

## A Single, Specially Designed AGV Delivers Large Steel Plates for the Construction of Aircraft Carriers



**At its fabrication** plant in Newport News, Virginia, Northrop Grumman designs and builds nuclear-powered aircraft carriers and submarines, in addition to providing aftermarket services to a wide array of naval and commercial vessels.

**Northrop Grumman's** unique plate transport system requires the movement of large steel plates from a single plate conveyor to one of seven individual delivery stations where the plates are trimmed to net shape for further ship assembly operations. Plate sizes generally vary from a minimum of three-sixteenths of an inch to a two-inch thickness, and up to 14 feet in width by 50 feet in length. The largest of these plates can weigh nearly 20 tons.

**Prior to 2004**, the company's fabrication sequence was to use a roller conveyor that carried primed plates from

the plate prep building to a rail car they called a "collocator." The collocator carried individual plates to each of six different trimming stations or bays. Powered by a roll-out AC power cable that followed the train track from station to station, the collocator was able to stack up individual plates on the ground in front of each individual bay. An electromagnetic crane lifted individual plates into the burn machines.

**As production increased** and the need arose for reduced cost, Northrop Grumman decided to build an additional station for the line, but it would have to be situated in another facility outside the area where the six trimming stations were lined up. This would entail a 90-degree bend in the collocator path—not feasible unless an additional, adjacent perpendicular track line was installed.

**The rail collocator** was 30 years old. Parts for the rail car were difficult to find and maintenance costs were escalating causing the company to consider other material handling alternatives. After a beta testing period, the decision was made in 2004 to upgrade the technology with a new, laser-guided Automatic Guided Vehicle (AGV), supplied by Mentor AGVS, which was acquired by Jervis B. Webb Company in March 2006. The AGV would replace the rail-based collocator.

**Webb's AGV not only** did away with the embedded steel rails in the floor, but also the cumbersome trailing AC cord apparatus, using a 48V battery instead to power the unit. With 4-wheel-drive independent steering, the new AGV could travel equally well in both directions, inside and outside the facility, and could travel sideways at any angle and also rotate at its center point.

**In Northrop Grumman's operation**, plates are rolled from the pickup conveyor onto the AGVs powered roller conveyor. When the AGV reaches the appropriate trim bay on the factory floor, the AGV stops and then reverses its direction. While reversing, it turns the onboard conveyor in the opposite direction to deposit a plate onto the floor. The AGV then returns to the conveyor, taking another plate and repeating the process.

**The unit is capable** of straddling a stack of plates up to 18" high, and it can both stack 10-15 plates and travel over the stack to deliver to other locations. With this capability, Northrop Grumman is able to stage different materials for the fabrication of tens of thousands of aircraft carrier applications, from hulls and decks to doors, ceilings, bulkheads and many other structures.

**The AGV operates automatically** according to programmed instructions from the operator's pulpit, using standard graphic communications interfaces with the vehicle. Safety features include a laser scanning system at each end of vehicle and photo-optics down the length of each side. The precision laser guidance system allows the unit to boast a plus or minus one-inch positioning stopping tolerance in operation.

The Northrop Grumman Newport News trim line is operational eight hours a day, and during idle time, the AGV recharges while docked at the loading conveyor.

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After about a year and a half in operation, Northrop Grumman Project Engineer John Chilbert says that the new unit is making a positive impact.

"The uniqueness of this AGV is that it has both a powered roller deck on top to roll the plates off," he says, "plus the ability to straddle a stack of plates along the entire length of its drop-off route."

The unique advantages of the unit were readily apparent: quick installation compared to a rail system, the capability to be easily modified or repositioned, and a less disruptive test-out period.

Chilbert says that Northrop Grumman is considering other possible AGV applications that involve the movement of parts between buildings and is especially interested in having a unit developed with solid rubber tires that can travel distances on their outdoor asphalt paths, yet remain stable in carrying heavy loads.

"As we replace our older material handling systems," Chilbert adds, "we want to replace it with the best new technology available. We've been very pleased so far with what Webb has been able to offer us."

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