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

RE: FAA Airworthiness Directives; NavWorx, Inc. Automatic Dependent Surveillance Broadcast Universal Access Transceiver Units
Docket No. FAA-2016-9226 (Oct. 20, 2016)

To Whom It May Concern:

The Aircraft Owners and Pilots Association (AOPA), the world's largest aviation membership association, has reviewed the Federal Aviation Administration's (FAA) notice of proposed rulemaking (NPRM), "Airworthiness Directives; NavWorx, Inc. Automatic Dependent Surveillance Broadcast Universal Access Transceiver Units," published in the *Federal Register* on October 20, 2016. The FAA's NPRM proposes to adopt an airworthiness directive (AD) for certain NavWorx, Inc. (NavWorx) Automatic Dependent Surveillance Broadcast (ADS-B) Universal Access Transceiver (UAT) units.

Given the safety benefits offered by UATs and the cost of compliance, confusion and concerns have arisen over the proposed AD. AOPA believes the FAA should provide additional information for AOPA, its members, and affected owners to assess and understand the necessity of the proposed AD. Specifically, AOPA recommends the FAA address the confusion over whether the internal position source meets the applicable performance requirements, the existence of an unsafe condition, and why the proposed AD applies to NavWorx's experimental UAT model. If the proposed AD is necessary, AOPA recommends any final rule minimize the economic burden on owners of the affected NavWorx ADS-B UAT units by allowing their use in limited circumstances.

ADS-B Out Background

Overview. Unless otherwise authorized, any aircraft operating in "rule airspace" below 18,000 feet MSL after January 1, 2020, must have equipment that (1) meets the performance requirements in TSO-C154c (UAT), *and* (2) meets the performance requirements established in 14 CFR § 91.227.¹ (§ 91.225(b).) The first requirement pertains to the standards for the *UAT ADS-B unit*, whereas the second requirement addresses standards for the *entire ADS-B Out*

¹ All references to parts or sections shall hereinafter refer to Title 14 of the Code of Federal Regulations, unless otherwise stated. References to a 1090 MHz ES have been removed.

system. The ADS-B Out system includes, at minimum, the UAT, position source, barometric altitude source, air-ground status source, and all associated antennas and displays. (Advisory Circular (AC) 20-165B, at 4.) A person must demonstrate that the ADS-B Out system complies with the performance requirements of § 91.227 through the type certification (TC) or supplemental type certification (STC) process if the system is to be installed in a type-certificated aircraft.

The UAT must meet the performance requirements of TSO-C154c. TSO-C154c, *Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz*, establishes minimum performance standards which a UAT must satisfy for purposes of § 91.225(b). To meet the performance requirements of TSO-C154c, the UAT must satisfy the minimum performance standards established in RTCA, Inc. document RTCA/DO-282B, *Minimum Operational Performance Standards for Universal Access Transceiver (UAT) Automatic Dependent Surveillance Broadcast (ADS-B)*, Section 2, dated December 2, 2009.

TSO-C154c and DO-282B apply only to a ADS-B UAT unit and do not contain any performance requirements for a position source, even if the position source is integrated into the UAT. (See TSO-C154c, DO-282B.) However, DO-282B requires the UAT manufacturer to encode values for certain fields depending upon the design of the position source being used in the ADS-B Out system. (DO-282B, at 64; AC 20-165B, at 19.) One of those fields is the source integrity level (SIL) value, which, generally, reflects the accuracy of the position source. The UAT manufacturer must accurately encode the SIL field depending upon the performance of the position source. Otherwise, the UAT unit is not compliant with the performance requirements of DO-282 and, as a corollary, TSO-C154c.

The entire ADS-B Out system, which includes both the UAT and position source, must satisfy the performance requirements identified in § 91.227. The FAA developed a means of compliance—known as AC 20-165B—on how a person can demonstrate that its ADS-B Out system, including the position source, meets the performance requirements in § 91.227 through the TC or STC process. Section 91.227(c) provides that the aircraft’s navigation accuracy category for position (NAC_P), navigation accuracy category for velocity (NAC_V), navigation integrity category (NIC), system design assurance (SDA), and source integrity level (SIL) must meet specified performance requirements. Whether these requirements are met depends largely upon the performance of the position source. (AC 20-165B, at 18–20.)

