European Aviation Safety Agency
Flight Standards Directorate

Commission Regulation (EC) No 29/2009 – Data Link Services Exemptions

Version 1.3

Executive Summary

Commission's letter to EASA dated 12 January 2017[1], requested EASA to proceed with a short term review of the Commission Regulation (EC) No 29/2009 (known as the DLS regulation), to include a review of the existing exemptions, new exemptions requests and the associated exemption criteria, provisions for 'non-AOC' traffic operators to access the DL service and the impact of the ICAO latest amendments. The Commission has also requested EASA to commence RMT.0524 on data link services, to support the SDM (SESAR Deployment Manager) DLS recovery plan and to provide the regulatory framework for the introduction of elements of PCP AF6 - 'Initial Trajectory Information Sharing', in particular the down-link trajectory information using the Extended Projected Profile (EPP) that is part of the ATN B2 services.

The exemptions within the DLS regulation comprise of 'automatic exemptions' and 'aircraft type exemptions'. The automatic exemptions provisions can primarily be found in Article 3, while the type based exemptions provisions are captured in Article 14.

More specifically, Article 14 foresees the possibility for the European Commission to grant exemptions to aircraft of specific types while Article 3 foresees that aircraft meeting the published conditions are exempted without further action. Aircraft type exemption requests are to be based on the criteria defined in Article 14 and were to be communicated to the European Commission before the 31 December 2012.

To date, 2 Commission Decisions have been adopted providing a list of aircraft types and models/series for which permanent and temporary exemptions have been granted.

The EUROCONTROL DLS Exemption Cell prepared a 3rd consolidated report listing the existing granted exemptions and the additional requests received prior to the 31 December 2012 deadline. At the request of the European Commission, EASA reviewed this 3rd Consolidated Report from the EUROCONTROL DLS Exemption Cell, in order to validate the recommendations made with respect to the additional exemption requests. Furthermore, a reassessment of the existing permanent exemptions as communicated in the Commission Decisions was undertaken in accordance with the approaches defined in this report to ensure consistency. Based on the EUROCONTROL'S proposal, in 2014 EASA has produced a draft report 'Commission Regulation 29/2009 Data Link Service exemption', version 1.1, containing the list of proposed exempted types which was made available to the Commission at that time.

Considering that the analysis of aircraft types was already performed and the draft results communicated to the Commission via the draft DLS exemption report version 1.1, and taking into account the feedback from the stakeholders and the limited time frame allowed for this short-term review, EASA has opted for minimum changes to the DLS exemption criteria for aircraft types. The focused consultation organised by EASA on the 22 May 2017 revealed that the stakeholders are requiring stability. The stakeholders requested just minor changes with regards to the types exemption (e.g. possibly adding aircraft model in the criteria). A change in the exemption criteria in Article 14 would have triggered a new consultation, comprehensive data collection,

[1] European Commission letter to EASA on DLS, dated 12 January 2017, attached in Annex 5

followed by a re-evaluation of all the applications for types/models proposed for exemption. However, while the type based exemptions criteria remain almost the same compared with the version 1.1 of the EASA draft DLS exemption report, the automatic exemptions are proposed to be revised, at least until the stakeholders' issues will be addressed. Various options have been analysed in section 5 of this report, and EASA is proposing a balanced approach taking into account the overall goal of the DLS regulation while acknowledging the current implementation issues, which would need to be addressed.

As such, EASA recommends that:

1) the 2 existing Commission Decisions C(2011) 2611 final and C(2011) 9074 final be repealed,

2) the final consolidated Commission Decision on Exemptions under Article 14 of the Commission Regulation (EC) No 29/2009, to be presented for adoption.

   Note 1: This final Commission Decision on DLS exemptions should be based on the table 'Exemptions' in section 4.5 of this report. The table includes transition measures for those aircraft types previously granted permanent exemptions in accordance with Commission Decisions C(2011) 2611 final and C(2011) 9074 final, which do not meet the criteria as applied and thus have not been proposed for exemption.

3) the DLS regulation be amended:

   - with the changes to the additional automatic exemptions, proposed in section 3.4 of this report
   - with the changes resulted from the review of the latest amendments to ICAO Annexes in relation to DLS, proposed in section 6.2 of this report
   - with minor changes to Article 14, proposed in section 4.4 and clerical corrections, proposed in section 7 of this report.

   Note 2: the proposed automatic DLS exemption criteria could be further revised, leading to a further increase in the DLS equipage percentage, once the related issues raised in this report (section 3.3 in particular) are addressed and the DLS will perform as intended.

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1. Introduction

DLS regulation publication and subsequent revision

On January 16th 2009, COMMISSION REGULATION (EC) No 29/2009[2], laying down requirements on Data Link services for the Single European Sky, was published. It required Data Link services to be implemented throughout the European Union, in a phased manner, by 2015: the airspace users needed to ensure that new aircraft delivered after 1 January 2011 are equipped and capable of operating CPDLC and that the remaining aircraft are retrofitted by 5 February 2015.

This requirement was not applicable to aircraft with an individual certificate of airworthiness issued before 1 January 2014 and fitted with data link equipment specified in point 10 of Annex III, or for aircraft which have an individual certificate of airworthiness first issued before 1 January 1998 and which will cease operation in the European airspace by 31 December 2017.

These additional criteria constitute in fact 'automatic exemption', as defined in the Commission letter to EASA on data link, dated 12 January 2017. Furthermore, in addition to the 'automatic exemptions', the regulation foresees the possibility for the European Commission to grant exemptions for aircraft of specific types. Any exemption requested is to be based on the criteria defined in regulation and communicated by Member States to the European Commission before 31 December 2012 at the latest.

The navigation service providers and operators reported technical issues when implementing Regulation (EC) No 29/2009, particularly disconnections, known as Provider Aborts ('PAs'), of existing air-ground data communications enabling the operations of data link services ('DLS') and which are beyond acceptable performance levels. EASA concluded in its investigation report[3] that acceptable data link performance levels can only be established by deploying a multi-frequency infrastructure, which is also optimised for radio frequency interference prevention. It recommended establishing and implementing a plan of actions to further investigate the identified technical issues and to validate the necessary technical solutions. However, since these measures required time, EASA recommended to reconsider the date of application of Regulation (EC) No 29/2009 and the other timeframes within the regulation.

Based on the above the DLS regulation was subsequently amended by the COMMISSION IMPLEMENTING REGULATION (EU) 2015/310 February 2015. The date of application of the requirements relating to the ground equipage for the airspace defined in Parts A and B of Annex I to Regulation (EC) No 29/2009 was set to 5

2 OJ L 13, 17.1.2009, p. 3

3 https://ec.europa.eu/transport/sites/transport/files/modes/air/single_european_sky/doc/implementing_rules/2014-04-23-easa-datalink-report.pdf

February 2018. In addition, the date by which the operators are required to ensure that the aircraft concerned have the capacity to operate the DLS in accordance with Annex II to Regulation (EC) No 29/2009, was adjusted to 2 February 2020. With respect to the automatic exemption relating to aircraft with an individual certificate of airworthiness first issued before 1 January 2014 and fitted with data link equipment compliant with one of the relevant Eurocae documents, the date remained unchanged, in the absence of clear and convincing data justifying their adjustment.

Aircraft type exemptions

2 Commission Decisions[4] were adopted by the European Commission providing a list of aircraft types and variants for which permanent and temporary exemptions have been granted. The EUROCONTROL DLS Exemption Cell has issued a 3rd consolidated report listing the existing granted exemptions and the new requests received prior to the 31 December 2012 deadline. At the request of the European Commission, EASA reviewed this 3rd Consolidated Report from the EUROCONTROL DLS Exemption Cell in order to validate the recommendations made by EUROCONTROL with respect to the proposed exemptions. A reassessment of the permanent (aircraft type) exemptions granted in the Commission Decisions, was undertaken in accordance with the approaches defined in this paper, to ensure consistency. A draft report providing a consolidated proposal for the permanent (aircraft type) exemptions to be included in a Commission Decision on Exemptions under Article 14 of Commission Regulation (EC) No 29/2009, was submitted to the Commission's attention in 2014. The current report version, reflects pragmatically various stakeholders' concerns, while proposing minimum changes to the aircraft type exemption criteria defined in Article 14.

European Commission request

Following the ELSA[5] study results and the SDM DLS recovery plan[6] finalised in Q4 of 2016, the Commission requested various stakeholders i.e. EASA, SDM, EUROCAE, EUROCONTROL-NM, to launch relevant actions, leading to the resolution of the DLS issues. In January 2017 a letter from the Commission has requested EASA to provide specific actions on a short-term review of the DLS regulation (EC) No 29/2009 and the launch of the RMT.0524 on DLS.

The purpose of the short-term review of Regulation (EC) No 29/2009 was to assess, clarify and adapt the conditions for exemptions, as well as to clarify the provisions regarding 'non-AOC' traffic operators. This action should lead to a proposed amendment to Regulation (EC) No 29/2009 and a potential review of existing Decisions on exemptions.

This report is the result of the analysis performed by EASA in support of Commission's request with regards to the short-term review.

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4 C(2011) 2611 final and C(2011) 9074 final

5 https://www.sesarju.eu/newsroom/brochures-publications/vdlm2-%E2%80%93-measurements-analysis-and-simulation-campaign-elsa-study

6 https://ec.europa.eu/transport/sites/transport/files/2016-10-18-dls-recovery-plan-final.pdf

1.1. Acronyms

The following list of acronyms are used throughout the report

ANSP	Air Navigation Service Provider
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AOC	Aeronautical Operational Communication, however in the EASA's Air Operations regulatory material, AOC may represent also 'Air Operator Certificate'
ATC	Air Traffic Control
ATN	Aeronautical Telecommunication Network
CANSO	Civil Air Navigation Services Organization
CAT	Commercial Air Transport
CMU	Communications Management Unit
CNS	Communication Navigation Surveillance
CofA	Certificate of Airworthiness
CPDLC	Controller/Pilot Data Link Communications
CRO	Central Reporting Office
CSC	Common Signalling Channel
CSP	Communications Service Provider
DLS	Datalink Services
EASA	European Aviation Safety Agency
EATMN	European Air Traffic Management Network
EBAA	European Business Aviation Association
EC	European Commission
ELSA	Enhanced Large Scale ATN deployment
EUROCAE	European Organization for Civil Aviation Equipment

FANS	Future Air Navigation Systems
FMS	Flight Management System
GA	General Aviation
GAMA	General Aviation Manufacturers Association
IATA	International Air Transport Association
MF	Multi-Frequency
JURG	Joint User Requirement Group
MTOM	Maximum Take-off Mass
MUAC	Maastricht Upper Area Control
NM	Network Manager
OEM	Original Equipment Manufacturer
PA	Provider Aborts
RF	Radio Frequency
RMT	Rulemaking Task
SB	Service Bulletin
SDM	SESAR Deployment Manager
SESAR	Single European Sky ATM Research
SJU	SESAR Joint Undertaking
S/W	Software
TCDS	Type Certificate Data Sheet
TCH	Type Certificate Holder
TCO	Third Country Operator
VDL	VHF Digital Link
VDLM2	VDL Mode 2
VDR	VHF Data Radios

VHF	Very High Frequency
VGS	VDL Ground Station

2. Assumptions and considerations:

The following assumptions and considerations need to be taken into account in support of the proposed regulatory changes, options or Decisions.

- Cost:

  The analysis to support the types/models exemptions is based primarily on the cost values quoted in the annexes as reported by the applicant. Where data reported was missing, engineering judgement was applied.

  The intent for the list of permanent exempted aircraft types is to capture primarily the out of production aircraft types/models, and in some few cases types and models where production life cycle was getting closer to end. As potentially the retrofit cost estimate is an important factor in deciding those aircraft types to be exempted.

  A better estimation of these costs, would require a re-validation of all the data received, and comprehensive surveys. A detailed cost benefit analysis process would require in depth data collection and subsequent analysis. Since the re-assessment of the reported cost was not possible within the allocated time, the existing data reported by the applicants was used (as already captured in the previous version of this draft report). As such, the cost analysis provided in this report for the types/model exemptions does not take not take into account that there may now be various low cost retrofit engineering solutions available (e.g. from Spectralux) for some types/models. EASA was made aware recently of these low cost solutions, however the analysis has been already completed for types/models exempted and was based on previous submitted data and the stakeholders' applications. As part of the RMT.0524, a cost benefit analysis will be performed, however the analysis should be focusing on compliance costs related to the future ED-92C standard and will take into account the current status of the fleet.

  Note 1: The lease contracts may require the operator to return the aircraft leased to the original configuration, unless the design changes had been implemented by the OEM. As such, some operators may need to consider the Service Bulletins (SBs) from the Original Equipment Manufacturer (OEM) rather than a low cost solution.

  Note 2: Cost related data may be sensitive and sometimes confidential, therefore the reported values should not be further distributed.

- DLS exemption application timeline:

  Based on Article 14.1, EASA did not have access to the original requests it is assumed that the requests for the exemption of the aircraft captured in the list proposed were submitted prior to 31 December 2012. Any new aircraft types/models /variants, type certified after 31 December 2012, are not eligible for exemptions in accordance with Article 14.

- Applicants for DLS exemptions:

  It should be noted that most of the requests have been submitted by the operators (or associations), for which the DLS regulation applies. However the exemptions currently granted are for types/models or marketing names.

  The list proposed reflects the applications received, as such it may not always be consistent with the detailed aircraft specifications in their Type Certificate Data Sheet (TCDS).

- Data available:

  Although the equipage requirement applies to all operators flying in the European airspace above FL285, it should be noted that the data used to substantiate the options in this report is based on the information from ASCEND[7] Fleets database from Flight Global. The number of flight hours analysed, represent the EASA Member State operators flight hours, and does not include the number of hours flown by the third country operators in the European airspace, nor the overflights. It is estimated that the TCO flights are approx. 12.8% of the total flights, while the overflights are estimated at 9.7%. As a note, the number of flight/hours flown by state aircraft is less than 0.1%. However, regardless if they are aircraft operated by TCOs or they are just overflying aircraft, the airspace requirement needs to be complied with.

  Specific assumptions were made when calculating the flight hours within European airspace exemptions (i.e. long haul aircraft are generally FANS-equipped, and the time spent (number of hours) in the European airspace is assumed to be 30% of the total number of hours flown).

- DLS regulation stability:

  The stakeholders consulted recommended to **not** change the 'type' exemption criteria and to maintain stability in the regulatory provisions. Considering such request, EASA reviewed the list of exempted aircraft types (starting from the ones proposed by the EASA draft report version 1.1), with the goal to provide minor changes and only when justified. However, the stakeholders recommended updating the automatic exemptions.

- DLS performance:

[7] http://www.ascendworldwide.com/what-we-do/ascend-data/aircraft-airline-data/ascend-online-fleets.html

There are concerns that in certain areas (particularly in the vicinity of high traffic aerodromes) the frequency is becoming congested even with the additional frequencies, as reported by the Network Manager (NM)(fig.1)

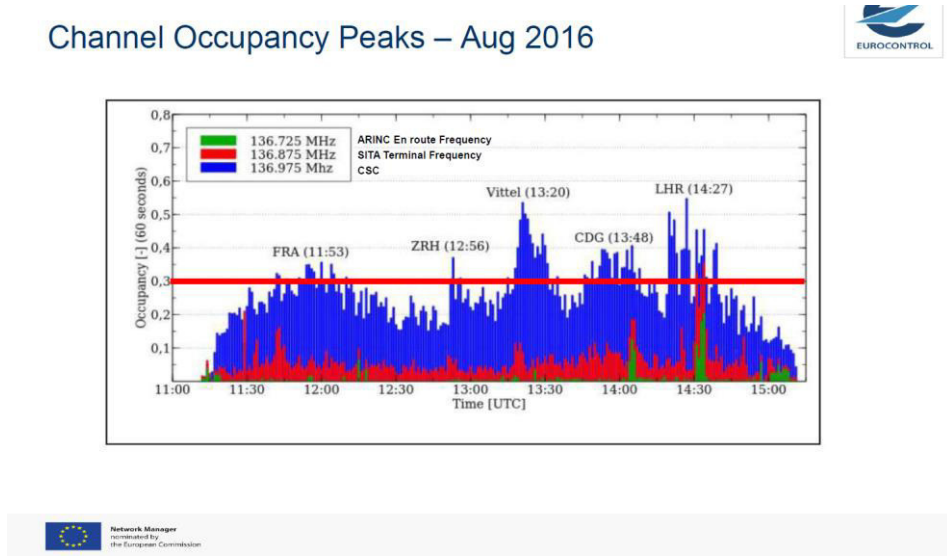


Figure 1: Channel Occupancy Peaks

According to the NM, the number of Provider Aborts (PAs) has increased again in May 2017(fig. 2)

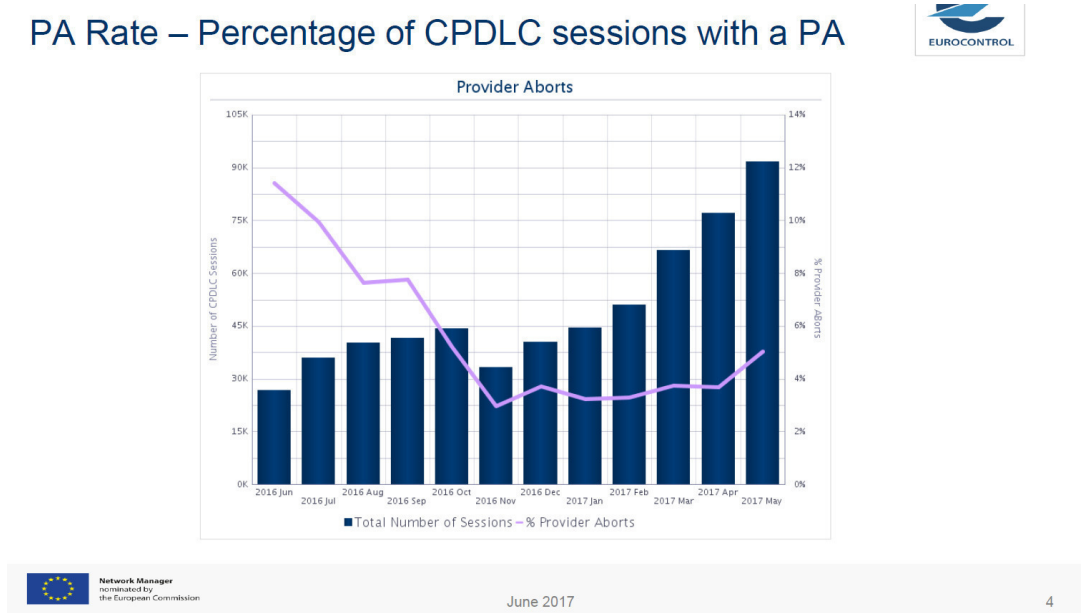


Figure 2: Percentage CPDLC sessions with PA

This increase is recorded even if the overall number of aircraft reporting CPDLC capability and using CPDLC is relative low.

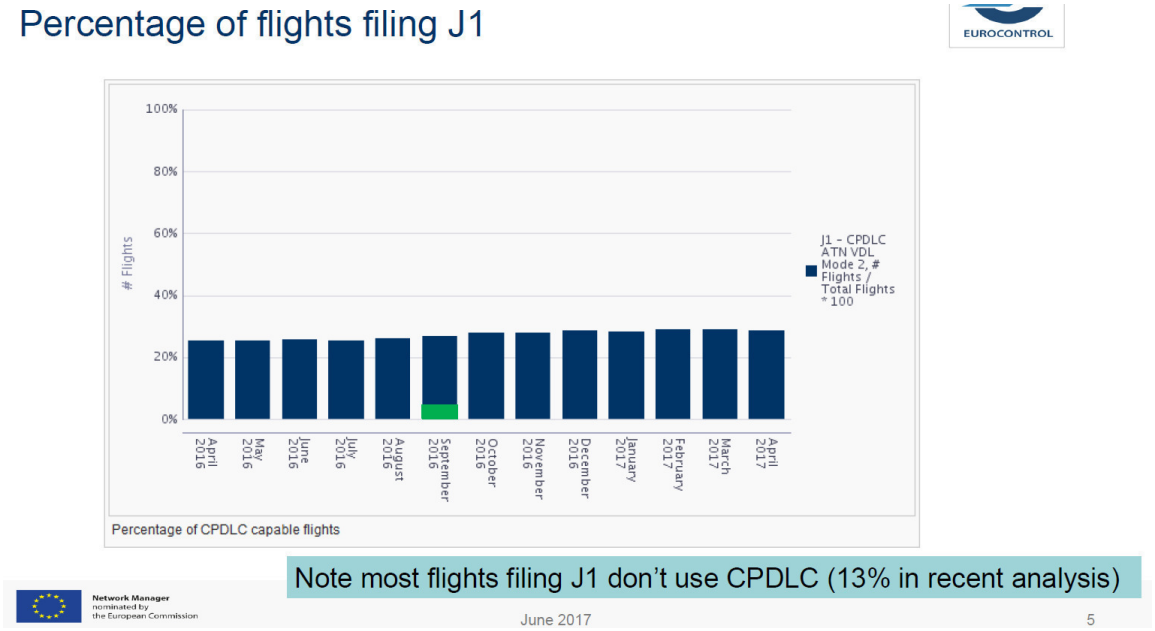


Figure 3: Percentage flights filing J1

Note: provider aborts (PA) is the technical term used to characterise ATN disconnections generated at the communication network and link level. Detailed explanations on their potential causes are explained in EASA DLS report and the ELSA report 'VDL Mode 2 Measurement, Analysis and Simulation Campaign'.

