AIRBUS Status

ISPACG34 – FIT27 presentation

Clement SELLES
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AIRBUS

General Information

Status on AIRBUS FANS-related developments

Airbus developments status (1/2)

S/W version	H/W prereq.	Capabilities	Major Fixes contained	Certification
CSB9	A10	FANS 1/A+ Or FANS 1/A+ & ATN B1 Or FANS 1/A+ & ATN B1 & B2	**Ack'n'Toss**, Spurious WILCO, **Max Uplink Delay**, Next on Busy HFDL removal, Unrecognized MRN, **VDL2 hand-offs improvements**	**Certified**
CSB7.5	None	FANS 1/A+	**Ack'n'Toss**, Spurious WILCO, **Max Uplink Delay**, Next on Busy HFDL removal, Media Transition improvements: RAT1/SAT7 timers, **VDL2 hand-offs improvements**	**Certified, pending SB**
CSB9.4	A10	FANS 1/A+ Or FANS 1/A+ & ATN B1 Or FANS 1/A+ & ATN B1 & B2	**ADS-C not starting at power-on**	**To be announced**

S/W version	H/W prereq.	Capabilities	Major Fixes contained	Certification
CLR9	A10	FANS 1/A+ Or FANS 1/A+ & ATN B1 Or FANS 1/A+ & ATN B1 & B2	**Ack'n'Toss**, Spurious WILCO, **Max Uplink Delay**, Next on Busy HFDL removal, Unrecognized MRN, **VDL2 hand-offs improvements**	**Certified**
CLR7.5	None	FANS 1/A+	**Ack'n'Toss**, Spurious WILCO, **Max Uplink Delay**, Next on Busy HFDL removal, Media Transition improvements: RAT1/SAT7 timers, **VDL2 hand-offs improvements**	**Certified**
CLR9.4	A10	FANS 1/A+ Or FANS 1/A+ & ATN B1 Or FANS 1/A+ & ATN B1 & B2	**ADS-C not starting at power-on**	**To be announced**

Airbus developments status (2/2)

S/W version	Capabilities	Major Fixes contained	Certification
A380 ATC CLA4.2	FANS 1/A+ Or FANS 1/A+ & ATN B1	Spurious WILCO, Max Uplink Delay	Certified
A380 ACR S3		Media Transition improvements	Certified

S/W version	Capabilities	Major Fixes contained	Certification
A350 CLV1.4	FANS 1/A+ & ATN B1	Spurious WILCO, Max Uplink Delay	Certified
A350 ACR S4		Media Transition improvements	Certified

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Airbus developments status: Airworthiness Approval Summaries

ANSPs & Operators (via AIRBUS TechRequest) are kindly invited to request a copy of the Airworthiness Approval Summary documents that are released every time a new FANS S/W version is certified on a given A/C family. These documents contain in particular the list of known deviations & clarifications to the standard, as well as various recommendations.


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FANS A+ Airworthiness Approval Summary for A320 family Aircraft

Technical Report


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FANS C Product Airworthiness Approval Summary for A320 Family

Airworthiness Approval Summary

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Airbus Light Cockpit SATCOM development – Inmarsat Swift BroadBand-Safety

Swift BroadBand-Safety for FANS 1/A+ traffic (short term)

- Results from Airbus CPDLC Round-Trip delay[1] measurements using intermediate development SATCOM Data Unit versions (VHF3 set to VOICE)

	Samples	Min	Max	Average	Σ	Min Bootstrap 95%	Average Bootstrap 95%	Max Bootstrap 95%
A320 Flight Test Results	133	3,29s	38,10s	6,23s	7,32s	5,91s	22,74s	35,05s
Lab Test Results	59	2,68s	5,44s	3,35s	0,49s	3,95s	3,62s	3,95s

[1]: Automated CPDLC exchanges generated by sending uplinks with an incorrect MRN, leading to an immediate rejection (error message) by the FANS avionics system: no “pilot in the loop”

Swift BroadBand-Safety for ATN traffic (medium term)

- A subsequent evolution of the Airbus ATSU (CSB/CLR10) and Light Cockpit SATCOM will allow to use SATCOM to route ATN traffic
- The major aim of this project led by the European Space Agency (dubbed “IRIS”) is to alleviate the VDL2 congestion in Europe