The FAA requires a position source to meet the performance requirements in appendix B to AC 20-165B for the position source to be included in the ADS-B Out system and for an aircraft to meet the § 91.227(c) performance requirements (e.g., SIL = 3). The FAA does not require the position source be compliant with a specific TSO. Any person may demonstrate to the FAA that its new (uncertified) position source meets the requirements of appendix B to AC 20-165B, thereby qualifying that position source to be used in an ADS-B Out system. However, integrating a TSO-certified position source into a UAT means that a person will have fewer requirements to satisfy in AC 20-165B appendix B during the STC process for the ADS-B Out system.

The FAA Should Disclose Additional Information

Whether Position Source Is Properly Qualified

One question arising from the proposed AD is whether NavWorx presented any data to the FAA demonstrating the position source met the applicable requirements in appendix B of AC 20-165B.

Around May 2014, the FAA issued NavWorx an STC for its ADS600-B UAT with part numbers 200-0012 and 200-0013 (Certified UATs). The STC allowed for the installation of those UATs into any type-certificated aircraft identified in the approved model list. The Certified UATs were compliant with TSO-C154c, but had internal, non-compliant GPS receivers. (ADS600-B Installation Manual 240-0008-00-36 (IM -36), at 17, 21, 28.) Specifically, section 2.3 of NavWorx's March 2015 installation manual states:

“For ADS600-B part numbers 200-0012 and 200-0013, the internal GPS WAAS receiver does not meet *14 CFR 91 FAA-2007-29305* for GPS position source. If the ADS600-B is configured to use the internal GPS as the position source the ADS-B messages transmitted by the unit reports:

A Source Integrity Limit (SIL) of 0 indicating that the GPS position source does not meet the *14 CFR 91 FAA-2007-29305* rule.” (IM -36, at 19.)

This means the Certified UATs, which utilized the internal, non-compliant position source, had to transmit a SIL of 0 for the UAT to remain compliant with TSO-C154c. By transmitting a SIL of 0, the Certified UATs did not meet the performance requirements in § 91.227, which require a SIL of 3.² On the other hand, the Certified UATs had been approved via STC for use with two separate external position sources: Garmin GNS480 and Accord Technology NexNav mini. (IM -36, at 33.) If configured to use either of these two external position sources, then the UATs could transmit a SIL of 3 and meet the requirements in § 91.227.

In September 2015, NavWorx upgraded its software in the Certified UATs to change the SIL value from 0 to 3 even though there does not appear to have been a design change. The SIL value, which generally reflects the accuracy of the position source, depends upon the performance of the position source in the ADS-B Out system. (AC 20-165B, at 19.) After the SIL value change, NavWorx noted in its revised installation manual that the internal position source complied with the requirements of AC 20-165B. (ADS600-B Installation Manual 240-0008-00-39 (IM -39), at 19.)

The FAA objected to NavWorx's software upgrade and SIL change through correspondence dated October 5, 2015, January 28, 2016, and February 29, 2016. (11/21/16 Emergency Order; FAA-2016-9226-0016.) The FAA contended NavWorx did not present any

² If a UAT contains an internal, non-compliant position source, the UAT can still be compliant with the performance requirements in TSO-C154c so long as the UAT transmits a SIL of 0. However, the ADS-B Out system containing that UAT would not satisfy the performance requirements in § 91.227.

data substantiating the change, and the SIL change rendered the Certified UATs non-compliant with TSO-C154c. (*Id.*) In an unapproved parts notification (UPN) and the subject NPRM, the FAA further indicated that the internal position source in the Certified UATs was uncertified and had not been shown to meet the performance requirements of § 91.227. (FAA UPN No. 2016-2016SW56001; 81 Fed. Reg. 72552, 72553 (Oct. 20, 2016).)

In response to both the UPN and NPRM, NavWorx issued public statements, contending that its testing verified the subject position source met the integrity levels required by § 91.227. (NavWorx UPN Statement; NavWorx Proposed AD Statement.) NavWorx's statements present a completely different position from the FAA, which has led to considerable confusion and concern. The fundamental disagreement centers on whether the integrated position source in the Certified UATs is properly qualified and meets the requirements in appendix B to AC 20-165B.