Even if the current observations for the month of June 2017 indicate that the number of PAs has been reduced, the PA number is considered high (15/100 hours) compared with the level which was agreed as a target (1/100 hours). The latest trend is presented in the graph (provided by the NM). There are still questions however, on what is considered as an acceptable number for the PA.

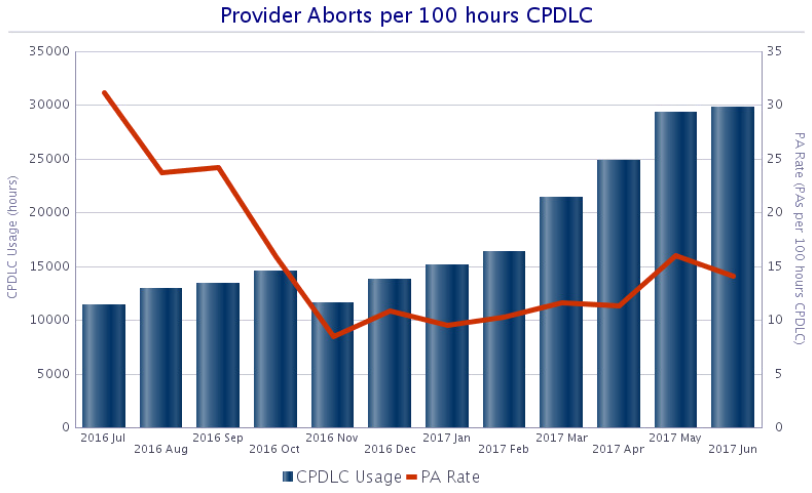


Figure 4: PAs per 100 hours

Nonetheless, requesting more aircraft to be DL(data link) equipped (and use the DLS service), may potentially lead to an increased frequency congestion in

certain areas, which may contribute to an increased number of PAs above expected levels, and therefore contribute to a further loss of confidence in datalink services by the pilots and controllers.

Focus should rather be on the implementation of ELSA model D with multi-frequency followed later on by a gradual re-introduction of provisions to request additional aircraft (currently proposed for exemptions) to be data link equipped.

- 75% flights DL equipage

The preambles of the DLS regulation states: '…A significant % of flights not less than 75% should be equipped with such capability in order to allow sufficient capacity increase…'. The intent of the text could be interpreted as flight cycles or as flight hours.
Some would believe that the overall number of flight hours would be more representative when calculating the benefits, when compared with the number of flight cycles, the word 'flights' referring to the overall number of hours. Others, would disagree. While the number in this report refer to the flight hours, an assessment was also done considering the flight cycles. The difference between these two ways to calculate the percentage of flights DL equipped are less than 2% and is also presented.
The minimum 75% of flights DL equipped within EU airspace was not explicitly requested in the regulation, however it is stated in point 8 of the DLS regulation preamble. While the regulation aim should be 'no exemptions' in order to maximise the operational benefits, until the implementation issues are addressed, 75 % could be seen as an acceptable ratio. The rationale for proposing additional automatic exemptions, was to ensure that in the first phase the DLS is stable and properly working, while the requirements would be applied pragmatically where it makes the biggest impact, factoring-in the financial effort of the operators for the benefits they receive.
A study may be needed to assess the risks of mixed data and voice communications for controllers'/pilots' performance and the link with the sectorial capacity increase and the 75% equipage value. Equipage value may be further re-assessed with the introduction of additional services or link technologies.

However, the certainty that the DLS system is working as intended is needed first, before attempting to ensure that majority of the flights are DL capable. Monitoring the DLS performance will provide the necessary operational feedback for a subsequent assessment of the aircraft exempted, in case the validity of the assumptions and considerations within this document, changes with time. To support that, DLS performance targets would need to be established.

- ATN B1 and ATN B2:

Some stakeholders recommended that (in particular for business aircraft), the DL equipage requirement should meet at a later stage the ATN B2 requirements directly without going through the ATN B1 phase. However, it should be noted that the future implementation of EPP (Extended Projected Profile) as part of ATN B2 in accordance with the current PCP regulation, is not necessarily binding. Pilot Common Project (PCP) regulation states that SDM (SESAR

deployment Manager) shall develop a strategy which shall include incentives, to ensure that at least 20 % of the aircraft operating within the airspace of European Civil Aviation Conference (ECAC) countries in the ICAO EUR region corresponding to at least 45 % of flights operating in those countries, are equipped with the capability to downlink EPP aircraft trajectory as from 1 January 2026.

If 20% of the aircraft would be targeted to correspond to 45% of the flights, it is likely that the same aircraft types compliant to ATN B1 by 2020, may be subject to another design change to ATN B2 before 2025, in order to support the future revised DLS regulation. A change from ATN B1 standard (required by the current DLS regulation) to ATN B2 may not be a simple S/W change and it may require a new FMS in some cases. The change to ATN B2 is not currently mandated but rather incentivised and the upgrade to ATN B2 avionics should be timed and integrated so it supports an operational concept.

It is not foreseen that exemptions from the current DLS regulation equipage requirements, will prevent SDM to promote (and incentivise) equipage in accordance with the PCP regulation (to achieve EPP) since:

a. The aircraft performing most of the flights in EU airspace are not proposed to be exempted, and they could be among the aircraft subject to further upgrade, due to their impact at the airspace level.

b. To support the PCP requirements (EPP), a design change will be needed for some types, and it could be more cost efficient to go directly to ATN B2, rather than to upgrade to ATN B1 then change the design again ATN B2.

c. Consideration for this approach (direct ATN B2 upgrade) has already been requested by some stakeholders

Any upgrade in the avionics should be linked with the airspace benefits resulting from the implementations of a consistent CNS strategy.

Consultations/workshops

To further understand the stakeholders' specific concerns, EASA organised a focused consultation and has participated to various other events (e.g. workshop organised by EBAA) where the DL exemptions were discussed.

a. DLS regulation short term review - focused consultation 22 May 2017

EASA organised a focused consultation hosted in Brussels 22 May 2017, which provided the participants with the chance to present their feedback with regards to the DLS exemption criteria, 'non-AOC' traffic, compliance dates, CPDLC, FANS and dual stack equipped aircraft.

The stakeholders included airspace users, aircraft manufacturers, associations representing airspace users, General Aviation manufacturers, CANSO and NM.

The feedback received can be summarised as follows:

- DLS exemption criteria should only be subject to minor modifications, potentially just clarifying the application to aircraft type/model/series.
- Final decision on DLS exemption should be based on Decision 1 and Decision 2 (permanent exemptions are included in Annex 4 of this report) and the subsequent exemption applications received.
- DLS Regulation application dates for airspace users should not be postponed again, thus creating certainty with the DLS mandate.
- While the 'non-AOC' traffic operators' lack of access to CPDLC is not technical in nature, the exemption criteria should pragmatically take into account the reality that the 'non-AOC' traffic operators cannot access DLS .
- Although a DLS exemption option based on first CofA date was also discussed, stakeholders believe that exemption criteria should remain as the type/model/series exemption criteria and not be replaced with other or additional criteria.

The additional feedback resulting from the focused consultation, is provided in this report when describing specific topics. (e.g. Section 3.1)

The completed set of notes from the meeting and the presentations are included in Annex 5 of this report.

b. JURG feedback on DLS exemptions

The summary of the EASA activity on DLS has been provided to the JURG. This was followed by the feedback from the short-term DLS review focused consultation held on 22 May 2017 in Brussels. Some stakeholders specified that the dual-stack option for some types is either cost prohibitive, or the engineering solution has not been developed yet.

The provision in the current DLS regulation for the aircraft with a first CofA date of 1 January 2014 after which aircraft equipped with FANS will no longer be exempted from equipage with ATN B1 solution, has been challenged. With this regards, stakeholders proposed a later compliance date for such equipped aircraft to shift to 2018 or 2019 to fit better with their business needs, and to align with other compliance dates (NAT DLS requirements). The stakeholders also requested that aircraft types like B737 classic, B747-400, B757, B767, B777 and A330 to be exempted.

Additional feedback received by EASA on FANS-1/A equipped aircraft and the dual stack avionics DL solution is presented in the 'automatic exemptions' section and in Annex 5 at the end of the report.

c. EBAA DLS workshop

Minutes from the meeting were not available at the time the report was drafted. Some stake holders (e.g. EBAA) expressed their views that solutions for airspace users not having an agreement with the communication service providers needs to be found. Furthermore, some stakeholders proposed that operators' aircraft 19 passengers or less should be DLS exempted, until a full air-ground CNS vision is defined. More details are provided throughout this report. Presentations were made available to the participants.

3. Automatic exemptions

Various options for automatic exemptions have been considered. They include:

(a) First CofA date, prior to which aircraft equipped with FANS-1/A are exempted, to be moved from 2014 to 2018 or 2019. (EASA's interpretation of the requirement is in section 3.1).

(b) First CofA date, prior to which an aircraft could be exempted, could be introduced for older aircraft (e.g. over 25 years old)

(c) Aircraft used in accordance with the non-commercial air operational rules could be exempted (in fact the non-commercial complex motor powered aircraft capable of flying above FL285 would be exempted)

(d) Aircraft with a certified seating configuration of 19 passenger or less, with a MTOM of 45359 Kg/100000 lbs or less, could be exempted (it was subsequently considered that this exemption provision should apply for retrofit)

Some of the measures proposed could be temporary (e.g. non- commercial operated aircraft exemption or exemption of aircraft 19 passengers or less) until a viable solution of connecting the 'non-AOC' traffic and the proper enforcement of the DLS regulation is achieved.

3.1. FANS-1/A equipped aircraft (including the dual stack avionics solution)

<u>DLS focused consultation feedback</u>

During the DLS focused consultation on May 22 at EASA in Brussels, some stakeholders express their concern with the availability of a solution for DL dual stack avionics for some types (built after 2014). Stakeholders were concerned that for certain types produced after 2014 no dual stack avionics solution may be found in time (by

2020). As such, stakeholders proposed to postpone this date in the DLS regulation to 2018 or 2019.

Some stakeholders advised that a forward fit solution would be more cost effective than a retrofit one, and ideally should be developed first. Retrofit compliance date should ideally be 2 years after the forward fit compliance date.

Other stakeholders argued that the FANS-1/A compliance date should not really change, as may be seen as unfair for some operators which decided to comply early with the DLS regulation.

Another issue was raised by some stakeholders with regards to the interpretation of the DLS regulation. For some aircraft built prior to 2014, the FANS option was not activated (although the installation existed). Question was raised if these aircraft should be exempted. Another question was raised with regards to DLS design changes completed post 2014 on aircraft with the first CofA prior to 2014. EASA's interpretation is that the CofA date of 1 January 2014 for aircraft equipped with FANS is linked with the DLS operational capability at that time. If a design change enabling DLS service was introduced after 2014 for an aircraft with a first CofA prior to 2014, the operator would not necessarily be in compliance with the intent of the DLS regulation.

JURG and IATA feedback on DLS.

During the JURG meeting, IATA has requested to include their feedback on DLS regulation exemptions (see Annex 5).

EASA proposal:

Based on the feedback received from the airspace users, with regards to the FANS-1A equipped aircraft, it is proposed to move the first CofA date of 1 January 2014 to 1 January 2018 is considered, the forward-fit requirement for all aircraft with a first CofA after 5 February 2020 to be also equipped with ATN B1 is proposed to remain unchanged.

Taking into account the following:

- Long range aircraft to be equipped with FANS 1/A which may not have ATNB1 implemented (built between 2014 and April 2017), in the worst-case scenario they would not fly more than 1.4% of the total flight hours (0.8% in number of flight cycles).
- Long range aircraft equipped with FANS 1/A will fly in other regions (e.g. ICAO-NAT), where FANS-1/A equipage is required.
- High cost is claimed for dual stack avionics or unavailability of technical solutions for some types/models.

- By moving this date to 2018, it is expected that the stakeholders request regarding certain older types/models still manufactured after 2014 (e.g. B767 and A330 - CEO) would be fulfilled and they would not have to provide the additional investment for the DLS for minimum operational benefit in the European airspace.

- Stable and acceptable DLS operations needs to be proven, and the focus on ground domain upgrade to ELSA Model D with multi-frequency should be considered as a higher priority.

- 'Best in class' avionics is not defined sufficiently for formal certification. Any design change proposed for the avionics parts and appliances based on the future ED-92 C standard, cannot be implemented before 2020.

- Implementation of the DLS regulation has to be proportionate (not following the 'one size fits all principles)

Based on the above, and considering the relative reduced impact, EASA proposed to amend the first CofA date for FANS-1/A aircraft to 1 January 2018.

Regulation text proposal:

[…]

3. Paragraph 2 shall not apply to:

(xx) aircraft with an individual certificate of airworthiness first issued before 1 January 2018 and fitted with data link equipment ~~certified against~~ compliant with the requirements of one of the Eurocae documents specified in point (10) of Annex III;

[…]

3.2. First CofA date

One of the options proposed for discussion by EASA during the focused consultation held in Brussels on 22nd May was to exempt all the aircraft with the first CofA prior to 1st January 2000.

While it was recognised by some stakeholders that the tracking and managing the implementation of the DLS based on the first CofA date appears simple, most of the stakeholders would prefer the type/model based exemptions. However some stakeholders appeared to be open to the idea especially if coupled with other automatic exemptions.

The analysis of the number of flight hours versus the aircraft age shows that the average annual flights are between approximately 400 and 500 hours for aircraft within the 5 to 20 year-old age group (see blue shading in the figure below) and then starts to decline sharply after the 25 year threshold. While aircraft older than 25 years are still operating

in Europe, their number of flight hours is reduced and the aircraft retirement rate is high. In 2020, for an aircraft to be at least 25 years old, it must have a first CofA prior to 1995.

The data represents the number of flights[8] operated in NM controlled airspace in Europe (ECAC) in 2014, broken down by aircraft age to estimate the correlation between the annual number of flights per aircraft and aircraft age. The source is a Eurocontrol[9] publication (pp 78–79).

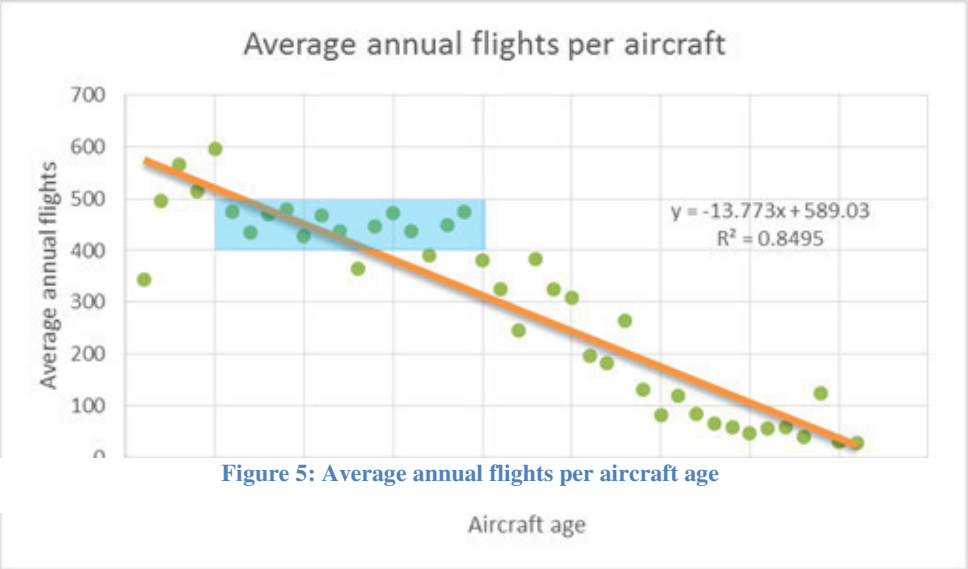


Figure 5: Average annual flights per aircraft age

The following table groups the aircraft flights based on their age bracket.

The last but one column demonstrates the decrease in average annual flights as the aircraft age increases. Aircraft in the 6–10 year old group fly 91% of the annual flight hours of the 1–5 year old group, while aircraft older than 35 do not fly more than 10% of the annual flight hours of the aircraft younger than 6 years.

The last column takes the average annual flights of the whole fleet as 100% (i.e. 405 movements per year), and compares the various age groups to this. Aircraft that are older than 20 fly less than the average of the whole fleet while aircraft younger than 21 tends to be on average more heavily utilised (see Fig. 6)

[8] Number of civil aircraft operating in Eurocontrol Network Manager controlled airspace in Europe (ECAC)

[9] Standard Inputs for EUROCONTROL Cost-Benefit Analyses. Edition Number: 7.0. Edition Date: November 2015. Available online at:
https://www.eurocontrol.int/sites/default/files/publication/files/standard-input-for-eurocontrol-cost-benefit-analyses-2015.pdf

Age group	Flights in 2014	Share of total flights	Number of aircraft	Average annual flights	Max = 100%	Average = 100%
1–5	2 832 834	31%	5 648	502	100%	124%
6–10	2 404 852	27%	5 250	458	91%	113%
11–15	1 713 036	19%	3 928	436	87%	108%
16–20	1 111 958	12%	2 616	425	85%	105%
21–25	710 444	8%	2 241	317	63%	78%
26–30	172 798	2%	976	177	35%	44%
31–35	61 447	1%	891	69	14%	17%
36–41	40 346	0%	804	50	10%	12%
Total	**9 047 715**	100%	**22 354**	**405**		

11%

23%

Above

Below

Figure 6: Age group and share of total flights

Currently, in the DLS regulation there is already a similar provision referring to the first CofA date (see 3 b below)

2. Without prejudice to paragraph 3, operators shall ensure that aircraft operating flights referred to in Article 1(3) have the capability to operate the data link services defined in Annex II as from 5 February 2020.

3. Paragraph 2 shall not apply to:

(a) …

(b) aircraft which have an individual certificate of airworthiness first issued before 31 December 2003 and which will cease operation in the airspace referred to in Article 1(3) before 31 December 2022;

(c)…

According to this provision, all the aircraft with a first CofA prior to 31 December 2003 are exempted as long as they retire by 31 December 2022. To continue to operate, this provision would in fact force equipage of the aircraft 19 years or older in 2023.

Removing this provision and replacing it with the provision to exempt all aircraft with a CofA before 2 February 2000, has encountered some resistance from the stakeholders, since it would affect their aircraft in the fleet which are manufactured between 2000 and 2003, which in this case will be no longer be exempted.

However, this provision may not be actually seen as proportionate with the aircraft usage, as aircraft older than 20 years would operate less and less, in particular when they reach 25 years of age.

Taking into account the following:

- Aircraft older than 20 years do not fly more than approximately 11 % of the total flight hours, and aircraft older than 25 years only fly approximately 3% of the total flight hours.

- Many of the older aircraft are business jets, which would be also proposed to be exempted under the '19 passenger or less' criteria and some types/models proposed to be exempted under the Article 14 types/models specific exemptions.

  Note: Business jets have generally a longer expected life.

- DLS implementation needs to be proven first, and the focus should be on the ground domain upgrade to ELSA Model D with multi-frequency.

- Best in class avionics concept is not yet defined. Any design change for the avionics parts based on the future ED-92 C standard cannot be implemented before 2020 and in practice will take considerably longer.

- older aircraft are flying less and less in the airspace and would only make a minor DLS contribution in overall airspace, although the retrofit cost for the individual operators may be significant higher when compared with the aircraft residual value.

EASA proposal

Based on the above, EASA proposes to introduce an age applicability threshold for aircraft, older than 25 years. These older aircraft are flying in general less, therefore contributing less to the potential frequency congestion, and in addition they are likely to have excessive retrofit costs in comparison to the operational benefits they receive.

Additionally, EASA would not propose at this time to remove the 31 December 2022 retirement age.

