Virgin Orbit Takes Off on Production

An iBASEt MES/Quality Customer Success Story

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INTRODUCTION

Virgin Galactic may be the best known of the Virgin Group's aerospace ventures, having captured the imagination of both the public and media for its development of commercial spacecraft, particularly its goal of providing suborbital spaceflights to tourists. For the business world, what may be the most interesting part of the Virgin Group portfolio of companies may be the newest: Virgin Orbit, a Long Beach, California-based organization focused on launching satellites for commercial, research, and governmental projects.

In a recent issue of The Verge, Dan Hart, CEO of Virgin Orbit, stated, "To me, the Virgin brand is about making life on Earth better, and we are going to fulfill that purpose by accessing Low Earth Orbit to connect billions of people and enabling valuable applications of data from space through Virgin Orbit's flexible, affordable, and reliable launchservice."

The first iteration of this vision is Virgin Orbit's LauncherOne program, an initiative that will launch small satellites from under the wing of a 747 airplane. The program is comprised of two vehicles:

- The LauncherOne rocket
- The Cosmic Girl 747-400 plane

Cosmic Girl will carry LauncherOne attached under its wing, up to 35,000 feet, where the rocket will fire its main engine to go into space. Later, the rocket will separate, and a second stage will ignite to boost the vehicle and its payload.

With a large and growing list of satellites slated to launch on LauncherOne Virgin Orbit established an aggressive production deadline, establishing the need for a Manufacturing Execution System (MES) that could support an expedited ramp-up time. Virgin Orbit selected iBASEt's Solumina to help manage its manufacturing floor to support both the ramp-up from prototype to production and an aggressively increasing production rate.

MEETING THE CHALLENGES

The challenges of a discrete complex manufacturing operation like the one at Virgin Orbit are significant. The processing of engineer to order, and multiple bill-of-material levels can go very deep. Work-in-process units incorporate engineering changes as the process progresses, and engineering must be involved in material review processes, dispositions, and rework instructions every step of the way. As-designed equals as-built validation is required, as is traceability of changes, deviations, and approvals. It's a complicated business that requires a complete solution.

The LauncherOne team at Virgin Orbit selected iBASEt's MES Solution, powered by Solumina, to address a host of needs, including:

- Paperless work instructions
- Real-time visibility
- Synchronization and control of production operations
- Quality management and corrective actions
- Shop floor change management
- Data collection, buy off, and certifications
- Execution of real-time, physical processes
- Work order completion management
- Integration, coordination, and execution of work orders with Virgin Orbit's ERP (Oracle) and PLM (Teamcenter) systems

To achieve these objectives, iBASEt's MES Solution was deployed, including Process Planning, Shop Floor Execution, and Shop Floor Quality functionality were deployed with no configurations.

"We had been working in a paper-based environment that was both labor- and time-intensive," says Darren Buonaguidi, project manager for the LauncherOne team. "A technician on the shop floor would have to read the work instructions, and often supplemental information, and then go to different places on the floor to get everything they needed. There were usually many steps, involved; often the accessed information was in Excel spreadsheets or other paper forms. Solumina provides the work instructions in one place, an easy-to-access and understand screen. Then it not only collects and presents all the relevant information, but automatically incorporates engineering changes and manages exceptions. In a complex environment like ours, the speed of reaction to exceptions is critical; Solumina enables quick response."

To speed understanding and adoption of this solution, iBASEt gave targeted implementation workshops to LauncherOne's core implementation team on each of the functional areas that included the basics of each area with best practices coaching, as well as a framework for business process transformation and execution/utilization for LauncherOne manufacturing. "This knowledge was passed on very successfully to the team at large," reports Andrzej Goryca, enterprise application manager at Virgin Orbit. "Communication with the entire team was essential to the ramp up, as was making sure everyone knew they were an important part of the team. The commitment we had from our top-level leadership also helped us get up to speed fast."

Buonaguidi adds that the application itself helps with training the staff. "Solumina is well thought out, so when team members have questions, the answers are at hand in the OOB Solumina," he says. "Its capabilities are really complete." Virgin Orbit team has done a great job managing business requirements and asking the "why" question each time a customization was being requested.

POWERFUL EXECUTION

Virgin Orbit went live with their iBASEt solution in four months – a month and a half ahead of their initial plan. This was accomplished significantly under budget, thanks to the Virgin Orbit support team performing a considerable amount of implementation tasks (i.e., the entire scope of integration). The iBASEt solution also contributed, enabling a quick roll-out by a feature-rich, well defined, and documented set of setup functions.

