National Aeronautics and Space Administration

technology opportunity

Hovercraft Landing System

Alternate Landing Concept Using a Hovercraft for Reusable Spacecraft and Launch Vehicles

A concept has been developed at NASA that captures returning medium to large reusable spacecraft capsules and launch vehicle subsystems (ie. engines, avionics, etc.) with a hovercraft. This concept uses an ocean going hovercraft to capture a spacecraft descending on a parachute(s). This landing technology makes possible the reuse of medium to large capsules and launch vehicle subsystems with minimal impact on the flight vehicle's performance. By making the flight vehicle or portions of the flight vehicle reusable, operational cost are greatly reduced. Furthermore, the hovercraft landing system is capable of being certified for landing of crewed capsules. Reusability is recognized as a key element in reducing the cost of spaceflight, however, incorporating reusability into spaceflight vehicles comes with a price in terms of performance, complexity, and cost due to the added subsystems required for entry, decent, and landing. This concept moves the landing system including terminal guidance, landing gear/cushioning, and protection from the landing environment (salt water) from the flight vehicle to a hovercraft with a cushioned landing platform covering the hovercraft.

An artist's conceptual drawing of a Hovercraft Landing System based on a NAVY LCAC.

Benefits

- Minimal impacts to flight vehicle design and weight to incorporate reusability
- Minimizes flight vehicle nominal vertical and lateral landing loads
- Maintains safety of flight crew and ground personnel in nominal and off nominal landing operations
- Spacecraft can be reused for subsequent launches with minimal refurbishment
- Landing system can be deployed to any ocean landing zone
- Landing system can be certified for crewed vehicles
- Existing hovercraft and flight vehicle entry system technology

Applications

- Missle systems
- Reusable solid rocket motors
- Launch vehicle separable engines
- Space flight capsules
- Manned space flight capsules

Technology in Detail

The concept of operations has the hovercraft pre-positioned at the flight vehicle's ocean landing site. The hovercraft moves at high speed to intercept the capsule or launch vehicle subsystems descending on a parachute. A suitably designed hovercraft will possess sufficient speed over open ocean water to position itself directly under the parachute prior to the spacecraft entering the water. The hovercraft will possess sufficient lateral maneuverability, tracking, and guidance to maintain its location directly under the descending spacecraft, moving synchronously with the spacecraft as it moves with the wind and the swing of the parachute. A cushioned platform with netting on top of the hovercraft softens the vertical landing loads and secures the spacecraft. Water landing capability is retained to provide off nominal landing such as missing the landing zone.

Little relative lateral motion between the hovercraft and the descending spacecraft prevent significant lateral loads being imparted to the spacecraft at landing. Once landed, the hovercraft is halted and spacecraft ground operations take place on the platform. This concept greatly reduces the impact of incorporating reusability into a flight vehicle while maintaining landing performance, ground safety, and minimizing refurbishment requirements. The approach is applicable to medium to large space flight vehicles and is achievable with existing spacecraft and hovercraft technology. In addition, it is possible to certify the hovercraft landing system for crewed space flight vehicles. Once landed on the hovercraft platform, the flight crew is able to exit the capsule on the platform instead of exiting into the water or having to remain in the capsule until it is recovered from the water.

Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Office, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to inquire about licensing possibilities for this technology for commercial applications.

For More Information

If you would like more information about this technology, please contact:

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