Network Manager
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EUROCONTROL

Data link Network Operational Status Report

April 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 shading indicates whether CPDLC over the ATN is currently operational in that airspace (<N-4>). The yellow shade represents areas where data link is provided but not in full compliance with the 2015/310 regulation. For each FIR/UIR, the five-line block of data provides the following information:

- **Line 1:** ICAO Ident and the date the service went operational. The planned dates are available from the data link services web site.
- **Line 2: Average PA:** The average PA rate in the FIR/UIR expressed as the number of PAs occurred per 100 hours CPDLC. <O-23>. A trend indicator shows whether the rate is increasing or decreasing since last month. A question mark indicates that no data is available.
- **Line 3**: **CL**. Channel load for the following frequencies: 136.975 MHz /136.875 MHz /136.825 MHz /136.775 MHz /136.725M Hz. <KPI_PHY_01>
- **Line 4**: **Freq PA**: The average PA rate for the following frequencies: 136.975 MHz /136.875 MHz /136.825 MHz /136.775 MHz /136.725M Hz. <O-23>
- **Line 5: Flt.** The first figure is the total number of flights during the month of the report, the second figure is the percentage of those flights for which the flight plan declared the flight capable of performing CPDLC over the ATN (i.e. filed 'J1')<N-1>, and the third figure is the percentage of the flights that are observed to use CPDLC over the ATN <N-2>. A trend indicator shows whether the percentage of flights actually using CPDLC is increasing or decreasing since last month

CPDLC Operational Status - April 2020

Label explanantion

ICAO ID : in-service date

Average PA : Average number of PAs per 100 hours CPDLC in the FIR/UIR

CL : Channel load for 136.975 / 136.875 / 136.825 / 136.775 / 136.725

Freq PA : The average PA rate per channel : 136.975 / 136.875 / 136.825 / 136.775 / 136.725

Flt : Total flights / Percentage of flights capable of CPDLC over ATN / Percentage of flights using CPDLC over the ATN

Operational

Data link provided but not in compliance with EU 2015/310

Not yet operational

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ENOR:
Average PA:
CL: ////
Freq PA: ////
Flt: 3k/76/

EFIN: Dec-18
Average PA:
CL: ////
Freq PA: ////
Flt: 1k/59/

EGPX: Oct-13
Average PA: 11 ↗
CL: ////
Freq PA: ////
Flt: 4k/46/14 ↘

EETT: Jun-18
Average PA: ?
CL: ////
Freq PA: ////
Flt: 3k/43/

ESOS+ESMM: Apr-15
Average PA: ?
CL: ////
Freq PA: ////
Flt: 5k/50/

EVRR: Nov-19
Average PA:
CL: ////
Freq PA: ////
Flt: 3k/44/

EKDK: Apr-15
Average PA: ?
CL: ////
Freq PA: ////
Flt: 4k/48/

EYVC:
Average PA:
CL: ////
Freq PA: ////
Flt: 3k/45/

EISN: Jun-14
Average PA: ?
CL: ////
Freq PA: ////
Flt: 5k/43/

EGTT: Oct-13
Average PA: 9 ↗
CL: ////
Freq PA: ////
Flt: 13k/48/24 ↘

EDYY: Jan-03
Average PA: 6 ↘
CL: ////
Freq PA: ////
Flt: 17k/45/17 ↘

EPWW: May-18
Average PA: 19 ↗
CL: ////
Freq PA: ////
Flt: 6k/43/9 ↘

EDUU: Jun-14
Average PA: 2 ↘
CL: ////
Freq PA: ////
Flt: 19k/45/16 ↘

LKAA: Feb-17
Average PA: 7 ↗
CL: ////
Freq PA: ////
Flt: 5k/46/20 ↘

LZBB:
Average PA:
CL: ////
Freq PA: ////
Flt: 4k/45/

LFRR: Apr-19
Average PA: ?
CL: ////
Freq PA: ////
Flt: 4k/39/

LFEE: May-16
Average PA: ?
CL: ////
Freq PA: ////
Flt: 6k/40/

LFFF: May-16
Average PA: ?
CL: ////
Freq PA: ////
Flt: 4k/39/

LSAG + LSAZ: Dec-12
CL: ////
Freq PA: ////
Flt: 3k/42/13 ↘

LOVV: Oct-14
Average PA: ?
CL: ////
Freq PA: ////
Flt: 6k/47/

LHCC: Nov-15
Average PA: ?
CL: ////
Freq PA: ////
Flt: 7k/50/

LRBB:
Average PA:
CL: ////
Freq PA: ////
Flt: 6k/50/

LFBB: Mar-19
Average PA: ?
CL: ////
Freq PA: ////
Flt: 3k/33/

LIMM: ??-18
Average PA: ?
CL: ////
Freq PA: ////
Flt: 2k/42/

LDZO: Mar-17
Average PA: ?
CL: ////
Freq PA: ////
Flt: 3k/38/

LBSR: Sep-19
Average PA:
CL: ////
Freq PA: ////
Flt: 7k/48/

LPPC:
Average PA:
CL: ////
Freq PA: ////
Flt: 1k/41/

LECM: Oct-18
Average PA: ?
CL: ////
Freq PA: ////
Flt: 5k/40/

LECB: Oct-18
Average PA: ?
CL: ////
Freq PA: ////
Flt: 2k/45/

LFMM: May-16
Average PA: ?
CL: ////
Freq PA: ////
Flt: 4k/33/

LIRR: ??-18
Average PA: ?
CL: ////
Freq PA: ////
Flt: 3k/43/

LIBB: Nov-16
Average PA: ?
CL: ////
Freq PA: ////
Flt: 1k/34/

LGGG:
Average PA:
CL: ////
Freq PA: ////
Flt: 5k/31/

LCCC:
Average PA:
CL: ////
Freq PA: ////
Flt: 3k/33/

LMMM:
Average PA:
CL: ////
Freq PA: ////
Flt: 1k/26/

GCCC: Oct-18
Average PA: ?
CL: ////
Freq PA: ////
Flt: 0k/50/

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 Figure 1 i.e. 'Data link provided but not in compliance with EU2015/310'

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.
LJLA	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 April 2020 43.4% of flights indicated the capability to perform CPDLC over ATN/VDL Mode 2 and 38.9% indicate they are exempt. The change is due to the change in the traffic mix due to the COVID-19 crisis.

