Large Payload Transportation and Test Considerations

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Ironically, the limiting factor to a national heavy lift strategy may not be the rocket technology needed to throw a heavy payload, but rather the terrestrial infrastructure—roads, bridges, airframes, and buildings—necessary to transport, acceptance test, and process large spacecraft. Failure to carefully consider how large spacecraft are designed, and where they are manufactured, tested, or launched, could result in unforeseen cost to modify/develop infrastructure, or incur additional risk due to increased handling or elimination of key verifications.

During test and verification planning for the Altair project, a number of transportation and test issues related to the large payload diameter were identified. Although the entire Constellation Program—including Altair—was canceled in the 2011 NASA budget, issues identified by the Altair project serve as important lessons learned for future payloads that may be developed to support national "heavy lift" strategies.

A feasibility study performed by the Constellation Ground Operations (CxGO) project found that neither the Altair Ascent nor Descent Stage would fit inside available transportation aircraft. Ground transportation of a payload this large over extended distances is generally not permitted by most states, so overland transportation alone would not have been an option. Limited ground transportation to the nearest waterway may be permitted, but water transportation could take as long as 66 days per production unit, depending on point of origin and acceptance test facility; transportation from the western United States would require transit through the Panama Canal to access the Kennedy Space Center launch site.

Large payloads also pose acceptance test and ground processing challenges. Although propulsion, mechanical vibration, and reverberant acoustic test facilities at NASA's Plum Brook Station have been designed to accommodate large spacecraft, special handling and test work-arounds may be necessary, which could increase cost, schedule, and technical risk. Once at the launch site, there are no facilities currently capable of accommodating the combination of large payload size and hazardous processing (which includes hypergolic fuels, pyrotechnic devices, and high pressure gasses).