NAT OPS BULLETIN

Serial Number: **2019_003** **Issued: 09 July 2019**
Subject: **Data Link Performance Improvement Options** **Effective: 09 July 2019**
Originator: **NAT SPG**

The purpose of this North Atlantic Operations Bulletin (NAT OPS) is to provide guidance to North Atlantic (NAT) operators regarding options that are available to improve data link performance.

Any queries about the content of the attached document should be addressed to:

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NAT OPERATIONS BULLETIN – DATA LINK PERFORMANCE IMPROVEMENT OPTIONS

1. Purpose of Bulletin. The purpose of this bulletin is to provide guidance to North Atlantic (NAT) operators regarding options that are available to improve data link performance.

2. Background. Application of the reduced lateral and longitudinal separation minima in the NAT Region is dependent on a smooth functioning FANS 1/A data link system. Various known data link related deficiencies in aircraft systems and poor data link performance have a detrimental effect on the air traffic control system and impede aircraft operator's efforts to obtain performance-based communication and surveillance (PBCS) authorizations. Many of these known deficiencies have already been fixed by aircraft manufacturers and software upgrades are available. To ensure the best possible functioning of the NAT air traffic control system, it is of utmost importance that aircraft operators always operate the latest available FANS 1/A related software version in aircraft that fly in the NAT high level airspace (HLA) and that the aircraft systems are configured in an optimal manner. Meanwhile, implementation of improvements and corrections is also a priority undertaking for the ground and network segments of the overall FANS 1/A system.

3. The list of recommended data link performance improvement options provided in the **Attachment** to this OPS Bulletin describes the problems and solutions identified to improve data link performance. However, it should be noted that not all aircraft operators experience all these problems and therefore not all solutions apply to all aircraft operators. Additionally, while acknowledging there is confidence that the recommended improvement options would improve the data link performance, it should be noted that these updates might not be necessarily seen as sufficient to ensure a PBCS authorization. Aircraft operators are advised to consult with aircraft manufacturers for guidance regarding implementation of the improvement options.

4. The certification status versus EUROCAE ED-122 / RTCA DO-306 standards and PBCS authorization requirements should be clarified by aircraft operators in coordination with the manufacturers concerned, recognizing the aircraft operators need to consider the economic and operational aspects and priorities.

5. Websites

5.1 The ICAO EUR/NAT Office Website is at: **www.icao.int/eurnat**. Click on **EUR & NAT Documents** >> **NAT Documents** to obtain NAT Operations and NAT Region Update Bulletins and related project planning documents.

6. Contacts

6.1 Any queries about the content of this bulletin should be addressed to ICAO EUR/NAT Office:

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ATTACHMENT - LIST OF DATA LINK PERFORMANCE IMPROVEMENT OPTIONS

PROBLEM / ISSUE	SOLUTIONS / ACTIONS
1. HF datalink – next-on-busy 1.1 Airbus ATSU and Rockwell Collins CMU-900 avionics may contain a feature called "next-on-busy" by which those avionics send a new downlink message via HF datalink when outside of VHF coverage and SATCOM is busy sending a previous downlink, instead of waiting for SATCOM to finish sending the previous downlink and then sending the new downlink via SATCOM. This feature reduces datalink performance because the avionics can actually deliver the new downlink more quickly if they wait for SATCOM to finish sending the previous downlink and then send the new downlink via SATCOM. On airframes equipped with Rockwell Collins CMU-900, this problem is compounded by subsequent downlink messages being queued while the avionics wait for acknowledgement of the HF datalink downlink message.	*Solution a): For CMU-900 installations with Iridium SATCOM where PBCS is showing poor performance, place the HF in "voice-only". This option removes HFDL as an available media so the "next-on-busy" function will not occur.* At the recent FAA PARC CWG40, an Iridium SATCOM equipped operator demonstrated the PBCS performance impact of HFDL "next-on-busy". Some other operators have also taken this action to place HF into "voice-only" mode. Iridium SATCOM operators, equipped with CMU-900, could take this action on interim basis prior to an available CMU software. See item 4 below on HFDL for similar recommendation.
	Solution b): Work with Airbus and Rockwell Collins to install software versions that disable the next-on-busy feature. (For the Rockwell Collins CMU-900 with recent software, this can be done with a database update).
2. VHF to SATCOM Transitions 2.1 Transitions from using VHF to using SATCOM, especially when they occur repeatedly in a short period of time, reduce datalink performance because the ACARS protocols are generally not designed to maximize performance but rather to minimize cost by persistently attempting to use less costly VHF.	*Solution a): Disable VHF datalink just prior to entering oceanic airspace* Implement flight crew procedures to disable VHF datalink (usually by placing the VHF radio used for VHF datalink into voice mode) just prior to entering oceanic airspace or prior to leaving contiguous VHF coverage in order to proactively force SATCOM use. Conversely, enable VHF datalink when exiting oceanic airspace or entering contiguous VHF coverage.
	Solution b): Implement more precise VHF region definitions In avionics that offer the capability to prefer specified subnetworks in defined geographic regions (including 777 DCMF and 787 CMF), implement more precise VHF region definitions that exclude areas of the world with only intermittent VHF subnetwork coverage in order to force SATCOM use in those areas. Such areas, in which the DLMA has observed consistent performance problems, include the North Pacific near the Aleutian Islands and the Kamchatka Peninsula, the South Pacific near New Caledonia and Vanuatu, and the North Atlantic near Bermuda and the Azores.