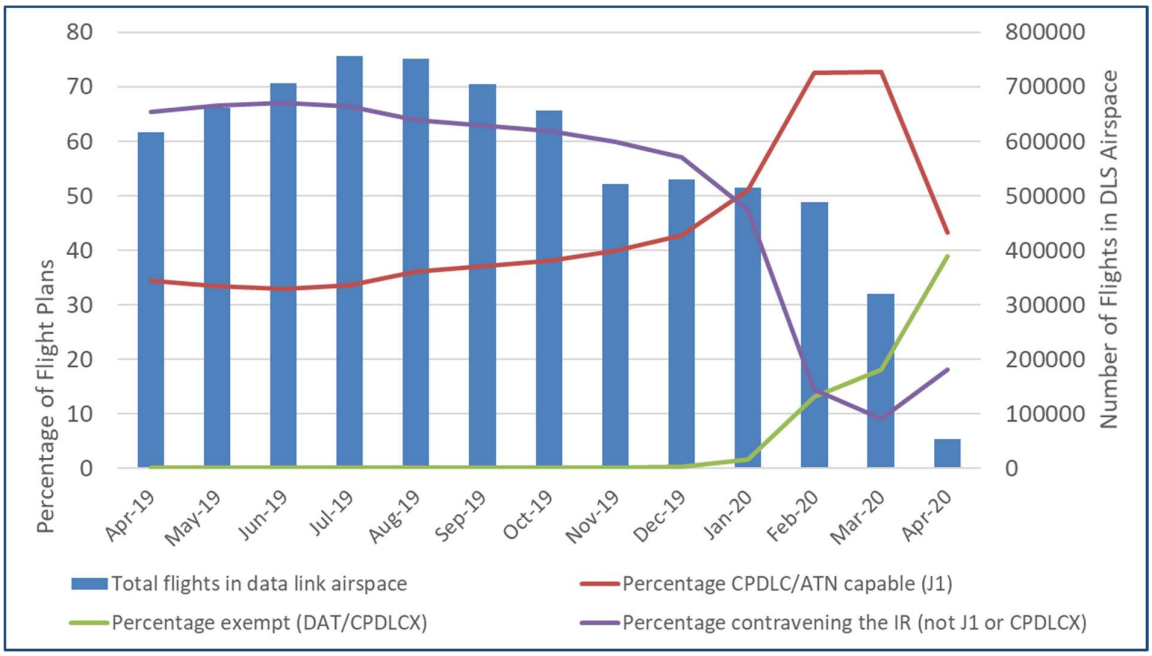

Figure 2: Proportion of flights capable of using CPDLC over ATN/ VDL Mode 2

For those centres providing data to the DPMF (see Figure 4 below) an average of 17% 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 April 2020 was 7.5 PAs per 100 hours. The increase in PA rate in April is caused by a much greater proportion of data link flights being made by Boeing 777 aircraft that have a higher than average PA rate.

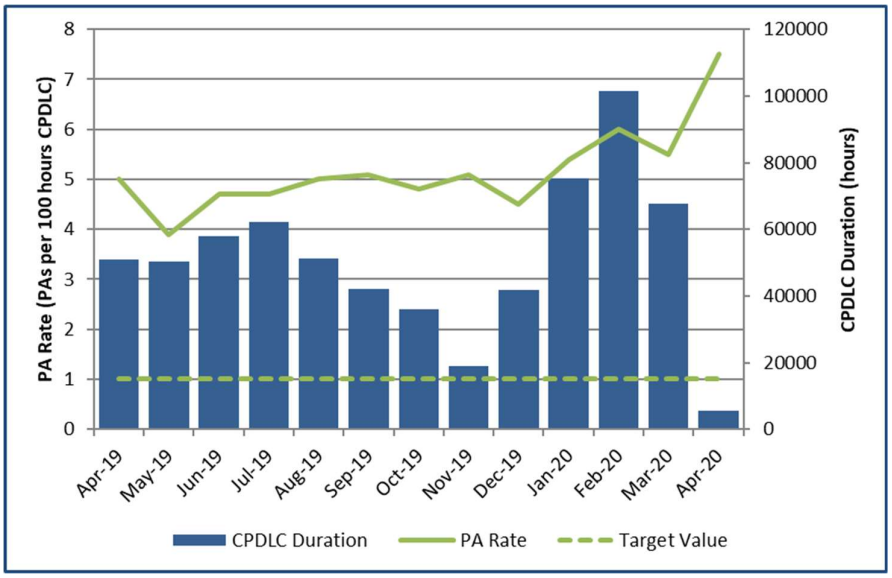

Figure 3: PA rate

Figure 3a 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].

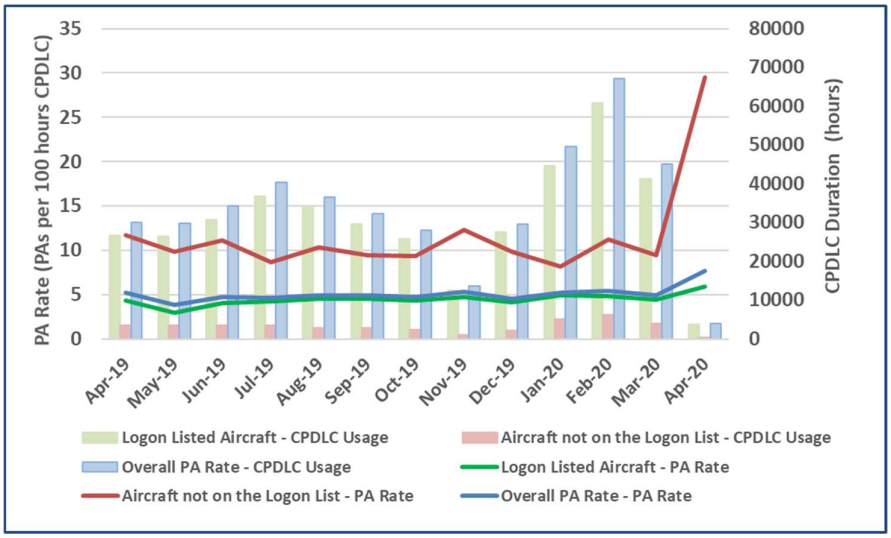

Figure 4a: Logon Listed Aircraft PA rate

[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.

