



U.S. Department of the Interior

Demonstrated Unmanned Aircraft Systems (UAS) Mission Applications

DOI Office of Aviation Services (OAS) UAS website:

<https://www.doi.gov/aviation/uas>

USGS UAS Project Office: <http://uas.usgs.gov/index.shtml>

BLM UAS website: <http://www.blm.gov/nifc/st/en/prog/fire/Aviation/uas.html>

- 1. Wildlife studies and surveys** – Population surveys and non-invasive census taking. http://rmgsc.cr.usgs.gov/UAS/pdf/UAS_Bird_Survey_Poster.pdf
http://rmgsc.cr.usgs.gov/UAS/pdf/CO_SandhillCranesMonteVistaNWR/MVNWR%20Raven%20Poster%202011_18x24.pdf
http://rmgsc.cr.usgs.gov/UAS/pdf/ND_ChaseLakeNWRPelicans/chase_lake_pelican_survey_poster_map_forviewing_35x28.pdf
http://rmgsc.cr.usgs.gov/UAS/pdf/NV_AnaholislandNWRPelicans/Anaho%20Raven%20Poster%202015_18x24.pdf
- 2. Habitat studies and surveys** – Evaluate vegetation cover and thermal environments of habitat.
http://rmgsc.cr.usgs.gov/UAS/pdf/ID_PygmyRabbitsLandscape/pygmyRabbitsPoster2011.pdf
- 3. Archeological mapping** – Photogrammetric documentation of extremely fragile and ephemeral fossilized footprints.
http://rmgsc.cr.usgs.gov/UAS/pdf/NM_FossilTraceWhiteSandsNationalMonument/White%20Sands%20NM%20USGS.pdf
- 4. Landslide mapping** – Safely map movement of landslide material.
http://rmgsc.cr.usgs.gov/UAS/pdf/CO_DebequeLandslide/poster_map_oct_2013_58x42_300dpi.pdf
- 5. Fluvial mapping** – Map sandbar sediment and estimate surface velocity in rivers.
http://rmgsc.cr.usgs.gov/UAS/pdf/NE_EmergentSandbarHabitats/South%20Platte%20NE%20USGS.pdf

- 6. Sage Grouse breeding ground monitoring** – Use infrared imagery and a quiet small UAS to discretely monitor Greater Sage Grouse breeding.
http://rmgsc.cr.usgs.gov/UAS/pdf/CO_GrandCountySageGrouseLeks/GreaterSageGrouse%20Raven%20Poster%202013_18x24.pdf
- 7. Land / environmental management** – Identification of abandoned materials – Identify and geo-locate abandoned materials on a national preserve quickly and with minimum environmental impact
http://rmgsc.cr.usgs.gov/UAS/pdf/CA_MojaveNP/NPS%20Mojave%20Poster_v2.pdf
- 8. Contour coal mining permit inspections** – Safely and efficiently conduct required inspections of permitted contour coal mines.
http://rmgsc.cr.usgs.gov/UAS/pdf/WV_OSMSurfaceCoalMineInspections/OSM%20Coal%20Mine%20Poster%202%20THawk_18x24%20.pdf
- 9. Abandoned mine land features mapping** – Map abandoned mine areas to assist in identifying hazards to the public and to assist in abandoned mine reclamation efforts.
http://rmgsc.cr.usgs.gov/UAS/pdf/CO_PitkinCountyCDMRSCoalBasin/CDMRS_CoalBasin_Pitkin_CO_18x24.pdf
- 10. Surface mine sediment ditch inspections and coal seam fire monitoring** – Inspection of dangerous mines and difficult areas to access. Inspections of sediment ditches and check dams for security and signs of runoff. Monitoring of underground coal seam fires.
http://rmgsc.cr.usgs.gov/UAS/pdf/WV_OSMSurfaceCoalMineInspections/OSM%20Coal%20Mine%20Poster_18x24.pdf
- 11. Soil erosion in river banks** – Map and quantify erosion along riverbanks.
http://rmgsc.cr.usgs.gov/UAS/pdf/SD_MissouriRiverBankErosion/Missouri%20River%20Poster.pdf
- 12. Remote boundary fence monitoring** – Monitoring dozens of miles of fencing in remote areas that are intended to keep invasive animals off sensitive landscapes.
http://rmgsc.cr.usgs.gov/UAS/pdf/HI_HaleakalaNP/HaleakalaNPHI_18x24.pdf
- 13. Groundwater discharge assessments** – Monitoring and measurement of groundwater discharge into a lake on a national wildlife refuge.
http://rmgsc.cr.usgs.gov/UAS/pdf/MT_GroundwaterDischargeMonitoring/Red%20Rocks%20Lake%20Poster%202011.pdf
- 14. Invasive plant and animal monitoring in extreme landscapes** – Monitoring sensitive landscapes to detect the presence of invasive plants and animals. http://rmgsc.cr.usgs.gov/UAS/pdf/HI_HaleakalaNP/HaleakalaNPHI_18x24.pdf

