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

Re: Docket Number FAA-2015-2147, Transponder Requirements for Gliders

The Soaring Society of America (SSA) is an organization with over 10,000 members that was created in 1932 to foster and promote all phases of gliding and soaring. The Society and its affiliates are involved in safety programs and flight training, technological research and development, and representation to Federal agencies. In this capacity, the SSA has discussed airspace issues with the FAA and NTSB over several decades, including the use of transponders in gliders in the National Airspace System (NAS.) SSA now submits this formal response in opposition to the suggestion made in FAA docket number 2015-2147 that the “transponder exemption” for gliders be abrogated.

SUMMARY OF SSA’S POSITION

- First, the SSA objects to the FAA’s call in the ANPRM for anecdotal evidence of traffic conflicts (NMACs) involving gliders. Collection of “data” in this manner is unreliable, subject to misinterpretation and selective disclosure (did the glider have a transponder?), and lacks any context such as total numbers of NMACs for all aircraft under similar conditions. The Aviation Safety Reporting System (ASRS) database (referenced by the NTSB and administered by NASA), is the proper forum for collection and interpretation of the context of these events. Events not entered in the ASRS database cannot be analyzed objectively by all interested parties. In this regard, SSA notes that the ASRS database includes no new incidents with gliders not equipped with transponders in the RNO or MEV areas in exempted airspace since the release some 7 years ago of the NTSB report on the 2006 incident. SSA therefore discounts the alleged urgency for an immediate change to the FARs that the Reno airport authority and its allies advance through anecdotal stories of conflicts between gliders allegedly lacking operating transponders and powered traffic.
- SSA agrees that expanded use of available forms of anti-collision technology in flying machines of all types – not just in gliders – obviously would make flying safer. Thus, a large number of US glider pilots have voluntarily added to their

cockpits either transponders (which broadcast the position of a glider to ATC and TCAS equipped traffic) or an alternative, effective, lower-cost technology called FLARM (which, in addition to broadcasting location information, also provides collision alert data in the cockpit of gliders, much as TCAS does in the cockpit of larger, more expensive aircraft.) FLARM has been widely accepted worldwide and has the support of the European Aviation Safety Agency (EASA.) It is so successful and effective that the use of FLARM (rather than transponders) is now mandated for gliders flying in French airspace.

- SSA encourages and applauds the voluntary adoption of anti-collision devices (1) where the owner/pilot has the financial resources to afford them, (2) where the value of the glider is high enough to make installation of the technology economically sensible, (3) where the instrument panel of a glider is large enough to install the equipment, and (4) where the glider is flown in high traffic areas where conflict with other traffic is most likely.
- However, SSA urges the FAA to consider that a large portion of the US glider fleet consists of gliders with low market values (many with a current market value of less than \$15,000) or that are owned and operated by small glider clubs, organizations such as the CAP or by commercial operations whose financial resources are limited and for whom the forced installation of transponders would likely result in the grounding and retirement of the glider rather than the installation of the equipment. Soaring has been an inexpensive gateway to aviation for youth and for others who simply cannot afford the more expensive option of powered aircraft. As a consequence, regulation requiring the installation and use of transponders, ADS-B out, or other similarly priced equipment could have a devastating impact on this form of flying.
- The 2006 mid-air incident south of Reno, NV that has led to this ANPRM arose as a result of conditions that are unique to that flying location and that do not exist anywhere else in the United States. SSA believes that a rule of nationwide applicability in reaction to conditions unique to this one geographical location is unnecessary and would be a regulatory overreaction.
- Regulations must be adopted only after a determination that the benefits of the rule outweigh the financial and other cost associated with complying with the proposed rule. SSA believes that the costs to the soaring community of complying with a rule mandating transponder (or ADS-B) use in airspace where gliders are currently exempt from mandatory use would greatly exceed the benefits of such a rule.
- SSA believes that a better approach to minimizing the chances of a mid-air between gliders and other traffic is to continue to encourage the voluntary use of transponders, FLARM and other future but lower cost anti-collision technologies while addressing the unique airspace issues south of the Reno-Tahoe Airport on a

“stand alone” basis, perhaps by modifying approach routes into RNO to minimize traffic conflicts.

