Network Manager
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EUROCONTROL

Data link Network Operational Status Report

February 2021

This report is the monthly 'Data link Network Operational Status Report' as identified in the DPMF Report Catalogue available from the DPMF OneSky team web site. It provides a summary of the operational status and technical performance of data link in Europe covering a rolling 12 month period for monthly statistics and a 15 week period for weekly statistics, ending in February 2021.

The report covers three main areas of the datalink operations in Europe:

1. Operational Status
2. Technical Performance
3. VDL Mode 2 Performance

For each of the three areas above different metrics are presented. A detailed definition of the metrics used in this report is available in the DPMF Report Catalogue. In the following report, the identifier for each metric used in the DPMF Report Catalogue is shown in angled brackets e.g. <N-1>.

Notes:

- The performance reports from 2021 onwards assess the technical performance of data link above the level from which each ATSU provides the data link service, using a single level for each Centre as described in https://ext.eurocontrol.int/WikiLink/index.php/Implementation_Status_Table
- As soon as new ANSPs are providing LISAT logs to DPMF, the metrics are updated accordingly (sometimes retroactively) and the values presented in this report might evolve from a report to another.
- As from August 2020 this report now includes data from LEBC, LEBM and GCCC (Spain) with data since March 2020
- As from September 2020 this report now includes data from EVRR (Latvia).
- As from December 2020 this report now includes data from DSNA (LFEE, LFFF, LFMM, LFRR and LFBB) with data since January 2020.

1. Operational Status

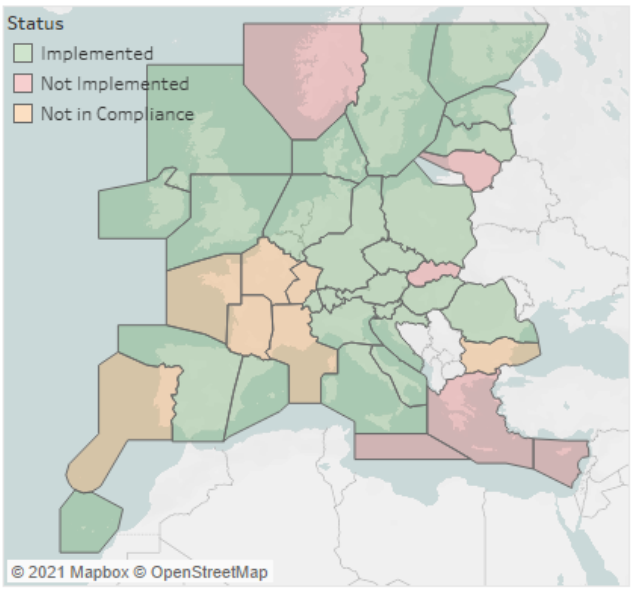
Figure 1 on the following page provides a status for each FIR/UIR covered by the DLS IR. The top map shows the operational status of each centre (<N-4>) as of end of February 2021. The map below shows which centres are providing LISAT data to NM as of end of February. The table on the right shows per centre for the month of February: i) the number of flights operating above FL285, ii) The Provider Abort rate (only for those centres providing LISAT data to NM), iii) what percentage of flights indicate that they are capable of performing CPDLC over the ATN (i.e. file 'J1') and iv) what percentage of the flights operating above FL285 are actually seen using CPDLC over the ATN

ANSPs with service limitations

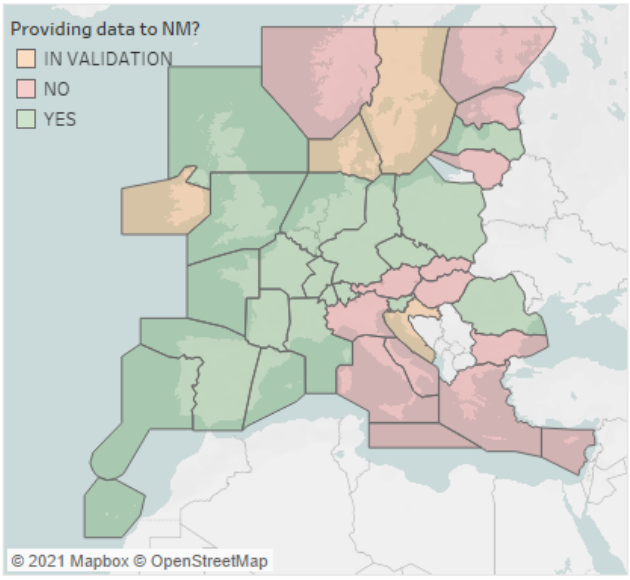
The table below explains the current service limitations.

Centre	Limitation of service
LPPC	Only the DLIC service is provided.
LFEE, LFFF, LFMM	DLIC, ACM, AMC services provided (no ACL).
LFRR, LFBB	DLIC, ACM, AMC and ACL services provided, but no downlink messages of ACL are supported.
LBSR	DLIC, ACL, ACM, AMC services provided but only for the SITA network.
EDUU	Airspace control in south-eastern part below FL315 is delegated to Munich ACC (EDMM). In this airspace DLS services are only available after prior coordination (i.e. when EDUU agrees to take/maintain control of flight).

Implementation Status



Providing Data to NM



Statistics

ATSU Code	Total Flights	PA Rate	% J1 Capable	% Us ing..
EDUU	37050	3.5	62%	27%
EDYY	31731	8.4	61%	29%
EETT	4317		64%	
EFIN	2701		69%	
EGPX	7766	10.5	56%	19%
EGTT	22107	7.6	56%	34%
EISN	10909		50%	
EKDK	7330		67%	
ENOR	4997		81%	
EPWW	13299	5.6	65%	29%
EVRR	5420	10.1	65%	14%
EYVL	5787		62%	
GCCC	3998	86.8	83%	6%
LBSR	18736		71%	
LCCC	8570		56%	
LDZO	10047		63%	
LECB	9208	7.8	68%	31%
LECM	18169	9.9	75%	37%
LFBB	13918	1.1	69%	36%
LFEE	16282	6.0	62%	19%
LFFF	13038	4.0	62%	21%
LFMM	14618	12.0	63%	24%
LFRR	12260	3.2	63%	25%
LGGG	11083		53%	
LHCC	14819		69%	
LIBB	5102		58%	
LIMM	9765		64%	
LIRR	9862		63%	
LJLA	4614	11.8	65%	32%
LKAA	11250	9.5	65%	33%
LMMM	2569		48%	
LOVV	14676		66%	
LPPC	6705		75%	
LRBB	15546	4.6	71%	29%
LSAG	7318	3.3	59%	23%
LSAZ	8004	5.6	57%	21%
LZBB	8046		66%	

Figure 1: Current operational status of data link over the ATN

CPDLC / ATN Flights

Figure 2 presents data only for flights operating above FL285 in the DLS airspace. It shows what percentage of flights in that airspace[1] file 'J1' in their flight plan <N-1>and what percentage indicate in the flight plan that the aircraft is exempt. For February 2021 63.1% of flights indicated the capability to perform CPDLC over ATN/VDL Mode 2 31.0% indicate they are exempt. The remaining 5.9% filed neither capability, nor exemption. Considering the known exceptions, NM is estimating that about 1.0% of the filed FPLs are likely contravening the DLS IR.