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Problem Reports Analyses

PR 2857/2885/2908/2925/2964: Multiple delayed & lost ADS-C & CPDLC messages

A321 / A330

PR analysis

- The PRs listed above trace ADS-C and CPDLC datalink communication issues reported by YBBB, NFFF and NZZO with A330 and A321 aircraft from a single operator:
  - PRs 2857/2885/2908 trace significant delays for receiving ADS-C reports on ground, preventing from meeting PBCS RSP180 requirements
  - PRs 2964 and 2905 describe CPDLC communication issues resulting in the non-delivery of uplink messages or a failed CPDLC transfer sequence

- Investigations showed that reported issues mainly resulted from SATCOM link misbehaviors including regular link disruptions and long transmission delays (e.g. 8 minutes to send a CPDL uplink message and receive an ACARS acknowledgement on ground). SATCOM link issues were also reported by the operator to Airbus customer support. Unfortunately inputs provided by the airline were not sufficient to clearly identify one root cause.
- One potential root cause could be the upgrade of airborne SATCOM units which may have not been performed following the introduction of Inmarsat I4 services.
  - But no status regarding this upgrade could be retrieved from the airline.
- The analysis of air/ground logs also showed that some downlink transmissions were performed via the HF data link while the SATCOM link was not available or when it was busy.
  - Because of its poor performance, using the HF media increased delays for some ADS-C/CPDLC transactions and therefore also contributed to degrading the overall FANS performance of the aircraft.
  - Sending downlinks via HF while SATCOM is busy (instead of waiting for SATCOM to be available again) corresponds to an avionics issue traced in the FANS tracker file as A30.
  - This design shortcoming, applicable to the A320/A330/A340 families, is corrected on certified CSB/CLR7.5 and CSB/CLR9 product.
- Finally, in order to minimize the use of HF for future flights, the operator also reported to Airways New Zealand that all A330 FPLs would be updated to remind flight crews to disable manually HF datalink.

Conclusion

- PRs proposed to be monitored (as SATCOM issues could not be explained).
- Or PRs to be closed if ANSPs confirm that these aircraft are no longer an issue.

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PR 2856: MAS131 CPDLC failure – Air Services Australia

A332

PR analysis

- During the flight MAS131, the CPDLC connection was properly established with A/C 9MMTU but it was not possible to exchange CPDLC messages.
- The analysis conducted confirmed that after a CPDLC transfer properly performed between WAAF and YBBB, two uplink messages correctly reached the Aircraft but no operational answer was received afterwards.
- Unfortunately, no root cause for this issue could be found in the logs or after performing tests. This issue does not correspond to any known avionics anomaly.
- Airbus intends to monitor any HMI freeze occurrence or any similar scenario to better understand the situation and perform new investigations.

Conclusion

- PR proposed to be monitored.

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PRs 2816/2882/2970: ATC Datalink fail

A330

PR analysis

- These PRs trace either the impossibility to establish a CPDLC connection or CPDLC Uplink messages not getting any operational answers from the crew.

- For all these PRs, air/ground traces analysis showed that communication perturbations resulted from a known avionics 'Ack and Toss' issue.
- The 'Ack and Toss' issue corresponds to an avionics anomaly occurring when one ACARS data link is temporarily disrupted during the transmission of an uplink ACARS multi-block message. When the data link is successfully re-established, all the uplinks received on this link are successfully acknowledged by the aircraft but no longer presented to the crew.
- For the three PRs, air/ground logs showed that the reception of a multi-block message was interrupted by a temporary loss of SATCOM means (PR 2882 and PR 2970) or HF means (PR 2816). Avionics then entered the 'Ack and Toss' condition. All the ACARS uplinks (including FANS 1/A messages) sent afterwards via SATCOM (PR 2882 and PR 2970) or HFDL (PR 2816) means were received on board but not displayed to the pilots.
- The issue can be mitigated on-board by resetting the FANS avionics system during flight.
- This on-board known anomaly, applicable to the A320/A330/A340 families, is corrected on certified CSB/CLR7.5 and CSB/CLR9 product.

Conclusion

- PRs proposed to be closed as fixed in certified and available FANS AVNCS S/W versions for A320/A330/A340 (Not Applicable to A380/A350).

PR 2893: A/C responds to on-demand contract request with 5 ACK concatenated with different on-demand reports – Airways New-Zealand

A21N

PR analysis

- During one flight, after an on-demand contract request was sent by NZZO, the aircraft responded with 5 ADS-C ACK messages concatenated with 5 on-demand reports including different time stamps. A nominal aircraft behavior was observed afterwards.