The manufacturing execution encompasses the following capabilities:

- Integrates with ERP jobs/work orders and financial modules, with interfaced information visible, actionable, and reportable in the target systems.
- Provides material status and labor status (i.e., inputs and outputs) to Oracle to calculate costs (i.e., time and material) against work orders.
- Integrates with PLM and ERP to exchange BOM, router, resource, and work order information.
- Manages, dispatches, and displays jobs/work orders to technicians, including visual aids management.
- Provides step-by-step work instructions and visual aids to technicians.
- Indicates clearly all materials and parts required for the work order.
- Displays and enforces second-party verification on build steps, as designed in the manufacturing process.
- Captures labor hours spent for the build against work orders (WIP and final assembly).
- Manages work order non conformances within the system
- Assists, captures, and maintains ad-hoc build processes.
- Empowers users to create ad-hoc jobs/work orders to capture materials and hours against rework, upgrades, or re-grades.
- Captures genealogy of components and assemblies built via lot and/or serial trace abilities.
- Reports on as-built configuration of a component or assembly, including removing and replacing.
- "Redlines" work orders on the shop floor.
- Lists and reports shop floor data (e.g., torque values, temperature readings, counts, measurements) via user input.
- Provides visual tools to manage predecessor/successor relationships between operations.
- Collects and reports on all as-planned, as-built, and as-maintained data.

"This is a very powerful system that is especially impressive when considering we didn't have to do any configurations for the primary implementation," says Goryca. "That not only speeds time-to-value, but it keeps the costs down."

According to Buonaguidi, immediate plans are to leverage their solution as it is now implemented, with an eye towards adding further functionality over time. So, the sky's the limit—but that is something that Virgin Orbit knows very well.

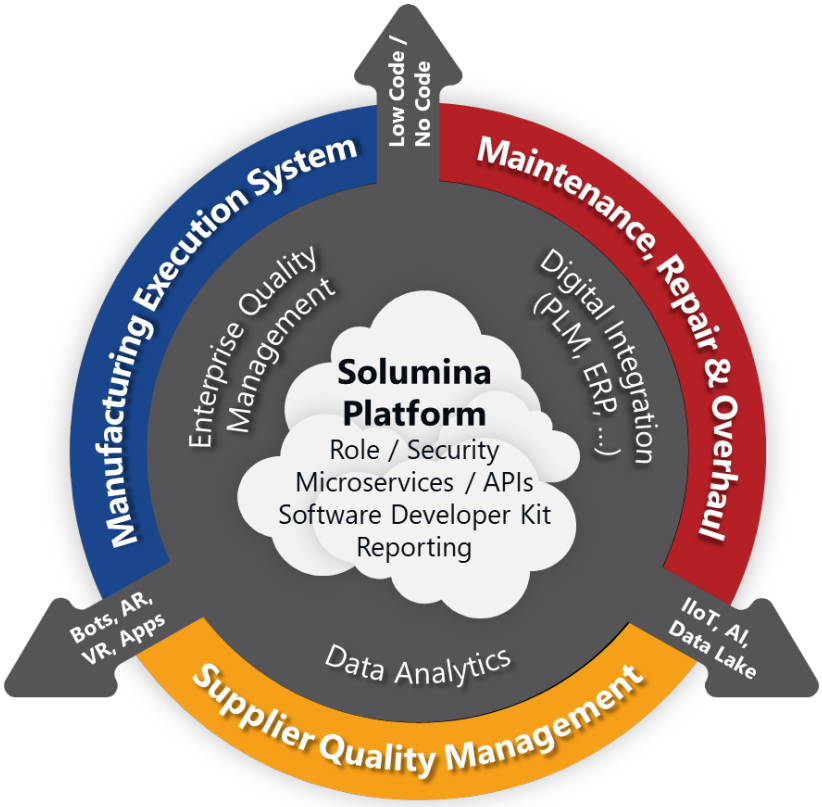
ABOUT IBASET

Headquartered in Foothill Ranch, California, iBASEt simplifies complex manufacturing. Its solutions replace disparate production, quality, and MRO applications with paperless, digitally integrated solutions. The iBASEt Digital Operations Suite synchronizes data and processes to foster collaboration by establishing and maintaining a digital thread that spans enterprise systems to internal and external teams. From process and inspection, planning to the shop floor, and the execution of sustainment activities, iBASEt's proven, pre-configured, and out-of-the-box solutions deliver real-time visibility and control that accelerates manufacturing performance.

The iBASEt Digital Operations Suite comprises a portfolio of Model-based Manufacturing applications that includes iBASEt's Manufacturing Execution System (MES), Supplier Quality Management (SQM), and Maintenance, Repair, and Overhaul (MRO) solutions. This digital suite connects the shop floor to the top floor to ensure high quality, consistent practices, continuous product and process improvement, and embedded compliance with process standards including ISO 9001, ISO 13485, AS9100, and FDA's 21 CFR Part 11 and Part 820.

With 30+ years of experience in highly engineered, regulated industries, iBASEt simplifies the complex by empowering customers to gain real-time visibility, take control, and drive velocity across their operations.

The iSeries, powered by the Solumina platform, has a cloud-native microservices architecture with open APIs that extends a digital ecosystem to drive innovation, simplify hardware and software systems integration, and deploy advanced technologies. iBASEt works closely with many industry leaders, including Lockheed Martin, Northrop Grumman, Rolls Royce, Pratt & Whitney, and Textron. Learn more at ibaset.com.



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