**Docket No.: FAA–2011–1279; Notice No. 11–07**

Airborne Wind Energy Systems (AWES)

The general public will probably not see any major issues with the proposal of establishing Airborne Wind Energy Systems (AWES). AWES, also known as Airborne Wind Energy Conversion Systems (AWECS) is a broad class of technologies designed to harness high-altitude wind power (HAWP).

For those who do not work in aviation or who are not pilots, but use aviation for transportation, generally fly on major airlines, from large airports, at high altitudes, will see vast opportunities to utilize the AWES.

As a general aviation pilot of 44 years, 37 years as a helicopter pilot, with over 30 years as a helicopter emergency medical evacuation service (HEMS) pilot I have several concerns with AWES proposal.

Today there are 800 – 850 helicopters conducting day and night HEMS flights in urban and rural locations, to improved and unimproved areas, in all airspace classifications, excluding Class A. In my experience en-route altitudes vary from 500 feet AGL to 5,000 feet AGL under visual flight rules (VFR) and higher altitudes for flights under instrument flight rules (IFR).

The HEMS industry has been dealing with the hazards of Cell towers and Meteorological (Met) towers for several years. Cell tower heights average 150 feet, Met towers range from 130 – 198 feet in height and 6 – 8 inches in diameter. These towers are inexpensive and are erected very quickly. At times it seems with indifference to existing airports and heliports. Met tower locations are transitory as they redeployed to gather meteorological information at various sites. Neither type of tower requires markings or lighting. Both are difficult to see during daylight operations and are invisible at night. Several HEMS pilots have been surprised by one of these towers when responding and landing to an accident site. This is an ongoing safety issue.

On January 10, 2011 an accident occurred in Oakley, California (NTSB accident number: WPR11LA094) where a crop duster collided with a met tower 197 feet 8.25 inches tall. There were two previous accidents involving Met towers; December 15, 2003 at Vansycle, OR (NTSB accident number: SEA04LA027) and May 19, 2005 at Ralls, TX (NTSB accident number: DFW05LA126).

The California accident resulted in the introduction of Bill AB 511 by Assembly Member Yamada to the California Assembly on February 15, 2011. The Bill requires a tower to be painted in seven equal, alternating bands of aviation orange and white with a red flashing obstruction light affixed to the highest point on the tower.

Now we are talking about adding yet another hazard to aviation navigation. Docket FAA-2011-1279 talks about confining testing at heights below 499 feet AGL. It goes on to ask for “any concerns about AWES operating at altitudes above 500 feet AGL, but, below 1,999 feet AGL”. The docket goes on to ask “if AWES were permitted to permanently operate at altitudes above 2,000 feet AGL, how do you foresee this as negatively impacting your missions”.

Although AWES deployment would require compliance with 14 CFR part 101, AWES deployed to those altitudes have the potential to adversely affect HEMS flights. While not a HEMS aircraft, the following accident is an example.

In April of 2007 a plane impacted an aerostat tether off Key West, Florida. The aircraft hit the tether at the cable payout level of 4,533 feet.

 The aerostat is located inside Restricted Area 2916, one of two restricted areas in Florida.

**R-2916** - Cudjoe Key, Monroe County; Unmarked Balloon on Cable to 14,000 feet AMSL
Latitude 24o 42’ 05" North; Longitude 81o 30’ 31" West

Sky WindPower Corporation refers to this accident on their website under Tab E. Tethers, Airplanes, Safety and Terrorism (<http://www.skywindpower.com/ww/page004.htm>). The following statement is an excerpt from that page.

* *“Three people were killed in this light plane, illegally flown, by a private pilot at night into this restricted airspace without using available warning electronics.”*

My review of the accident found the following facts from the NTSB investigation (NTSB accident number: MIA07FA083) of the accident.

