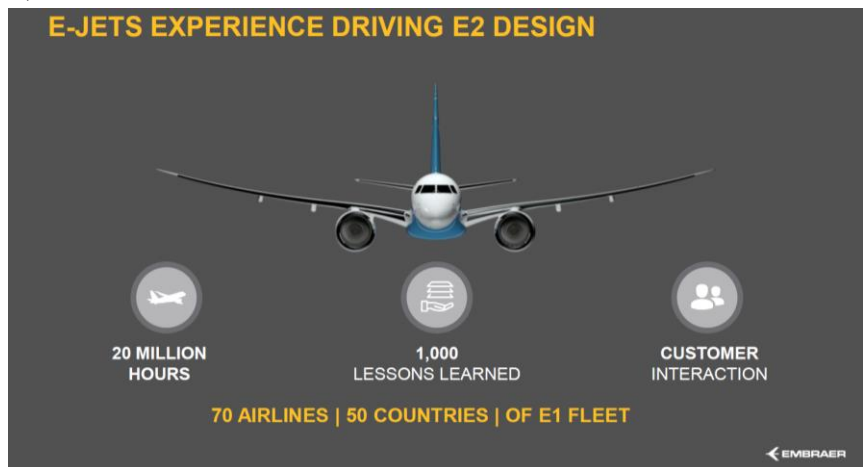
Commercial Aviation aircraft deliveries are historically responsible for up to half of Embraer’s annual revenues. To maintain these results while facing the new market challenges, the company decided to develop the E2 generation bringing more competitiveness to our portfolio. At the end of development, the company needed to ensure that E2 aircraft were successfully deployed in the market and all the existing operators could upgrade their fleet to the next generation. Within the scenario above, the E190-E2/E195-E2 Entry Into



Service project comes in place and represents a massive step in the commercial aviation market perception related to Embraer’s new products. Usually, an aircraft presents low maturity levels after its Entry into Service. Therefore customers wait for some years until they become more mature to proceed with the purchase and start their operation, mainly considering the fast-paced development phase. Thus, in the last 20 years, Embraer delivered more than market 20 new different programs, reaching an incredible achievement in the aviation industry and a unique knowledge level from all the lessons learned for continuous evolution from every upcoming program. Based on the excellent results obtained through this project measured by Schedule Reliability (SR), Accumulated Flight Hours, Cycles, and Completion Rate, Embraer was able to reduce the concerns of launch customers, achieve new deals with new and existing operators, ensure its sustainability in the segment and, encourage investors/sponsors to support the launch of upcoming programs.

Value to COMMERCIAL AVIATION TEAM

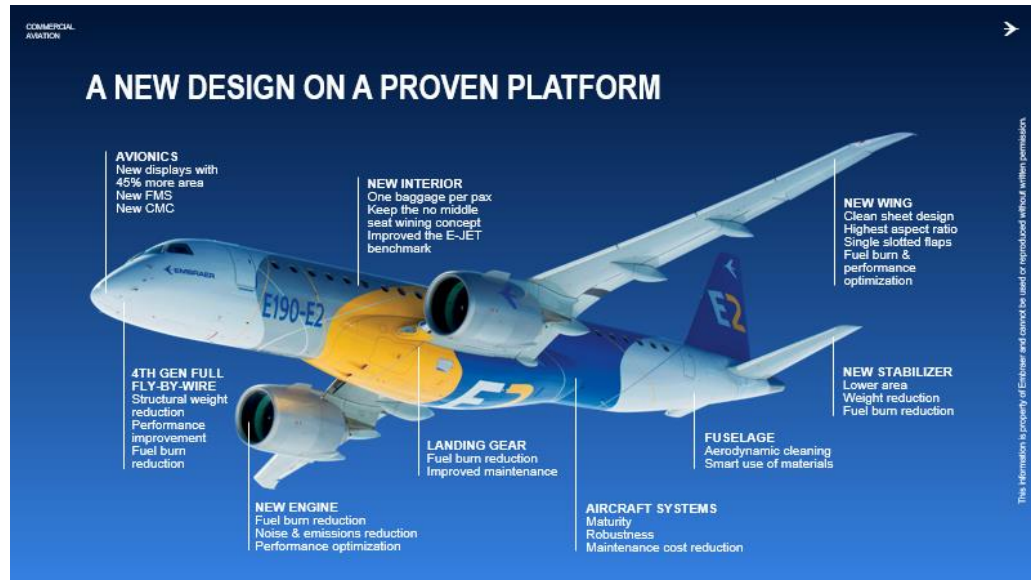
Challenge. Create. Outperform. Is the motto that defines our people’s essence and leads our teams to the same goals of excellence. The entry into the service of a commercial aircraft is a complex process. In the case of the E190-E2/E195-E2 program, there were additional challenges to be tackled since the aircraft is 85% different from its previous generation, demanding a complete restructuration of the supply chain, manufacturing, services, and support. This unique challenge and lifetime opportunity motivated our teams of all experience levels to



