

Service Bulletin # SBFO-06-001

Title: Crossbow NAV420 Field Issues

Planning Information

Effective Data

April 1, 2006

Compatibility

This Service Bulletin applies to Crossbow NAV420 Attitude and Heading Reference Units with the following hardware/software part numbers:

Part Number
NAV420CA-100

References

1. Crossbow Service Letter Update, Document Number NAV425-06-02, NAV425EX-200 Field Issues, Rev. A, March 15, 2006 (available at www.xbow.com/support)

Reason

Crossbow has issued the reference service letter in response to field issues with the NAV425EX AHRS. The Crossbow NAV420 AHRS, also manufactured by Crossbow and shipped with the Flight Op EFIS and OP Integrated packages has some of the same issues described in the reference letter.

Description

The reference service letter describes issues that have been observed in the field with the NAV425EX-200 AHRS. Op Technologies ships the NAV420 AHRS with our EFIS packages and this unit is similar to the NAV425 so some of the issues documented in the reference service letter are applicable. The reference service letter is included as an appendix to this document for reference. To date, no Op Technologies customers have reported any of the errors documented. In some cases (as with the GPS problems and the Built-in Test issues), these issues were not applicable to our customers. These issues were the overwhelming percentage of those observed in the field. The VHF radio interference issue was airplane and installation specific and it turned out to not affect any of our installations so the combination of these factors explains why Op Technologies customers have not experienced issues with the NAV420 units we have shipped.

Crossbow had put into place a recall program that will allow all NAV420 customers to receive a unit that incorporates solutions to all of the known field issues over the life of the unit. Op Technologies strongly recommends that all customers who received NAV420 units with our EFIS packages take advantage of this recall even if problems have been observed. An essentially new unit will be returned after the update procedure. The NAV420/NAV425 AHRS units have been through countless thousands of hours of actual field use on hundreds airplanes and the experience that has been gained from this real-world use of the product have undoubtedly made what has already been a reliable unit for Op Technologies customers even more trustworthy.

Labor Time

Combined removal and reinstallation and calibration of the NAV420 AHRS should take one person approximately 45 minutes.

Weight and Balance Effect

No change.

Electrical Load Data

No change.

Software Accomplishment Summary

None.

Publications Affected

None.

Material – Cost and Availability

All NAV420 AHRS units removed for accomplishment of this service bulletin will be returned to an address provided in the RMA instructions. Units will be modified and returned as soon as possible. There is no charge for this service or for return shipping.

Accomplishment Instructions

See attachment for Crossbow recall instructions

ATTACHMENT

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Crossbow Service Letter Update NAV425-06-02 NAV425EX-200 Field Issues Rev A

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Notices

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Revision History

Revision	Date	Author	Comments
A	3/15/06	DJ	Initial Release

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1.1 NAV425 AHRS - Problems and Solutions

It is never easy to accept that one of your products has exhibited problems in the field, and most certainly no fun to publicly announce this fact. However, Crossbow is fully committed to customer satisfaction and successful NAV425 AHRS installations, and we believe that the report included below will help to avoid any further confusion and misinformation about this product.

1.2 Current Status

We have successfully completed Crossbow tests with finalized upgrade hardware and software. We have fielded additional prototype upgrade units with customers that have experienced Crossbow NAV425 AHRS problems in an effort to confirm that the problems are corrected not only in Crossbow's test environment but our customers' environment. The field tests have been successful to date.

1.3 Problem and Solution Report

The following discussion summarizes the problems encountered, the solutions that have been developed and validated, and the schedule for NAV425 AHRS customer hardware upgrades.

1.3.1 Intermittent Startup

The intermittent startup problem manifested itself as a tumbling or tilted AHRS attitude display on powerup. Several power cycles would usually cure the problem. The problem was actually two problems, one hidden by the other. Both involved new integrated circuits with internal reset issues.

The first was a new power supply regulator chip, "name brand", that would occasionally plateau at the wrong voltage during powerup. The failure required several hours to an overnight wait for a chance to see it again. We designed in a different chip, did a new board layout, and built and tested several units.

We field tested the power supply fix with customers to see if the problem would reoccur in the same aircraft and environment. The testing revealed a second startup problem that was less frequent and hidden by the power supply chip problem.

The second startup issue was found in the accelerometer chip. We worked with our "brand name" accelerometer supplier (overseas) to reproduce the problem, fix it, and send us upgraded samples. We also changed the design to use an accelerometer from a different supplier as an alternate. Both the alternate and the upgraded design have tested out successfully.

1.3.2 VHF Radio Interference

The EMI problem displayed an incorrect attitude during keying of the microphone. The problem is somewhat frequency dependent and aircraft grounding system dependent.

Crossbow contracted with independent EMI test labs to recreate the problem and improving the EMI performance. We also built our own EMI test setup and bombarded the unit with aircraft frequencies. The original NAV425 EMI control system was designed for very low impedance paths to ground. That type of design works well in a metal aircraft but not as well in composite airplanes with grounding cables running the length of the plane. The upgraded NAV425 EMI

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control system was redesigned to work more effectively in composite aircraft. The engineering effort includes an updated lower housing design, new coatings, new connector/EMI board parts and layouts, an external EMI filter, and a new RF connector. Final testing at the lab included the usual DO160 testing and full sweeps of all the aircraft VHF frequencies using a handheld transceiver next to the NAV425 with all the simulated aircraft wiring in place.

