NextGEN

A320 Large ASE Status Update

North American Approvals Registry and Monitoring Organization

Date: 13-15 September 2016



By:





Federal Aviation Administration

Topics for Discussion

- FAA Concern with Airbus A320 Aircraft
 - FAA Data
- Cooperation with United Airlines
- Cooperation With Jet Blue Airways
- Cooperation with Airbus
 - Airbus analysis





Interest in Large ASE A320 Aircraft

- The lack of uniformity for US Airways and United Airlines fleets was notable.
 - + US Airways acquired many aircraft from the merger with America West.
 - It was decided that working with United (UAL) seemed to be a more tractable problem definition.
- The FAA contacted Airbus in order to get geometric data for each Airbus aircraft type.
 - Geometric height reference: at the GPS antenna or corrected to the altimetry system station on the aircraft?
 - No correction needed.





ASE Performance 2015

Results for Airworthiness-Approved Airframes A320







Aircraft Operator

• AAL • AAY • ACA • AIJ

ANA
AWE
CBJ
CEF

CES
 CRV
 CUB
 DAL

DTR

• FFT

• ISS • JBU • KAY • KFR

KNE
KOM
LMJ
MLM

MXA
NKS
NVD
PTG

• QAF • RMF • ROU • SAI

• SLI • TAI • UAE • UAL

• VLG • VOI • VRD • WHT

· WOW

ASE Performance 2016

Results for Airworthiness-Approved Airframes A320







Mean ASE Performance 2015

Results for Airworthiness-Approved Airframes A320







Mean ASE Performance 2016

Results for Airworthiness-Approved Airframes A320







· AAL

· AAY · ACA · AIB · AIJ · ANA

AVA · CEF · CES · CRV · CUB

· DAL • DTR

· EVA · FFT · GAF • IGA • JBU · KAY · KNE · KOM

LKE · LRC · MIL • MIM MXA

· NKS

 NVD · PTG · QAF . ROU · SLI

· SVW · SXA - TAI • UAE UAL

· VLG · VOI • VRD . WOW

Group Mean ASE and SD 2016

Results for Airworthiness-Approved Airframes



Aircraft Group	ps Monitore
A124	12
A306	122
A310-GE	19
A310-PW	13
A320	1323
A330	364
A340	85
A346	51
A380	90
ASTR	23
ASTR-SPX	47
B712	95
B727	30
B732	15
B737CL	219

Note: ASE variance estimate reduced by assumed measurement variance of (43.2 ft^s) Date of Chart: Monday, August 22, 2016













A320 ASERs







A320 History (1)

- 09/29/11
- The CMO received copies of six large Altimetry System Error (ASE) Reports (ASE-Rs) sent to the operator by the North American Approvals Registry and Monitoring Organization (NAARMO). (A total of 12 ASE-Rs were delivered on this operator's aircraft in 2011-2012) The CMO discussed the ASE-Rs with the carrier. They were to review the data and develop a plan to address the reported ASE.
- 11/15/11
- The CMO and the operator conducted a teleconference with NAARMO and AFS-360. The measurements methods and potential sources for the altitude deviations were discussed. The operator will contact Airbus to discuss the ASE-Rs and determine if they can help.
- 02/13/12
- The CMO received an ASE-R Resolution Form from the operator for a specific aircraft. As this aircraft shows the highest error of the six ASE-Rs, the CMO and the operator agreed to concentrate on correcting this aircraft to determine how best to correct the other aircraft. The aircraft in question had Air Data testing performed on it and it showed an error of 10 feet between the Captains and First Officers altimeters. The CMO, AFS-360, and the operator agreed the best approach to determine the cause of the anomalous altitude measurements was to selectively replace air data components on the subject aircraft and see what effect that made to the measurements. The operator replaced two (2) Air Data Modules which provide input to the #1 (Captain's) Air Data Inertial Reference Unit. Further measurements were requested and the Resolution Form was forwarded to NAARMO.





N419UA ASE Performance







Continued Investigation

• Aircraft N419UA

- + After swapping ADMs, the resulting ASE was still unsatisfactory.
- A visual inspection of the static ports revealed that the painted red stripes surrounding the left and right primary static ports had a thickness (0.012 in) that exceeded SRM limits.
 - The red stripes were sanded down and repainted within limits.
- The Captain's and F.O.'s left and right Air Data Modules (4 total modules) were replaced as a precaution.
 - The removed ADMs were returned to the vendor for further evaluation with a request from UAL that the units be tested under cold soak conditions.
- The #2 ADIRU was also replaced.