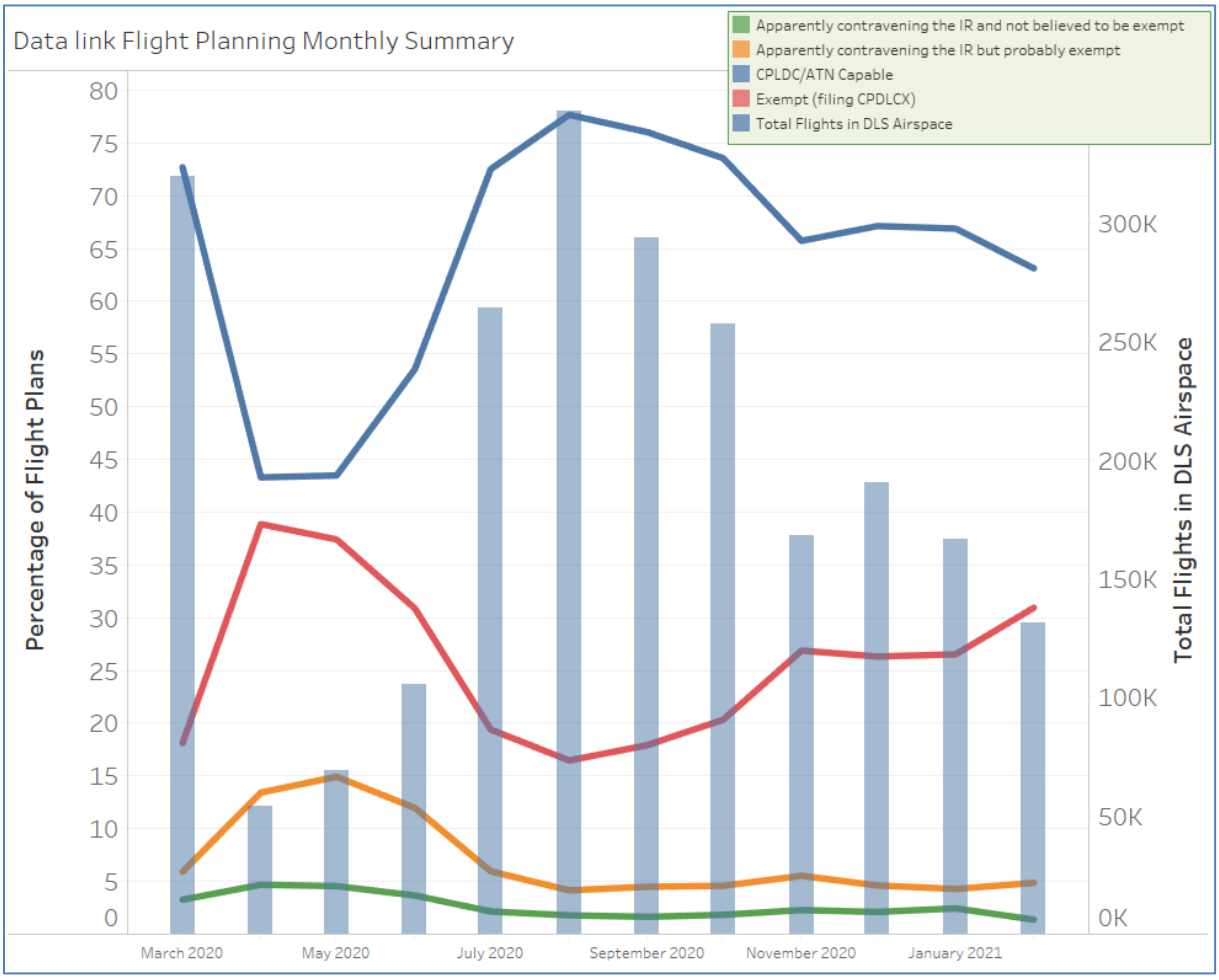


Figure 2: Proportion of flights capable of using CPDLC over ATN/ VDL Mode 2

[1] EHAAFIR, LOVVFIR, LECBUIR, LIBBUIR, EBURUIR, GCCCUIRN, GCCCUIRS, LFFFUIR, EDVVUIR, LPPCFIR, EGTTUIR, LECMUIR, LIMMUIR, EDUUUIR, LIRRUIR, EGPXUIR, EISNUIR, LZBBFIR, LRBBFIR, LHCCFIR, EKDKFIR, LJLAFIR, LCCCFIR, LKAAFIR, LBSRFIR, EPWWFIR, EFINFIR, LGGGUIR, LMMMUIR, EVRRUIR, ESAAUIR, EETTUIR, EYVLUIR.

2. Technical Performance

Overall Provider Abort Rate

Figure 3 below shows the PA rate <O-23> aggregated for all ANSPs providing data to LISAT[2]. The target value is 1 PA per 100 hours CPDLC (shown as a dashed line on the graph below). The overall average rate for February 2021 was 6.8 PAs per 100 hours.

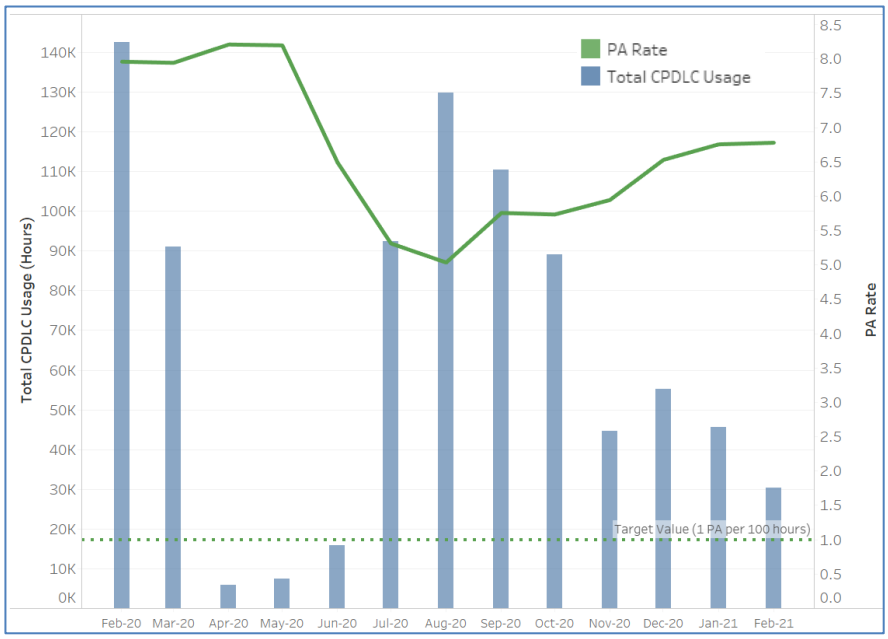


Figure 3: PA rate

Figure 4 below shows the PA rate of aircraft on the Logon List against aircraft not on the Logon List using only data from centers that do not support the Logon List[3].

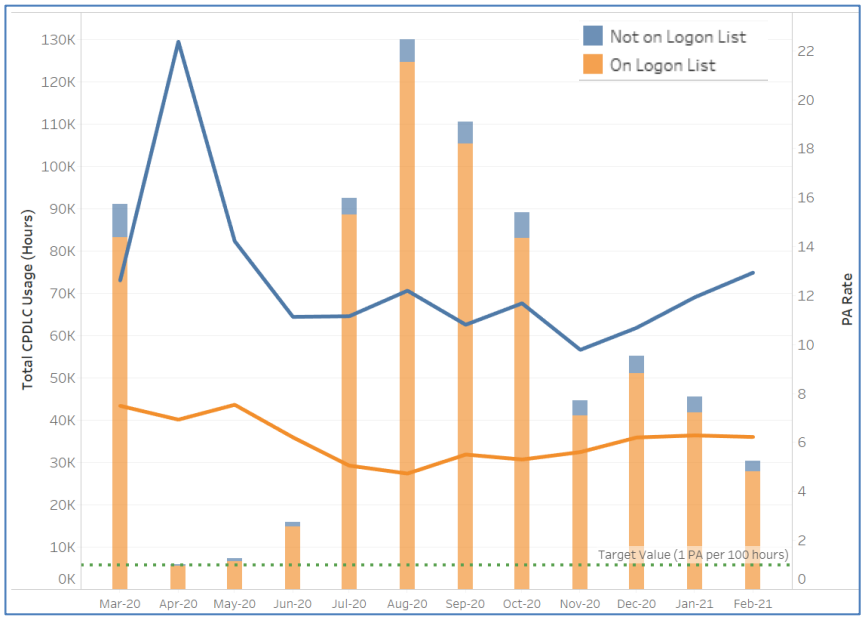


Figure 4: Logon Listed Aircraft PA rate

[2] Currently MUAC, Skyguide, DFS, NATS, ANS CZ, Slovenia Control, PANSA, ENAIRE, Latvia, Romatsa and DSNA.

