

Title:

Supporting NASA Science with High-Altitude Long-Endurance Aircraft
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Abstract:

NASA Earth Science and Aeronautics researchers have been involved in development and use of High Altitude Long Endurance (HALE) unmanned aircraft systems (UAS) since the 1990's. The NASA Environmental Research Aircraft Sensor and Technology Program (ERAST) demonstrated the promise of HALE aircraft for providing observations while also proving the importance of triple-redundant avionics to improve system reliability for large unmanned aircraft. Early efforts to develop an operational HALE capability for earth observations languished for nearly two decades owing to insufficient solar panel efficiency, battery power density, and light-weight, yet strong, materials. During this time NASA researchers focused on using the Global Hawk to demonstrate the utility of providing diurnal measurements over severe storms (ie. HS3) and to track stratospheric water vapor transport (ATTREX). Recent significant commercial investments are now leading to the realization of a long-held goal of week- to month-long sustained observations and measurements from the stratosphere. In addition to a historical review of NASA use and interest in HALE aircraft, this paper will present current concepts for exploiting current and planned HALE aircraft capabilities including in situ characterization of atmospheric composition and dynamics as well as imagery collection. NASA researchers anticipate HALE will provide a useful means to test smallsat instruments and components. Observations from HALE-based instruments might also provide useful gap-filler observations to flagship satellite missions where the repeat time doesn't allow for measurements of quickly changing phenomenon. HALE will likely also provide measurements and communications relay to facilitate other aircraft in multi-aircraft campaigns. We will also report on progress towards a NASA-funded flight test planned for summer 2019 of a solar-electric vehicle designed to carry 7kg (15lbs) for 30 days at 20km altitude.