SAFER SKIES COALITION

Response to consultation for Canada Gazette, Part I – Flight Crew Member Hours of Work and Rest Periods, Published July 1, 2017

Submitted to
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Executive Summary

On behalf of Safer Skies, a coalition of more than 8,000 of Canada’s commercial pilots – represented by the Air Canada Pilots Association, Air Line Pilots Association, Unifor, the International Association of Machinists and Aerospace Workers, and the Office and Professional Employees International Union – we are pleased to provide comments on the Regulations Amending the Canadian Aviation regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods), which was published in the Canada Gazette, Part I on July 1, 2017.

As the coalition highlighted in our comments of April 24, 2017 on the Notice of Intent to Amend the Canadian Aviation Regulations, fatigue is a type of impairment – it causes reduced alertness and degraded physical and mental performance. Fatigue affects all people – pilots included. It is therefore critical that this update of Canada’s more than 20-year old aviation fatigue regulations adopt the latest science and best practices, like other countries have already done with their regulations.

No less an authority than NASA’s Ames Research Centre underlines the link between safety and fatigue management in aviation, given the industry’s 24-hour operational demands. “Shift work, night work, irregular work schedules, unpredictable work schedules, and time zone changes will continue to be commonplace components of the aviation industry. These factors pose known challenges to human physiology, and because they result in performance-impairing fatigue, they pose a risk to safety.”

Upon review of the draft regulations, it is clear that the new rules proposed by Canada lag behind international standards and are dangerously out of synch with modern sleep science.

e-Petition 1051

The Safer Skies coalition has registered a Parliamentary petition calling on the government to take action in three areas to ensure pilots, other crew, and passengers are not endangered by lax regulation. The petition was created because we are disappointed that the proposed regulations do not address these fundamental issues that are shared by thousands of everyday Canadians.

- **One level of safety:**
  Pilots and passengers on all sizes of aircraft – whether they carry passengers or cargo – should have the same protective fatigue limits, coming into force at the same time;

- **Long-haul flights at night:**
  Address pilot fatigue on long-haul flights at night by limiting duty periods that begin after 1700h to 10 hours (or 8.5 hours of flight time) – in line with NASA research findings; and

- **Prescriptive limits and oversight as part of any Fatigue Risk Management System:**
  Ensure that any Fatigue Risk Management System relies on science-based prescriptive limits as a foundation, requiring independently verifiable data and stringent Transport Canada approval and oversight.
Regulatory Feedback – Critical Issues
Our submission describes 60 deficiencies within the proposed draft regulations. We have identified the most critical of these issues as follows:

Long-Haul Flights at Night and Returning from Overseas Un-acclimatized Issue
A significant body of undisputed scientific evidence (including NASA’s Ames Research Center) has found that pilot fatigue during night-time operations has significant consequences for alertness and vigilance. Following the 2009 Colgan Air crash, the U.S. Federal Aviation Administration implemented new science-based fatigue rules which limited flight time for US pilots to 8 hours at night. The proposed regulations will allow pilots to fly up to 10.5 hours at night on long-haul flights – both when sleep is compromised when returning to home base after an overseas flight or for duty periods that begin at night. This is 2.5 hours longer than the Federal Aviation Administration allows American pilots to fly in the United States during a comparable timeframe, and 2 hours longer than NASA science recommends.

Figure 1 illustrates the deficiency in the proposed regulations compared with other jurisdictions.

![Figure 1 - on duty periods beginning at 9pm](image-url)
When evaluating the proposed regulations beside those enjoyed by US pilots and the recommendations made by NASA’s Ames Research Center, Canada’s safety gap is readily apparent.

![Maximum Single Sector Flight Time](image)

*Figure 2 - Safety gap between US rules, NASA recommendations, and Canada's proposed regulations*

**SAFER SKIES Position**
The Safer Skies coalition supports NASA’s recommendation for a maximum flight duty time of no more than 10 hours (8.5 hours of flight time) on long-haul flights at night. This is also comparable to that of the United States.

**Maximum Flight Time Values**

**Issue**
The draft regulations propose to allow 112 hours of flight time in less than 28 days; the global standard is 100 hours or less. As illustrated in the chart below, under the proposed regulations Canada will be one of only three jurisdictions that permit professional pilots to fly more than 100 hours in a single 28-day period.
SAFER SKIES Position
The Safer Skies coalition supports a limit of maximum flight time of 100 hours in 28 days, the global standard for professional pilots.

Maximum Duty Time
Issue
The draft regulations impose a maximum duty time of 2400 hours, a full 20% higher than the what pilots in the European Union are permitted to work. Moreover, the average Canadian works approximately 1700 hours per year, meaning that the proposed duty limit for Canadian pilots is 37% higher than the

1 (European Agency for Safety and Health at Work, 2017)
2 (Organization for Economic Co-Operation and Development, 2017)
average for Canadian workers. Changes to weekly, monthly, and annual limits resulting in the 2400-hour maximum result in Canada having the highest duty time limits in the world.

SAFER SKIES Position
Duty time should reflect best practice as established by the European Union of 1900-2000 hours of duty time in 365 days rather than maximum values in the Canada Labour Code. Further, duty limits must reflect time of day sensitivity and ensure that adequate rest recovery is provided.

Rest Periods

Issue
The proposed regulations would permit an operator to have a pilot at work for up to 17 days in a row without a day off.

SAFER SKIES Position
As noted in Transport Canada’s Regulatory Impact Analysis Statement, “Flying (piloting) is a highly psychomotor and cognitively demanding job. Working long duty days consecutively without adequate rest and restoration will degrade human performance over time.” Accordingly, piloting should have lower duty and more rest than the minimum required by the Canada Labour Law.

The time free from duty requirement in the proposed regulations should follow international best practice: for example, the regulatory framework in the European Union provides for extended recurrent rest.”

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3 (Transport Canada, 2017, p. 2913)
Flight Duty Periods with Augmentation

Issue
There are a number of critical issues in the Flight Duty Period provisions that must be addressed in order to ensure safe flight. These issues include the definition of rest facilities, regulations vs. guidance, and table values for augmented flight crew and rest.

- **Definition of Rest Facilities**
  Rest facility definitions, especially those for class one and class three, are suboptimal. In particular, regulations must set out that class one rest facilities meet the standard established by Society of Automotive Engineers’ (SAE) aerospace Recommended Practice (ARP) 4101/3. Class three rest facilities cannot be joined with or attached to any seat occupied by a passenger.

- **Regulations vs. Guidance**
  As proposed, a significant amount what should be regulatory content is located in guidance material. Since guidance material is not compulsory, there is no guarantee that operators will follow guidance material and therefore guidance material must be written into the regulations.

- **Augmented Flight Crew and Rest**
  Restore table values from augmented flight crew and rest, incorporating time of day sensitivity.

Reprisal

Issue
The system of reporting fatigue contained within the prescriptive portion of the proposed regulations permits reprisal and punishment. Fatigue reporting must be done without fear of reprisal. As there are no explicit safeguards or protections in the proposed regulations, responsible pilots who declare themselves to be fatigued via the reporting system are exposed to the whims of vindictive operators who put profits before safety.

SAFER SKIES Position
The Safer Skies coalition will only support a regulatory system if it provides professional pilots with protections from reprisal when they report fatigue and other safety issues.

Professional Pilots Cannot Support Proposed Fatigue Risk Management System
As proposed, the Fatigue Risk Management System (FRMS) is of major concern. Almost every prescriptive limit set out in the draft regulations can be bypassed -- without regulator oversight or approval. By the government’s own estimation in CG1, FRMS is expected to be implemented by operators on up to 20% of regulated flights, meaning that a significant percentage of flights would essentially have no effective oversight. Compare this to approximately a dozen flights exempted under the United States’ FRMS model, where any deviation from prescriptive limits requires approval from the FAA as the regulator.
SAFER SKIES Position
Based on the severity of the critical deficiencies in the FRMS model as proposed, the 8,000 pilots of the Safer Skies coalition will refuse to participate in the FRMS without significant changes as we cannot support a system that is all risk and no management.

Incorrect Claims Regarding Science and other Jurisdictions
CG1 claims that its recommendations are in keeping with scientific recommendations and comparable jurisdictions. This is clearly not the case, when the recommendations do not meet the agreed upon scientific standard established by the original CARAC working group, and when the recommendations are offside by up to two hours of flight time at night with the United States, Canada’s closest neighbouring jurisdiction.

Financial Analysis
CG1 Analysis Did Not Consider Key Issues
The Cost-Benefit Analysis conducted by Transport Canada and described in the preamble to the draft regulations omits a number of factors that would have otherwise had an impact on the final analysis. In particular, the Analysis did not:

- calculate the costs or benefits of reducing flight duty periods for long-haul flights at night to match scientific recommendations.
- calculate the benefit of reduced and avoided impacts to passengers, including reduced flight delays.
- include a calculation of the cost of appropriate crew rest facilities.
- provide transparency around avoided injuries and their related costs.

SAFER SKIES position
By neglecting these important considerations, the Cost Benefit Analysis cannot be considered complete.

CG1 Analysis Was Not Independent
In addition to neglecting the factors described above, the CG1 Cost-Benefit Analysis suffers from another serious deficiency: there is no evidence that Transport Canada conducted a critical review or assessment of the third-party financial figures provided by operators. The department has not made public the fundamentals underpinning its analysis, meaning that there is no to determine whether or not operator-provided figures are representative.

As occurred in the US during the modernization of their fatigue rules in 2011, financial figures provided by operators, who were lobbying against updating fatigue rules, were often inflated. Indeed, following a critical evaluation of figures provided by American commercial operators, the FAA determined that industry had overstated the financial impact by 5,026%; specifically, the FAA estimated costs of $390 million for a 10-year implementation period, while the airline industry had claimed these
implementation costs would be $19.6 billion⁴. If the FAA’s cost assessment was inaccurate, one would have anticipated a significant financial impact be reflected in airline financial performance, which did not occur. Given the dramatic discrepancy between US industry figures and the FAA’s own calculations, it is imperative that Transport Canada’s be independent and based on its own findings and research.

In particular, costs provided by Canadian operators with respect to crew scheduling and crew management did not receive scrutiny by Transport Canada. In the US case, the FAA independently calculated crew costs.

According to the financial model put forward by Transport Canada (CG1 pg. 2955), “The proposed amendments would result in approximately $0.14 per passenger per flight. The maximum that could be passed on to consumers is $0.28 per passenger per flight. Therefore, the cost passed on to consumers would be negligible.”

CG1 Analysis is Based on Questionable Assumptions
The proposal contains a number of questionable assumptions whose inclusion further undermines the validity of the final assessment. In particular:

- Transport Canada’s 17.5% fatigue contribution rate to accidents is derived from taking an average value from a single study. This unscientific approach to modeling, incorporated into the Cost-Benefit Analysis without any apparent validation, makes it difficult to ascertain the benefits to the aviation industry in terms of true costs of proper fatigue management and savings from accident avoidance. Furthermore, reduced fatigue leads to tertiary benefits, as was seen in the rail industry when improved fatigue rules led to reduced wear and tear in locomotives⁵. A more robust scientific approach to determining the actual contribution rate is necessary for a valid Cost-Benefit Analysis.

- Transport Canada employs a period of 15 years in their Cost-Benefit Analysis; 50% longer than the modeling that the FAA used. Transport Canada attempts to justify this expanded timeframe by pointing to the long implementation period for certain air operators, neglecting to consider that the cost to industry is significantly magnified by incorporating an additional five years of impact on major airlines. A more appropriate safety-first approach would, as previously indicated, establish a one-year implementation period across all operators, rather than delaying implementation for some portions of the industry; including those flying into rural and remote areas in small aircraft. Failing that, an honest accounting would independently assess separate 10-year periods starting after the coming into force dates for each portion of the sector.

- More people are filling aircraft seats today and airlines are operating aircraft with more seats than they did 10-20 years ago. Essentially, there is a high probability that in the event of a fatal accident, the fatality rate could be higher because the average amount of passengers per aircraft has risen. Transport Canada does not provide details in their analysis that they have accounted for this trend. High fatality rates in an accident means that the industry enjoys even higher benefits when accidents are avoided.

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⁴ (Office of Aviation Policy and Plans, 2011, p. 11)
⁵ (Dorrian, Hussey, & Dawson, 2007)
**Conclusion**

While the proposed regulations make some improvements to Canada’s regulatory regime, there are shortfalls that must be addressed. The more than 8,000 professional pilots represented by the Safer Skies coalition will have grave reservations about the integrity the Canadian system if the changes we propose to improve fatigue provisions are not made.

The draft regulations set out flight duty time limits that fall short of those recommended by science to a significant degree, while also not harmonizing with the rules adopted by the United States in 2010, as well as other jurisdictions.

The draft regulations propose a two-tier implementation period forcing the most vulnerable pilots, those flying smaller aircraft (typically in rural and remote areas) to wait four times longer than other pilots for the rules providing fatigue protection to come into force. The regulations should come into force in no more than 12-18 months.

With respect to the Fatigue Risk Management System, based on the severity of the draft regulation’s critical issues, as well as the other concerns detailed in the attached regulatory review, the 8,000 pilots of the Safer Skies coalition have no choice but to refuse to participate in the FRMS as proposed.

The Safer Skies coalition calls on Transport Canada to adjust its proposal so that Canada’s fatigue regulations are more closely aligned with science and harmonized with the best practices of our international aviation partners.
Milt Isaacs, CEO
Air Canada Pilots Association

Dan Adamus, President
ALPA Canada

Jerry Dias, National President
Unifor

Richard Lanigan, President
OPEIU

Stan Pickthall, General Vice President
IAMAW, Canada
Guidance Material that Changes Regulations

Issue
Current guidance has at times changed dramatically over the years without any formal vetting procedure.

Resolution
A formal vetting process is developed that includes industry stakeholders prior to issuing guidance that changes regulation.

Rationale
Modifications to guidance without input from a community of industry stakeholders can lead to conflicts between distinct pieces of guidance as well as guidance and the regulations.

For example, the following successive guidance updates on Unforeseen Operational Circumstances (UOC) which contradict each other. While the regulation did not change during this period of time, the guidance material significantly changed the rule.

Guidance UOC 2005:
Due to unforeseen operational circumstances, 37 flight time hours are flown on days 1 to 6. Day 7 has 6 flight time hours scheduled. If these 6 flight time hours are flown, the flight crew member will have flown 43 flight time hours in 7 days. Exceeding to limitation on day 7 is not the result of an unforeseen operational circumstance.

Guidance UOC 2012:
Unforeseen operational circumstances (UOC) may be used to allow a pilot to complete a “block” or “cycle” with an extension to the flight time limitations for either the seven, 30 or 90-day periods. For example, a pilot on a 7-day block accumulates 3 additional flight hours during the first 6 days due to UOC. The pilot may still fly a trip on day 7 which takes him/her to a maximum of 43 hours in 7 days. In all cases, the maximum extension allowed is three consecutive hours.
Coming into Force

| Air operators operating pursuant to Subpart 705 would have one year to implement the proposed Regulations after they come into force, while air operators operating pursuant to Subparts 703 and 704 would have four years. |

Issue
We support a one-year implementation period for 705 operators. The implementation period for CAR 703/704 Air Operators is too long, and does not reflect the heightened safety risk posed by fatigue in these operators. In fact, according to the TSB’s statistical summary (see below), CAR 703 and 704 Air Operations have the highest rate of incidents, accidents and fatalities.