[3] EDUU,EGTT,EGPX,LKAA,GCCC,LECB,LECM,LJLA,EPWW,.

PA rate per ACSP

Figure 5 below shows the PA rate per ACSP for aircraft on the Logon List.[4] The ACSP information is taken from the declarations made by the aircraft operators when adding their aircraft to the Logon List; 'BOTH' implies that the aircraft may use ARINC or SITA.

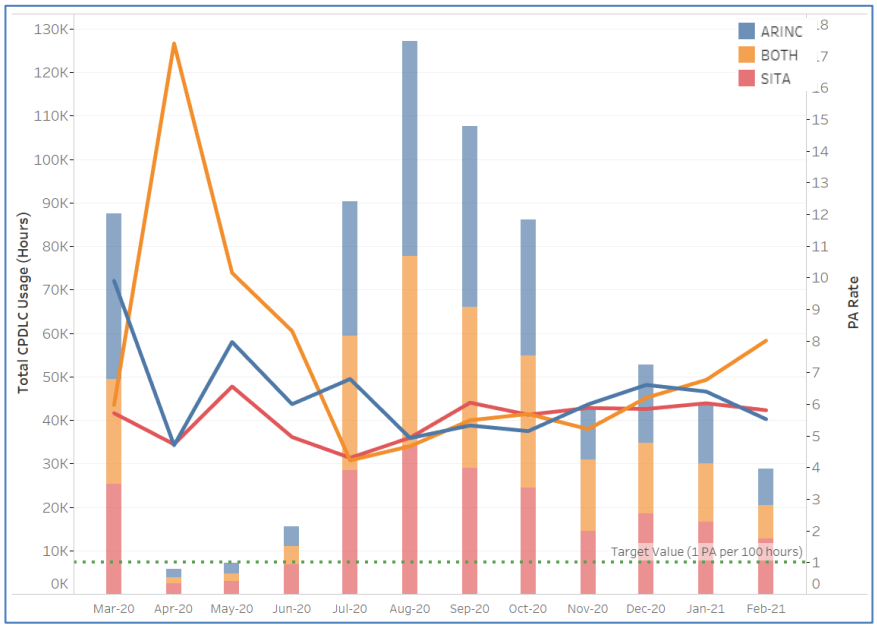


Figure 5: ACSP PA rate

Weekly PA rate per Centre

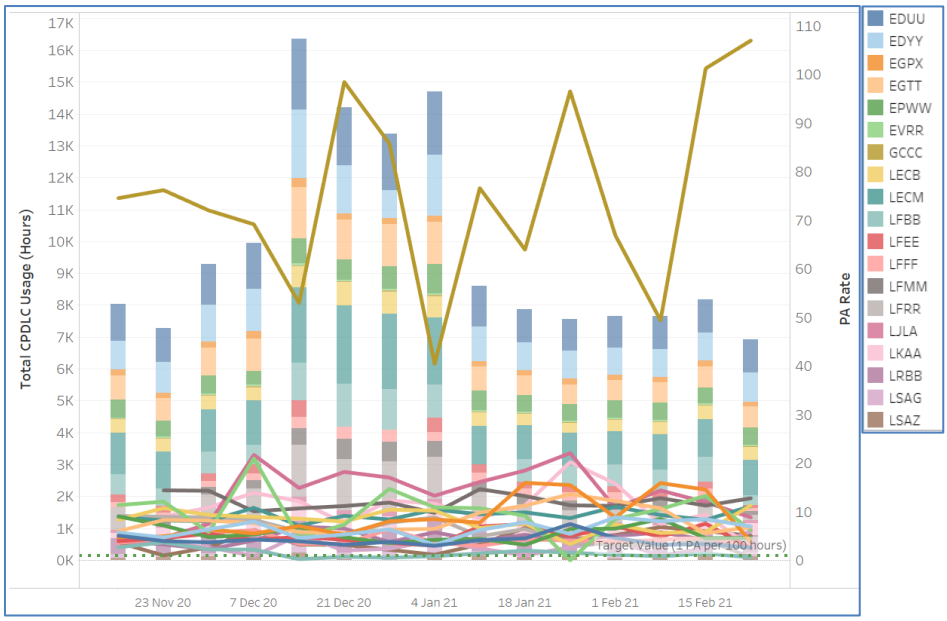


Figure 6: Weekly PA Rate per Centre

[4] At the beginning of 2021, RYR changed in the logon list the ACSP they were declaring to be connected to ("BOTH" was used before). Until the report of January 2021, the PA rate per ACSP was computed with RYR in the "BOTH" category. As there is no time information in the logon list for the change of ACSP by an airline operator, any change affects all the statistics retroactively. Since the January 2021 report the PA rate per ACSP was computed using the "new" logon list affecting hence the "BOTH" category retroactively. In order to keep pre-2021 statistics as they were before, a specific filter is now applied to keep RYR aircraft on the "BOTH" category before February 2021. This is the reason why the graph for the last report was different.

Weekly PA Rate for Major Aircraft Operators

Figure 7 below shows the weekly PA rate for the three aircraft operators with the lowest average PA rate and the three aircraft operators with the highest average PA rate from a list of the top 30 aircraft operators in terms of usage of CPDLC/ATN over the past 15 weeks.