integrate and prioritize activities in innovative methods and adjust the existing metric controls to new standards permitting actions without impacting the launch customers' experience and results. From this experience, we can emphasize that this new program brought a new company with it. Our teams became even more mature in program development and confident to be taking the aviation industry to a new standard when it comes to early adopters of a new aircraft. They made it easier and faster for the market to absorb new programs and permit global transportation to access new technologies as fast as possible without compromising quality and operational and financial results.

Value to Customer

The near-term benefits to the customer in this project include a better ROI (Return On Investment) over a brand-new product purchased, consistent recovery from COVID19 impacts with the right size aircraft readily available for the changing market scenario, profit maximization considering aircraft optimized performance



from its design and, smooth transition between aircraft generations in operational and financial aspects. The long-term values are a more efficient and reliable aircraft compared to its previous generation, a better residual value due to its improved interior reconfiguration process, extended operational lifecycle, and one of the lowest carbon footprints available in the current market.

Value to the Greater Good

The global aviation industry produces around 2.1% of all human-induced carbon dioxide (CO2) emissions¹.

As new technologies respecting new environmental concerns emerge, the aviation industry has to undergo a process to implement and release solutions to the market. This project intended to hit directly in the market adherence period bringing a benchmark airline and passenger experience, and transition to a new aviation product to unique levels, speeding up as much as possible the process ensuring that all hesitancy points were satisfied and considered at the earliest moments during the development phase and delivery. The E2 aircraft generation brings reduced fuel burn, emissions, and noise levels with innovative smart use of new technologies and materials to a broader society that includes smaller communities that are only served by regional aviation. *Embraer E2 aircraft use less than 3 liters of jet fuel per 100 passenger kilometres. This matches the efficiency of most modern compact cars.¹* The aircraft's right size also aims to tackle the bigger piece of aviation emission impact, considering that: *Around 80% of aviation CO2 emissions are emitted from flights of over 1,500 kilometers (810 nm), for which there is no practical alternative mode of transport¹.* We believe that by reaching the goals, EMBRAER would permit global transportation to access new technologies as fast as possible, impacting our society positively and helping aviation to minimize its environmental impacts worldwide.

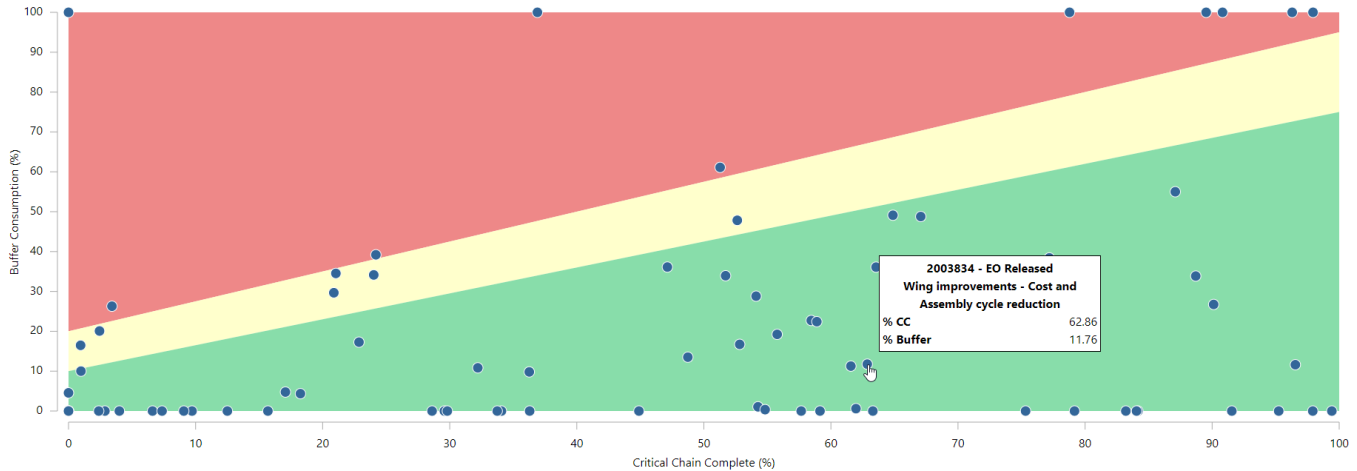
¹Source: <https://www.atag.org/>

METRICS (Value: 15 pts)

Please respond to the following prompt:

➤ What are your predictive metrics?