- The air/ground traces analysis shows that due to VHF communication issues, an ADS-C On demand Contract Request was received 5 times on-board due to ground re-emissions (A/C network acknowledge not received by the VGS).
- The aircraft sent an ADS-C positive acknowledgement, along with the report itself, each time it received this ADS-C on-demand contract request.
- As the request was sent via a single ACARS block, retransmitted blocks should have been detected as duplicates and discarded by the aircraft. However, the duplication was not detected at ACARS level because VHF communications were lost at the time each block was received and thus no duplicate detection logic is performed in such a context.
- On CSB/CLR9 product, available for the A320/A330/A340 families, a duplicate messages detection was implemented in ADS-C application in order to detect duplicated contracts and ignore (silently discard) them.

Conclusion

- PR proposed to be closed as fixed in certified and available FANS AVNCS S/W versions for A320/A330/A340 (fix pending for A380/A350).

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PR 2901: A/C responds to on-event contract request with 1 ACK followed by 3 NAK, causing the A/C to disconnect ADS-C as per specification – Airways New-Zealand A20N

PR analysis

- The PR traces one flight where, following the transmission of an uplinked ADS-C contract request, the aircraft responded with an ACK message followed by three NAKs. The aircraft then terminated the contract as per compliance with the ED-100A/DO-258A standard.

- Traces showed that the A/C received 4 copies of the event contract request via VHF whereas intermittent losses were experienced on this link (A/C was at the limit of VHF coverage).
  - The 1st request was accepted and the contract was established.
  - Like for PR 2893, as the request was sent via a single ACARS block, retransmitted blocks should have been detected as duplicates and discarded by the aircraft. However, the duplication was not detected at ACARS level because VHF communications were lost at the time each block was received and no duplicate detection logic is performed in such a context.
  - As a consequence, each retransmitted request was relayed to the airborne ADS-C application. A NACK was generated then for the following 3 requests, as they are identified as duplicates.
  - As per compliance with ED-100A/DO-258A, after the 3 NACKs, the aircraft sent an ADS-C DIS (disconnection) message
- This issue is a duplicate of PR 1627 (Issue A38 in FANS Problem Solution Tracker file).
- On CSB/CLR9 product, available for the A320/A330/A340 families, a duplicate messages detection was implemented in ADS-C application in order to detect duplicated contracts and ignore (silently discard) them (instead of rejecting them with a NACK).

Conclusion

- PR proposed to be closed as fixed in certified and available FANS AVNCS S/W versions for A320/A330/A340 (fix pending for A380/A350).

PR 2947: MSG RECORD NOT RELIABLE – Air New-Zealand

A20N

PR analysis

- Airbus avionics are fitted with an ATC message logbook (also referred to as Message record) containing all the FANS exchanges which were exchanged.
- The PR, initiated by an operator, indicates that during one flight the ATC message record was unexpectedly detected as empty and the crew was reported 'MSG RECORD UNRELIABLE' on the cockpit HMI (MCDU).

- The analysis of air/ground traces indicates that the issue may correspond to a known avionics memory issue upon CPDLC message storage attempt.
- In air/ground traces, from ATSU initial start-up sequence until 'MSG RECORD NOT RELIABLE' detection, two flights are identified (Flight 0992 then 0998), during which CPDLC messages are exchanged. ATS 623 messages were also exchanged during Flight 0992.
- When the avionics memory issue occurs during the recording attempt of a CPDLC message:
  - The scratchpad message "MSG RECORD NOT RELIABLE" would be displayed
  - All previously stored CPDLC messages are no more visible in MSG RECORD
  - All CPDLC messages exchanged after the issue occurred are not stored
  - A623 messages (both before and after memory issue) should be kept.
- The issue observed most likely corresponds to this case, provided that the pilot had erased the MSG RECORD at the beginning of the flight 0998 (as per Airbus SOP). This erasure could explain that no A623 message is reported to be present in message record.
- Internal avionics logs would be necessary to confirm the analysis. Unfortunately these logs were not available for further investigation.
- On CSB/CLR9 product, some abnormal identified occurrences of MSG RECORD NOT RELIABLE issue have been corrected.

Conclusion

- PR proposed to be closed as fixed in certified and available FANS AVNCS S/W versions for A320/A330/A340 (Not Applicable to A380/A350).

Thank you