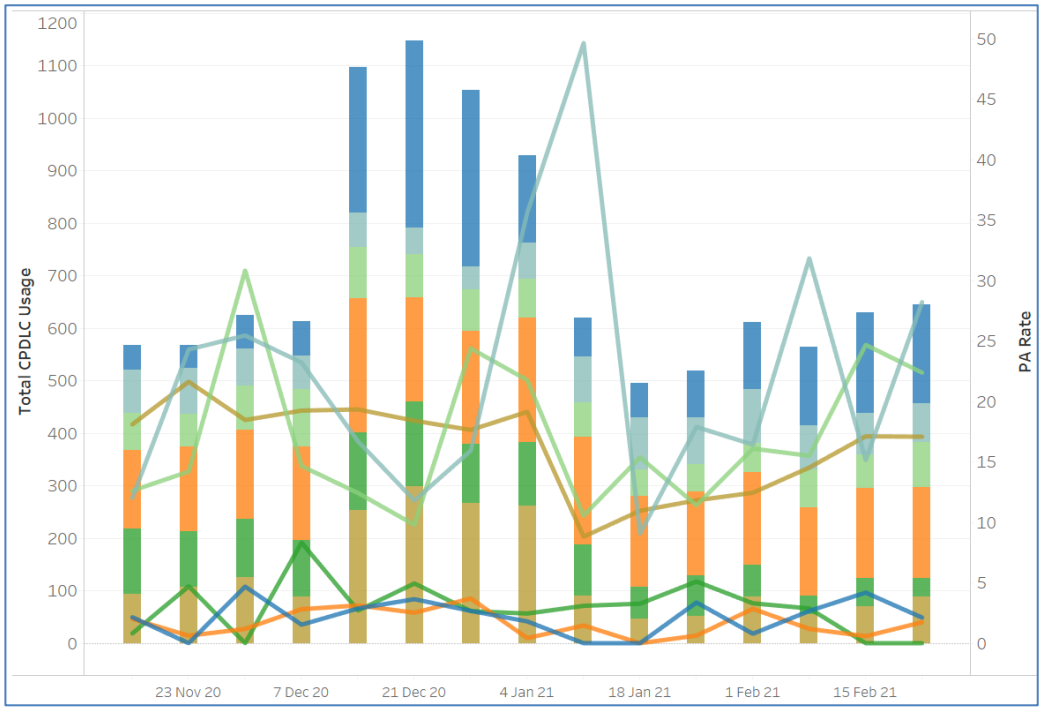


Figure 7: Top 3 and bottom 3 PA Rate for Major Aircraft Operators

Weekly PA Rate for 5 biggest CPDLC users

Figure 8 below shows the weekly PA rate for the five aircraft operators that have used CPDLC most over the past 15 weeks.

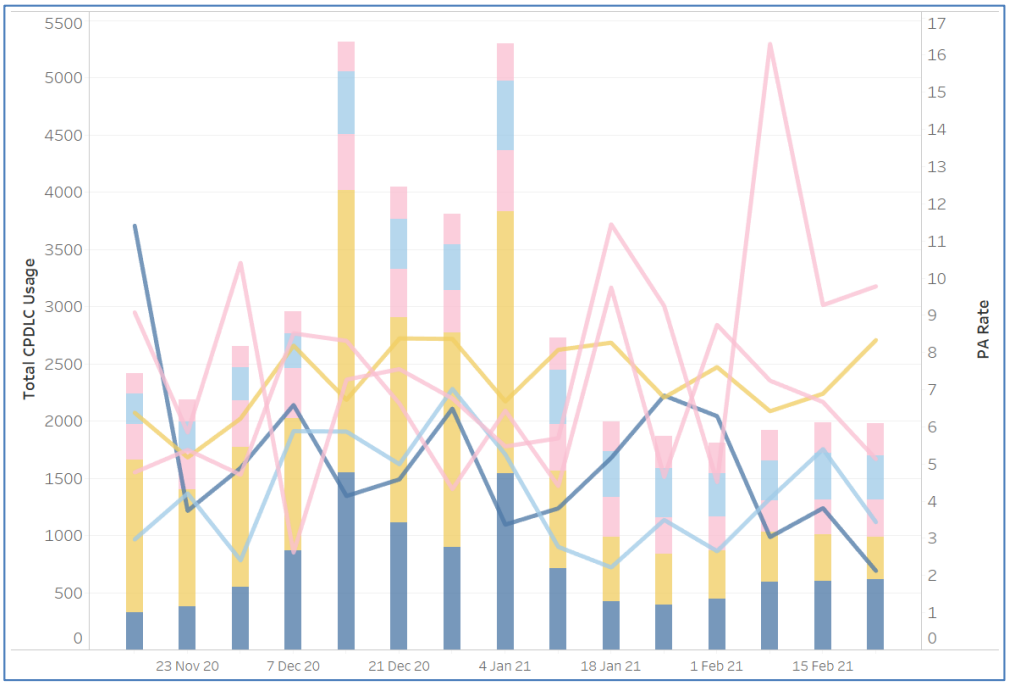


Figure 8: PA Rate of the 5 biggest users of CPDLC

Weekly PA Rate for various aircraft types

The figures below show the weekly PA rate for specific aircraft types for the five aircraft operators using CPDLC the most over the past 15 weeks with the particular aircraft type.

