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EUROCONTROL

Data link Network Operational Status Report

June 2020

This report is the '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.

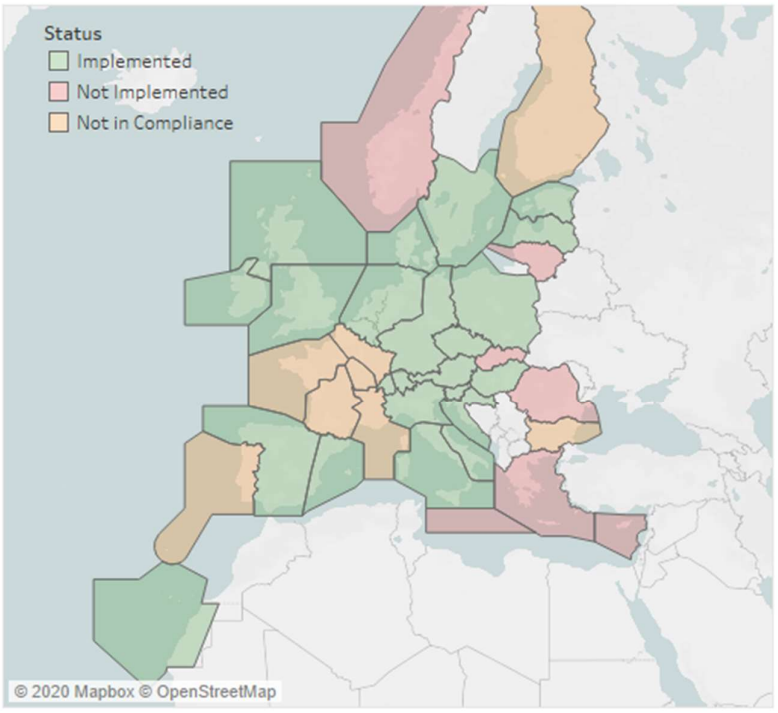
A definition of the metrics used in this report is available in the DPMF Report Catalogue, the identifier for each metric is shown in angled brackets e.g. <N-1>.

NB 1: Between the end of July and the middle of December 2019 the data for EDYY and EDUU is incomplete with no data at all for some flights and just partial data for some flights. So data for EDUU and EDYY is not representative and any total counts of flights etc. are underestimated in that period.
NB 2: As from 1st January 2020 this report now also includes data from EPWW (Warsaw).

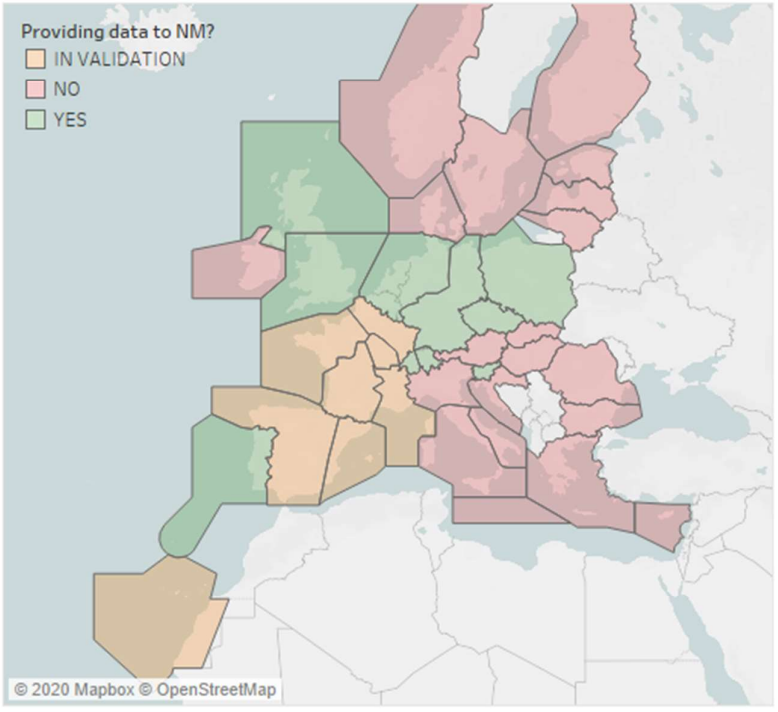
Operational Status

Figure 1 on the following page provides a status and performance summary for each FIR/UIR. The format has changed from previous reports and any feedback on the new format is welcome. The top map shows the operational status of each centre (<N-4>). The map below shows which centres are currently providing LISAT data to NM. The table on the right shows per centre: 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.

Implementation Status



Providing Data to NM



Statistics

Ats Code	Total Flights	PA Rate	% J1 Capable	% Using..
EDUU	35804	3	56%	24%
EDYY	30020	6	52%	27%
EETT	4938		45%	
EFIN	2487		63%	
EGPX	7179		51%	
EGTT	21125		51%	
EISN	8524		47%	
EKDK	7741		52%	
ENOR	5174		75%	
EPWW	10268		55%	
EVRR	6114		49%	
EYVL	4950		55%	
GCCC	1545		58%	
LBSR	13584		59%	
LCCC	4724		41%	
LDZO	9230		59%	
LECB	5561		60%	
LECM	9154		58%	
LFBB	8378		54%	
LFEE	12998		51%	
LFFF	10143		50%	
LFMM	11403		50%	
LFRR	9659		54%	
LGGG	9184		48%	
LHCC	14444		63%	
LIBB	3667		51%	
LIMM	8637		53%	
LIRR	8333		54%	
LJLA	4388	8	59%	27%
LKAA	10541	10	56%	29%
LMMM	1481		33%	
LOVV	14598		60%	
LPPC	3901		62%	
LRBB	11172		57%	
LSAG	5950	3	48%	18%
LSAZ	6808	5	47%	22%
LZBB	7714		56%	

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

ANSPs with service limitations

The table below explains the limitations of service for those centres shown in yellow in 'Implementation Status' map on Figure 1 i.e. those centres that provide data link but not in full compliance with (EC) No 29/2009 as amended.

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 service provided, but no downlink messages of ACL are supported.
EFIN	DLIC, ACL, ACM, AMC but only for the SITA network.
LBSR	DLIC, ACL, ACM, AMC but only for the SITA network.

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 June 2020 53.1% of flights indicated the capability to perform CPDLC over ATN/VDL Mode 2 and 31% indicate they are exempt.