Weekly PA rate per Centre

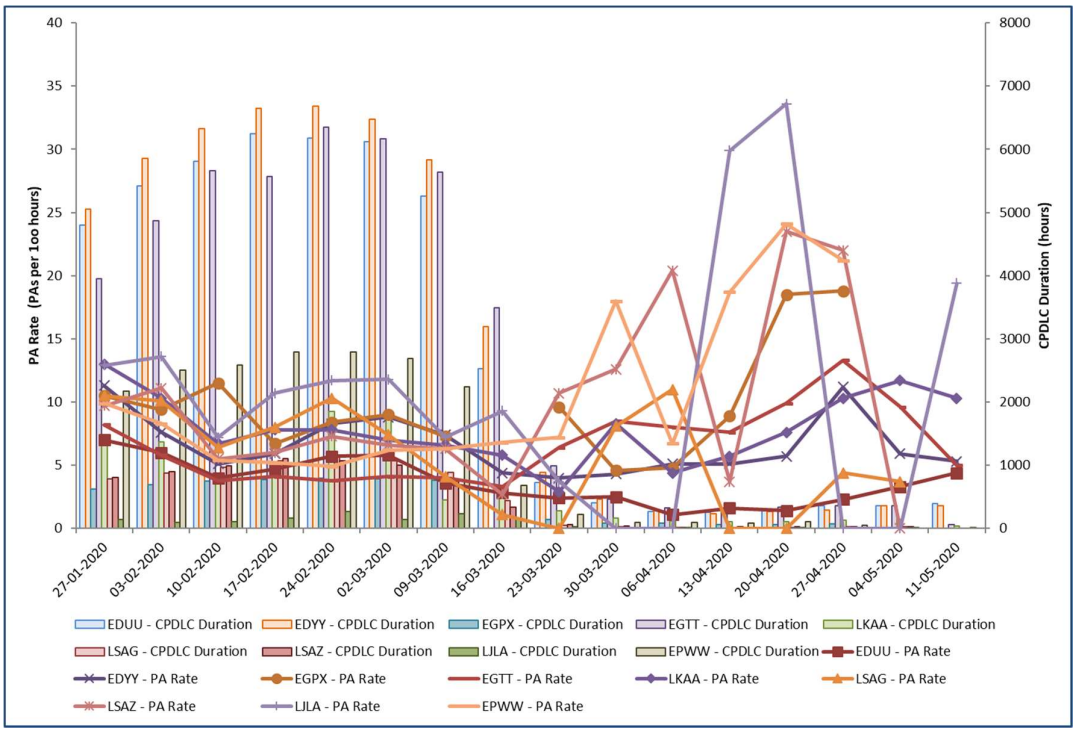

Figure 5: Weekly PA Rate per Centre

Weekly PA Rate for Major Aircraft Operators

Figure 6 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.

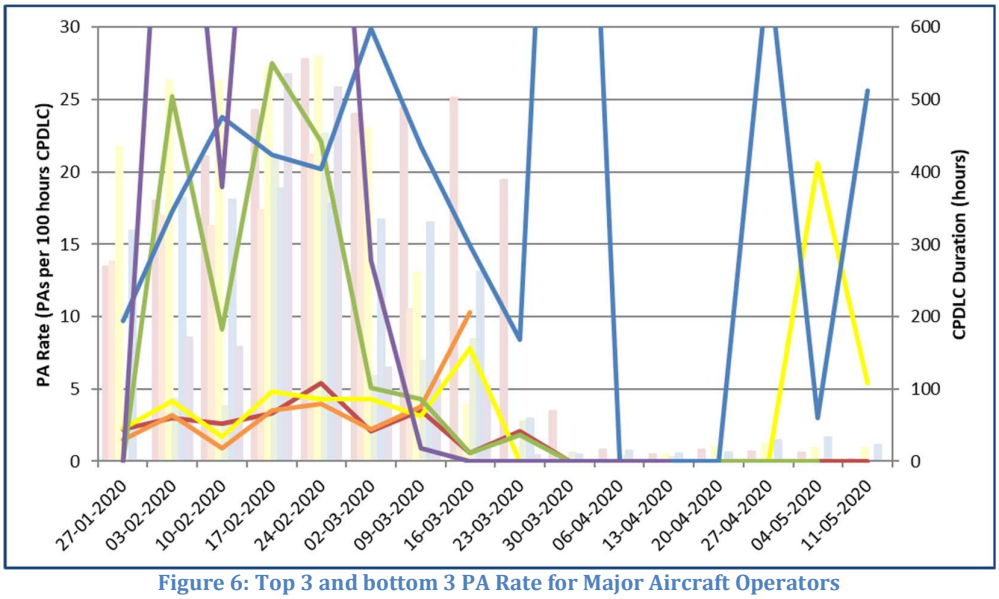

Figure 6: Top 3 and bottom 3 PA Rate for Major Aircraft Operators

Weekly PA Rate for 5 biggest CPDLC users

Figure 7 below shows the weekly PA rate for the five aircraft operators that have used CPDLC most over the past 15 weeks.