Airbus A320 Family

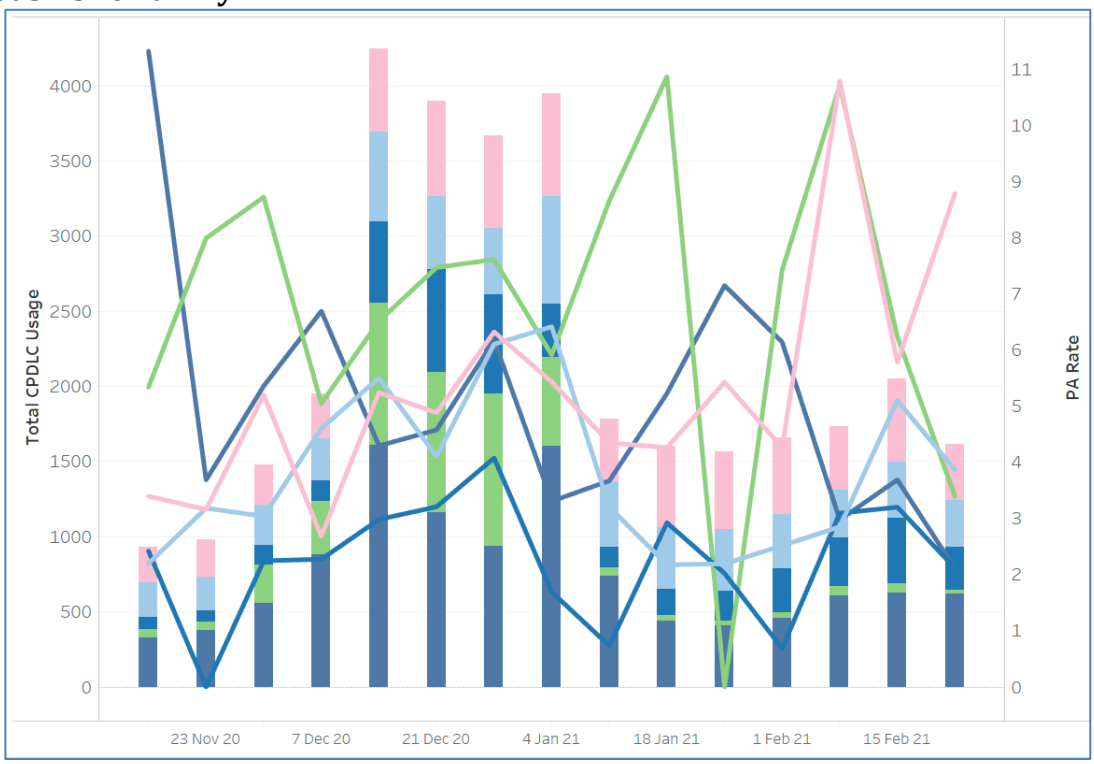


Figure 9: A320 Family (A318/319/320/321/20N/21N) Aircraft Operator PA Rates

Boeing B737 Family

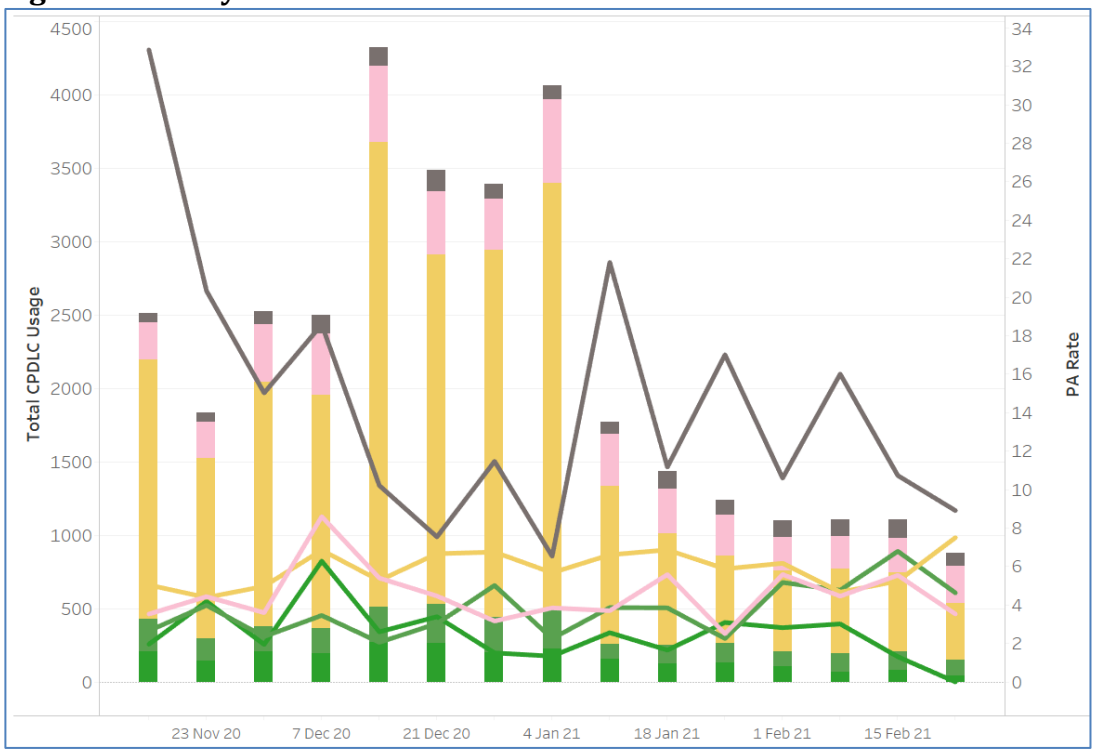


Figure 10: B737 Family Aircraft Operator PA Rates

Technical Round Trip Delay

Figure 11 below shows the 95th and 99th percentile of the technical round trip delay <O-2><O-3>. It represents the delay between when a message is uplinked and the ground system receives the corresponding application level acknowledgement (aggregated for all systems providing data to LISAT). As agreed during DPMG8, the TRTD is now computed taking into account downlinked error messages. This has resulted in an increase of the 99th percentile value.

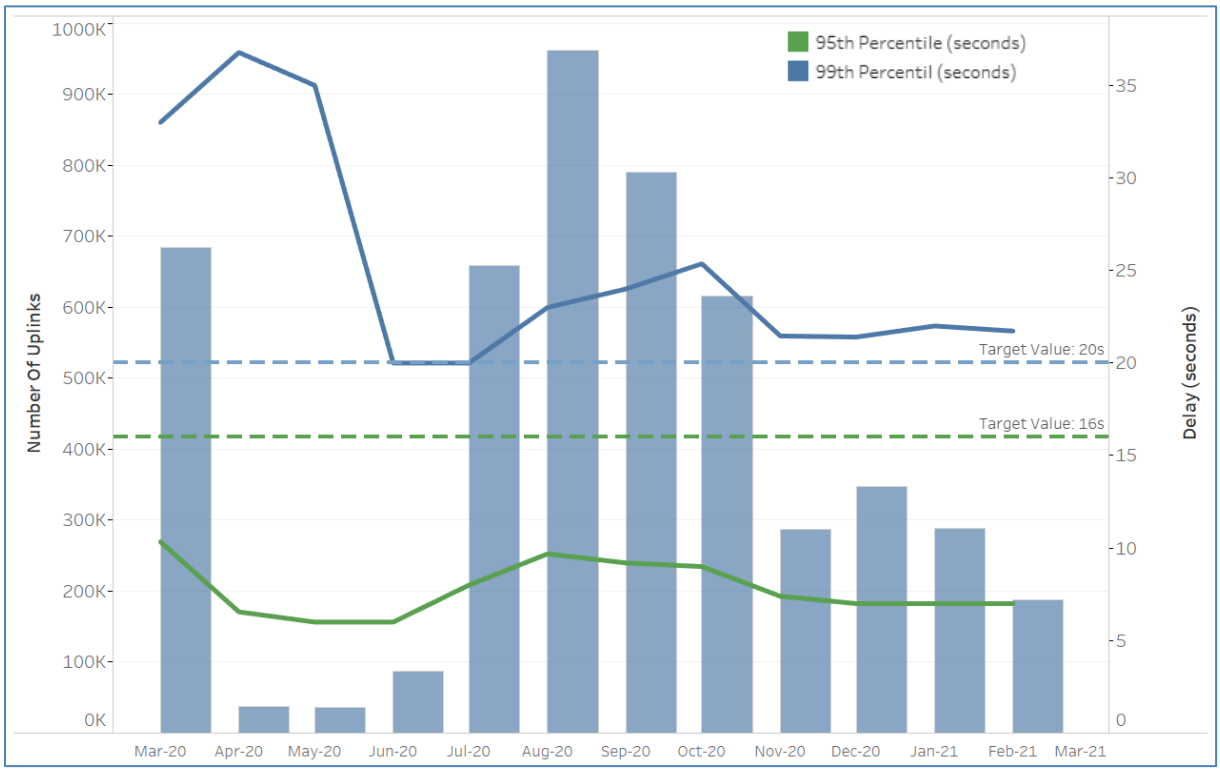


Figure 11: Technical Round Trip Delay

Technical Continuity

The graph below shows the 'Technical Continuity" (<0-25>). This is the probability that a LACK is received for an uplink message before the technical response timer expires i.e. within 40 seconds.

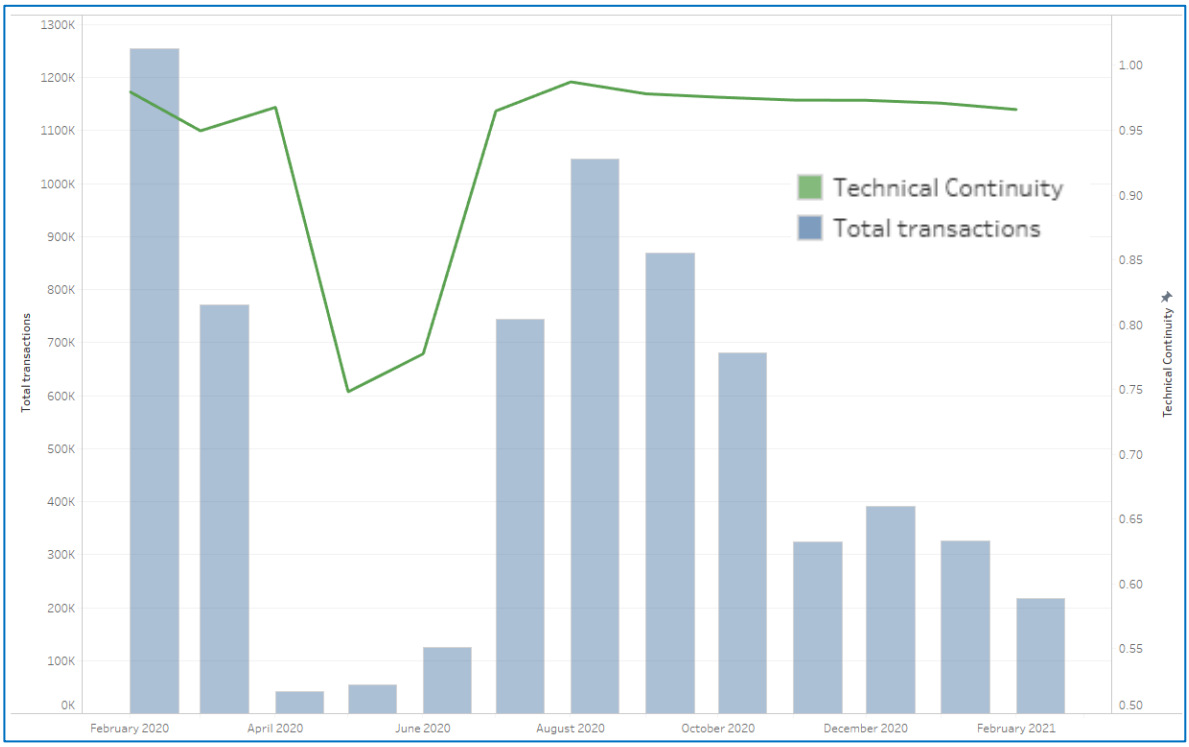


Figure 12: Technical Continuity

N.B.: The way this metric is calculated is now correct (compared to previous reports) and taking into account messages which do not receive a LACK.

