European Aviation Safety Agency

APPENDIX 1 TO OPINION 04/2012 – 'Regulatory Impact Assessment to RMT.0440 (OPS.055) – (Flight Time Limitations)'

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1 Process and consultation

The aim of this Regulatory Impact Assessment (RIA) is to establish that the objectives of a rulemaking activity have been reached while minimizing potential negative impacts. By providing a transparent and evidence-based analysis of the advantages and disadvantages of the proposed rule against the defined objectives, it aims at providing decision-makers and stakeholders with a reference framework for discussion and informed evidence-based decisions.

This RIA summarizes the analysis performed to date on Flight Time Limitation and focusses on the impacts expected from this Opinion. In doing so the RIA looks at the impacts of the proposal as a package rather than at individual measures. For readers interested in the assessment of individual measures and the original wider range of options please refer to the RIA to NPA 2010-14[1].

2 Issue analysis and risk assessment

2.1 The current legal framework: Subpart Q

The current legal framework for FTL is laid down in Subpart Q[2] of EU-OPS. Harmonised rules ensure a minimum safety level by establishing a set of legally binding minimum requirements. Only one EU Member State is applying a different FTL regime[3]. Under Subpart Q there are however, several cases where different rules apply in different Member States for the following reasons:

- Recital 7 of the same regulation contains a so-called non-regression clause which authorises Member States to maintain legislation which contains provisions more favourable than those laid down in Regulation (EC) 1899/2006 and to retain or conclude collective labour agreements which provide for better conditions as regards flight and duty time limitations as Subpart Q.
- Recital 11 of Regulation (EC) 1899/2006 allows Members States to apply national provisions on FTL as long as they below the maximum limits and above the minimum limits laid down in Subpart Q.
- Certain elements of FTL are not covered by Subpart Q, namely provisions for the extension of a Flight Duty Period (FDP) due to split duty, provisions for the extension of an FDP due to in-flight rest, rest requirements to compensate the effects on crew members of time zone differences, reduced rest arrangements and standby provisions. For those, article 8 (4) of Regulation (EC) 1899/2006 allows Member States to adopt or maintain provisions until Community rules are established.

2.2 Stakeholders affected

Effects on the following stakeholders have been identified:

- The travelling public, because of the positive safety impact.
- Crew members, because of the positive safety impact and the potential social impacts.

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1 See http://www.easa.europa.eu/rulemaking/docs/npa/2010/NPA%202010-14.pdf

2 Subpart Q – Flight and Duty Time Limitations and rest requirements of Annex III of Commission Regulation (EC) No 859/2008 of 20 August amending Council Regulation (EEC) No 3922/91 as regards common technical requirements and administrative procedures applicable to commercial transportation by aeroplane.

3 The UK is applying CAP 371, a guide to requirements for the avoidance of fatigue in aircrews.

- The European Commission, because of the potential impact of administrative processes resulting from derogation requests in accordance with Article 14(6) of Regulation (EC) 216/2008.
- The Agency, because of the potential impact of administrative processes resulting from deviation requests in accordance with Article 22(2) of Regulation (EC) 216/2008 and derogation requests in accordance with Article 14(6).

In order to estimate the magnitude of the impacts generated by the potential changes to Flight Time Limitations schemes it is crucial to identify the different types of operators on the basis of their business model.

For the purpose of this RIA, the Agency has identified the following categories of operators, knowing that these are only models and any given Operator may not in practice fall exactly in one of these categories or may conversely pertain to more than one category.

- Legacy Carrier (LEG):
    - long haul and short haul
    - Hub operations
    - Scheduled
- Low Cost Carrier(LCC):
    - Short haul
    - Scheduled
    - Day flights
    - Point to point
- Charter (CHR)
    - Short and long haul
    - Economy seats only
    - Non scheduled
    - Point to point
- Regional Operators (REG)
    - Short haul
    - Hub operations
    - Day flights
    - Scheduled
- All Cargo (CAR)
    - Mix of long haul and short haul flights
    - Hub operations
    - Scheduled
    - Significant proportion of night flights

2.3 Safety analysis accidents and serious incidents under Subpart Q

Accidents and serious incidents are important indicators As a first step it is therefore important to look into this data as it can also give an indication of the potential benefits of rule changes. A rule change could improve the fatigue risk mitigation and thereby reduce the number of

accidents and serious incidents in the future by minimising contributing factors such as degraded performance and human errors.

When collecting data it is crucial to collect only such accidents and incidents on which the proposed rule could possibly have had an impact. Therefore, the Agency's Safety Analysis Department extracted from the European Central Repository records the following criteria:

- EASA-country registered fixed-wing aircraft;
- Commercial Air Transport;
- Period 2000–2010;
- Narrative containing mention of 'crew fatigue'.

The period of 10 years was chosen in order to capture accidents and incidents under recent national FTL regulations, upon which EU-OPS is based to a certain extent, therefore in a context comparable to the one under the current EU-OPS Subpart Q. Subpart Q itself has only been in force since 2008.

Accidents and incidents that occurred outside the EU legal framework were not considered for this analysis as the FTL rules vary widely and were partly under revision. In order to assess the potential safety benefits of a rule it is crucial to look only at cases that can actually be influenced by EU legislation.

When assessing this data, it is to be borne in mind that focussing on the narrative specifically mentioning 'crew fatigue', 'fatigue-related' incidents might be missed. Another possibility would have been to use the term 'human factor' as behind a human factor fatigue might be a contributing element, but then the risk would have been to overestimate the number of fatigue-related incidents. Also, many operators operate according to their collective labour agreements with air crew, containing further mitigating measures beyond the legal requirements of Subpart Q (or national regulations), which could explain the relatively low number of identified events (see below). Finally, fatigue is an issue that is traditionally under-reported by aircrew, as (self) assessing fatigue is generally a difficult exercise.

By applying this rather conservative approach, the Agency found two accidents and eight serious incidents involving three fatalities. However, in both accidents the crew operated outside the legal limits. In one case the FDP was exceeded by almost 3 hours and in the other case the crew did not respect the minimum rest period. These accidents therefore indicate that oversight is a key issue when looking at crew fatigue rather than the rules themselves.

The Accident Investigation report on one serious incident indicates that an arrangement of economy seats may be an inadequate in-flight rest facility. This was taken into account for the development of the proposed rule.

On the whole, this data contains a number of facts worth noting related to fatigue, but

- the data is statistically insufficient to directly deduct potential benefits of rule changes;
- the data is statistically insufficient to detect current and future safety risks, in particular as more fatigue risks may be masked under human factor-related incidents or as they are not reflected at all in this data.

On the other hand, the analysis has shown that certain elements need to be carefully assessed:

- There are limitations to the current reporting system. For example, there is no code in the European Central Repository for 'crew fatigue', thus the search had to be based on the narrative.
- 'Human factor' related accidents and incidents may have fatigue as a contributing factor. However, there was no evidence on the degree to which this was happening.

- The mere lack of related accident and incident reports, even if accurate, does not exclude the possibility of existing safety issues.

Consequently, the Agency decided to follow a pro-active and predictive approach by basing the development of EASA FTL rules on a process of hazard identification and safety risk management, which takes into account the above arguments and goes beyond the analysis of past data. The following section describes the approach and the gaps identified in the current regulatory framework ('Subpart Q').