Regulatory text proposal:

…2. Without prejudice to paragraph 3, operators shall ensure that aircraft operating flights referred to in Article 1(3) have the capability to operate the data link services defined in Annex II as from 5 February 2020.

3. Paragraph 2 shall not apply to:

[…]

(-) aircraft which have an individual certificate of airworthiness first issued before 1 January 1995;

[…]

For transparency and completeness, it should be pointed that one stakeholders requested an additional 'or' between the various points in paragraph 3, to clarify that if in

any of the 3(a), 3(b), 3(c), etc., conditions are fulfilled, the aircraft is exempted. This EASA believes however, that the additional 'or' is not necessarily needed.

3.3. Non-AOC traffic

Clarification of the AOC/Non-AOC terminology

'AOC' within the data link context is understood as 'Aeronautical Operational Control' (AOC) services. (this refers to the data and voice services which serves to support the airline such as transmitting for example information on engine performance)

'AOC' in the EASA's Air operations regulatory framework is understood as an Air Operator's Certificate (AOC) (approval granted by a competent authority to an aircraft operator – generally for aircraft flying – Commercial Air Transport (CAT))

A non-AOC operator is to be understood as an operator which does not subscribe to any data link AOC services but is still mandated to use data link for the purposes of ATS. General aviation and business operators are more likely to be part of this category. However some airlines do not use AOC data either.

Feedback on non-AOC traffic topic, received during the EASA DLS exemptions focused consultation

An aircraft DL equipped according to the regulation has the right to access the DLS. CSPs must therefore provide proper connection and access to the DL network. The focused consultation revealed the opinion of the group that the 'AOC' or 'Non-AOC' traffic should be treated similarly. The opinion of the stakeholders was that the issues is not technical in nature, rather a contractual one. Additionally, it was recommended that aircraft of 19 passengers or less, should be provided with a temporary exemption until the CSPs would be able to ensure the correct DL connection.

The number of GA/Business aircraft is comparable with the number of aircraft flying commercial operations, however GA/Business aircraft fly significantly less. Therefore from an airspace operational perspective it would not make a major impact in terms of flights/flight hours, if the GA/Business aircraft are exempted.

On the other hand, avionics manufacturers are working with EASA to find solutions for ATN B1, therefore it would be unfair to have a blanket permanent exemption.

Conclusions of the focused consultation stated that the Commission/regulators must find ways to enforce the current regulation which obliges the ANSPs to ensure ATS communication to all the aircraft capable of DLS. ANSP should enforce CSP to provide the service.

Feedback on non-AOC traffic topic, provided during the EBAA DLS workshop (as per the presentation).

(GARMIN): Although there were technical preventions previously in place which restricted non-AOC operators, Garmin has determined through test and log analysis that non-AOC avionics can now be used in DLS-IR airspace. Garmin is not aware of the CSPs setting up a program to allow for contractual arrangements with non-AOC operators. While non-AOC operators are technically able to use the DLS service, they may not be protected under a contractual arrangement.

The other issue raised by GAMA/EBAA refers to the benefits of DLS. Many of their members are required to install equipment without really benefiting from the DLS. A possible option coming from EBAA was to exempt for retrofit all the aircraft with 19 passengers or less until a long term solution is found.

All the presentations from various other stakeholders have been provided to the workshop participants.

EASA proposal

Taking into account the following:

- Solutions for the users not having an agreement with the CSPs are still not clear. As such there is still no guarantee of service availability.
- GA/Business aircraft all together do not fly more than approximately 8.7% of the total flight hours with a fleet size comparable to the commercial airline, and only approximately 7% when taking into account only the aircraft operating above FL285.
- The CBA for the business aircraft operators is less favourable than for the scheduled service airline due to their type of operations.
- Some of the business aircraft fly at the high altitude, less crowded, where the use of the DLS may be therefore needed less frequent.
- Best in class avionics concept is not defined.
- Implementation of the DLS regulation has to be proportionate (no following the 'one size fits all principles)
- Some avionics manufacturers which have already developed retrofit packages would be impacted. Additionally some operators who decided to comply earlier with the DLS regulation may feel that their investment was not justified and may be reluctant to comply earlier in the future.

EASA proposes an automatic exemption for aircraft with 19 passengers and less **for retrofit only,** until the non-AOC traffic connection issue is addressed. This would alleviate the pressure for the retrofit packages (generally more expensive), while maintaining the focus for forward fit avionics. The weight limit of 45359 Kg /100000 lbs was added with the intention to differentiate between the typical GA/Business aircraft,

and aircraft converted from a regular airliner into a business aircraft and to separate the typical GA/business aircraft from freighters.

Regulatory text proposal:

[…]
3. Paragraph 2 shall not apply to:
[…]
(xx) aircraft which have a certified maximum seating capacity of 19 passengers or less and a MTOM of 45359 Kg (100000 lbs) or less, with a first individual certificate of airworthiness issued before 5 February 2020;
[…]

Additional proposal to address non-AOC traffic topic

During the DLS focused consultation, as an alleviation measure to the 'non-AOC' traffic issue, it was proposed to exempt the non-commercial (CAT) operated aircraft.

DLS regulation is an airspace requirement and is applicable to all airspace users within the EATMN, regardless if the operator has or does not have an AOC traffic contract with a CSP. In practice and as stated above, many operators are concerned that they are forced to carry equipment on board (i.e. DL equipment) which they cannot use. Therefore, until CSP's can and will be actually providing a service to all aircraft requiring the service, as per the DLS regulation, the non-CAT operated aircraft which do not benefit from an AOC contract, may not be provided with DLS, therefore, these operations are proposed to be exempted.

While such measure should be a temporary measure until the right mechanism to enforce ATN/ATS service provision to all airspace users, as foreseen in the DLS regulation, is found, the hurdles in the implementation of the regulation may not offer the non-CAT operators a positive CBA for a useful and effective DLS. The Commission supported by other stakeholders should ensure that the DLS regulation is enforced.

The question to be asked is what would be impact on the 75% minimum equipage target when exempting the non-CAT aircraft, or when exempting aircraft with a 19 passengers or less seating configuration? It should be noted that the values shown below are calculated when the criteria are used as standalone ones. The values below are approximate, and what should be noted here is the order of magnitude.

Statistics showing the separation between non-commercial and commercial operated aircraft, certified to carry 19 passengers or less and being able to fly above FL 285, but not including freighters is provided below. (MTOM division of *45359 Kg /*100000 lbs was provided to reflect in general the higher threshold for the largest business jets, which are not conversions from regular airliners).

The ratio between non-commercially versus commercially operated aircraft, expressed in flight hours, for aircraft capable flying above FL 285 is between 2-3%. The table

represents the percentages for Non-commercially /State /Commercially operated aircraft.

The number of flights/flight hours performed by State aircraft proportion is actually less than 0.05%, therefore is shown in the table as 0.0%.

Description	Non-commerc	State	Commercial	Total
Below 100,000	1.1%	0.0%	1.5%	2.7%
100,000 or more	0.0%	0.0%	0.0%	0.0%
Total	1.2%	0.0%	1.5%	2.7%

A related table with the estimated number of flight hours in European airspace:

Description	Non-commerc	State	Commercial	Total
Below 100,000	116 277	1 263	154 531	272 071
100,000 or more	4 239	186	0	4 425
Total	120 516	1 449	154 531	276 496

A related table provides the number of aircraft 19 passengers or below and the relationship with non-commercial/state/commercial operation.

Description	Non-commerc	State	Commercial	Total
Below 100,000	1 637	8	1 549	3 194
100,000 or more	28	1	5	34
Total	1 665	9	1 554	3 228

From the above tables it can be seen that almost half of the aircraft 19 passengers or below operate commercial. Their number of flight hours, hence potential DLS contribution is 20-30 % more than the number of flight hours flown by non-commercial fleet. However, the overall impact of the typical business aircraft and non-commercial aircraft, on the total number of flight hours in the European airspace is rather low.

Note: When assessed together with the other criteria (aircraft age, FANS -1/A, proposed/draft Decision no 3), the overall impact on the number of flights is not a direct addition, due to various aircraft which could be exempted at the same time by multiple criteria.

Regulatory text proposal:

[…]
3. Paragraph 2 shall not apply to:
[…]

(xx) aircraft engaged in non-commercial operations;

[…]

3.4. Regulatory text proposal for automatic exemptions:

Considering all the proposals regarding the automatic exemptions the resulting regulatory text proposal is:

[…]
2. Without prejudice to paragraph 3, operators shall ensure that aircraft operating flights referred to in Article 1(3) have the capability to operate the data link services defined in Annex II as from 5 February 2020.

3. Paragraph 2 shall not apply to:

(a) aircraft with an individual certificate of airworthiness first issued before 1 January 20148 and fitted prior to this date, with data link equipment ~~certified against~~ compliant with the requirements of one of the Eurocae documents specified in point (10) of Annex III;

(b) aircraft engaged in non-commercial operations;

(c) aircraft with an individual certificate of airworthiness first issued before 1 January 1995;

(~~b~~d) aircraft which have an individual certificate of airworthiness first issued before 31 December 2003 and which will cease operation in the airspace referred to in Article 1(3) before 31 December 2022;

(e) aircraft which have a certified maximum seating capacity of 19 passengers or less and a MTOM of 45359 Kg (100000 lbs) or less, with a first individual certificate of airworthiness issued before 5 February 2020;

(~~c~~f) State aircraft;

(~~d~~g) aircraft flying in the airspace referred to in Article 1(3) for testing, delivery or for maintenance purposes or with data link constituents temporarily inoperative under conditions specified in the applicable minimum equipment list required by point (1) of Annex III and Regulation (EC) No 216/2008 and its implementing rules.

4. Member States which decide to equip new transport type State aircraft entering into service after 1 January 2019 with data link capability relying upon standards which are not specific to military operational requirements, shall ensure that those aircraft have the capability to operate the data link services defined in Annex II.
[…]

3.5. Re-assessment of the automatic exemption criteria

Pending a successful implementation of DLS and the resolution of the non-AOC traffic not being able to connect, the automatic exemption criteria should reviewed and amended accordingly. While the 75% is currently viewed as a minimum for DLS equipped flights, the target should be 100% to maximise the operational benefits. The overall number of exempted flights should be monitored for example by NM, and

corrective actions should be taken by EASA in case some of the assumptions or the automatic exemption criteria will not lead towards the 25% target of maximum exempted flights by 2022 in the operational airspace volumes. Some possible reasons for not meeting the 75% minimum may include the increase usage of older aircraft benefitting from the type/model exemption, delaying the replacement of the fleet with new aircraft in compliance with the DLS regulation.

Note: the requirement referring to datalink constituents temporarily inoperative under the conditions specified in the applicable minimum equipment list, would need to be reviewed during the RMT.0524, and a DLS rectification interval to be introduced as appropriate In the DLS rule. Other related documents may need to be aligned.

4. Aircraft specific exemptions (by type/model/series)

4.1. Assessment of the "exemption criteria"

Commission Regulation (EC) No 29/2009 Article 14 paragraph (3) defines the criteria based on which aircraft of specific types might be granted exemption to the requirements of DLS. The criteria are currently the following:

(a) aircraft types reaching the end of their production life and being produced in limited numbers; and
(b) aircraft types for which re-engineering costs required would be disproportionate due to old design.

During the focused consultation the criteria was proposed to be revised to add 'models'. The addition of the wording models would not necessarily change the current list of aircraft types/models proposed for exemption, however may be needed if another exemption exercise would be required.

As the Regulation offers no definition of the elements specified in a) and b) above **the objective of the following sections is to provide quantifiable and transparent definitions which can be used** for assessing the applications for exemptions.

The following sections will look at how to define 'types reaching the end of their production life and being produced in limited numbers' and offer alternative approaches on how to measure the criteria 'disproportionate due to old design'. The analysis done was based on the intention to meet both criteria a) and b). These approaches are then applied to the aircraft types for which exemption have been granted and requested.

4.2. Defining the production life / limited numbers

The impact assessment of the Justification Material for the Draft Implementing Rule on Data Link Services by EUROCONTROL assumes that '*exemptions will represent a very small proportion of the total number of IFR/GAT flights in the applicable airspace*' (page A-16).

Article 14 (3) (a) of the Commission Regulation grants exemption to aircraft types:

- reaching the end of their production life and
- being produced in limited numbers.

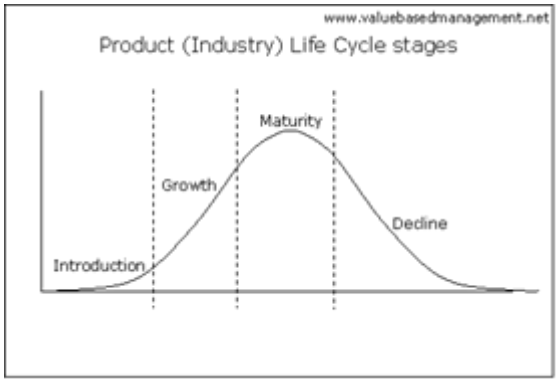
A product life cycle usually have four distinct stages after development:

- introduction
- growth
- maturity

• decline.

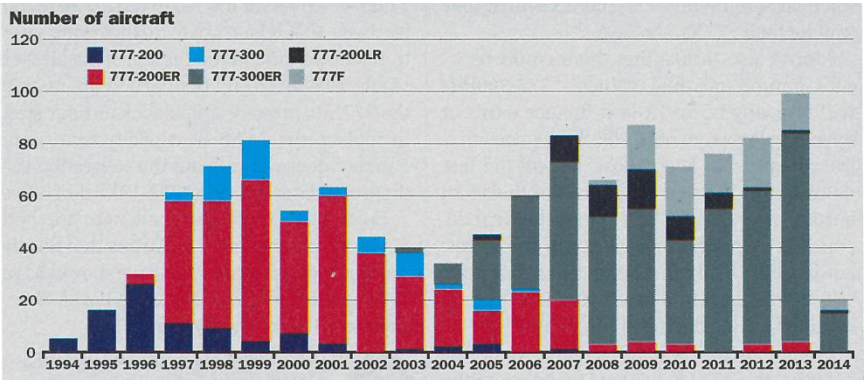
These four stages can be well illustrated with the bell-shaped curve of a normal distribution. The time is on the horizontal axis and the number of units delivered on the vertical axis (see Fig. 7).

Figure 7: Stages of product life cycle



Real life delivery figures do not resemble the normal distribution perfectly, e.g. they are often screwed to the right or aircraft series and variants might have their own production life (see Fig. 8). Despite this, assessing historical delivery figures based on the bell-shaped curve of normal distribution can help identify the end of production life.

Figure 8: Boeing 777 deliveries[10]



[10] Source: Ascend online

Approximating the product life cycle with a normal distribution allows several type of prediction about future deliveries. If it is assumed that the aircraft type is reaching the end of their production life when 95% of the production has been delivered this can be represented by:

- the production has reached its peak, and
- the annual production is in 'decline phase' and is no more than roughly 1/4 of the peak value.[11]

The criteria, *being produced in limited numbers*, is a difficult condition to define as this can be interpreted in many ways, for example a fixed number, a fixed number per annum, a percentage of existing fleet depending on the type of aircraft. Additionally, the concept of being 'produced in limited numbers' is highly dependent upon the market segment that is being targeted. For some aircraft types production rates of 10 aircraft a year are significant and this rate cannot be compared to the production rates of aircraft such as the A320/B737. However, they all operate in the airspace and are subject to the same operating conditions. Therefore as a condition on its own, cannot be used. The requirement in Art 14 is '(a) aircraft types reaching the end of their production life **and** being produced in limited numbers; and (b) aircraft types for which re-engineering costs required would be disproportionate due to old design'. The key word here is 'and'. Therefore, to be legible for an exemption the aircraft type must first be reaching the end of it production, (i.e. no more or limited orders) and compared to the peak production rates, the numbers of aircraft produced are significantly reduced.

4.3. Defining disproportionate costs

4.3.1. Approach 1 - Proportionality: Cost of retrofit as percentage of the average current market value (CMV)

In regulatory impact assessments low, medium and high economic impacts may be defined based on either percentage thresholds or absolute euro figures.

A negative impact is defined in table 1 as a cost as a percentage of the annual turnover for any single firm. However, in this case linking a possible exemption to an individual company's turnover is not practical as aircraft are moveable asset and during their life are operated by more than one company that have different annual turnovers. An exemption based exactly on these criteria is therefore not practical and may have a negative impact on the transfer of aircraft between companies. If we are to assume the intent of such a definition is to link the cost related to implementing the regulation to the economic status of the company, we could in this case link such and cost to the value of the asset. Therefore, a **one-off retrofit cost that is less than 1%** of the asset could be considered a low impact, or in other words an impact that can be considered proportionate. The 1% value is a standard assessment cost benefit applied as part of the regulatory impact assessment criteria. The value of the asset can be considered to be the residual value or current market value.

[11] 25.85% in case of the standard normal distribution

Table 1: Assessment of economic costs and benefits[12]

Assessment	Description
Highly positive impact	Savings of more than 5% of annual turnover for any single firm. Total annual saving of more than 100 million euros.
Medium positive impact	Savings of 1-5% of annual turnover for any single firm. Total annual savings of 10-1000 million euros.
Low positive impact	Savings of less than 1% of annual turnover for any single firm. Total annual savings of less than 10 million euros.
No impact	
Highly negative impact	Costs of more than 5% of annual turnover for any single firm. Total annual costs of more than 100 million euros.
Medium negative impact	Costs of 1-5% of annual turnover for any single firm. Total annual costs of 10-100 million euros.
Low negative impact	Costs of less than 1% of annual turnover for any single firm. Total annual costs of less than 100 million euros.

The Information contained in the ASCEND database[13] on the average residual value or current market value (CMV) of most aircraft types in the European fleet is available. Based on the CMV as well as the estimated costs for retro fitting an aircraft with a DL compliant system, the cost/value ratio can be calculated and based on the above consideration all aircraft **with a ratio higher than 1% should be exempted**.[14]

This approach provides a straightforward way of assessing the proposals and can be implemented with the available data. However, it does not take into account initial rationale of the exemption, which was based on the number of flights and the idea that old aircraft should be exempted as their potential benefit generated by their number of flights with DL would not be proportionate to the costs for retrofitting the aircraft.

[12] EASA impact assessment guidelines. Original source: Government of Canada: FRAMEWORK FOR THE TRIAGE OF REGULATORY SUBMISSIONS

[13] http://www.ascendworldwide.com/what-we-do/ascend-data/aircraft-airline-data/ascend-online-fleets.html

[14] For a number of aircraft no current market value is available in the data base but can be estimated based on new price and depreciation rates.

4.3.2. Approach 2 – Proportionality: Cost of retrofit in relation to the aircraft specific benefit from DLS

Although the regulation does not provide any indication that the proportionality of cost should be linked to the anticipated benefits, from an economic perspective such an approach may be more appropriate. Such an approach could take into account the aircraft age, number of flights and potential benefits expected over the life of the aircraft. The following approach is an attempt to review the potential benefits with the available data.

In order to make an economically sound judgement on the proportionality of costs it would be necessary to look into the costs and benefits by type.

As far as the **costs** are concerned, the aircraft equipage costs for retro fitting DL on the European fleet was originally estimated by EUROCONTROL in the Economic Appraisal of Eurocontrol's Justification Material[15], to be ranging from EUR 5000 up to EUR 100.000 depending on the type. The average was considered to be around EUR 40.000.

By contrast, for the aircraft types were an exemption has been requested, the costs are estimated to be on average EUR 318.000, ranging from 70.000 to 450.000. Based on this information the costs and benefits can be compared on a by-type-level if an estimate for the benefits by type can be found.

In order to estimate the benefits by type, the starting point is the Economic Appraisal of Eurocontrol's Justification Material, which contains aggregate level data on the following key variables of the forecast model:

- Annual aircraft and traffic projections up to 2025:
  - *number of flights of* all aircraft and thereof number of flights of eligible aircraft and aircraft equipped with DL
  - *number of* all aircraft, eligible aircraft and aircraft equipped with DL
- Correlation between aircraft age and flights per aircraft

EUROCONTROL also estimated the benefits in the operating period of just over 10 years[16] after mandatory equipage to be EUR 875 million, assuming baseline traffic growth and compliance with the deadline for equipage.

If we assume the overall benefit of EUR 875 million to be accurate, the benefit per flight can be calculated by dividing the total benefits with the number of flights equipped with DL. A 3.4% average annual traffic increase was assumed at that time, therefore the number of eligible flights increases from 3.5 million in 2006 to 4.8 million in 2015 and 6.7 million in 2025. Taking into account the share of flights equipped with DL, the baseline traffic growth and equipage scenario assuming 56 million flights with DL in the 2015–2025 period. The average benefit per flight is EUR 875 million divided by 56 million

[15] Annex C of EUROCONTROL (2007) SES Regulation justification material SES/IOP/DLS/JMA/2.0

[16] February 2015–2025

flights, which is EUR 15.65 (or USD 20.77[17]). It should be noted that current exchange rate is (1 euro=1.17 dollars).