Resolution
Air operators operating pursuant to Subpart 705, 704, and 703 would have up to 18 months to implement the proposed Regulations after publication of Canada Gazette, Part II

Failing 18 months for all, our position remains at 12 months for Part 705 air operators.

Rationale
705 Operators
Transport Canada has proposed – and Canada’s pilots in the Safer Skies coalition fully support – a one-year implementation period for 705 operators. This is in line with the successful implementation of new fatigue rules in the US for similar operators. In fact, in the US the implementation period was successfully completed within 24 months without causing any dramatic shift in pilot productivity, or detrimental financial impact as this sector enjoyed record profits during this period. This included acquisition of software, schedule adjustments, upgrading aircraft rest facilities, etc.

Any extension of the implementation time-line for these operators places profits squarely ahead of passenger and flight crew safety. While the past incidence of accidents – fatal or otherwise – among this group may be lower than in 703/704 operations – it does not ensure that there will not be such an incidence in future. In fact, these statistics do not take into account incidents in which there has not been a fatality or serious injury in which fatigue may be a contributing factor.

703/704 Operators
Transport Canada has provided a four-year implementation period for the proposed fatigue regulations for Air Taxi (703), and Commuter (704) Air Operators, citing cost concerns. Transport Canada assesses
annual average cost savings owing to an extended implementation period for 704 Air Operators at $47,000, and 703 Air Operators at $12,000.

This approach places greater importance on operator financial performance than it does safety. Statistics published by the Transportation Safety Board of Canada (detailed in the TSB’s Statistical Summary – Aviation Occurrences 2015 report) conclusively demonstrate that the majority of aviation accidents and fatalities in Canada occurring between 2006 and 2015 are associated with 702, 703, and 704 Air Operators.

As a large country, Canada has a significant number of remote, rural, and isolated communities that are primarily served by 703 and 704-class air operators. Delaying implementation of the new regulations for four years condemns populations residing in these locales to lower level of safety and a higher risk than populations that rely strictly on 705 Air Operators. Further, residents of these rural and remote communities have a higher than normal dependency on air travel, and therefore have a greater exposure to lower safety levels and compounded risk.

Requiring that communities in rural and remote areas continue to endure air operations with substandard fatigue regulations for three years longer than major carriers in order to save mere tens of thousands of dollars is poor public policy. All air operators should be subject to an identical one-year implementation period.

<table>
<thead>
<tr>
<th>Operator Group</th>
<th>Fatalities</th>
<th>Serious Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>705</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>704</td>
<td>27</td>
<td>19</td>
</tr>
<tr>
<td>703</td>
<td>155</td>
<td>105</td>
</tr>
<tr>
<td>Total</td>
<td>194</td>
<td>141</td>
</tr>
</tbody>
</table>

Table 1 – Source: Statistical Summary – Aviation Occurrences 2015
700.01: Definition: Flight Duty Period

**flight duty period** means the period that begins at the earliest of the following events and ends at engines off or rotors stopped at the end of a flight:

a) the flight crew member carries out any duties assigned by the private operator or the air operator or delegated by the Minister before reporting for a flight,

b) the member reports for a flight or, if the flight duty period consists of more than one flight, reports for the first flight,

c) the member reports for positioning, and

d) the member reports as a flight crew member on standby; (*période de service de vol*)

**Issue**

The word “and” bridges conditions in (a) through (d) together.

**Resolution**

**flight duty period** means the period that begins at the earliest of the following events and ends at engines off or rotors stopped at the end of a flight:

(a) the flight crew member carries out any duties assigned by the private operator or the air operator or delegated by the Minister before reporting for a flight,

(b) the member reports for a flight or, if the flight duty period consists of more than one flight, reports for the first flight,

(c) the member reports for positioning, or

(d) the member reports as a flight crew member on standby; (*période de service de vol*)

**Rationale**

The manner in which the regulatory text has been written implies that all conditions (a through d) must be satisfied, rather than just one condition, in order for the flight duty period to be satisfied. Replacing the conjunction “and” with an “or” would clarify the intent of this definition.
700.01: Definition: Fitness for Duty

602.02 of the CARs would prohibit an operator of an aircraft to require any person to act as a flight crew member or to carry out any pre-flight duties, or a person to act as a flight crew member or carry out such a duty, if the operator or the person is not, or is not likely to be, fit for duty.

Issue
There appears to be a typographical error, where “air operator” has been reduced to “operator.”

Resolution
602.02 An air operator of an aircraft shall not require any person to act as a flight crew member or to carry out a pre-flight duty, and a person shall not act as a flight crew member or carry out such a duty, if the operator or the person has reason to believe that the person is not, or is not likely to be, fit for duty.

Rationale
The word “operator” is defined in the current CARs as:

operator, in respect of an aircraft, means the person that has possession of the aircraft as owner, lessee or otherwise; (utilisateur)

air operator means the holder of an air operator certificate; (exploitant aérien)

Changing the prohibition in this definition to apply to “air operators” rather than “operators” will provide clarity to the text and ensure that the correct entities are prohibited from requiring persons unfit for duty to act as flight crew or carry out duties.
700.01: Absence of Definition: Duty

Issue
The definition of what constitutes "duty" is missing from the proposed regulations. The current definition in the existing regulations does not include other work assigned by an air operator.

Resolution
Duty means any task that a flight crew member is assigned by an air operator at a specific time, including flight duty, pre- and post-flight duty, administrative work, training, positioning, reserve, standby and deployed standby.

Justification
The closest thing to a definition of Duty in the current regulations is “flight duty time”. However, none of the limitations and restrictions apply to “flight duty time”.

A definition for Duty was included in the 2014 NPA:

**Duty** means any task that a flight crew member is assigned by an air operator at a specific time, including flight duty, administrative work, training, positioning, and standby.

A definition for duty is included in the pending Advisory Circular – Flight Crew Fatigue Management – Prescriptive Limits XX AC700-XX guidance publication.

**Duty** means any task that a flight crew member is assigned by an air operator at a specific time, including flight duty, administrative work, training, positioning, reserve, and standby (not defined in regulation).

A definition for Duty should be included in the body of the regulatory text (rather than described in guidance).
700.01: Definition: Home Base

**home base** means the location where a flight crew member normally **begins and ends a flight duty period**; (base d’affectation)

**Issue**
The phrase “begins and ends a flight duty period” could allow air operators to interpret home base as a layover location rather than a permanent, designated location.

**Resolution**
*home base* means the location **designated by the air operator where a flight crew member normally begins and ends a pairing and where, under normal circumstances, the operator is not responsible for providing accommodation to the crew member. To change a flight crew member’s home base assignment, the air operator must provide the flight crew member with 168 hours free from duty;* (base d’affectation)

**Rationale**
Pilots are frequently assigned single or multi-day pairings. A multi-day pairing may consist of several Flight Duty Periods. The definition proposed could be maliciously interpreted to mean that a pilot can be assigned to a different home base with every new Flight Duty Period.

For example, consider the case of a pilot who lives in and is based out of Vancouver but who spends a single five-day window starting and ending her Flight Duty Periods in Calgary. Under the proposed regulations, because the pilot is normally beginning and ending in Calgary, the air operator could change home base from Vancouver to Calgary because the series of FDP beginning and ending in Calgary, despite the fact that the pilot resides in Vancouver and normally operates out of that airport.
700.01: Definition: Pairing

No definition is provided for “pairing”.

Issue
There is no definition given for “Pairing” in the proposed regulatory text, despite it being used throughout the regulations.

Resolution
Pairing means an assignment of a flight or several flights over a single, or multiple day(s) which starts and ends at a flight crew’s home base.

Rationale
Because the proposed regulations use the term pairing, the regulations should explicitly define the term in order to ensure that there is no chance of confusion over the desired meaning.
700.01: Definition: Day

No definition is provided for “day”.

Issue
Several of the proposed regulations refer to “day/days” and it is unclear whether “day” refers to “calendar day” or to the already included definition of “day or daylight.”

Examples include: time required off between flight duty periods, hours of duty in “7 days,” and time required for assignment shifting on reserve.

Resolution
*calendar day* means a 24-hour period that begins at Midnight (0000) and ends at the following Midnight (2359). Normally a calendar day is in acclimatized time.

Change references to the term “Day/days” in the proposed regulatory text to “Calendar Day/days,” as necessary for clarity.

Rationale
It is important that the language in the regulation on this matter is clear, concise, unambiguous, and not subject to interpretation. Confusion between calendar day and daylight⁶ will lead to situations in which the regulatory text is unclear. To be effective, the regulations should explicitly reference whether they refer to calendar days or day/daylight.

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⁶ The current CARs definition is: *day or daylight* means the time between the beginning of morning civil twilight and the end of evening civil twilight; (jour)
700.01: Definition: Rest Facility

**class 1 rest facility** means a bunk or other horizontal surface located in an area that
(a) is separated from the flight deck and passenger cabin;
(b) has facilities to control the temperature and light; and
(c) is subject to a minimal level of noise and other disturbances; *(poste de repos de classe 1)*

**class 2 rest facility** means a seat that allows for a horizontal sleeping position in an area that
(a) is separated from passengers by a curtain or other means of separation that reduces light and sound;
(b) is equipped with portable oxygen equipment; and
(c) minimizes disturbances by passengers and crew members; *(poste de repos de classe 2)*

**class 3 rest facility** means a seat that reclines at least 40 degrees from vertical and that has leg and foot support; *(poste de repos de classe 3)*

**Issue**

The language defining rest facilities (of classes 1, 2, and 3) in the proposed text are less restrictive than the current Canadian Aviation Regulations. Relaxing these standards will contribute to the problem of flight crew fatigue rather than alleviating the issue.

**Resolution**

*In flight rest facility* means a bunk, seat, room, or other accommodation that provides a flight crew member with a suitable location for sleep and uninterrupted rest:

**Class 1 rest facility** means a bunk that meets the Society of Automotive Engineers’ *(SAE)* Aerospace Recommended Practice *(ARP)* 4101/3\(^7\), *Crew Rest Facilities*, used in conjunction with ARP 4101, *Flight Deck Layout and Facilities*\(^8\).

**class 2 rest facility** means a seat that allows for a horizontal sleeping position in an area that
(a) is separated from passengers by a curtain or other means of separation that reduces light and sound;
(b) is equipped with portable oxygen equipment; and
(c) minimizes disturbances by passengers and crew members; *(poste de repos de classe 2)*

**class 3 rest facility** means:

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\(^7\) ARP4101/3: Crew Rest Facilities, (December 7, 2006)

\(^8\) ARP4101: Flight Deck Layout and Facilities, (February 25, 2003)
(a) In passenger aircraft, a seat in an aircraft cabin or flight deck that reclines at least 40 degrees from vertical, provides leg and foot support and is not attached or joined to any seat occupied by passengers or crew; and

(b) In cargo aircraft, a seat in an aircraft cabin that reclines at least 40 degrees from vertical, provides leg and foot support and provides adequate personal control for ambient light, noise, and comfort for the resting crew member. The rest of the crew member must not be interfered by the movement of fellow flight crew members or supernumerary personnel during the course of their duties (using the washroom, accessing the galley or accessing main deck cargo). (poste de repos de classe 3)

Rationale
The changes made in the proposed regulatory text degrade requirements for rest facilities that were established in the current regulations, and will lead to less than optimal fatigue outcomes.

The accepted international standard is established by the Society of Automotive Engineers’ (SAE) Aerospace Recommended Practices; which are adopted by regulatory bodies including the FAA. Canadian rest facility regulatory provisions should mirror international best practices.

With respect to cargo operations, the resting flight crew member will typically have no control over the movement of fellow flight crew members or supernumerary personnel due to the confined space generated by a cargo aircraft conversion which relocates the washroom, galley, and personal storage into the communal flight deck space. With this in mind, special considerations must be taken for this type of flight to ensure proper and adequate rest.
700.01: Definition: Deployed standby

**Definition:** Deployed standby

The definition for deployed standby does not provide a clear and concise definition for what constitutes being “near an airport.”

**Resolution**

Deployed standby means a flight crew member on standby, who is located within 15 minutes travel time from an aerodrome and who has been provided with suitable accommodation by an air operator for the period during which they are available to report for flight duty; (membre d’équipage de conduite en attente de déploiement)

**Rationale**

At present, there is no definition for “deployed” or “deployed standby”. It is therefore unknown if flight crews are considered “deployed.” This is an especially important distinction if they are in an isolated community where an air operator provides crew housing (suitable accommodations) near an aerodrome.

Further, our suggested replacement for the proposed definition aligns with current definition of reserve which provides more than 60 minutes to report for duty. Less than 60 minutes would require 45 minutes personal hygiene to prepare for work and 15 minutes for travel.
700.01: Definition: Local Night’s Rest

**Local night’s rest** means a *rest period* that begins at 22:30 and ends at 07:30 at the location where a flight crew member is acclimatized; (nuit de repos locale)

**Issue**
A rest period must be a minimum of 10 hours to allow for 8 hours of prone rest; 22:30 to 07:30 is only a 9-hour rest period.

**Resolution**
Local Night’s Rest means the **portion of a rest period that encompasses 22:30 to 07:30** at the location where a flight crew member is acclimatized; (nuit de repos locale)

**Rationale**
We submit that the proposed definition of “local night’s rest” in section 700.01 should be revised to clarify that a local night’s rest is not a full rest period for the purposes of proposed section 700.40.

“Rest period” is a defined term in the proposed amendment to Subsection 101.01 (1) of the Regulations, and proposed section 700.40 requires air operators to provide flight crew members with rest periods of varying durations at the end of a flight duty period. The minimum amount of time identified as a rest period in this section is 10 hours.

Conversely, “local night’s rest” is defined as running from 22:30 to 7:30 – a period of only nine hours.

Therefore, defining a local night’s rest as a “rest period” is inconsistent and could lead air operators to believe that it is sufficient to provide flight crew members with rest periods of only 9 hours. This does not appear to be the intent. Proposed section 700.41 makes it clear that the requirements for a local night’s rest apply in addition to the rest periods identified in proposed section 700.40. However, in the interest of removing any ambiguity, it makes sense to revise the definition of local night’s rest to make it clear that it is not a full rest period.
700.01: Definition: Single Day Free from Duty

**single day free from duty** means a period free from duty that **begins at the end of the first local night’s rest and ends at the beginning of the following local night’s rest**; (journée isolée sans service)

**Issue**
The definition of Single Day Free from Duty is unclear. Clarification is needed to ensure that two nights’ rest are included as part of the single day free from duty.

**Resolution**
**Single day free from duty** means a period free from duty **that runs from the beginning of a local night’s rest to the end of a second consecutive local night’s rest**.

**Rationale**
Safer Skies submit that the definition of a single day free from duty should be revised to make it clear that a single day free from duty includes two local night’s rest periods.