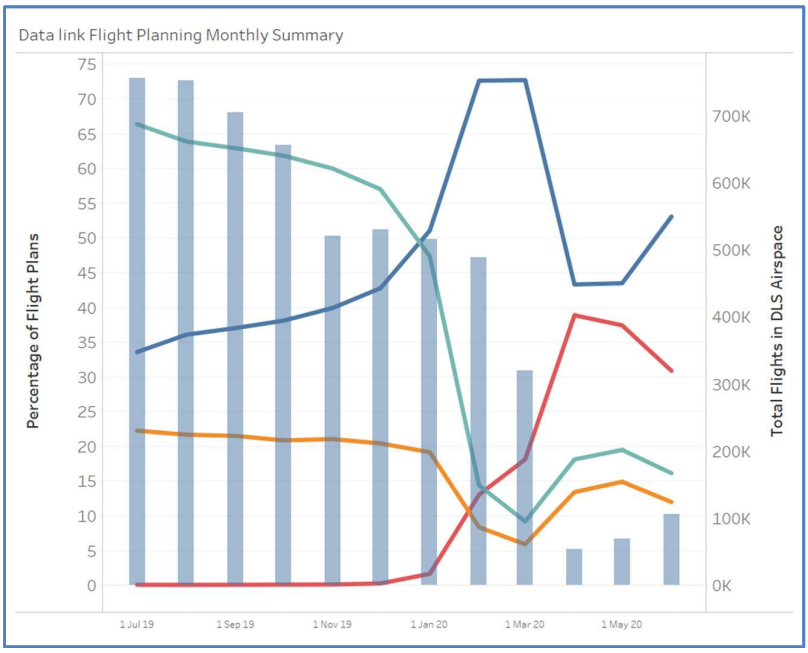


Figure 2: Proportion of flights capable of using CPDLC over ATN/ VDL Mode 2

For those centres providing data to the DPMF (see Figure 4 below) an average of 25% of flights logged on to data link over the month.

[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.

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 June 2020 was 4.8 PAs per 100 hours.

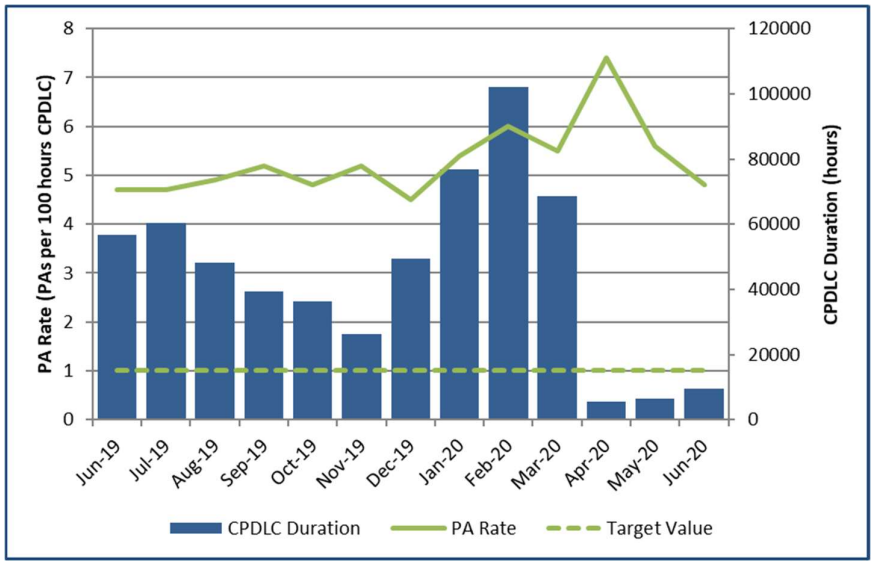


Figure 3: PA rate

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

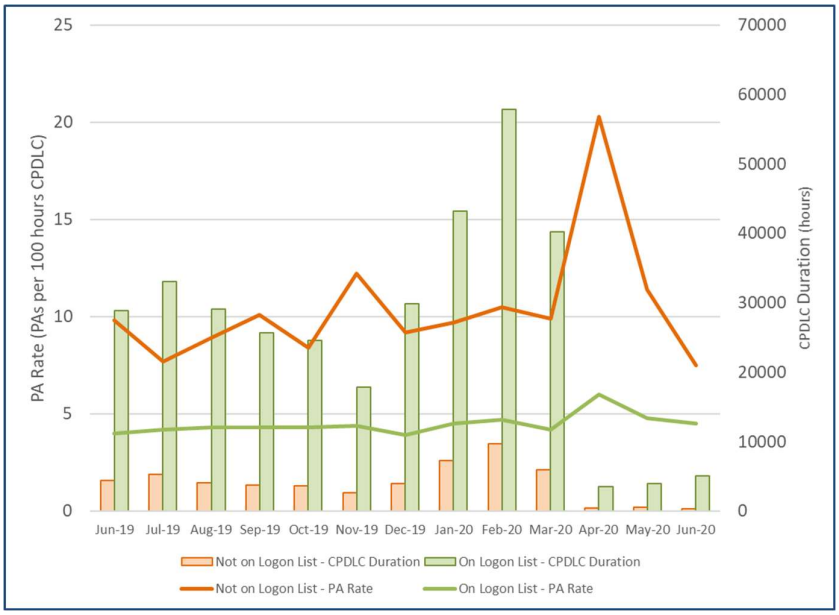


Figure 4: Logon Listed Aircraft PA rate

[2] Currently MUAC, Skyguide, DFS, NATS, ANS CZ, Slovenia Control and PANSA. ENAIRE and DSNA have started to provide data but it is still being validated and so is not included in this report.
[3] EDUU,EGTT,EGPX,LKAA,LJLA,EPWW.

PA rate per ACSP

Figure 5 below shows the PA rate per ACSP for aircraft on the Logon List. 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.