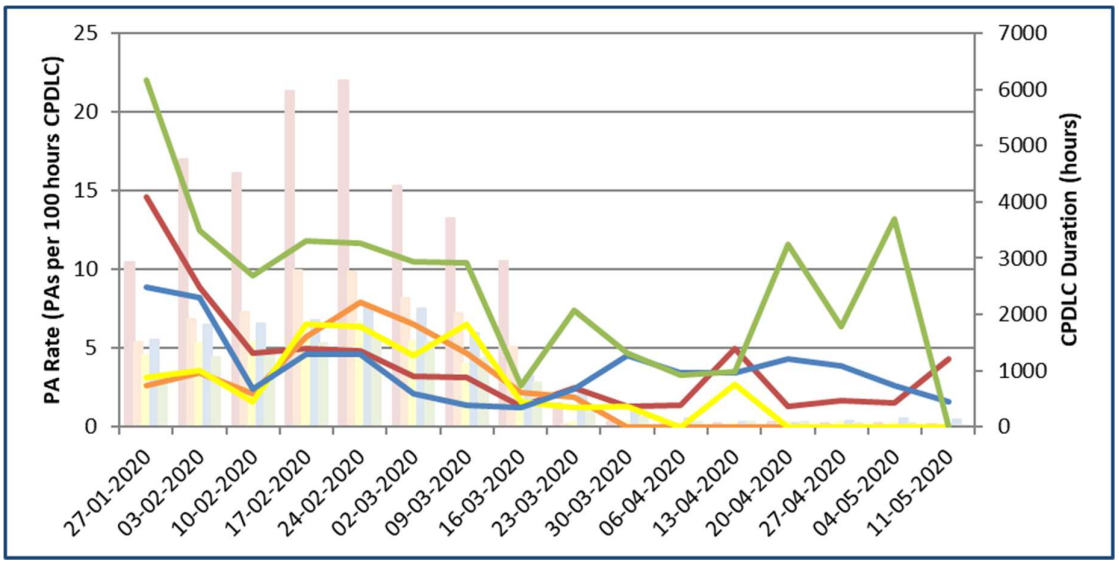

Figure 7: PA Rate of the 5 biggest users of CPDLC

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

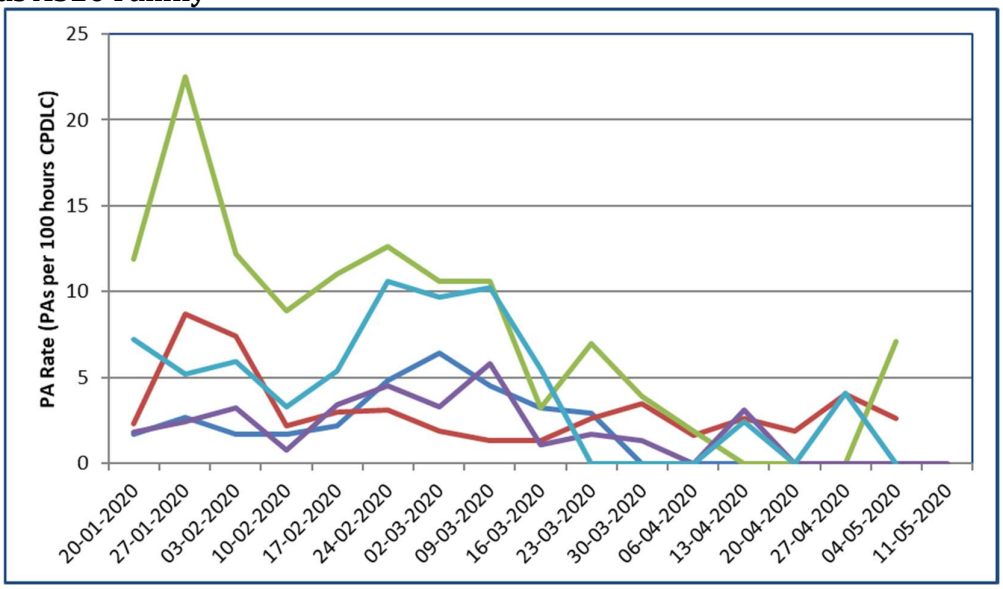

Figure 8: A320 Family (A318/319/320/321/20N/21N) Aircraft Operator PA Rates

Boeing B737 Family

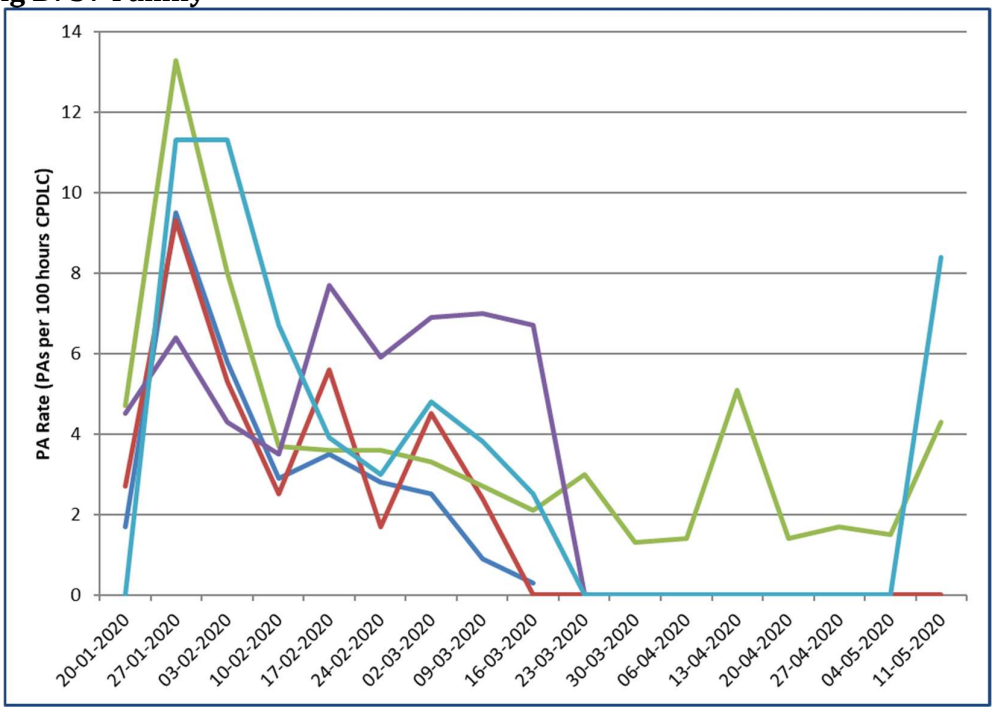

Figure 9: B737 Family Aircraft Operator PA Rates

The peaks in PA rate in late January weeks are due to problems with the SITA network.