Minden Mid-Air accident

At the outset, we note that the proposal advanced in the ANPRM to eliminate the “glider exemption” for mandatory transponder use is based on essentially a singular accident in 2006 in which the SSA disagreed with the NTSB’s findings, conclusions, and recommendations in their final report (LAX06FA227A.) The SSA took issue with many of the facts and representations in that report and we expressed our concerns to the NTSB at the time, but they never responded to our complaints. Given that the issue of transponders in gliders has been raised again based on the inaccuracies in that report, we believe that the discussion the NTSB chose to avoid is now necessary.

In understanding the background behind the 2006 mid-air, it is important to note the unique soaring conditions south of Reno. In addition to thermal soaring conditions, the mountain range that runs generally north-south between Reno and Minden generates a phenomena called “wave lift” when the weather conditions are right. When the mountain wave is present, gliders can climb high and fly for hundreds of miles along the length of the range while barely making any turns. The wave conditions present in the area are perhaps the best in the country and attract glider pilots not only from throughout the United States but also from around the world.

The band in which a glider can make use of this wave lift is, however, narrow. Thus, while gliders can make long, straight runs in a generally north-south direction parallel to the mountain range, they can go only a short distance east-west before they fly outside the lift area. Thus, the gliders south of Reno flying in thermal and wave conditions are where they fly because they have to fly there, not because they are trying to make things hard for the airline traffic flying into Reno or other area airports.

In the aftermath of the mid-air collision between the glider and the Hawker on August 28, 2006, the assigned NTSB investigator met with representatives of the glider community and the pilots of both aircraft to discuss the circumstances leading up to the accident. One of the items the SSA brought to the attention of the NTSB during that meeting was that RNO had changed their approach patterns several years prior to the mid-air. We noted that – over the objections of the glider community -- RNO had rerouted the approaches into Reno to bring high speed commercial traffic directly through the area of highest concentration of glider activity. Previously, the approach routes were generally east of the critical area. During our discussions with the NTSB investigator, she indicated that she considered this to be a contributing factor in the accident. However, in their final report the NTSB only discussed that the FAA had documented concerns over glider conflicts with other traffic prior to the accident. It failed to note that the approach paths had changed, that the glider community objected to those changes, or that the FAA’s growing concerns coincided with the changes. In fact, just prior to the release of the NTSB final report we discussed this issue with the investigator and she specifically informed the SSA that she had been directed to exclude the information that the

approaches were changed. The SSA believes that routing the RNO approaches to go through the highest concentration of glider activity in the area where the gliders have no choice but to operate was a major contributory factor in the accident and should be considered in evaluating any proposed solution to the problem of glider-power traffic conflicts in the RNO area.

The SSA also objected to the NTSB's statement that since gliders were not required to carry transponders it was acceptable for the glider pilot to have turned it off (he "wanted to reserve battery power for radio use.") The SSA had discussed this several times with the FAA prior to the accident and the FAA made their position quite clear -- per the FARs, if a transponder was installed it must be on. The glider pilot, who was a foreign national visiting in the US, acted in violation of FAR 91.215(c) when he turned off his transponder.

The NTSB also put great emphasis on the fact that a TCAS unit was installed on the Hawker. Nowhere in their narrative was it mentioned that for part 91 operations (which the Hawker was operating under) a TCAS is not required. Also not mentioned was that TCAS are installed on less than 17% of aircraft (FAA 2013 survey.) The SSA feels that it was a misrepresentation by the NTSB to point out that the glider did not require a transponder while remaining mute on the TCAS also being optional. In fact, the NTSB could have recommended that TCAS be required for high speed (i.e. above 250 KCAS) aircraft operations above 10,000 ft MSL, but failed to do so.