2.4 Identifying issues with the effectiveness of Subpart Q fatigue risk mitigation

2.4.1 Methodology

The purpose of the rulemaking task was to review the flight and duty time limitations and rest requirements specified in Subpart Q, taking account of relevant recent and publicly available scientific and/or medical studies/evaluations and operational experience.

In the previous section it was established that reported accidents and incidents do not provide sufficient ground for assessing the safety performance of current European FTL rules ('Subpart Q'). In order to ensure a comprehensive review and to identify any inadequate fatigue hazard mitigation in Subpart Q, the rulemaking group agreed with the following methodology:

1. Identify all possible hazards related to the fatigue of crew members.
2. Identify generic mitigating measures associated to these hazards.
3. Identify if and how these mitigating measures are covered by a specific Subpart Q requirement.
4. Identify other possible specific mitigating measures to those from Subpart Q, insofar as they are supported by scientific evidence taking into account operational experience.
5. The Subpart Q requirements and the specific mitigating measures identified under point 4 would then form the basis of the Agency proposal (see chapter 4).

The following sections summarise the main issues identified in the above process (steps 1 to 4). The full table of hazards and mitigation measures is available in section 9.2 of NPA 2010-14. The specific proposals that were developed in order to address these issues can be found in Chapter 4.

2.4.2 Ambiguity of limits on flight duty periods

The 13-hour basic value for FDPs starting at the most favourable time of the day was introduced in Subpart Q as the result of social negotiations and the evolution of FTL over many years. During the discussions in rulemaking group OPS.055, with stakeholders and the scientific community it became apparent that this limit is supported by a broad industry consensus. The basic maximum FDP limit of 13 hours should be reduced in function of the time of the day and the number of sectors flown. Comments from some stakeholders indicated that the current way of calculating maximum FDP in Subpart Q may lead to some ambiguity[4] as to what exact maximum FDP applies in certain conditions.

2.4.3 Protection against cumulative fatigue with flight time and duty limitations

The current 190-hour duty limit in 28 days is deemed acceptable by the members of the rulemaking group as well as certain scientific reports and evaluations (e.g. Moebus Aviation report 2008, p. 14,). Additionally, the Moebus report recommends introducing an new limit of

[4] E.g. the calculation of the maximum FDP with WOCL encroachment gives different results if sector reduction is applied before or after the reduction due to WOCL encroachment.

100 duty hours in 14 days, in order to avoid the possible accumulation of those 180 hours in 21 days (3 x 60 hours week). Current CAP 371 provisions also include such a limit on duty in a 14 days period.

Concerning the cumulative limit of 900 flight hours per calendar year, the Moebus Aviation report (2008, p.14) points out that it may lead in practice to 1 800 flight hours in 18 consecutive months.

2.4.4 Protection against cumulative fatigue with recurring rest periods

The Subpart Q requirement for a 36-hours weekly rest including two local nights occurring after no more than 168 hours between the end of one and the start of the next is commonly accepted by stakeholders as an effective mitigating measure to counteract cumulative fatigue. This is also supported by scientific evidence: 'Scientific studies show that two nights of recovery sleep are typically needed to resume baseline levels of sleep structure and waking performance and alertness' [Rosekind, 1997, p. 6]. Dinges [*Principles and guidelines for duty and rest scheduling in Commercial Aviation 'NASA Study'*, 1996] specifies that 'the standard off-duty period for recovery should be a minimum of 36 continuous hours, to include two consecutive nights of recovery sleep, within a 7-day period'.

The effectiveness of this provision depends however also on how good the second night sleep is protected. Moebus Aviation (2008, p. 26) recommends deleting the exemption in current Subpart Q which allows a 04:00 reporting time after weekly rest if the weekly rest is at least 40 hours.

2.4.5 Protection against fatigue of crew on night flights with extension

Under Subpart Q the maximum FDP overnight for 1-2 sectors is 11 hours and includes the possibility for a planned extension twice per week. This extension is limited depending on the number of sectors and the Window of Circadian Low (WOCL) encroachment. For a 2-sector FDP, starting at the most unfavourable time of the day the limit is set to 11:45 hours.

Various scientific papers [Goode, Spencer, Powell] point towards restricting the possibility of extension for night flights. The scientists analysing NPA 2012-14 also suggested not to allow duty extensions for night flights.

2.4.6 Mitigating measures against fatigue effects of disruptive schedules

Crew schedules are considered 'disruptive' if they comprise an FDP or a combination of FDPs starting, finishing during or encroaching any portion of the day/night which disrupts the sleep opportunity during the optimal sleep time window. Subpart Q currently mitigates against this only by reducing FDP which encroaches the WOCL, but there current FTL regime does not foresee compensating the cumulative effects of curtailed sleep. Scientists[5] have recommended that this protection should be increased. Also, existing regulation CAP 371 includes additional protection.

2.4.7 Lack of a uniform level of safety due to Article 8 provisions

Although Subpart Q has been a big step towards providing harmonized safety standards of a high level, due to the complexity of the issue, until now the harmonisation of all FTL aspects has not been achieved. Introducing uniform requirements for all elements of FTL shall provide equivalent safety standards across all EU-27 + 4. Currently the following important rule elements are left to national rules:

- Duty extension due to in-flight rest;

[5] CRD 2010-14 Appendix III. Scientists Reports: Provision of Scientific Expertise to submit an assessment of the NPA on Flight Time Limitations (FTL) and to provide guidance and advice to the FTL Review Group - Final Report - Mick Spencer.

- Split duty;
- Standby;
- Reduced rest;
- Rest to compensate for time zone transitions.

2.4.8 Fatigue management training

Scientific evidence and operational experience indicate that the effects of fatigue can vary depending on individual circumstances. There are different strategies to manage fatigue, therefore Alexander Gundel[6] suggests fatigue management training to be made mandatory. Currently Subpart Q does not include any requirements on fatigue management training.

2.4.9 Conclusion on the issues identified

With the support of Rulemaking Group OPS.055 the Agency developed options addressing the issues identified above. These options were discussed in an iterative process with the group as well as the broad public through the Notice of Proposed Amendment NPA 2010-14 and the Comment-Response Document (CRD) 2010-14. The final result of this consultation process is the rule proposal with this Opinion as described in Chapter 4. The analysis of the impacts of this proposal as compared to Subpart Q can be found Chapter 6.

3 Objectives

The objective of this rulemaking activity as outlined in the Terms of Reference (ToR) is to:

- review the flight and duty time limitations and rest requirements specified in Subpart Q;
- address those areas/points in EU-OPS Subpart Q currently subject to national provisions in accordance with Article 8(4) of Council Regulation (EEC) No 3922/91 (e.g. extended FDPs with augmented flight crew, split duty, time zone crossing, reduced rest and standby); and
- take account of all relevant recent and publicly available scientific and/or medical studies/evaluations and operational experience, as well as the conclusions drawn from the discussions on Subpart Q by the Air Safety Committee, relevant comments to NPA 2009-02, experience gained in requests for derogations to Subpart Q, any amended ICAO SARPS, and international developments. In particular, the outcome of the ICAO Fatigue Risk Management System Task Force was to be considered.

4 Identification of options: the proposed rule

To achieve the objectives outlined in the previous chapter and address the issues identified in chapter 2.4, a range of options were developed by the rulemaking group OPS.055. These options were developed based on the fatigue hazards identification and risk management approach as presented in NPA 2010-14. NPA 2010-14 presented a preferred option, which was further discussed and refined in CRD 2010-14 based on stakeholder comments as well as reports prepared by scientists.