The following table (Table 2) represents the prediction done in 2014 over the DLS equipage of the fleet:

Table 2 Number of flights equipped with DLS

Year	Eligible flights	Share of flights equipped	Number of flights equipped
2006	3 539 208	0%	0
2007	3 659 541	0%	0
2008	3 783 965	0%	0
2009	3 912 620	2%	78 252
2010	4 045 649	4%	161 826
2011	4 183 201	11%	460 152
2012	4 325 430	24%	1 038 103
2013	4 472 495	47%	2 102 073
2014	4 624 560	71%	3 283 437
2015	4 781 795	83%	3 968 890
2016	4 944 376	87%	4 301 607
2017	5 112 485	89%	4 550 111
2018	5 286 309	90%	4 757 678
2019	5 466 044	91%	4 974 100
2020	5 651 889	91%	5 143 219
2021	5 844 053	91%	5 318 089
2022	6 042 751	91%	5 498 904
2023	6 248 205	90%	5 623 384
2024	6 460 644	90%	5 814 579
2025	6 680 305	90%	6 012 275
Total (2015–2025)			55 962 835

Based on this figure, the benefit of a given type may be estimated using the remaining number of flights of a given type, which is based on:

A. Average annual number of flights of the aircraft type

[17] European Central Bank 2013 annual average reference exchange rate (1 euro = 1.3281 dollar)

B. Average service life of the aircraft class[18]
C. Average age of the fleet of the type operated in Europe
D. Benefit per flight

Benefit of DLS per aircraft type = A × (B – C) x D

This approach provides a more robust assessment of proportionality based on initial estimates of the total number of flights as this is considered the basic driver for the proportionality of costs to benefits and the assumed overall benefit.

Note: A recent value for average annual traffic increase changes the value to 2.9%.

4.3.3. Approach 3 – Proportionality: Cost of retrofit in relation to the cost of forward fit

An additional simplistic method to access the proportionality is to compare the relative costs of retro fitting an aircraft with a DLS system compared to the cost of equipping an aircraft on the production line (i.e. forward fit). Although it is very difficult assess or to estimate the cost to install a DLS system to an aircraft in production as this data is not readily available. However, as the majority of the costs are related to the equipment, LRU's, MCDU's, cables connects etc., the overall production installation costs can conservatively be assumed to be to the same as the retrofit costs.

As a result of these conservative assumption the cost ratio in this case, is basically the ratio the cost of a new aircraft to the residual cost. If the aircraft has depreciated to 1/10 of the value, any retrofit cost would be difficult to be justified from a cost-benefit perspective. Thus, all aircraft types with **a cost ratio higher than 10 should be exempted**.

The value of this approach is rather limited, since many of the values are not available.

4.4. Regulatory text proposal - Article 14

Considering the feedback received that the exemption criteria should only be subject to minor modifications, potentially just clarifying aircraft type/model/series, and taking into account that the table provided on DLS exemption does not reflect consistently just the aircraft type, the word 'models' is proposed to be added.

[…]

3. The criteria referred to in paragraph 1 shall be the following:
(a) aircraft types/models reaching the end of their production life and being produced in limited numbers; and

[18] Average service life of aircraft operated by EASA operators: Average age at permanent retirement from service of six aircraft classes (business jets, turboprops, regional jets, narrow-bodies and wide-bodies).

(b) aircraft types/models for which re-engineering costs required would be disproportionate due to old design.

[…]

4.5. Aircraft specific Proposed Exemptions (by type/model/series)

The intent for the list is to capture exemptions for the types and models out of production, or for one-off case where the production cycle is ending by 2020. The list of types and models proposed for exemption is not envisioned to contain any new model/variant, type certified after 1 January 2014.

As the primary driver for the exemptions as requested by the applicants is related to the cost of the retro-fit a review of the results of the analysis as described in paragraphs 4.3.1, 4.3.2 and 4.3.3 has been undertaken to assess those aircraft types that should be subject to a permanent exception. In a number of cases all 3 approaches indicated that an aircraft type should be exempted. Where this is not the case, if 2 out of the 3 indicated that the type should be exempted this was applied. When the analysis only returning 2 valued results, an aircraft type was considered to be suitable for exemption if at least it met the criteria of approach 1, i.e. the analysis is weighted to the approach 1 methodology.

Aircraft types for which a permanent exemption has already previously granted in accordance with Decisions 1 and 2, have been reassessed in accordance with approached described in paragraphs 4.3.1, 4.3.2 and 4.3.3 in order to determine a consistent approach. This analysis has confirmed the majority of the permanent exemptions already granted are consistent with the approach applied in this report with the exceptions noted in the comments section of the exemptions table.

Note: the detailed results for approach 1 to 3 can be found in Annex 1 to 3

The proposed exempted type/models are in the following ‘Exemptions’ table, which is proposed to be the base for the ‘Draft Decision 3’.

Table ‘Exemptions’ (Base for Draft Decision 3)

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
AN-12 all	Antonov	AN12	Exempted under Decision 1	Exemption recommended	Out of production since 1973 Exemption recommended due to high retrofit costs
AN-124 100	Antonov	A124		Exemption recommended	Production stopped 2014. Limited numbers produced 55. Exemption recommended due to high retrofit costs Operator reported impossibility to comply with the latest avionics requirements.
IL-76 all	Ilyushin	IL76		Exemption recommended	Out of production Exemption recommended due to high retrofit costs
A300 all	Airbus	A30B		Exemption	Out of production since 2007

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
		A306		recommended	Remaining operations are cargo avionics design is old Exemption recommended due to disproportionate retrofit costs
A310 all	Airbus	A310		Exemption recommended	Out of production since 1998 Remaining operations are cargo Avionics design is old Exemption recommended due to disproportionate retrofit costs
A330 Series 200/300	Airbus	A332 / A333	Exempted under Decision 2	Exemption recommended for retrofit. See Transition 1. Recommendation only applicable for 200 and 300 Series.	In production. Long range aircraft potentially FANS equipped Costs of retrofit are not high enough to justify exemption, for the remaining production aircraft forward fit. Dual stack solution will be available by 2019. Note: Future model A330 NEO (A330-

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					800/900) is not exempted
A340 all	Airbus	A342 A343 A345 A346	Exempted under Decision 2	Exemption recommended	Out of production since 2011 Long range aircraft potentially FANS equipped Exemption recommended due to high retrofit costs
A318-112	Airbus	A318	Exempted under Decision 2	Exemption recommended	Out of production since 2013 Decision 2 exempted model -112.
ACJ318	Airbus	A318	Exempted under Decision 2	Exemption NOT recommended See Transition 2	In production (*) 19 or less passengers (pax) but heavier than threshold Costs of retrofit are not high to justify exemption Long range aircraft potentially FANS equipped.
ACJ319	Airbus	A319	Exempted under	Exemption NOT	In production (*)

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
			Decision 2	recommended See Transition 2	19 or less pax but heavier than threshold Costs of retrofit are not high to justify exemption Long range aircraft potentially FANS equipped.
ACJ320	Airbus	A320	Exempted under Decision 2	Exemption NOT recommended See Transition 2	In production (*) 19 or less pax but heavier than threshold Costs of retrofit are not high to justify exemption Long range aircraft potentially FANS equipped.
ACJ-321	Airbus	A321		Exemption NOT recommended See Transition 2	In production (*) 19 or less pax but heavier than threshold Costs of retrofit are not high to justify exemption Long range aircraft potentially FANS equipped.

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
AVROLINER (RJ-100)	AVRO	RJ1H	Exempted under Decision 2	Exemption recommended	Production ended Exemption recommended due to high retrofit costs
AVROLINER (RJ-85)	AVRO	RJ85		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
BA146-301	British Aerospace	B463		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
B717 Series 200	Boeing	B712		Exemption recommended	24 in service in 2014 Production ended 2006 Exemption recommended due to high retrofit costs
B737-700IGW (BBJ)	Boeing	B737		Exemption NOT recommended See Transition 2	In production (*) 19 or less pax but heavier than threshold Costs of retrofit are not high to justify exemption

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					Long range aircraft potentially FANS equipped.
B737-800 (BBJ2)	Boeing	B738		Exemption NOT recommended See Transition 2	In production (*) 19 or less pax but heavier than threshold Costs of retrofit are not high to justify exemption Long range aircraft potentially FANS equipped.
B737-900ER (BBJ3)	Boeing	B739		Exemption NOT recommended See Transition 2	In production (*) 19 or less pax but heavier than threshold Costs of retrofit are not high to justify exemption Long range aircraft potentially FANS equipped.
B737-300	Boeing	B733		Exemption recommended	Production ended Exemption recommended due to high retrofit costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
B737-400	Boeing	B734		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
B737-500	Boeing	B735		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
B747-Series 400 (except freighter)	Boeing	B744		Exemption recommended	Production of -400 passenger version ended in 2005 Exemption recommended due to high retrofit costs Long range aircraft potentially FANS equipped.
B747-400F	Boeing	B744		Exemption recommended	Production of -400F freighter version ended in 2008 Costs of retrofit are not high to justify exemption. However benefit for operators from retrofitting is minimal.

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					Long range aircraft potentially FANS equipped.
B757 Series200	Boeing	B752		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
B757-Series 300	Boeing	B753		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
B767-Series 200	Boeing	B762		Exemption recommended	Production ended Exemption recommended due to high retrofit costs
B767-Series 300	Boeing	B763		Exemption recommended	Production of passenger models is ended, however production of freighter is not. In case passenger models are produced after 2020, exemption may not be justified Costs of retrofit are high to justify exemption. Long range aircraft potentially FANS

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					equipped
B767-300F	Boeing	B763		No exemption recommended See Transition 2	Still production planned for 2018-2023. Costs of retrofit are not high to justify exemption. Long range aircraft potentially FANS equipped.
B767-400	Boeing	B764		Exemption recommended	Production ended 2014 Exemption recommended due to high retrofit costs
MD-82	Boeing	MD82		Exemption recommended	Production ended 1997 Exemption recommended due to disproportionate retrofit costs
MD-83	Boeing	MD83		Exemption recommended	Production ended 1999 Exemption recommended due to disproportionate retrofit costs
MD-11	Boeing	MD11	Exempted under Decision 2	Exemption recommended	Production ended 2000 Exemption recommended due to high

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					retrofit costs
Global Express/5000	Bombardier	GLEX/GL5T		Exemption recommended only for retrofit See Transition 1	In production since 1996 19 or less pax Exemption recommended due to high retrofit costs Ultra long range business jet (potentially FANS equipped)
CL-600-2B19 (CRJ100/200/440)	Bombardier	CRJ1/ CRJ2	Exempted under Decision 1	Exemption recommended	Production ended 2006. Exemption recommended due to high retrofit costs. Note: If still in production, variant 850 is not exempted.
CL-600-1A11 (600)	Bombardier	CL60		Exemption recommended	Production ended 1982 19 or less pax Exemption recommended due to high retrofit costs
CL-600-2A12 (601	Bombardier	CL60		Exemption	Production ended

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
Variant)				recommended	19 or less pax Exemption recommended due to high retrofit costs
CL-600-2B16 (601-3A variant)	Bombardier	CL60		Exemption recommended	Production ended 19 or less pax Exemption recommended due to high retrofit costs
CL-600-2B16 (601-3R variant)	Bombardier	CL60		Exemption recommended	Production ended 19 or less pax Exemption recommended due to high retrofit costs
CL-600-2B16 (604 variant)	Bombardier	CL60	.	Exemption recommended	Production ended 19 or less pax Exemption recommended due to high retrofit costs. Note Model 650 is not exempted (still in production).

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
CL-600-2C10 (CRJ-700)	Bombardier	CRJ7		Exemption recommended only for retrofit See Transition 1	In production (*) Exemption recommended only for retrofit due to high retrofit costs In production, started in 1999
Learjet 23	Bombardier	LJ23		Exemption recommended	End production 1964 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 24, series	Bombardier	LJ24		Exemption recommended	End production 1977 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 25, all	Bombardier	LJ25		Exemption recommended	End production 1982 19 or less pax Exemption recommended due to disproportionate retrofit costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
Learjet 28	Bombardier	LJ28		Exemption recommended	End production 1982 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 29	Bombardier	LJ28		Exemption recommended	End production 1982 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 31, 31A	Bombardier	LJ31		Exemption recommended	End production 2003 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 35, 35A	Bombardier	LJ35		Exemption recommended	End production 1994 19 or less pax Exemption recommended due to disproportionate retrofit costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
Learjet 36, 36A	Bombardier	LJ35		Exemption recommended	End production 1994 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 40/45	Bombardier	LJ45		Exemption recommended	Ended production 19 or less pax Exemption recommended due to high retrofit costs
Learjet 55, 55B, 55C	Bombardier	LJ55		Exemption recommended	End production 1987 19 or less pax Exemption recommended due to disproportionate retrofit costs
Learjet 60	Bombardier	LJ60		Exemption recommended	End production 2012 19 or less pax Exemption recommended due to disproportionate retrofit costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
Learjet 60XR	Bombardier	LJ60		Exemption recommended	End production 2012 19 or less pax Exemption recommended due to disproportionate retrofit costs
C208	Cessna	C208		Exemption recommended, however not needed. Aircraft max ceiling is below FL 250.	Automatically exempted due to max ceiling below FL285 19 or less pax
C414	Cessna	C414		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs
C414A	Cessna	C414		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
C421	Cessna	C421		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs
C421A	Cessna	C421		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs
C421B	Cessna	C421		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs
C421C	Cessna	C421		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
C425	Cessna	C425		Exemption recommended	End production 1986 19 or less pax Exemption recommended due to disproportionate costs
C441	Cessna	C441		Exemption recommended	End production 1987 19 or less pax Exemption recommended due to disproportionate costs
C500 (Citation I)	Cessna	C500		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs
C501 (Citation I)	Cessna	C501		Exemption recommended	End production 1985 19 or less pax Exemption recommended due to disproportionate costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
C525 (CJ/CJ1/CJ1+) variants	Cessna	C525	Exempted under Decision 1	Exemption recommended	CJ1 out of production 19 or less pax Exemption recommended due to disproportionate costs
C525A, CJ2 variant	Cessna	C25A		Exemption recommended	CJ2 is out of production 19 or less pax Exemption recommended due to disproportionate costs
C525A, CJ2+ variant	Cessna	C25A		Exemption recommended	CJ2+ is out of production 19 or less pax Exemption recommended due to disproportionate costs Note: Exemption is not recommended for Citation M2 model which is in production with G3000 avionics
C525B, CJ3	Cessna	C25B		Exemption recommended	CJ3 is out of production 19 or less pax

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					Exemption recommended due to disproportionate costs Note: Exemption is not recommended for Citation CJ3+ model which is in production with G3000 avionics
C525C, CJ4	Cessna	C25C		Exemption recommended only for retrofit. See Transition 1	In production since 2010. 19 or less pax Exemption recommended for retrofit due to high retrofit costs
C550/C551 (Citation II, Bravo))	Cessna	C550 C551		Exemption recommended	Production ended 2006 19 or less pax Exemption recommended due to disproportionate costs
C551 (Citation II)	Cessna	C551		Exemption recommended	Production ended 2006 19 or less pax Exemption recommended due to disproportionate costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
C560 (Citation V, Ultra, Encore, Encore +)	Cessna	C560	Exempted under Decision 1	Exemption recommended	Production ended 2011 19 or less pax Exemption recommended due to disproportionate costs
C560XL (Citation Excel)	Cessna	C56X		Exemption recommended	19 or less pax Excel and XLS models are not produced since XLS+ began deliveries (2008) Exemption recommended due to high retrofit costs
C560XL (Citation XLS+)	Cessna	C56X		Exemption recommended for retrofit See Transition 1	19 or less pax In production (*) Exemption recommended for retrofit due to high retrofit costs
C650 (Citation III)	Cessna	C650		Exemption recommended	End production 1992 19 or less pax

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
C680 - Honeywell Primus EPIC (Citation Sovereign)	Cessna	C680		Exemption recommended for Sovereign model Not recommended for Sovereign+ (C680+)	Note: EASA certified 2014. Exemption recommended due to disproportionate costs to model with Honeywell avionics. Model Sovereign+ in production (*) and equipped with G5000
CS550	Cessna	C550		Exemption recommended	Production ended 2006 19 or less pax Exemption recommended due to disproportionate costs
C750 (Citation X)	Cessna	C750	Exempted under Decision 1	Exemption recommended (only for Citation X)	Model X certified in 1999 by JAA Model X+ in production (*) 19 or less pax Exemption for model X recommended due to disproportionate costs Exemption not applicable for model X+ (in production and equipped with G5000)

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
Falcon 10	Dassault	FA10	Exempted under Decision 2	Exemption recommended	Production ended 1989 19 or less pax Exemption recommended due to disproportionate costs
Falcon 20	Dassault	FA20	Exempted under Decision 2	Exemption recommended	Production ended 1988 19 or less pax Exemption recommended due to disproportionate costs
Falcon 50	Dassault	FA50	Exempted under Decision 2	Exemption recommended	Production ended 2008 19 or less pax Exemption recommended due to disproportionate costs
F2000	Dassault	F2TH	Exempted under Decision 2	Exemption recommended (only for retrofit) See transition 1	Models 2000LXS and 2000S still in production (*) 19 or less pax Exemption recommended due to high costs

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
F900	Dassault	F900	Exempted under Decision 2	Exemption recommended (only for retrofit) See transition 1	Model 900LX in production (*) 19 or less pax Exemption recommended due to high costs
DO328-100	Dornier	D328		Exemption recommended	Production ended 2000 Exemption recommended due to disproportionate costs
Dornier DO328-300	Dornier			Exemption recommended	Production ended 2000 Exemption recommended due to disproportionate costs
ERJ 190-100ECJ	Embraer	E190		Exemption NOT recommended See transition 2	In production (*) 19 or less pax but heavier than threshold
EMB-500 (Phenom 100)	Embraer	E50P		Exemption recommended only for retrofit See transition 1	Exemption recommended due to high retrofit costs 19 or less pax In production (*)

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
EMB-505 (Phenom 300)	Embraer	E55P		Exemption recommended only for retrofit See transition 1	Exemption recommended due to high retrofit costs 19 or less pax In production (*)
EMB-135BJ (Legacy 600)	Embraer	EJ135	Exempted under Decision 1	Exemption recommended for retrofit only See transition 1	Exemption recommended due to high retrofit costs 19 or less pax In production (*)
EMB-135EJ (Legacy 650)	Embraer	EJ135	Exempted under Decision 1	Exemption recommended For retrofit See transition 1	Exemption recommended due to high retrofit costs 19 or less pax In production (*)
ERJ 145 Family (135/140/145)	Embraer	E135 E145	Exempted under Decision 1	Exemption recommended For retrofit See transition 1	Exemption recommended due to high retrofit costs In production (*)

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
Fokker 70	Fokker	F70	Exempted under Decision 1	Exemption recommended	Production ended 1997 Exemption recommended due to disproportionate costs
Fokker 100	Fokker	F100	Exempted under Decision 1	Exemption recommended	Production ended 1997 Exemption recommended due to disproportionate costs
Astra, Astra SP, Astra SPX, G100	Gulfstream	ASTR		Exemption recommended	Production ended 19 or less pax Exemption recommended due to disproportionate costs
G150	Gulfstream	G150		Exemption recommended	Production ended 2017 19 or less pax Exemption recommended due to disproportionate costs
GII & GIIB	Gulfstream	GLF2		Exemption recommended	Production ended 19 or less pax Exemption recommended due to high

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					retrofit costs
GIII	Gulfstream	GLF3		Exemption recommended	Production ended 1986 19 or less pax Exemption recommended due to high retrofit costs
G300 G400 GIV GIV-SP	Gulfstream	GLF4	Exempted under Decision 2	Exemption recommended	Production will end by 2018 19 or less pax Exemption recommended due to high retrofit costs
GV	Gulfstream	GFL5	Exempted under Decision 2	Exemption recommended	Production will end by 2018 19 or less pax Exemption recommended due to high retrofit costs
G200	Gulfstream	GALX	Exempted under Decision 1	Exemption recommended	Production ended 2011 19 or less pax Exemption recommended due to high

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					retrofit costs
Hawker Beechcraft 400A	Beechcraft	BE40	Exempted under Decision 1	Exemption recommended	Production ended 2009 Exemption recommended due to disproportionate costs 19 or less pax
Hawker Beechcraft 390	Beechcraft	PRM1		Exemption recommended	Production ended 2013 Exemption recommended due to disproportionate costs 19 or less pax
Hawker Beechcraft 4000	Beechcraft	HA4T		Exemption recommended	Production ended 2013 Exemption recommended due to disproportionate costs 19 or less pax
Hawker Beechcraft HS 125 series (incl Hawker 750/800/800XP/850XP/900XP/1000)	Beechcraft	H25A H25B H25C		Exemption recommended	Exemption recommended due to disproportionate costs 19 or less pax

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
					Production ended in 2013
King Air series (90/100/200/300)	Beechcraft	BE9L BE20 B350		Exemption recommended	19 or less pax Exemption recommended due to disproportionate costs In production (*) Operationally may be limited to fly below FL285 Therefore exempting even the forward fit would be acceptable.
Hercules L-382-G-44K-30	Lockheed	C130		Exemption recommended	Exemption recommended due to disproportionate costs
Saab2000 / SAAB SF2000	SAAB	SB20		Exemption recommended	Production ended 1999. Exemption recommended due to disproportionate costs
TBM-700 Series	Socata	TBM7		Exemption recommended	Production ended in 2005. Exemption recommended due to disproportionate costs 19 or less pax

Aircraft Type/Series/Model	Manufacturer	ICAO Type	Previous exemption	Exemption recommendation	Comments
PC-12	Pilatus	PC12		Exemption recommended	Exemption recommended due to high retrofit costs 19 or less pax
PC-12 NG	Pilatus	PC12		Exemption recommended (only for retrofit) See Transition 1	Exemption recommended due to high retrofit costs In production (*) 19 or less pax

Transition 1:

- Exemption 'only for retrofit' means that all the aircraft with the first CofA prior to 5 February 2020 are exempted from complying with the DLS regulation.(this 'type specific exemption' overlaps with the one of the proposed 'automatic exemptions')
- Aircraft with a first CofA after 5 February 2020 and prior to 5 Feb 2022 should be equipped by 5 February 2022(allow for 24 months).
- Aircraft with a first CofA after 5 February 2022, shall be equipped, to operate.