The proposed definition describes a single day free from duty as beginning at the end of the first local night’s rest, i.e. 7:30, and ending at the beginning of the following local night’s rest, i.e. 22:30. This is a period of 15 hours. However, by defining a single day free from duty this way, the language also indicates that the 15-hour period has to be flanked by two local nights’ rest periods. This is a very indirect and ambiguous way of describing a period of time free from duty that is actually 33 hours. However, the proposed time free from duty rules set out in the Table at paragraph 700.29 (b) only make sense and represent any type of reasonable limit if the single day free from duty is actually understood as a day and two local night’s rest periods. Therefore, for greater clarity, we submit that a single day free from duty should be defined as meaning a period free from duty that runs from the beginning of a local night’s rest to the end of a second local night’s rest.
700.01: Definition: Missing Definitions

(RDIMS NO. 12672610-V5)
- Duty
- Flight crew member on reserve
- Flight crew member on standby
- Flight time
- Suitable accommodation
- Unforeseen operational circumstances

(RDIMS NO. 12181964-V23)
- Accountable Executive
- Alertness
- Document
- Fatigue
- Fatigue data
- Fatigue Hazard
- Fatigue information
- Fatigue Modelling
- Fatigue Risk
- Fatigue Risk Management System
- Fatigue-Related Event
- Major incident
- Policy

Issue
Several definitions included in proposed Guidance material (RDIMS NO. 12672610-V5) and (RDIMS NO. 12181964-V23) are missing from CG1.
Resolution
The aforementioned definitions should be included in regulation rather than in guidance.

Rationale
The Safer Skies Coalition submits that there are a number of terms that are used throughout the proposed Regulations that should be defined therein. In the absence of a specific definition, principals of statutory interpretation would prevail. However, the proposed Regulations deal with a very technical subject, and there are numerous terms that do not necessarily have an accepted and well-established “ordinary” meaning. Defining these terms in the Regulations is critical to ensuring that they are interpreted and applied consistently. In addition, there are numerous terms that are defined in the applicable guidance material but that are not defined in the Regulations. To the extent that this is the case, we submit that these definitions should be included in the regulations so that it is clear that they have the full force and effect of the law.
700.21 (1): Air Operator Obligations – Scheduling

700.21 (1) An air operator shall provide a flight crew member with his or her schedule sufficiently in advance for the member to plan for adequate rest.

Issue
The language “schedule sufficiently in advance” is ambiguous, unlike the language used in proposed section 700.70, which sets clear time limits on when air operators are required to provide flight crew members on reserve with notice of reserve availability periods.

Resolution
1. An air operator shall provide a flight crew member with his or her schedule sufficiently in advance for them to plan for adequate rest. At a minimum this requires the air operator to provide the following:

(a) **12 hours notice of the planned flight duty period, if no part of the of the planned flight duty period falls during the flight crew member’s window of circadian low;**

(b) **32 hours notice of the planned flight duty period, if any part of the planned flight duty period falls during the flight crew member’s window of circadian low; or**

(c) **Any lesser period of notice that is mutually agreed upon between the flight crew member and the air operator.**

Rationale
Proposed Subsection 700.21 (1) addresses an important subject. It is crucial that flight crew members be provided with their schedules sufficiently in advance so that they can plan for adequate rest. Crew members are in the best position to know their own sleep/wake patterns and to plan their rest accordingly. However, the language “sufficiently in advance” is quite vague. The airline industry is one in which schedules are constantly changing as adjustments are made for increased bookings, aircraft are substituted etc. In this context, it is important for the regulator to place a strict limit on when schedules need to be provided as opposed to leaving this open to air operators to determine. We have proposed strict limits that can be varied with the concurrence of the crew member. The limits that we have proposed mirror the limits that apply to crew members accepting a reserve assignment. We think this amount of notice is the absolute minimum in terms of what would be acceptable. However, we also understand that air operators may need to crew flights on an emergency basis. Therefore, the Safer Skies Coalition’s proposed wording would not permit air operators to contact crew members without providing the required notice and ask them whether they have or obtained or can obtain sufficient rest to accept a particular duty assignment or scheduling change.
700.21 (2): Air Operator Obligations - Scheduling

(2) An air operator shall, on a monthly basis, determine if a flight crew member’s maximum flight duty period with respect to a flight is exceeded more than 10% of the time in a period of 90 consecutive days.

Issues
Air Operators should be required to monitor instances of Flight Duty Period or Flight Time exceedance on a continuous basis rather than a monthly basis.

Measuring the 10% limit in a period of 90 consecutive days may not allow operators to identify schedules that are truly unrealistic with respect to flights scheduled on a weekly or monthly basis.

Resolution
(2) An air operator shall continuously monitor to determine if the maximum flight duty periods or flight time with respect to a flight or flight crew member pairing is exceeded more than 10% of the time in either

(a) 10 consecutive flights or flight crew member pairings; or
(b) 90 consecutive days.

Rationale
Monitoring should be continuous

Subsection 700.21 (2) addresses an important subject – schedules that are unrealistic and that result in exceedance of maximum flight duty period -- but stops short of introducing monitoring obligations that would identify problems in a timely manner. Subsection 700.21 (2) introduces a critical requirement for air operators to determine if a flight crew members flight duty period is being exceeded more than 10% of the time. However, the requirement to do this on a “monthly basis” and to look at a period of 90 days is insufficient. Air operators should be required to monitor instances of Flight Duty Period or Flight Time exceedance on a continuous basis. Limiting these reviews to a monthly basis could cause undue delay in recognizing that a particular schedule is problematic and exceeds the 10% limit. For example, the 10% limit could be exceeded on the first day of a month, but according to the “monthly basis” requirement, an air operator would not be required to look at the monitored data for another 29 days. With modern computers, air operators have the capability to track the relevant data continuously and receive notification alerts when the relevant threshold has been exceeded. Therefore, the Safer Skies Coalition submits that this section should be revised to make monitoring for flight duty period or flight time exceedance a continuous obligation.

Include option of calculating 10% limit on the basis of 10 flights
The Safer Skies Coalition also proposes that 700.21 be revised to provide air operators with more flexibility in terms of measuring the 10% limit. We agree that the 90-day sample period is, generally, appropriate, but the period of time may not provide operators with the opportunity to identify schedules that are truly unrealistic with respect to flights that are only scheduled on a weekly or monthly basis. Accordingly, the Safer Skies Coalition’s position is that it is appropriate to provide air operators with the additional option of calculating the 10% limit on the basis of 10 flights or flight crew member pairings.
**700.21 (3)(4): Air Operator Obligations - Scheduling**

**Issues**

1. The language of subsection (4) permits the air operator to delay making changes to unsafe schedules simply because it sets its schedules on a seasonal basis. This delay constitutes an unnecessary safety risk. Instead, if the historical data\(^9\) already exists that demonstrates the flight duty period maximum will be exceeded, no delay should be permitted.

2. The assessment should include calculations of the flight crew member’s maximum flight time in addition to the maximum flight duty period. If either calculation is more than 10% of the maximum, then article 700.21(3) should apply without exception.

3. In addition, a definition of “seasonal” is needed for clarification.

**Resolution**

(3) If an air operator determines that more than 10% of a flight crew member’s maximum flight duty periods or flight time periods are exceeded as a result of an unforeseen operational circumstance, the air operator shall change the schedule or the flight crew member pairing for the flight not later than 28 days after the day on which the determination was made.

(4) If the air operator sets schedules on a seasonal basis, the changes referred to in subsection (3) may be delayed until the beginning of the same season in the following year if no data exists for the time period prescribed in 700.21(2).

**Rationale**

The proposed regulations allow certain air operators to circumvent scientific safety standards and delay corrective action simply because they set out schedules on a seasonal basis. Often times, these operators already have data to determine if their schedules exceed more than 10% of a flight crew member’s maximum flight duty period or flight period. The approach to flight planning and scheduling

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\(^9\) Historical data: using a sampling of the previous 90 days or 10 consecutive flights or flight crew pairings, (please see submissions on 700.21(2))
should be data-driven. If data exists for (1) the preceding 90 days or (2) 10 consecutives flights or flight crew member pairings, then that data should be used to determine if the schedules contravene article 700.21(3). This analysis will result in more accurately scheduled flight times and scheduling reliability. There is no scientific basis for delaying scheduling relief by one year. In fact, the delay in issuing the changes constitutes an unnecessary safety risk\textsuperscript{10}.

\textsuperscript{10} (Spencer M., 2011; Federal Aviation Administration, 10)
700.21: Addition to the Proposed Regulations (Rest and Recovery)

New text proposed below

Issue
The proposed language does not include the requirement that air operators are responsible for building flight crew schedules that allow flight crew members to plan for adequate rest and recovery. This was agreed to by a full consensus of the CARAC Working Group and stated in the NPA released prior to CG-1. As such, it should be added to the proposed regulations.

Resolution
(5) It is the air operator’s responsibility to provide flight crew members with a schedule that permits the flight crew member with sufficient opportunity to rest and recover.

Rationale
The addition is necessary not only to protect against fatigue but also to ensure that a flight crew member can comply with their obligations under article 700.21 (1) of the proposed regulations. In particular, a flight crew member cannot plan for adequate rest if that rest and recovery time is not first built into the member’s schedule. Importantly, this will allow crews to be sufficiently rested prior to the beginning of their Flight Duty Period and will increase the safety of the operation.

Further, this puts the responsibility squarely on the air operator, which has the most control of a pilot’s schedule.
700.26 (5): Rest Period Advisory

(5) If a flight crew member or any other person becomes aware that the member was not granted their rest period or time free from duty, the member or other person shall advise the air operator as soon as feasible.

Issue
A notification requirement does not promote a safe working environment. Once the air operator is notified that a flight crew member was not granted their rest period or time free from duty, it should immediately take sufficient steps to rectify its oversight. Adequate protections should also be put in place in this part of the proposed regulations to ensure protection against reprisal for flight crew members who refuse to commence flight duties until adequate rest or time free from duty is achieved or who advise the air operator that they are not provided sufficient rest.

Resolution
700.26 (5)(a) If a flight crew member or any other person becomes aware that the member was not granted their rest period or time free from duty, the member or other person shall advise the air operator as soon as feasible. The air operator will not assign, and the flight crew member will not accept, a Flight Duty until the required rest or time free from duty is achieved, in accordance with 602.02.

(b) No air operator or person acting on behalf of an air operator shall intimidate, dismiss or otherwise penalize a flight crew member or threaten to do so because the flight crew member exercises their right to sufficient rest and recovery under this part.

Rationale
Several studies have concluded that fatigue is a form of impairment that makes the operation of an aircraft unsafe. In fact, article 602.02 of CARS states that:

602.02 No operator of an aircraft shall require any person to act as a flight crew member and no person shall act as a flight crew member, if either the person or the operator has any reason to believe, having regard to the circumstances of the particular flight to be undertaken, that the person

(a) is suffering or is likely to suffer from fatigue;....

It must be made clear that 700.26(5) of the proposed regulations must be read in conjunction with 602.02. Specifically, that there is not merely a notification requirement, but that air operators and flight crew members have the responsibility to ensure that flight crew members are sufficiently rested.
Additionally, flight crew members should not be penalized for complying with the regulations, proven scientific evidence and prioritizing the safe operation of an aircraft.
700.27 (1): Monthly Limit

700.27 (1) No air operator shall assign a flight crew member for flight time, and no flight crew member shall accept such an assignment, if the member’s total flight time in all flights conducted by him or her will, as a result, exceed

(a) 112 hours in any 28 consecutive days;

Issue
The new prescribed limits are among the highest limits in the world and are inconsistent with the American Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA). Allowing 112 hours of flight time in 28 consecutive days increases the potential for air operators to abuse the regulations because it permits more flight hours in a 30-day period than the existing regulations.

Resolution
700.27 (1) No air operator shall assign a flight crew member for flight time, and no flight crew member shall accept such an assignment, if the member’s total flight time in all flights conducted by him or her will, as a result, exceed

(a) 100 hours in any 28 consecutive days;

Rationale
One of the main goals of developing the proposed regulations is to harmonize the flight and duty time rules with other jurisdictions. This is evidenced by the CG1 Regulatory Analysis Statement which reads, “Transport Canada endeavours to create amendments that adopt the best practices of its international partners,” the terms of reference for the CARAC Flight and Duty Working Group and objectives of the CARAC Charter. Importantly, the Charter states that one of the reasons the CARAC was established is 1993 was to “facilitate harmonization with other national aviation authorities”. [Emphasis added]. The proposed regulations in CG1 lack harmonization with other jurisdictions such as the FAA and EASA.

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11 (Transport Canada, 2017, p. 2965)
12 “In addition, the working group will consider the work already completed by Transport Canada in regards to FRMS, as well as the regulations and proposals of ICAO and other States in an effort to adopt and harmonize regulations and best practices with those States, where appropriate.”
13 (Canadian Aviation Regulation Advisory Council Management Charter, 2016)
14 (Canadian Aviation Regulation Advisory Council Management Charter, 2016, p. 6)
In fact, the majority of the world has set the flight time limit at 100 hours in 28 days. A flight time limit of 112 hours in 28 days falls well below other jurisdictions including the USA, EASA, Pakistan and China. In fact, the flight time limit of 112 hours as set out in the proposed regulations, are on par with Bangladesh and India. Furthermore, the proposed regulations have the effect of allowing air operators to schedule up to 137 hours of flight time in a 30-day period whereas the existing regulations only permit 120 hours in a 30-day period. Now that computers will schedule pilots as efficiently as possible, the following situation is highly probable if a pilot bids for maximum flying.
For example, when considering a rolling 28-day schedule:

<table>
<thead>
<tr>
<th>Day</th>
<th>Daily Flight Time (hours)</th>
<th>Cumulative Flight Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1 (of 28)</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Day 2 (of 28)</td>
<td>16</td>
<td>27</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Day 28 (of 28)</td>
<td>...</td>
<td>112</td>
</tr>
<tr>
<td>Day 29</td>
<td>11</td>
<td><strong>121</strong></td>
</tr>
<tr>
<td>Day 30</td>
<td>16</td>
<td><strong>137</strong></td>
</tr>
</tbody>
</table>
## Table: Maximum Daily FDP Calculation

<table>
<thead>
<tr>
<th>Average Flight Time</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Flights</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 minutes or more</td>
<td>1–4</td>
<td>5–6</td>
<td>7+</td>
</tr>
<tr>
<td>30 minutes or more but less than 50</td>
<td>1–7</td>
<td>8–11</td>
<td>12+</td>
</tr>
<tr>
<td>minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 30 minutes</td>
<td>1–11</td>
<td>12–17</td>
<td>18+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Start of FDP</th>
<th>Maximum FDP (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24:00-03:59</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>04:00-04:59</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>05:00-05:59</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>06:00-06:59</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>07:00-12:59</td>
<td>13.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13:00-16:59</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>17:00-21:59</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>22:00-22:59</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>23:00-23:59</td>
<td>10.0</td>
</tr>
</tbody>
</table>
Issue

These flight duty period limits do not adequately reflect sleep science, and would see Canada diverge from ICAO and most other jurisdictions. Specifically, science demonstrates that flight crew operating at night are at a heightened risk of impairment by fatigue – degraded cognitive abilities, reduced decision-making capacity, slower reaction time and focus.

Resolution

The table should more accurately reflect the appropriate fatigue science. Table A below permits a more graduated reduction in maximum flight duty period – and still complies with fatigue science.