Based on the reactions to CRD 2010-14 the Agency developed the below details of the proposed rule. Table 1 gives an overview of the key elements of the proposal. To increase readability and concentrate on the most important safety issues a number of changes and edits are not mentioned in the table . For a full and detailed description of the proposed changes, please see the Explanatory Note to this Opinion.

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[6] CRD 2010-14 Appendix III. Scientists Reports: Provision of Scientific Expertise to submit an assessment of the NPA on Flight Time Limitations (FTL) and to provide guidance and advice to the FTL Review Group - Final Report – Alexander Gundel.

Table 1: Key characteristics of proposed rule vs. current legislation (Subpart Q)

FTL rule element	*For reference: Subpart Q*	*EASA FTL Opinion*
Flight Duty Periods	Defined through a formula, taking into account reporting time, number of sectors and WOCL. E.g. 13 hours during the day, 11 at night with 1-2 sectors.	Defined through a table, taking into account reporting time, number of sectors and WOCL. Figures based on Q.
Rolling limit on flight time	- No EU requirements	1 000 hours of flight time per 12 consecutive months
Rolling limit on duty time per 14 days	- No EU requirements	110 duty hours per 14 consecutive days
Minimum recurrent rest	36 hrs with 2 local nights. Reporting time 04:00 possible if rest is >40 hrs	36 hrs with 2 local nights; Twice per month 48 hrs. Reporting time 06:00
Duty extension	Twice per week by 1 hour	Twice per week by 1 hour, but not at night
Additional rest due to disruptive schedules	- No EU requirements	- Introducing a definition for early start, late arrival and night duties. - Additional rest after 2 night duties: 48 instead of 36 hours weekly rest - Mitigation against the effect of early to late and late to early transitions: one additional night rest at home base
Rest to mitigate the effects of Time-zone crossing	- (Article 8, i.e. non harmonised rule across EU))	Harmonised and flexible requirements through Certification Specifications
Duty extension due to in-flight rest	- (Article 8, i.e. non harmonised rule across EU))	Harmonised and flexible requirements through Certification Specifications
Split Duty	- (Article 8, i.e. non harmonised rule across EU))	Harmonised and flexible requirements through Certification Specifications
Standby	- (Article 8, i.e. non harmonised rule	Harmonised and flexible requirements through Certification

	across EU))	Specifications
Reduced rest	- (Article 8, i.e. non harmonised rule across EU))	Harmonised and flexible requirements through Certification Specifications
Requirements on fatigue management training	- No EU requirements	Operator required to provide training

5 Applied methodology

The proposed EASA FTL is analysed compared to the current legislation (Subpart Q). The following types of impacts are considered: safety, social, economic as well as regulatory co-ordination and harmonisation.[7]

As discussed in section 2.3, the assessment of **safety impacts** for this RIA could not be based on statistical data from accidents and incidents as there was no statistically significant number of accidents and incidents for EASA-country operators. Furthermore, the Terms of Reference (ToR) of the rulemaking group mandate that the assessment should be based on relevant recent and publicly available scientific and/or medical studies/evaluations and operational experience, as well as on the conclusions drawn from the discussions on Subpart Q by the Air Safety Committee.

This RIA therefore assesses the safety impacts based on two main elements: the review of scientific evidence and operational experience.

For the review of scientific evidence the members of the OPS.055 rulemaking group provided the Agency with a comprehensive list of scientific studies, reports and evaluations, which includes more than 200 items (see Bibliography). In a thorough process the rulemaking group discussed each option to identify which scientific study included some evidence to support or discard a particular option. The studies mentioned in the chapter on safety impact below were identified by this way. The Agency then reviewed the evidence in these studies and discussed with the group to what extend they are applicable to the options. One basic issue encountered in this process was that no study exists that assesses the effectiveness of Subpart Q as a whole and under all types of operations. Nevertheless, there is a broad body of scientific literature on certain requirements that exist in Subpart Q. A number of issues was identified where no scientific study was available to guide the rulemaking group. These issues are listed in chapter 8.

As regards **economic impacts**, FTL schemes limit the way crews can be scheduled by airlines in order to mitigate fatigue hazards. The mitigating measures include duty and flight time limits, minimum rest rules and other constraints. The most immediate economic effects induced by these measures are on crew productivity and the number of crew members required for a certain operation. This RIA will initially focus on the potential effects on crew productivity. Knock-on effects on capital use and competitiveness are currently not considered.

The way in which different FTL schemes impact on airlines depends to a large extent on the flight routes and rosters they operate, which depend on the business model. Therefore, a meaningful analysis of economic impacts has to differentiate business models.

[7] The standard EASA RIA methodology (WI.RPRO.00046-002) also considers environmental and proportionality issues. However, no issues related to these items were identified.

As it was not feasible for this RIA to use the real schedules and rosters of all European airlines or even to have a representative selection of them, the approach taken here is to look at certain business models and analyse the impacts on a 'model airline'.

Potential **social impacts** were identified where possible with the help of the rulemaking group. This could include effects on employment conditions, potentially including effects on health that should be considered.

6 Analysis of impacts

6.1 Safety impact

6.1.1 Ambiguity of limits on flight duty periods

The way of calculating maximum FDP in Subpart Q has reportedly lead to some ambiguity as to what exact maximum FDP applies in certain conditions. The Agency proposal removes this ambiguity by introducing a clear FDP table in function of reporting time and number of sectors flown. By taking the more restrictive interpretation of the Subpart Q formula, the Agency proposal is considered to provide a safety improvement on current Subpart Q provisions.

6.1.2 Protection against cumulative fatigue with flight time and duty limitations

Certain scientific evaluations (the Moebus report as well as the scientist that commented on NPA 2010-14) recommend introducing an new limit of 100 duty hours in 14 days, in order to avoid the possible accumulation of those 180 hours in 21 days (3 x 60 hours week). Current CAP 371 provisions include a 100 hours limit on duty in a 14 days period. The Agency proposal introduces a 14 day limit, albeit with 110 hours. As there is no conclusive scientific evidence on the number of hours, a gliding limit itself is considered a safety improvement[8].

Concerning the cumulative limit of 900 flight hours per calendar year, the Moebus Aviation report (2008, p.14) points out that it may lead in practice to 1 800 block hours in 18 consecutive months. This could be achieved by scheduling the largest part of the 900 hours at the end of one calendar year and then again at the beginning of the following year (see Figure 1, 19). The Agency proposal prevents this extreme possibility by adding a rolling limit of 1 000 flight hours per 12 *consecutive* months.

6.1.3 Protection against cumulative fatigue by recurring rest periods

Moebus Aviation (2008, p. 26) recommends deleting the exemption in current Subpart Q which allows a 04:00 reporting time after weekly rest if the weekly rest is at least 40 hours. Scientific researches [Simons and Valk, 1997] have also shown the impact on sleep duration of having to wake up early. A curtailed second local night is therefore clearly reducing the effectiveness of the extended recovery rest period.

The Agency proposes to delete the Subpart Q exemption on the basis of the Rulemaking Group's consensus that this exemption seriously impairs the weekly rest provision. The Agency proposal is therefore considered to provide a safety improvement on current Subpart Q provisions.

