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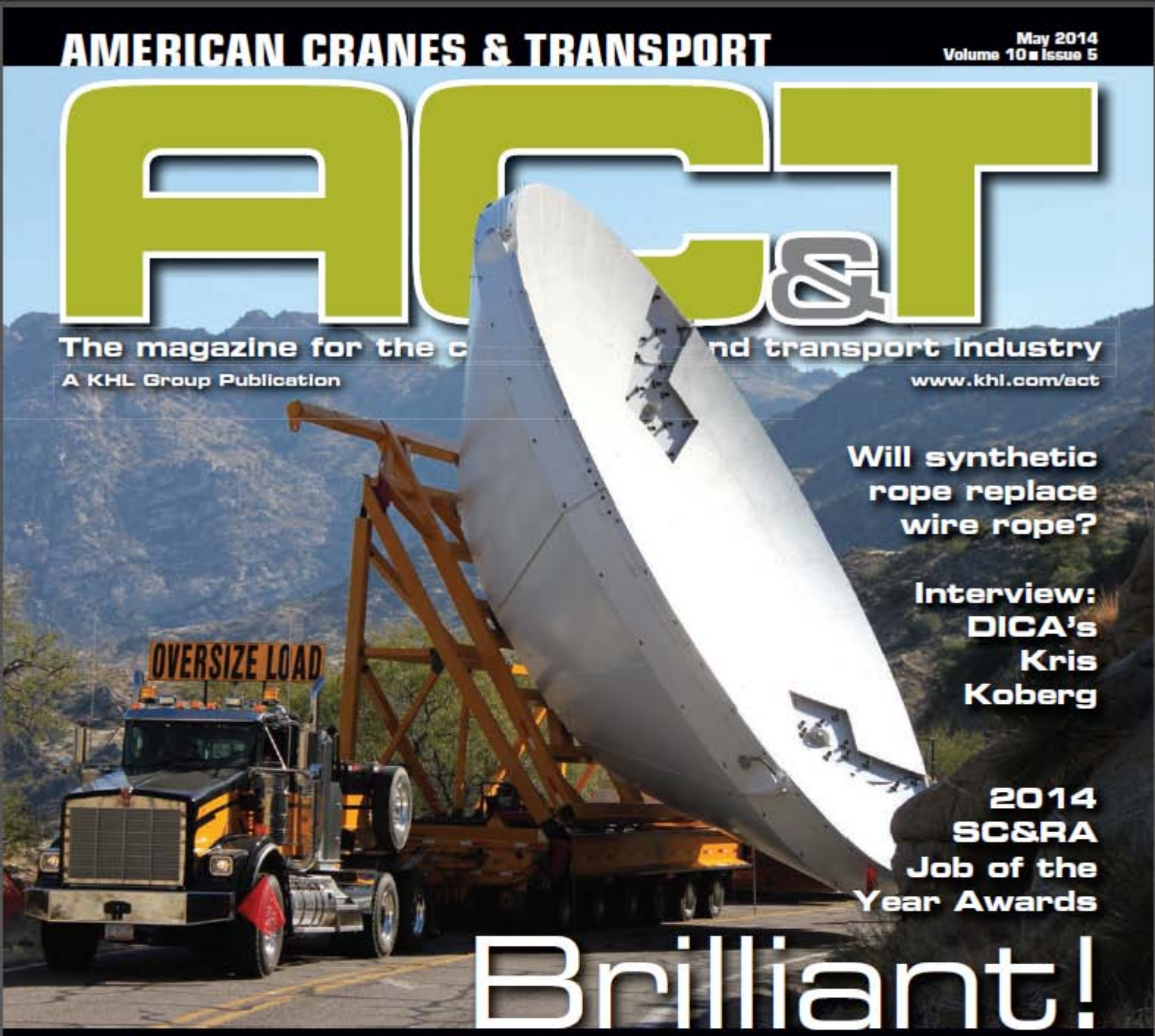
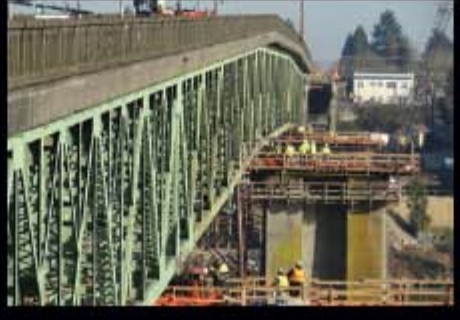


Will synthetic rope replace wire rope?