Technical Round Trip Delay

Figure 10 below shows the 95th and 99th percentile of the technical round trip delay <0-2><0-3>. 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).

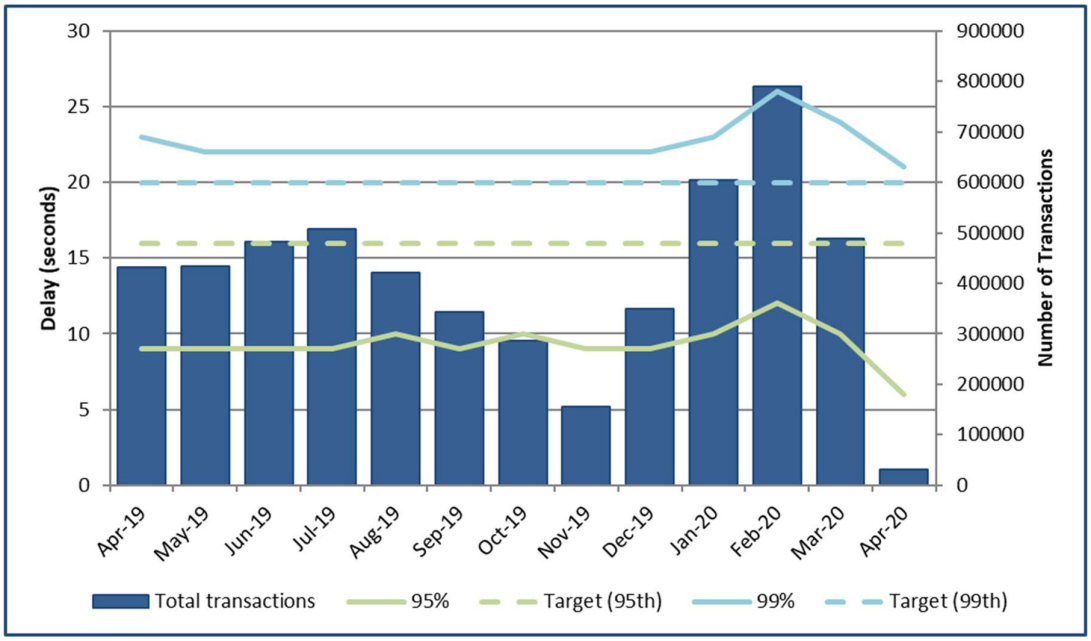

Figure 10: Technical Round Trip Delay

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.

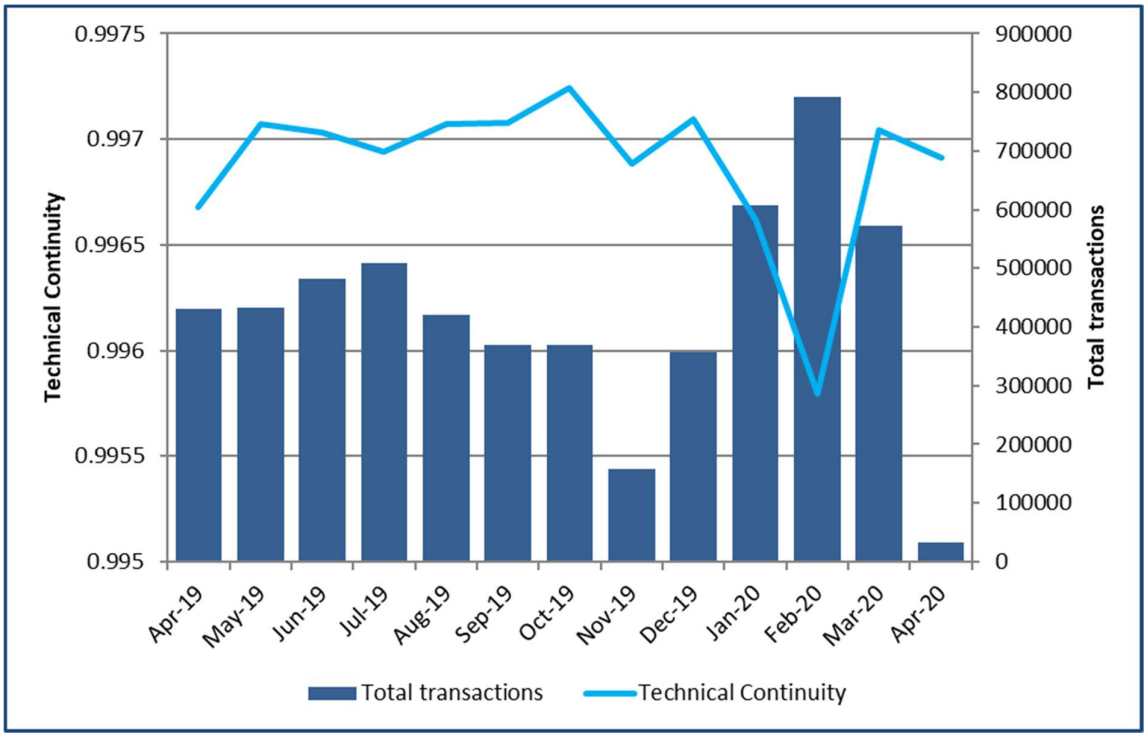

Figure 11: Technical Continuity

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.