6.1.4 Protection against fatigue of crew on night flights

The maximum FDP overnight for 1-2 sectors is 11 hours and includes the possibility for a planned extension twice per week. This extension is limited depending on the number of sectors and the WOCL encroachment.

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[8] CRD 2010-14 Appendix III. Scientists Reports: Provision of Scientific Expertise to submit an assessment of the NPA on Flight Time Limitations (FTL) and to provide guidance and advice to the FTL Review Group - Final Report - Mick Spencer and Philippe Cabon.

The Agency proposal takes qualitative account of various scientific papers [Powell et al., 2008; Spencer & Robertson, 1999; Spencer & Robertson, 2000; Spencer & Robertson, 2002] and proposes restricting the possibility of extension for night flights. The scientists analysing NPA 2012-14 also suggested not to allow the duty extension for night flights. They considered the extension during the day as non-critical. EASA FTL thus provides a safety improvement in this area.

6.1.5 Mitigating measures against fatigue effects of disruptive schedules

Crew schedules are considered 'disruptive' if they comprise an FDP or a combination of FDPs starting, finishing during or encroaching any portion of the day/night which disrupts the sleep opportunity during the optimal sleep time window.

Subpart Q currently mitigates against this only by reducing FDP which encroaches the WOCL. Scientists[9] recommend increasing this protection. Also, existing regulation CAP 371 offers additional protection by limiting the number of consecutive disruptive FDPs. Consequently, the proposed EASA FTL includes additional protection against disruptive schedules in Certification Specifications (CS FTL.1.235) in form of a prolonged extended recovery rest period. Limiting the consecutive number of such duties is not the most effective mitigating measure to compensate for the sleep loss that characterises such duties. A limitation of the consecutive number of i.e. early starts could encourage operators to roster transitions between early starts and night duties or late finishes once the limit of i.e. early starts is reached. Transitions between the different types of disruptive schedules are also fatiguing. The proposal therefore prescribes the prolonged extended recovery rest if 4 or more such duties are rostered. Also, if at home base a transition is planned from a late finish/night duty to an early start, the rest period between the 2 FDPs shall include one local night.

This countermeasure shall avoid the accumulation of fatigue resulting from the concatenation of curtailed night sleep. The Agency proposal therefore provides a safety improvement in FTL provisions.

6.1.6 Lack of a uniform level of safety due to Article 8 provisions

Currently, a number of important FTL elements are left to national rules. A harmonised standard for these provisions will contribute to creating a uniform high level of safety. This section discusses the safety aspects of the proposed regulatory solutions for the issues that under the current legal framework as described in section 2.1, are subject to Member State discretion. Certification Specifications (CS) are the regulatory tool of choice here for the further harmonisation. Flexibility is provided in the case Member States need to approve individual solutions tackling specific operational needs. The cost impact of this solutions should be minimal because operators may propose individual flight time specification schemes for their specific type of operation, provided an equivalent level of safety is demonstrated. Harmonisation is however safeguarded by the intervention of the Agency in the approval process. This approach ensures sufficient flexibility whilst limiting the cost impact and harmonising safety standards to a high level.

- ***Time zone crossing***

The complex issue of fatigue resulting from rapid time zone transitions, the so-called jet lag, and how mitigating measures against this type of fatigue can be included in prescriptive FTL, consists of three elements. Firstly, the time needed to re-synchronise the body clock with the local time – in this Opinion called 'acclimatisation'. Secondly, the impact of not being acclimatised on the maximum FDP. And finally, the time needed to recover from the fatiguing

[9] CRD 2010-14 Appendix III. Scientists Reports: Provision of Scientific Expertise to submit an assessment of the NPA on Flight Time Limitations (FTL) and to provide guidance and advice to the FTL Review Group - Final Report - Philippe Cabon, Alexander Gundel and Mick Spencer..

effects of de-synchronisation of the body clock from the home base local time upon return from such rotations.

The issue of acclimatisation is tackled in this Opinion by including a definition in form of a table. This table retains the notion of Subpart Q that crew members are assumed to remain acclimatised to the local time of their home base for 48 hours. There are three different states of acclimatisation: acclimatised to the local time at the departure airport, the 'unknown state of acclimatisation', when the body clock is so to speak trying to catch up with the local time after a rapid time zone transition and finally the state of being acclimatised to the local time of the destination airport. The proposed definition is based on scientific recommendations[10].

After any significant time-zone shift there will be a period of about two days when the crew member might be considered to be 'partially acclimatized' to home time [Spencer, 2011]. During this period and to produce a simple rule, the FDP limits are proposed to be based on home time. After this initial period, and depending on the size and direction of the transition, there would be a period of one, two or three days when both the amplitude and phase of the circadian rhythm would be difficult to predict [Spencer, 2011]. This is when crew members are considered to be in an unknown state of acclimatisation. During this time a cautious approach is taken an the FDP limit is set as if the crew members was at the most unfavourable starting time of the day at any time.

The time needed to recover from such de-synchronisation of the body clock is addressed in a table in CS FTL.1.235. The output of this table are recovery nights at home base expressed as a function of the maximum time difference from home during the time away and the total time away. The table represents a streamlined adaptation of the recommendations given by the authors of the Moebus Report. The table has been amended in so far as it includes a minimum rest at home base always including at least 2 local nights.

As far as minimum rest away from home base following rapid time zone transitions is concerned, many studies have shown that sleep times are displaced and sleep disrupted when aircrew have to sleep during layovers after crossing several time zones [e.g. Graeber RC, 1986; Spencer MB et al, 1990; Samel A et al, 1991; Lowden A & Åkerstedt T, 1998]. Therefore, following the recommendations of the authors of the Moebus Report the minimum rest period away from home base, if the FDP encompasses 4 time zones or more is at least as the preceding duty or 14 hours to allow for time when normal sleep time on the body clock overlaps with normal sleep time in the local environment [Moebus Report, p.23].

- ***Duty extension due to in-flight rest***

The benefits of in-flight sleep in terms of improved alertness have been sufficiently demonstrated [Moebus Report, p.28]. Three aspects have be taken into account in the Opinion when defining FDP extensions due to in-flight rest: firstly, the number of sectors flown, because only the cruise phase is available for in-flight rest. Secondly, the quality of the in-flight rest facility, because it will determine the average ratio of in-flight rest to actual in-flight sleep. The more comfortable and free from disturbance the in-flight rest arrangement, the better this ratio. And lastly, by how many pilots the flight crew is augmented.

The most comprehensive scientific study on this subject, the TNO report[11] has served as a guideline to define the technical specifications of three types of in-flight rest facilities. Although the TNO advised against the use economy class seats for in-flight rest, the definitions of the technical specifications are addressed in CS FTL.1.205 and would, if this was supported by new

[10] CRD 2010-14 Appendix III. Scientists Reports: Provision of Scientific Expertise to submit an assessment of the NPA on Flight Time Limitations (FTL) and to provide guidance and advice to the FTL Review Group - Final Report - Mick Spencer.

[11] Extension of flying duty period by in-flight relief, Simons & Spencer 2007.

scientific evidence, allow for deviation under Article 22 point 2 of the Regulation (EC) 216/2008.

