



Effectiveness of Flight Time Limitation (FTL)

D3.1 *Analysis of the Fitness for Purpose of the Current Safety Management Controls*

MOVE/C2/2016-360
Classification: Restricted

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Chapter 1: Introduction to the research study

Main objective and scope of the research study

The European Aviation Safety Agency (EASA) was mandated to perform a continuous review of the effectiveness of the rules concerning flight and duty time limitations and rest requirements contained in Annexes II and III of Commission Regulation (EU) No. 965/2012¹.

The review commenced in 2017 with the commission of a research study.

The research study was broken down into smaller phases; each focused on specific flight duty periods (FDPs). The first and current research phase studied the following two FDPs:

- FDP1: Duties of more than 10 hours at the less favourable time of day.
This focuses on operations that encroach (fully or partially) any portion of the period between 02:00h and 04:59h; and
- FDP2: Disruptive schedules.
This focuses on consecutive early duty starts, late duty finishes, night duties, and combinations thereof.

Scope of the current deliverable

This Deliverable D3.1 (Analysis of the Fitness for Purpose of the Current Safety Management Controls) reports the results of the work performed to analyse the adequacy of the fatigue management measures embodied in the Regulation 83/2014.

¹ Commission Regulation (EU) No. 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No. 216/2008 of the European Parliament and of the Council.

Chapter 2: Assessment of the strength of the evidence collected

We assessed the strength of the evidence found based mainly on the degree of alignment between the field study results and the results of the roster modelling, online survey, and relevant prior research (benchmarking exercise²). Also, the data sample sizes for the particular FDP types were considered.

The summary tables below provide an overview of the main FTL study results and the strength of evidence collected based on our assessment. The strength of the evidence collected was assessed as strong, moderate, or weak.

Assessment of the strength of the evidence for FDPs of interest

FDP of interest	Strength of the evidence collected
Night duties (> 10h)	Strong: i) strong alignment with roster data, survey, and benchmark; ii) sufficient sample sizes
Nights	Strong: i) strong alignment with roster data, survey, and benchmark; ii) sufficient sample sizes
Early starts	Moderate: i) moderate alignment with roster data, survey, and benchmark; ii) sufficient sample sizes
Late finishes	Strong: i) strong alignment with roster data, survey, and benchmark; ii) sufficient sample sizes
Consecutive early starts	Moderate: i) moderate alignment with roster data, survey, and benchmark; ii) insufficient field data sample size
Consecutive late finishes	Weak: i) alignment inconsistent with roster data, moderate with survey, and strong with benchmark; ii) insufficient field data sample size
Consecutive nights	Strong: i) strong alignment with roster data, survey, and benchmark; ii) large sample sizes
Mix	Weak: i) moderate alignment with roster data, moderate with survey, and moderate with benchmark; ii) sufficient sample sizes but insufficient field data on <i>specific</i> mixed work patterns

The assessment of the strength of the evidence provides no reason to rebuke any of the main results as summarised in D2.3 (Performance of the Data Collection and Data Analysis). The main results already accounted for the weak and moderate levels of the evidence provided.

² Presented in D3.2 (Benchmark of this Analysis with Other Relevant Resources).

Chapter 3: Recommendations on potential options for improvements

Following the assessment of the strength of the collected evidence, below we provide our recommendations (in no particular order) on potential options for improvement for those areas of the Regulation 83/2014 where the analysis has detected inadequacies.

Recommendation 1

Within the FDPs that are defined as 'night' FDPs in the current regulation, three subgroups can be distinguished based on the probability of occurrence of high fatigue at TOD:

- FDPs starting between 02:00h and 04:59h;
- FDPs ending between 02:00h and 05:59h and starting at 01:59h or earlier; and
- FDPs ending at 06:00h or later and starting at 01:59h or earlier.

It is recommended to include these subgroups in the definition of night FDPs to help operators to design effective fatigue risk management strategies.

Recommendation 2

The analysis provides evidence of high fatigue at TOD during late finish FDPs. It is recommended to require operators to apply appropriate fatigue risk management to mitigate the fatiguing effect of late finish FDPs, regardless of FDP duration.

Recommendation 3

The analysis provides evidence of high fatigue at TOD during both long duration (> 10h) and shorter duration (≤ 10 h) night FDPs. It is recommended to require operators to apply appropriate fatigue risk management to mitigate the fatiguing effect of *all* night FDPs, regardless of FDP duration.

Recommendation 4

Within night FDPs, duty periods that end at 06:00h or later, combined with a start at 01:59h or earlier, show the greatest probability of high fatigue at TOD. It is recommended that the regulation define this category of FDP and require operators to pay specific attention to these FDPs when applying fatigue risk management for *all* night FDPs, as proposed in recommendation 3.

Recommendation 5

The analysis found shorter prior sleep to be a predictor of high fatigue at TOD for all night FDPs. The current guidance material for night duties (GM1 CS FTL.1.205) stipulates that it is 'critical for the crew member to obtain sufficient sleep' for night duties of more than 10 hours. It is recommended to amend the GM to state that it is critical for the crew member to obtain sufficient sleep before *all* night duties, regardless of FDP duration.

Recommendation 6

The analysis provides evidence of high fatigue at TOD during night FDPs. This phenomenon seems to be fairly independent of FDP characteristics (e.g. start and end times, duration), as long as the FDP in question meets the criteria for a night FDP. Prior sleep is the main predictor of eventual fatigue. We therefore recommend that for night FDPs, operators should be required to promote optimum use of sleep opportunities (i.e. before reporting and during the FDP).

Scope and expected impact of the recommendations

To estimate the scope and expected impact of the recommendations, we considered the fraction of FDPs of European operators to which these recommendations would apply. This estimate is based on the roster data that is described in D2.1 (Identification of Potential Fatigue Hotspot). The roster data comprises 264,746 FDPs from six European airlines.

30,773 FDPs in the roster data sample (11.6%) are FDPs with a late finish. Therefore it is estimated that recommendation 1 applies to 11.6% of all European FDPs.

34,690 FDPs in the roster data sample (13.1%) are night FDPs ≤ 10 h. Therefore it is estimated that recommendations 2, 4, and 5 apply to 13.1% of all European FDPs.

22,959 in the roster data sample (8.5%) are 'deep night' FDPs; i.e., FDPs that start before 2:00h and end after 5:59h. This means that recommendation 3 applies to 8.5% of all European FDPs.

List of abbreviations

Abbreviations	Description
CS	Certification Specification
D	Deliverable
EASA	European Aviation Safety Agency
EC	European Commission
EU	European Union
FDP	Flight Duty Period
FTL	Flight Time Limitation
GM	Guidance Material
TOD	Top Of Descent