AOPA suspects that the integrated position source in the Certified UATs does not meet the performance requirements in § 91.227. If the position source was properly qualified and compliant with the applicable requirements, NavWorx could expeditiously resolve this issue by presenting the necessary, supporting data to the FAA. Nevertheless, to eliminate confusion and concerns, AOPA recommends the FAA resolve the contradictory positions. If the FAA has not received any data from NavWorx, the FAA should state such fact in a final rule, or explain why the submitted data does not meet the applicable requirements.

Whether Unsafe Condition Exists

Given the safety benefits offered by UAT technology, the FAA's proposed AD has raised the question whether an unsafe condition exists to necessitate the proposed AD. The FAA can issue an AD when the FAA finds that an unsafe condition exists in the product, and the condition is likely to exist or develop in other products of the same design. (§ 39.5.) An unsafe condition must exist to require removal of a product not properly certified before being installed into an aircraft.

In this case, the FAA proposed an AD for NavWorx UATs with part numbers 200-0012, 200-0013, and 200-8013 (for the experimental market) (Affected UATs). (81 Fed. Reg. at 72554.) The proposed AD, which would require removal of the Affected UATs and prevent their installation in any aircraft, identifies the unsafe condition as transmitting a SIL of 3 instead of a SIL of 0. AOPA understands emitting an incorrect SIL value may result in unreliable position information being transmitted to and relied upon by other pilots and ATC for purposes of separating traffic. (*Id.*) However, AOPA recommends the FAA explain with greater descriptive clarity how emitting an incorrect SIL value constitutes an unsafe condition which may cause an aircraft collision.

In making the determination of whether an unsafe condition exists, the FAA follows the Small Airplane Risk Analysis (SARA) process. (*See Small Airplane Risk Analysis (SARA) Handbook* (2010).) During this process, an FAA engineer performs the required SARA analysis and outlines its work on the SARA worksheet. (*See, e.g., id.* at 24.) AOPA recommends the FAA produce the SARA analysis, including any accompanying worksheets, to further explain its finding that an unsafe condition exists.

Whether Proposed AD Should Apply to ADS600-EXP Units

The FAA has not outlined why the proposed AD should be applicable to the NavWorx ADS600-EXP unit with part number 200-8013 (“200-8013”), a UAT intended for installation in experimental aircraft. An ADS-B Out system must meet the performance requirements of the applicable TSO and in § 91.227 for *both* type-certificated aircraft and experimental category aircraft. (§§ 91.225, 91.227.) The FAA’s involvement in the process is the only difference between installing an ADS-B Out system in a type-certificated aircraft versus an experimental category aircraft.

A manufacturer must demonstrate to the FAA that its ADS-B Out system complies with the performance requirements of the applicable TSO and in § 91.227 for type-certificated aircraft. (*See* AC 20-165B.) However, manufacturers of an ADS-B Out system intended for installation in experimental category aircraft, including experimental light sport aircraft (E-LSA), do not have to demonstrate such compliance. Those manufacturers must only prepare a statement of compliance (SOC). (AC 90-114A, CHG1, at 10.)

The SOC indicates that when installed in accordance with the installation instructions, the ADS-B Out system complies with the performance requirements of the applicable TSO and in § 91.227. Before making the SOC, the ADS-B Out system manufacturer must “perform appropriate engineering efforts to determine that the equipment complies with all § 91.227 and TSO performance requirements.” (AC 90-114A, CHG1, at 10.) The FAA does not approve or concur with a manufacturer’s SOC. However, the FAA retains the right to investigate those engineering efforts and address potential safety issues arising in the field when necessary. (*See* AC 39-7D, at 4.)

In these circumstances, NavWorx prepared the required SOC for 200-8013, attesting that appropriate engineering efforts had been performed and the unit met all the applicable requirements. AOPA suspects that the position source in 200-8013 is identical to the position source in the Certified UATs. The question raised then is whether the FAA independently determined that the position source in 200-8013 and/or the Certified UATs does not meet the requirements in appendix B to AC 20-165B.