The proposed rule for maximum FDP due to in-flight rest for flight crew is not a direct transcript of the TNO report figures, but a transposition of its recommendations into practical term. The rule is easy to apply, operators and crew members can see immediately how many pilots are needed resting in which type of in-flight rest facility to achieve a specific extended FDP. In order to keep this rule simple, the limits are irrespective of the WOCL. This approach has been used by a number of operators and relies on the assumption that in-flight rest during the night hours is more conductive to recuperative sleep, compensating by this way for the greater extensions that is applied to an FDP encroaching the WOCL.

The rule does not foresee a requirement to augment the cabin crew in operations with an extended FDP due to in-flight rest. Therefore the same approach could not be followed for in-flight rest requirements for cabin crew members. The minimum consecutive in-flight rest is set to 90 consecutive minutes, just as for pilots. The requirements are reflected in a table. The output of this table is the minimum in-flight rest as a function of the extended FDP and the in-flight rest facility. Based on the average ratio of in-flight rest in a certain in-flight rest facility and the actual in-flight sleep, the table credits 2 hours additional wakefulness for each hour of sleep. It also preserves the principle that any crew members should a total sleep opportunity of 8 hours in a 24-hour period. Therefore, longer extensions are only achievable with high quality in-flight rest arrangements.

- ***Split duty***

The provisions for split duty are supported by the operational experience under CAP 371. Although there is very little scientific evidence justifying split duty provisions directly, an analogy with the extensions due to in-flight rest can be derived. Also the requirements for accommodation with its analogy to a class 2 in-flight rest facility and suitable accommodation with its analogy to class 1 in-flight rest facility allow for an estimation of an average ratio between the duration of the break and the actual sleep that could be achieved during that break.

- ***Airport standby***

No direct scientific evidence is currently available on this issue [Spencer, 2011]. The benefit that can be derived from a comfortable and quiet environment is however likely to be limited. Therefore, to avoid excessive awake times towards the end of an FDP resulting from a callout, the provisions for airport standby have to define the relationship between the airport standby and the assigned flight duty. CS FTL.1.225 proposes reducing the maximum FDP by any time spent on standby in excess of 4 hours. A second restriction limits the duration of airport standby to 16 hours. These two limitations alone would however permit awake times of over 18 hours if the crew member was called out for an extended FDP at the very end of the 4-hour buffer. Therefore a third limit has been included restricting the combined duration of airport standby and assigned basic maximum FDP to 16 hours for FDPs without in-flight rest or the possibility to manage transient fatigue with a break on the ground (split duty).

- ***Standby other than airport standby***

There are very few studies that address the issue of sleep quality and duration while on standby at home or in suitable accommodation. There is however some evidence that individuals who are on call may suffer a degree of sleep disturbance [Torsvall & Åkerstedt, 1988]. Although there is no direct evidence from aircrew studies, CS FTL.1.225 proposes a buffer of 8 hours after which the maximum FDP is reduced by any time exceeding 8 hours and a maximum duration standby other than airport standby of 16 hours. Considering the vast variability of current standby provisions, ranging from a 12-hour maximum duration and FDP restrictions as a function of the time spent on standby and a 24-hour maximum duration

without any further restrictions, this harmonised approach seems to be finding the middle ground.

There is no scientific evidence that addresses the issue of how much standby other than airport standby should count for the calculation of cumulative duty limits. Also here the proposed 25% seems to be reasonable based on general considerations and taking into account that current practices range from 0% to 50%.

- ***Reduced rest***

Following the recommendations of the scientific assessment of NPA 2010-14, the requirements for reduced rest are designed to provide crew members with the opportunity to report for duty after having benefitted from an 8-hour sleep opportunity. This 8-hour sleep opportunity is protected by setting the minimum values for reduced rest to 12 hours at home base and 10 hours away from home base. To avoid cumulative effects of reduced rest the shortfall of one rest period shall be recovered in the next rest period and the FDP after the reduced rest period shall be reduced by the shortfall of the rest period.

The impact of reduced rest however depends much on the schedule within which it is included and how frequently it is used. It is therefore proposed to permit the use of reduced rest provisions within these controlled limits only under FRM.

6.1.7 Fatigue management training

The Agency proposal makes fatigue management training mandatory for the Operator. This is in line with scientific recommendations [Gundel, 2011] and thus expected to increase the level of safety.

6.1.8 Summary safety impact

The Agency proposal includes the following safety improvements:

General

- Harmonized safety standards of a high level across all EU-27 + 4 by introducing uniform safety requirements for all FTL aspects.

Home base

- A single airport location assigned with a high degree of permanence.
- Increased extended recovery rest period prior to starting duty after a change of home base.
- Travelling between the former and the new home base counts as duty (either positioning or FDP).
- Records on assigned home base to be kept for 24 months.

Cumulative fatigue

- Improved requirement for extended recovery rest by removing the possibility to have an earliest reporting time after the extended recovery rest before 06:00.
- Additional cumulative duty limit per 14 days.
- Additional rolling limit per 12 calendar months.
- Prolonged extended recovery rest period twice a months.
- Increased extended recovery rest to compensate for disruptive schedules.

Maximum basic daily FDP

- Time window during which the maximum FDP is limited to 11 hours extended to cover 12 hours between 17:00 and 05:00.

Planned FDP extensions

- The possibility to plan extensions for most unfavourable starting times has been removed.

FDP extension due to in-flight rest

- Extension based on quality of in-flight rest facility.
- No extension due to in-flight rest in economy seats.

Commander's discretion

- Non-punitive reporting process.

Split duty

- Defined minimum standards for accommodation and suitable accommodation.
- Protection of useful break duration by excluding post and pre-flight duties and travelling from the break.

Airport standby

- Defined minimum standards for accommodation during airport standby.
- FDP reduced for time spent on airport standby in excess of 4 hours.
- Limited duration of combination of airport standby plus FDP when called out (for FDPs with unaugmented crew and if no break on the ground is planned).
- Minimum rest period after airport standby as long as duty.

Standby other than airport standby

- Duration limited to 16 hours.
- 25% of standby time counts for the purpose of cumulative duty time calculation.
- FDP reduced for time spent on standby in excess of 8 hours.
- Reasonable response time between call and reporting time to be established by operator.
- Standby has to be followed by a rest period.

Reduced rest

- Protected 8-hour sleep opportunity.
- Impact on cumulative fatigue mitigated by extension of the minimum rest period and reduction of the maximum FDP following the reduced rest.
- Continuous monitoring of the performance of the rule with FRM.

Rest to compensate for time zone differences

- Increased rest at destination.
- Monitoring of fatiguing effects of rotations.
- Additional rest after alternating rotations east-west / west-east.
- Minimum rest at home base measured in local nights with a minimum of 2 local nights after significant (4 or more) time zone transitions.

Fatigue management training

- Mandatory initial and recurrent training for crew members, crew rostering personnel and concerned management personnel.

Other elements

- Operator requirement to specify how nutrition is ensured in the Operations Manual.
- Improved requirements on record keeping.

6.2 Social impact

The Agency proposal will improve safety, legal certainty and is more protective than national limits in most cases. This should also imply positive effects on working conditions and general well-being. Furthermore, it is re-called that the majority of airlines operate today in line with collective labour agreements (CLAs) which are more favourable than Subpart Q. Some stakeholders claim that the proposed provisions will incentive operators to reduce the protection provided by collective labour agreements arguing that the new technical safety rules are enough. This does however, not fall under the competence of a safety regulation. Removing national differences in FTL will also remove the possibility of benefiting from a less favourable FTL regime in one or another EU Member State. This will improve a level playing field for fair competition with its positive side effect of avoiding social dumping based on FTL regulation.