3. VDL Mode 2 Performance

The following metrics[5] are computed based on the available data from the VGS logs provided each month to the DPMF by ARINC and SITA. These logs contain the AVLC traffic recorded at each VGS during the 24hrs of the first Friday[6] of each month.

AVLC Round Trip Time for the first Friday of the month.

The graph below shows the cumulative distributions per frequency (and per CSP) for the AVLC Round Trip Time (RTT) of acknowledged AVLC INFO frames conveying ATN packet to Logon-List aircraft and considering all the VGS logs. The 95th and the 99th percentile of ED-120 together with the 95th and the 99.9th percentile of ED-228A are also provided for comparison purposes and tabulated values are reported in the legend. Please note the logarithmic scale of the RTT.

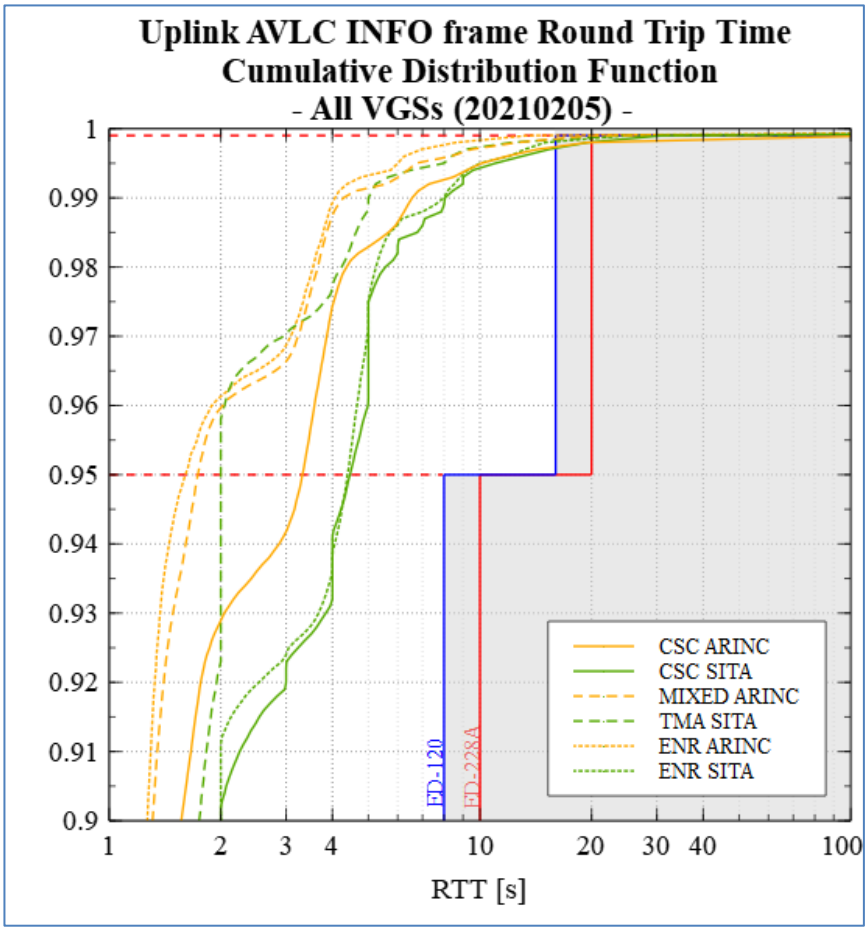


Figure 13: AVLC Round Trip Time

Important note: SITA is providing logs for all their users whereas ARINC is only providing data for their 28 largest ATN users as well as non-AOC users. Moreover, ARINC is providing logs for all their European VGSs whereas SITA is only providing logs of VGSs from which they have access to (mainly: Norway, Sweden, UK, The Netherlands, Germany, Czech Rep., France, Switzerland, Austria and Spain). Therefore the CSPs data does not represent the behaviour of their network as a whole. The trend information for each CSP is valuable and useful but the comparison between the two CSPs is problematic since different data sets are being compared.

[5] The *Channel load*, the *AVLC RTT distribution* and the *number of retransmission distribution* are defined in the DPMF report catalogue.

[6] Friday is observed to have the highest flight traffic of the week.

Number of retransmissions for the first Friday of the month.

The graph below shows the cumulative distributions per frequency (and per CSP for the CSC) for the number of retransmissions needed before acknowledgement of uplink AVLC INFO frames conveying ATN packet to Logon-List aircraft considering all the VGS logs. N=0 represents successes on the first attempt, N=1 to N=5 represent successes on the first to the fifth retransmissions and N>5 represents N2T1 events.