The NTSB incorrectly stated that there were 60 relevant NMACs involving gliders in the ASRS database at the time of the accident. We note that in the current ANPRM the FAA corrects that inaccuracy to "approximately 45 reports of NMACs involving gliders in or near the excepted areas of § 91.215" for the period from 1988 to October, 2014 (6 additional years of data). While true, there is no context to these numbers, including a lack of discussion of how many of these included transponder equipped gliders. The SSA interrogated the same database and found that during the same time period there were 4433 NMACs for all aircraft during "IFR" flight, and for both VFR and IFR flight, 8873 NMACs. Clearly, carrying a transponder does not make an aircraft immune from NMACs. As a further point, the FAA's GA survey database for 2013 indicates that there were 1594 active gliders operating in the US, out of a total 199,927 active aircraft. So while gliders represent 0.80% of the active GA fleet, they were involved in only 0.68% (60/8873) of the total reported NMACs

Also noted in the NTSB report was a reference to 8 NMACs involving gliders in the RNO area. When the SSA checked the NMAC database we found references to 19 total NMACs in the RNO area, including one that was balloon to balloon (they are also exempt.) Of the glider NMACs noted by the NTSB, 3 occurred over 20 years ago, one appears to be a pair of hang gliders (ACN 617696) and only one has occurred (ACN 910665 in 2010) since the release of the NTSB report and that was with a mode C equipped glider. The other non-glider NMACs involved powered aircraft, some (if not all) of which were transponder equipped.

An incident that was referenced during the discussions of the Minden mid-air event was ACN 751929. That event was a reported NMAC between a 737 and a transponder equipped glider in 2007. It is important to note that this glider was transponder equipped, thus illustrating SSA's argument that transponders are not a "magic bullet" that will prevent all future air to air conflicts between gliders and other traffic.

The SSA in their response to the NTSB following the release of the final report of the Minden mid-air reiterated (we discussed this with the investigator) that low cost anti-collision technology (FLARM and its more capable variant, PowerFLARM) is in widespread use today in Europe and has been mandated for gliders in France since 2013. FLARM is similar to TCAS in that it can provide the pilot of a FLARM equipped aircraft direct traffic situational awareness, detecting and alerting pilots to the presence of ADS-B, transponder, and other FLARM equipped aircraft. Transponders on the other hand, provide no information to the pilot of the aircraft in which they are installed. None of this appears in the NTSB report.

The mid-air between the Hawker and the glider was an unfortunate event. However, given that the glider pilot was a visiting foreign national, flying a transponder equipped (borrowed) glider in violation of the FARs 42 nmi. from RNO, that the approaches to RNO had been changed to go through an area of known high concentration of glider activity, that TCAS was not required for the Hawker, and that other incidents referenced in the report included transponder equipped gliders, the SSA disagreed (and still does) with the conclusions and the resulting recommendations (A08-10-13 and A08-14-15) made by the NTSB as a result of this accident.

Traffic Awareness Beacon System (TABS)

The FAA is certainly aware of the high cost of equipping aircraft with transponders and ADS-B out technology and has been encouraging the development of TABS devices built to TSO C199 standards. However, we note that C199 was only approved in October, 2014 and neither SSA nor representatives of the Mitre Corporation who were contacted by SSA (Mitre is a Federally Funded Research and Development Center used by the FAA) are aware of any C199 compliant equipment currently available in the marketplace, so there is currently no way to assess cost, viability, or performance. Even if these devices were close to being marketed, it would be difficult to make qualitative assessments about a class of devices that are not yet in broad usage in the aviation community.

In any discussion of these devices, it should be noted that costs of such devices include installation and recurring maintenance. While there is a potential for these devices to be less expensive than transponders, the installation must still be consistent with current practices, so installation costs would likely be the same as for a transponder or ADS-B device. And while the devices may be less expensive because of part costs, the manufacturer will need to price their product to recoup development and certification costs, which have not been reduced by TSO C199. Unless installation and maintenance

costs are also significantly reduced, these devices will likely only provide marginal overall cost benefit while providing some reduced level of performance.