### TABLE A

<table>
<thead>
<tr>
<th>Average flight times</th>
<th>Columns</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ 50 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row</td>
<td>Start of FDP</td>
<td>Max FDP</td>
<td>Sectors 1-4</td>
<td>Sectors 5</td>
<td>Sectors 6</td>
</tr>
<tr>
<td>1</td>
<td>2300-0359</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>0400-0459</td>
<td>10</td>
<td>9.5</td>
<td>9</td>
<td>9</td>
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<tr>
<td>3</td>
<td>0500-0529</td>
<td>11</td>
<td>10.5</td>
<td>10</td>
<td>9.5</td>
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<td>4</td>
<td>0530-0559</td>
<td>11.5</td>
<td>11</td>
<td>10.5</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>0600-0629</td>
<td>12</td>
<td>11.5</td>
<td>11</td>
<td>10.5</td>
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<td>6</td>
<td>0630-0659</td>
<td>12.5</td>
<td>12</td>
<td>11.5</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>0700-1259</td>
<td>13</td>
<td>12.5</td>
<td>12</td>
<td>11.5</td>
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<td>1900-2059</td>
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<tr>
<td>12</td>
<td>2100-2259</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

➢ When a FDP includes a sector with a planned flight time greater than 9 hours the maximum FDP in Table A is reduced by 1 hour, to a minimum of 10 hours.
➢ Following a duty period that includes total time zone changes in excess of 4 hours (four 1-hour time zones), if the crew does not have sufficient time off to acclimatize to local time, the
subsequent FDP shall be reduced to 11 hours, or to the duty limit established by the FDP table (700.28), whichever is less.

Alternatively, Table B uses science to address the gap in flight duty times for duty periods that begin late in the day but it is worth noting that the duty period referenced in row 7 below – 17:00 to 21:59 – has been compressed into one row, when compared to a previous iteration of this table (2014 Notice of Proposed Amendment) which compromises the science.

**TABLE B**

<table>
<thead>
<tr>
<th>Average Flight Time</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Flights</td>
<td></td>
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<tr>
<td>50 minutes or more</td>
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<td>7+</td>
</tr>
<tr>
<td>30 minutes or more but less than 50 minutes</td>
<td>1–7</td>
<td>8–11</td>
<td>12+</td>
</tr>
<tr>
<td>less than 30 minutes</td>
<td>1–11</td>
<td>12–17</td>
<td>18+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Start of FDP</th>
<th>Maximum FDP hours</th>
</tr>
</thead>
<tbody>
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<td>04:00-04:59</td>
<td>10.0</td>
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<tr>
<td>3</td>
<td>05:00-05:59</td>
<td>11.0</td>
</tr>
<tr>
<td>4</td>
<td>06:00-06:59</td>
<td>12.0</td>
</tr>
<tr>
<td>5</td>
<td>07:00-12:59</td>
<td>13.0</td>
</tr>
<tr>
<td>6</td>
<td>13:00-16:59</td>
<td>12.5</td>
</tr>
<tr>
<td>7</td>
<td>17:00-21:59</td>
<td><strong>10.0</strong></td>
</tr>
<tr>
<td>8</td>
<td>22:00-22:59</td>
<td><strong>10.0</strong></td>
</tr>
<tr>
<td>9</td>
<td>23:00-23:59</td>
<td><strong>9.0</strong></td>
</tr>
</tbody>
</table>

➢ When a FDP includes a sector with a planned flight time greater than 9 hours the maximum FDP in Table B is reduced by 1 hour, to a minimum of 10 hours.
Following a duty period that includes total time zone changes in excess of 4 hours (four 1-hour time zones), if the crew does not have sufficient time off to acclimatize to local time, the subsequent FDP shall be reduced to 11 hours, or to the duty limit established by the FDP table (700.28), whichever is less.

Moving the limits for flight duty periods noted above to 10 hours (for 1-4 sectors, with corresponding reductions for a greater number of flight segments) will:

- **Ensure Canada’s regulations are based on science** – including recommendations from NASA Ames Research Centre and additional scientific research which identified pilot fatigue in actual flight conditions.

- **Align Canada regulations with that of other jurisdictions** – including the US, which updated its flight crew fatigue rules after a fatal aircraft accident in which pilot fatigue was cited as a contributing factor.

**Rationale**

While the proposed Flight Duty Table introduces the concept of time of day sensitivity to reduce duty periods during evening and overnight hours when cognitive function – including decision-making, reaction time and focus – are at risk of impairment by fatigue, it does not conform with either scientific findings or industry best practices.

Specifically, the flight duty period limits set out in rows 10, 11 and 12 in CG1 do not reflect recommendations by NASA’s Ames Research Centre or scientific studies of pilots in actual flight conditions for long-haul flights at night, in which pilots who self-identify as sufficiently alert experienced “micro sleeps” during operations\(^\text{15}\).

Flying at night can degrade a pilot’s performance by as much as 30%, and sleep-deprived individuals significantly underestimate their level of performance impairment. Studies have shown that the chance of an accident or incident is 8 times higher for flights that arrive between midnight and 5:00 AM, and 10 times higher for flights that leave between midnight and 5:00 AM.\(^\text{16}\)

Of further concern, these values have deteriorated from Transport Canada’s prior iteration set out in the 2014 NPA, which was already deficient with respect to fatigue management for long-haul flights at night. The current safety gap – which widened since the 2014 NPA after extensive operator lobbying – lacks scientific justification and leaves Canada offside the US and Europe.

As the following graphics demonstrate, the flight duty period limits proposed by CG1 exceed scientific recommendations and do not harmonize with other jurisdictions particularly with respect to the highly fatiguing long-haul flights at night.

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\(^{15}\) (Samel, Wegmann, & Vejvoda, Air Crew Fatigue In Long-Haul Operations, 1997)

\(^{16}\) (National Transportation Safety Board, 2010)
The proposed Table also deviates from any other FDP Table in the world in terms of the number of sectors allowed. In most tables in other regulatory jurisdictions, flight duty periods are reduced after the first sector. The US (FAA) and Europe (EASA) are exceptions, reducing subsequent duty periods after two sectors, while Thailand reduces subsequent duty periods after four sectors.
Comparison with closest jurisdiction: US

Under the rules proposed in CG1, it will be impossible to harmonize Canada’s aviation safety regulations with those in the US, where FAA flight crew fatigue rules provide important additional layers of protection, including a flight time limit and a mandatory Fatigue Risk Management Plan (FRMP).

Unlike Canada’s proposed regulations, the FAA regulations – introduced in 2011 after the fatal Colgan Air accident in which flight crew fatigue was found to be a contributing factor – add an additional layer of protection via a “stick time” of “flight time” limit. The maximum flight time for a single sector (one take-off and one landing) is 9 hours during the day and 8 hours at night. This additional limit aligns with science\(^{17}\). By not including such a limit, Canada will be particularly offside industry leaders in the management of flight crew fatigue.

This table further illustrate the significant gap between Canada’s pilots compared to their counterparts in the US:

<table>
<thead>
<tr>
<th>Start of FDP</th>
<th>Maximum flight time permitted for single sector flights under proposed limits*</th>
<th>Flight time in excess of US pilot single sector maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0400-0459</td>
<td>9 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>0500-0659</td>
<td>10 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>0700-1259</td>
<td>12 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>1300-1659</td>
<td>11.5 hours</td>
<td>2.5 hours</td>
</tr>
<tr>
<td>1700-2159</td>
<td>11 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>2200-2259</td>
<td>10 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>2300-2359</td>
<td>9 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>0000-0359</td>
<td>8 hours</td>
<td>0</td>
</tr>
</tbody>
</table>

*Flight time is maximum duty period, reduced by 90 mins to take into account pre- and post-flight duties – times may be higher depending on individual operator circumstance (i.e. Major carriers use between 60-75 minutes)

\(^{17}\) (Samel A. , et al., 1997; Battelle Memorial Institue, 1998; Samel, Wegmann, & Vejvoda, Air Crew Fatigue In Long-Haul Operations, 1997; Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996; Simons & Spencer, 2007)
Note that, despite the substantial gap in single sector limits during daytime hours between Canada and the US, the Safer Skies coalition has focused its concern on the significantly higher risk of fatigue posed by flight duty periods that begin after 1700 hours and extend to 2359. That is because pilots who begin their duty during this period will generally be in a critical phase of flight – landing – during their window of circadian low (WOCL), during which time the body is most at risk for performance impairing fatigue\(^\text{18}\).

**2014 NPA FDP table**

The 2014 NPA proposed a table that came closer to scientific recommendations. However, this table still fell well short of ensuring adequately alert pilots for flight duty periods beginning after 1700 hours.

<table>
<thead>
<tr>
<th>Rows</th>
<th>Start of FDP</th>
<th>1-3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2300-0429</td>
<td>10.0</td>
<td>9.5</td>
<td>9.0</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>2</td>
<td>0430-0459</td>
<td>10.5</td>
<td>10.0</td>
<td>9.5</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>3</td>
<td>0500-0529</td>
<td>11.0</td>
<td>10.5</td>
<td>10.0</td>
<td>9.5</td>
<td>9.0</td>
</tr>
<tr>
<td>4</td>
<td>0530-0559</td>
<td>11.5</td>
<td>11.0</td>
<td>10.5</td>
<td>10.0</td>
<td>9.5</td>
</tr>
<tr>
<td>5</td>
<td>0600-0629</td>
<td>12.0</td>
<td>11.5</td>
<td>11.0</td>
<td>10.5</td>
<td>10.0</td>
</tr>
<tr>
<td>6</td>
<td>0630-0659</td>
<td>12.5</td>
<td>12.0</td>
<td>11.5</td>
<td>11.0</td>
<td>10.5</td>
</tr>
<tr>
<td>7</td>
<td>0700-0729</td>
<td>13.0</td>
<td>12.5</td>
<td>12.0</td>
<td>11.5</td>
<td>11.0</td>
</tr>
<tr>
<td>8</td>
<td>1300-1459</td>
<td>12.5</td>
<td>12.0</td>
<td>11.5</td>
<td>11.0</td>
<td>10.5</td>
</tr>
<tr>
<td>9</td>
<td>1500-1659</td>
<td>12.0</td>
<td>11.5</td>
<td>11.0</td>
<td>10.5</td>
<td>10.0</td>
</tr>
<tr>
<td>10</td>
<td>1700-1859</td>
<td>11.5</td>
<td>11.0</td>
<td>10.5</td>
<td>10.0</td>
<td>9.5</td>
</tr>
<tr>
<td>11</td>
<td>1900-2059</td>
<td>11.0</td>
<td>10.5</td>
<td>10.0</td>
<td>9.5</td>
<td>9.0</td>
</tr>
<tr>
<td>12</td>
<td>2100-2259</td>
<td>10.5</td>
<td>10.0</td>
<td>9.5</td>
<td>9.0</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Further, despite their participation in the CARAC working group process, industry representatives have gone on to lobby for further extensions of these flight duty periods, in part at meetings with the regulator where pilot representatives were excluded.

As a consequence of these lobbying efforts, the table establishing flight duty period limits in CG1 reduces the number of rows in the 2014 NPA table, increasing the risk of performance-impairing fatigue after 1700 well beyond what was contemplated in this earlier iteration.

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\(^{18}\) (Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996; Battelle Memorial Institute, 1998)
Impairment from fatigue

Scientific research has shown that fatigue can impair cognition in a similar manner to the effects of alcohol.

The Safer Skies coalition assessed two recent Transport Canada proposals for flight duty period limits using the Samn Pirelli fatigue model, which corresponds impairment from fatigue to impairment from alcohol. This biomathematical modelling analysis presumed sleep of 8 hours prior to a flight duty period, or 8 hours sleep plus a 1-1.5-hour nap for late afternoon/evening check-in. The results are shown in the Samn Pirelli scale, which establishes fatigue. Under this scale, a value of 4.9 would equate to cognitive impairment equivalent to a blood alcohol level of 0.08.

Of note, the federal government is currently considering reducing the legal blood alcohol limit for Canada’s drivers to 0.05, recognition that impairment is undesirable. Like intoxication, fatigue is a form of impairment, and must be reduced.

2014 – NPA Flight Duty Period limits

Those duty periods highlighted in yellow correspond to a blood alcohol level of slightly above 0.08 – Canada’s current blood alcohol limit for drivers – while those values highlighted in red exceed the legal blood alcohol limit by a significant margin. In other words, impairment from fatigue as proposed under the NPA would exceed Canada’s legal limit for drivers for many pilots after 1700 hours.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>5.0 - .091</td>
<td>5.2 - .102</td>
<td>5.4 - .114</td>
<td>5.5 - .127</td>
<td>5.7 - .141</td>
</tr>
<tr>
<td>4</td>
<td>3.9 - .039</td>
<td>4.1 - .046</td>
<td>4.3 - .054</td>
<td>4.5 - .062</td>
<td>4.6 - .071</td>
</tr>
<tr>
<td>5</td>
<td>4.0 - .043</td>
<td>4.1 - .049</td>
<td>4.3 - .056</td>
<td>4.5 - .064</td>
<td>4.7 - .073</td>
</tr>
<tr>
<td>6</td>
<td>4.0 - .044</td>
<td>4.2 - .049</td>
<td>4.3 - .056</td>
<td>4.5 - .063</td>
<td>4.6 - .071</td>
</tr>
<tr>
<td>7+</td>
<td>4.1 - .045</td>
<td>4.2 - .050</td>
<td>4.3 - .056</td>
<td>4.4 - .062</td>
<td>4.6 - .069</td>
</tr>
<tr>
<td>0600-0659</td>
<td>4.1 - .048</td>
<td>4.2 - .052</td>
<td>4.3 - .057</td>
<td>4.4 - .062</td>
<td>4.6 - .068</td>
</tr>
<tr>
<td>0630-0659</td>
<td>4.2 - .050</td>
<td>4.3 - .054</td>
<td>4.3 - .058</td>
<td>4.4 - .062</td>
<td>4.6 - .069</td>
</tr>
<tr>
<td>0700-1259</td>
<td>4.6 - .070</td>
<td>4.7 - .072</td>
<td>4.7 - .074</td>
<td>4.7 - .077</td>
<td>4.8 - .079</td>
</tr>
<tr>
<td>1300-1459</td>
<td>4.9 - .086</td>
<td>5.0 - .090</td>
<td>5.0 - .093</td>
<td>5.1 - .096</td>
<td>5.1 - .099</td>
</tr>
<tr>
<td>1500-1659</td>
<td>5.1 - .100</td>
<td>5.2 - .106</td>
<td>5.3 - .111</td>
<td>5.4 - .117</td>
<td>5.5 - .121</td>
</tr>
<tr>
<td>1700-1859</td>
<td>5.1 - .097</td>
<td>5.2 - .105</td>
<td>5.3 - .113</td>
<td>5.5 - .121</td>
<td>5.5 - .127</td>
</tr>
<tr>
<td>1900-2059</td>
<td>5.1 - .097</td>
<td>5.2 - .105</td>
<td>5.3 - .115</td>
<td>5.5 - .125</td>
<td>5.7 - .139</td>
</tr>
<tr>
<td>2100-2259</td>
<td>5.1 - .096</td>
<td>5.2 - .105</td>
<td>5.4 - .115</td>
<td>5.5 - .125</td>
<td>5.7 - .139</td>
</tr>
</tbody>
</table>
2017 – CG1 Flight Duty Period limits

Under the same analysis, Flight Duty Period Table shows an even greater detrimental effect on fatigue under the Flight Duty Period limits proposed in CG1. This analysis shows that by the end of the flight duty period in the proposed CG1 table, pilots would have a Samn Pirelli score of greater than 4.9 – with a blood alcohol equivalency of 0.082 – 81% of the time.