* *Night visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed for the flight to Leesburg, Florida.*
* *At the time of the accident, the airplane had been in radio communications contact with Federal Aviation Administration (FAA) Miami Air Route Traffic Control Center (ARTCC), and according to an official at Miami ARTCC, the pilot had been informed of the restricted area at Cudjoe Key.*
* *A video record from the camera mounted on the TARS flight control building, which monitors the aerostat while aloft, showed the aerostat's position lights, and at 2312:55, the video record showed the position lights of the accident airplane as it approached the tether.*
* *The weather, about the time of the accident, at Key West International Airport (EYW), Key West, Florida, approximately 14 NM southwest of the accident site included the following: winds from 010 degrees at 7 knots, 10 statute miles visibility, clear skies, temperature 75 degrees F, dew point 59 degrees F, and altimeter 29.98 inches of mercury. Sunset was at 1951, and the moonset was at 2351 with approximately 14 percent of the moon's visible disk illuminated.*

I do not agree with Sky WindPower Corporation claim that the pilot illegally flew into restricted airspace. The pilot filed an instrument flight plan and was in communication with Miami Center. Flight into a restricted area is not prohibited by regulation.

* 14 CFR part 1 defines a restricted area as, “ A restricted area is airspace designated under part 73 within which flight of aircraft, while not wholly prohibited, is subject to restriction.”
* 14 CFR part 91.133(a) states, No person may operate an aircraft within a restricted area (designated in part 73) contrary to the restrictions imposed, or within a prohibited area, unless that person has the permission of the using or controlling agency, as appropriate.

The NTSB determined the probable cause as,” The pilot's failure to maintain clearance from an active restricted area, which resulted in the airplane colliding with the tether of an aerostat.” I question why Miami Center did not vector an aircraft on an instrument flight plan to circumnavigate the restricted area.

I also am concerned that the pilot of the aircraft apparently did not or could not identify the aerostat’s position lights. Weather conditions did not appear to be a factor as the video record showed position lights of the aerostat and the aircraft. There is no reference to any tether lighting in the accident report. Was the tether marked with lighting at specified intervals, as currently required for towers?

However, there is conflict as the accident report references video evidence of position lights of the aerostat and the description of R-2916 states “Unmarked Balloon on Cable to 14,000 feet AMSL”.

My limited research of the AWES has found that companies are making plans to deploy AWES to altitudes of 15,000 feet. If an aerostat requires a restricted area of a diameter of 4 statute miles, approximately 12.5 square miles, what may we expect for AWES?

Speaking of footprints, Makani Airborne Wind Turbine, purposes a concept of kite surfing with wind turbines. Its goal is to achieve the same motion of a turbine without the structure itself. “The difference between a wind turbine and what we’re doing is we have a wing that is free-flying and tethered to the ground,” said Corwin Hardham, Makani CEO. “You have this kite flying the same pattern as wind turbine blade, but up higher in the sky.”

They go on to ask us to imagine a fleet of 26-feet wide, motorized fixed-wing gliders tracing circles in the air at 150 miles per hour, sending a constant stream of electricity to the grid via the tether connecting them to the ground.

What is the size of the fleet? Is it five, ten, twenty, or more units? What is the projected footprint of their required restricted area for each unit or fleet of turbines?

There are safety concerns about security of AWES in adverse weather. How quickly can AWES be returned to the surface to wait out severe weather? Assuming a retraction rate of 25 feet per minute, AWES deployed to only 4,500 feet will require approximately 3 hours returning the surface.

The AWES industry has conducted wind studies at altitudes as high as 15,000 feet from Aberdeen, SD, to Brownsville, TX and Chatham, MA to Oakland, CA. I can foresee urban areas such as Detroit, San Diego and Denver requiring more units to satisfy demand as opposed to areas such as Bismarck, ND, Rapid City, SD or Midland, TX. I can also see rural electric co-ops exploring the technology.

Granting the AWES industry access to existing Prohibited Areas would provide a platform for the required testing and data collection to confirm the concept of airborne wind energy systems. Using existing Prohibited Areas would have little to no impact on current general and commercial aviation.

I believe we will see an offshoot of this technology as we have seen in the wind farm arena. That is the development of smaller systems for private use, either individuals or small companies. This also must be considered when looking at the question before the FAA.

I support the development of alternate energy systems however the potential negative impact of this technology on the existing general and commercial aviation demands careful study by the FAA and the AWES industry.

Thank you,

Clark Kurschner

ATP, CFII