Two new facilities on Florida's Space Coast will build and support a strategically important U.S. Naval aircraft.

Ground SUPPORT

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Northrop Grumman

WHEN YOU DUB a facility a "Center of Excellence," it had better deliver.

In early 2013, Northrop Grumman announced the creation of not one but five Centers of Excellence across the country for its Aerospace Systems sector. The ongoing goal of this initiative is to develop increasingly innovative and affordable products, services and solutions for Northrop Grumman's customers. Two of these Centers of Excellence are located in Florida, one in Melbourne and the other in St. Augustine.

Hawkeye in the Sky

Northrop Grumman's Manned Aircraft Design Center of Excellence campus in Melbourne is the home of Building 228, which houses the program, engineering and integration labs for the U.S. Navy's E-2D Advanced Hawkeye early warning aircraft.

The most challenging aspect of this facility was the speed with which it was to be designed, engineered and built: 58 weeks from the start of design to occupancy and 42 weeks from groundbreaking to occupancy—an effort that by construction industry benchmarks would typically have been implemented over a three-year period. This remarkably aggressive schedule made structural steel a necessity.

With two years to be taken out of the schedule, normally sequenced activities had to be overlapped, with decisions made on an as-needed basis to support a rapid start on construction. As such, construction was significantly accelerated.

A project-specific risk points and mitigation measures plan helped identify potential risk factors, with a work package control schedule serving as the project "guidebook" and work plan for design, engineering and procurement activities. This approach required flexibility to develop design and engineering drawings out of traditional sequence. The design and engineering team was driven by the construction schedule and maintained close coordination with the construction management team. During construction, Austin and its subcontractors held daily and weekly full-team meetings that included schedule reviews to ensure that the team was progressing as anticipated.

Structural engineering actually led the design team in early weeks, as structural design began shortly after the building's bay spacing and overall dimensions were blocked out. Structural steel erection was closely coordinated to coincide with architectural precast panel erection.

Selecting the right trade subcontractors was one of the most critical components of the project. The success of the subcontractors depended on their full understanding of the scope of work and time constraints, and how they correlated to labor requirements. Nearly 1,400 construction tradespeople worked on the project up to 18 hours a day in shifts, six days a week, over the course of the project. At any time, more than 300 construction tradespeople and supervisors were working on the project.

Approximately 1,200 tons of steel was used in the construction of Building 228. The structural system includes more than 1,500 pieces of structural steel with exterior wall braced frames. The 210,000-sq.-ft structure has three floors and reaches a height of 55 ft at the roof. From there, a special

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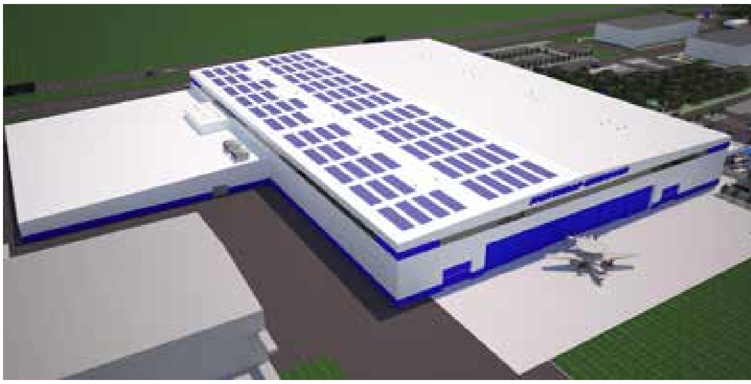
Photos this page: The Austin Co.

Building 100 will be the new production home for the U.S. Navy's E-2D Advanced Hawkeye early warning aircraft and was designed to withstand winds of up to 130 mph.



aerospace equipment enclosure on the roof reaches a height of 78 ft, with a steel substructure containing more than 500 pieces of steel.

In addition, in order to comply with Florida Building Code for the area, the building was engineered to withstand a wind load even higher than that of the St. Augustine facility: 150 mph. The building's exterior envelope includes 400 architectural precast concrete panels with 15,000 sq. ft of low-e, high-performance and hurricane projectile-resistant exterior window glazing. In addition, Building 228 was designed to achieve LEED certification.

The use of structural steel on this project, along with daily communication between the structural engineering team, detailer, fabricator and erector, resulted in an early completion of steel erection, supporting on-time occupancy for the project.

Up the Road

At the St. Augustine location, a few hours' drive north of Melbourne on I-95 along Florida's Space Coast, work is underway for the expansion of Northrop Grumman's Aircraft Integration Center of Excellence, including the planning, design, engineering and construction of Building 100, which will be the new production home for the E-2D Hawkeye.