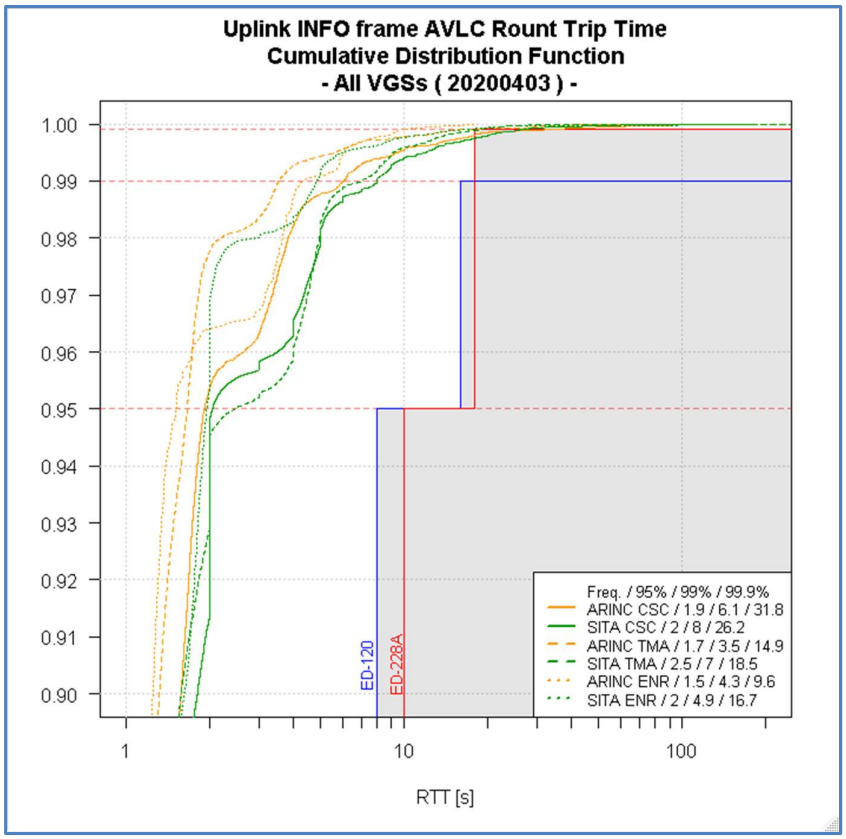

Figure 12: AVLC Round Trip Time

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.

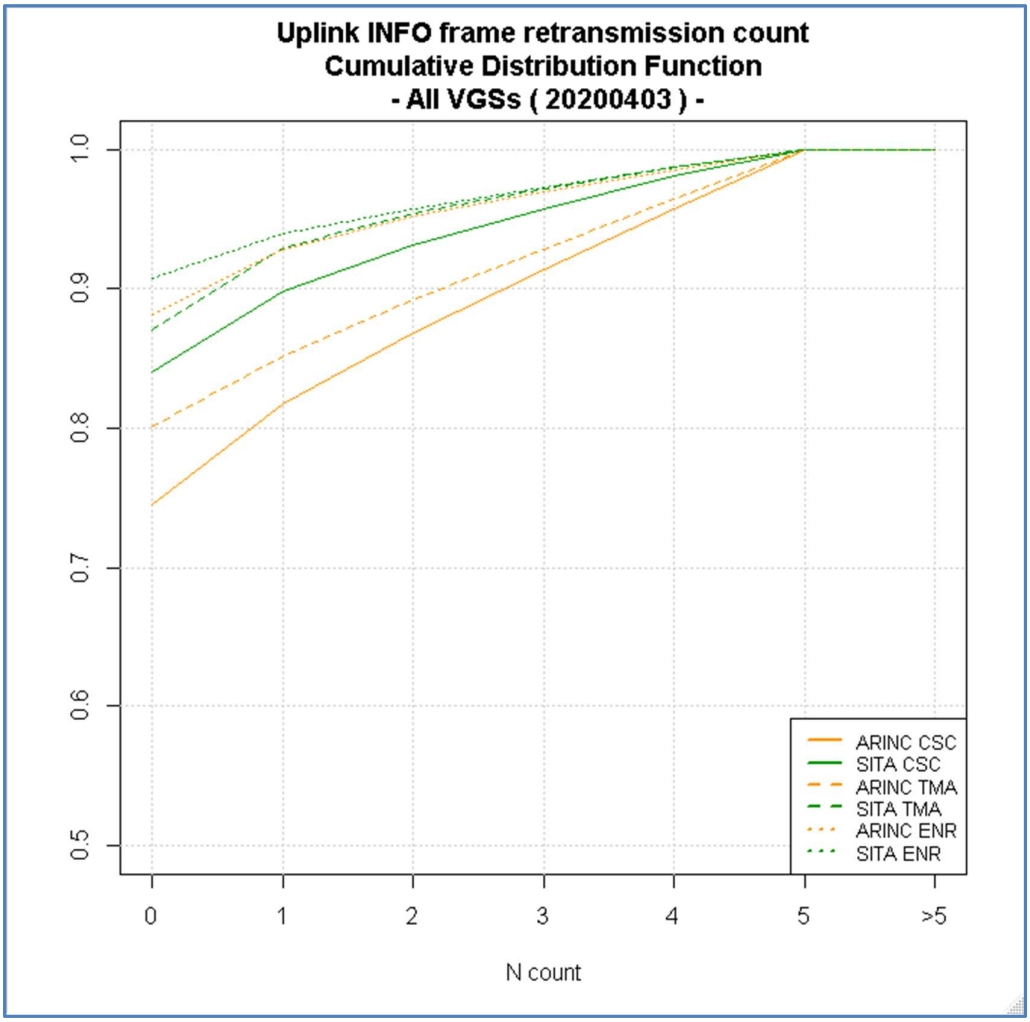

Figure 13: AVLC Uplink INFO frame retransmission count

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.