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	Solution c): Implement the ARINC 618 RAT1 timer Upgrade ACARS router avionics (CMU or equivalent) software to include the new ARINC 618 RAT1 timer when it becomes available. This timer is intended to improve performance for FANS downlink messages during VHF-to-SATCOM transitions by additionally attempting to send a message via SATCOM when attempts to send it via VHF have not been successful for 60 seconds (such as when exiting land-based VHF coverage). This feature is available on some new aircraft types and will gradually become available for retrofit via software updates on existing aircraft.
3. "Ack-and-toss" 3.1 ACARS router (CMU or equivalent) avionics may for various reasons acknowledge receipt of a FANS uplink message but then fail to deliver the message to the avionics that host the FANS applications. This is commonly known as "ack-and toss" behaviour.	*Solution a) Rockwell Collins CMU-900 software problem* For the 747-8, Boeing has certified core software -202 that fixes this problem. For the 737, 747-400, 757, 767 and MD11, Rockwell Collins is certifying core software -014 that fixes this problem. For the 747-400, 757, and MD-11, Boeing and Rockwell Collins are investigating certification opportunities.
	Solution b) Boeing 777 AIMS-2 software problem Boeing developed AIMS-2 BPV17.1 software that fixed this problem.
	Solution c) Airbus A320/A330/A340 software problem This problem occurs only in the ATSU CSB/CLR7.1 to 7.4 software versions. Airbus is developing the CSB/CLR7.5 software that fixes this problem. The issue is also fixed in the CSB/CLR9 software under development.
	Solution d) ARINC 618 false-positive duplicate uplink block identifier (UBI) determination ARINC 618-8, which was published in August 2016, contains a recommended avionics enhancement that reduces the likelihood of this problem occurring. For the 777, Boeing is developing AIMS-2 BPV17B software that implements the avionics enhancement. For the 787, Boeing developed CMF BPV4 software that implements the avionics enhancement. For the Honeywell CMU Mark II, Honeywell developed -522 software that implements the avionics enhancement. Similar software upgrades are or will be available for other affected ACARS router (CMU or equivalent) avionics, although it should be noted that the Rockwell Collins CMU-900 was never subject to this problem; the way it detects duplicate uplink blocks was standardized in ARINC 618-8 as the