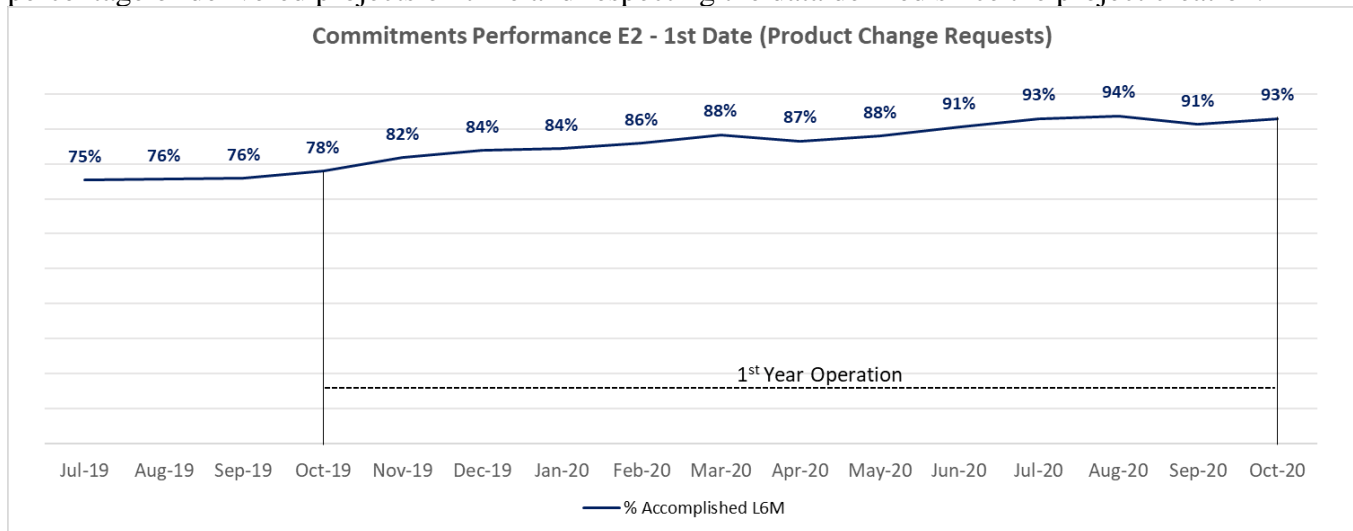
During the aircraft certification campaign, EMBRAER decided to go beyond the requirements and



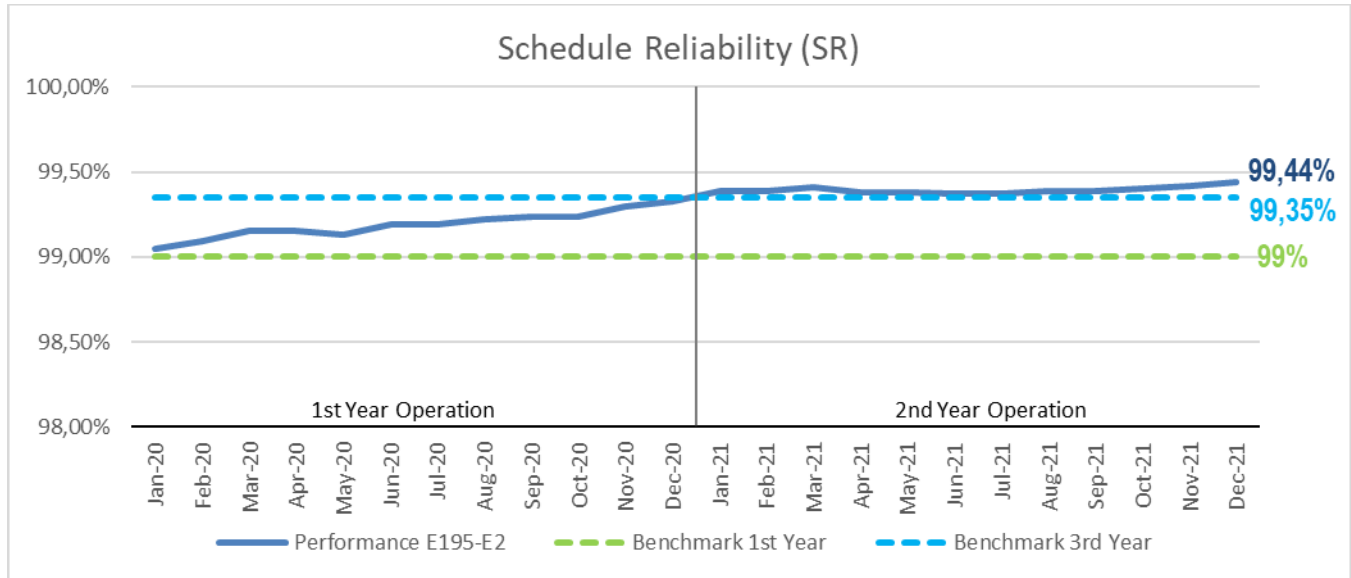
expose the product to conditions similar to that customers would be facing daily – high utilization and harsh environment. Therefore, all the data gathered from the certification campaign was used for the upcoming aircraft program phases to adjust management tools and continuously improve methodologies. The predictive metrics used during this project were mainly the Critical Chain Project Management, Fever Charts, and Theory of Constraints allied with existing knowledge from previous programs and data from extended airline-like flight tests executed during the development phase. Based on those assumptions, through the Fever Charts (example below), it was possible to guarantee the commitments were delivered in a predictive manner, on time, with a continuous reduction in execution cycles as teams became more mature as they managed and executed multiple projects simultaneously.