An FAA determination that the position source in 200-8013 and/or the Certified UATs does not meet the applicable requirements in appendix B of AC 20-165B would refute NavWorx’s SOC and justify the FAA applying the proposed AD to 200-8013. On the other hand, 200-8013 should not be included in the final rule if NavWorx has simply not demonstrated to the FAA that the position source meets those requirements. Indeed, NavWorx declared that its unit met the requirements and fulfilled its duty by completing the required SOC. Given the lack of information, AOPA recommends the FAA clarify why 200-8013 has been included in this proposed AD.

Final Recommendations

Recommendation: Provide additional information for AOPA, its members, and affected owners to assess and understand the necessity of the proposed AD.

Based upon the foregoing, AOPA recommends the FAA resolve the confusion over whether the internal position source in the Certified UATs and 200-8013 meets the performance requirements in appendix B to AC 20-165B. AOPA also recommends the FAA explain with greater descriptive clarity how emitting an incorrect SIL value constitutes an unsafe condition in the aircraft in which an Affected UAT is installed. Similarly, the FAA should produce the SARA analysis and accompanying worksheets to further explain the FAA's finding that the Affected UATs create an unsafe condition.

Recommendation: Clarify the meaning of "uncertified GPS source."

In the NPRM proposing the AD, the FAA noted that the Affected UATs "include an internal uncertified GPS source." (81 Fed. Reg. at 72553.) However, NavWorx does have an STC, a design approval, allowing the internal position source to be installed into a type-certificated aircraft. In that sense, the internal position source could be considered certified. The FAA has also established that a compliant position source does not need to meet a specific TSO, only meet the requirements set forth in appendix B to AC 20-165B. AOPA suggests the FAA clarify exactly what it means by "uncertified GPS source."

Recommendation: Clarify whether the FAA intended to apply the AD to experimental category aircraft.

Paragraph (a) of the proposed AD states that the AD "applies to the following NavWorx, Inc., [ADS-B UAT] units (unit) installed on aircraft *certificated in any category*:" (81 Fed. Reg. at 72554 (emphasis added).) In policy, the FAA states that the agency will identify whether the AD applies to non-type-certificated aircraft on which the appliance is installed. (AC 39-7D, at 4.) The accompanying examples use significantly different language than what the FAA states in the proposed AD. (*Compare* AC 39-7D, at 4, *with* 81 Fed. Reg. at 72554; *see also* FAA-IR-M-8040.1C, at 44.)

Recommendation: Allow the operation of an aircraft with an Affected UAT under limited circumstances should an AD be necessary.

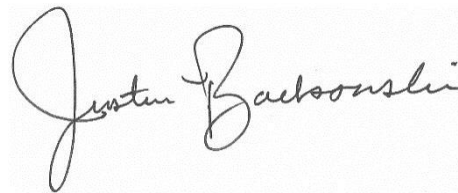
If the proposed AD is necessary, AOPA believes the FAA should amend the proposed corrective action to minimize the economic impact on owners. AOPA is concerned over the cost of complying with this proposed AD. Although the FAA estimated the cost of compliance at \$85 per aircraft, the FAA did not consider the cost of purchasing and installing another ADS-B Out system to comply with the FAA's 2020 ADS-B mandate. That is not an insignificant cost. To limit the number of required uninstallations, AOPA recommends the FAA still allow any person to operate an aircraft equipped with an Affected UAT:

- If an owner of an Affected UAT has his or her system configured to use an external position source (not the integrated position source) approved for use under NavWorx's STC.
- If NavWorx upgrades its software, thereby allowing the Affected UAT to transmit a SIL value of 0.
- If NavWorx upgrades the internal, non-compliant position source with a position source which meets the requirements of appendix B to AC 20-165B.

The FAA could issue a global alternative means of compliance (AMOC) or incorporate these limited exceptions into the final AD. In either case, AOPA encourages the FAA to allow certain limited use of the Affected UATs without complying with the proposed AD.

AOPA appreciates the opportunity to provide comments on the FAA's NPRM proposing to issue an AD for certain NavWorx ADS-B UAT units. AOPA stands ready, willing, and able to assist the FAA in any way possible to limit the cost and harm on affected owners.

Sincerely,

A handwritten signature in black ink, reading "Justin T. Barkowski". The signature is fluid and cursive, with the first name "Justin" and last name "Barkowski" clearly legible.

Justin T. Barkowski
Director, Regulatory Affairs