On the other hand harmonised provisions for FDP extensions due to in-flight rest, not allowing certain long extensions if in-flight rest facilities are not optimal will improve well-being especially among European cabin crew members.

More robust rest requirements to mitigate the cumulative effects of disruptive schedules and additional prolonged extended recovery rest periods twice per month will also enhance crew members' work–life balance.

The Agency proposal allows split duty and reduced rest provisions across Europe. It can be assumed that more airlines would use these possibilities once available.

The introduction of split duty would mean that some crew members across Europe would have longer working hours and thereby limiting their social lives.

Reduced rest may have a slight positive social impact as it allows crew to return earlier than otherwise feasible.

Certain crew members in the UK, where CAP 371 was applied, may encounter social impact as the proposed EASA FTL scheme allows for longer FDP at certain times of the day, although this will automatically be compensated by longer rest periods and the fact that the reduction of the maximum FDP due more unfavourable reporting times, starts earlier in the afternoon than under CAP 371.

Overall, the social impacts are expected to be limited as the rule represents a careful and well balanced update to Subpart Q.

6.3 Economic impact

6.3.1 FTL schemes and crew costs

FTL schemes may affect crew productivity as well as aircraft utilisation. The significantly different airline business models, the lack of detailed financial and crew scheduling data as well as the complexity of both FTL rules and the way they impact crew productivity make it difficult to estimate the quantitative economic impact of the Agency proposal. Therefore, the following sections will discuss the economic impacts of the Agency proposal 'EASA FTL' relative to the current situation as described in "Subpart Q" on a qualitative basis and wherever necessary include a discussion of the effects on different business models. The analysis will focus on the

elements of the proposal, which are expected to have the most significant economic impact. The economic impacts are summarised in a table in paragraph 6.3.9. For this summary airline operations have been categorised as 'Legacy Airlines' with a business model based on a hub operation, 'Low Cost Carriers' operating point-to-point flights, 'Charter Operators' carrying out seasonal flights to holiday destinations, 'Regional Operators' connecting regions with a hub airport or operating between regional airports and 'Cargo Operators' transporting cargo. Most individual operators have characteristics of more than one type of operation. Therefore, the economic impact of this Agency proposal has been assessed without any quantitative estimation.

6.3.2 Limit on cumulative duty within 14 days

The proposed additional **limit on cumulative duty within 14 days** is expected to have an economic impact driven by the degree to which airlines actually schedule beyond the proposed limit of 110 hours per 14 days.

According to operators, legacy carriers (LEG) and cargo operators (CAR) tend to operate within the range of 60 to 110 cumulative duty hours per 14 days. A number of legacy carriers have CLAs, which prescribe 55 hours per week and thus cannot exceed 110 hours per 14 days. Nevertheless there are legacy carriers which exceptionally exceed 110 hours on medium haul operations.

Low cost carriers (LCC) tend to operate relatively stable rosters (e.g. 5 days on, 4 days off, 5 days on, 3 days off) which allow for an even distribution of duty time across a given period. Therefore they can be expected not to be significantly affected by the proposed 14-day limitations.

Regional airlines (REG) generally have longer daily duty periods due to split duties or due to the effects of operating from multiple bases. Therefore airlines estimate their operations to range between 70 and 110 hours per 14-day period.

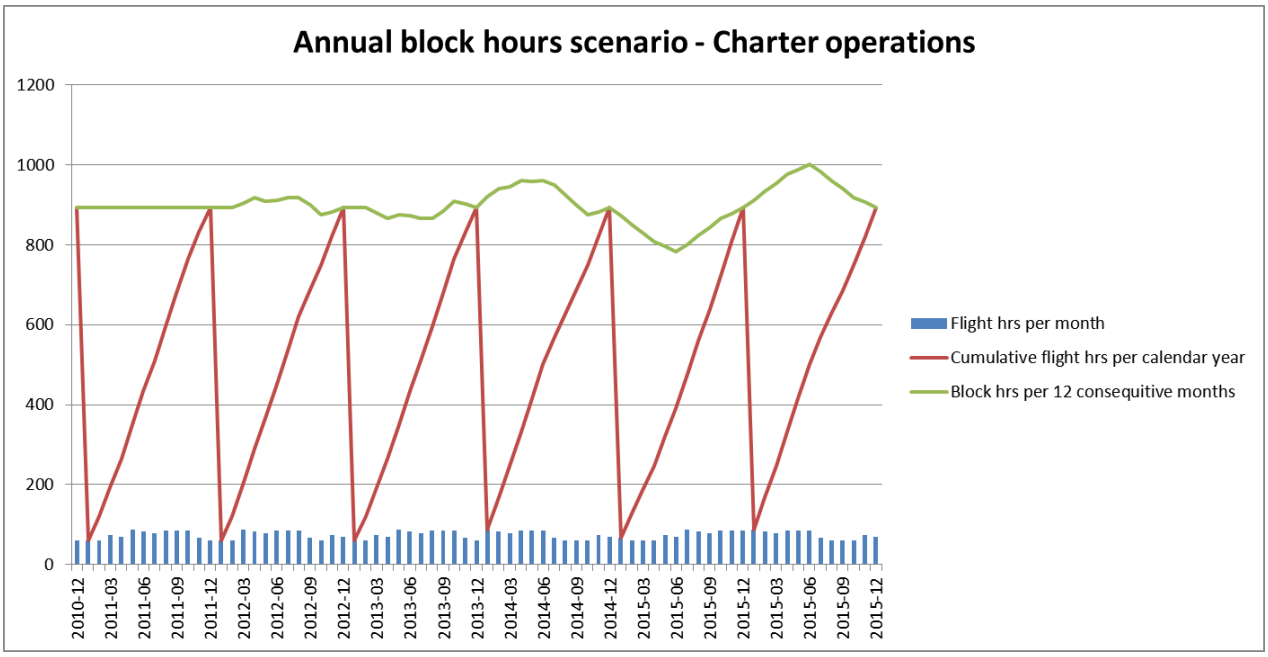
Charter operators (CHR) tend to make most use of the possibilities during their peaks times. They are assumed to operate a range up to the maximum of 120 hours per 14 days.

The above overview shows that charter operators would be most severely affected due to their holiday period peaks. Additional costs could be however, minimised through adaptive rostering practices.1 000 block hours per 12 consecutive months

Another new element introduced in the proposal is a limit of **1 000 block hours per 12 consecutive months.** This limit is intended to avoid cumulative fatigue created by crew members serving two peak times within 12 consecutive months. Due to their services provided to the leisure industry, charter operators would be most affected by such an additional limit. Especially in Member States where holiday seasons can shift from one year to another, charter operators have to address this peak demand and follow the shifting season.

In order to see the possible effect, a simulation was performed based on average monthly block hours provided by charter operators. These block hours show a peak in the months of May and then again August to October with monthly block times in excess of 80 hours. To simulate a worst case scenario, these peak block hours were then put at the end and at the beginning of a year in order to simulate the block hours that could be achieved within 12 consecutive months in an extreme case with shifting peak times. The results in Figure 1 show that block times per 12 consecutive months may — under these extreme assumptions — reach 1 000 hours.