Transition 2:

- All aircraft operating from 5 February 2022 must be DLS equipped.

(*) Aircraft still in production, newly manufactured aircraft should not be exempted. Evaluation for type/model exemption is based on the proportionality of retrofit costs versus aircraft value. For new aircraft, if capable of flying above FL285, new production should embody the systems to allow datalink.

4.5.1. Re-assessment of exempted types/models

The aircraft types/series/models performing most of the flights in EU airspace are: A320, B738, A319, A321, E190, DH8D, B737, AT75, CRJ9, E170, DH8A. None of them are actually permanently exempted (as types) through this proposal, or they do not fly above FL285 (DH8 or AT75).

However other types/models like A332, B763, B744 which are performing a relative high number of flights are exempted by this proposal. An up-to-date cost benefit analysis related with the introduction of the new ED-92C standard (in work with Eurocae), will be completed during the RMT.0524. Pending on a successful datalink implementation with the aircraft not currently DLS exempted, and depending on the operational model, the exemption aircraft types list may be revised.

5. Options - Exemptions options and DLS aircraft equipage ratio

An important factor when defining the options, was to keep the 75% of the flights (or flight hours) equipped with a functioning datalink. The benefits of equipping over 75% of the flights with DLS consist of R/T communication reduction and sector capacity gain (as per the Eurocontrol – slide shown below). R/T communication reduction may be considered safety improvement, however the R/T communication should be replaced by a properly functioning DLS, otherwise the operational effects of the poor data link performance could lead to additional workload and potential confusion.

The number of 75% is currently in the preamble of the DLS regulation, therefore cannot be strictly enforced. On the other hand there is a degree of variability and a margin of error when the number of flight hours was calculated.

The estimated flight hours and flight cycles are based on information available in Ascend Fleets from FlightGlobal. In the assessment of options:

The current fleet was extracted from Ascend Fleets on 3rd April 2017. It includes all jets and turboprops in service or in temporary storage operated by EASA Member State operators. The cumulative hours and cycles of each individual aircraft was divided by their age to get average annual hours and cycles. The total fleet consists of 9,295 aircraft that fly annually 12.9 million hours and 6.7 million cycles.

Aircraft types typically used in long-haul flights were assumed to spend only one-third of their flight hours in European airspace. All other models were assumed to spend all of their flight time in European airspace.

In the various options several exemptions criteria were used to identify exempted aircraft (as per the table summarising all the options). The sum of flight hours performed by the exempted aircraft are expressed as percentage of the total calculated above.

In the case of a few options where the exempted flight hours exceeded 25 per cent significantly, an estimate was made to forecast future development up to 2023. In this analysis:

1. The age distribution of the relevant exempted fleet was determined.

2. A mathematical model of aircraft retirement as function of aircraft age based on EASA-Member-State-operator retirements in the 1994–2013 period was developed and applied to the relevant fleet. (The number of new aircraft deliveries each year were based on a 2.9 per cent annual growth assumption. The annual flight hours were also assumed to be growing by 2.9 per cent each year. It should be noted that the traffic growth assumption has been reduced form 3.4 % in a previous estimate to 2.9%)

3. The share of exempted flight hours was decreased proportionally with the decreasing share of the relevant fleet.

Limitations of the analysis:

- Around 28.2 and 28.5 per cent of the fleet has no flight hours and flight cycles information available, respectively.

- Aircraft tend to fly less and less as they age. The average flight hours and cycles for individual airframes tend to overestimate utilisation the older the aircraft the more.

- The aircraft retirement model is based on past retirement characteristics of the whole fleet. Future retirement of a subset of the full fleet might differ.

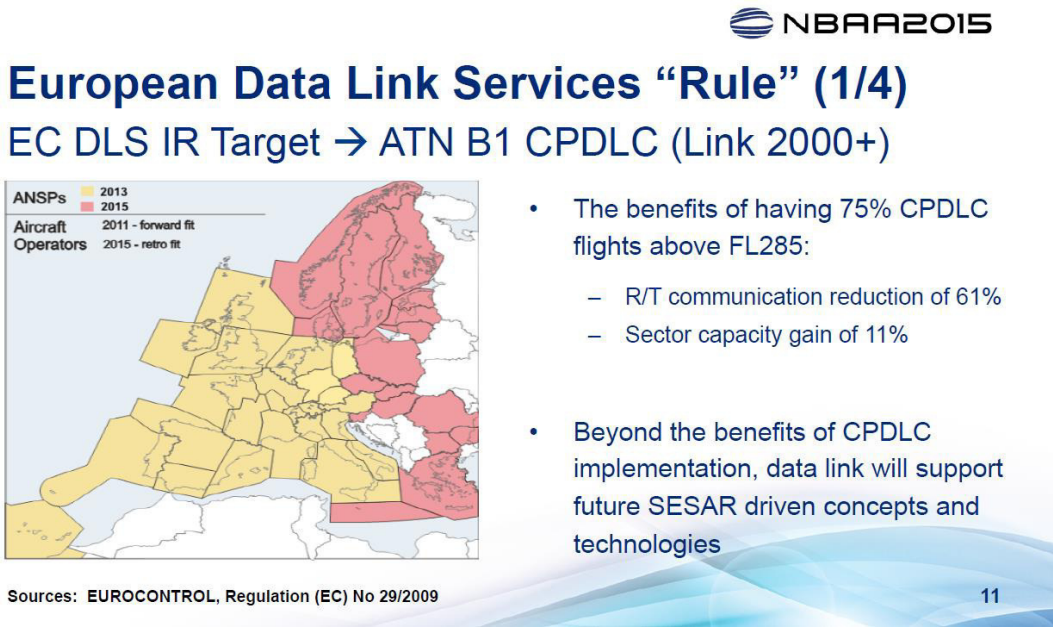


Figure 9: DLS targets and benefits

The following options have been created based on the feedback received form the stakeholders during the DLS focused consultations and other DLS related workshops, as well as based on the discussions with various other experts.

Objectives of the options were to reach the minimum 75% target of flights DLS equipped by 2020-2022, having in mind proportionate and cost effective solutions.

In some cases, aircraft types which were required to be equipped by the current DLS regulation, are proposed to be exempted by some of the options, either through permanent exemptions or through the additional automatic exemptions. This may put some early compliers to the DLS regulation at disadvantage, since they would like to take advantage of their early investment. This fact should be taken into account during the RMT.0524 which could be looking into defining operational advantages for the DLS equipped aircraft. If the proposal from the RMT.0524 would also result in operational benefits for DLS compliers, this issue would be efficiently addressed.

Option -1:

Repeal the DLS regulation or exempt all the aircraft until the DLS implementation is working properly.

Notes: Repealing the DLS regulation would immediately alleviate the burden for the stakeholders. The CNS vision/strategy and the subsequent the DLS requirements should be driven by the current and the predicted operational needs. Additional rulemaking tasks beyond the current RMT.0524 would provide the regulatory framework to implement the 'air-ground Communications' component of the CNS strategy. It should be noted that the evolution of the available technical solutions may require ATN B1 equipment to be upgraded in the near future, as such the stakeholders may require subsequent upgrades. It should also be noted that ATN B2 specs are already available. On the other hand, repealing the regulation will send a negative message of regulatory incertitude to the stakeholders, which have made or will shortly be making investments in DLS.

Option 0: Implement current DLS IR plus aircraft types exempted as per the 'Exemptions' table – base for draft Decision 3

No change to the DLS regulation, other than one clarification - addition of 'model' as type/model in the Article 14 on exemptions

The automatic exemptions will remain unchanged, based on exempting aircraft equipped with FANS 1/A with a first CofA prior to 2014, the sunset criteria (aircraft with a first CofA prior to 2003 and aircraft retiring before the end of 2022.

The type based exemptions are captured in the Decision 3 (which is based 'Exemption' table propose din this report).

An estimate of the number of flights hours flown by exempted aircraft as compared with the total number of flights flown by the EASA Member States aircraft:

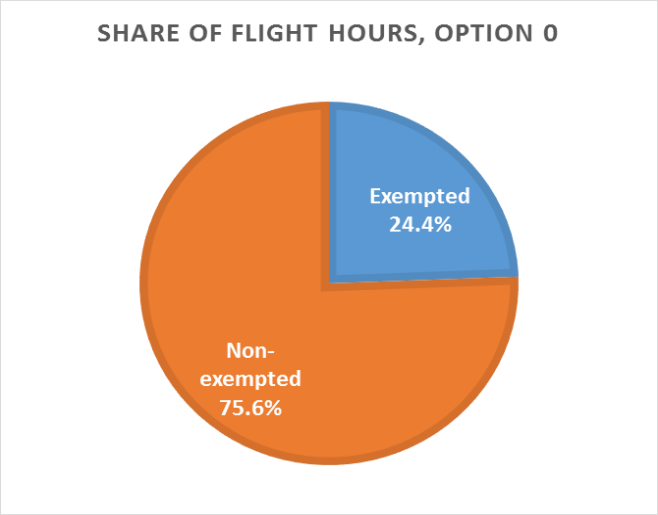


Figure 10: Option 0

Option 1:

Exemption criteria are the following:

- The automatic exemptions will remain unchanged, based on exempting aircraft equipped with FANS 1/A with a first CofA prior to 2014, the sunset criteria (aircraft with a first CofA prior to 2003 and aircraft retiring before the end of 2022).
- There will be no type /model exemptions. (no Draft Decision 3)
- Aircraft with a first CofA prior to 1st January 2000
- Aircraft operated in accordance with in non-commercial type operations
- Aircraft with not more than 19 passenger seats and a MTOM of 45359 Kg /100000 lbs or less (for aircraft with a first CofA prior to 2 February 2020)

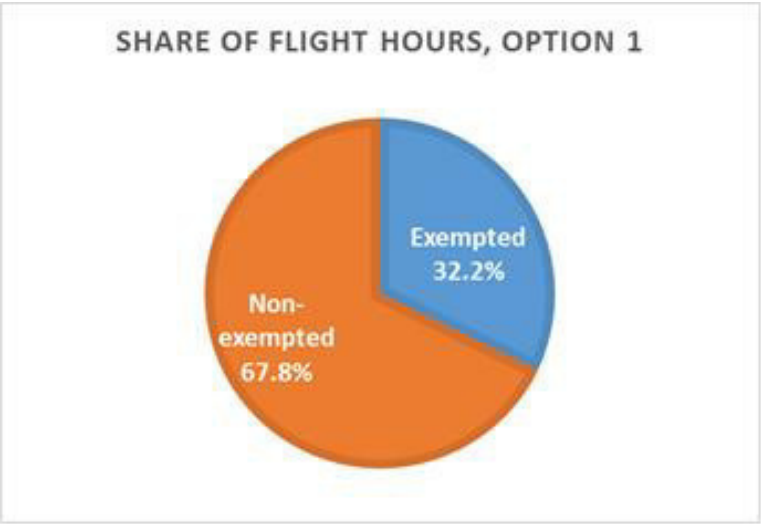


Figure 11: Option 1

Note: The 'sunset' automatic exemption criteria (aircraft with a first CofA prior to 31 December 2003 and retiring before 31 December 2022) may not necessarily align with the other automatic exemption criteria proposed (CofA date prior to 2000). However, based on the feedback from stakeholders (justified by the investment plans already planned), it is proposed to keep this already existing automatic exemption criteria.

The same note could apply for the other options analysed where the 'sunset' criteria coexist with an exemption criteria based on CofA date.

This option proposes that there will be no type/model based exemptions (no draft Decision 3), rather the issues been addressed through automatic exemptions. This option is rather simpler to manage, when comparing with the other ones. However, based on the feedback received during the focused consultation, the stakeholders would prefer a type/model based exemption.

Option 2:

Exemption criteria is Option 0, plus exempting the following:

- Aircraft operated in accordance with non-commercial type operations

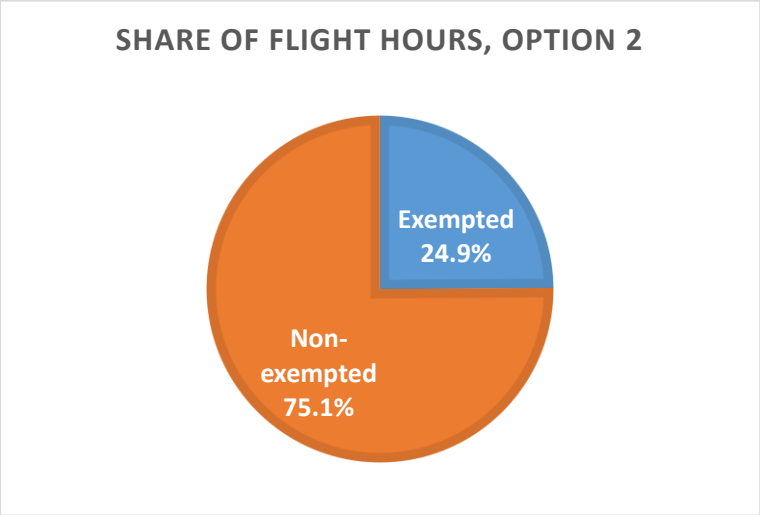


Figure 12: Option 2

Adding non-commercial aircraft to Option 0 would increase the estimated share of exempted flights by only 0.5 per cent.

Option 3:

Exemption criteria is Option 0, plus exempting the following:

- Aircraft operated in accordance with non-commercial type operations
- Aircraft with a first CofA prior to 1st January 2000

Analysis: Adding aircraft with a first CofA prior to 2000 would mean a 9.5 per cent increase in the share of exempted flight hours (calculated as of today). However, this share is expected to decrease by 2020 and further decrease by 2023. These graphs are provided below:

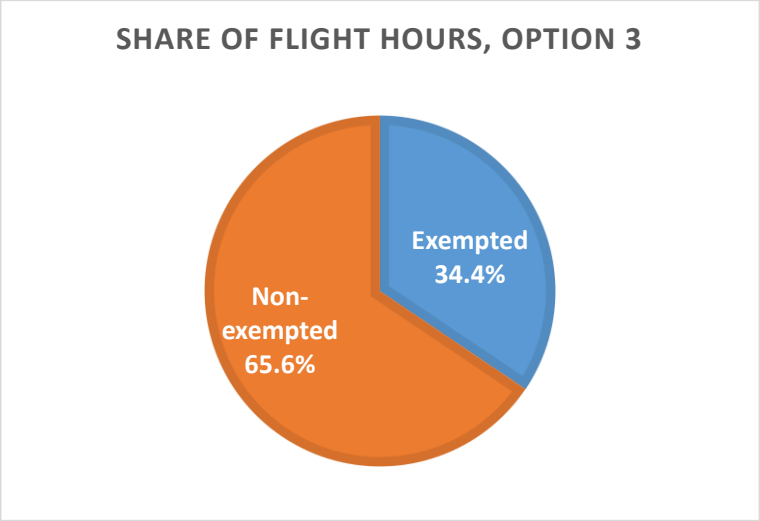


Figure 13: Option 3

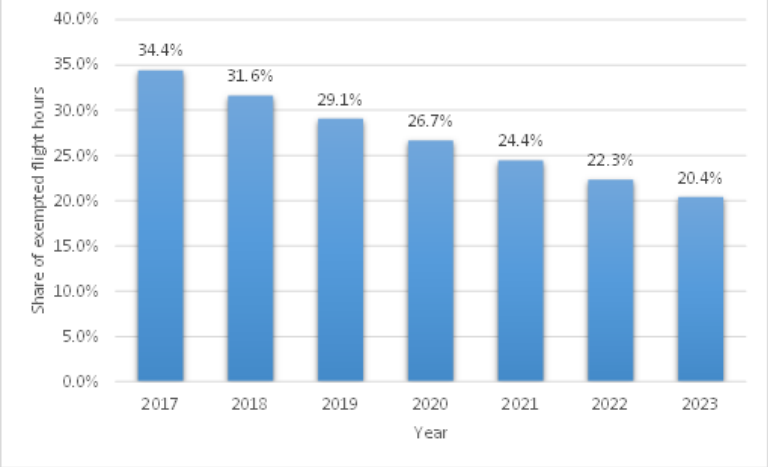


Figure 14: Option 3 (includes retirement prediction)

Option 4:

Exemption criteria is Option 0, plus exempting the following:

- Aircraft with seating capacity of 19 passenger capacity or less and a MTOM of 45359 Kg /100000 lbs or less (for aircraft with a first CofA prior to 2 February 2020)

This increases the share of exempted flight hours by 1.6 percentage points.

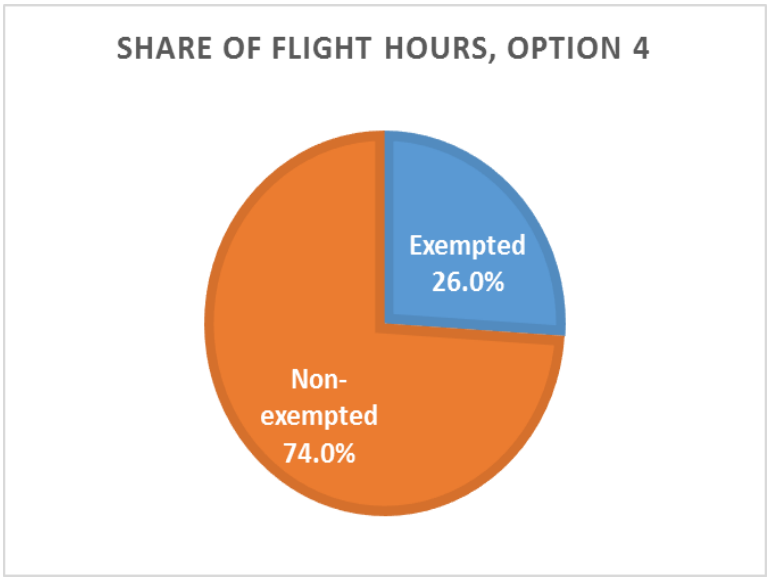


Figure 15: Option 4

Option 5:

Exemption criteria Option 0 (current DLS regulation + Decision 3), plus exempting the following:

- Aircraft with a first CofA prior to 1st January 1995
- Aircraft operated in accordance with non-commercial type operations
- Aircraft with not more than 19 passenger seats and a MTOM of 45359 Kg / 100000 lbs or less (for aircraft with a first CofA prior to 2 February 2020)

FANS-1/A requirement, is also revised extending the exemptions for aircraft equipped with FANS-1/A with a first Cof A of 1 January 2018.

Both Options 5 and 6 are variations of Option 1 in terms of changing the age-based criteria from a first CofA before 2000 to 1995 in case of Option 5, and allowing FANS/1 equipped aircraft to be exempted with a first CofA up to 2018.

These two changes increase the share of exempted flight hours by 0.2 and 3.7 percentage points, respectively.