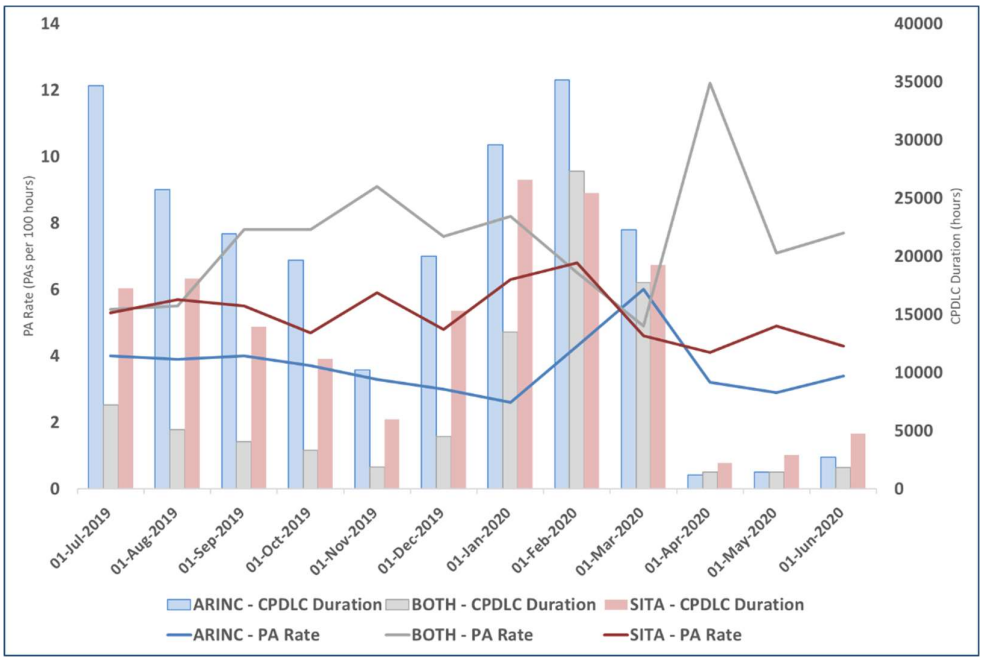


Figure 5: ACSP PA rate

Weekly PA rate per Centre

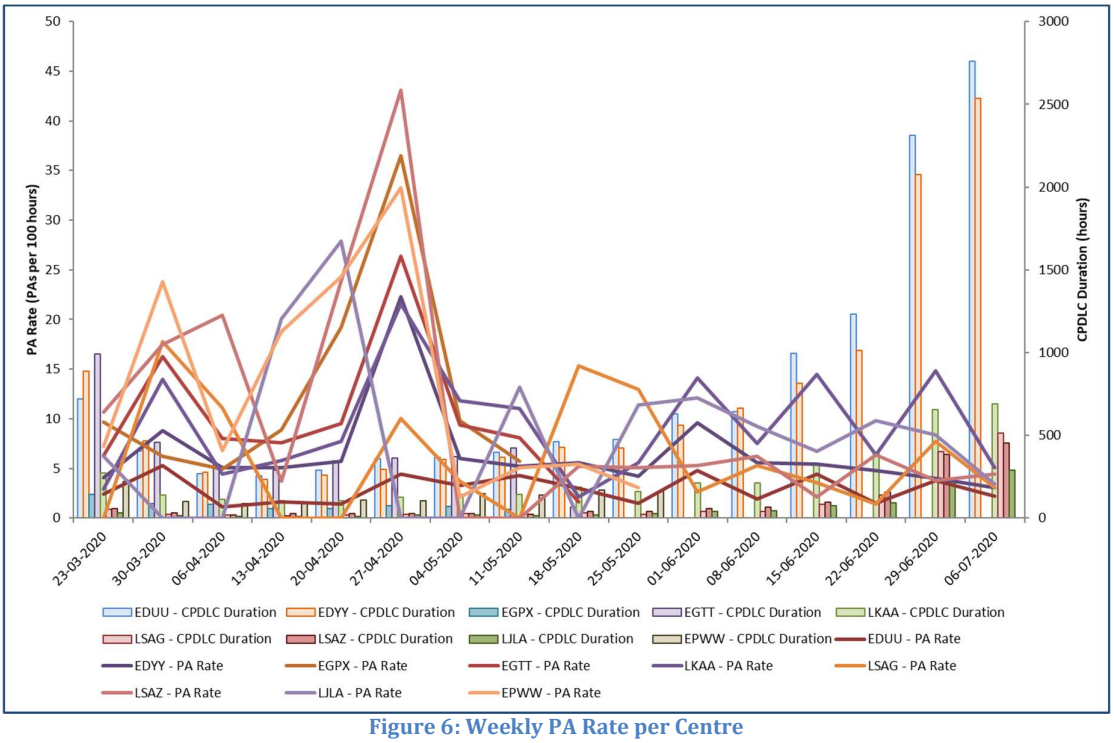


Figure 6: Weekly PA Rate per Centre

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. The large variations in the individual PA rate after mid-March is due to the very low level of traffic and so is probably not significant.

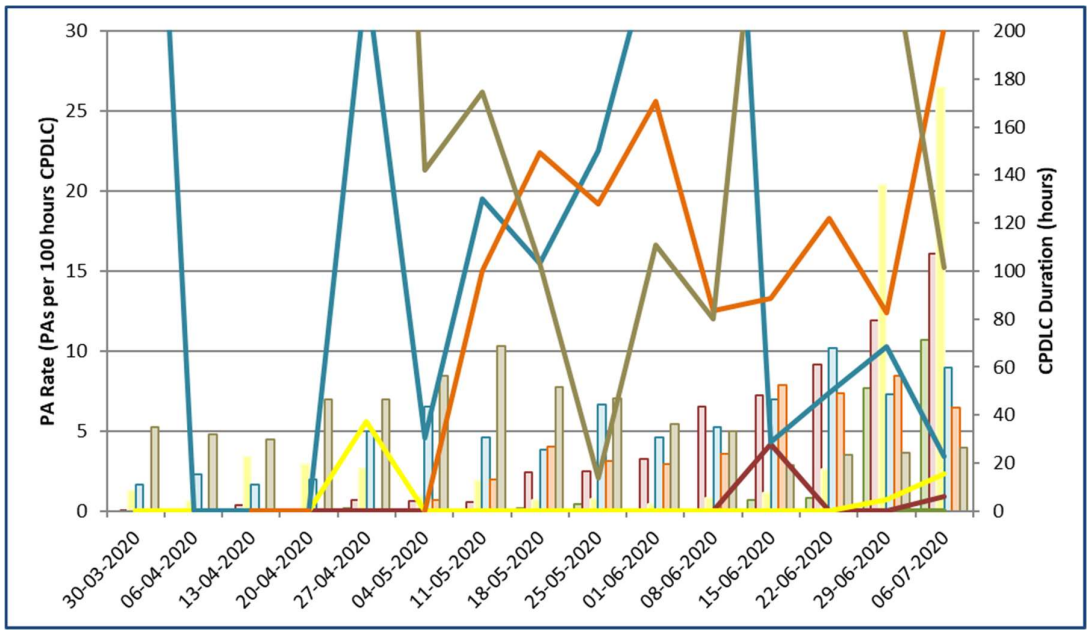


Figure 7: Top 3 and bottom 3 PA Rate for Major Aircraft Operators

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.

