AVIATION WEEK NETWORK

2021 PROGRAM EXCELLENCE NOMINEES
FOCUS ON SPEED

An Aviation Week Network Whitepaper

Carole Rickard Hedden

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Recognizing excellence in program execution is the most visible outcome of Aviation Week Network's annual Program Excellence Awards. But the foundation of the initiative is identifying lessons learned and best practices—and by sharing them, raising the overall performance of the industry.

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One of the biggest challenges for aerospace and defense program and project leaders in 2021 is demonstrating the ability to speed things up—from the time needed to develop a proposal response to the development of new capabilities to moving products through the manufacturing process and then introduce to operation.

It's just as important after the product is delivered—continuous rolling out of upgrades and improvements, maintaining and keeping those assets in use.

This doesn't really sound like a new challenge, but it's a change in prioritization that began with the Trump administration. While cost and affordability remain important, the focus is on speed.

It's fundamental to the U.S. defense strategy as the U.S. faces a peer threat from China, which requires the U.S. to defend itself in Asia against an opponent that has more force strength and is willing to spend more than other nations.

A similar situation exists for civil space, where the U.S. is no longer the lone dominate force. Instead, countries around the world are racing to gain a foothold on the Moon and beyond. That drive to extend the frontier in space isn't reserved for the few—there's a new generation of companies emerging and willing to move past traditional ideas about space launch and satellites to develop new economic models that more closely resemble those established in the world of smart phones than in rockets and spacecraft.

Not to be left behind, the world of commercial transport is also rushing to a deadline of its own to drive down emissions to zero, reduce noise and relieve congestion—all while moving more people and goods than ever before.

For this reason, the 2021 Aviation Week Network Program Excellence initiative focused on two areas in identifying best practices: speed and risk. Following are details about some of these best practices.

Late Start/Late Finish

BAE Systems
Limited Interim Missile Warning System
Tadg Corkery

Anyone who has launched a program knows the early days are the toughest in terms of measuring progress … before you get behind. The Limited Interim Missile Warning System (LIMWS) program at BAE Systems solved part of the problem by devising a Late Start/Late Finish metric and developing an innovative iterative hardware prototyping system to deal with shortages in the supply chain.

Tadg Corkery, LIMW lead, says dealing with those early weeks of a program were a major concern for BAE Systems and the customer, the U.S. Army. The missile warning system—BAE's next-generation 2-Color Advanced Warning System (2CAWS)—was an upgrade from a previous BAE Systems product and was designed to get better detection of the threat and the infrared domain. The schedule was aggressive: do in 24 months what in the past had taken 36 months.

In addition to a commitment to collaboration between the Army and BAE from the outset, the team leadership was willing to be challenged to do things differently. Stepping up the speed at the outset of the program would be crucial to maintaining the tempo.

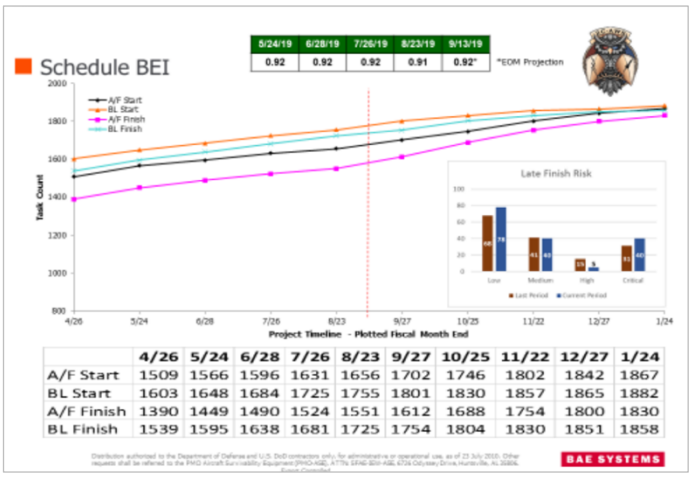
And, Corkery says, Master Planner Chris Neffinger knew how to make planning tools sing, to tell a story, whether in Microsoft Project, Excel or other system.

What was missing was data because the program was just starting. The team instead looked at the baseline execution index (BEI)— how many tasks were supposed to get started within a given timeframe, how many were scheduled to finish, and whether they actually were finished.

"By taking a look at raw numbers–at say 100 tasks that this month didn't finish that were supposed to—we got an estimate of where we were," Corkery said.