<table>
<thead>
<tr>
<th>Flight duration</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;50 / 30-50 / &lt;30</td>
<td>5.1-.094 / 5.6-.134 / 5.8-.148@6.5</td>
<td>5.4-.120/5.8-.148@6.5/5.7-.141@4.4</td>
<td>5.8-.146@8.7/5.8-.142@5.4/5.8-.145@4.1</td>
</tr>
<tr>
<td>0000-0359</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0400-0459</td>
<td>4.1-.047 / 4.7-.075 / 5.6-.132</td>
<td>4.5-.062/ 5.4-.115 / 5.8-.148@7.3</td>
<td>4.8-.081 / 5.7-.143 / 5.7-.142@5.7</td>
</tr>
<tr>
<td>0500-0559</td>
<td>4.1-.047 / 4.7-.072 / 5.4-.116</td>
<td>4.4-.061/ 5.3-.113 / 5.8-.148@7.7</td>
<td>4.8-.078 / 5.7-.139 / 5.8-.144@5.8</td>
</tr>
<tr>
<td>0600-0659</td>
<td>4.2-.052 / 4.8-.079 / 5.5-.125</td>
<td>4.5-.064/ 5.4-.117 / 5.8-.148@8.7</td>
<td>4.8-.078 / 5.7-.138 / 5.8-.145@7.0</td>
</tr>
<tr>
<td>0700-1259</td>
<td>4.4-.059 / 4.9-.087 / 5.7-.136</td>
<td>4.5-.066/ 5.4-.120 / 5.7-.143@9.8</td>
<td>4.7-.077 / 5.7-.136 / 5.7-.142@8.2</td>
</tr>
<tr>
<td>1300-1659</td>
<td>4.9-.085 / 5.4-.119 / 5.8-.148@11.6</td>
<td>5.0-.088/5.8-.144@11.3/5.7-.140@8.9</td>
<td>5.0-.093 / 5.7-.140@10.0/5.8-.145@8.2</td>
</tr>
<tr>
<td>1700-2159</td>
<td>5.4-.116 / 5.8-.145@11 / 5.8-.145@9.2</td>
<td>5.6-.131/5.8-.145@9.0 / 5.8-.144@7.2</td>
<td>5.7-.142@9.7/5.7-.140@7.7/5.7-.137@6.3</td>
</tr>
<tr>
<td>2200-2259</td>
<td>5.3-.108/5.8-.148@10.7/5.8-.146@7.2</td>
<td>5.6-.135/5.8-.148@6.9/5.8-.0145@5.2</td>
<td>5.7-.144@7.9/5.7-.141@5.7/5.7-.139@4.5</td>
</tr>
<tr>
<td>2300-2359</td>
<td>5.2-.102/ 5.7-.142 / 5.8-.145@6.7</td>
<td>5.5-.127/5.8-.148@6.3/5.8-.145@4.7</td>
<td>5.8-.147@8.0/5.8-.147@5.6/5.7-.138@4.2</td>
</tr>
</tbody>
</table>

Accordingly, we believe that our recommendation is much more appropriate and ought to be adopted.
700.28 (5)(a)(b)(c): Determination of Approach to Acclimatization

(5) For the purposes of subsections (2) to (4), a flight crew member is considered acclimatized if

(a) in the case of a time zone difference of less than four hours between local time and the time at the last location where the member was acclimatized, any rest periods required under these Regulations have been provided and the member has spent 72 hours in the same time zone;

(b) in the case of a time zone difference of four hours or more between local time and the time at the last location where the member was acclimatized, any rest periods required under these Regulations have been provided and the member has spent 96 hours in the same time zone; or

(c) the member has spent 24 hours in the same time zone for each hour of difference between local time and the time at the last location where the member was acclimatized.

Issue

Permitting operators to switch between these methods during the same pairing – without sufficient time for flight crew members to adjust their body clocks – poses a significant risk for causing or exacerbating impairment from fatigue.

Resolution

Introduce new language to ensure operators must maintain the same method to permit flight crew members to acclimate, unless a pilot is already fully acclimated to home base time by an adequate rest period:

(d) The air operator will select method 700.28 (5) (a) and (b) or method 700.28 (5) (c), and can only switch between methods at home base when the pilot is fully acclimatized to home base with 96 hours off at home. The method to be used is to be included in the company operations manual.

This will ensure that flight crew members can use consistent strategies to manage their fatigue during operations where they cross time zones and effective acclimatization is an essential safety measure.

Rationale

Pilots are especially vulnerable to the dangerous effects of sleep deprivation due to irregular schedules, frequent time zone changes, sedentary work conditions, and sleeping in unfamiliar environments.19

19 (Spencer M., 2011)
Night-time departures, early morning arrivals, and adjusting to several time zones all in a matter of days can significantly disturb a pilot’s circadian rhythms\textsuperscript{20}. Yet these are the conditions many pilots face as they contend with a technically challenging job in which they are responsible for the safety of hundreds of lives.

CG1 sets out three options for operators to establish schedules that would permit a flight crew member’s body clock to acclimatize to operational time. However, there is no language to establish how and when an operator may switch between these three methods.

Permitting air operators to switch between these three methods during the same pairing – without sufficient time for flight crew members to adjust their body clocks – poses a significant risk for causing or exacerbating impairment from fatigue. For instance, each pilot must adopt strategies to allow for adequate rest and recovery; these strategies will need to be tailored for each pilot’s personal body clock.

Under the current language proposed in CG1, air operators could be permitted to select the method which allows them to extend flight duty periods when possible, but to ignore that method if it resulted in more restrictive flight duty periods. An air operator could also opt for different methods for different aircraft types.

This switching between methods could create or exacerbate impairment from fatigue, as pilots would have to work even harder to tailor their personal strategies to adjust.

For instance, if an air operator assigns a flight crew to fly from Vancouver to Toronto, then to fly out of Toronto for 4 days the pilots and the air operator need to know which acclimatization method they are using under 700.28 (5) (a) or 700.28 (5) (c).

An air operator should be permitted to elect which method of acclimatization to use, but be required to use it for the entire operation.

\textsuperscript{20} (Gander, Nguyen, Rosekind, & Connell, 1993; Goode, 2003)
(5) For the purposes of subsections (2) to (4), a flight crew member is considered acclimatized if

(a) in the case of a time zone difference of less than four hours between local time and the time at the last location where the member was acclimatized, any rest periods required under these Regulations have been provided and the member has spent 72 hours in the same time zone;

(b) in the case of a time zone difference of four hours or more between local time and the time at the last location where the member was acclimatized, any rest periods required under these Regulations have been provided and the member has spent 96 hours in the same time zone; or

(c) the member has spent 24 hours in the same time zone for each hour of difference between local time and the time at the last location where the member was acclimatized.

Issue
Notwithstanding our prior comment on section 700.28 (5) (a)(b)(c) (beginning on page 51), the language used in CG1 for item (c) is difficult to understand and does not adequately reflect the intention of the regulation.

Resolution
Introduce new language for item (c) that more accurately reflects sleep science:

(c) For 5 times zones or less, for every 24 hours spent in a time zone east of one’s acclimatized time zone, acclimatization is delayed by 1 hour and for every 24 hours spent in a time zone west of one’s acclimatized time zone acclimatization is advanced by 1 hour.

Rationale
Scientific studies on rate of acclimatization shows that for large time zone differences, the body clock may advance or delay (retard) in an effort to acclimatize to the current time zone.21

Sleep science has determined that rate of acclimatization should be based upon a flight crew member’s exposure via travel either east or west of the pilot’s home base acclimatization – and not on the amount of time spent in a time zone during layover.22 In fact, when there are differences between the time zone

22 (Simons & Spencer, 2007; Spencer M., 2011, p. 4; Federal Aviation Administration, 2000)
of home base and a layover, the rate of acclimatization will vary and depend on factors that include the length of layover and the direction of time zones crossed\textsuperscript{23}.

For smaller time zone shifts, the rate of one hour per day east or west is reasonably accurate. However, when a larger shift is experienced, that rate may no-longer provide adequate fatigue mitigation.

For example, when a person is 9-12 hours out of phase\textsuperscript{24}, his or her circadian rhythm (or body clock) may advance or regress to acclimatize. In fact, a one-size-fits-all regulation using a simple one hour per day formula is at significant risk of being dangerously ineffective at mitigating the potentially impairing affects of fatigue experienced when crossing and then adjusting to time zones.

\textsuperscript{23} (Samel, Wegmann, & Vejvoda, Air Crew Fatigue In Long-Haul Operations, 1997; Nicholson & Stone, 1987; Cabon, Coblenz, Mollard, & Fouillot, 1993)

\textsuperscript{24} (Spencer M., 2011)
700.28 (9): Day Visual Flight Rules (VFR)

(9) When all scheduled flights are conducted under day VFR, the maximum flight duty period that begins during a period set out in column 1 of the table to this subsection is set out in column 2.

Issue
Operating under Visual Flight Rules (VFR) is no less fatiguing than operating under Instrument Flight Rules (IFR).

Resolution
Non-scheduled VFR helicopter operations always use Column 1 of the Table.

Rationale
The rule as proposed includes any day VFR operations in division 703, 704, or 705. This presents a potential avenue for abuse, especially in northern communities where all 703, 704, and 705 operations are conducted under VFR rules, but there are extended daylight hours in summer months.
700.29: Maximum Duty Time

**Issue**
The Maximum Duty Table that also includes time free from duty options is confusing. The intent and application of this table is unclear.

**Resolution**
Replace the table with:

700.29 To provide sufficient rest and recovery from duty as well as to provide limitation on weekly, biweekly and monthly duty the following limitation will apply:

(1) For Duties that include Early, Late, or night duties there is a requirement:

(a) to have a minimum of one single day free from duty within every 168 consecutive hours;

(b) twice within every 672 consecutive hours to have two consecutive days free from duty; and
(c) total duty hours to which a crew member may be assigned shall not exceed:

i. 55 duty hours in any 7 consecutive days for non-disruptive schedules;

ii. 50 duty hours in any 7 consecutive days for disruptive* schedules;

iii. 100 duty hours in any 14 consecutive days for non-disruptive schedules;

iv. 75 duty hours in any 14 consecutive days for disruptive* schedules;

v. 190 duty hours in any 28 consecutive days for non-disruptive schedules;

vi. 120 duty hours in any 28 consecutive days for disruptive* schedules.

2) For Duties that do not include Early, Late or Night Duties the requirement:

(a) i. to have a minimum of one single day free from duty within every 168 hours; or

ii. to have a minimum of 5 consecutive days free from duty within every 480

(b) total duty hours to which a crew member may be assigned shall not exceed:

i. 60 duty hours in any 7 consecutive days;

ii. 110 duty hours in any 14 consecutive days; or

iii. 190 duty hours in any 28 consecutive days;

* disruptive schedule is one in which at least 50% of the duty periods either encroach on the crew member’s WOCL or include a time zone difference greater than 4 hours between start and finish of the duty period.

Rationale
As noted in Transport Canada’s Regulatory Impact Analysis Statement, “Flying (piloting) is a highly psychomotor and cognitively demanding job. Working long duty days consecutively without adequate rest and restoration will degrade human performance over time.25 Accordingly, piloting should have lower duty and more rest than the minimum required by the Canada Labour Law.

The proposed free from duty requirement fails to follow international best practice: For example, the regulatory framework in the European Union provides for extended recurrent rest:

Flight time specification schemes shall specify recurrent extended recovery rest periods to compensate for cumulative fatigue. The minimum recurrent extended recovery rest period shall be 36 hours, including 2 local nights, and in any case the time between the end of one recurrent extended recovery rest period and the start of the next extended recovery rest period shall not be more than 168 hours.26


26 EASA ORO.FTL.235 Rest Periods Language “Recurrent extended recovery rest periods”
Scientific findings\textsuperscript{27}, coupled with the accident and incident rate in aviation\textsuperscript{28} establish a definite need for pilots to receive time off on a weekly basis- specifically, providing one day off a week that includes two consecutive local nights’ rest to recover is critical.

An examination of many of the aviation accidents in the past five years shows that in 70-90\% of these events – pilot decision making played a role. When a pilot is fatigued decision making is also affected and is therefore a contributing cause to aviation accidents.

\textbf{Science}

With extensions to the flight duty period (permitted only if the window of circadian low is not encroached), NASA recommends a maximum of 4 hours of extension time within a seven-day period\textsuperscript{29}. This could be arranged as either two two-hour blocks or one four-hour block. Therefore, a non-disruptive maximum for 5 work days with two days off would be 54 hours (four 11-hour days plus one 10-hour day).

NASA further recommends that if two or more flight duty periods within a seven-day period encroach on all or any portion of the WOCL, then the standard 36 hours off within seven days be extended to a 48-hour recovery period\textsuperscript{30}. Therefore, one can only work five days. Further, accounting for disruption from the window of circadian low, the standard 10 hours per day is recommended (5 days at 10 hours per day is a total of 50 hours).

A battery of scientific evidence suggests that two nights of recovery is required to recover from sleep debt\textsuperscript{31}, which accumulates at a rate of 1.2 hours/day on typical short-haul rotations\textsuperscript{32}.

The proposed regulations permit a circumstance in which the prescribed time off could translate to only four days off in 21 days, as illustrated below:

\begin{center}
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
DAY 1 & DAY 2 & DAY 3 & DAY 4 & DAY 5 & DAY 6 & DAY 7 \\
\hline
\textbf{DAY AT WORK} & \textbf{WORK FROM} & \textbf{RELEASED} & \textbf{RELEASED} & \textbf{RELEASED} & \textbf{RELEASED} & \textbf{RELEASED} \\
\textbf{0700 TO 2000} & \textbf{0700 TO 1200} & \textbf{TIME FREE FROM DUTY} & \textbf{TIME FREE FROM DUTY} & \textbf{TIME FREE FROM DUTY} & \textbf{TIME FREE FROM DUTY} & \textbf{FREE FROM DUTY} \\
\hline
\textbf{RELEASED} & \textbf{1 DAY OFF} & \textbf{2 DAYS OFF} & \textbf{3 DAYS OFF} & \textbf{4 DAYS OFF} & \textbf{START WORK} & \textbf{1201 TO 2100} \\
\textbf{TIME FREE} & \textbf{FROM DUTY} & & & & & \\
\textbf{FROM DUTY} & & & & & & \\
\hline
\end{tabular}
\end{center}

In the above example 120 consecutive hours are free from duty but it only provides 4 days off.

Under the proposed CG1 regulations the following would be possible which is the minimum time off required under the labour code by using the averaging provision:

\begin{itemize}
\item \textsuperscript{27} NASA (Dinges, et al 1996) Section 2.3.5 Extended flight duty period
\item \textsuperscript{28} Transportation Safety Board of Canada, Aviation Investigation Report A11W0048
\item \textsuperscript{29} NASA (Dinges, et al 1996)
\item \textsuperscript{30} NASA (Dinges, et al 1996), Section 2.3.5: Extended flight duty period
\item \textsuperscript{31} Battelle Report: Required Recovery Time, pg 21
\item \textsuperscript{32} NASA (Gander et al 1994)
\end{itemize}
This would permit an operator to have a pilot at work for up to 17 days in a row without a day off and although the intent in the NPA was to only permit an option of more than 6 days of work in a row in limited circumstances where sleep would be constantly protected, that provision does not exist in the proposed regulations.

The proposed regulations also have permissible duty hours that would be the highest in the world. The current highest values are 60 hours in a week and 190 hours in 28 days. The values of 70 hours in a week and 210 hours in 28 days are well above the current other world norm.

