



WORKING FOR SPACE-TRAVEL HISTORY WORLDWIDE

USA, Washington DC, New York City Terex® CC 2800-1 HELPS MOVE SHUTTLES DISCOVERY AND ENTERPRISE TO THEIR FINAL DESTINATIONS

This April, J.F. Lomma Inc. used a CC 2800-1 to help hoist Space Shuttle Discovery from its Boeing 747 Shuttle Aircraft Carrier (SAC) before being towed from Dulles Airport to its final exhibit place in the James McDonnell Space Hangar in Washington D.C. The lift marked the last of the shuttle's adventures since its maiden voyage on August 30, 1984, and after flying 39 successful missions into space over its 27-plus years of service.



NASA specific about its choice of crane

From the late evening of April 19 to the early morning of April 20, Lomma and the United Space Alliance crews hoisted the 89,085 kg (196,400 lb) shuttle off of the 747 SAC. "You cannot describe what it's like to be part of space shuttle history," says Frank Signorelli, crane and rigging manager for J. F. Lomma, Inc.

For Lomma, who has seen its share of historic work, including supplying crane and rigging services for construction work that continues today at the World Trade Center, planning for this job started nearly two years ago. NASA asked specifically for the Terex CC 2800-1 as the primary crane to do the pick. Part of the reason for this lies with NASA's experience with this crane model in the early 1990s when it had the rare need to hoist a shuttle from the 747 SAC.

"A Demag 2800 crane was used," mentions Jim Creek, Terex Cranes senior product manager for crawler cranes – North America. "NASA has a history of successful lifts with this crane".

CC 2800-1 - powerful and simple to operate

Staples of the Terex crawler crane line, the CC 2800-1 and its predecessor, the CC 2800, have worked on jobsites throughout the world for more than 20 years. Featuring a maximum 60 m (196.9 ft) main boom length and a variable 30.5 m (100 ft) radius superlift attachment to boost lift capacities, the CC 2800-1 offers a 600 t (660 US t) capacity at a 10 m (32.8 ft) radius. "Superlift offers an additional 1,814 to 272,155 kg (4,000 to 600,000 lb) of counterweight on the tray, which allows the crane to lift more weight further from the crane's base, which was more than enough to handle Discovery's weight," says Creek. With the right experience and the necessary equipment to complete the job, Lomma was awarded not one but two shuttle hoists.

The first lifted the Space Shuttle Discovery off of the 747 SAC for the shuttle's eventual spot at the Smithsonian. The second loaded the Space Shuttle Enterprise onto the carrier, so it could be flown to John F. Kennedy International Airport in New York. It took Lomma nearly three months to prepare and arrange the pick. "We had conference calls with NASA two times a week," says Signorelli. "Communication was often and thorough between our company and NASA."

Precise and safe

"We ran the crane in our yard," says Signorelli. "The IC-1 computer screen is extremely user friendly and self-explanatory. It's not a complicated crane to operate."

Upon completing the dry run at the yard, Lomma disassembled the crane and sent the components to the jobsite. When it came time for the shuttle pick, there was very little left to question. The CC 2800-1 was equipped with a 53.9 m (177 ft) main boom and a 29.9 m (98 ft) superlift mast. Lomma used 159,665 kg (352,000 lb) of main counterweight with no central ballasts. Superlift counterweight of 124,738 kg (275,000 lb) was added to the tray 15.2 m (50 ft) from the crane base. "Normally, a lift like this would require only 99,790 kg (220,000 lb) on the superlift mast, but NASA's additional safety factor required an extra 24,948 kg (55,000 lb)," explains Barnett. The additional safety requirement stemmed from the need for workers to be under the live load while unhooking the shuttle from its 747 SAC. "NASA required a 75% derate from the crane's standard 85% chart," mentions Signorelli. NASA engineers used calculations from the CC 2800-1's IC-1 controls to map out the final position of the crane. "They wanted the connection between the shuttle and our crane to be at 34.1 m (112 ft)," says Barnett, "and the actual distance from the center of the crane to the hook was 34.1 m (111.9 ft). They were impressed with the IC-1's accuracy." The pick began with the weight shifting and then



transferring to the cranes as the brackets were removed from the shuttle and carrier. After the shuttle hovered a safe distance over the carrier, a pushback tug backed the carrier from underneath, then lowered it to within a few meters from the ground. Auxiliary hydraulic power lowered the shuttle's landing gear for a final time before the crane lowered it to the ground. "The subtle movements offered by the CC 2800-1's hydraulic system definitely helped with this pick," says Barnett. "If the crews only needed 12.7 mm (0.5 in) of movement, the crane was able to give it to them." A few days later, Discovery was towed to the Smithsonian to replace the Space Shuttle Enterprise, which has been displayed in the James S. McDonnell Space Hangar since 2003. This prompted a second pick to move the Enterprise to its new home in New York.

A second lift to move shuttle Enterprise

Within a week after the Discovery pick, Lomma's crews were back at Dulles, this time to reverse the process and load Enterprise on the 747 SAC. "Enterprise was actually much lighter than Discovery, so we had no issues," says Signorelli. Originally scheduled for the morning hours of Monday, May 14, the Enterprise pick was moved up due to inclement weather. "Projected wind speeds were predicted to approach NASA's 16 kmph (10 mph) wind speed limit for removing the shuttle from its carrier," mentions Signorelli. Enterprise, via the 747 SAC, left Dulles on April 27 for its final home in New York City and landed at JFK International Airport. In conjunction, the CC 2800-1's components were derigged and loaded onto vehicles heading for New York's JFK airport, where the crane equipment was rigged, tested and ready for another shuttle pick. Even though the CC 2800-1's configuration for the Enterprise pick was rated for a maximum wind speed of 40 kmph (25 mph), NASA's tighter wind threshold was followed. Therefore, the pick was moved to start under clear weather conditions. On Saturday, May 12, Lomma began the pick just before midnight. By 7 a.m. Sunday, May 13, Enterprise was loaded onto a special wheeled transporter and moved into a hangar at JFK. It embarked on a threeday journey on the Hudson River in early June. Its final destination is the Intrepid Sea, Air and Space Museum 12 in New York City.

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