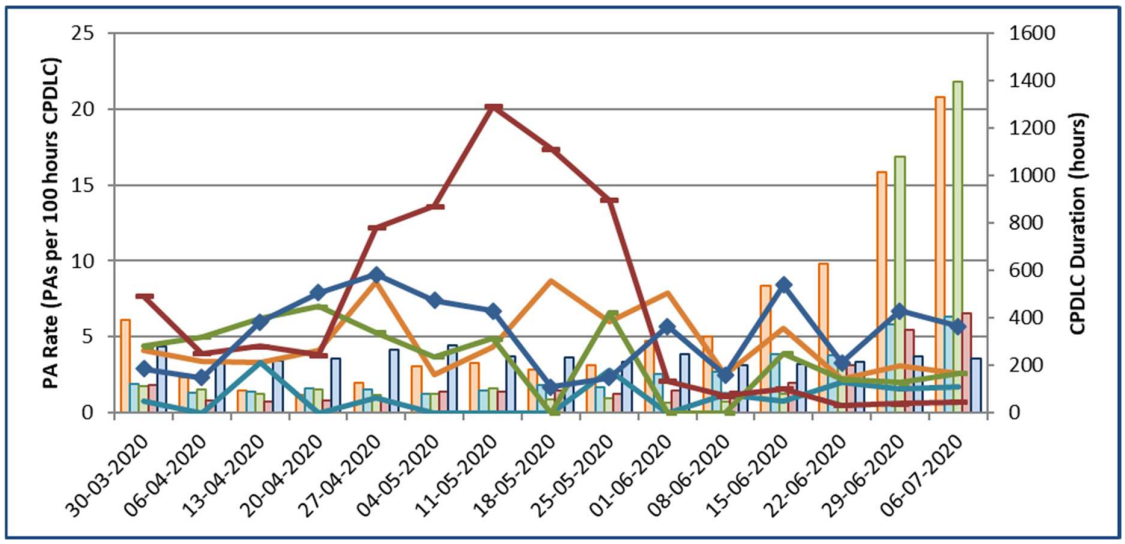


Figure 8: PA Rate of the 5 biggest users of CPDLC

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

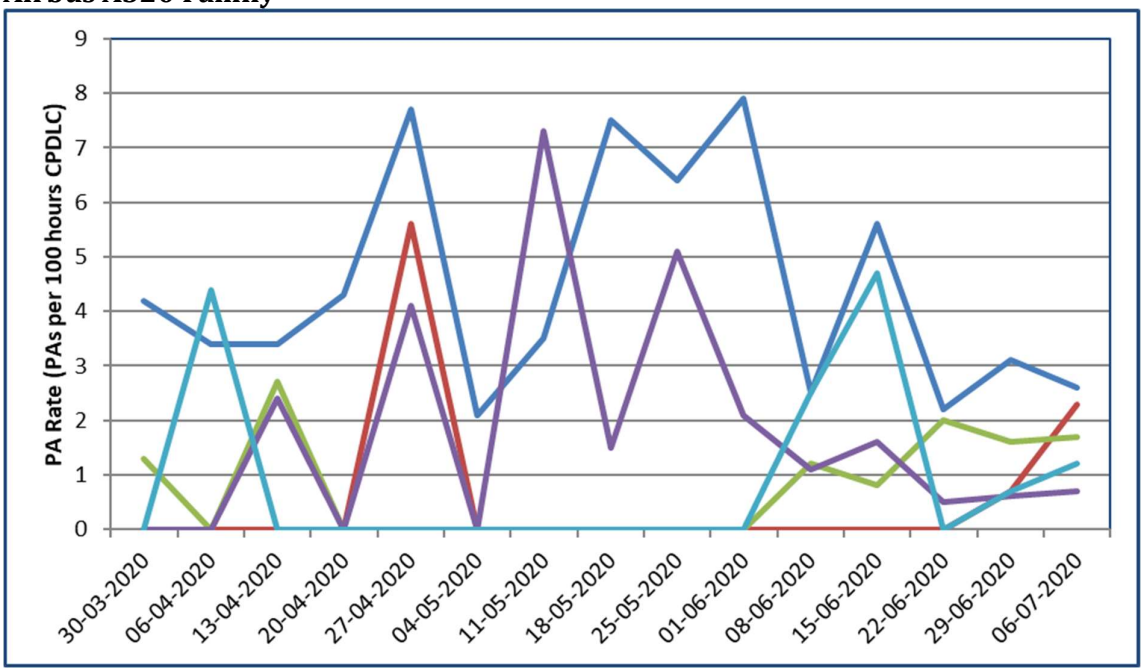


Figure 9: A320 Family (A318/319/320/321/20N/21N) Aircraft Operator PA Rates

Boeing B737 Family

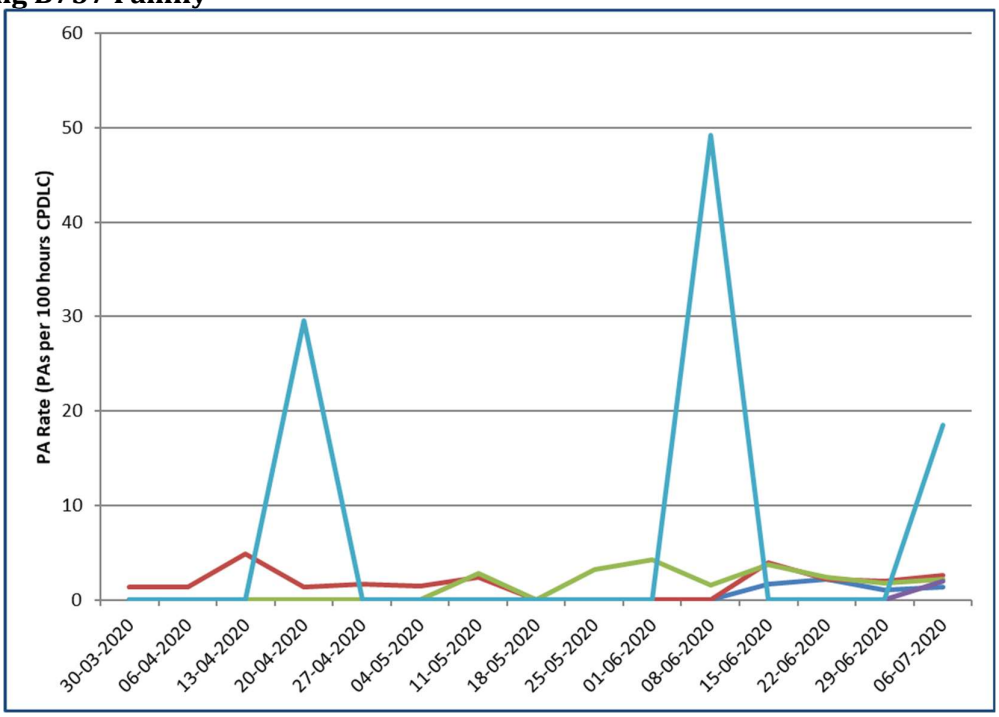


Figure 10: B737 Family Aircraft Operator PA Rates

The peaks in PA rate in teal blue line are caused by the fact that there is very little data so a small number of PAs can cause a very high PA rate. This is not significant.