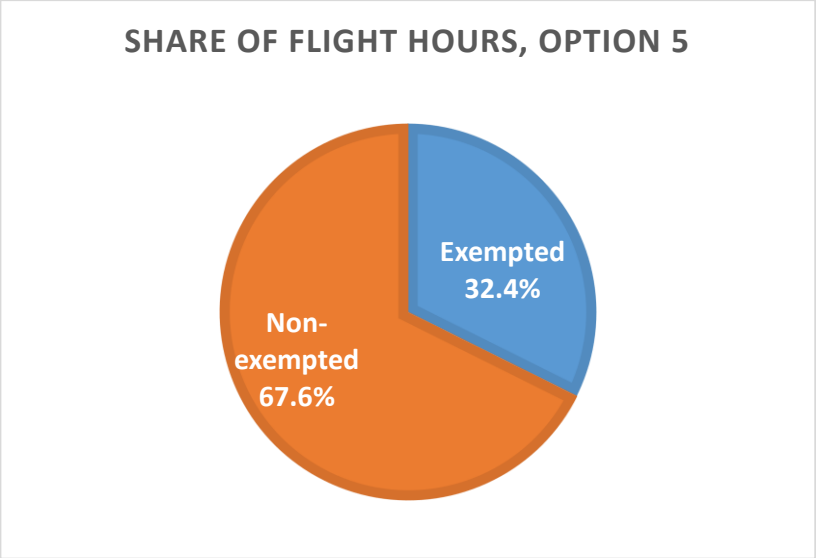


Figure 16: Option 5

Due to the sunset 2022 criterion, 1.6% points should be added for all options ending in 2022.

Exemption considering aircraft retirement: The variation of the number of hours flown by the excluded aircraft factoring also the retirement of some of the older aircraft from 2017 to 2020 is presented below. By 2020 there should be 26.3% (24.7%+1.6%) excluded, while the number will drop to 22.2% (20.6% +1.6%) in 2022.

Note: The graph below does not include the 1.6% points.

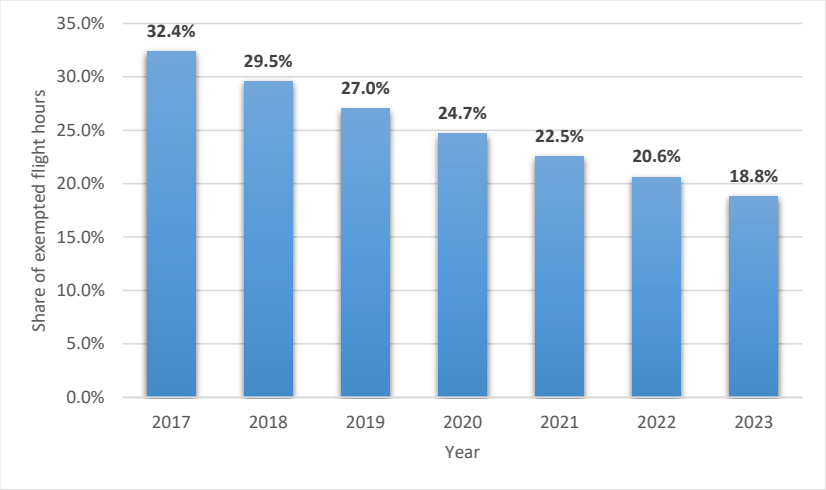


Figure 17: Option 5 (includes retirement)

Option 6:

Exemption criteria Option 0 (current DLS regulation + Decision 3), plus exempting the following:

- Aircraft with a first CofA prior to 1st January 2000
- Aircraft operated in accordance with non-commercial type operations
- Aircraft with not more than 19 passenger seats and a MTOM of 45359 Kg / 100000 lbs or less (for aircraft with a first CofA prior to 2 February 2020)

FANS-1/A requirement, is revised extending the exemptions for aircraft equipped with FANS-1/A with a first Cof A of 1 January 2018.

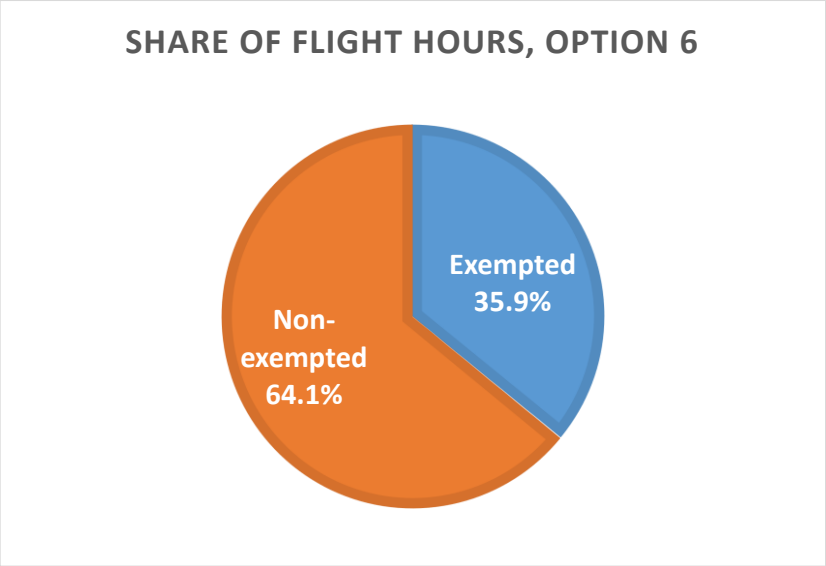


Figure 18: Option 6

Due to the sunset 2022 criterion 1.6% points should be added for all options ending in 2022.

Exemption considering aircraft retirement: The variation of the number of hours flown by the excluded aircraft factoring also the retirement of some of the older aircraft from 2017 to 2020 is presented below. By 2020 there should be 29.8% (28.2%+1.6%) excluded, while the number will drop to 25.4% in 2022.

Note: The graph below does not include the 1.6% points (from the 'subset criteria').

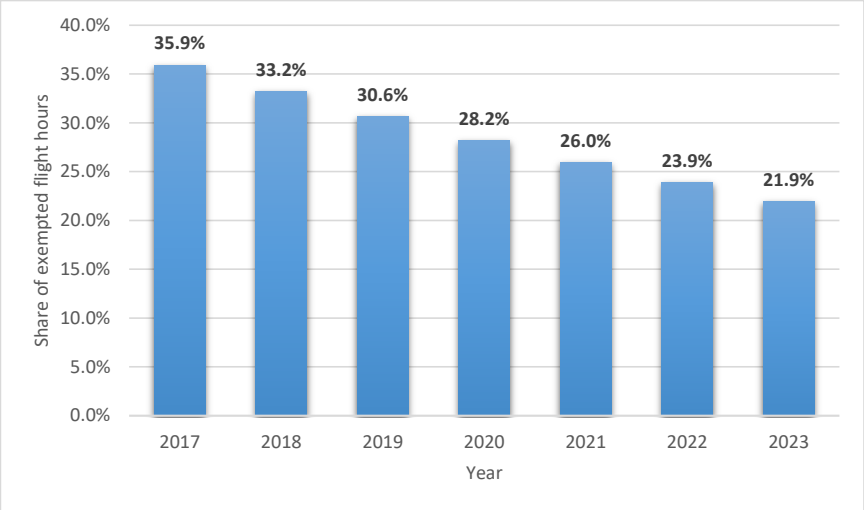


Figure 19: Option 6 (includes retirement)

A summary of the options and the criteria proposed by each option is consolidated in the table below (Fig.:20). Explanations on the criteria meaning are provided in the subsequent table.

Criteria	Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
FANS 2014	✓	✓	✓	✓	✓		
FANS 2018						✓	✓
Draft proposal No3	✓		✓	✓	✓	✓	✓
CofA 2000		✓		✓			✓
CofA 1995						✓	
Non-commercial		✓	✓	✓		✓	✓
Seat number		✓			✓	✓	✓
Sunset 2022	✓	✓	✓	✓	✓	✓	✓

Description	Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Exempted flight hours	24.4%	32.2%	24.9%	34.4%	26.0%	32.4%	35.9%
Sunset 2022	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%
Total	26.0%	33.8%	26.5%	36.0%	27.6%	34.0%	37.5%

Figure 20: All options summary

The graph above represents the situation in 2017, if the regulation would be applicable today. However in 2020 we need to take into account the aircraft which will be potentially retiring and the new aircraft coming into service are assumed to be DLS compliant (production line should have been modified already). Considering these factors, by 2020 the values in the table above will be less by an average of 7% points.

Criteria	Explanation
FANS 2014	exempt aircraft equipped with FANS 1/A, with a first CofA prior to 1 January 2014 (existing in the DLS regulation)

FANS 2018	exempt aircraft equipped with FANS 1/A, with a first CofA prior to 1 January 2018
Draft proposal 3	exempt aircraft based on the type/model exemption list proposed by draft Decision 3
CofA year 2000	exempt aircraft with a first CofA prior to 1 January 2000
CofA 1995	exempt aircraft with a first CofA prior to 1 January 1995
Non-commercial	exempt aircraft operating non-commercial
Seat number	exempt aircraft with a certified seating configuration of 19 seats or less and a MTOM of 45359 Kg/100000 lbs or less
Sunset 2022	exempt aircraft with first CofA prior to 31 December 2003, which will retire by 31 December 2022 (existing in the DLS regulation)

Calculating the exemptions based on flight cycles rather than flight hours, the variations for the various options proposed are presented below:

Exemptions	Option 0	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Flight hours	24.4%	32.2%	24.9%	34.4%	26.0%	32.4%	35.9%
Flight cycles	22.6%	30.5%	23.0%	33.5%	24.6%	33.2%	34.4%
Change	-1.8%	-1.7%	-1.9%	-0.9%	-1.4%	0.8%	-1.6%

Based on the analysis above, and taking into account that:

- the number of PAs measured (as reported by Eurocontrol) after showing some improvement is slowly increasing again.
- from a human factor perspective, the operational effects of the poor data link performance are universal for all flight crews in all aircraft types and with all avionics. They create additional workload and potential confusion. The ATCOs experience the same negative operational effects plus uncertainly on aircraft intent. These effects are detailed in the EASA report on technical issues with the DLS regulation implementation.[19]

[19] EASA report 'Technical Issues in the Implementation of the Regulation (EC) 29/2009.

- increasing the number of aircraft to be required to be equipped with DLS would further strain the frequency spectrum. The problem will be compounded due to the increase of both AOC and non AOC traffic.

- non-AOC traffic accessing the DLS service issue is still not addressed, at this time most GA/Business aircraft required to be DLS equipped would not be able to access the DLS service.

- action no 1 in the EASA report recommends to address the ground domain infrastructure. While both airborne and ground DLS domains would need to be addressed, the proper resolution of action 1 (ground infrastructure) may have a more visible effect on performance than requiring the airspace users to upgrade their avionics by 2020, in particular since the 'Best in class' concept has not been really defined, and with the information we currently have it is difficult to be standardised. As such, at this time, addressing the DLS ground domain multi-frequency/Model D should have priority.

- aircraft which contribute the most to the number of flights/flight hours should be required to equip and operate the DLS system first, while the aircraft which are flying less (including retiring aircraft, aircraft flying non-commercial, or GA/Business aircraft) should be exempted. In many cases the older aircraft types/models would also be more expensive to be retrofitted, as such they should benefit for permanent type/model exemption.

- the RMT.0524 should take into account during the development of the rulemaking proposal that some operators are early compliers with the DLS regulation, possibly linking the DLS equipage with operational benefits. However, the cost benefit analysis performed during the RMT.0524 with regards to airborne should look forward to assess the future compliance with the ED-92C.

Based on the above assessment EASA is proposing Option 5.

6. ICAO Amendment analysis

6.1. Document review

With the purpose of completing the short-term revision of Regulation (EC) 29/2009, the Commission requested that EASA reviewed, as applicable and as needed, the ICAO references in the Regulation.

The DLS Regulation refers to ICAO standards included in the following annexes to the Convention on International Civil Aviation:

- Amendment 81 to ICAO Annex 10 – Aeronautical Telecommunications – Volume II on Communication Procedures including those with PANS status;

- Amendment 81 to ICAO Annex 10 – Aeronautical Telecommunications – Volume III on Communication Systems, Part I (Digital Data Communication Systems);

- Amendment 45 to ICAO Annex 11 – Air Traffic Services.

EASA has analysed the changes introduced by ICAO in subsequent amendments to these annexes and the information is presented in the table that follows this introduction (see next page).

The first column displays the contents of the standards and recommended practices (SARPs) considered at the time in which the DLS Regulation was published, while the second column shows the equivalent and more recent SARPs and highlights the main differences by means of a different font colour (purple).

Despite Recommended Practices are not being compulsory as per Chicago Convention, they are included in the table to provide a wider view of the subject. ICAO notes are also reproduced in the table, as they give factual information or references bearing on the SARPs in question.

It should be noted that a short analysis follows each of the technical references proposed by the regulation in a separate row. The analysis rows contain the following information:

- Subject introduces the technical matter described in the standards referred to in the 'DLS Regulation'.

- Objective explains what the 'DLS Regulation' intends to achieve by mandating the corresponding standards.

- Changes summarises the differences introduced by the amendments to the SARPs that are applicable today, as per the DLS regulation.

- CONCLUSION provides a recommendation about the potential adoption of the latest changes proposed by ICAO.

CONTENTS OF THE SARPS REFERRED TO IN THE DLS REGULATION [PRESENT REFERENCES]	SUBSEQUENT AMENDMENTS TO THE SARPS REFERRED TO IN THE DLS REGULATION [POTENTIAL NEW REFERENCES]
AMDT 81 to Annex 10, VOL III, Part 1, 1st ed., July 1995 3.5.1.1 CONTEXT MANAGEMENT (CM) APPLICATION *Note.- The CM application provides the capability for an aircraft to log on with an ATS ground system; in some instances the ground system will request the aircraft to contact a specific ground system. Once an appropriate connection is established, CM provides for the exchange of information on each supported ATN application including the network address of each, as appropriate. For ATN systems supporting security services, CM also obtains and exchanges key and key usage information. CM also provides the capability to update log-on information and the capability for an ATS ground system to forward log-on information to another ATS ground system. The registration function of the CM allows the sharing of information with other applications on the ground or on the aircraft.* 3.5.1.1.1 The ATN shall be capable of supporting the following CM application functions: a) log-on; b) contact; c) update; d) CM server query; e) CM server update; f) ground forwarding; and g) registration. *Note.- The technical provisions for the CM application are defined in Doc 9705, Sub-volume II.*	**AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** 3.5.1.1 **The ATN shall support the data link initiation capability (DLIC) applications when air-ground data links are implemented.** *Note.— The Manual of Air Traffic Services Data Link Applications (Doc 9694, Part I) defines the data link initiation capability (DLIC) application.* **AMDT 82 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** 3.5.1.1 CONTEXT MANAGEMENT (CM) APPLICATION [No changes with regard to AMDT 81]

Subject: context management (CM) application
Objective: To ensure that the ATN supports the CM application
Changes: The standard has been replaced in AMDT 90 by a different one that refers to the DLIC application. In addition, the concept of context management (CM) has been deleted from ICAO Annex 10, Vol III.
CONCLUSION: since the DLIC service is already addressed in the Annex II to the DLS Regulation and in order to avoid altering the rule structure**, the simplest option is to refer to the most recent ICAO AMDT in which the text remains the same as in AMDT 81, i.e. AMDT 82 to ICAO Annex 10, VOL III, 2nd ed., July 2007, Part 1. EASA would work concurrently on changes to the rule structure and to the technical requirements as part of RMT.0524.**

AMDT 81 to Annex 10, VOL III, Part 1, 1st ed., July 1995	**AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007**
3.5.2.2 CONTROLLER-PILOT DATA LINK COMMUNICATION (CPDLC) APPLICATION *Note.- The CPDLC application, comprising an airborne and ground component, provides capability for data link communications between ATS units and aircraft under their control and/or aircraft about to come under their control. The CPDLC application has the capability to establish, manage, and terminate CPDLC dialogues for controller-pilot message exchange and for ground message forwarding.* 3.5.2.2.1 The ATN shall be capable of supporting the following CPDLC application functions: a) controller-pilot message exchange; b) transfer of data authority; c) downstream clearance; and d) ground forward. *Note.- The technical provisions for the CPDLC application are defined in Doc 9705, Sub-volume II.*	~~**3.5.2.2 CONTROLLER PILOT DATA LINK COMMUNICATION (CPDLC) APPLICATION**~~ [It should be noted that this standard has been deleted and the standard 3.5.2, Air-ground applications, amended as follows] 3.5.2 Air-ground applications 3.5.2.1 The ATN shall be capable of supporting one or more of the following applications: a) ADS-C; b) CPDLC; and c) FIS (including ATIS and METAR). *Note.— See the Manual of Air Traffic Services Data Link Applications (Doc 9694).* **AMDT 82 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** *Note.— The CPDLC application, comprising an airborne and ground component, provides capability for data link communications between ATS units and aircraft under their control and/or aircraft about to come under their control. The CPDLC application has the capability*

	to establish, manage and terminate CPDLC dialogues for controller-pilot message exchange and for ground message forwarding. 3.5.2.2.1 The ATN shall be capable of supporting the following CPDLC application functions: a) controller-pilot message exchange; b) transfer of data authority; c) downstream clearance; and d) ground forward. *Note.— The technical provisions for the CPDLC application are defined in Doc 9880, Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) (in preparation).*
Subject: air-ground applications Objective: To ensure implementation of CPDLC and its associated capabilities as an ATN application Changes: The standard has been replaced in AMDT 90 by a different one that also relates to ADS-C and FIS. **CONCLUSION:** since the objective of the rule was exclusively to enable CPDLC, the most logical choice is **to refer to the most recent ICAO AMDT in which the text remains the same as in AMDT 81, i.e. AMDT 82 to ICAO Annex 10, VOL III, 2nd ed., July 2007, Part 1.** The note was also amended to refer to Doc 9880 ("in preparation" at the time). This Manual was actually published later on, and PART I, *Air-Ground applications*, describes all the CPDLC functions, so the up-to-date reference is certainly adequate.	
AMDT 81 to Annex 10, VOL III, Part 1, 1st ed., July 1995 3.3 GENERAL 3.3.1 The aeronautical telecommunication network (ATN) shall provide data communication services and application entities in support of: a) the delivery of air traffic services (ATS) to aircraft; b) the exchange of ATS information between ATS units; and c) other applications such as aeronautical operational control (AOC) and aeronautical administrative communication (AAC). *Note I.- Provisions have been made to accommodate the exchange of information such as weather; flight plans, notices to airmen and*	**AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** 3.3 GENERAL *Note — The Standards and Recommended Practices in sections 3.4 to 3.8 define the minimum required protocols and services that will enable the global implementation of the aeronautical telecommunication network (ATN).* **3.3.1 ATN communication services shall support ATN applications.** **3.3.2 Requirements for implementation of the ATN shall be made on the basis of regional air navigation agreements.** **These agreements shall specify the area in which the**

dynamic real time air traffic flow management between aircraft operating agencies' ground-based systems and ATS units. *Note 2.- Provisions have also been made to accommodate aeronautical passenger communication (APC).* 3.3.2 When the ATN is used in support of air traffic services, it shall conform with the provisions of this chapter. 3.3.3 Requirements for use of the ATN shall be made on the basis of regional air navigation agreements. 3.3.4 Recommendation.- Civil aviation authorities should co-ordinate, with national authorities and aeronautical industry, those implementation aspects of the ATN which will permit its world-wide safety, interoperability and efficient use, as appropriate.	**communication standards for the ATN/OSI or the ATN/IPS are applicable.** **AMDT 82 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** 3.3 GENERAL [No changes with respect to AMDT 81]
Subject: General requirements for the Aeronautical Telecommunication Network (ATN) Objective: definition of communication protocols to enable the transmission and reception of data units between ground and aircraft systems hosting the relevant air-ground applications Changes: ATN requirements have significantly evolved. Now the standards refer to the possibility of implementing ATN/IPS on a regional basis, which implies to make a strategic decision. **CONCLUSION:** EUROCAE WG-92 is already working on a revision of the current standard ED 92-B with the purpose of updating the minimum performance requirements for airborne equipage. This standard refers to ICAO material and current references could be revised in the short term (next ED-92 C could be delivered in 2018). On the other hand, the EASA RMT.0524 on DLS is about to start and it is expected to assess which is the minimum standard needed to enable datalink communications. The operational benefits and impact on stakeholders that the latest ICAO amendments could bring should be properly evaluated during the development of the RMT. In order to avoid potential conflicts with the future standards proposed by EUROCAE and EASA, **it is strongly recommended that the rule refers to the most recent ICAO AMDT in which the text remains the same as in AMDT 81, i.e. AMDT 82 to ICAO Annex 10, VOL III, 2nd ed., July 2007, Part 1.**	
AMDT 81 to Annex 10, VOL III, Part 1, 1st ed., July 1995 3.4 SYSTEM LEVEL REQUIREMENTS *Note.- The system level requirements are high-level technical requirements that have been derived from operational requirements,*	**AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** **3.4 GENERAL REQUIREMENTS**

technological constraints and regulatory constraints (administrative and institutional). These system level requirements are the basis for the functional requirements and lower-level requirements. 3.4.1 The ATN shall use International Organization for Standardization (ISO) communication standards for open systems interconnection (OSI). 3.4.2 The ATN shall provide a means to facilitate migration to future versions of application entities and/or the communication services. *Note.- It is an objective that the evolution towards future versions facilitates the backward compatibility with previous versions*. 3.4-3 The ATN shall enable the transition of existing AFTN/CIDIN users and systems into the ATN architecture. *Note.- The transition from the AFTN or from the CIDIN to the ATN is handled by AFTN/AMHS and CIDIN/AMHS gateways respectively, which are defined in Doc 9705, Sub-volume III.* 3.4.4 The ATN shall make provisions whereby only the controlling ATS unit may provide ATC instructions to aircraft operating in its airspace. *Note.- This is achieved through the current and next data authority aspects of the controller-pilot data link communications (CPDLC) application entity.* 3.4.5 The ATN shall accommodate routing based on a pre-defined routing policy. 3.4.6 The ATN shall provide means to define data communications that can be carried only over authorized paths for the traffic type and category specified by the user. 3.4.7 The ATN shall offer ATSC classes in accordance with the criteria in Table 3-1.	**3.4.1 The ATN shall either use International Organization for Standardization (ISO) communication standards for open systems interconnection (OSI) or use the Internet Society (ISOC) communications standards for the Internet Protocol Suite (IPS).** *Note 1.— ATN/IPS implementation is preferred for ground-ground networks. While ATN/OSI continues to be supported in air-ground networks, particularly when using VDL Mode 2, it is expected that future air-ground implementations will use the ATN/IPS.* *Note 2.— Interoperability between interconnecting OSI/IPS networks is expected to be arranged prior to Implementation.* *Note 3.— Guidance material on interoperability between ATN/OSI and ATN/IPS is contained in Doc 9896.* **3.4.2 The AFTN/AMHS gateway shall ensure the interoperability of AFTN and CIDIN stations and networks with the ATN.** **3.4.3 An authorized path(s) shall be defined on the basis of a predefined routing policy.** **3.4.4 The ATN shall transmit, relay and deliver messages in accordance with the priority classifications and without discrimination or undue delay.** **3.4.5** The ATN shall provide means to define data communications that can be carried only over authorized paths for the traffic type and category specified by the user. **3.4.6 The ATN shall provide communication in accordance with the prescribed required communication performance (RCP).** *Note.— The Manual on Required Communication Performance (RCP) (Doc 9869) contains the necessary information on RCP.*

