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United States Air Force
ACC - Beale AFB

This request is made pursuant to the Freedom of Information Act.

1. According to the Beal AFB Web site (http://www.beale.af.mil/index.asp):

> The 9th Reconnaissance Wing is responsible for delivering timely, relevant, and persistent high altitude intelligence, surveillance and reconnaissance, deploying warrior Airmen, and leveraging technology to increase capability for our joint partners. To accomplish this mission, the wing is equipped with the nation's fleet of U-2 and RQ-4 reconnaissance aircraft and associated support equipment. The wing also maintains a high state of readiness in its combat support and combat service support forces for potential deployment in response to theater contingencies. The 9th Reconnaissance Wing is composed of more than 3,000 personnel in four groups at Beale and multiple overseas operating locations.

2. I would like all documents relating to the use of Synthetic Vision in operating the RQ-4 and other Unmanned Aerial Vehicles, Unmanned Aerial Systems, or Remotely Piloted Vehicles operated by the Air Force.

A. Synthetic Vision is defined by the FAA in FAA Title 14 Part 1 as follows:

> Synthetic vision means a computer-generated image of the external scene topography from the perspective of the flight deck that is derived from aircraft attitude, high-precision navigation solution, and database of terrain, obstacles and relevant cultural features.

FAA Title 14 Part 1 is available at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title14/14tab_02.tpl

A mirrored copy is available at: www.jmargolin.com/svr/refs/ref05_faa.pdf

Synthetic Vision includes *Enhanced Synthetic Vision*.

B. According to the following report (quoting OSD's *UAV Reliability Study* issued in 2003) the use of enhanced synthetic vision was recommended to help UAV operators maintain flight and sensor perspective.

> HSW-PE-BR-TR-2005-0001
>
> UNITED STATES AIR FORCE
> 311th Human Systems Wing

U.S. Military Unmanned Aerial Vehicle Mishaps: Assessment of the Role of Human Factors Using Human Factors Analysis and Classification System (HFACS)

Thompson, Tvaryanas, and Constable

March 2005

From pages 1-2:

> The Office of the Secretary of Defense's *UAV Reliability Study* (19) issued in 2003 is the most comprehensive review of UAV mishaps to date, the results of which were extracted in large part into DoD's *UAVRoadmap 2002-2007* (21) and served as the basis for the Defense Science Board's analysis of UAV mishaps (20). This study found the aggregate sources of failures in the Air Force's RQ-1 Predator, Navy/Marine's RQ-2 Pioneer, and Army's RQ-5 Hunter were power/propulsion (37%), flight controls (26%), communications (11%), human factors (17%), and miscellaneous (9%). It noted "the proportions of human error-induced mishaps are nearly reversed between UAVs and the aggregate of manned aircraft, i.e., human error is the primary cause of roughly 85% of manned mishaps, but only 17% of unmanned ones." Two theories were offered to explain this observation. First, human influence in UAVs is significantly reduced (e.g., "70% less") and is countered by increased automation. Second, human error rates remain constant between UAVs and manned aircraft and are simply overshadowed by the higher unreliability of other subsystems in UAVs. Although no breakdown of human factors was provided, the study reported "three of the areas (power/propulsion, flight control, and operator training) have historically accounted for 80 percent of UAV reliability failures" and "overall mishap rates for UAVs could be significantly reduced by focusing reliability improvement efforts in these areas," implying human error-induced mishaps were related to training deficiencies. Additionally, the study suggested UAV operator situational awareness may be degraded by the challenges of "human-machine synergy" when the human is on the ground. **Recommendations included enhance operator training, particularly through simulation in the ground control station (GCS) environment, automate launch and recovery operations, and employ enhanced synthetic vision technology to help UAV operators maintain flight and sensor perspective.** The only additional human factors identified in the Defense Science Board's UAV study (20) were the limited experience level of UAV operators and maintainers, inadequate overall professional development of UAV personnel, and the need to better address takeoff and landing errors.

{Emphasis added.}

Thus, there is good reason to believe that USAF's RQ-4 and other UAVs have and use synthetic vision.

Costs

I claim the journalist exemption. The answers to these questions are material to the articles/blogs I am writing called:

1. **How NASA Treats Independent Inventors** at www.jmargolin.com/nasa/nasa.htm

2. **How the United States Air Force Plays the Shell Game with the Freedom of Information Act and How They Treat Independent Inventors** at http://www.jmargolin.com/usaf/usaf_web.htm

Sincerely yours,

/Jed Margolin/

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