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).

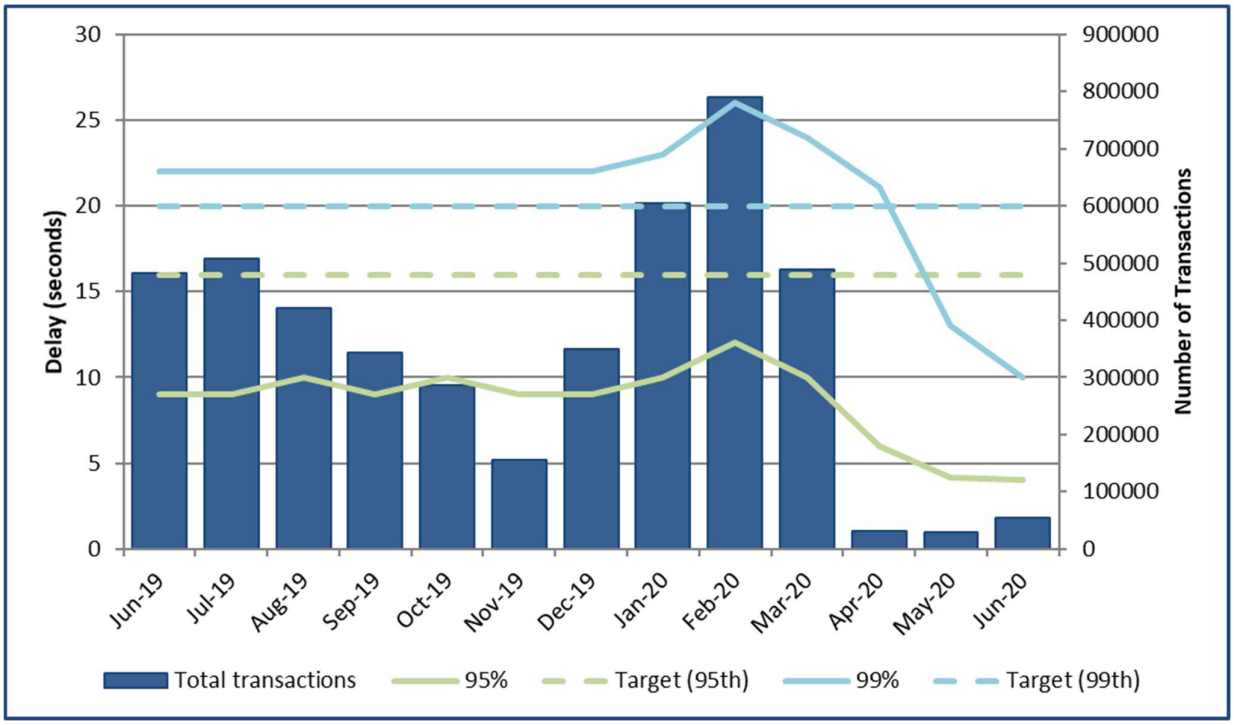


Figure 11: Technical Round Trip Delay

Technical Continuity

The graph below shows a new metric measuring 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.

N.B The way this metric is currently calculated is not correct; it is presenting the probability of the TRTD being less than 40 seconds, but the TRTD is only calculated for uplink messages which receive a LACK. So the graph below represents an optimistic view of the true performance since some uplink messages do not receive a LACK at all.