➤ How did you perform against these metrics?

During the 1st year of operation, the 1st date commitment had an average of 88%. In summary, this is the percentage of delivered projects on time and respecting the data defined since the project creation.



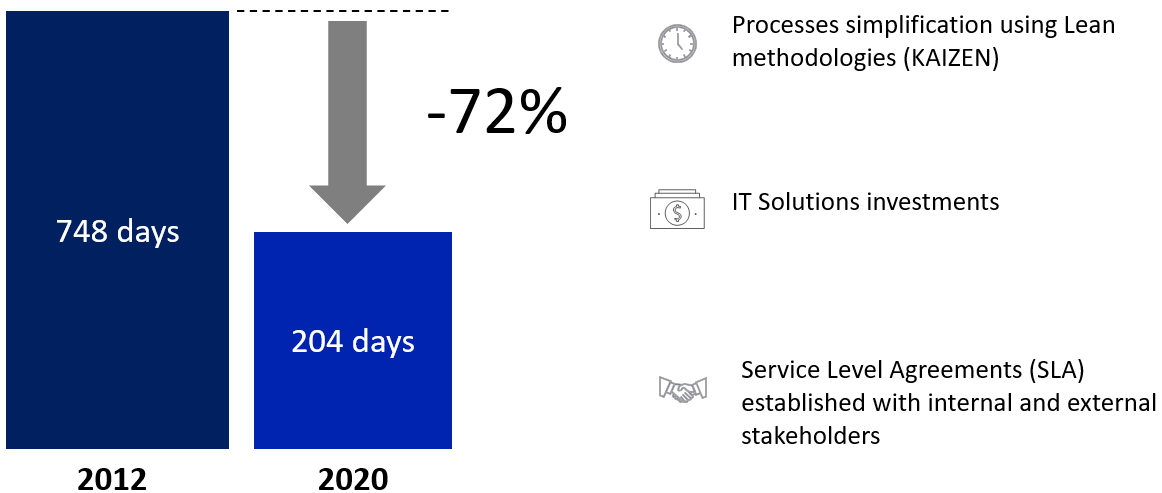
With this percentage of commitments achieved, Embraer delivered the E190-E2/E195-E2 with Schedule Reliability (SR) at outstanding levels and following the use of the methodologies mentioned. Afterward, through continuous improvement implementation, at the end of the first year of operation, the E190-E2/E195-E2 SR value was at the same standard as an aircraft with three years of operation, using the market as a reference.