Interview: DICA's Kris Koberg

2014 SC&RA Job of the Year Awards

Brilliant!



Official domestic magazine of the SC&RA

SC&RA

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Canada
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HAULING UNDER 160,000 POUNDS (Net)

Precision Heavy Haul

A scientific haul

How on earth does an extremely sensitive, 40-foot wide scientific marvel travel across two states, up one mountain, on roads half its width? That was the question facing Precision Heavy Haul, Inc. (PHH) of Tolleson, AZ when accepting the challenge of transporting a $14 million "Prototype Antenna."

The Atacama Large Millimeter Array (ALMA) antenna is used for the detection and collection of data on radio sources as they operate in the radio frequency range of the electromagnetic spectrum. Antennas are usually set in an array, which upgrades their performance significantly. Locations of such objects are important because electromagnetic interferences from everyday objects affect data collection.

This transport originated at the Very Large Array site located approximately 50 miles west of Socorro, NM. Its destination was Kitt Peak National Observatory, 55 miles west/southwest of Tucson, AZ, at an elevation of 7,000 feet. This observatory gained fame by hosting the first telescope used to search for near-earth asteroids, and calculating the probability of an impact with Earth.

PHH's responsibility, on the other hand, was to eliminate any probability that the antenna itself would have an impact with Earth during a transit of over 1,276 total loaded miles. That was no easy task, considering that the antenna's reflector was going to be the widest load ever to cross New Mexico and Arizona, and a separate haul would require bridge engineering because of the extreme weight created, in part, by the need for specialized transport frame and lifting features.

Mountain climbing

To minimize teardown of the antenna, PHH determined that dividing the unit into two subassemblies, each of which, in turn, required two different trailer configurations. One subassembly consisted of the main reflector, which needed to be attached to the support frame by means of isolators, preventing the sensitive piece from undergoing random frequencies produced by metal components of frame and minimizing vibrations from the transport. The reflector on an 8-line Goldhofer had a net weight of 15,000 pounds and a gross weight of 154,000 pounds stretching 72 feet long by 40 feet wide by 15 feet 8 inches high. For the final mountainous climb from the Kitt Peak staging area to the 12 meter observatory site, the reflector was trans-loaded to a 6-line Goldhofer with a custom-built tilt frame. At that point, the gross weight jumped to 246,000 pounds, the length to 110 feet and the height to 35 feet 9 inches. However, the width narrowed from 40 feet to 24 feet 9 inches after careful tilting of the reflector through innovative lifting features designed by PHH.

The second subassembly, the pedestal with receiver cabin, was heavier than the reflector by about 130,000 pounds. After determining the concentrated weight of the pedestal could only be supported over three points, PHH designed two identical side brackets bolted near the given center of gravity that held 87 percent of the weight at all time, while a fabricated extension replacing the bolted pedestal food held the other 13 percent. Holding the support brackets to the pedestal were 108 bolts; the brackets also served as securement points.

The configuration for the pedestal on a dual lane hydraulic spread 11 axle perimeter frame with Kenworth T-800s for pull and push trucks had a net weight of 143,000 pounds and a gross weight of 472,750 pounds. The transport length was 185 feet 4 inches long by 22 feet 8 inches wide by 16 feet 6 inches high. After switching to a pedestal onto an 8 line Goldhofer from the Kitt Peak staging area to the 12 meter observatory site, the gross weight dropped to 398,000 pounds and the length declined to 120 feet but raised the height to 20 feet.

The mountain portion of the transport was located on Tohono O'odham Nation land, with a side hill cut on one side of the road and canyon off the other. Rock outcroppings and trees lined the entire route. The final 100 feet on an even narrower access road had power lines and observatory building eves. The entire job required the removal of 313 trees and signs. Thanks to months of planning, state-of-the-art equipment and the skills of everyone involved, the work was completed within budget, on or ahead of schedule and without accidents.

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Transporting a $14 million ALMA antenna required tedious planning through a mountainous obstacle course.