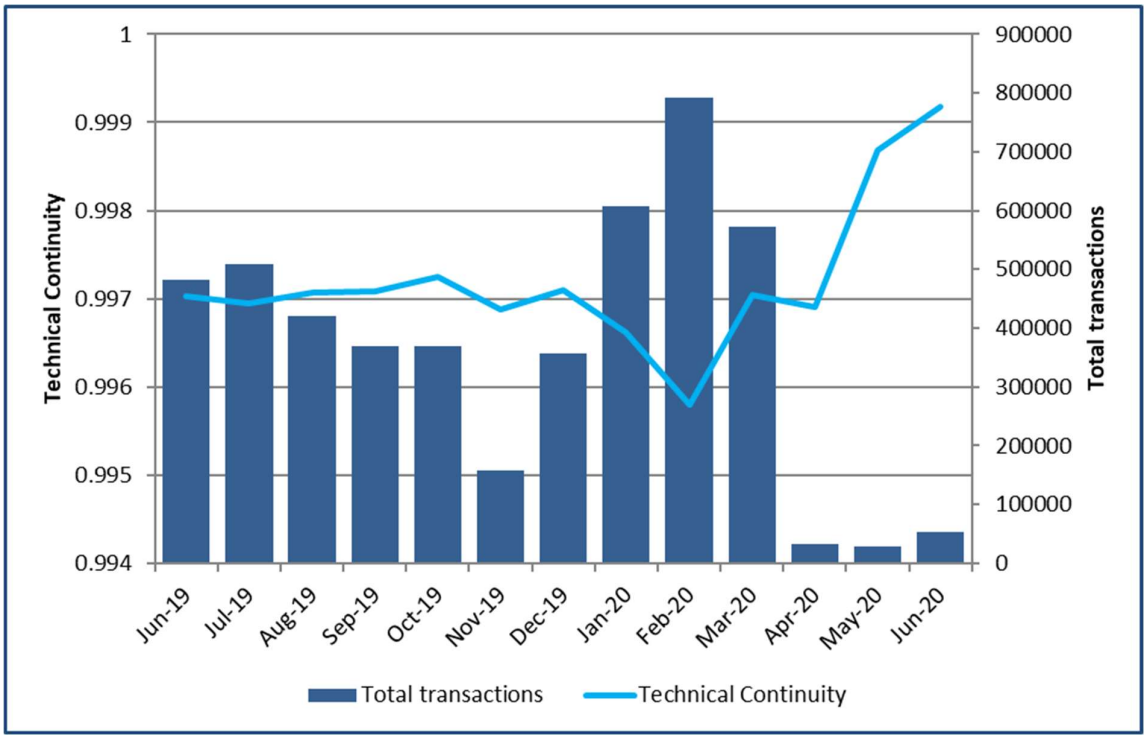


Figure 12: Technical Continuity

VDL Mode 2 Performance

The following metrics[4] 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[5] 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) 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.

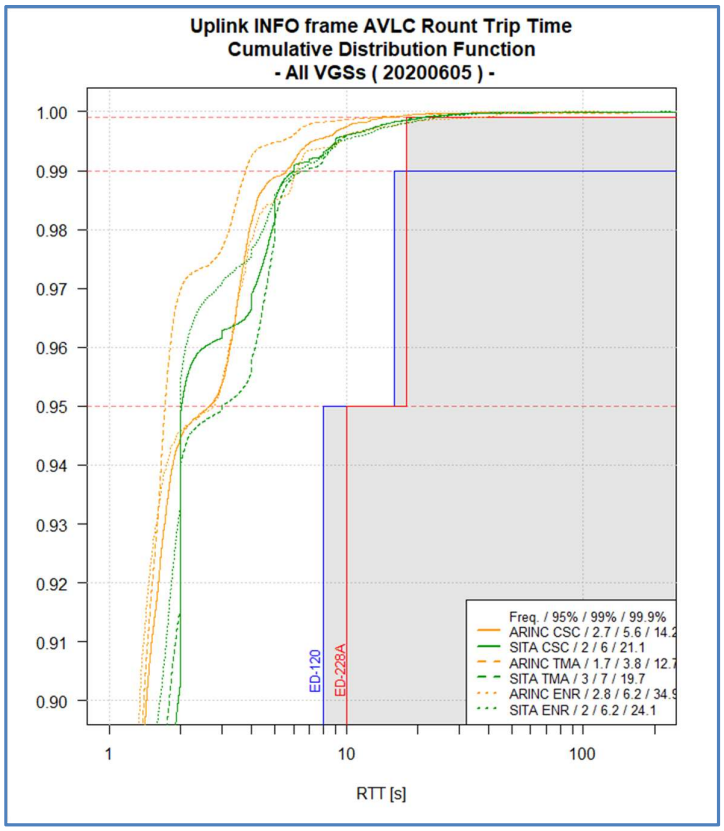


Figure 13: AVLC Round Trip Time

Important note: : SITA is providing logs for all their users whereas ARINC is only providing data for their 9 largest ATN users (SAS, EZY, DLH group, BAW, EIN, IBE, BOS, VLG and FIN) 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.

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

[5] 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 the acknowledged retransmissions considering all the VGS logs (N2T1 events are not counted). N=0 represents the first attempt, N=1 to N=5 represent the first to the fifth retransmissions and N>5 aggregates all the retransmissions greater than 5.