<table>
<thead>
<tr>
<th>Type of Schedule</th>
<th>Non-Disruptive</th>
<th>Partially Disruptive</th>
<th>Disruptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consecutive 7 Days</td>
<td>55</td>
<td>52.5</td>
<td>50</td>
</tr>
<tr>
<td>Consecutive 14 Days</td>
<td>95</td>
<td>83.5</td>
<td>72</td>
</tr>
<tr>
<td>Consecutive 28 Days</td>
<td>190</td>
<td>155</td>
<td>120</td>
</tr>
</tbody>
</table>

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Harmonization
The following countries have a duty limit of 55 hours: Hong Kong, UK, Singapore, Bermuda, Mauritius, Cyprus, Malaysia, Sri Lanka, Macao, Oman, Ghana, UAE, and Seychelles. The following countries have a duty limit of 60 hours: USA, South Africa, EU, India, Brazil, and Maldives. The other regulators have limited flights time to between 30 and 35 hours per week as a method to avoid cumulative fatigue on a weekly basis. No country would permit 70 hours a week and 210 hours in 28 days. Canada as proposed, will have the highest duty times in the world.
700.29 (1): Maximum Duty Hours

(1) No air operator shall assign a duty to a flight crew member, and no flight crew member shall accept such an assignment, if, as a result, the member’s duty time will exceed

(a) **2,400** hours in any 365 consecutive days; or

**Issue**
The duty limit of 2400 hours significantly exceeds international best practice.

**Resolution**
(1) No air operator shall assign a duty to a flight crew member, and no flight crew member shall accept such an assignment, if, as a result, the member’s duty time will exceed

(a) **2000** hours in any 365 consecutive days; or

**Rationale**
The limit imposed by regulation is 2400 hours, a full 20% higher than the what pilots in the European Union are permitted to work (EU Directive (2000/79/EC)). The average Canadian works approximately 1700 hours per year\(^\text{33}\), meaning that the proposed duty limit is 37% higher than the average for Canadian workers. Changes to weekly, monthly, and annual limits resulting in the 2400-hour maximum result in Canada having the highest duty time limits in the world.

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\(^{33}\) (Organization for Economic Co-Operation and Development, 2017)
700.29 (1)(a): Daily Duty Limit

Issue
There is no limit to duty that can be assigned to a pilot after a flight duty period (FDP).

Resolution
The total daily duty hours to which a crew member may be assigned shall not exceed:

(a) The period published in Table 700.28 (9) Column 2, plus 1 hour, or

(b) The period published in Table 700.28 (9) Column 2, plus up to 3 hours, with the agreement of the flight crew, or

(c) Daily duty period when positioning will be limited by 700.43 (1) and (2), whether or not it occurs after a flight duty period.

Rationale
700.29 (1)(a) should also include a Daily Duty Hour Limit. Since the adoption of Duty Time is being introduced into the regulations, much like the daily Flight Duty Period has a limit so should Duty Periods. Without this limit, a flight crew could be exposed to extreme fatigue.
700.29 (2): Suitable Accommodation Exemption

(2) Items 1 and 3 of column 2 of the table to paragraph (1)(b) do not apply if suitable accommodation is available for the flight crew member’s time free from duty.

Issue
A flight crew member who is free from duty is, by definition, always in suitable accommodations – whether at his/her home or on accommodations provided by the operator per the regulations. As such, time free from duty provisions in Column 2 should be deleted as they would never come into effect.

Resolution
Remove 700.29 (2).

(2) Items 1 and 3 of column 2 of the table to paragraph (1)(b) do not apply if suitable accommodation is available for the flight crew member’s time free from duty.

Rationale
This item conflicts with the guidance material.

RDIMS No. 12672610-V5 700.29 (2) states:

CAR 700.29 (2)

1) Stipulates that maximum duty time limits of:
   a) 192 hours in any 28 consecutive days; and
   b) 60 hours in any 7 consecutive days or 168 consecutive hours;
2) Which are tied to the use of time free from duty Option 1, are not available when the flight crew member is away from home base.

This guidance conflicts with the language in the proposed regulation’s 700.29 (2).

A flight crew is always away from home base when on flight duty. Therefore, according to guidance, the limits established in item 1 and 3 would never be in effect, and it should be removed.
700.29 (6): Deployed standby

**(c)** 20% of the time that the flight crew member is a flight crew member on deployed standby.

**Issue**
For the purposes of fatigue and its mitigation, there is no difference between “deployed’ standby or “standby.” Further, “deployed” is not included in the definition of Duty.

**Resolution**
**(c)** 100% of the time that the flight crew member is a flight crew member on deployed standby.

**Rationale**
Deployed means a flight crew member is anticipated to be at or near the airport for immediate call. An air ambulance company which has a crew staying at an airport for immediate medivac could refer to the type of duty as “deployed standby” instead of “standby” – the terminology does not make a flight crew member less susceptible to performance-impairing fatigue. As such, there should be no difference in the duty calculations between the two.

Scientific literature has determined that time on call has a cumulative impact on fatigue (as discussed in 700.29 (6)(a)), which recognizes that individuals in an on-call state suffer from fatigue, especially if a call-out occurs during normal sleeping hours\(^\text{34}\). Further, research also indicates that the unpredictability of on-call schedules can lead to sleep loss\(^\text{35}\).

Further, applying a meaningless ratio in the context of CG1’s already too high weekly and monthly duty limits simply exacerbates fatigue concerns.

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\(^{34}\) (Torsvall & Åkerstedt, 1988)

\(^{35}\) (Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996)
700.29 (6)(a): Reserve Duty

(6) A flight crew member’s duty time is to include

(a) 33% of the time that the flight crew member on reserve is in a reserve availability period;

Issue
Being on call to be ready to go to work with very short notice has a fatiguing effect, but the value of 33% is non-limiting and does not reflect international best practices and accepted norms.

Resolution
(6) The calculation of a flight crew member’s duty time is to include

(a) 50% of the time that the flight crew member on reserve is in a reserve availability period;

Rationale
The text included in the draft regulations is problematic because the 33% credit is non-limiting towards the 60-hours weekly cumulative duty hour limit. A 50% credit would reflect scientific findings and industry best practices.

For example, given a 14-hour Reserve Availability Period, the 33% allocation amounts to 4.6 duty hours per day and 32.2 duty hours per week. This would mean that with the proposed limit of 60 hours of duty in seven days, the crew member would have to accumulate more than 55.4 hours of flight duty in five days before he would be prevented from having a 14 hours RAP on the sixth day. This problem is further exacerbated if 70 hours of duty in seven days is an option.

Scientific literature recognizes that individuals in an on-call state suffer from fatigue, especially if a call-out occurs during normal sleeping hours36. Further, research also indicates that the unpredictability of on-call schedules can lead to sleep loss37.

These findings are recognized in policies prescribed by aviation authorities including the UK’s Civil Aviation Authority, who in CAP 371, provides a credit of 50% for standby duty, and IFALPA, who in Annex 6, provide the same 50% credit to non-airport standby38.

36 (Torsvall & Åkerstedt, 1988)
37 (Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996)
38 (International Federation of Air Line Pilots’ Associations, 2009, p. 15; Civil Aviation Authority, 2003)
700.37: Nutrition Break

An air operator shall provide a flight crew member with not less than 15 minutes every 6 hours within a flight duty period to eat and drink.

Issue
Fatigue science has established nutrition breaks as helpful in mitigating fatigue. However, the values set out here fall far short of being effective or practical. The minimum time should be 30 minutes.

Resolution
700.37 An air operator shall provide a flight crew member with not less than 30 consecutive minutes every 6 hours within a duty period for the opportunity to eat and drink.

Rationale
Nutrition is an important tool to avoid fatigue\(^\text{39}\). At the same time, all flight crews (703/704/705) share the same unique challenges:

No ability to pack a lunch or dinner before leaving for duty, except for the first day of a pairing,

- No ability to store food safely at work,
- Almost all morning operations require early morning wake up,
- No access to food when restaurants are not open,
- Hotels are not usually in residential areas, therefore no grocery stores, and/or
- On most aircraft, no refrigeration to store food.

Most provincial labour codes use 30 minutes as a minimum meal break, providing a reasonable timeframe for employees to secure and then consume their food and drink.

Unfortunately, pilots often must deal with their nutritional requirements at an airport that could be busy or outside of normal hours. It is hardly conducive to safe and efficient operations to have pilots required to sprint from their flight deck to an airport café or store – if there is even one available or without a long line-up – and then sprint back to the flight deck to resume operations on another flight.

\(^{39}\) (Belenky D. G., 2012, p. 4)
700.40 (1)(a)(i): Home Base Rest

700.40 (1) An air operator shall provide a flight crew member with the following rest periods at the end of a flight duty period:

(a) if the flight duty period ends at home base,
   i. either 12 hours, or 11 hours plus the travel time to or from the place where the rest period is taken, or
   ii. if the air operator provides suitable accommodation, 10 hours in that suitable accommodation; and

Issue
Providing 11 hours plus travel time to the place where the rest period is taken creates a burden on the air operator to know or dictate where a pilot lives.

Resolution
700.40 (1) An air operator shall provide a flight crew member with a minimum rest period. The minimum rest period provided before undertaking an FDP will be:

(a) if the flight duty period ends at home base,
   i. either 12 hours, or
   ii. if the air operator provides suitable accommodation, 10 hours in that suitable accommodation subject to the Flight Crew’s prior agreement.

Rationale
The concept of 11 hours plus travel time was discussed and rejected by the CARAC Working Group. The compromise was that 12 hours at home base would be provided. This would allow for 11 hours at home to rest and 1 hour for travel and the pilot would be responsible to obtain rest should travel time exceed the 1 hour allocated. This was also a factor in accepting the FDP Table times.

Also, the Guidance Material states:

Where an air operator decides to employ the at home base 11 hours option: the air operator must document how the travel time is determined; the travel time allotted must reflect reality; the travel time must be adjusted for seasonal changes (commuting at +15° C is generally quicker than at - 45° C) - if required, or account for the worst case (longest commute).

The above guidance then deviates from the intent of the regulation. If the air operator assumes a travel time and provides a generalized commuting time, therefore it’s no longer 11 hours plus travel time but 11 hours plus an assumed travel time. As stated in guidance winter travel times can vary from summer but it also varies from vehicle to vehicle. I.e. the air operator could use a small compact vehicle which
may be ready to travel in 5 minutes, while the pilot may have a large vehicle (truck, diesel, etc.) that my take 15-20 minutes to be ready to travel in the winter.
700.40 (1)(a)(ii): Home Base Rest

**Issue**
This measure could permit air operators to require crew to rest at airport hotels, even during off-duty periods at a pilot’s home base.

**Resolution**

700.40 (1) An air operator shall provide a flight crew member with a minimum rest period. The minimum rest period provided before undertaking an FDP will be:

(a) if the flight duty period ends at home base,
   i. either 12 hours, or 11 hours plus the travel time to or from the place where the rest period is taken, or
   ii. if the air operator provides suitable accommodation, 10 hours in that suitable accommodation; …

It is essential that the regulations explicitly capture the necessity for travel and personal hygiene time to be clearly specified as a requirement for minimum rest.

Further, by requiring the Flight Crew’s agreement to this measure, it ensures that any air operator’s requirement for suitable accommodate does not impair a pilot’s ability to secure the high-quality rest required at home base that will help mitigate both acute and chronic fatigue.

**Rationale**
Inclusion of this concept in the regulations would permit operators to require crew rest at airport hotels, even during off-duty periods at a pilot’s home base. One could envision this measure being used following a duty period in order to facilitate an early check-in for duty the following day. It does not take into consideration the flight crew’s requirement for fatigue mitigation through high quality rest at home.

Flight crews often travel away from their home base for extended periods of time. Air operators routinely assign flight crew on multi-day pairings away from home, provide one day at home base, and then schedule the flight crew for another multi-day pairing.
If implemented, this measure would effectively prevent flight crew members from returning to their home base – and the ability to secure high quality rest and recovery in their own surroundings.

Science clearly indicates that sleep can be compromised any time rest occurs in unfamiliar surroundings. All pilots develop and use mitigation strategies to manage disruptive sleep schedules. However, return to home base and familiar surroundings are an important mitigating factor -- particularly for the cumulative effects of sleep loss and/or disruption.40

Note: Independent of its impact on fatigue, if applied, this rule would have a detrimental impact on an operator’s duty to accommodate pilots under the Canadian Human Rights Act for a number of considerations, including providing adequate child, family or elder care.

40 (Spencer M., 2011)
700.41 (1): Disruptive Schedules

(1) In addition to the rest periods referred to in section 700.40, an air operator shall provide a flight crew member with one local night’s rest between

(a) the time at which late duty or night duty ends and the time at which the following early duty begins; or

(b) the time at which early duty ends and the time at which the following late duty or night duty begins.

(2) Subsection (1) does not apply when a flight crew member is at a location where local time differs by more than four hours from the local time at the last location where the member was acclimatized.

Issue
As drafted, this element of the fatigue regulations does not provide sufficient protections to prevent performance impairing fatigue due to disruptions in a pilot’s circadian rhythm.

Resolution
(1) In addition to the rest periods referred to in section 700.40, an air operator shall provide a flight crew member with one local night’s rest between

(a) the time at which late duty or night duty ends and the time at which the following early duty begins; or

(b) the time at which early duty ends and the time at which the following late duty; or

(c) two local nights’ rest between the time at which early duty ends and the time at which the following night duty begins.

(2) Subsection (1) does not apply when a flight crew member is at a location where local time differs by more than four hours from the local time at the last location where the member was acclimatized.

Rationale
Fatigue science has clearly identified that an individual’s body clock will adapt to a consistent sleep/wake cycle. As such, following one or more duty periods that begins early in the day, a person’s body clock would adapt to that cycle. A dramatic move away from that sleep/wake cycle increases the likelihood of a disruption to the pilot’s ability to secure sufficient high quality rest, given the dramatic adjustment required to the established pattern.

As drafted, the regulation would not provide sufficient fatigue protections for situations where flight crew are alternating between early morning and late-night duty. To ensure adequate fatigue rest and to
prevent the introduction of performance impairing fatigue, a second night of local night’s rest is required.

Example: This element of the draft regulations could result in a pilot meeting the minimum rest requirements as set out in CG1, but without any regard for human physiology. In this scenario, performance-impairing fatigue is extremely likely. One local night’s rest does not provide a day free from work.

Without additional protection this is an example of what is legal:

- Day one 05:00 – 15:00
- Day two 07:00 – 16:00
- Day three 04:00 – 1400
- Day four 04:00 – 14:00 (one local night’s rest provided is insufficient to do a complete flip of sleep wake)
- Day five 21:00 – 08:00 (extremely high fatigue attempting to fly through-out the night)

**Science**

Science: The science is clear on the disruptive nature of schedules that prevent a person from sleeping on regular schedule.

The NASA Technical Memorandum states: “Required sleep and appropriate awake time off promote performance and alertness. These are especially critical when challenged with extended periods of wakefulness (i.e., duty) and circadian disruption (i.e., altered work/rest schedule). Recovery is important to reduce cumulative effects and to return an individual to usual levels of performance and alertness.”

In his comments to EASA, Spencer wrote: “The duration of sleep following a late finish gradually reduces with progressively later duty-end times. After waking, individuals tend to remain in bed for around 20 minutes, possibly in an attempt to obtain more sleep, before finally getting up. The end of sleep generally occurs in the late morning, when the circadian rhythm of body temperature is on an upward trend, and when sleep is more difficult to sustain. Prior to an early start, the amount of sleep obtained reduces with progressively earlier start times. Individuals advance their bedtime, but normally take over a half an hour to fall asleep, because the early to mid-evening is a particularly difficult time at which to initiate sleep.”