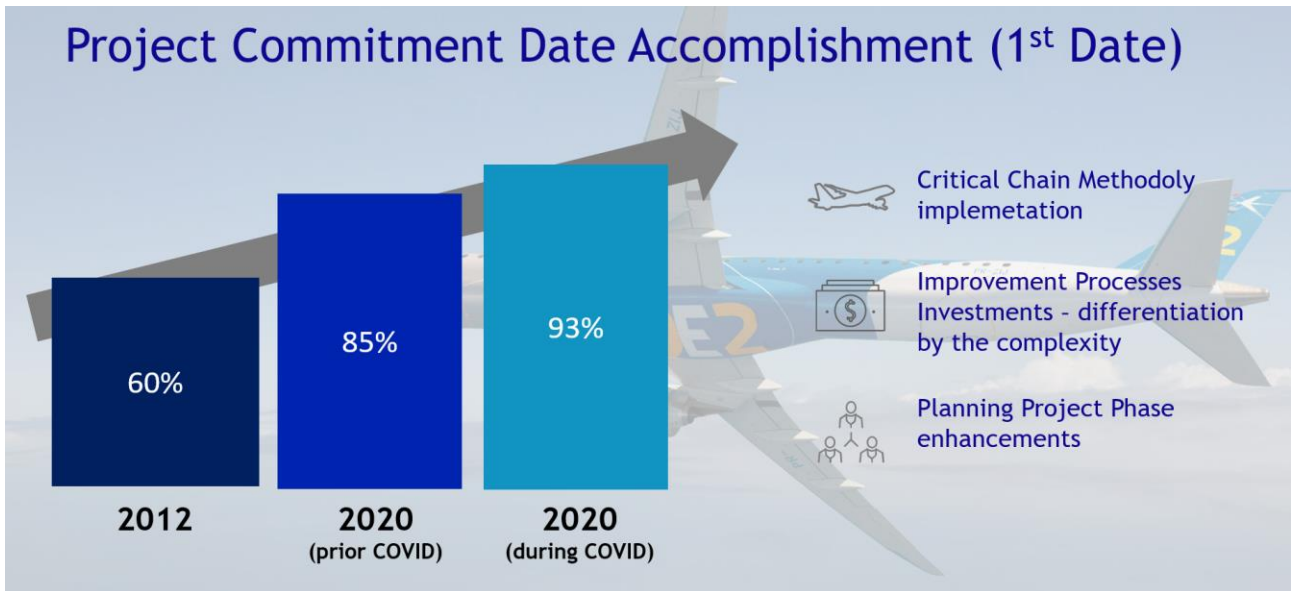
➤ How do your predictive metrics drive action toward program excellence? Please provide examples.

Through the extensive use and control of Fever Charts evolution and adding up concepts of other methodologies, Embraer has continuously improved the skills related to program management. Those results can be observed by the cycle reduction on the projects and achievement of the initial commitments dates.

Projects Average Cycle

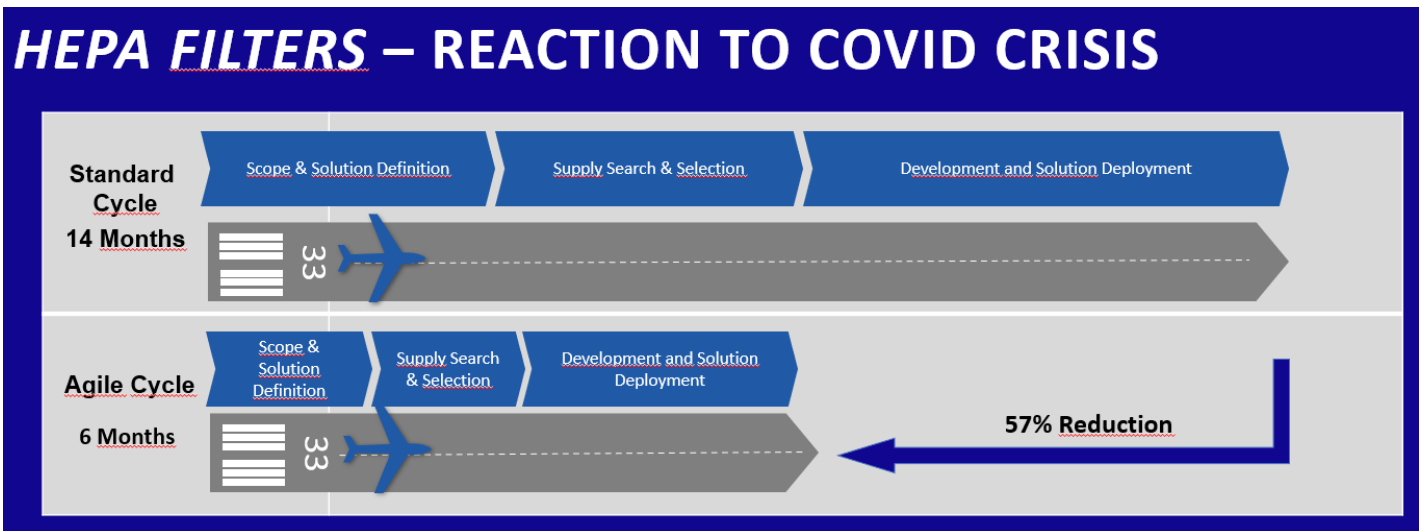


Project Commitment Date Accomplishment (1st Date)



As a project example, during the HEPA filter implementation in the older commercial aircraft (ERJ-145 family) in response to the COVID19 crisis, Embraer could reduce the standard cycle of a project, considering the complexity level, by around 57%.

HEPA FILTERS – REACTION TO COVID CRISIS



DEALING WITH PROGRAM COMPLEXITY (VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, OR VUCA)

(Value: 25 pts)

Please respond to the following prompts:

- 10 pts: Describe areas of VUCA faced by your program and why.
- 15 pts: Explain how your team responded to these challenges.

