February 6, 2012

Docket Operations, M – 30
U.S. Department of Transportation
1200 New Jersey Avenue, SE
West Building Ground Floor, Room W12 – 140
Washington, DC 20590-0001

Re: Docket Number FAA 2011-1279

To Whom It May Concern:

The National Agricultural Aviation Association (NAAA) appreciates the opportunity to comment on the FAA's Notice of policy and request for information on airborne wind energy systems (AWES).

Importance of Aerial Application Industry

The NAAA consists of more than 1,700 members in 46 states, and represents the interests of small business owners and pilots licensed as commercial applicators that use aircraft to enhance the production of food, fiber and bio-fuel; protect forestry; protect waterways and ranchland from invasive species; and control health-threatening pests. Aerial application is so important to agricultural, forestry and public health protection because it is by far the fastest method of application. Furthermore, when the presence of water, wet soil conditions, rolling terrain or dense plant foliage prevents the use of other methods of pesticide application, aerial application may be the only remaining method of treatment. Moreover, aerial application is conducive to higher crop yields, as it is non-disruptive to the crop and causes no soil compaction. Applying crop protection products by air is an essential component of no-till or reduced tillage farming operations which limit storm water runoff and reduces soil erosion. These farming methods, through their preservation of organic matter and topsoil, help maintain productive soils and reduce greenhouse gas emissions through the sequestration of carbon. According to the USDA's Economic Research Service, there are a total of 442 million cropland acres in the U.S. Approximately 70 percent are commercially treated with crop protection products, and an estimated 25 percent of commercial crop protection product applications are made through aerial applications. As a result, NAAA estimates that 77 million acres of cropland are treated via aerial application in the U.S. each year. This does not include the aerially treated pasture and rangeland of which there are 587 million total acres in the U.S. or the 651 million total forestry acres and 60 million total urban acres in the U.S.—a portion of which is treated by air. Because aerial application is so important, it is vital a safe low-level airspace exists. Ensuring safe low-level airspace includes minimizing obstructions which are difficult to be seen and identified by the pilots. In addition to aerial application operations, aircraft users of low-level airspace include: Emergency Medical Services (EMS), air tanker firefighting aircraft and their lead aircraft; power line and pipeline patrol aircraft; power line

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maintenance helicopters; fish and wildlife service aircraft; animal control aircraft (USDA-APHIS-ADC); military helicopters and fixed-wing operations; seismic operations (usually helicopters); livestock roundup (ranching or animal relocation); helicopter GIS mapping of noxious weed populations; and others.

Safety Concerns Associated with AWES

The ability of pilots to see and identify hazardous obstructions will save the lives of low-level aircraft pilots. The very design of AWES places the bulk of the generating system high above the ground with only a small, hard-to-see tether connecting the turbine to the ground. These tethers have characteristics that make them particularly hazardous to low-level aviation because they are difficult to see. Contributing to the tethers' difficulty in being seen is the combination of the tether being a single thin conduit, which may prove indistinguishable from the background depending on time of day and weather conditions, and having a minimal or non-existent footprint on the ground.

In January 2011, the FAA asked for comments on the marking of Meteorological Evaluation Towers (METs) in **Docket Number FAA 2010-1326**. NAAA responded to that document by giving our view that any object in the airspace above the ground should be clearly marked to ensure the safety of pilots and passengers navigating the airspace. Many of the same arguments would pertain to AWES as well.

As with the METs, AWES result in conditions ripe for a low-level aviation accident. Aircraft collisions with towers usually result in fatal injuries. Sadly, as the chart below indicates, collisions with towers account for 8.3 percent of the agricultural aircraft accident fatalities from 2000-2010. Collisions with power lines, some of which could be related to the connection of wind farms to the national power grid, account for an additional 12.8 percent of the accidents and 16.7 percent of the reported fatalities in the aerial application industry.

The chart below provides agricultural aviation statistics related to accidents involving aircraft colliding with wires and towers. Collision with wires data are included to demonstrate the lethal nature of obstructions which penetrate the airspace used by the agricultural pilot. Because of these accidents, the agricultural aviation industry places a great amount of importance on the identification and marking of these obstructions that extend into the airspace in which they operate. The operating realm of the ag pilot, by the nature of the work performed, must be located in the air but near the ground.

The chart below covers an 11-year period from 2000 to 2010 as 2011 data has not been finalized. The left half of the chart involves tower accidents and the right half are accidents involving wires and their related structures (poles, guy wires, etc.). NAAA considers wire accidents to be relevant because they are hard to see obstructions and additional power lines would be needed to connect the electrical energy from the AWES to the electrical power grid.