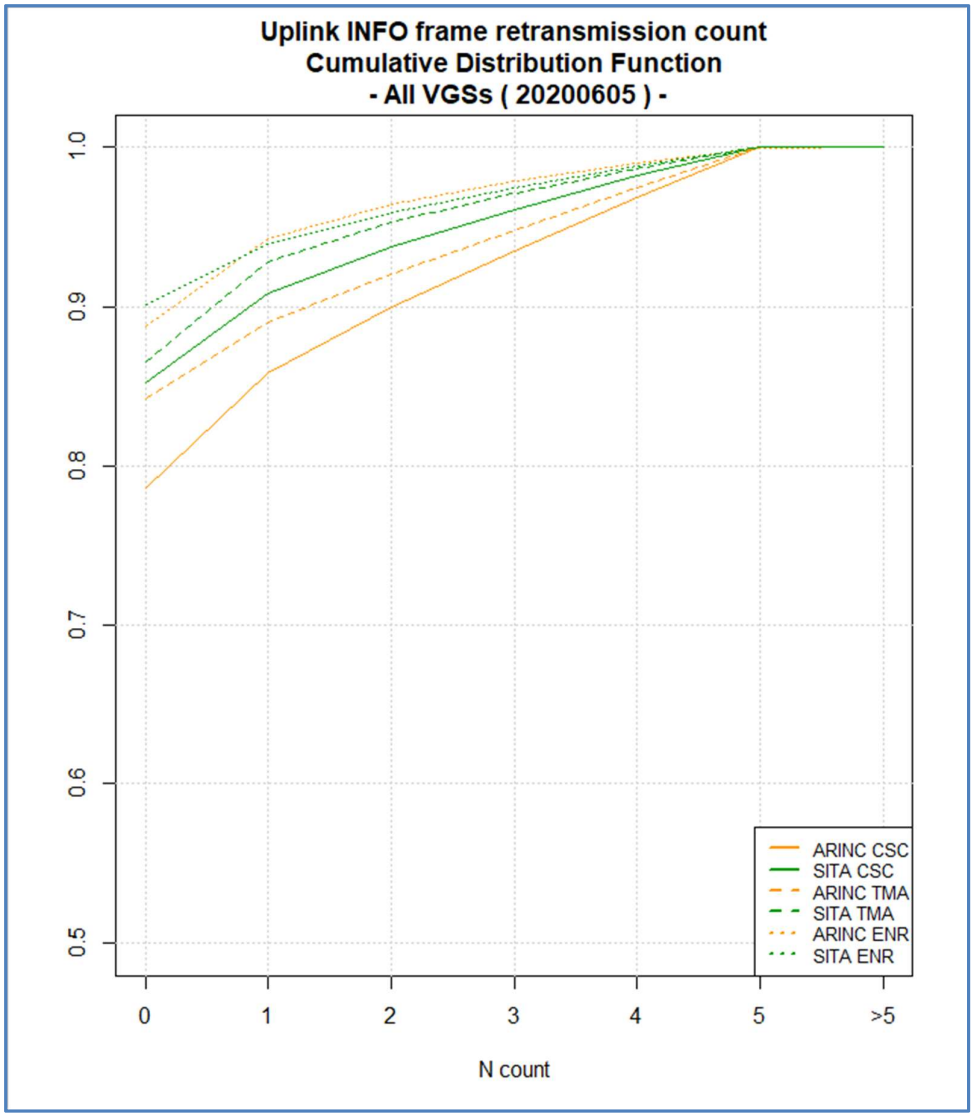


Figure 14: AVLC Uplink INFO frame retransmission count

Important note: : SITA is providing logs for all their users whereas ARINC is only providing data for their 9 largest ATN users (SAS, EZY, DLH group, BAW, EIN, IBE, BOS, VLG and FIN) 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.

AVLC Round Trip Time per frequency trend

The following set of graphs show the 50th, 95th, 99th and 99.9th percentile of the AVLC RTT (in seconds)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.

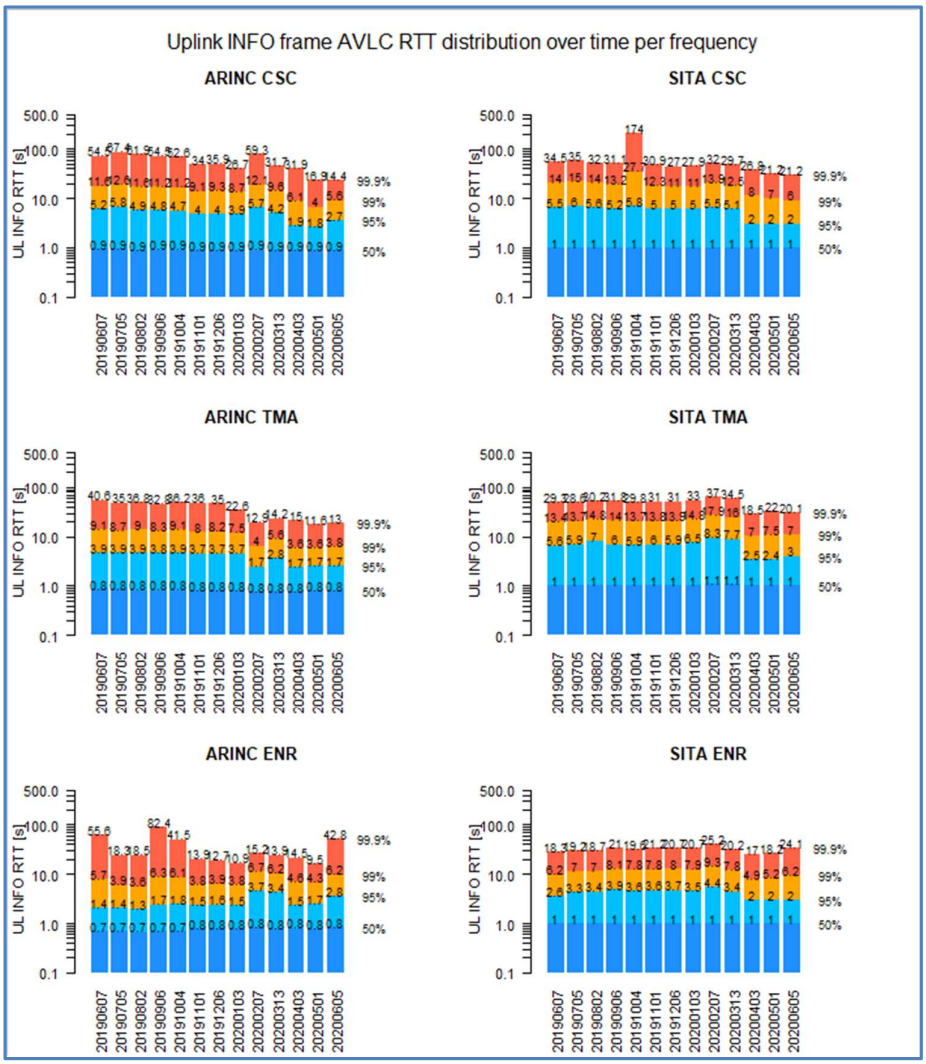


Figure 15: AVLC Uplink INFO Round Trip Time per Frequency

Important note: : SITA is providing logs for all their users whereas ARINC is only providing data for their 9 largest ATN users (SAS, EZY, DLH group, BAW, EIN, IBE, BOS, VLG and FIN) 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.

Retransmissions per frequency trend

The following set of graphs show the distribution of the number of retransmissions for the first Friday of each month for each frequency with the CSC is split over the two CSPs. The vertical axis shows the number of AVLC uplink INFO frames considered with the same range for the different frequencies. N=0 represents the first attempt, N=1 to N=5 represent the first and fifth retransmissions and N>5 aggregates all the retransmissions greater than 5.