(12 pt. Times Roman)

Entry into service during a worldwide pandemic:

Before the COVID-19 pandemic, the EMBRAER's delivery pace was around 100 commercial aircraft annually, and suddenly this was reduced to 40 units. The low cadency increased the fixed-cost-related portion of the Cost of Good Sold (COGS). It had drastically impacted the entire OEM market with a historical reduction of deliveries in 2020 and 2021.

Response

Embraer delivered the reduced deliveries expected and maintained its firm orders by focusing on tailored solutions to address its client's needs to surpass the crisis. As an example of this commitment to Customer needs, EMBRAER studied and developed a sterile lavatory solution and HEPA filter implementation for its new and older commercial programs. Additionally, initiatives to speed up and prioritize COGS reduction projects were implemented in our internal processes. One of these initiatives was the Fit for Growth, a program based on strategic pillars of Supply chain Management, Operational Excellence (Reduction Cost Day), and Product Redesign. During the Reduction Cost Day, all the employees of specific areas were encouraged to contribute with ideas that could bring better financial All ideas went through an evaluation board. The authors that brought ideas that improved results received awards from the company..



Aircraft new technologies and their reliability in operation

Bringing new technologies to the market generated the benefit from a superior standard, creating competitive differentiation. Still, on the other hand, it could create a product with early maturity and low-reliability issues. The E190-E2/E195-E2 brings from its design a whole package of new technologies that extend from its Engines to its Passenger Cabin. This risk had to be closely monitored and controlled to maintain uncertainty levels within acceptable standards.

Response

Program Management planned additional provisions and readiness to develop new and fast solutions to the field. Keeping close control and measurements from the flight tests and maturity campaign was critical to identify the issues and solve them as early as possible. One good example was a new selected material that, during the flight test campaign, was presenting premature wear signs and not maintaining the quality standards established by Embraer. Following this strategy, we prioritized a project that replaced it with another material, respecting the committed dates for deliveries.

Supply Chain Crisis

The COVID-19 pandemic made Embraer face a singular situation with global logistics and supply chains operating at a reduced pace and causing widespread shortages in the overall industry.

Response

The supply chain architecture and its processes played a critical role in this project, being one the most critical enablers to guarantee its success. Since the external factors were constantly increasing the uncertainty levels, Embraer had to act by examining its internal processes and implementing new methods to prevent shortages and ensure that all commitments, such as aircraft deliveries, manufacturing,

and field support were accomplished. As a result, the supply chain organization was adjusted to maintain focus on Strategy and Operational, and a Crisis Committee was created. The main objective was to rapidly identify or anticipate shortage risks and initiate alternative material analysis and even a new supplier evaluation considering the worst-case scenario.

Hybrid Production Line

Embraer's movement to accommodate a new generation of its main commercial aircraft portfolio was a huge challenge. First, the company had to ensure that the expertise and best practices were already running. Manufacturing one aircraft type is a complex activity. Still, once another aircraft type is added to the line, including its wide variety of customizations, it takes process complexity to an exceptional level, which would also request excellent levels of management and operation.

Response

One of the most critical factors of a fully developed manufacturing line is its speed/pace of execution. This speed/pace magnitude is obtained through extensive execution and continuous improvement methodologies to make it as small as possible. The main challenge in this project was to accommodate two products in completely different phases and production time paces to share the same production line without impacting each other. The manufacturing teams developed an innovative line position scheme to overcome that obstacle. As a result, all the additional hours E190-E2/E195-E2 required, which would slow down the overall line, were executed in positions outside the critical working flow, similar to a parking spot philosophy. This innovation in the production line flow permitted both productions to maintain their own individual pace, delivering aircraft as planned.



ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP (Value: 35 pts)