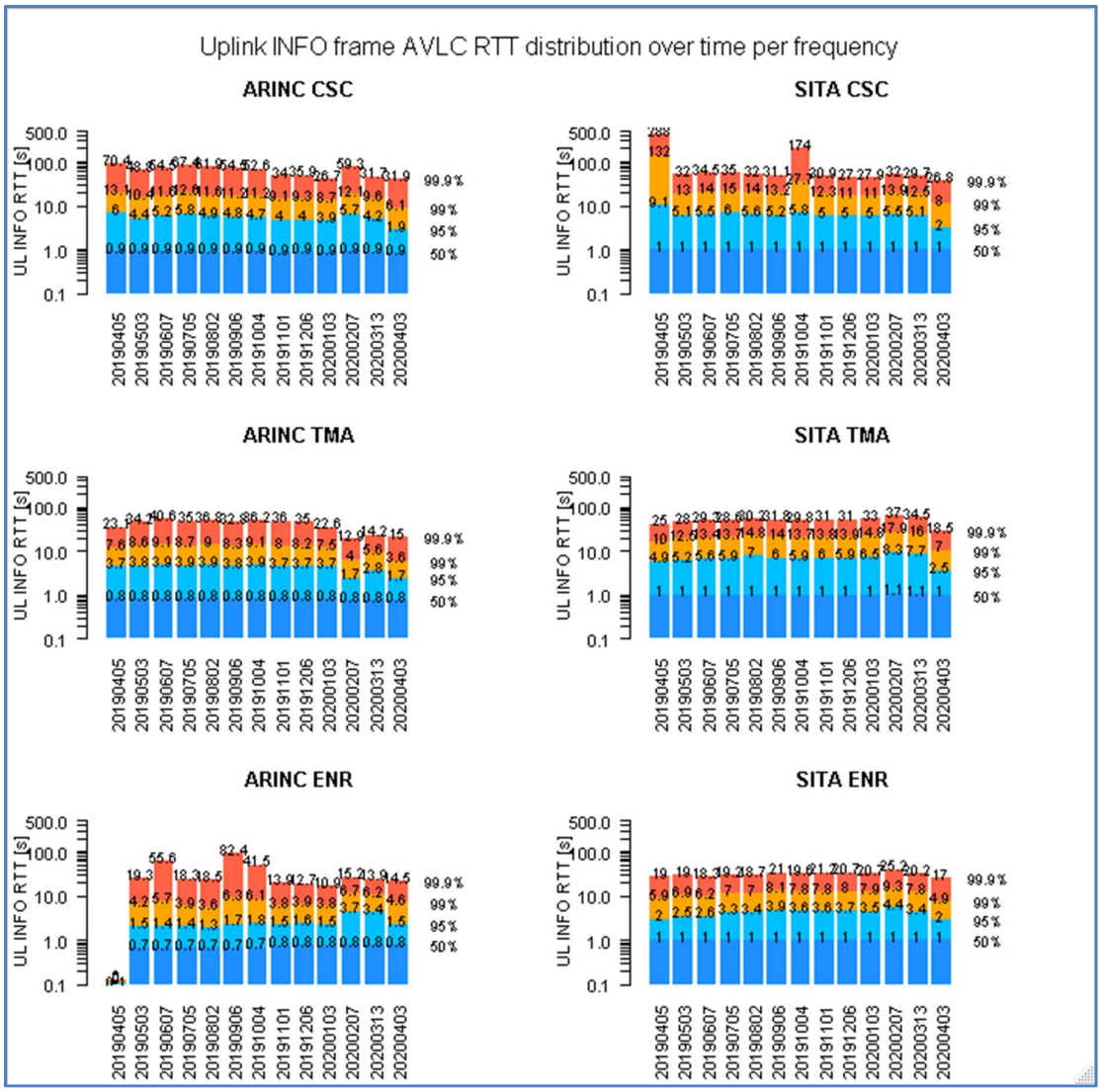

Figure 14: AVLC Uplink INFO Round Trip Time per Frequency

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.