A transition from a late finish to an early start without an intervening night’s sleep will inevitably involve some sleep disruption and, without direct information, it is difficult to speculate on how aircrew would adjust their sleep pattern. However, these results from individual late finishes and early starts provide a strong argument for a redefinition of both, in order to limit the overall loss of sleep. The critical times

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41 (Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996)
42 (EASA, 2012, p. 171)
appear to be around midnight for a late finish and 07:00 for an early start. Compared with the current definitions, this would entail an advance of an hour for a late finish and a delay of an hour for an early start. Thereby the combined sleep loss from consecutive duties, based on Figure 8, would be limited to approximately three hours.43

43 (Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996, p. 3)
700.41: Addition to the Proposed Regulations (reduction to FDP to address lack of acclimatization)

Missing is any fatigue protection for an unacclimatized pilot sleeping out of phase with local time.

Issue
Since sleep will be disrupted when a pilot attempts to secure adequate rest against his or her circadian rhythm – during daytime hours with the attendant light and noise – that pilot’s subsequent duty period should be reduced to mitigate against performance degrading fatigue.

Resolution
Add the following regulatory text:

Following a duty period that includes total time zone changes in excess of 4 hours (four one-hour time zones), if the crew does not have sufficient time off to acclimatize to local time, the subsequent FDP shall be reduced to 11 hours, or to the duty limit established by the FDP table (700.28), whichever is less.

Rationale
When an acclimatized pilot attempts to secure adequate rest in a different time zone, he or she will be working against not only their own body block, but also their surroundings.

It has been established that light has an impact on serotonin and melatonin production that affects sleep duration. Daytime noise and unfamiliar surroundings will also reduce the quality and quantity of sleep.

“Sleep episodes during layovers were shorter than those either pre-trip or post trip. Sleep episodes on post-trip days were shorter than those on pre-trip days, and tended to be deeper. Overall, crewmembers reported significantly less sleep per 24-hour during trips than either pre-trip or post trip. Consequently, they accumulated a sleep debt across the days of the trip.”

In a key study on aircrew fatigue in long-haul operations, sleep loss under these conditions was found to be 8 hours. For return flights, not all pilots were able to nap – only 41% of pilots were able to nap and 55% of the pilots reported not sufficiently rested after a 24-hour layover.

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44 (Barnes, Forbes, & Arendt, 1998; Dumont, Benhaberou-Brun, & Paquet, 2001; Koller, et al., 1994)
46 (Samel, Wegmann, & Vejvoda, Air Crew Fatigue In Long-Haul Operations, 1997; Samel A. , et al., 1997)
With such a dramatically reduced ability to secure sufficient sleep, it is not surprising that scientific research has also demonstrated that flight crews will suffer from impaired alertness and performance after time zone crossings\(^\text{47}\). Specifically, it has been demonstrated that the impact of disruptive schedules such as night duties or morning duties or the rapid transition of time zones lead to objective signs of sleepiness during flight measured by electrophysiological data\(^\text{48}\).

This has been borne out by operational experience, with consistent reports that sleep during the day is frequently interrupted by noise, even at the best hotels. At the Air Canada Pilots Association, pilots on nighttime return flights from Hong Kong after a 24-hour layover found that the fatigue they experienced on the subsequent 13-hour flight duty period was too onerous.

This desynchronization from time zone crossings has led fatigue scientists to recommend a reduction in the flight duty period permitted for un-acclimatized crew\(^\text{49}\). This is because flight duty period limits are designed around the assumption that pilots will be able to secure “normal sleep” – that is, working in synch with their own body clock, at night. As such, the majority of similar jurisdictions around the world have an additional layer of fatigue protection by applying a duty period restriction, beyond the standard limits, for unacclimatized pilots (or when there is an unknown state of acclimatization).

United Kingdom
Provides at least a 1-hour reduction off the most generous FDP when a pilot is not acclimatized. For undesirable layovers, the basic values in the FDP table is reduced by 2:30 from the most generous duty day. (UK Cap 371)

United States

\(^{47}\) (Samel A., et al., 1997; Klein, et al., 1970)
\(^{48}\) (EASA / Moebus Aviation, 2008)
\(^{49}\) (EASA / Moebus Aviation, 2008)
Provides a 30-minute reduction in the maximum flight duty period for a pilot not acclimatized to local time. This is in addition to single sector maximum flight time of 9 hours during the day or 8 hours at night. (FAA Part 117)

**Europe**
Uses a table that essentially reduces the FDP by 1 to 2 hours.

**Other countries with duty restrictions for unacclimatized pilots**
Hong Kong, Singapore, Bermuda, Mauritius, Cyprus, Taiwan, Malaysia, Sri Lanka, Macao, Oman, South Africa, Ghana, New Zealand, UAE, Seychelles, Fiji, Cambodia.

**Other**
Countries without duty restrictions for unacclimatized pilots generally rely on the additional layer of protection offered by a flight time limit of, in most cases, 8 hours (or a flight duty period of 9.5 hours) to protect against fatigue: Japan, China, Brazil, Argentina, Chile, Saudi Arabia.

For the typical 24-hour layover in HKG overseas Air Canada along with the assistance of Dr. Drew Dawson in 2005, with data collected, came to the conclusion that 13:20 FDP for the most restrictive FDP time band 2300-0429 was too long with 3 pilots and committed double augmentation. Air Canada experience with a 13-hour FDP at the same time of day for acclimatized crews for night flights similar routes does not trigger any Air Safety reports, therefore 13 hour FDP for acclimatized crews for the restricted time band is acceptable. A 13-hour FDP for un-acclimatized crew is unacceptable. In a recent survey with a slightly faster 777 aircraft with a 12:50 FDP 88% of the pilots flying the route indicated the flight was unacceptable from a fatigue perspective with 3 pilots, un-acclimatized and the least favorable time band.

For unacclimatized crews after a typical 24-hour layover following a long flight of greater than 13 hours a FDP maximum of less than 12 hours for night time operations should be the limit. Having the one-hour reduction for unacclimatized pilots will trigger double augmentation on this route bringing the SAFE scores down from a SP score of 4.7 (BAC of 0.075%) to a score of 4.0 (BAC of 0.044%) - significantly less fatiguing.
700.42: Rest Periods - Time Zone Differences

(1) Despite section 700.40, an air operator shall provide a flight crew member with the following rest periods when their duty period begins in a time zone other than the time zone in which home base is located and ends away from home base:

   (a) 11 consecutive hours in suitable accommodation, if the local time at the location where the flight duty period began differs by up to four hours from the local time at the location where the flight duty period ends; and

   (b) 14 consecutive hours in suitable accommodation, if the local time at the location where the flight duty period began differs by more than four hours from the local time at the location where the flight duty period ends.

(2) Despite section 700.40, an air operator shall provide a flight crew member with the following rest periods when their duty begins in a time zone other than the time zone in which home base is located and ends at home base:

   (a) 13 consecutive hours, if the local time at the location where the flight duty period began differs by up to four hours from the local time at home base and the member has been away from home base for more than 36 consecutive hours;

   (b) if the local time at the location where the flight duty period began differs by more than four, but not more than 10, hours from the local time at home base, and

      i. the member has been away from home base for 60 consecutive hours or less and no part of the flight duty period occurs during any part of the member’s window of circadian low, one local night’s rest before the beginning of the next flight duty period, or

      ii. the member has been away from home base for more than 60 consecutive hours, or any part of the flight duty period occurs within any part of the member’s window of circadian low, two local night’s rest before the beginning of the next flight duty period; or

   (c) if the local time at the location where the flight duty period began differs by more than 10 hours from the local time at home base and

      i. the member has been away from home base for 60 consecutive hours or less, two local night’s rest before the beginning of the next flight duty period, or

      ii. the member has been away from home base for more than 60 consecutive hours, three local night’s rest before the beginning of the next flight duty period.

Issue

Insufficient time off to recover from the impact on human physiology of crossing multiple time-zones on an overseas flight, prior to flying another overseas flight – which will lead to significant likelihood of performance-impairing fatigue. This is a significant regression from even the current CARs, which has a 40-hour limit in 7 days that would prevent this type of back-to back long range overseas flights – a protection which has been removed in CG1.
Recommendation

700.42 (1) Despite section 700.40, an air operator shall provide a flight crew member with the following rest periods when their duty period begins in a time zone other than the time zone in which home base is located and ends away from home base:

(a) 11 consecutive hours in suitable accommodation, if the local time at the location where the flight duty period began differs by up to \textit{50} four hours from the local time at the location where the flight duty period ends; and

(b) 14 consecutive hours in suitable accommodation, if the local time at the location where the flight duty period began differs by more than four hours from the local time at the location where the flight duty period ends.

(2) Despite section 700.40, an air operator shall provide a flight crew member with the following rest periods when their duty begins in a time zone other than the time zone in which home base is located and ends at home base:

(a) 13 consecutive hours, if the local time at the location where the flight duty period began differs by up to \textit{51} four hours from the local time at home base and the member has been away from home base for more than 36 consecutive hours;

(b) if the local time at the location where the flight duty period began differs by more than four, but not more than 10, hours from the local time at home base, and

i. the member has been away from home base for 60 consecutive hours or less and no part of the flight duty \textit{while away from home base} occurs during any part of the member’s window of circadian low, one local night’s rest before the beginning of the next flight duty period, or

ii. the member has been away from home base for more than 60 consecutive hours, or any part of the flight duty \textit{while away from home base} occurs within any part of the member’s window of circadian low, two local night’s rest before the beginning of the next flight duty period; or

(c) if the local time at the location where the flight duty period began differs by more than 10 hours from the local time at home base and

i. the member has been away from home base for 60 consecutive hours or less, \textit{and no part of the flight duty while away from home base occurs during any part of the member’s window of circadian low}, two local night’s rest before the beginning of the next flight duty period, or

ii. the member has been away from home base for more than 60 consecutive hours, \textit{or part of the flight duty while away from home base occurs during any part of the member’s}

\footnote{50}{This was noted by Transport Canada as a transcription error}
\footnote{51}{As above.}
window of circadian low, three local night’s rest before the beginning of the next flight duty period.

Rationale
Fatigue science has established the cognitive impact of acute and cumulative fatigue caused by crossing multiple time zones, especially when duty periods encroach upon a pilot’s window of circadian low.

For instance, Samel et al determined that the sleep deficit from a night flight followed by a day flight in typical airline operation results in an average sleep loss of 8 hours. (Samel et al, 1997)

The necessary recovery period from such a disruptive schedule – at least two night’s rest – is supported by extensive scientific study:

**NASA, Dinges et al, 1996:** “48 continuous hours upon return home following flight duty period across multiple time zones.”

**Samel et al, 1997:** “Based on the results from sleep, it must be concluded that at least 48 hours of rest (if not more, to be on the safe side) are necessary for recovery from sleep deprivation after rotations as described in this report.”

It was also recommended to Transport Canada and the CARAC Working Group in April, 2011 by their own sleep expert, Dr. Gregory Belenky:

Q: The papers recommend 48 hours rest at home after the flight. What is your opinion on this suggestion?

Dr. Belenky: “48 hours at home seem to be a reasonable as it provides 2 biological nights of recuperation. This is of course provided that the person is not out of synch with their body clock.”

It is important to note that, because of the focus on rest and recovery, two local day’s rest does not mean two days off; in fact, it is the equivalent of one day off. Three nights of local rest is the equivalent of 2 days off.

A 2011 joint study between EASA and Moebus Aviation determined the approximate average recovery time that would be necessary to ensure that crews have re-adjusted to home time before undertaking another duty function. The numbers in the table below represent the recovery nights required as a function of the maximum time difference from home base during the time away, and the total time away (layover duration).

<table>
<thead>
<tr>
<th>Layover hours</th>
<th>Recovery nights with maximum time difference of &lt;5 hours</th>
<th>Recovery nights with maximum time difference of 5-7 hours</th>
<th>Recovery nights with maximum time difference of 8-12 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;36</td>
<td>1 night</td>
<td>2 nights</td>
<td>2 nights</td>
</tr>
<tr>
<td>36-60</td>
<td>2 nights</td>
<td>3 nights</td>
<td>3 nights</td>
</tr>
<tr>
<td>60-84</td>
<td>3 nights</td>
<td>3 nights</td>
<td>3 nights</td>
</tr>
<tr>
<td>84-132</td>
<td>3 nights</td>
<td>4 nights</td>
<td>5 nights</td>
</tr>
<tr>
<td>&gt;132</td>
<td>3 nights</td>
<td>5 nights</td>
<td>6 nights</td>
</tr>
</tbody>
</table>

52 (EASA / Moebus Aviation, 2008)
The authors of the Moebus report also recommended that the above table should be amended in the event that any part of the FDP for the return flight overlapped the WOCL (on home base time)\(^{53}\). In this case, to ensure sufficient time for the recovery of sleep, it was recommended that at least two local nights free of duty should be provided.

Other jurisdictions have addressed this clear risk of excessive fatigue by increasing the amount of recovery time for pilots based on the number of time zones crossed, the time away from home base. They also consider whether any of these duty periods infringe upon a pilot’s window of circadian low, which will make it much more difficult for a flight crew member to recover lost sleep. For example:

US: Mandatory FRMP that will prevent high fatigue values for back to back long range overseas flights.

EU: Requires \textbf{between 36 and 72 hours off} depending on how many time zones crossed and time away from base.

The graph below demonstrates just how far behind Canada would be under the proposed regulations. Under CG1, Canada would find itself completely offside sleep science and other jurisdictions in proposing a \textbf{minimum of 12 hours off} after traveling up to 10 time zones\(^{54}\).

\(^{53}\) (EASA / Moebus Aviation, 2008)

\(^{54}\) (Spencer M., 2011, p. 89)
700.43 (1)(b): Rest Period - Positioning

If a flight crew member is required by the air operator to travel for the purpose of positioning immediately after the completion of a flight duty period and the sum of flight duty period and the travel time required for positioning would exceed the maximum flight duty period set out in section 700.28, the air operator shall provide the member with a rest period before the beginning of the next flight duty period that is equal to the duration of...

(b) the sum of the duty time and the amount of time in excess of the maximum flight duty period, if the maximum flight duty period is exceeded by more than three hours.

Issue
Issue 1: This provision does not contemplate the potential for performance impairing fatigue that can occur if flight crew are required to position PRIOR TO their duty period.

Issue 2: The formula provided for recovery sleep following such positioning is inadequate.

Resolution
If a flight crew member is required by the air operator to travel for the purpose of positioning either immediately before or after the completion of a flight duty period...

(b) the sum of the duty time and twice the amount of time in excess of the maximum flight duty period, if the maximum flight duty period is exceeded by more than three hours

Rationale
Pilots crossing time zones or at irregular hours for the purpose of positioning are subject to fatigue. That fatigue is not limited to periods following duty.

Further, if that positioning requires a pilot to cross multiple time zones with the resulting disruption to circadian rhythm, it will cause a significantly greater potential for performance impairing fatigue.

As such, this regulation should ensure a provision similar to Transport Canada’s 2014 Notice of Proposed Amendment which included a formula that would prevent a sleep duration of 24 hours – which does not sufficiently permit the body clock to adjust to a different time zone after an extended positioning flight.
700.51 (1): Consecutive Night Duty Periods

An air operator shall not assign to a flight crew member more than three consecutive night duty periods if any part of these periods falls during a period that beginning at 02:00 and ending at 05:59, unless the air operator provides the member with one local night’s rest at the end of the third duty period.

Issue
The intention of this provision is to prevent consecutive duty that falls in the window of circadian low (WOCL) between 02:00 - 05:59. However, as drafted to specify simply “night” duty periods, it is much less restrictive and could potentially lead to repeated duty periods that fall during the most fatigue-impairing WOCL.