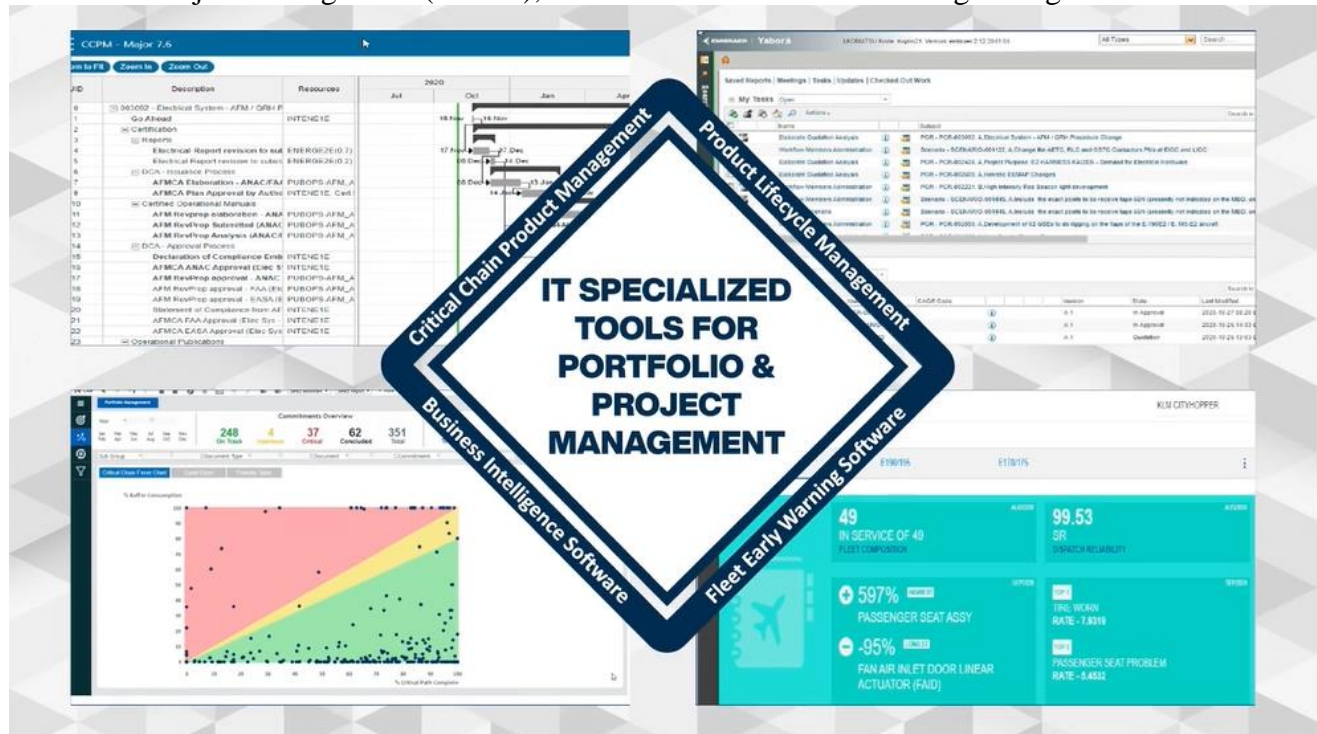
Please respond to the following prompts

➤ 15 pts: Describe the innovative tools and systems used by your team

Hybrid Planning Methodologies and Tools

EMBRAER constantly evolves its processes and tools through the P3E - Embraer Enterprise Excellence Program to ensure that all activities are performed with optimized efficiency. This lean journey has been within our company for more than 15 years and has become part of our daily activities to always look for continuous improvements and excellence pursuit.

For the most part, the innovation evolution is incremental, but there are some excellent examples of significant disruptive innovations during this project. In the E2 development and transition to the serialization phase, we have been using a mix of the Theory of Constraints, Product Lifecycle Management, Critical Chain Project Management (CCPM), and extensive Buffer Monitoring through Fever Charts.



This singular mix of tools and methodologies was one of the innovations that permitted results beyond the specific project goals. It also saved a few millions of dollars, some months in the development, and took us to international recognition, as mentioned before. Currently, we are using the same concepts in the Portfolio of aircraft modification with internally developed and integrated tools.