Resulting Observations for N419UA







Other Operator Maintenance (2)

- 10/21/13 ADM Swap Test
- Operator swapped 4 ADMs (a poor performing aircraft and a good performing aircraft.)





Resulting Observations for N429UA





Resulting Observations for N494UA

Repeated AGHME Measurements for A620B7 (N494UA) January 1, 2012 to March 31, 2016



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Other Operator Maintenance (3)

- ADIRU 4 MCU v 10 MCU:
- There was some discussion about the group of this operator's aircraft that only one of the 8 aircraft have an ADIRU 4 MCU while the other 7 have a ADIRU 10 MCU. There seems to be some indication that aircraft with the 4 MCU have better ASE performance.
- Aircraft SN452 was planned to have a change to the 4-MCU.
- FAA was notified of change, which occurred January 13, 2016





Resulting Observations for N452UA







Cooperation With Operator 2 Maintenance Results

• The following work was performed by the operator:

- Replaced ATC2 Transponder 4/10/14
- Purged all static ports no water contamination found 10/7/14
- + Performed Altitude and Airspeed Functional check found normal 10/7/14
- + Accomplished Altitude reporting test Normal findings 10/8/14
- Performed skin waviness check found within limits 10/8/14
- Performed ATC Transponder Function test found normal 10/8/14
- Removed Flight Control Unit replaced S2 switch 10/8/14
- + Removed ATC1 Transponder confirmed external failure 10/17/14
- + Removed TCAS computer (erroneous display indications) found normal 10/17/14
- Performed all ADIRUs bite check found normal 10/21/14
- Performed ADM Accuracy test found within limits 10/28/14
- Removed 2 Captain side ADMs confirmed failure
 - Software fault on 1 ADM
 - The other ADM NFF 11/7/14
- Removed 2 FO side ADMs
 - 1 ADM confirmed failure
 - The other was returned to stock on SOS program 11/30/14
- Extracted several FDR datas 10/8 flights and 11/30 flights- some flights exhibited high altitude readings as compared to ISIS altitude readings. Sent to Airbus for their analysis 12/30/14.
- Provided 4 FAA ASE Charts to Airbus for analysis-12/30/14.





Maintenance Results (continued)

- Provided ADM test results to Airbus -12/30/14
- Provided Skin waviness test results to Airbus 12/30/14
- Informed Airbus that mods 31038/31039 Altitude Trim correction not embodied during production
 - noticed that aircraft exhibited Trim = -150ft = Law 3= PM P6129 12/30/14
- Provide Airbus with actual flight profile data on flight 577 FLL-SFO with altitude readings on Captain, FO, and Standby with AP1 on command and AP2 in command 1/13/15.
- + Provided a clear close-up digital pics on all static ports done during the RON to Airbus 1/20/15
- + Provided Airbus with requested all ADIRS BITE discrete digital inputs 2/19/15.
- + Provided Airbus with an in- depth measurements on Captain side and FO side static ports 2/19/15
- Provided Airbus with requested alpha call-up parameters 2/19/15
- + Provided Airbus with the second skin waviness test results 3/2/15
- On 4/3/15, the operator changed all of the static ports on the aircraft.
- One port (FIN 8DA1) which was installed at delivery was found with a plastic plug installed in it.
- After the static ports were changed, ops and leak checks were performed per AMM 34-11-16, which yielded normal results.





ASE History on N629JB







Airbus Analysis of FAA ASE Data (December 2015)

- Airbus was notified by the operator of the large number of ASE-Rs. They contacted ANG-E61 directly for data exchange
 - Timeframe: from April 2013 to April 2015
 - ASE measurements: 318,263
 - Aircraft (MSN): 1772 (1244 SA & 528 LR)
 - Discard MSN without ASE excursions
 - → |ASE| < 245 ft
 - Discard MSN with unconfirmed ASE excursions
 - |20 days moving average| < 200 ft
 - Discard MSN with beneficial trend
 - + |6 Months Forecast | < 245 ft
 - Found 2 aircraft of concern
 - Aircraft 1
 - Aircraft 2





Aircraft 1







Current Aircraft 1 ASE Results







Aircraft 2







Current Aircraft 2 ASE Results







Summary

 Continuing to work with United and Airbus on large ASE causal factors