Transponders

Transponders are not true collision avoidance devices in that they do not provide any direct information to the pilot. They may be useful to other pilots who are equipped with a TCAS (or similar) device, but because of very high costs those devices are not in widespread use except by the highest end of the aviation community. As an additional issue, when air traffic controllers have too many targets on their displays, they may suppress VFR traffic, which would include transponder equipped gliders. And as a matter of policy, ATC does not necessarily give IFR traffic advisories on uncontrolled VFR traffic in its vicinity even if that traffic is transponder equipped. (Gliders rarely operate under positive ATC control and are therefore generally “uncontrolled” even when operating a transponder). Aircraft that fly VFR only and are not in contact with ATC derive essentially no direct safety benefit from equipping with a transponder; doing so only assists ATC in applicable areas and the high end users of the NAS that are equipped with expensive collision avoidance devices like TCAS; or in the case of gliders, with PowerFlarm.

Currently transponder costs start at approximately \$2,000 for the transponder alone. One of the most popular transponders for gliders is the Trig TT21, which with the necessary antennae and cables, can be purchased from one popular soaring vendor for \$2,755. (Note: the TT21 is not ADS-B compliant because of power limitation; a more robust version, the TT22 can be purchased for about \$300 more.) Installation costs for a typical glider start at ~\$1500 and may be considerably more depending on the complexity of the installation, and the construction of the glider (fiberglass, carbon, wood, metal.)

One factor that greatly effects the cost of installing a transponder in gliders is the very small size of glider instrument panels. Many existing panels are completely full already and there is no open slot into which a transponder can be easily mounted. To install a transponder in these gliders could either require a complete rebuilding of such instrument panels or a remote mounting of the transponder unit itself away from the instrument head, greatly increasing the complexity and costs of installation.

Recurring maintenance costs for transponders may be \$200 semi-annually. Battery costs to run a transponder in an aircraft with a battery driven electrical system can cost between \$30-\$200, depending on the battery capacity and type desired. Transponder installations increase the overall aircraft power load so, for glider pilots expecting to make longer flights, either multiple or higher power batteries such as the Lithium Iron Phosphate (LFP) would be required. A typical battery may last 2-3 years before requiring replacement and many pilots carry multiple batteries onboard to meet power requirements, or have backup batteries so that they can have one charging while they are using the other.

The FAA's aviation survey from 2013 estimates that there are 2796 gliders in the US, of which 1594 are considered "active" by the FAA, and 372 (23% of the active gliders) of them have voluntarily equipped with transponders. If the changes proposed to just 91.215 were enacted, the estimated cost to the glider community to install transponders in the remaining active gliders alone would be \$5 million at a minimum, and could be closer to \$10 million if all gliders were required to do so. This cost might force many clubs to cease operations, similar to what happened when the Blanik model L-13 glider was grounded by the FAA in 2010. The SSA also notes that many older model gliders (for example, most US made Schweizer gliders, which represent approximately 25% of the gliders in the US registry), have a value below \$15,000, so imposing a cost of \$4-5,000 per aircraft would be a significant burden.

As a final note on transponders, many older model gliders were not certified with an approved electrical system and were produced by manufacturers which no longer exist. While some of these aircraft have a FAA field approved (form 337) battery driven electrical system installed, some do not. The SSA is aware that some requests for field approval of a battery driven electrical system have been denied by the local FSDO on the grounds that the manufacturer never approved or provided for one.

TCAS

TCAS is a transponder based collision avoidance system that is used by some higher end aircraft. However, TCAS is not mandated for any Part 91 users in the airspace in which gliders are currently exempt from carrying transponders. Additionally, gliders often travel in groups (gaggles) and studies conducted in Europe indicate that multiple transponders in close proximity to each other (<500 ft) will confuse TCAS as to the location of the transponder equipped aircraft, rendering them useless in avoiding conflict in such situations. For light aircraft, installing traditional TCAS is not an option for several reasons, including cost (starting around \$10,000, not including installation), weight, and power (current lightweight batteries are insufficient.) TCAS is based on transponder technology with a very rough analog estimate of intruder position. It's adequate if you fly at 450 kt with 1000 ft separation, but for small aircraft and especially gliders circling close to each other, it simply doesn't work.