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	recommended avionics enhancement. A complete solution, however, requires the Communication Service Providers (CSPs) to ensure that two sequential non-general response uplinks do not contain the same UBI value.
4. HF data link - general 4.1 HF datalink performance has not been demonstrated to meet the RCP240 and RSP180 specifications, although for various reasons the avionics may send FANS downlink messages via HF datalink. This behaviour has a detrimental effect on data link performance.	*Solution Manually prevent HF datalink use* Prevent HF datalink use manually by implementing flight crew procedures to disable HF datalink (usually by placing the HF radio used for HF datalink into voice mode).
5. Internetworking 5.1 The DLMA has observed that some performance problems are caused by the challenges of effective CSP internetworking when an aircraft operator chooses to use one of the two global CSPs (ARINC or SITA) for VHF and the other global CSP for SATCOM. (The DLMA also realizes that some aircraft operators configure their avionics to first prefer regional DSPs, such as Avicom in Japan, which has not been shown to affect performance).	*Solution: For aircraft operators that do not configure their avionics to first prefer a regional CSP, use the same global CSP for both VHF and SATCOM* It is likely that the data link performance will be improved if the same global CSP is used for both VHF and SATCOM.
6. Large Pilot Operational Response Time (PORT) values 6.1 PORT is one component of the Actual Communications Performance (ACP), the other being the Actual Communications Technical Performance (ACTP). For an uplink-downlink CPDLC transaction, PORT captures the human portion of the transaction time and ACTP captures the technical (mainly network) portion of the transaction time. Accordingly, large PORT values reduce performance.	*Solution: Implement flight crew procedures to respond to CPDLC messages with STANDBY when appropriate.* In accordance with ICAO Doc 9869, Performance-Based Communication and Surveillance (PBCS) Manual, ATS providers should exclude CPDLC transactions with STANDBY responses from performance monitoring. ICAO Doc 10037, Global Operational Data Link (GOLD) Manual explains in paragraph 4.3.2.4 when STANDBY responses are appropriate under certain circumstances: *4.3.2.4 The flight crew should respond to CPDLC messages as soon as practical after they are received. For most messages, the flight crew will have adequate time to read and respond within one minute. However, the flight crew should not be pressured to respond without taking adequate time to fully understand the CPDLC message and to satisfy other higher priority operational demands. If additional time is needed, the flight crew should send a RSPD-3 STANDBY response.*

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7. 747-8 and 787 SATCOM problems 7.1 The 747-8 and 787 aircraft occasionally experience undiagnosed SATCOM problems that have been shown to reduce performance. Aircraft operators are urged to assist Boeing and Rockwell Collins with investigating these problems by promptly submitting service requests to Boeing for SATCOM problems and by providing any requested information (such as SDU logs). The same recommendation to operators applies whenever SATCOM issues are reported/suspected on any other individual airframes.	*Promptly submit service requests to Boeing for SATCOM problems and provide any requested information (such as SDU logs).*
8. Unknown causes 8.1 If a data link performance problem has an unknown cause, then the DLMA recommends submitting a problem report at http://www.fans-cra.com/ so that the DLMA and other involved stakeholders can attempt to determine the cause.	*Submit problem reports at http://www.fans-cra.com/*
9. Software updates 9.1 Aircraft and avionics manufacturers work persistently on fixing problems that have been identified in data link operations. Periodically new software releases are issued that solve some of the problems that have been identified. Some of those fixes may improve data link performance and most of them fix issues that cause problems for pilots and air traffic controllers in the use of data link. 9.2 To ensure the best possible functioning of the NAT air traffic control system it is of utmost importance that aircraft operators take care to always operate the latest available FANS 1/A related software version in aircraft that fly in the NAT high level airspace and to ensure that the aircraft systems are configured in an optimal manner. A list of recommended aircraft avionics software versions is provided in the table below. 9.3 It should be noted that new software versions that fix several known data link problems will become available for many aircraft types within the next year. Operators are advised to seek information from aircraft manufacturers about the status of those new software releases.	*Update FANS 1/A related software using the list of recommended aircraft avionics software versions provided in the table below.*

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RECOMMENDED AVIONICS DATA LINK SOFTWARE VERSIONS

Recommended software versions for NAT data link operations			
Aircraft type	**FANS software**	**ACARS software**	**Notes**
A318/A319/A320/A321	CSB7.4 or CSB9	CSB7.4 or CSB9	Aircraft with Thales FMS: S8
A330/A340	CLR7.4 or CLR9	CLR7.4 or CLR9	Aircraft with Thales FMS: T6
A350	CLV1.3.1	S4	
A380	CLA4.1	S2.1	
MD11	FMS Pegasus -923	Refer to applicable Service Bulletins and/or STCs	
B736/7/8/9	FMS U11, U12, or U13		
B744	With original FMS: Load 16		
	With B748 FMS: BPV4.0		
B748	FMS BPV4.0		
B75x	Pegasus I FMC – Peg '09 Pegasus II FMC – BP1		
B76x			
B77X	With AIMS-1: BPV16		
	With AIMS-2: BPV17a.1		
B78X	CMF BPV5		
Beechcraft 4000	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs
Bombardier Learjet 35, 36, 35A, 36A, 40, 40XR, 45, 45XR, 60, 60XR	Universal Avionics FMS SCN 1002.1	Universal Avionics UniLink UL-80X SCN 31.3	
Bombardier Challenger 300, 350	Collins Proline 21 Advanced	Collins RIU-4000	