Corkery and the engineering lead on the program then looked at the tasks, placing them in buckets based on their impact on the program's critical path. "We might have 50 or 60 tasks that were important, but not resource-loaded or where we knew resolution was coming," explained Corkery. That allowed the team to laser-focus on the 10 tasks that would impact the schedule and assign more resources or help where needed.

Throughout the process, the tasks that fell behind were not a surprise, but the system gave visibility at a point when most programs are still forming and norming. Again, the program leaders applied a qualitative approach, assigning low, medium, high and critical categories for each late finish.



Measurement of early and late starts and finishes also provided a risk tool that uncovered problems, but which also revealed opportunities.

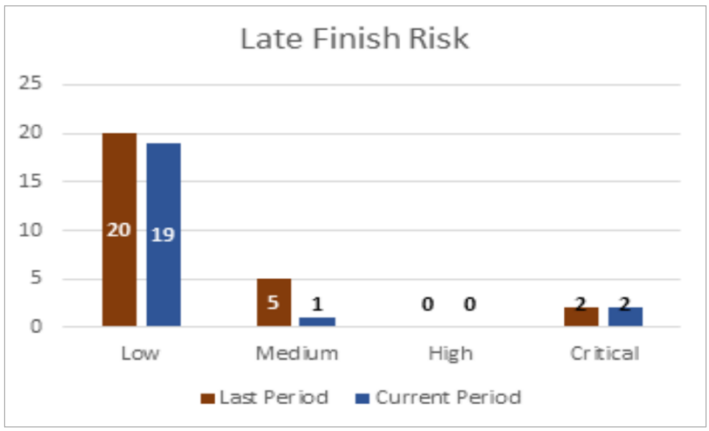
"Typically, [the most critical] were pinch points that we had known were going to be issues," Corkery said, and the majority had to do with integration.

Which led to the second best practice adopted by the LIMWS team—***iterative hardware development.***

Getting software and hardware across the finish line together was the goal, and there was no denying that supply chain shortages and late deliveries were going to be an obstacle. "Lead times for certain materials didn't align with the 'need' times," Corkery said.

Again, team strength paid off. A group of "creative minds," as Corkery refers to them, took two days to lock themselves away and come up with an alternative—developing hardware prototypes based not on what was needed, but based on what was available. The argument was convincing in terms of the time that could be saved, so the second phase of work began, identifying alternatives that were readily available so that work could continue until the preferred material or item was available. "We knew we could get our hands on certain stuff, which would be better than nothing so we could get started," Corkery said. "It was always about forward momentum and not waiting."

These were not prototypes that matched up with the envisioned configuration, but with each iteration there was enough capability available to keep development and integration—the pinch point—moving forward.



The risk involved in late starts was tracked regularly

"For instance, perhaps the prototype was valuable for testing—it didn't have to have the latest, greatest updated circuit card," Corkery said. "I'm sure this has been done in some form somewhere, but in our case, it was willingness by everyone to do things differently when you faced a challenge."

Achieving Speed

Boeing Defense, Space & Security
MQ-25A Engineering & Manufacturing Development
David Bujold
Sr. Director/Program Manager

The Boeing MQ-25 program, led by David Bujold, has transformed the typical risk, issue and opportunity process into an offset strategy designed to accelerate work, but also accelerate capitalizing on opportunities.

As risks are identified and plans documented, cost and schedule analysis provides a forecast of future impacts. These forecasts are predictive measures that incentivize opportunity generation.

Each quarter opportunity targets are distributed across the program teams based on the issues realized and risks forecasted, demanding new ways to generate opportunities.

In turn, a special grassroots program nicknamed the "Stingray Tank" was launched to cultivate innovation from within. At the "Stingray Tank," employees from any discipline are invited to pitch ideas that have cost, schedule, or technical benefit to the program. Those that make it through the Stingray panel quickly graduate into formal "opportunities" on the program.

Employee incentives for ideas and creativity keep it fun and competitive with a proven performance track-record generating multi-millions of dollars in opportunities. These key examples highlight how predictive metrics are institutionalized across the program to drive quick action and engaging strategies to ensure critical milestones are met.

These measures have led to several design trade studies, increasing the speed of design maturity combined with driving continuous improvement for the program.

The MQ-25 team believed core to achieving speed was simple but complex—People.

