Solving the Challenge of Transporting Wind Turbine Blades

Presented by:
Lockheed Martin Corporation

December 2017

Overview:

According to the Global Wind Energy Council, the global market for wind energy continues to grow in excess of 10 percent per year. This means as many as 10,000 new turbines will need to be installed around the world over the next 20 years.

Currently, the size of a wind turbine can be 100 meters or more, and the nacelle, tower and blade may easily weigh over 75, 24 and 9 tons respectively (Cotrell, Stehly, Johnson, Roberts, Parker, Scott & Heimiller, 2014). These dimensions often exceed the limits of U.S. infrastructure, making them difficult and costly to transport.

This paper highlights the logistical and infrastructure challenges of transporting wind turbine blades from manufacturing facilities to end-user markets, and outlines a solution: Lockheed Martin's Hybrid Airship.

Problem:

Wind turbines are large, heavy and extremely difficult to transport. Typically, in traditional route planning, the fastest, most cost-effective route is chosen. However, with wind turbine transportation, the best route is adjusted for limitations and barriers, including both physical and regulatory.

The issue of size is not likely to subside. Wind turbines have grown significantly since the 1980s and continue to today (AWEA, 2017). This expected increase in size will ultimately lead to higher transportation costs.

Currently, wind components are transported using a variety of different modes, including ship, rail and truck. For example, a 150 megawatt wind farm can require as many as 650 truckloads, 140 railcars and eight ships to complete the transportation process (AWEA, n.d.).

Wind energy companies require a more cost effective and efficient mode of transportation as year-over-year construction of wind turbines continues to rise by 27 percent (AWEA, 2017).

Solution:

Lockheed Martin's Hybrid Airship is capable of hauling more than 40,000 pounds of cargo, equipment and personnel with little to no infrastructure. It offers the capability to seamlessly transport turbine and installation and offloading equipment for 1,400 nautical miles without refueling.

The Hybrid Airship is capable of serving as a blade carrier and handler. Attached to the airship's gondola, a two part system is self-propelled and designed to securely hold the blade during transport, facilitate the process of loading and unloading, and provide support to easily transport the blade once on land.

Additionally, the airship's one-of-a-kind air cushion landing system allows wind turbine companies to affordably and safely transport parts to nearly anywhere on the planet. Coupling its strength with technologies that preserve the environment and create efficiencies, the Hybrid Airship will revolutionize heavy lift cargo operations.

The technologies for the Hybrid Airship are mature and have been demonstrated in-flight. In 2006, the half scale prototype vehicle, P-791, flew in Palmdale, California, and successfully completed all flight test objectives.

Since then, the Hybrid Airship team has completed all required FAA certification planning steps for a new class of aircraft and they're ready to begin construction of the first commercial model and complete the FAA Type certification process.

Parameters:

Payload	Up to 21,000 kg/47,000 lbs 19 passengers
Range	1,400 nm
Cruise Speed	60 kts
Cargo Bay	3 x 3 x 18 m/ 10 ft x 10 ft x 10 ft
Fuel Capacity	10,000 lbs
Field Requirements	730 m/2,400 ft
VTOL	150 m/500 ft

Contact Information:

Erica Turner
erica.r.turner@lmco.com
661-572-6263
lockheedmartin.com/hybridairship

References:

J. Cotrell, T. Stehly, J. Johnson, J. O. Roberts, Z. Parker, G. Scott, and D. Heimiller. Analysis of Transportation and Logistics Challenges Affecting the Deployment of Larger Wind Turbines: Summary of Results, NREL/TP-5000-61063, 2014. URL https://www.nrel.gov/docs/fy14osti/61063.pdf

American Wind Energy Association. U.S Wind Industry Third Quarter 2017 Market Report, October 2017. URL http://awea.files.cms-plus.com/3Q%202017%20AWEA%20Market%20Report%20Public%20Version.pdf

American Wind Energy Association. Transportation & Logistics in the Wind Industry, n.d. URL http://awea.files.cmsplus.com/FileDownloads/pdfs/Transportation_1 Pager -2.pdf

###