Table 3-1. Transit delays for ATSC Classes

Maximum one-way ATN end-to-end transit delay at 95% probability (seconds)	*ATSC Class*
Reserved	A
4.5	B
7.2	C
13.5	D
18	E
27	F
50	G
100	H
No value specified	no preference

Note 1.— The value for the ATN end-to-end transit delay represents approximately 90% of the value for the total end-to-end transit delay between the ultimate users of the system.

Note 2.— The 95% probability is based on the availability of a route conforming to the requested ATSC class.

Note 1.- When an ATSC class is specified by an ATN application, packets will be forwarded in the ATN internet communication service on a best effort basis. Best effort basis means that when a route is available of the requested ATSC class, the packet is forwarded on that route. When no such route is available, the packet will be forwarded on the first known route of the ATSC class higher than the requested, or if there is no such route, first known route of the ATSC class lower than that requested.

3.4.7 The ATN shall operate in accordance with the communication priorities defined in **Table 3-1 and Table 3-2.**

Table 3-1. Mapping of ATN communication priorities

Message categories	*ATN application*	*Corresponding protocol priority*	
		Transport layer priority	*Network layer priority*
Network/systems management		0	14
Distress communications		1	13
Urgent communications		2	12
High-priority flight safety messages	CPDLC, ADS-C	3	11
Normal-priority flight safety messages	AIDC, ATIS	4	10
Meteorological communications	METAR	5	9
Flight regularity communications	DLIC, ATSMHS	6	8
Aeronautical information service messages		7	7
Network/systems administration	DIR	8	6
Aeronautical administrative messages		9	5
<unassigned>		10	4
Urgent-priority administrative and U.N. Charter communications		11	3
High-priority administrative and State/Government communications		12	2
Normal-priority administrative communications		13	1
Low-priority administrative communications and aeronautical passenger communications		14	0

Note.— The network layer priorities shown in the table apply only to connectionless network priority and do not apply to subnetwork priority.

Note 2.- The ATN communications service will not inform application entities if the requested ATSC class was not achieved. It is the responsibility of the application entity to determine the actual transit delay achieved by local means such as time stamping.

3.4.8 The ATN shall operate in accordance with the communication priorities defined in Table 3-2 and Table 3-3.

Table 3-2. Mapping of ATN communication priorities

Message categories	*ATN application*	*Corresponding protocol priority*	
		Transport layer priority	*Network layer priority*
Network/systems management	SM	0	14
Distress communications		1	13
Urgent communications		2	12
High-priority flight safety messages	CPDLC, ADS	3	11
Normal-priority flight safety messages	AIDC, ATIS	4	10
Meteorological communications	METAR	5	9
Flight regularity communications	CM, ATSMHS	6	8
Aeronautical information service messages		7	7
Network/systems administration	SM, DIR	8	6
Aeronautical administrative messages		9	5
<unassigned>		10	4
Urgent-priority administrative and U.N. Charter communications		11	3
High-priority administrative and State/Government communications		12	2
Normal-priority administrative communications		13	1
Low-priority administrative communications and aeronautical passenger communications		14	0

Note.— The network layer priorities shown in the table apply only to connectionless network priority and do not apply to subnetwork priority.

Table 3-2. Mapping of ATN network priority to mobile subnetwork priority

Message categories	*ATN network layer priority*	*Corresponding mobile subnetwork priority (see Note 4)*					
		AMSS	*VDL Mode 2*	*VDL Mode 3*	*VDL Mode 4*	*SSR Mode S*	*HFDL*
Network/systems management	14	14	see Note 1	3	14	high	14
Distress communications	13	14	see Note 1	2	13	high	14
Urgent communications	12	14	see Note 1	2	12	high	14
High-priority flight safety messages	11	11	see Note 1	2	11	high	11
Normal-priority flight safety messages	10	11	see Note 1	2	10	high	11
Meteorological communications	9	8	see Note 1	1	9	low	8
Flight regularity communications	8	7	see Note 1	1	8	low	7
Aeronautical information service messages	7	6	see Note 1	0	7	low	6
Network/systems administration	6	5	see Note 1	0	6	low	5
Aeronautical administrative messages	5	5	not allowed	not allowed	not allowed	not allowed	not allowed
<unassigned>	4	unassigned	unassigned	unassigned	unassigned	unassigned	unassigned
Urgent-priority administrative and U.N. Charter communications	3	3	not allowed	not allowed	not allowed	not allowed	not allowed
High-priority administrative and State/Government communications	2	2	not allowed	not allowed	not allowed	not allowed	not allowed
Normal-priority administrative communications	1	1	not allowed	not allowed	not allowed	not allowed	not allowed
Low-priority administrative communications and aeronautical passenger communications	0	0	not allowed	not allowed	not allowed	not allowed	not allowed

Note 1.— VDL Mode 2 has no specific subnetwork priority mechanisms.

Note 2.— The AMSS SARPs specify mapping of message categories to subnetwork priority without explicitly referencing ATN network layer priority.

Note 3.— The term "not allowed" means that only communications related to safety and regularity of flight are authorized to pass over this subnetwork as defined in the subnetwork SARPs.

Note 4.— Only those mobile subnetworks are listed for which subnetwork SARPs exist and for which explicit support is provided by the ATN boundary intermediate system (BIS) technical provisions.

Table 3-3. Mapping of ATN network priority to mobile subnetwork priority

Message categories	*ATN network layer priority*	*Corresponding mobile subnetwork priority (see Note 5)*			
		AMSS-1 (see Note 4)	*VDL Mode 2*	*SSR Mode S*	*HFDL*
Network/systems management	14	14	see Note 1	high	14
Distress communications	13	14	see Note 1	high	14
Urgent communications	12	14	see Note 1	high	14
High-priority flight safety messages	11	11	see Note 1	high	11
Normal-priority flight safety messages	10	11	see Note 1	high	11
Meteorological communications	9	8	see Note 1	low	8
Flight regularity communications	8	7	see Note 1	low	7
Aeronautical information service messages	7	6	see Note 1	low	6
Network/systems administration	6	5	see Note 1	low	5
Aeronautical administrative messages	5	5	restricted see Note 1	not allowed	4 restricted
<unassigned>	4	not assigned	not assigned see Note 1	not allowed	not assigned
Urgent-priority administrative and U.N. Charter communications	3	3	restricted see Note 1	not allowed	3 restricted
High-priority administrative and State/Government communications	2	2	restricted see Note 1	not allowed	2 restricted
Normal-priority administrative communications	1	1	restricted see Note 1	not allowed	1 restricted
Low-priority administrative communications and aeronautical passenger communications	0	0	restricted see Note 1	not allowed	0 restricted

Note 1.— VDL Mode 2 has no specific subnetwork priority mechanisms.
Note 2.— The AMSS SARPs specify mapping of message categories to subnetwork priority without explicitly referencing ATN network layer priority.
Note 3.— The term "not allowed" means that only communications related to safety and regularity of flight are authorized to pass over this subnetwork as defined in the subnetwork SARPs.
Note 4. — The term AMSS-1 refers to the first generation aeronautical mobile satellite service.
Note 5. — Only those mobile subnetworks are listed for which subnetwork SARPs exist and for which explicit support is provided by the ATN boundary intermediate system (BIS) technical provisions.
Note 6. — The term "restricted" means for this message category the use of this subnetwork may not be allowed in certain States and/or regions based on ITU radio frequency spectrum allocation.

3.4.9 The ATN shall enable exchange of application information when one or more authorized paths exist.

3.4.10 The ATN shall notify the appropriate application processes when no authorized path exists.

3.4.1 1 The ATN shall provide means to unambiguously address all ATN end and intermediate systems.

3.4.12 The ATN shall enable the recipient of a message to identify the originator of the message.

3.4.13 The ATN addressing and naming plans shall allow States and organizations to assign addresses and names within their own administrative domains.

3.4.14 The ATN shall support data communications to fixed and mobile systems.

3.4.15 The ATN shall accommodate ATN mobile subnetworks as

3.4.8 The ATN shall enable exchange of application information when one or more authorized paths exist.

3.4.9 The ATN shall notify the appropriate application processes when no authorized path exists.

3.4.10 The ATN shall make provisions for the efficient use of limited bandwidth subnetworks.

3.4.11 Recommendation.— The ATN should enable an aircraft intermediate system (router) to connect to a ground intermediate system (router) via different subnetworks.

3.4.12 Recommendation.— The ATN should enable an aircraft intermediate system (router) to connect to different ground intermediate systems (routers).

3.4.13 The ATN shall enable the exchange of address information between **applications.**

3.4.14 Where the absolute time of day is used within the ATN, it shall be accurate to within 1 second of coordinated universal time (UTC).

Note.— The time accuracy value results in synchronization errors of up to two seconds.

AMDT 82 to Annex 10, VOL III, Part 1, 2nd ed., July 2007

3.4 SYSTEM LEVEL REQUIREMENTS

[No changes with respect to AMDT 81]

defined in this Annex. 3.4.16 The ATN shall make provisions for the efficient use of limited bandwidth subnetworks. 3.4.17 The ATN shall enable an aircraft intermediate system to be connected to a ground intermediate system via concurrent mobile subnetworks. 3.4.18 The ATN shall enable an aircraft intermediate system to be connected to multiple ground intermediate systems. 3.4.19 The ATN shall enable the exchange of address information between application entities. 3.4.20 The ATN shall support the context management (CM) application when any of the other air-ground applications are supported. 3.4.21 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the context management (CM) application. 3.4.22 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the automatic dependent surveillance (ADS) application. 3.4.23 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the controller-pilot data link communications (CPDLC) application. 3.4.24 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the automatic terminal information service (ATIS) application. 3.4.25 The ATN shall be capable of establishing, maintaining, releasing and aborting application associations for the ATS message handling services (ATSMHS) application. 3.4.26 The ATN shall be capable of establishing, maintaining,	

releasing and aborting peer-to-peer application associations for the ATS interfacility data communication (AIDC) application. 3.4.27 Where the absolute time of day is used within the ATN, it shall be accurate to within 1 second of coordinated universal time (UTC). *Note.- A time accuracy value may result in synchronization errors of up to two times the stated accuracy value.* 3.4.28 The end system shall make provisions to ensure that the probability of not detecting a 255-octet message being mis-delivered, non-delivered or corrupted by the internet communication service is less than or equal to 10^{-8} per message. *Note.-- It is assumed that ATN subnetworks will ensure data integrity consistent with this system level requirement.* 3.4.29 ATN end systems supporting ATN security services shall be capable of authenticating the identity of peer end systems, authenticating the source of application messages and ensuring the data integrity of the application messages. *Note.- Application messages in this context include messages related to ATS, systems management and directory services.* 3.4.30 ATN ground and air-ground boundary intermediate systems supporting ATN security services shall be capable of authenticating the identity of peer boundary intermediate systems, authenticating the source of routing information and ensuring the data integrity of routing information. 3.4.31 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the exchange of directory information. 3.4.32 ATN systems supporting ATN systems management shall facilitate enhanced continuity of ATN operations, including the monitoring and maintenance of the quality of the communications	

service. 3.4.33 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the systems management (SM) application. 3.4.34 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the aviation routine weather report service (METAR) application.	
Subject: General requirements for the Aeronautical Telecommunication Network (ATN) Objective: definition of communication protocols to enable the transmission and reception of data units between ground and aircraft systems hosting the relevant air-ground applications Changes: ATN could either use ISO/OSI or ATN/IPS. ICAO anticipates that future air-ground implementations will use the ATN/IPS. Use of the Required communication performance (RCP) is mandated to support data exchanges on the ATN. **CONCLUSION:** EUROCAE WG-92 is already working on a revision of the current standard ED 92-B with the purpose of updating the minimum performance requirements for airborne equipage. This standard refers to ICAO material and current references could be revised in the short term (next ED-92 C could be delivered in 2018). On the other hand, the EASA RMT.0524 on DLS is about to start and it is expected to assess which is the minimum standard needed to enable datalink communications. The operational benefits and impact on stakeholders that the latest ICAO amendments could bring should be properly evaluated during the development of the RMT. In order to avoid potential conflicts with the future standards proposed by EUROCAE and EASA, **it is strongly recommended that the rule refers to the most recent ICAO AMDT in which the text remains the same as in AMDT 81, i.e. AMDT 82 to ICAO Annex 10, VOL III, 2nd ed., July 2007, Part 1.**	
AMDT 81 to Annex 10, VOL III, Part 1, 1st ed., July 1995 3.6 ATN COMMUNICATIONS SERVICE REQUIREMENTS *Note.- The ATN communication service requirements define the requirements for layers 3 through 6, as well as part of layer 7 of the OSI reference model. This services take information produced by one of the individual ATN applications and perform the end-to-end communication service using standard protocols. These communication service requirements are divided into two parts. The*	**AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** 3.6 ATN COMMUNICATIONS SERVICE REQUIREMENTS **3.6.1 ATN/IPS upper layer communications service** **3.6.1.1 An ATN host shall be capable of supporting the ATN/IPS upper layers including an application layer.** **3.6.2 ATN/OSI upper layer communications service** **3.6.2.1 An ATN/OSI end-system (ES) shall be capable of supporting the OSI upper layer communications service (ULCS)**

upper layer communications service defines the standards for layers 5 through 7. The Internet communications service defines standards for layers 3 and 4. The requirement for layers 1 and 2 are outside the scope of the ATN SARPs. 3.6.1 Upper layer communications service 3.6.1.1 The upper layer communications service shall include the: a) session layer; b) presentation layer; c) application entity structure; d) association control service element (ACSE); e) security application service object (ASO), for ATN systems supporting security services; and f) control function (CF). *Note 1.- The technical provisions for the upper layer communications for all ATN applications, except the ATS message service function of the ATSMHS application, are defined in Doc 9705. Sub-Volume IV.* *Note 2.- The technical provisions for the upper layer communications service for the ATS message service function of the ATSMHS application are defined in Doc 9705. Sub-Volume III.* 3.6.2 ATN Internet communications service *Note.- The ATN Internet communications service requirements are applicable to the end system and the intermediate system functional entities which together provide the ATN lnternet communication service. The ATN Internet* *Communication service is provided to its user (i.e. the upper layers) via the transport layer service interface.* 3.6.1.1 An ATN end system (ES) shall be capable of supporting the ATN Internet including the: a) transport layer; and	**including session, presentation and application layers.** **3.6.3 ATN/IPS communications service** **3.6.3.1 An ATN host shall be capable of supporting the ATN/IPS including the:** **a) transport layer in accordance with RFC 793 (TCP) and RFC 768 (UDP); and** **b) network layer in accordance with RFC 2460 (IPv6).** **3.6.3.2 An IPS router shall support the ATN network layer in accordance with RFC 2460 (IPv6) and RFC 4271 (BGP), and RFC 2858 (BGP multiprotocol extensions).** **3.6.4 ATN/OSI communications service** **3.6.4.1 An ATN/OSI end-system shall be capable of supporting the ATN including the:** **a) transport layer in accordance with ISO/IEC 8073 (TP4) and optionally ISO/IEC 8602 (CLTP); and** **b) network layer in accordance with ISO/IEC 8473 (CLNP).** **3.6.4.2 An ATN intermediate system (IS) shall support the ATN network layer in accordance with ISO/IEC 8473 (CLNP) and ISO/IEC 10747 (IDRP).** **[An ATN host is an ATN end-system in OSI terminology; an ATN end-system is an ATN host in IPS terminology.]** **AMDT 82 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** 3.6 ATN COMMUNICATION SERVICE REQUIREMENTS [No changes with regard to AMDT 81]

b) network layer. 3.6.2.2 An ATN intermediate system (IS) shall support the ATN network layer provisions as appropriate to the class of ATN IS under consideration. *Note.- The number of different ATN intermediate systems for which network layer profiles are defined are contained in Doc 9705, Sub-volume V.*	
Subject: ATN communications service requirements Objective: definition of communication protocols to enable the transmission and reception of data units between ground and aircraft systems hosting the relevant air-ground applications Changes: requirements for ATN/IPS and ATN/OSI, including specific capabilities. **CONCLUSION:** EUROCAE WG-92 is already working on a revision of the current standard ED 92-B with the purpose of updating the minimum performance requirements for airborne equipage. This standard refers to ICAO material and current references could be revised in the short term (next ED-92 C could be delivered in 2018). On the other hand, the EASA RMT.0524 on DLS is about to start and it is expected to assess which is the minimum standard needed to enable datalink communications. The operational benefits and impact on stakeholders that the latest ICAO amendments could bring should be properly evaluated during the development of the RMT. In order to avoid potential conflicts with the future standards proposed by EUROCAE and EASA, **it is strongly recommended that the rule refers to the most recent ICAO AMDT in which the text remains the same as in AMDT 81, i.e. AMDT 82 to ICAO Annex 10, VOL III, 2nd ed., July 2007, Part 1.**	
AMDT 81 to Annex 10, VOL III, Part 1, 1st ed., July 1995 [Note: for the sake of simplicity, only differences are shown] Chapter 6, VHF AIR-GROUND DIGITAL LINK (VDL) 6.1 DEFINITIONS AND SYSTEM CAPABILITIES *Note 2.— Additional information on VDL is contained in the Manuals on VHF VDL Mode 2, VDL Mode 3 and VDL Mode 4 Technical Specifications.* 6.1.1 Definitions Automatic dependent surveillance-broadcast (ADS-B). A surveillance technique in which aircraft automatically provide, via a broadcast	**AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007** [Note: for the sake of simplicity and due to the length of Chapter 6 , only differences are shown below] CHAPTER 6, VHF Air-Ground Digital Link (VDL) 6.1 DEFINITIONS AND SYSTEM CAPABILITIES *Note 2.— Additional information on VDL is contained in the Manuals on VHF VDL Mode 2, VDL Mode 3 and VDL Mode 4 Technical Specifications (Docs 9776, 9805 and 9816).* 6.1.1 Definitions Automatic dependent surveillance-broadcast (ADS-B). A means by which aircraft, aerodrome vehicles and other objects can automatically

mode data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position, and additional data as appropriate.	transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link.
Mode 4. A data-only VDL mode using a GFSK modulation scheme and self-organizing time division multiple access.	Mode 4. A data-only VDL mode using a GFSK modulation scheme and self-organizing time division multiple access (STDMA). VSS user. A user of the VDL Mode 4 specific services. The VSS user could be higher layers in the VDL Mode 4 SARPs or an external application using VDL Mode 4.
6.3.5 Receiving function	6.3.5 Receiving function
6.3.5.3.1 After 1 January 2002, the receiving function of all new installations of VDL shall satisfy the specified error rate with a desired signal field strength of not more than 40 microvolts per metre (minus 114 dBW/m2) and with an undesired VHF DSB-AM, D8PSK or GFSK signal at least 60 dB higher than the desired signal on any assignable channel 100 kHz or more away from the assigned channel of the desired signal.	6.3.5.3.1 After 1 January 2002, the receiving function of all new installations of VDL shall satisfy the specified error rate with a desired signal field strength of not more than 40 microvolts per metre (minus 114 dBW/m2) and with an undesired VHF DSB-AM, D8PSK or GFSK signal at least 60 dB higher than the desired signal on any assignable channel 100 kHz or more away from the assigned channel of the desired signal.
Note.-- This level of interference immunity performance provides a receiver performance consistent with the influence of the VDL RF spectrum mask as specifed in Volume III, Part I, with an effective isolation transmitter/receiver isolation of 69 dB. Better transmitter and receiver performance could result in less isolation required. Guidance material on the measurement technique is included in Annex 10, Volume V, Attachment A, section 7.	*Note.— This level of interference immunity performance provides a receiver performance consistent with the influence of the VDL RF spectrum mask as specified in **6.3.4** with an effective isolation transmitter/receiver isolation of 69 dB. Better transmitter and receiver performance could result in less isolation required. Guidance material on the measurement technique is included in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies (Doc 9718).*
6.9.2.1 VDL MODE 4 STATION FREQUENCY RANGE	6.9.2.1 VDL MODE 4 STATION FREQUENCY RANGE
6.9.2.1.1 Transmitter/receiver tuning range. A VDL Mode 4 transmitter/receiver shall be capable of tuning to any of the 25 kHz channels from 112 MHz to 137 MHz. The transmitter shall have a means for the tuning range to be restricted to a narrower range.	6.9.2.1.1 Transmitter/receiver tuning range. A VDL Mode 4 transmitter/receiver shall be capable of tuning to any of the 25 kHz channels from 112 MHz to 137 MHz. ~~The transmitter shall have a means for the tuning range to be restricted to a narrower range.~~

