PL&HA Domain
Precision Landing & Hazard Avoidance

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HAT: 4.1.a Precision Landing & Hazard Avoidance

OVERVIEW
The Precision Landing and Hazard Avoidance (PL&HA) domain addresses the development, integration, testing, and spaceflight infusion of sensing, processing, and GN&C functions critical to the success and safety of future human and robotic exploration missions. PL&HA sensors also have applications to other mission events, such as rendezvous and docking.

INFUSION SPACE / EARTH
The 2014 Morpheus-ALHAT closed loop free flight campaigns successfully demonstrated several advanced lidar sensors combined with autonomous, real-time HDA.

Both JPL and APL have developed and successfully demonstrated optical TRN techniques. JPL’s Lander Vision System is baselined on the Mars 2020 mission. APL’s APLNav system is baselined on the Resource Prospector mission.

NASA has funded the CoOperative Blending of Autonomous Landing Technology (COBALT) flights on the Masten Xodiac testbed to demonstrate precision landing using TRN combined with the LaRC Navigation Doppler Lidar (NDL) sensor.

NASA has funded a Europa lander study at JPL using TRN, HDA, and advanced sensors/processing to create a PL&HA capability called the Intelligent Landing System (ILS).

NASA is supporting the infusion of PL&HA functions and advanced lidar sensors into commercial spaceflight missions.

PARTNERSHIPS / COLLABORATIONS
The NASA PL&HA effort reflects multiple, successful, long term collaborations across NASA and industry.

FUTURE WORK
Continued development of lidar sensors for ranging, velocimetry, and terrain mapping; Refinement of TRN and HDA algorithms; Advancements in space-qualified processors; Advanced navigation filter development; Infusion of PL&HA capabilities on future robotic and human exploration missions.