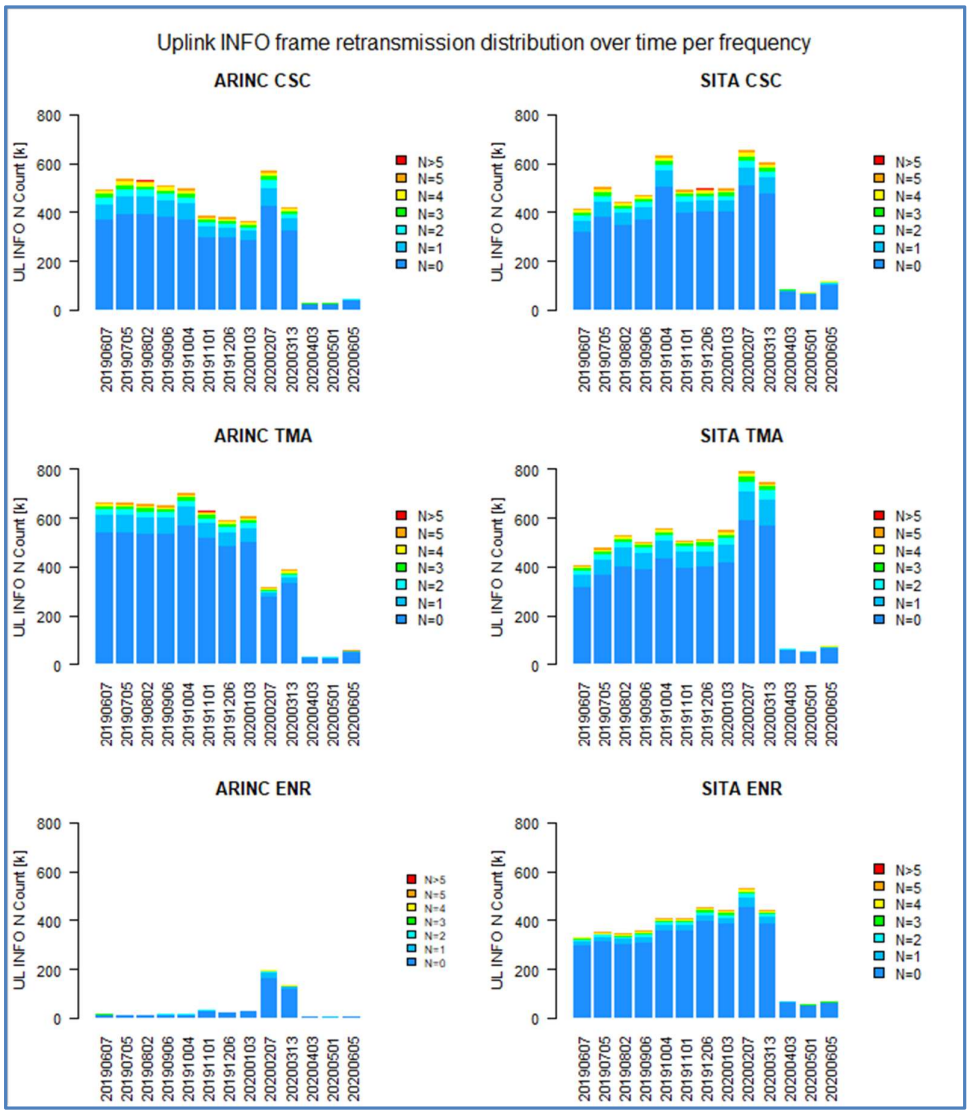


Figure 16: AVLC Retransmission rate per frequency

Important note: : SITA is providing logs for all their users whereas ARINC is only providing data for their 9 largest ATN users (SAS, EZY, DLH group, BAW, EIN, IBE, BOS, VLG and FIN) 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.

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[6]) 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.

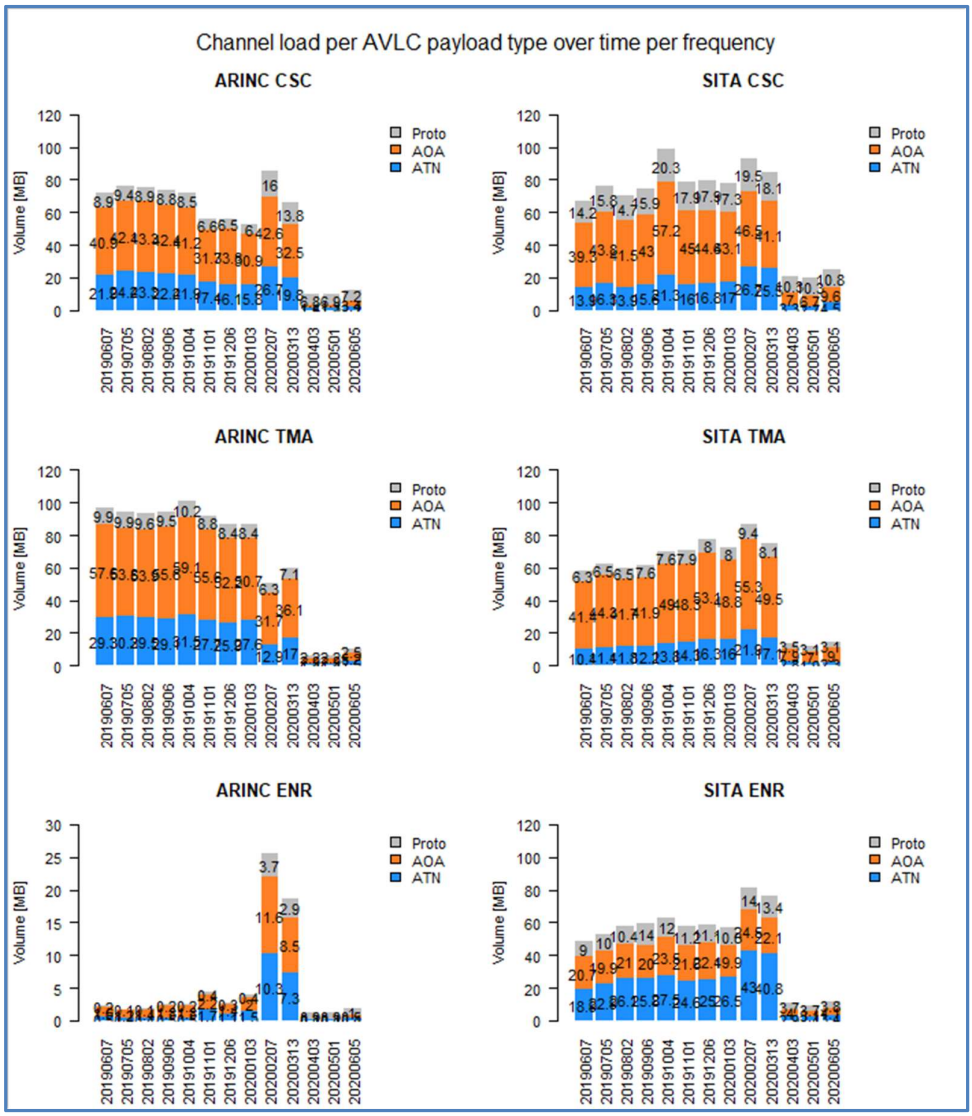


Figure 17: AVLC Channel load per frequency

Important note: : SITA is providing logs for all their users whereas ARINC is only providing data for their 9 largest ATN users (SAS, EZY, DLH group, BAW, EIN, IBE, BOS, VLG and FIN) 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.

[6] i.e. RR, SREJ, XID, …