Recommended software versions for NAT data link operations			
Aircraft type	**FANS software**	**ACARS software**	**Notes**
Bombardier Challenger 600, 601, 601-1A, 601-3A, 601-3R, 604	Universal Avionics FMS SCN 1002.1	Universal Avionics UniLink UL-80X SCN 31.3	
Bombardier Challenger 600, 601, 601-1A, 601-3A, 601-3R	Honeywell NZ6.1.1	Honeywell CMU MK II+	
Bombardier Challenger 605, 650	Collins Proline 21 Advanced	Collins CMU-4000	
Bombardier Global 5000 GVFD	Collins Proline Fusion	Collins DLCA-6000	
Bombardier Global 6000	Collins Proline Fusion	Collins DLCA-6000	
Bombardier Global Express, Global Express XRS, Global 5000	Honeywell NZ6.1.1	Refer to applicable Service Bulletins/STCs	
Bombardier Global 7500	Collins Proline Fusion	Collins DLCA-6000	
Dassault F50, F50EX	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs
Dassault F50, F50EX	Honeywell NZ6.1.1	Honeywell CMU MK II+	3rd party STCs
Dassault F2000	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs
Dassault F2000 DX/EX/LX/S	Honeywell EPIC NZ7.1.2	Honeywell EPIC CMF 2.51	EASy II 4th Cert
Dassault F900, F900B, F900C, F900EX	Honeywell NZ6.1.1	Honeywell CMU MK II+	
Dassault F900 DX/EX/LX	Honeywell EPIC NZ7.1.2	Honeywell EPIC CMF 2.51	EASy II 4th Cert
Dassault F900B	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs
Dassault F7X	Honeywell EPIC NZ7.1.2	Honeywell EPIC CMF 2.51	EASy II 4th Cert
Dassault F8X	Honeywell NGFMS	Honeywell EPIC CMF 3.0	EASy III 2nd Cert
Embraer E135/145 "Legacy 600/650" business jet version	Honeywell NZ6.1.1	Honeywell CMU MK III Bld 1.29	
Embraer E170/190 "Lineage 1000" business jet version	Honeywell NGFMS	Honeywell EPIC CMF 3.0	
Embraer E170/175/190/195	Honeywell NGFMS	Honeywell EPIC CMF 3.0	
Embraer E2-190/195	Honeywell NGFMS	Honeywell EPIC CMF 3.3	
Gulfstream G100	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs

Recommended software versions for NAT data link operations			
Aircraft type	**FANS software**	**ACARS software**	**Notes**
Gulfstream G150	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	Gulfstream STC
Gulfstream G200	Collins Proline 4 (FMC SW 4.0)	Collins CMU-1000	Gulfstream STC
Gulfstream G200	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	Gulfstream STC
Gulfstream G200	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs
Gulfstream G280	Collins Proline Fusion	DLCA-6000	Production Standard
Gulfstream GII, GIIB, GIII	Honeywell NZ6.1.1	Honeywell CMU MK III Bld 1.29	3rd party STCs
Gulfstream GII, GIIB, GIII	Universal Avionics UNS-1	Universal Avionics UniLink UL-80X SCN 30.4	3rd party STCs
Gulfstream G450	Honeywell EPIC NZ7.1.2	Honeywell EPIC CMF 2.6	(ASC 912B)
Gulfstream G550	Honeywell EPIC NZ7.1.2	Honeywell EPIC CMF 2.6	(ASC 912B)
Gulfstream GIV, GIV-SP	Honeywell NZ6.1.1	Honeywell CMU MK III Bld 1.29	
Gulfstream GV, GV-SP	Honeywell NZ6.1.1	Honeywell CMU MK III Bld 1.29	
Gulfstream G650	Honeywell NGFMS	Honeywell EPIC CMF 3.0	(ASC 902B)
Gulfstream G500	Honeywell NGFMS	Honeywell EPIC CMF 3.1	(Type Cert)
Gulfstream G600	Honeywell NGFMS	Honeywell EPIC CMF 3.1	(Type Cert)

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