The columns titled "Tower Accidents" display the annual total of tower strikes compared to the total number of ag aviation accidents occurring during that year. The column titled "Tower Fatalities" shows the number of fatalities occurring as a result of tower impacts compared to the total annual ag aviation fatalities. The columns "Wire Accidents" and "Wire Fatalities" report the same information except the accidents and fatalities are the result of wire or related structure strikes.

Year	Tower Accidents			Tower Fatalities			Wire Accidents			Wire Fatalities		
	Towers	%	Total	Towers	%	Total	Wires	%	Total	Wires	%	Total
2000	3	2.5%	122	3	15.8%	19	16	13.1%	122	2	10.5%	19
2001	1	1.3%	78	1	7.7%	13	10	12.8%	78	1	7.7%	13
2002	0	0.0%	82	0	0.0%	6	14	17.1%	82	3	50.0%	6
2003	0	0.0%	82	0	0.0%	6	13	15.9%	82	2	33.3%	6

2004	1	1.3%	75	2	25.0%	8	8	10.7%	75	1	12.5%	8
2005	2	2.3%	87	2	18.2%	11	13	14.9%	87	1	9.1%	11
2006	0	0.0%	61	0	0.0%	9	4	6.6%	61	1	11.1%	9
2007	0	0.0%	78	0	0.0%	7	7	9.0%	78	3	42.9%	7
2008	1	1.1%	95	0	0.0%	6	15	15.8%	95	0	0.0%	6
2009	0	0.0%	66	0	0.0%	5	6	9.1%	66	0	0.0%	5
2010	0	0.0%	81	0	0.0%	6	10	12.3%	81	2	33.3%	6
'00-'10	8	0.9%	907	8	8.3%	96	116	12.8%	907	16	16.7%	96

* The lower row indicates the totals for the 11 year period from 2000-2010 from NAAA records.
* Every reported tower strike was fatal during the period through 2007.
* In 2008 there was a non-fatal tower strike.
* The fatal accident (1) in 2004 in which an airplane hit a tower, was 1 accident with 2 fatalities.

Below is a brief summary of the fatal tower accidents occurring during the 11 year reporting period:

- August 1, 2000 – near Tracy, CA – airplane collided with a 300 foot tower – pilot was headed toward the tower and raised the nose of the airplane to clear the tower – airplane appeared to stall just before the collision – continued 130 yards before hitting the ground in an inverted attitude and was partially consumed by fire.
- September 14, 2000 – near Lariat, TX – airplane collided with a tower located in the field that was being sprayed – airplane pulled up and banked to the left – the right wing caught the uppermost guy wire – aircraft spun to the right, impacted the ground and caught fire.
- September 29, 2000 – near Stanton, TX – while trimming the field, the aircraft struck a 180-foot tower and guy wires located adjacent to the fields being sprayed – struck the tower and guy wires about 145-feet above the ground – airplane tumbled to the ground, exploded and was consumed by post impact fire.
- September 5, 2001 – near Lydia, LA – it is known only that the pilot was maneuvering near 500 feet above the ground – aircraft hit the 500 foot tower with the left wing – the crash site was 700 feet from the base of the tower.
- September 11, 2004 – Lake Wales, FL – airplane containing 2 rated pilots was doing night spraying for mosquito control under contract with the state of Florida – aircraft impacted about 20 feet below the top of a 520 foot tower – the tower was unlighted due to an automobile accident that had occurred about 90 minutes before which knocked out the electrical service and consequently, the tower lighting – main wreckage found about a quarter mile from the base of the tower with some wreckage near the base of the tower – both pilots were killed by “blunt force trauma”.
- May 19, 2005 – near Ralls, TX – pilot had just finished his second application load and was returning to the airport when he collided with a 197-foot high tower – the airplane apparently impacted the tower 3 feet from the top – the wreckage was found approximately 831 feet from the tower base with part of the wing located near the base – the airplane was further damaged by post-impact fire.
- June 18, 2005 – near Senath, MO – aircraft impacted a guy wire of a 1,040-foot tower located adjacent to the field being sprayed – the main wreckage was located 607 feet from the base of the tower – the aircraft was destroyed by impact and post-impact fire - the tower was guyed with three sets of guy wires at 120 degree intervals around the base terminating about 425 feet from the base – there was one additional guy wire that extended out 729 feet from the base.

Not included in the above report, because it was not an agricultural use aircraft but it did nevertheless hit a MET tower, is another fatal accident which occurred on Dec. 15, 2003 near Vansycle, Ore. - pilot and one passenger en route from Yakima, Wash. to Walla Walla, Wash. intersected with the top portion of a164-foot high tower – the top portion of the tower was found near wing fragments and the remainder of the plane was found approximately 1,000 feet further away –upon impact the occupants were killed and thrown clear of the wreckage – post fire consumed most of the airplane.