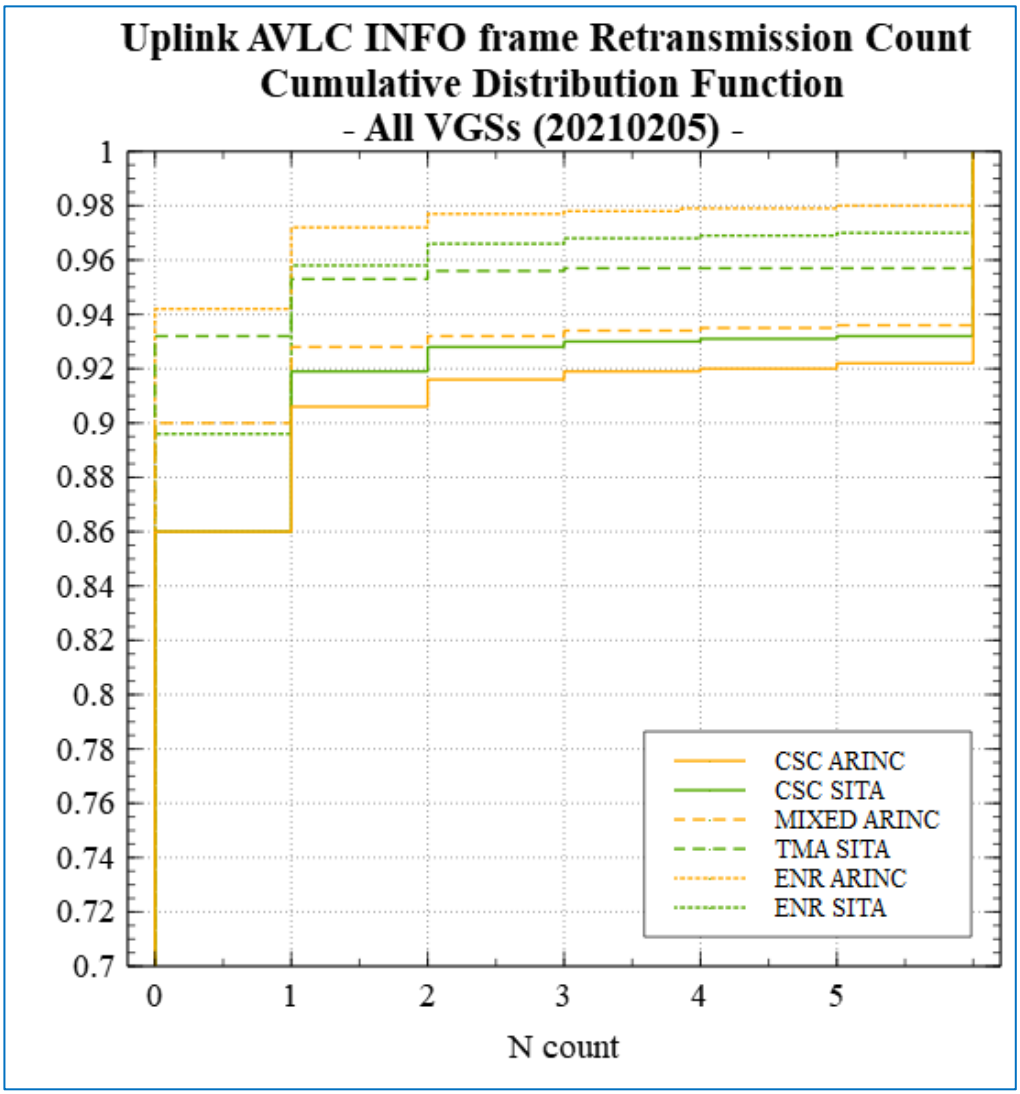


Figure 14: AVLC Uplink INFO frame retransmission count

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AVLC Round Trip Time per frequency trend

The following set of graphs show the 95th and the 99th percentile of the AVLC RTT (in seconds) of acknowledged AVLC INFO frames conveying ATN packet to Logon-List aircraft for the first Friday of each month for each frequency with the CSC split over the two CSPs. The RTT axis has a logarithmic scale with the same range for the different frequencies. The graphs also shows the number of AVLC frames taken into account in the percentiles calculations (Frame count in linear scale) and the 95% confidence interval (gray area).

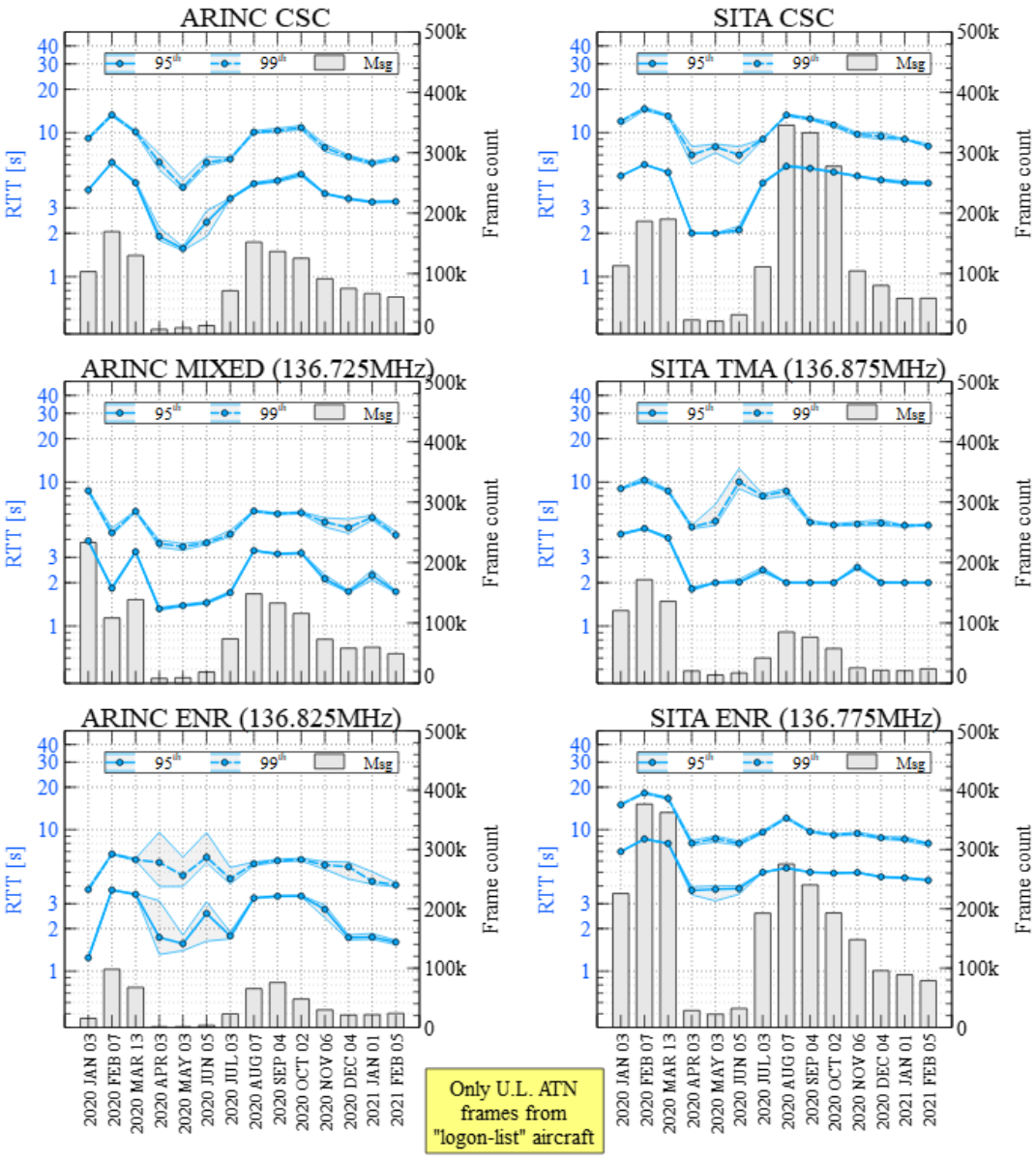

Figure 15: AVLC Uplink INFO Round Trip Time per Frequency

Important note: SITA is providing logs for all their users whereas ARINC is only providing data for their 28 largest ATN users as well as non-AOC users. Moreover, ARINC is providing logs for all their European VGSs whereas SITA is only providing logs of VGSs from which they have access to (mainly: Norway, Sweden, UK, The Netherlands, Germany, Czech Rep., France, Switzerland, Austria and Spain). Therefore the CSPs data does not represent the behavior of their network as a whole. The trend information for each CSP is valuable and useful but the comparison between the two CSPs is problematic since different data sets are being compared.

Uplink delivery success rate

The following set of graphs show the uplink delivery rate of AVLC INFO frames conveying ATN packet to Logon-List aircraft for the first Friday of each month for each frequency with the CSC split over the two CSPs. It is the probability that an AVLC uplink INFO frame is correctly delivered to the aircraft (ACK received). The graphs also shows the number of AVLC frames taken into account in the calculations (Msg count in linear scale = AVLC frame count sent on first attempt) and the 95% confidence interval (gray area).