Figure 1: Annual block hours scenario for charter operations



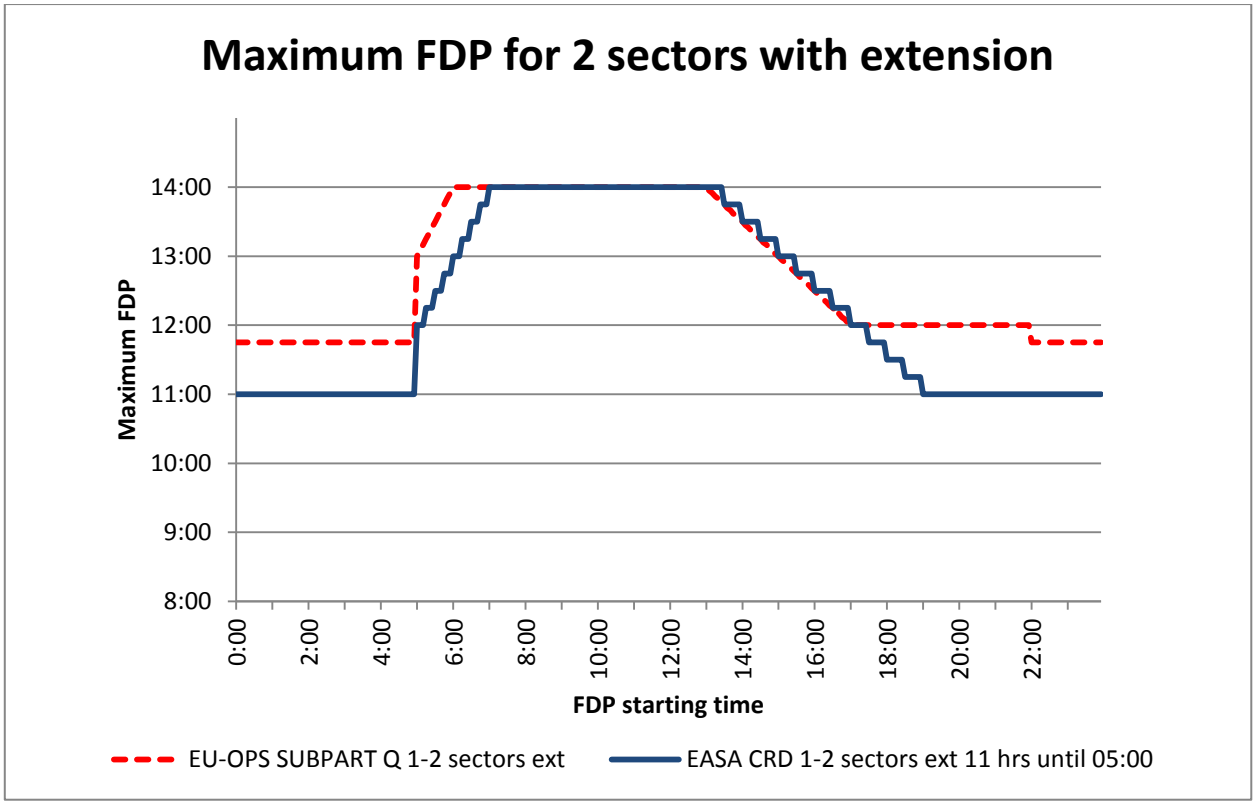
The smaller a company with fewer pilots, the more the effects of such a limit. As far as other business models are concerned the effects of this annual rolling limit are likely to be minimal. The impact on LEG, LCC, REG and CAR is deemed negligible.

6.3.3 Duty extensions not allowed over night

Planned duty extensions give additional flexibility to the operator to schedule up to 14 hours of FDP twice per week with certain mitigation measures. The extent to which any changes to this provision would impact an airline depends on the degree to which it currently uses the flexibility (or will need to use it in the future). The need to use this kind of flexibility partly depends on the routes operated and the business model.

The Agency proposal would certainly require a significant adjustment for certain operators as company extensions would no longer be allowed between 19:00 and 06:15. Figure 2 gives an overview of how this would affect the maximum allowable FDP for 1–2 sector flights. The blue line represents the current Subpart Q provisions.

Figure 2: Maximum allowable FDP with extension



The economic effects of introducing such a new provision depend on the individual flight plans of airlines and more specifically on how many of their flights leave during the period 19:00 - 06:15 and require an extended FDP.

For a typical low cost operator operating 2, 4 or 6 sectors with two crews between 05:00 and 23:00 the additional requirement would not pose a significant problem. The maximum FDP limits are unlikely to restrict their operations under the current conditions.

Charter and cargo operators would be affected the most. According to charter operators[12], 15% to 51% of charter flights depart before 08:00. More significantly, due to their networks and flight patterns their FDPs tend to be closer to the limits currently allowed. Many return flights from European metropolitan areas to popular holiday destinations in the middle east or the Canary Islands etc. can currently be achieved with the extended FDP even at the most unfavourable time of the day.

6.3.4 Duty extension due to in-flight rest

Since provisions for duty extensions with augmented crew were subject to Member State discretion there is no absolute reference point for this area.

Legacy carriers, cargo operators and charter airlines operate routes that require FDP beyond 14 hours. The economically most relevant parameter is in the type of in-flight rest facility (Class 1, 2 or 3) available to the member of crew resting and the associated FDP extension possible, as well as the minimum rest per crew member.

The EASA FTL does not foresee economy seats as in-flight rest facility. The proposal can therefore be expected to have overall a medium negative economic effect, mainly on certain charter operators. This negative effect is partly mitigated by an additional transition period which allows Member States to delay the application of the harmonised rules for FDP extension

[12] Based on a sample of 7 airlines, 6 of which operate under a Collaborative Labour Agreement.

due to in-flight rest for one more year. This year should give operators time to adapt their fleets or investigate alternatives to the proposed in-flight rest arrangements

Standard long-range aircraft models operated by legacy carriers and cargo operators on the other hand are usually equipped with Class 1 or at least Class 2 in-flight rest facilities. The harmonised rules should therefore only have a minimal impact on them. Only if FDP extensions due to in-flight rest are used on low density routes which are served by narrow body aircraft which are not prepared for the installation of Class 1 in-flight rest facilities a low negative economic effect could be predicted.

As the current requirements for augmented crew differ from Member State to Member State it is difficult to give a full picture on how this would impact the European aviation industry. At least eight Member States did not require a certain percentage of in-flight rest to calculate the allowable FDP extension. As this included Member States with significant traffic this applied to 30% to 50% of European long haul traffic. For the other half the introduction of the harmonised requirement would therefore have a low positive economic impact as current in-flight rest requirements would no longer apply. As a careful estimate, the Agency therefore assigns a low negative economic impact to this proposal on LEG and CAR, and a medium negative impact on CHR.

6.3.5 Split Duty

There is no reference situation for the mitigation measures related to split duty Therefore the proposal can only be assessed for its relative economic impact.

Nine European countries (AT, BE, CH, IR, IT, LT, MT, SLO, UK) currently apply a similar approach to split duty, where the FDP extension may be up to 50% of the on–ground break. The Scandinavian countries NO, DK and SE allow for an FDP extension of 100% of the on-ground break. FI, DE and NL allow for a fixed extension period irrespective of the duration of the break on-ground (beyond a minimum break period). FI and NL have low limits for the extension (2 and 2.5 hours respectively). In DE the limit is 4 hours.