ADS-B

ADS-B has the potential to significantly improve situational awareness for all pilots operating in the NAS. Unfortunately, there are no low cost TSO compliant ADS-B solutions available. Basic ADS-B units suitable for general aviation currently require integration of an expensive GPS receiver with a separate transponder to operate. The need for two pieces of complex electronics roughly doubles the acquisition costs to somewhere in the range of \$5,000 to \$7,000 for the equipment alone. For example, an ADS-B compliant Trig TT22 transponder, antennae and cable bundle can be purchased from one well known vendor of soaring supplies for \$3,035 while the GPS engine that the FAA has certified to be paired with the TT22, the FreeFlight WAAS 1201, costs some \$2,889 from one vendor for the GPS unit alone. Total equipment cost for the package is

thus at least \$5,924 (plus tax.) Stand-alone low cost ADS-B in/out equipment does not appear to be commercially available at this time. If only the approximately 1594 active (of 2796 total) gliders in the US equipped at an average cost of \$6000 per installation, the cost to the glider community of meeting a change to 91.225 alone would be approximately \$10 million.

FLARM & PowerFlarm

Originally developed for gliders and sailplanes to solve the inherent shortcomings and cost of TCAS, FLARM and PowerFlarm are award-winning and affordable collision avoidance systems for General Aviation, light aircraft and UAVs. Invented in 2004, today there are more than 25,000 aircraft flying worldwide with a FLARM system installed. In Central Europe, where it was developed specifically to address mid-air collisions, virtually 100 % of gliders have FLARM.

Each FLARM device determines its position and altitude with a highly sensitive state of the art GPS receiver. Based on speed, acceleration, heading, track, turn radius, wind, altitude, vertical speed, configured aircraft type, and other parameters, a very precise projected flight path can be calculated. The flight path is encoded and sent over an encrypted radio channel to all nearby aircraft at least once per second.

At the same time, the FLARM device receives the same encoded flight path from all surrounding aircraft. Using a combination of own and received flight paths, an intelligent motion prediction algorithm calculates a collision risk for each received aircraft based on an integrated risk model. The FLARM device communicates this, together with the direction and altitude difference to the intruding aircraft, to the connected FLARM display. The pilots are then given visual and aural warnings and can take resolute action.

The newer FLARM devices are based on the improved PowerFLARM technology and also incorporate a very accurate ADS-B and transponder (SSR) Mode-C/S receiver. This enables all transponder equipped aircraft to be included in the collision prediction algorithm and is especially valuable when flying in controlled airspace.

In addition to issuing audible collision warnings, FLARM displays also show nearby aircraft on a simulated “radar screen.” This helps pilots to “see and avoid,” before a collision warning becomes necessary.

FLARM is approved by EASA for fixed installation in certified aircraft. EASA supports FLARM as it significantly decreases the risk of a mid-air collision between participating aircraft. FLARM has also been referenced in several EASA publications, including being approved as a Standard Change.

Importantly, FLARM is a significantly less expensive technology than transponders or ADS-B. A typical PowerFlarm installation including a display costs approximately \$1,700 and does not require professional installation.

Today (sales numbers as of 2015) there are over 1500 PowerFlarm units in operation in the US. Since the latest FAA survey indicates that there are 1594 active gliders in the US (out of 2796 total), the SSA concludes that at least 50% of the gliders in the US are so equipped. Since they are likely installed in predominantly active gliders, the percentage of usage in active gliders is probably much higher than that estimate.

Other Considerations

Most of the airspace between 10,000 ft and 18,000 ft MSL in the CONUS exempted by 91.215 has relatively little powered aircraft traffic on a regular basis compared to lower airspace. PowerFlarm equipped gliders flying at locations in the western US in states such as Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming rarely encounter other traffic in this airspace. If the proposed changes to 91.215 are enacted, for many western US states the high average elevation and mountainous terrain would make it impossible to fly gliders without transponders. Because of the remote nature and lack of traffic in many of the areas used by gliders in the western US, requiring transponders would be at a significant cost to the glider community, and based on NMAC data, with no appreciable increase in aviation safety.