1.3.3 GPS Hard to Lock

Several customers have had problems getting the GPS receiver to lock and stay locked. In the early days of the NAV425 customers began using a general purpose antenna similar to what Crossbow used for our testing. Typically our testing was done with the antenna mounted on a 6 inch square aluminum ground plate in the cockpit, laying on the instrument panel. It worked so well during our tests that the GPS would stay locked with the antenna turned upside down. We had to put the antenna on the floor, under the seat, to get rid of GPS lock. We now know that differences in cabling, antenna mounting, ground plate sizing, and sky visibility can seriously hamper the ability of the GPS receiver to receive weak satellite signals reliably.

To summarize our learning cycle, the antenna performance and installation have a lot to do with how well the GPS will behave and lock. Crossbow now recommends an external GPS antenna designed for aviation use. The external antenna avoids GPS signal attenuation caused by the composite fuselage and windshield materials. The external antenna does not require a ground plane and can be installed with screws from the underside, leaving the external aircraft surface clean. Eliminating the guesswork and variability in antenna installations by using an aviation grade antenna will help ensure reliable GPS performance and easier antenna installations.

1.3.4 GPS Unlock/Lock Problem

We had one report of an attitude problem after a GPS unlock/lock cycle during maneuvers while simulating a blocked antenna. The problem was difficult to reproduce at first because the unlock/lock sequence had to occur during certain flight dynamics and specific GPS conditions. We performed a variety of dynamic tests and figured out how to recreate the situation and capture the required data for analysis. We found that under weak GPS signal conditions (marginal/noisy antenna signals) in the presence of high speed and high acceleration dynamics, the GPS will sometimes report valid velocity information with out of tolerance errors. With the root cause determined, we developed a method to detect this situation and avoid the use of the erroneous GPS data. This has resulted in a general software robustness improvement.

1.3.5 Built-In-Test

Crossbow received reports that the NAV425s failed more frequently as they accumulated operating hours. The NAV425, like our certified products, contain a continuously running Built-In-Test (BIT) system that monitors critical internal hardware and software parameters. A failure, once detected and qualified, results in a “hard” failure indication that is sent to the PFD. The PFD recognizes the “hard” failure indication and notifies the pilot that the AHRS data may be misleading. In the case of the NAV425, one of the BIT test parameters did not have the test limits set correctly and the test was not implemented properly. As the startup temperature and environment changed, this BIT parameter would sometimes step out of range on startup or during flight and flag a failure to the PFD. Due to the incorrect tolerance setting and BIT flag

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implementation, the rate of error could increase with elapsed operating time and the problem could become more frequent as the unit accumulated hours. The limits have been corrected and the BIT software changed to eliminate this problem.

1.4 Schedule

During the time since our first service letter, Crossbow has had to extend upgrade release dates due to longer than expected problem resolution and validation testing. We regret to report that our last date estimate has slipped another two weeks due to extended Crossbow testing. Crossbow will not release the NAV425 until we are satisfied the problems are solved and all the testing is successfully completed. Prototype upgrade units have been shipped to test customers for field testing. The field test results to date have been positive. The following is our latest schedule estimate based on successful conclusion of the customer and Crossbow field test results:

- Customer Test Units shipped: 3/08/2006 - COMPLETED
- Customer testing program completed: 3/31/2006
- Crossbow on-going testing completed: 3/31/2006
- Release upgrade to production: 3/31/2006
- NAV425 customers begin upgrades: 4/03/2006

1.5 Upgrade Program

The upgrade program will be operated directly by Crossbow to ensure complete satisfaction for our NAV425 and NAV420 AHRS customers. Status of the upgrade program and the procedure for completing the upgrade will be posted at <http://www.xbow.com>.

At the end of the day from a customer viewpoint, Crossbow has delayed the full utilization of the NAV425 and created a very frustrating situation for everyone.

We have worked through all the problems but no matter how good the engineering "excuses" are we have caused great inconvenience to our customers. Crossbow apologizes for the problems and strives to improve for the future.

Crossbow is committed to earning your trust as a reliable, trouble-free, and responsive AHRS supplier. We welcome your feedback and appreciate your patience. Please contact our customer service at 1-800-XBOWTEC, or fill out a customer survey on our website at <http://www.xbow.com/support>, or contact Dean Johnson, Vice President, directly by email djohnson@xbow.com or phone @ 408.965.3348

Best regards,

Dean Johnson

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All returns will require a Crossbow RMA number. Instructions for the return will be included in the next service letter on or before 4/3/06. **DO NOT SHIP THE UNIT NOW.**

We apologize for the inconveniences caused by the problems listed above and assure you that corrective actions have been identified, are being thoroughly tested, and will available as soon as possible.

Contact Directory

United States: Phone: 1-408-965-3300 (8 AM to 5 PM PST)

Fax:1-408-324-4840 (24 hours)

Email: techsupport@xbow.com

Non-U.S.: refer to website www.xbow.com

Return Procedure

Before returning any equipment, please contact Crossbow to obtain a Returned Material Authorization number (RMA). Be ready to provide the following information when requesting an RMA:

- Name and Address
- Telephone, Fax, Email
- Equipment Model Number
- Equipment Part Number
- Equipment Serial Number
- Installation Date