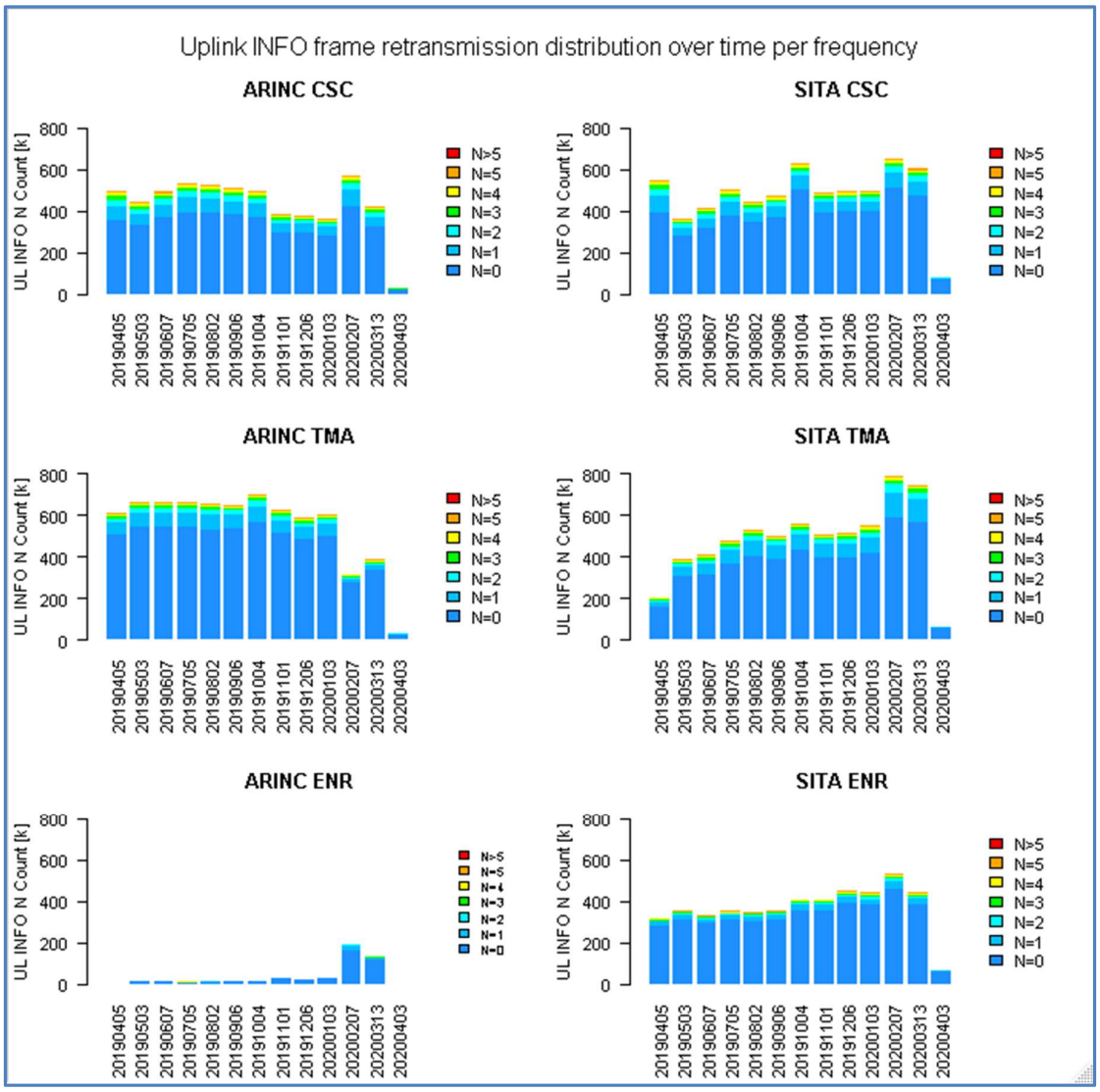

Figure 15: AVLC Retransmission rate per frequency

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.

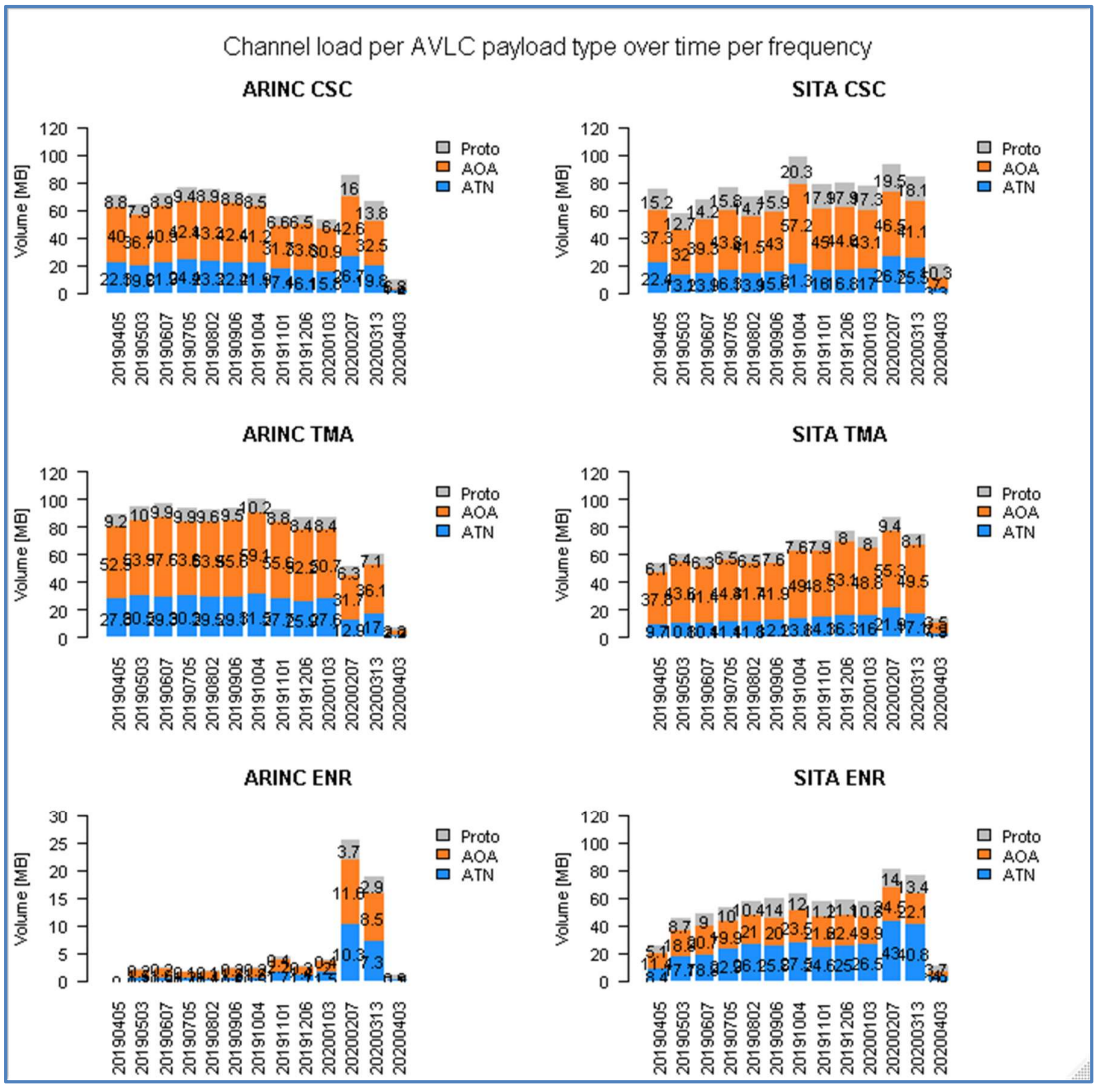

Figure 16: AVLC Channel load per frequency

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, …