Ball Aerospace Delivers One-of-a-Kind Cryogenic Electronics for NASA's James Webb Space Telescope

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BOULDER, Colo., July 18, 2013 /PRNewswire/ -- The Ball Aerospace & Technologies Corp. cryogenic flight electronic boxes recently shipped to NASA Goddard Space Flight Center and Northrop Grumman Aerospace Systems for the James Webb Space Telescope are unlike any previously designed and manufactured.

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(Logo: http://photos.prnewswire.com/prnh/20130108/LA39163LOGO)

"Nothing was typical about this innovative solution," said Robert D. Strain, Ball Aerospace president. "To our knowledge, we are the only company that has ever created these kinds of electronics for a space telescope, and we're proud of the ingenuity at Ball that enabled this breakthrough."

Electronics on a spacecraft are usually kept warm, operating over a temperature range from -4 degrees F to 131 degrees F. The Webb electronics are collocated with each of the telescope's 18 hexagonal cold primary mirror segments and therefore must be operated at the same temperature as the primary mirror segments. These temperatures are as low as -405 degrees F (30K) in order to capture some of the earliest infrared light in the cosmos.

Ball, a principal subcontractor to Northrop Grumman Aerospace Systems, successfully undertook the challenge to design the Webb electronics to operate in a deep-freeze cryogenic environment, recognizing that existing components had yet to be proven for such a space mission and therefore a "how-to" manual was not available.

To create the 6.5-meter Webb aperture, the mirror segments must be aligned on orbit, requiring that a set of cryogenic actuators be mounted to each segment to control individual mirror positioning and curvature radius within one ten-thousandth the width of a human hair. To do that, all 132 actuators required multiple wires to carry power and instrumentation signals between the actuators and control electronics.

To meet all of these complex requirements, Ball located, tested and qualified off-the-shelf components for use in both a 30K cryogenic and a radiation environment to create a unique electronics architecture consisting of 22 cryogenic flight electronics boxes. Each box operates between 30K and room temperature to multiplex signals from the warm control electronics to one actuator at a time. Achieving this critical technological advancement for future spacecraft to explore the solar system also required:

- Determining how to create a multiplex design essential to minimize wiring and reduce the thermal heat leak from the warm control electronics to the passively cooled region of the telescope
- Reducing the mass of electronic cables by nearly 98 percent to effectively reduce overall mass of the spacecraft, and
- Developing robust manufacturing processes to allow the boards to survive both launch loads and multiple thermal cycles from room temperature down to 30K.

The electronic boxes drive the telescope's success because they also control the Secondary Mirror Assembly,

the backplane wing and secondary mirror support structure latches, and the Webb's deployable tower. The Ball team made all the electronics for the Webb cryogenic electronics boxes, from design to manufacture, to test, to integration onto the circuit boards and into the boxes.

This advancement for the Webb was based on several earlier cryogenically cooled infrared systems supported by Ball Aerospace which include the Spitzer Space Telescope, the Infrared Astronomical Satellite, and the Cosmic Background Explorer.

"We learned through this challenge that trying to unlock the secrets of the Universe can require difficult and amazing engineering on Earth," said Strain.

Ball Aerospace is responsible for the Webb's optical technology and lightweight mirror system. By the end of 2013, Ball is expecting to deliver all 18 beryllium primary mirror segments that comprise the telescope to Goddard Space Flight Center where they are planned to be integrated in 2015. In addition to the primary mirror, Ball has designed and delivered the secondary and tertiary mirrors, a fine steering mirror, and several engineering development units.

NASA's Webb Telescope, the premier observatory of the next decade, is on track for an October 2018 liftoff.

Ball Aerospace & Technologies Corp. supports critical missions for national agencies such as the Department of Defense, NASA, NOAA and other U.S. government and commercial entities. The company develops and manufactures spacecraft, advanced instruments and sensors, components, data exploitation systems and RF solutions for strategic, tactical and scientific applications. For more information, visit www.ballaerospace.com.

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Forward-Looking Statements

This release contains "forward-looking" statements concerning future events and financial performance. Words such as "expects," "anticipates," "estimates" and similar expressions identify forward-looking statements. Such statements are subject to risks and uncertainties, which could cause actual results to differ materially from those expressed or implied. The company undertakes no obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events or otherwise. Key risks and uncertainties are summarized in filings with the Securities and Exchange Commission, including Exhibit 99 in our Form 10-K, which are available on our website and at www.sec.gov. Factors that might affect: a) our packaging segments include fluctuation in product demand; availability and cost of raw materials; competitive packaging, pricing and substitution; changes in climate and weather; crop yields; competitive activity; failure to achieve productivity improvements or cost reductions; mandatory deposit or other restrictive packaging laws; changes in major customer or supplier contracts or loss of a major customer or supplier; political instability and sanctions; and changes in foreign exchange or tax rates; b) our aerospace segment include funding, authorization, availability and returns of government and commercial contracts; and delays, extensions and technical uncertainties affecting segment contracts; c) the company as a whole include those listed plus: changes in senior management; successful or unsuccessful acquisitions and divestitures; regulatory action or laws including tax, environmental, health and workplace safety, including U.S. FDA and other actions affecting products filled in our containers, or chemicals or substances used in raw materials or in the manufacturing process; technological developments and innovations; litigation; strikes; labor cost changes; rates of return on assets of the company's defined benefit retirement plans; pension changes;

uncertainties surrounding the U.S. government budget, sequestration and debt limit; reduced cash flow; ability to achieve cost-out initiatives; interest rates affecting our debt.

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