➤ 10 pts: Define how you developed, led, and managed people

Corporate Culture Basis

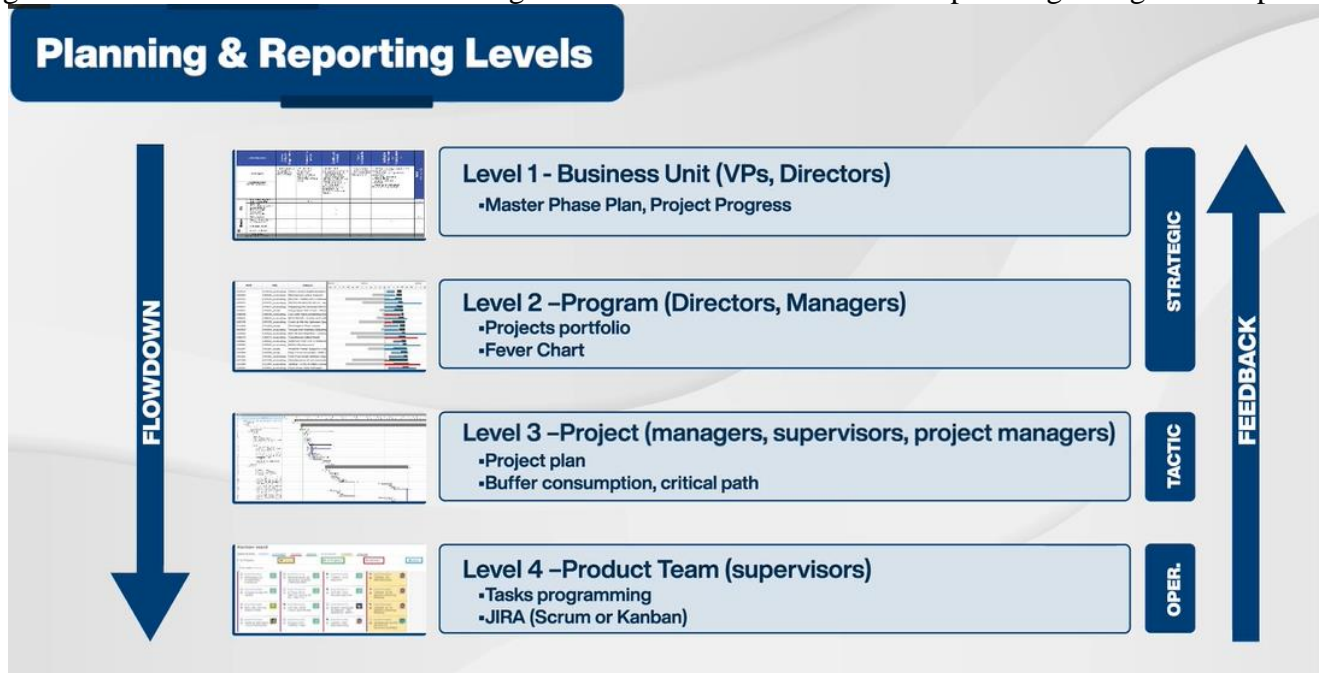
The culture among our company and colleagues is the foundation that enables Embraer to reach higher results every day. From the complete adherence to the “Challenge. Create. Outperform.” motto, the organization could rely on a robust bond from all company areas with the continuous improvement philosophy and commitment to the pursuit of excellence. It creates a perfect atmosphere where strategy can flow freely, from the upper management to our operational levels, and define the company’s directions

without significant internal resistance. This culture is reinforced every day within the company, from e-mail signatures to major project goals.

If there is a challenge, we want to provide an Embraer solution for it and delight customers and the market. Once the customer outperforms, we outperform.

Continuous Communication Flow

Over the previous two years, the world passed through severe scenarios for entrepreneur activity which highlighted the importance of a company maintaining its capabilities to adapt as high as possible. Therefore, it was essential to guarantee that all responsibilities and commitments were unfolded efficiently through management tools at each hierarchy level within the company structure. In addition, creating a reliable, organized, and assertive communication channel was also critical. With this structure of Planning & Reporting, constant communication could fill all the teams with an intense sensation of ownership over the program and a much more cohesive working environment with readiness for upcoming changes in the path.



Core Team Structures

Each program platform was defined as a Program Core Team to execute a central role in the program management and ownership. This team was responsible for managing the product and projects and determining the dynamic criteria to take those projects through a selection before their execution. The team formation counted on different specialties, with experts from Engineering, Quality, Manufacturing, Procurement, Customer Relationship Management, and several other pertinent areas. This strategic manner of teaming up generated a tremendous value through diversity. From this team, different knowledge was able to work together collaboratively, speeding up and improving the decision-making process constantly. It is pertinent to highlight that the same team that manages a multi-million dollar project will also manage a multi-billion portfolio of projects for a specific program.



Spreading Knowledge Culture

There is a Nationwide pride and passion for an extraordinary individual in Brazil called Alberto Santos Dumont. He reached exceptional aeronautical achievements in life and became an influential pioneer in Aviation. Santos Dumont had meticulously registered all of his aircraft in detail to achieve all those objectives. He surprisingly made it available to anyone who requested it and, even more admirably, never asked for any patent for his machines. This idealist spirit is still alive within our engineers and still shapes our culture as a Brazillian company.

As a leader company in the Regional Aviation, EMBRAER has extensive experience developing and offering aircraft in the market. Therefore, all this knowledge is registered, analyzed, and constantly spread within the company areas through “Communities of Practice” and pre-established processes. For example, there are gates to enter the next phase. These gates have reports in which all the work performed is analyzed. They also include lessons learned to avoid repetition in the next phase or even in upcoming programs.

- 10 pts: How did you leverage the skills and technologies of your suppliers?
(12 pt. Times Roman)

The Critical Chain Project Management concepts were shared and reinforced with our suppliers through several Workshops. It was essential to have all the stakeholders sharing standard methodologies and tools to facilitate communication and establish similar objectives. Additionally, Embraer decided to pursue operational excellence that would share every gain obtained with its suppliers. From this initiative, we could reinforce the continuous improvement mentality among our partners, spread the best practices that we have in the company, and ensure a more competitive cost.