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➤ A special aerospace equipment enclosure on the roof of Building 228.

The 386,565-sq.-ft Building 100 consists of a 220,000-sq.-ft aircraft manufacturing and assembly high bay; 73,000 sq. ft of support shops; a 61,000-sq.-ft support office mezzanine; a first-level employee lunchroom and production support spaces; and a 13,000-sq.-ft cafeteria and auditorium.

The facility was designed and is being built on an accelerated schedule to meet E-2D production requirements. As with Building 228, structural steel was selected due to its rapid fabrication and erection, which was necessary to meet the project schedule and easily provide the required clear spans in the production space.

The schedule required the main structural steel framing design to be completed in less than six weeks to support bidding and fabrication. This early release meant that final loading information for various building systems, such as HVAC and cranes, was not yet available, requiring that assumptions had to be made to complete the main structural steel framing design. Minor modifications to the structural steel supports were made upon final shop drawing review and approval of various building systems.

Building 100's production requirements necessitated large clear-span floor areas with a 40-ft clear height above the finish floor. Steel trusses 220 ft long span the center high bay, with 85-ft steel trusses spanning the north and south side bays. Each of the 220-ft-long by 28-ft-high steel trusses weighs more than 80 tons. The space between the 220-ft truss bottom chord and the top chord was carefully designed with eight platforms for housing air-handling units, as well as distribution ductwork and maintenance access catwalks. Truss loading accommodates a 12-ton overhead crane system in the 220-ft bay and eight-ton cranes in the 85-ft bays. A total of six underhung bridge cranes suspended from the bottom chord of the trusses are being provided for complete coverage within the high bay.

Photos this spread: The Austin Co.

The structural frame includes over 10,000 pieces of steel. In aggregate, more than 5,700 tons of steel, connected by more than 100,000 high-strength bolts, is being used. The foundation is comprised of concrete spread footings placed on a stone column ground improvement system. Overall height at the high-bay roof is 65 ft, just under the maximum height allowed as dictated by the adjacent airport runway.

The building's exterior envelope is an architectural insulated metal panel system using low-e, high-performance and hurricane projectile-resistant exterior window glazing for the office mezzanine. In addition, the wall separating the

➤ Building 100 contains 5,700 tons of steel.

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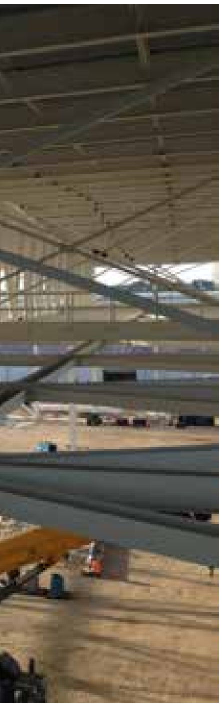

Roof trusses in Building 100.

Building 228 houses the aerospace program, engineering and integration labs for the E-2D Advanced Hawkeye aircraft.

offices from the production high bay was designed as a double-wall system to block manufacturing sound transmission from the manufacturing high bay. Sound transmission-limiting windows, along with double-stud walls with sound insulation, are being used to create this sound barrier.

To comply with Florida's Building Code, Building 100 was designed to withstand winds of up to 130 mph. The production center bay's 215-ft clear-width bottom-rolling sliding door was specially detailed to meet this requirement. Typically, most high-bay door systems are designed to run outside of the clear opening for the door, resulting in a large overhang of the roof framing system and a soffit. In a high-wind zone, this condition is not desirable. In response, Austin's bottom-rolling sliding door system was designed and detailed to run inside the clear opening of the door without any roof overhang. To support the 30-ft-high, bottom-rolling sliding door system, horizontal structural steel framing was designed to brace and transfer the load to the main roof truss bottom chord level at 40 ft above the finished floor. The long-span roof trusses were field assembled and erected with long-reaching cranes due to the extremely tight job-site conditions. In addition, BIM was used to assist with MEP coordination in the truss areas. ■

Owner

Northrop Grumman Aerospace Systems, Sector Headquarters, Redondo Beach, Calif.

Design-Build General Contractor, Architect and Structural Engineer

The Austin Company, Atlanta; Cleveland; Irvine, Calif.; Kalamazoo, Mich.; St. Louis

Steel Fabricator, Erector and Detailer

FabArc Steel Supply, Inc., Oxford, Ala.
(AISC Member/AISC Certified Fabricator)