Note.— Operational conditions or certain applications may require the equipment to be operated in a narrower frequency range.	*Note.— Operational conditions or certain applications may require the equipment to be operated in a narrower frequency range.*
6.9.2.1.2 Recommendation.- A VDL Mode 4 transmitter/ receiver should be capable of tuning to any of the 25 kHz channels from 108 to 117.975 MHZ	~~6.9.2.1.2 Recommendation.- A VDL Mode 4 transmitter/ receiver should be capable of tuning to any of the 25 kHz channels from 108 to 117.975 MHZ~~
Note.- The band 108-117.975 MHz may be utilized in accordance with the relevant provisions of the ITU Radio Regulations.	~~*Note.- The band 108-117.975 MHz may be utilized in accordance with the relevant provisions of the ITU Radio Regulations.*~~
6.9.2.1.3 Simultaneous reception. A VDL Mode 4 station shall be capable of receiving two channels simultaneously.	6.9.2.1.**2** Simultaneous reception. A VDL Mode 4 station shall be capable of receiving two channels simultaneously.
6.9.2.1.4 Recommendation.— A VDL Mode 4 station should be capable of receiving additional channels simultaneously as required by operational services.	6.9.2.1.**3** Recommendation.— A VDL Mode 4 station should be capable of receiving additional channels simultaneously as required by operational services.
6.9.3 System capabilities	6.9.3 System capabilities
6.9.3.1 ATN compatibility. The VDL Mode 4 system shall support ATN/IPS-compliant subnetwork services for surveillance applications.	6.9.3.1 ATN compatibility. The VDL Mode 4 system shall support ATN/IPS-compliant subnetwork services ~~for surveillance applications~~.
	Note.— VDL Mode 4 provides a seamless transfer of data between ATN/IPS ground networks and ATN/IPS aircraft networks. Interoperability with ATN/OSI networks, where required, is expected to be arranged prior to implementation. VDL Modes 2 and 3 provide ATN/OSI-compliant subnetworks.
6.9.5.3 CHANNEL SENSING	6.9.5.3 CHANNEL SENSING
6.9.5.3.2 The algorithm used to estimate the noise floor shall be such that the estimated noise floor shall be lower than the maximum power value measured on the channel over the last minute when the channel is regarded as idle.	6.9.5.3.2 The algorithm used to estimate the noise floor shall be such that the estimated noise floor shall be lower than the maximum power value measured on the channel over the last minute when the channel is regarded as idle.
Note.— The VDL Mode 4 receiver uses an energy sensing algorithm as one of the means to determine the state of the channel (idle or busy). One algorithm that can be used to estimate the noise floor is described in the Manual on VDL Mode 4 Technical Specifications.	*Note.— The VDL Mode 4 receiver uses an energy sensing algorithm as one of the means to determine the state of the channel (idle or busy). One algorithm that can be used to estimate the noise floor is described in the Manual on VHF Digital Link (VDL) Mode 4 (Doc 9816).*

6.9.5.6 FM BROADCAST INTERFERENCE IMMUNITY PERFORMANCE FOR VDLMODE 4 RECEIVING SYSTEMS

6.9.5.6.2.2 The VDL Mode 4 receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels in accordance with Table 6-5 and 6-6.

Table 6-5. VDL Mode 4 operating on frequencies between 108.0–111.975 MHz

Frequency (MHz)	Maximum level of unwanted signal at receiver input (dBm)
88–102	+15
104	+10
106	+5
107.9	–10

6.9.5.6 FM BROADCAST INTERFERENCE IMMUNITY PERFORMANCE FOR VDLMODE 4 RECEIVING SYSTEMS

6.9.5.6.2.2 The VDL Mode 4 receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels in accordance with **Table 6-5 ~~and 6-6~~**.

[Note that Table 6-5 (*VDL Mode 4 operating on frequencies between 108.0-111.975 MHz*) was deleted and, in consequence, Table 6-6 (*VDL Mode 4 operating on frequencies between 112.0-117.975 MHz*) was renamed as Table 6-5]

Table 6-5. VDL Mode 4 operating on frequencies between 112.0–117.975 MHz

Frequency (MHz)	Maximum level of unwanted signal at receiver input (dBm)
88–104	+15
106	+10
107	+5
107.9	0

Note.— The relationship is linear between adjacent points designated by the above frequencies.

6.9.6 Link layer

Note.— Details on link layer functions are contained in the Manual on VHF Digital Link (VDL) Mode 4 (Doc 9816).

6.9.7 Subnetwork layer and SNDCF

Note.— Details on subnetwork layer functions and SNDCF are contained in the Manual on VHF Digital Link (VDL) Mode 4 (Doc

Table 6-6. VDL Mode 4 operating on frequencies between 112.0–117.975 MHz

Frequency (MHz)	Maximum level of unwanted signal at receiver input (dBm)
88–104	+15
106	+10
107	+5
107.9	0

Note.— The relationship is linear between adjacent points designated by the above frequencies.

6.9.6 Link layer

Note.— Details on link layer functions are contained in the Manual on VDL Mode 4 Technical Specifications.

6.9.7 Subnetwork layer and SNDCF

Note.— Details on subnetwork layer functions and SNDCF are contained in the Manual on VDL Mode 4 Technical Specifications.

6.9.8 ADS-B applications

Note.— Details on ADS-B application functions are contained in the Manual on VDL Mode 4 Technical Specifications.

9816).

6.9.8 ADS-B applications

Note.— Details on ADS-B application functions are contained in the Manual on VHF Digital Link (VDL) Mode 4 (Doc 9816).

Subject: VHF AIR-GROUND DIGITAL LINK (VDL)

Objective: To set out requirements for air-ground communications systems based on VDL Mode 2

Changes: a few definitions have been revised and several references in the standards have been updated without any impact; most of the technical changes concentrate on Section 6.9, which contains Standards and Recommended Practices for VDL Mode 4 and it is, therefore, out of the scope of the Regulation No 29/2009.

CONCLUSION: to be updated to AMDT 90 to Annex 10, VOL III, Part 1, 2nd ed., July 2007.	
AMDT 81 to Annex 10, VOL II, 6th ed., July 2001 3.5.1.5 Telecommunication logs, written or automatic, shall be retained for a period of at least thirty days. When logs are pertinent to inquiries or investigations they shall be retained for longer periods until it is evident that they will be no longer required.	**AMDT 90 to Annex 10, VOL II, 7th ed., July 2016** 3.5.1.5 Telecommunication logs, written or automatic, shall be retained for a period of at least thirty days. When logs are pertinent to inquiries or investigations they shall be retained for longer periods until it is evident that they will be no longer required.
Subject: Record of communications Objective: To ensure a proper recording function of data exchanges Changes: No changes. **CONCLUSION: to be updated to AMDT 90 to Annex 10, VOL II, 7th ed., July 2016.**	
AMDT 45 to Annex 11, 13th ed., July 2001 2.25.3 Air traffic services unit clocks and other time-recording devices shall be checked as necessary to ensure correct time to within plus or minus 30 seconds of UTC. Wherever data link communications are utilized by an air traffic services unit, clocks and other time-recording devices shall be checked as necessary to ensure correct time to within 1 second of UTC.	**AMDT 50-A to Annex 11, 14th ed., July 2016** **2.26.3** Air traffic services unit clocks and other time-recording devices shall be checked as necessary to ensure correct time to within plus or minus 30 seconds of UTC. Wherever data link communications are utilized by an air traffic services unit, clocks and other time-recording devices shall be checked as necessary to ensure correct time to within 1 second of UTC.
Subject: Time in air traffic services Objective: To ensure a proper recording function of data exchanges Changes: Same text, but different numbering. **CONCLUSION: the right reference to be updated to AMDT 50-A to Annex 11, 14th ed., July 2016.**	
AMDT 45 to Annex 11, 13th ed., July 2001 6.1.1.1 Radiotelephony and/or data link shall be used in air-ground communications for air traffic services purposes. Note.— Requirements for ATS units to be provided with and to maintain guard on the emergency channel 121.5 MHz are specified in Annex 10, Volumes II and V. 6.1.1.2 Where RCP types have been prescribed by States for ATM functions, ATS units shall, in addition to the requirements specified in	**AMDT 50-A to Annex 11, 14th ed., July 2016** 6.1.1.1 Radiotelephony and/or data link shall be used in air-ground communications for air traffic services purposes. Note.— Requirements for ATS units to be provided with and to maintain guard on the emergency channel 121.5 MHz are specified in Annex 10, Volumes II and V. 6.1.1.2 Where **an** RCP specification has been prescribed by States for **performance-based communication**, ATS units shall, in addition to

6.1.1.1, be provided with communication equipment which will enable them to provide ATS in accordance with the prescribed RCP type(s). *Note.— Information on RCP and associated procedures, and guidance concerning the approval process, will be contained in the Manual on Required Communication Performance (RCP) (Doc 9869) (in preparation). This document also contains references to other documents produced by States and international bodies concerning communication systems and RCP.*	the requirements specified in 6.1.1.1, be provided with communication equipment which will enable them to provide ATS in accordance with the prescribed RCP **specification(s)**. *Note.— Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869).*
Subject: air-ground communications performance Objective: To ensure a proper recording function of data exchanges Changes: Text has evolved to take into account the concept of RCP specifications and its potential use. Also, the text now reflects that the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869) has been published. The RCP concept is not employed in Europe yet. **CONCLUSION: to be updated to AMDT 50-A to Annex 11, 14th ed., July 2016**.	

6.2. Regulatory text proposal as regards ICAO references

The analysis conducted shows that, with the exception of references to Chapter 3 of ICAO Annex 10, Volume III, Part I, the latest ICAO amendments to ICAO annexes could be adopted to be in line with the latest standards. This is possible because, in these cases, the new standards would not affect the original objectives of the DLS Regulation, nor would alter the way in which the regulation is structured.

However, changes to the SARPs related to the Aeronautical Telecommunication Network represent a significant change from a technical point of view. Therefore, EASA recommends that a more detailed analysis should be performed as part of the RMT.0524, otherwise these changes could influence the outcome of said task and compromise technical decisions that should only be made after a proper impact assessment is conducted.

In consequence of this analysis, the text of Annex III to Commission Regulation (EC) No 29/2009 might be amended as follows:

ICAO provisions referred to in Articles 3, 5, 6, 7, 8, 9 and 13 and Annex IV

1. […]
2. Chapter 3 – Aeronautical Telecommunication Network, Section 3.5.1.1 'Context Management (CM) application' items (a) and (b) of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (Second ~~First~~ edition July 2007~~1995~~ incorporating ~~Amendment~~ ~~81~~ amendments 70-82 ~~(23.11.2006)~~).
3. Chapter 3 – Aeronautical Telecommunication Network, Section 3.5.2.2 'Controller-Pilot Data Link Communications (CPDLC) application' items (a) and (b) of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (Second ~~First~~ edition July 2007~~1995~~ incorporating ~~Amendment~~ ~~81~~ amendments 70-82 ~~(23.11.2006)~~).
4. Chapter 3 – Aeronautical Telecommunication Network, Sections 3.3, 3.4 and 3.6 of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (Second ~~First~~ edition July 2007~~1995~~ incorporating ~~Amendment~~ ~~81~~ amendments 70-82~~(23.11.2006)~~).
5. Chapter 6 – VHF air–ground digital link (VDL) of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (Second ~~First~~ edition July 2007~~1995~~ incorporating Amendment ~~81~~ 90 ~~(23.11.2006)~~ (10.11.16)).
6. Chapter 3 – General procedures for the international aeronautical telecommunication service, Section 3.5.1.5 of ICAO Annex 10 – Aeronautical Telecommunications – Volume II, (Communication Procedures including those with PANS status) (~~Sixth~~ Seventh edition ~~October~~ July ~~2001~~ 2016 incorporating ~~Amendment 81~~ amendments 40-90 ~~(23.11.2006)~~).
7. Chapter 2 – General – Sections ~~2.25.3~~ 2.26.3 of ICAO Annex 11 – Air Traffic Services (~~13th~~ 14th edition July ~~2001~~ 2016 incorporating Amendment ~~45~~ 50-A ~~(16.7.2007)~~).
8. Chapter 6 – Air traffic services requirements for communications – Sections 6.1.1.2, of ICAO Annex 11 – Air Traffic Services (~~13th~~ 14th edition July ~~2001~~ 2016 incorporating Amendment ~~45~~ 50-A ~~(16.7.2007)~~).

9. […]
10. […]
11. […]

7. Other proposed corrections

Commission Implementing Regulation (EU) 2015/310 of 26 February 2015 adjusted the date by which the operators are required to ensure that the aircraft concerned have the capacity to operate the DLS in accordance with Annex II to Regulation (EC) No 29/2009, to correspond to the amended date of application of that Regulation. Since it was decided to no longer distinguish between aircraft on the basis of the date of their individual certificate of airworthiness, paragraphs 2 and 3 of Article 3 on data link services have merged into one, hence the paragraph 4 was re-numbered as paragraph 3. As such, Article 8 on 'Data link communication for transport type State aircraft' needs to change the references to reflect the updated paragraph numbers.

Article 8

Data link communication for transport type State aircraft

[…]

1. Member States shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board transport type State aircraft referred to in Article 3(~~5~~4) support the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.

2. Member States shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board transport type State aircraft referred to in Article 3(~~5~~4) apply end-to-end communications in compliance with requirements of Part A of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.

3. Member States shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board transport type State aircraft referred to in Article 3(~~5~~4) apply air-ground communications in compliance with requirements specified in Part B or Part C of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.

8. Conclusions

This report provides a proposal for changes to the automatic exemption criteria and a list of aircraft types/models to be considered for exemptions, based on the assumptions defined within the report. As such, EASA recommends that:

EASA recommends that:

1) the 2 existing Commission Decisions C(2011) 2611 final and C(2011) 9074 final be repealed,

2) the final consolidated Commission Decision on Exemptions under Article 14 of the Commission Regulation (EC) No 29/2009, to be presented for adoption.

Note 1: Note 1: This final Commission Decision on DLS exemptions should be based on the table 'Exemptions' in section 4.5 of this report. This Decision on DLS exemptions includes transition measures for those aircraft types previously granted permanent exemptions in accordance with Commission Decisions C(2011) 2611 final and C(2011) 9074 final, which have not been exempted as per the proposed Decision based on this report.

3) the DLS regulation be amended:

- with the changes proposed for the additional automatic exemptions, proposed in section 3.4 of this report
- with proposed changes resulting from the review of the latest amendments to ICAO Annexes in relation to DLS proposed in section 6.2 of this report, and
- with the additional clerical corrections, proposed in section 4.4 and section 7 of this report.

Note 2: the proposed automatic DLS exemption criteria could be reviewed, leading to a further increase in the DLS equipage rate, once the related issues raised in this report will be addressed and the DLS will perform as intended.

Note 3: the review of the current amendments of the relevant ICAO Annexes will be continued during the RMT.0524, which could generate further changes in the DLS regulation.

Annex 4.

Tables - existing Commission Decisions

Decision 1 (from 20.05.2011): Permanent Exemptions

Model	ICAO Identifier (Doc 8643)	Marketing Name
Antonov 12	AN12BP	AN-12BK-2
Bombardier CL-600-2B19	CRJ1/M and CRJ2/M	CRJ440
Cessna 525	C525	Citation CJ1+
Cessna 560	C560	Citation Encore+
Cessna 750	C750	750 Citation X
Embraer EMB-135BJ	E135	LEGACY 600
Embraer EMB-135EJ	E135	LEGACY 650
Embraer EMB-135ER	E135	ERJ-135
Embraer EMB-135KE	E135	ERJ-140
Embraer EMB-135KL	E135	ERJ-140
Embraer EMB-135LR	E135	ERJ-135
Embraer EMB-145	E145	ERJ-145
Embraer EMB-145EP	E145	ERJ-145
Embraer EMB-145ER	E145	ERJ-145
Embraer EMB-145EU	E145	ERJ-145
Embraer EMB-145LR	E145	ERJ-145
Embraer EMB-145LU	E145	ERJ-145
Embraer EMB-145MK	E145	ERJ-145
Embraer EMB-145MP	E145	ERJ-145

Model	ICAO Identifier (Doc 8643)	Marketing Name
Embraer EMB-145MR	E145	ERJ-145
Embraer EMB-145XR	E45X	ERJ-145XR
Fokker 100	F100	Fokker 100
Fokker 70	F70	Fokker 70
Gulfstream G200	G200	G200
Hawker Beechcraft 400A	BE40	Hawker 400XP

Decision 2 (from 9.12.2011): Permanent Exemptions

Model	ICAO Identifier (Doc 8643)	Marketing Name
Airbus A318 - 112	A318	A318
Airbus ACJ - 319	A319	ACJ 319
Airbus ACJ - 320	A320	ACJ 320
Airbus A330 – 200/300	A332/A333	A330
Airbus A340 – 200/300/500/600	A342/A343/A345/A346	A340
British Aerospace AVRO RJ100	RJ1H	AVRO RJ
Dassault Falcon 10 and Falcon 100	FA10	Falcon 10
Dassault Fan Jet Falcon Basic and Series C/D/E/F/G	FA20	Falcon 20
Dassault Mystère-Falcon 200, 20GF and 20-C5/D5/E5/F5	FA20	Falcon 20
Dassault Falcon 50EX and Mystère Falcon 50	FA50	Falcon 50
Dassault Falcon 900, 900B, 900C and 900 EX	F900	Falcon 900
Dassault Falcon 2000 and 2000EX	F2TH	Falcon 2000
Gulfstream GIV and GIV-SP	GLF4	Gulfstream IV
Gulfstream G300	GLF4	Gulfstream 300
Gulfstream G400	GLF4	Gulfstream 400
Gulfstream GV	GLF5	Gulfstream V
McDonnell Douglas MD11-F and MD11-CF	MD11	MD-11

Annex 5

Focused consultation notes and presentations

Focused consultation minute

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Data link services - Exemptions - IACA c

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Other attachments

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