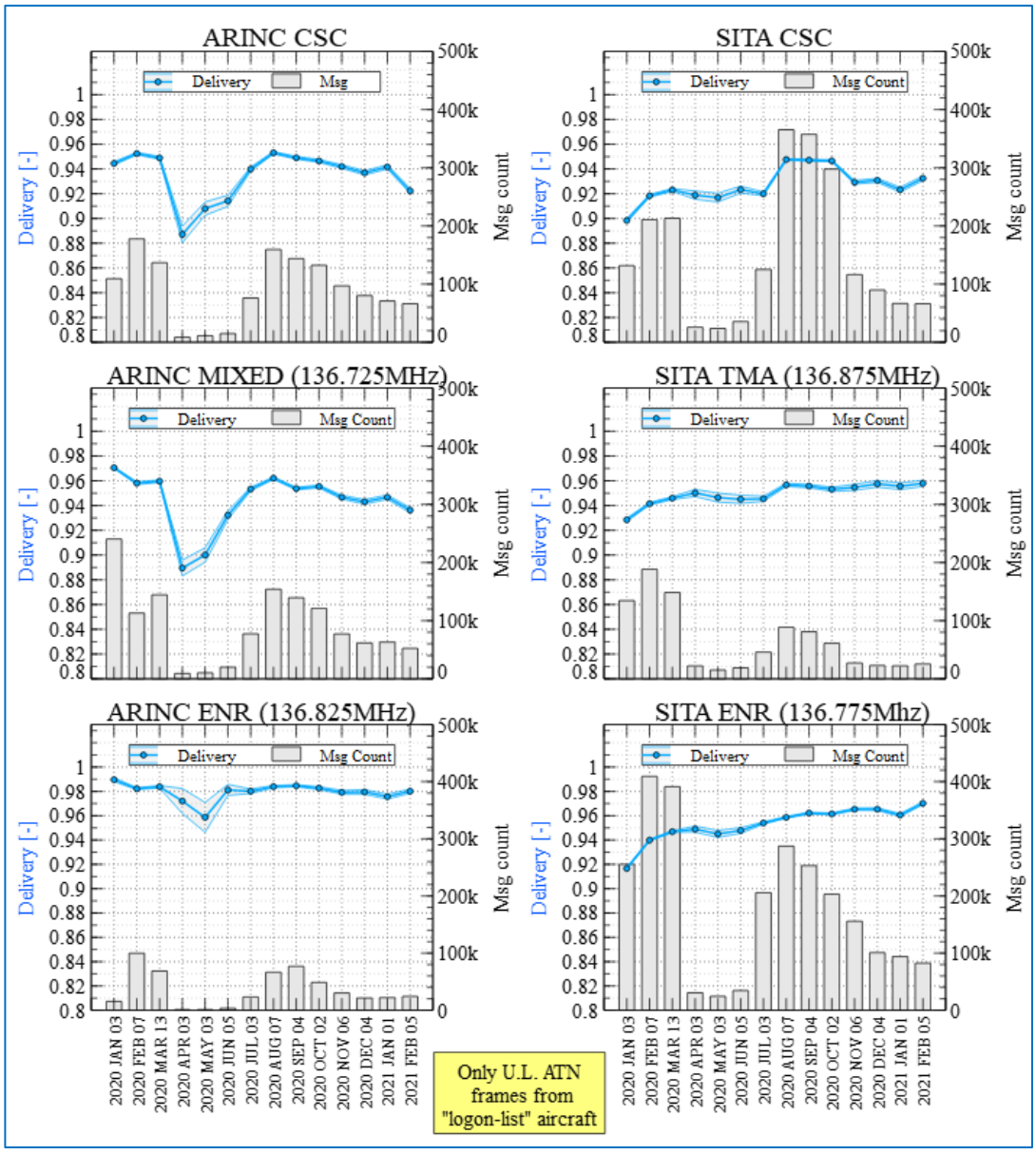

Figure 16: AVLC successful delivery rate per frequency

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Channel load per frequency trend

The following set of graphs show the channel load per AVLC payload type (ATN, AOA and AVLC protocol related frames[7]) for the first Friday of each month for each frequency with the CSC split over the two CSPs. The channel load is expressed in megabytes with the same range for the different frequencies.

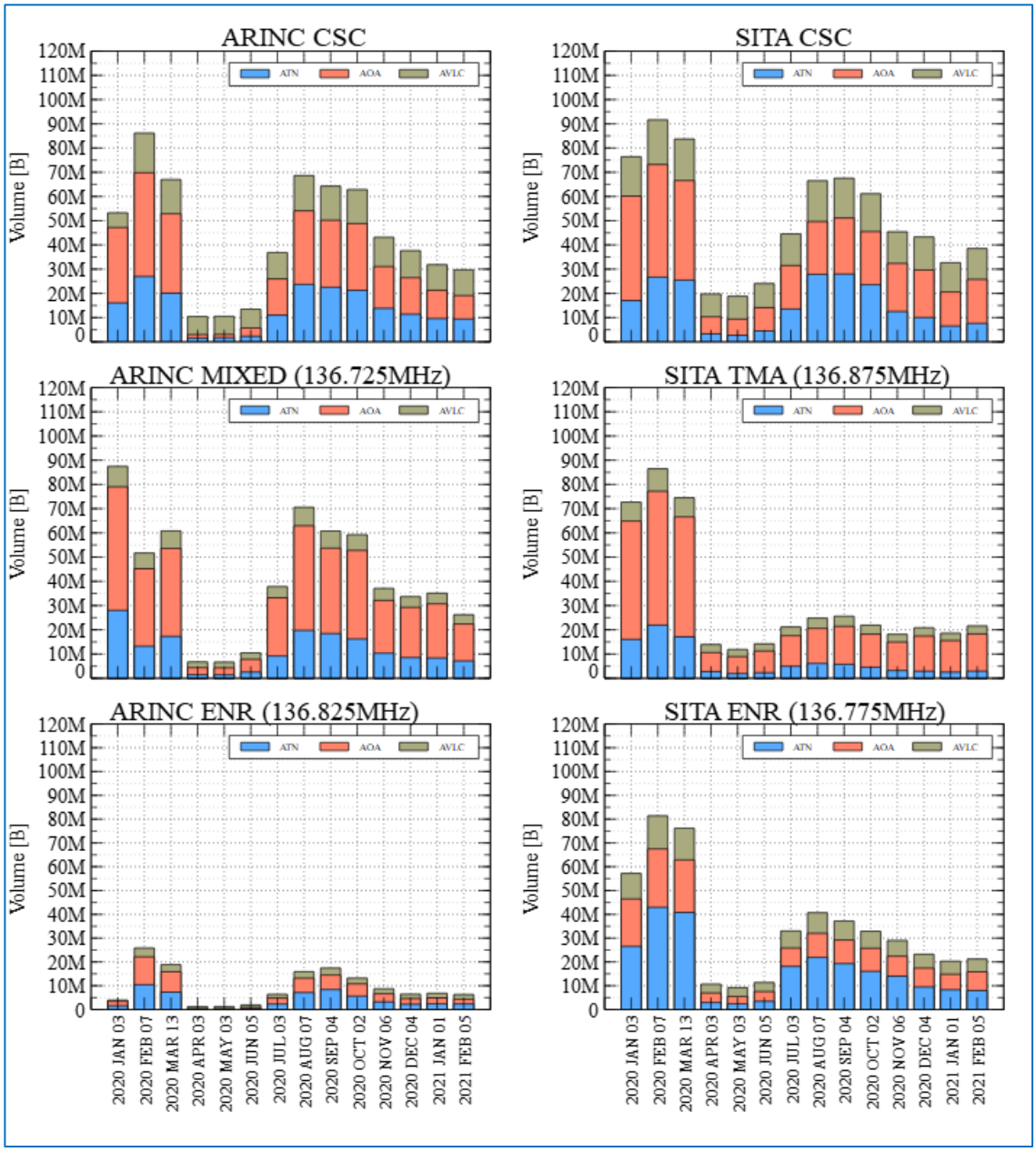

Figure 17: AVLC Channel load per frequency

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[7] i.e. RR, SREJ, XID, …