The National Transportation and Safety Board (NTSB) recently released its “probable cause” report on the most recent fatal accident involving a collision with an unmarked MET tower which occurred on Jan. 10, 2011. The

accident was assigned NTSB accident number WPR11LA094. A California pilot was performing an aerial application operation near San Francisco when he impacted the recently installed and unmarked MET tower. Investigators on the scene reported that the tower was almost invisible against the sky background. The report stated the NTSB's probable cause for the accident was: "An in-flight collision with an unmarked meteorological evaluation tower (MET) during an aerial application flight due to the pilot's failure to see and avoid the obstacle. Contributing to the accident was the lack of visual conspicuity of the MET and the lack of information available to the pilot about the MET before the flight."

As referenced in the fatalities listed above, previous to this most recent fatal collision with an unmarked MET tower, two others occurred in 2005 and 2003 respectively. In May 2005 a fatal crash occurred in Texas and the investigation revealed the unmarked MET tower had been erected a mere 15 days prior to the accident and the tower was of an unpainted metal color and was not equipped with an obstruction light. In December 2003, a similarly fatal crash occurred in an area of wind turbines with an unmarked MET tower in Oregon. The investigation revealed the non-ag plane, containing one pilot and one passenger, had probable impact with the top portion of a MET tower.

Information gathered during the investigation of the January 2011 California accident revealed that the county where the accident occurred, Contra Costa, had an ordinance numbered Article 88-3.618 relating to Wind Energy Conversion Systems (WECS). Paragraph (a) of the ordinance reads: "WECS (towers and blades) structures and fencing shall be of a non-reflective, unobtrusive color." Paragraph (b), printed in part, alludes to the reason for the previous requirement: "All WECS, buildings, and structures shall be sited to minimize visual impact to residences . . . ." In an effort by local bodies to make wind equipment more pleasing to the eye, it makes the same equipment more hazardous to air navigation.

Promotional information for AWES boast the wind turbines floating high above the earth are more pleasing to the eye than conventional surface-mounted wind turbines. It further implies they are almost invisible to spectators looking across the landscape. This lack of conspicuous clues to the location of the tether makes the AWES as dangerous, if not more dangerous than a MET tower. In addition, the exact location of the tether in relation to its base will depend on the wind direction and velocity. Therefore, these obstructions must be conspicuously marked and lighted to give pilots the ability to identify them.

Safety Risks Growing

Because of the projected growth of the wind energy industry in the United States, the number of METs being erected throughout the U.S. is already expected to grow significantly. The addition of AWES will further exacerbate a potentially dangerous situation. This will further jeopardize aerial applicators and other low-level aviation operations, particularly if no effort is made to properly mark these obstructions, because the number of METs and AWES installed will increase as the wind energy industry increases resulting in more dangerous obstacles for users of low-level airspace. The wind energy industry experienced a growth surge of 50 percent in 2008. Currently, wind energy only accounts for approximately two percent of the country's energy production; however, the American Wind Energy Association (AWEA) is seeking a national standard of 25 percent renewable energy by the year 2025. In 2008, the U.S. Department of Energy (DOE) published a report that examines the technical feasibility of using wind energy to generate 20% of the nation's electricity demand by 2030. Achieving 20% wind energy will require the number of turbine installations to increase from approximately 2000 per year in 2006 to almost 7000 per year in 2017. Pike Research's perspective on the wind energy industry is that it expects wind energy turbine sales in the U.S. to grow by a compound annual growth rate (CAGR) of 9.7% to reach an annual production volume of almost 8,000 turbines (with an average capacity of greater than 1 MW) by 2015. (**Pike Research, Research Report, 3Q, 2009).** Again, the number of METs

and possibly AWES erected to support the growth in wind energy production will markedly increase as well, contributing greater risk to low-level aviation operations, particularly if these obstructions are unmarked.

Aerial Application Industry Efforts to Mitigate Low-Level Obstacle Collisions

For over half a decade, NAAA and a number of state and regional agricultural aviation associations have attempted to work with the wind energy industry to better mark METs. Unfortunately, minimal results have been achieved from the Association's efforts. NAAA has met with the American Wind Energy Association (AWEA) on the subject of visible marking of METs similar to those proposed by the FAA in this **Docket Number FAA 2010-1326**. In those meetings there was a discussion that visible marking designs for METs be published in AWEA's *Energy Siting Handbook*, which can be found at the organization's website at http://www.awea.org/sitinghandbook/downloads/AWEA_Siting_Handbook_Feb2008.pdf. The *Handbook* presents general information about regulatory and environmental issues associated with the development and siting of wind energy projects in the United States. It is intended to be a general guidance document for wind energy companies providing technical information and tools for identifying potential issues that may arise with wind energy projects. To date, there is no information related to the marking of METs in the AWEA *Energy Siting Handbook* similar to those suggested by the FAA in **Docket Number FAA 2010-1326**.