- Given the nature of this fast-moving development program and the uniqueness of an unmanned program, it was clear that our teammates would have to come up to speed faster and be more engaged and driven to succeed than ever before. Therefore, we focused our efforts in three different areas:
- Continuous Learning: The program hosts weekly "Stingray School" self-enrolled tutorials featuring Boeing and Navy subject matter experts presenting on an array of technical and functional topics, all aimed to connect employees to each other, and the MQ-25 program mission. Recent attendees (up to 250 employees) have gained insight through a virtual tour of the MQ-25 T1 test asset and flight test facilities that so few have been able to see in a COVID environment.
- Creating Connections: To continue developing our talent in our U.S.-based program, we have established a top talent mentorship circle to provide a support system, networking, and development opportunities across a diverse set of competencies and peer programs. This select group has been given special projects related to advancing program initiatives, and the benefits are two-fold: the infusion of energy and expertise helps us tackle challenges and get ahead of others, and the top talent benefits from the experience and exposure to further their careers.
- We're also applying a global view to people development, teaming with Boeing India for additional technical skills and talent to execute engineering work. The global team has been learning from one another and inherently growing their own skillsets in

executing work globally, learning how to adapt tools and processes, and gaining cross-cultural experiences that are necessary for building diverse, inclusive teams.

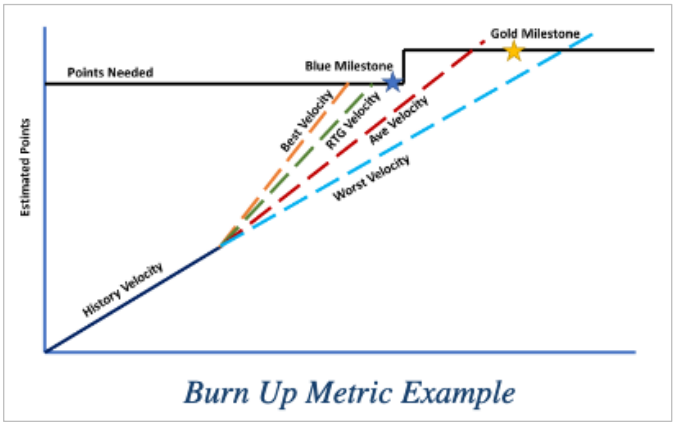
- Crediting Employee Contributions: Each month, outstanding work on the MQ-25 program is recognized through the peer-nominated "Employee of the Month" program. The monthly recognition approach not only rewards employees and helps them feel valued for their contributions, but it also creates visibility across the program's senior leadership team for the individuals who are going above and beyond. This approach helps develop the next group of top talent across the program. Feedback from winners has shown the value they feel in being recognized by their peers and the program and inherently increases their employee satisfaction and desire to continue the work for which they were recognized.

Fast Burn

Lockheed Martin
Command and Control, Battle Management and Communications (C2BMC)
Mark Johnson
Program Director

Understanding the threshold for a team's work is at the base level of knowing what is possible. For the C2BMC team, velocity and capacity provide data points necessary for leaders to understand the impacts of re-prioritization and quickly make data-driven decisions. These metrics, and management of them to the most basic levels within the program, enabled the team to leverage early indicators and what-if scenarios.

One of the primary predictive metrics used for C2BMC is ***a milestone burn up chart*** for the program, product team and sub-product team. As the chart (right) indicates, the two axes are estimated points and time.



Burn Up Metric Example

Points are a unitless measure of the size and complexity of work allowing comparison of each piece of work. It also allows the aggregate to be compared to historical data, which then defines a velocity rate at any level of the program.

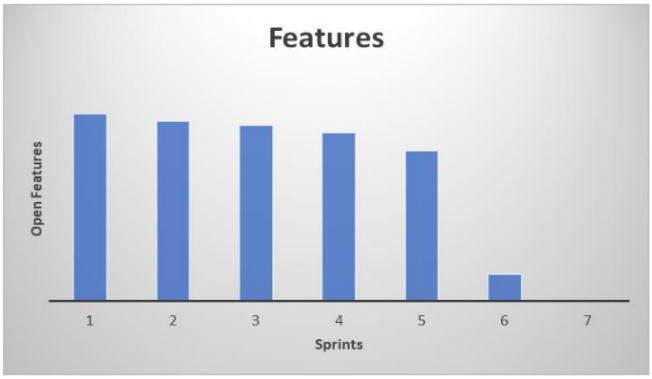
Velocity is then used to predict the amount of future work a team can achieve. The predicted velocity line crosses a target horizontal line of the total points needed to achieve a milestone producing an understanding of positive or negative margin.