The proposal allows split duty across Europe based on current UK CAP 371 requirements. This would therefore not significantly affect operators from the nine European countries currently working under similar rules. Requirements will become more restrictive for operators from NO, DK, SE and DE. The proposal is considered most cost-effective delivering the desired safety improvement at the same time.

6.3.6 Airport Standby

Under the current conditions, nine EASA countries do not have a maximum time limit on standby at the airport (CH, DE, FI, DE, IE, MT, NO, ES and SE). These countries represent about 50% of the European traffic.

The Agency proposal provides some additional protection in terms of facility requirements and FDP reduction which may induce costs for operators working under less restrictive schemes. On the other hand there will be operators which will benefit because the harmonised rule is less restrictive than their national rules. The requirement is expected to incur limited costs and benefits to European operators, depending on current national requirements.

Notwithstanding variations from country to country, this is likely to affect equally all categories of operators.

6.3.7 Other Standby

As there is currently no common European requirement in this area, no reference situation is available. The new requirement needs to be analysed for its potential cost impact.

Limiting the maximum duration of standby to 16 hours will have an impact on costs. This impact will however be mitigated by the fact that the number of crew members that are

needed to cover a standby shift depends on the number of flights scheduled at certain times of the day.

As discussed in the previous chapter, the use of standby varies significantly between different operators. The Agency received information from eight European airlines. The actual use of pilot standby ranges between 2 days per pilot and year and 33 days. If one considers the highest value an extreme case, the range is still likely to be between 2 and 10 days per year and crew, i.e. between 0.4% and 3% of total crew days.

For the countries which currently allow 24 hours of home standby, the Agency proposal could require operators in these countries to double their standby and thus result in additional crew requirement, i.e. an additional 0.4% to 3% of crew hours. 50% of this standby is assumed to be home standby and 30% of crew is assumed to be affected.

As regards cabin crew, the range of standby used is not that wide, and as an average 1.7 % can be assumed based on the information provided by operators.

The crew costs increase was estimated based on the above information, assuming that adequate facilities for airport standby are available to the operators. In relative terms this is estimated to represent less than 0.4% of cost increase across Europe. For most operators this would mean no increase at all since 70% of the European crews are estimated not to be affected as similar rules already apply. Overall, the Agency proposal is therefore estimated to have a low negative economic impact.

Notwithstanding variations from country to country, this is likely to affect equally all categories of operators.

6.3.8 Fatigue management training

The Agency proposal requires operators to develop **fatigue management training** as well as the possibility to report fatigue. It is assumed that the fatigue management training can be integrated in other training activities and thus will require only limited additional off-time for the crew member. The requirement is expected to incur limited initial and recurrent training costs. This is likely to affect equally all categories of operators.

6.3.9 Summary Economic impact

Overall a low economic effect is estimated for the Agency proposal.

However, all categories of operators will not be equally affected. The table below shows the impact of the respective categories of operators: Legacy Airlines (LEG), Low Cost Carriers (LCC), Charter Operators (CHR), Regional Operators (REG) and Cargo Operators (CAR.). In this table, a medium negative impact is identified by '—', a minor negative impact by '-', and a negligible impact by '='. Similarly, positive economic impacts range from '+' to '++'.

Table 2: Summary economic impact

Issue	Economical Impact				
	LEG	LCC	CHR	REG	CAR
Flight Duty Periods	-	=	-	-	-
Rolling limit on flight time	=	=	--	=	-
Rolling limit on duty time per 14 days	-	=	-	-	-
Minimum recurrent rest	-	=	-	-	-
Duty extension	-	=	--	-	--
Additional rest due to disruptive schedules	-	=	-	-	-
Rest to mitigate the effects of Time-zone crossing	-	=	-	=	-
Duty extension due to in-flight rest	=	=	--	=	=

Split Duty	+	=	+	+	+
Standby	+	+	+	+	+
Reduced rest	+	+	+	+	+
Requirements on fatigue management training	-	-	-	-	-

In summary, the Low Cost Airlines should have a negligible cost impact and Legacy, Regional and Cargo Operators a limited cost impact. Charter Operators may incur a more significant cost impact than the other categories of operators, especially due to the ban of economy seats as in-flight rest facility, but this has to be balanced by the correlated safety improvements. Furthermore, the flexibility provided by the use of Certification Specifications in this area, combined with appropriate transition measures will provide the Charter Operators with an opportunity to develop alternative in flight rest facilities, meeting both their economic model and the requirement for a high uniform level of safety.

6.4 Impact on regulatory coordination and harmonisation

Historically, FTL regulations have been developed by NAA's with the concern to best fit the operating models of their operators. This has resulted in significantly diverse approaches around the globe and in the EU. For instance, countries with a huge domestic market and a relatively limited international (long-haul) market have developed FTL principles that may significantly differ from those having mainly an international (long haul) market. A careful study of some third country regulations shows that different regulations may reach an equivalent level of safety by significantly different means. It is therefore not relevant to compare these regulations point by point, knowing that e.g. longer FDP may be compensated by longer rest requirement.

Further harmonisation within the EU however, has been a common objective of all stakeholders, including operator and crew organisations, and consumers organisations. This Agency proposal will improve the level playing field in the EU and therefore contribute to fair competition. Removing national differences in FTL regulations of EU Member States will also help avoiding social dumping based on FTL.

This said, it should also be observed that historically Crew Fatigue regulations have not been identified as a harmonisation topic between the Agency and its main international counterpart. This, combined with the fact that the Agency proposal does not represent a fundamental change to the existing rule, allows us to say that this impact of this proposal on international coordination and harmonisation is negligible.

7 Conclusions

The proposed legal text is the result of intensive exchange and debate in Rulemaking group OPS.055, two public consultations (NPA and CRD) as well as numerous meetings with various stakeholder groups and NAAs.

The proposed rule introduces **significant safety improvements** over the current EU legislation (EU OPS - Subpart Q), has a **limited economic impact** on EU Operators, a **positive social impact** and a**positive impact on regulatory harmonisation and coordination at EU level.**

8 Monitoring, evaluation and further research

Once a rule is in place it is crucial to monitor if the objectives are indeed achieved in an effective and efficient manner. It is also necessary to ensure that any subsequent external developments which may require a reassessment of those objectives are identified. To this end the Agency draws on a number of external and internal feedback loops which may again be fed into the process as new proposals. These feedback loops include the European Aviation Safety Plan, Safety Recommendations from Accident Investigation Boards, the Agency's consultative

bodies with representatives from Member States and Industry, Third Country NAAs, ICAO, Standardisation.

In the case of Flight Time Limitations it is proposed to put in place a programme of work on pilot fatigue and performance. Such a programme would include gathering data on a long term basis, monitoring the impact of the new rules, assessing the effectiveness of fatigue management within the industry and researching specific issues as appropriate. Research subjects would include, but might not be limited to:

- The impact of duties of more than 13 at the more favourable time of the day
- The impact of duties of more than 10 hours at the less favourable time of the day
- The impact of duties of more than 11 hours for crew members in an unknown state of acclimatisation
- The possible impact of a high level of sectors (>6) on crew alertness.
- The impact of disruptive schedules on cumulative limits.

9 Annexes

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