Summary

SSA is aware that there are some glider pilots who have contacted the SSA (and will respond to the ANPRM) in favor of eliminating the glider transponder exemption. SSA believes that these commenters are, for the most part, pilots who have already voluntarily installed transponders and now think that everyone else should as well. While SSA agrees with these pilots that wide usage of anti-collision technology is desirable, SSA feels the need to point out that a broad, nation-wide rule change mandating costly transponder (and potentially more expensive ADS-B) use would have an extremely detrimental effect on the sport of soaring by pricing the lower-end ships and owners out of the ability to continue flying with only a minimal increase in flying safety, except perhaps in a very few high traffic areas such as south of Reno, NV.

The SSA believes that the current proposal for changes to Part 91.215 and 91.225 is based entirely on the result of one accident – the 2006 midair. The SSA objected to the NTSB findings in the report of that accident based on omissions of fact, misrepresentations of factual data, conclusions drawn based on inaccurate data, and recommendations made without consideration of the full circumstances of the event. Since the 2006 accident, the local glider community that flies near RNO has undertaken successfully to educate pilots on collision avoidance and to encourage the voluntary use of either FLARM or transponders. As a result of these voluntary efforts, the official ASRS database includes no new incidents with gliders not equipped with transponders in the RNO or MEV areas in exempted airspace since the release some 7 years ago of the NTSB report on the 2006 incident. Thus, SSA believes that at this point mandating transponder use in the RNO area would have minimal improvement to safety. Instead, the best way to approach the unique traffic problems that remain in this special

geographical area is to modify the approach routes into the affected airports in order to minimize the number of potential conflicts between gliders and powered traffic.

Bringing this ANPRM proposal forward at this time discounts the efforts the SSA and its affiliates have made in the 9 years since the accident, including educating its members on collision avoidance and encouraging voluntary transponder compliance in high traffic areas. It also ignores the substantial advantages that PowerFlarm anti-collision technology brings to the entire aviation community. This proposal ignores the glider safety record since the accident, instead continuing to quote statistics based on events that occurred over 20 years ago before any safety initiatives were considered necessary. The proposal would unnecessarily restrict broad areas of US airspace (anything above 10,000 ft MSL) that are virtually unused by other aviation interests. Enacting this proposal would also provide a false sense of security in areas where there are high concentrations of uncontrolled glider activity mixed with controlled traffic by allowing other users of the NAS to believe that they do not need to practice see-and-avoid.

Based on the experience of Flarm technology in Europe, the SSA believes that gliders operating in the NAS today that are equipped with PowerFlarm anti-collision technology are actually safer than other users and are doing so in large numbers at a substantially lower overall cost than installing transponders or ADS-B.

Based on the NMAC data, there is very little safety benefit to the gliding community by having the FAA mandate transponders or ADS-B. It only marginally benefits other aircraft operating in exempt airspace, such as those in direct contact with ATC and the high end users carrying TCAS, which is not even mandated for them. NASA's statistics show that installing transponders or ADS-B does not assure that aircraft carrying these devices are immune from potential mid-air collisions. If the FAA cannot assure collision avoidance, via positive ATC, for all aircraft that are equipped with a transponder or ADS-B then the safety benefit, if any, of mandating use of the technology is marginal and the cost to the gliding community of implementing this change is not justified.

Regards,

/signature/

Richard Maleady, Chairman
Soaring Society of America

List of Abbreviations and Acronyms Frequently Used in This Document

ACN—acronym for aircraft incident reports
ADS-B—Automatic Dependent Surveillance—Broadcast
ANPRM—Advance Notice of Proposed Rulemaking
ASRS—Aviation Safety Reporting System
ATC—Air Traffic Control
CONUS—Continental United States
EASA—European Aviation Safety Agency
FAA—Federal Aviation Administration
FAR—Federal Aviation Regulation
GA—General Aviation
IFR—Instrument Flight Rules
MEV—Minden, NV airport
NAS—National Airspace System
NASA—National Aeronautics and Space Administration
NMAC—Near Midair Collision
NTSB—National Transportation Safety Board
RNO—Reno, NV airport
TABS—Traffic Awareness Beacon System
TCAS—Traffic Alert and Collision Avoidance System
TSO—Technical Standard Order
UAV—Unmanned Air Vehicle
VFR—Visual Flight Rules