C2BMC predicts into the future with three lines (best, average, and worst velocities) to understand the risk associated with achieving a milestone. This allows us to determine red (the best velocity cannot achieve the milestone), yellow (the average cannot, and the best can achieve the milestone), and green (the average velocity achieves the milestone). When a prediction comes up red or yellow two actions are taken:

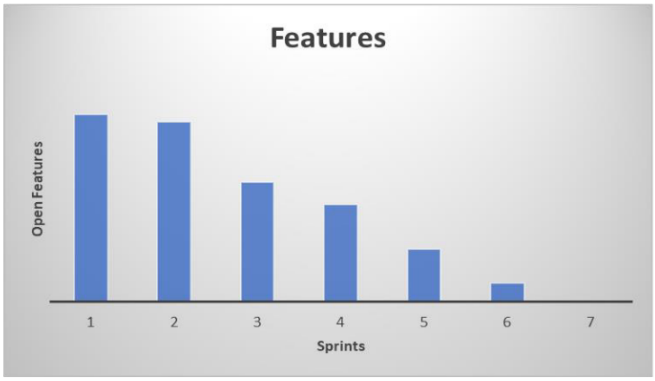
1. The team looks at the work to meet the milestone, refines the estimates given any new information or learning from the team.
2. Leadership looks for ways to invest in the team to increase the velocity.

C2BMC also predicts and tracks feature (an amount of meaningful work shared by two or more small teams) closure for a three-month period. The three months are broken up into two-week sprints, 1 through 7. The following charts illustrate a predicted

burn down of features showing all work is completing at the end of the three-month period. This builds risk and indicates team dynamic problems to be addressed. It can also indicate education or assistance needed in understanding how to decompose work.



Unfavorable Feature Burn Down



Favorable Feature Burn Down

All the metrics described scale up and down the program to allow for quick action at any level based on the best predictions available. As these metrics are aggregated up to the program level, senior leaders can look at trends near real time through a consolidated dashboard in Tableau.

This dashboard provides development status across the entire program and provides a quick visualization of favorable and unfavorable trends which enables leadership to react and address before a metric turns "Red", thus driving more preventive action instead of corrective action.

The metrics proved particularly valuable during the global pandemic. Given the nature of the work on the C2BMC program, much of the development for the system is in a classified environment, thus did not provide the team the luxury of working from home. As waves of COVID-19 impacted the program over the last year, re-planning was a constant requirement given the unpredictable nature of the team's true productivity.

These metrics resulted in quick assessment and reaction to the ever-changing environment and provided the forecast data necessary for the team and the customer to make appropriate decisions regarding major program milestones.

Burn Up Metric Example

Each small team (about seven engineers) writes stories to satisfy a feature. The stories and features, as mentioned above, are estimated in points. The team measures over time how many points they achieve in a two-week sprint. Over time, this becomes the team's velocity.

The team uses the velocity to predict how much work can be accomplished in the next several sprints. Velocity also allows the team to plan appropriately for holidays and vacations by proportionately reducing the total points capacity for that sprint. The team also meets at the end of each sprint to discuss ways the team could improve their own velocity as small opportunities. The opportunities are written as stories and prioritized against other necessary work for the coming sprints.

Summing Up the Lessons Learned

As part of the Program Excellence scoring process, evaluators looked at four categories of performance: value creation, organizational excellence, identify and managing through complexity, and metrics.

It's no surprise that programs chosen as finalists or winners normally exhibit the highest success in identifying best practices and lessons learned—the project and program leaders know best how to identify where they have strong performance and where performance needs the help of lessons learned.

Following is a listing of the programs that best performed in these categories. You can read more about how these programs achieved the highest levels of performance by reviewing their submissions. These are available at https://aviationweek.com/program-excellence

Value Creation

Boeing MQ-25A
Boeing International Space Station
Honeywell Aerospace UV Light Treatment
L3Harris Technologies Nancy Grace Roman Telescope Optical Telescope Assembly
U.S. Navy F/A-18 E/F Readiness

Organizational Practices/Team Leadership

Boeing MQ-25A
Honeywell Aerospace UV Light Treatment
Lockheed Martin C2BMC
Qioptic JSF ROA Ramp Up

Dealing with Program Complexity

Boeing International Space Station
Honeywell Aerospace UV Light Treatment
Lockheed Martin OSIRIS-REx
U.S. Air Force KRADOS
U.S. Navy F/A-18 E/F Readiness

Unique Metrics

BAE Systems LIMWS
Boeing International Space Station
Lockheed Martin C2BMC
Qioptiq JSF ROA Ramp Up
U.S. Navy F/A-18 E/F Readiness