- 15. Dam removal impact studies** – Study the impact of a dam removal on the fish, reservoir sediment, topography, and vegetation during the removal process. http://rmgsc.cr.usgs.gov/UAS/pdf/WA_BORRiverSedimentMonitoring/BoRElwhaDamRemoval_18x24.pdf
- 16. Rapid-response mapping of coastal change** – Rapidly respond to episodic events to effectively monitor and assess coastal hazards and changes in landscape, land use, and ecosystems. This research includes mapping of offshore and coastal bathymetry, topography, geology, and habitat. Coastal hazards are assessed using these data with statistical and process-based models. http://uas.usgs.gov/MA_CapeCodRapidResponseCoastalChange.shtml
http://uas.usgs.gov/pdf/MA_CapeCodRapidResponseCoastalChange/CACO_UAS_Mapping_Report.pdf
- 17. Paleowetland deposit study** - Geologic deposits associated with springs and wetlands in arid environments provide critical information regarding the hydrologic response of small desert watersheds to climate change. Wetland deposits are often associated with faults or other substructural impediments to ground-water flow, which may be expressed at the surface by subtle features that are difficult to trace when on the outcrop. http://uas.usgs.gov/CA_PaleowetlandDeposits.shtml
https://www.flickr.com/photos/usgs_uas_project_office/sets/72157665208158951 http://rmgsc.cr.usgs.gov/gecsc/projects/paleo_hyd/project.shtml
- 18. Fire mapping, hotspot identification, and suppression outcome estimation (operationally tested)** – Map fire edge boundaries, identify hotspots and through interpretation of pre and post suppression imagery, estimate the outcome of suppression efforts. <https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/2015%20Paradise%20Fire%20sUAS%20Technology%20Demonstration%20Tests%20-%20Overview%20of%20Preliminary%20Results.pdf>
<http://www.king5.com/story/news/local/wildfires/2015/08/31/drones-state-fire-crews-overwhelmed-goldmark/71489070/>
<http://www.ktvb.com/story/news/2015/09/23/drones-could-help-protect-firefighters-idaho/72709626/> <http://www.thedrones.link/2015/08/31/drone-tracks-fire-hot-spots-in-successful-olympic-forest-test-the-seattle-times/>
- 19. Burned area assessment and mapping** – Quickly and efficiently assess the size of and damage to burned areas. <https://youtu.be/ryqrl6f41Ng>
- 20. Fire suppression (operationally tested)** – Use optionally piloted helicopters in the unmanned configuration to triple the amount of initial and direct attack

support available to our ground firefighters and the communities they protect. Currently, manned aircraft are only able to support our firefighters in the field with direct suppression about 8 hours a day, due to reduced visibility conditions or night, that make it unsafe for these air missions to be conducted. By using optionally piloted helicopters we can fly them in the manned configuration during the day in periods of good visibility when other manned aircraft are flying and then employ them during periods of reduced visibility and night when manned aircraft do not fly, using a single contract for both. The optionally piloted feature also enables the easy relocation of these aircraft without the additional constraints associated with flying unmanned aircraft in the National Airspace System under current rules. <http://www.ktvb.com/videos/news/local/2015/10/14/military-technology-used-for-fighting-fires/73958324/>
http://www.idahostatesman.com/2015/10/14/4035127_feds-eye-pilotless-helicopters.html?rh=1 <http://www.firefighternation.com/article/news-2/pilotless-helicopter-tested-wildland-firefighting>

- 21. Cargo resupply (operationally tested)** - Use optionally piloted helicopters in the unmanned configuration to triple the amount of direct logistical resupply support available to our ground firefighters. Currently, manned aircraft are only able to resupply our firefighters in the field about 8 hours a day, due to reduced visibility conditions or night, that make it unsafe for these air missions to be conducted. By using optionally piloted helicopters we can fly them in the manned configuration during the day in periods of good visibility when other manned aircraft are flying and then employ them during periods of reduced visibility and night when manned aircraft do not fly, using a single contract for both. The optionally piloted feature also enables the easy relocation of these aircraft without the additional constraints associated with flying unmanned aircraft in the National Airspace System under current rules.

<http://goldrushcam.com/sierrasuntimes/index.php/news/local-news/4957-interior-u-s-forest-service-explore-use-of-unmanned-aircraft-to-improve-firefighter-safety>
<http://www.ktvb.com/story/news/2015/10/14/pilotless-helicopters-wildfires/73951152/>

- 22. Aerial Ignition** – Aerial ignition is used to set prescribed fires, which is an important element of a comprehensive hazardous fuels reduction program. Traditionally conducted from manned helicopters, aerial ignition involves flying very low and slow over the intended ignition area. Using onboard Plastic Sphere Dispenser (PSD) equipment, self-igniting plastic spheres are dropped from the helicopter onto the intended ignition line/area. Aerial ignition is one of our most hazardous missions. Since 2005, there have been two helicopter accidents in the aerial ignition mission which claimed 5 lives and resulted in the destruction of both aircraft. Results of UAS tests in this application may

contributed to improved safety and reduced future cost for this important, yet hazardous wildland fire support mission.

<http://aviation-safety.net/wikibase/wiki.php?id=44544>

<http://aviation-safety.net/wikibase/wiki.php?id=174977>

<https://www.youtube.com/watch?v=vlZgQfJNoN8>

<http://news.unl.edu/newsrooms/unltoday/article/aerial-fire-drone-passes-homestead-test/>

<http://www.1011now.com/content/news/Aerial-fire-robots-tested-at-Homestead-National-Monument-376792971.html>

<http://wildfiretoday.com/2016/04/22/using-a-drone-to-ignite-a-prescribed-fire/>

<http://www.wowt.com/home/headlines/Drones-firebomb-Nebraska---sort-of-376762021.html>

http://journalstar.com/news/state-and-regional/nebraska/experimental-drone-used-for-controlled-burn/article_47e5f7af-0666-58f9-adfa-a3c1fdb62f7.html