

Weather Avoidance Guidelines for NASA Global Hawk High-Altitude UAS

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Abstract Text:

NASA operates two Global Hawk unmanned aircraft systems for Earth Science research projects. In particular, they are used in the Hurricane and Severe Storm Sentinel (HS3) project during 2012, 2013, and 2014 to take measurements from the environment around tropical cyclones, and from directly above tropical cyclones. There is concern that strict adherence to the weather avoidance rules used in 2012 may sacrifice the ability to observe important science targets. We have proposed modifications to these weather avoidance rules that we believe will improve the ability to observe science targets without compromising aircraft safety.

The previous guidelines, used in 2012, specified:

- Do not approach thunderstorms within 25 nm during flight at FL500 or below
- When flying above FL500: Do not approach reported lightning within 25NM in areas where cloud tops are reported at FL500 or higher. Aircraft should maintain at least 10000 ft vertical separation from reported lightning if cloud tops are below FL500
- No over-flight of cumulus tops higher than FL500
- No flight into forecast or reported icing conditions
- No flight into forecast or reported moderate or severe turbulence

Based on past experience with high-altitude flights over tropical cyclones, we have recommended changing this guidance to:

- Do not approach thunderstorms within 25 nm during flight at FL500 or below.
 - Aircraft should maintain at least 5000 ft vertical separation from significant convective cloud tops except: a) When cloud tops above FL500: In the event of reported significant lightning activity or indicators of significant overshooting tops, do not approach within 10-25 nm, depending on pilot discretion and advice from Mission Scientist. b) When cloud tops are below FL500, maintain 10000 ft separation from reported significant lightning or indicators of significant overshooting tops.
 - No flight into forecasted or reported icing conditions
 - No flight into forecasted or reported moderate or severe turbulence
- The key changes have to do with overflight of high convective cloud tops and those producing lightning. Experience shows that most tropical oceanic convection (including that in tropical cyclones) is relatively gentle even if the cloud tops are quite high, and can be safely overflown. Exceptions are convective elements producing elevated lightning flash rates (more than just the occasional flash, which would trigger avoidance under the previous rules) and significant overshooting cloud tops.

The presentation will report our justification for the proposed modifications, and report on the experience using these guidelines during the August - September 2013 deployment of HS3.