It would appear similar awareness campaigns and regulations on lighting and marking would be necessary if AWES were allowed in the airspace system. A number of states have enacted laws governing the marking and lighting of obstructions attached to the ground in their respective states. The issue of AWES was not envisioned when these laws were passed but the hazard to aviation also exists for AWES and should take into account low-level aviators' safety and livelihood.

NAAA's Response to Notification for Airborne Wind Energy Systems (AWES) Docket Number FAA 2011-1279

NAAA agrees with the FAA's opinion that AWES are unique and do not fit under 14 CFR part 101 which covers *Moored balloons, kites, amateur rockets and unmanned free balloons.* One design being tested by a California company "flies" in a circle under its own power around the base similar to a string controlled model airplane. The tether used is about 1,000 feet long. This "flying" wind turbine has the ability to automatically winch itself down to the base when wind conditions are less favorable to power generation and launch itself when conditions become more favorable.

Furthermore NAAA believes it is imperative that AWES facilities be studied under 14 CFR part 77 for evaluating the impact of wind turbines and other forms of renewable energy on the navigable airspace. Consideration should not only be given to airways and airports but to the overall accessibility to airspace used by all aircraft including those operating at low altitudes.

NAAA agrees with the FAA's concerns about the following:

1) Impact(s) to various surveillance systems (radars);
2) Conspicuity to aircraft (marking and lighting);
3) Overall safety – safety to other airspace users, safety to persons and property on the ground, safety to the efficient and effective use of NAS facilities, safety to airports, safety to air commerce, and safety to the efficient operations and managing of the NAS;
4) AWES fly-away protection (mooring cable is severed);
5) AWES physical dimensions per unit and per farm;
6) AWES operating dimensions per unit and per farm (amount of airspace in may require);
7) AWES mobility (potential for AWES to relocate from physical ground location to a different ground location); and

8) Wake turbulence or vortices of wind capturing component(s).

Additionally, NAAA would propose the Agency create a central database cataloging all AWES locations nationally. This would provide a clearinghouse for pilots to consult prior to low-level flying. A low-level obstruction's location could then be inputted onto an aircraft's GPS system and warn the pilot of its whereabouts when flying near to it. This would be a huge benefit to low-level aviation safety.

The NAAA also requests the FAA include in the marking recommendations the addition of a strobe light on each individual structure and lighting on the tether. This recommendation would differ from some wind farms that only light the outer turbines in the cluster. This would assist all low-level aviation operators in noticing the presence of these devices during daylight hours. Lighting is also necessary to identify the location of the entire structure during night time operations. Throughout the country, night operations are routine for EMS operators and in some areas, agricultural operations are necessary at night to comply with environmental conditions. Operators that don't participate in night operations occasionally fly to or return from the site of application during the hours of darkness.

More needs to be done by the FAA to protect low-level aviators from the threat that METs, AWES and other obstructions pose. Another Federal agency—the National Safety Transportation Board—echoes these sentiments from its accident report issued on Jan. 17, 2012 regarding the Jan. 10, 2011 MET tower collision in California when the Board concluded "Although the FAA in 2011 approved an update to Advisory Circular (AC) 70/7460-1K, Obstruction Marking and Lighting, that will provide recommended guidance on marking METs, ACs are only advisory in nature. Because of this, MET constructions will likely continue to meet only the minimum requirements and, thus, will remain a hazard to pilots operating at low altitudes."

The public and farm owners should also be made aware of the presence these tethered systems may cause in forcing blocks of farm land to be untreatable by air. Calculating the surface area directly under a single tethered AWES, using a 2,500 foot tether and a 45 degree angle from the base, the affected area is about 225 acres per installation. Safety concerns would dictate not flying and applying crop protection products under the "cone of flight" of the AWES considering the shifting location and angle of the tether due to wind variations. The location of a tower is stationery and can be plotted but an AWES is constantly in motion. The issue of properly marking obstructions so they are visible is a life or death issue for pilots flying in low-level airspace, and in the case of agricultural aviators, an issue of great importance to the safe, affordable and abundant production of food, fiber and bio-fuel to our global population.

NAAA appreciates the FAA addressing this life-saving issue vital to the agricultural aviation industry. It urges the Agency to consider the above stated comments in an effort to strengthen aviation safety overall.

Thank you for the opportunity to comment.

Sincerely,

Andrew D. Moore
Executive Director