Resolution
700.51(1): Consecutive Duties Infringing on the WOCL

An air operator shall not assign to a flight crew member more than three consecutive night duty periods if any part of these periods falls within a period that beginning at 02:00 and ending at 05:59, unless the air operator provides the member with one local night’s rest at the end of the third duty period.

Rationale
To provide the greatest clarity, this section should be referred to as “Duties in the WOCL” – as it was in Transport Canada’s 2014 NPA – rather than the current and more vague reference to “Consecutive Night Duties.”

There is an abundance of scientific research that establishes the heightened risk of performance-degrading fatigue – and accident data supports this – when duty periods fall within or after Window of Circadian Low (WOCL). This risk is further exacerbated during consecutive duty periods that fall within the WOCL.

During the CARAC Working Group sessions, Dr. Gregory Belenky noted there is extensive research to demonstrate that early starts and late finishes truncate sleep. Waking up prior to 0600 truncates sleep. Consecutive days exacerbate the problem. He advised that two night’s sleep will reset the cumulative fatigue.
In fact, a 2007 TNO\textsuperscript{55} report stated: "It is recommended that night duties and duties that encompass the WOCL are limited to 10 hours. It is also proposed that the number of consecutive duties starting or ending in the WOCL should be limited." The Battelle report also recommends: "Two nights of recovery are required to recover from sleep debt.\textsuperscript{56}\textsuperscript{a}\textsuperscript{a}\textsuperscript{a}

Other jurisdictions have insisted on adequate protections when duty periods require pilots to operate during this period when human physiology is most likely to create performance-impairing fatigue.

**United States**

"Otherwise, no certificate holder may schedule and no flight crewmember may accept more than three consecutive flight duty periods that infringe on the window of circadian low.\textsuperscript{57}\textsuperscript{a}\textsuperscript{a}\textsuperscript{a}

**United Kingdom**

"7.2 Sleep deprivation, leading to the onset of fatigue, can arise if a crew member is required to report early for duty on a number of consecutive days. Therefore, not more than 3 consecutive duties that occur in any part of the period 01:00 to 06:59 hours local time can be undertaken, nor will there be more than 4 such duties in any 7 consecutive days.\textsuperscript{58}\textsuperscript{a}\textsuperscript{a}\textsuperscript{a}

This revised language ensures the regulation conforms to extensive scientific research on cognitive impairment when operating during the WOCL, in addition to aligning with the vast majority of other jurisdictions.

\textsuperscript{55} (Simons & Spencer, 2007)
\textsuperscript{56} (Battelle Memorial Institue, 1998)
\textsuperscript{57} (Cornell Law School, 2017)
\textsuperscript{58} (Civil Aviation Authority, 2003)
Issue
The proposed regulation has no time of day sensitivity for augmented flights. From a safety perspective, maintaining the same limits at any time of the day or night is illogical and is not supported by science. Further, the regulation should incorporate a method of providing greater consideration to the fact that more sleep would occur at night.

The new regulations around augmented flights should be amended to reflect new realities and updated, more modern aircraft and onboard facilities.
Resolution

Modify the augmented flight time limitations to more accurately reflect the experience of Canadian operators and provide an improve benefit for state of the art class 1 facilities.

Maximum Flight Duty Period Limits for Augmented Operations

<table>
<thead>
<tr>
<th>Scheduled Time of Start</th>
<th>Maximum Flight Duty Period (hours) Based on Rest Facility and Number of Pilots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 1 Rest Facility</td>
</tr>
<tr>
<td>3 Pilots</td>
<td>4 Pilots</td>
</tr>
<tr>
<td>2000-0459</td>
<td>14</td>
</tr>
<tr>
<td>0500-0559</td>
<td>14.5</td>
</tr>
<tr>
<td>0600-1259</td>
<td>15</td>
</tr>
<tr>
<td>1300-1659</td>
<td>14.5</td>
</tr>
<tr>
<td>1700-1959</td>
<td>14</td>
</tr>
</tbody>
</table>

*3 pilots refers to a crew with single augment i.e. 2 pilots + 1 augment pilot
4 pilots refers to a crew with double augment i.e. 2 pilots + 2 augment pilots

Rationale

The Safer Skies coalition’s recommended resolution is appropriate for reasons of science and operational data.

Science

The science to support the table in 700.60 is greater than 10 years old and there has been substantial change in aircraft technology – including state-of-the-art bunks, aircraft with low cabin altitudes and humidity control. The proposed rules more closely align with the science\(^{59}\).

\(^{59}\) (Simons & Spencer, 2007)
Allowing a FDP of 15.25 hours for a double augmented crew with a class 3 seat vs. allowing only 15 hours for a single augment crew and a class 1 bunk is illogical. Any operation with a class 1 bunk reduces the risk of fatigue to a greater extent when compared with use of a class 3 seat.

The basic scientific justification for longer duty is that when sleep is introduced to a duty period the duty period could be increased on a minute by minute increase on duty for every minute of sleep that is likely.

For example, for a duty period with a FPD limit of 9 hours, an increase in duty of 5 hours up to 14 hours duty is possible when only approximately 1 hour of sleep will be obtained in a Class 3 rest facility.

**TNO report**:

<table>
<thead>
<tr>
<th>Single Augment</th>
<th>Double Augment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range of 2:45 – 3:05 extension to the FDP for class 1. Average 2:55</strong></td>
<td><strong>Range of 4:45 – 5:20 extension to the FDP for class 1. Average 5:03</strong></td>
</tr>
<tr>
<td><strong>Range of 1:45 - 2:15 extension to the FDP for class 11. Average 2:00</strong></td>
<td><strong>Range of 3:00 – 3:50 extension to the FDP for class 11. Average 3:25</strong></td>
</tr>
<tr>
<td><strong>Range of 0:45 – 0:55 extension to the FDP for class 111. Average 0:50</strong></td>
<td><strong>Range of 1:15 – 1:35 extension to the FDP for class 111. Average 1:25</strong></td>
</tr>
</tbody>
</table>

Further the TNO report also uses 80% of these values for unacclimatized flight crew. There is no provision in CG1 for unacclimatized pilots.

**Operational Data**

Air Canada has experimented with various FDP maximums for 3 pilot operations. Due to pilot Fatigue Reports and Air Safety Reports, the FDP maximum has been set at 15 hours for single sector long range flights with 3 pilots. Air Canada has tried 14 hours, 15 hours and 16 hours for single augment flight crew (3 pilots). The operational data brought Air Canada to the conclusion that 15-hour FDP with 13.5 hours flight time should be the limit during the day with a 15-minute post flight duty included.

Fatigue data collected by Air Canada correlates strongly to the TNO report that pilots sleep longer during the circadian night and less in the circadian day.

Most of the world’s airlines that fly greater than 13.5 hours flight time or 15 hours FDP only do so with 4 pilots (double augment). In fact, the global average is about 14:30 FDP and 12.5 hours flight time as a limit for 3 pilots (single augment). The only data available for a flight time greater than 13.5 hours was from Air Canada and Air New Zealand. In Air Canada’s case, the data collection resulted in an additional

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60 (Simons & Spencer, 2007)
61 (Simons & Spencer, 2007)
augment pilot at that level due to pilot fatigue issues. There is extremely limited operational or scientific data to support a FDP greater than 15 hours with single augmentation (3 pilots).

Example

Air New Zealand – with years of experience with FRMS and one of the most mature systems in the world today – follows a data driven approach to FTL limits. In fact, it operates the longest single augmented flight: Hong Kong to London, with a flight time of 13:40 and a planned FDP of 14:40, using three pilots. Their flight crews must be fully acclimatized and, based on fatigue science, they use an ideal departure time of 08:25. Further, due to the duration of this flight, the Captain can only extend his or her flight duty period to 15:30 hours under unforeseen operational circumstances. All flights of greater duration than this – even during ideal departure times – would trigger the addition of a 4th pilot (double augment). Flights leaving later in the day would also trigger double augmentation (4 pilots).
700.61: Long Range Flights

No air operator shall assign a flight duty period to a flight crew member, and no flight crew member shall accept such an assignment, if the flight duty period includes a flight that, when it follows a scheduled flight of more than seven hours, occurs within the flight crew member’s window of circadian low.

Issue
No provision exists in the proposed regulations to prevent long range flights at night and returning from overseas when crews are attempting to rest out of phase with the local environment.

Resolution
Air operators must limit flights to 10 hours duty and 8.5 flight hours at night any time after 1700 as well as when the flight crew incurs sleep debt from sleeping out of phase with the local time (return flight from overseas) and limit the duty to 12 hours or 10.5 flight hours during the day with no sleep compromised.

Rationale
Our recommended resolution comes directly from NASA Technical Memorandum 110404. It is supported by extensive scientific study as to the performance impairing impact of fatigue in long-range operations. Specifically, “studies have found that each additional hour worked after approximately 8 or 9 hours exponentially increases the risk of an accident."

The approach taken by CG1 does not reflect recommendations by NASA’s Ames Research Centre or scientific studies of pilots in actual flight conditions for long-haul flights at night, in which pilots who self-identify as sufficiently alert experienced “micro sleeps” during operations.

In a 1999 study demonstrated similar results: “The evidence from the subjective evaluation of fatigue and sleepiness, together with the results from the computer task, suggests that the crews were struggling to remain alert during some of the flights. The most difficult times were towards the end of duty periods starting between 19:00 and 04:00 local time on the outward leg."

These results led to clear recommendations in line with NASA’s recommendations: “This study has clarified some more general issues related to flight time limitations. Based on these results, supported by previous research, we would recommend that unaugmented flight duty periods overnight should not exceed 10 hours. A maximum of 12 hours is permissible for two-crew operations during the day, while the possibility of extending this by one hour at the most favourable times of day requires further

62 (Federal Aviation Administration, 2000)
63 (Samel, Wegmann, & Vejvoda, Air Crew Fatigue In Long-Haul Operations, 1997)
64 (Spencer & Robertson, 1999)
Flying at night can degrade a pilot’s performance by as much as 30%, and sleep-deprived individuals significantly underestimate their level of performance impairment. Studies have shown that the chance of an accident or incident is 8 times higher for flights that arrive between midnight and 5:00 AM, and 10 times higher for flights that leave between midnight and 5:00 AM.66

Of further concern, these values have deteriorated from Transport Canada’s prior iteration set out in the 2014 NPA, which was already deficient with respect to fatigue management for long-haul flights at night. The current safety gap lacks scientific justification and leaves Canada offside the US and Europe.

As the following graphics demonstrate, the flight duty period limits proposed by CG1 exceed scientific recommendations and do not harmonize with other jurisdictions particularly with respect to the highly fatiguing long-haul flights at night.

### Comparison with closest jurisdiction: US

Under the rules proposed in CG1, it will be impossible to harmonize Canada’s aviation safety regulations with those in the US, where FAA flight crew fatigue rules provide important additional layers of protection, including a flight time limit and a mandatory Fatigue Risk Management Plan (FRMP).

Unlike Canada’s proposed regulations, the FAA regulations – introduced in 2011 after the fatal Colgan Air accident in which flight crew fatigue was found to be a contributing factor – add an additional layer of protection via a “stick time” of “flight time” limit. The maximum flight time for a single sector (one take-off and one landing) is 9 hours during the day and 8 hours at night. This additional limit aligns with science. By not including such a limit, Canada will be particularly offside industry leaders in the management of flight crew fatigue.

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65 (Spencer & Robertson, 1999)
66 (National Transportation Safety Board, 2010)
This table further illustrates the significant gap between flight time limits for Canada’s pilots compared to their counterparts in the US:

<table>
<thead>
<tr>
<th>Start of FDP</th>
<th>Maximum flight time permitted for single sector flights under proposed limits*</th>
<th>Flight time in excess of US pilot single sector maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0400-0459</td>
<td>9 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>0500-0659</td>
<td>10 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>0700-1259</td>
<td>12 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>1300-1659</td>
<td>11.5 hours</td>
<td>2.5 hours</td>
</tr>
<tr>
<td>1700-2159</td>
<td>11 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>2200-2259</td>
<td>10 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>2300-2359</td>
<td>9 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>0000-0359</td>
<td>8 hours</td>
<td>0</td>
</tr>
</tbody>
</table>

*Flight time is maximum duty period, reduced by 90 mins to take into account pre- and post-flight duties – times may be higher depending on individual operator circumstance (i.e. Major carriers use between 60-75 minutes)

Note that, despite the substantial gap in single sector limits during daytime hours between Canada and the US, the Safer Skies coalition has focused its concern on the significantly higher risk of fatigue posed by flight duty periods that begin after 1700 hours and extend to 2359. That is because pilots who begin their duty during this period will generally be in a critical phase of flight – landing – during their window of circadian low (WOCL), during which time the body is most at risk for performance impairing fatigue.

Of note, in the US, the limits are “hard” in that they can only be exceeded for events that occur once in the air, such as unforeseen weather or traffic delays; as a result, US operators tend to add the extra augment pilot to permit longer duty limits. In Canada, these limits can be exceeded even if a flight is projected to exceed the flight duty period limit before the flight crew even boards the aircraft.
**700.62 (1): Ultra Long Range Flights**

| 700.62 (1) | No air operator shall assign a flight duty period of more than 18 hours to a flight crew member and no flight crew member shall accept such an assignment. |
| (2) | No air operator shall assign a flight crew member to a flight with a scheduled flight time of more than 16 hours, and no flight crew member shall accept such an assignment |

**Issue**
Crewing requirements need to be established in regulation that are compliant with industry best practice and with other regulatory authorities.

Due to the strenuous operational demands of ULR flights, industry best practice calls for a minimum crew complement of 2 Captains and 2 First Officers.

**Resolution**
(1) No air operator shall assign a flight duty period of more than 18 hours to a flight crew member and no flight crew member shall accept such an assignment.

(2) No air operator shall assign a flight crew member to a flight with a scheduled flight time of more than 16 hours, and no flight crew member shall accept such an assignment.

(3) All ULR operations will have a minimum crew complement and qualification of Two (2) Captains and Two (2) First Officers.

**Rationale**
In 2000, Boeing Corporation approached Flight Safety Foundation to address the operational issues created by changes in aircraft technology that would allow for Ultra Long Range (ULR) flight operations (flights times greater than 16 hours and flight duty times greater than 18 hours). The Crew Alertness Steering Committee was co-sponsored by Airbus, Boeing, and the Flight Safety Foundation to address the challenges of ULR flights that far outstrip those of Long Range flights.\(^67\)

Flight Safety Foundation in conjunction with Boeing and Airbus concluded Two (2) Captains and Two (2) Pilots with the ability to Take-Off and Land as the minimum ULR Flight Crew Complement after their Crew Alertness Steering Committee meetings chaired by Dr. Curtis Graeber (Boeing Human Factors Engineer) and Mr. Robert Vandel (Flight Safety Foundation Executive Vice-President) in Washington D.C. in 2001, Paris 2002, and Kuala Lumpur 2003, and Los Angeles 2005\(^68\) from:

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\(^{67}\) (Flight Safety Foundation, 2003, p. 1)  
\(^{68}\) (Flight Safety Foundation, 2003, p. 2)
- 14 countries
- 3 airline associations
- 16 airlines
- Boeing
- Airbus
- 12 pilot unions
- 3 cabin crew unions
- 14 scientific organizations
- 9 regulatory authorities

An international consensus was developed on operational guidelines, regulatory requirements and supporting research requirements that will help ensure that pilots maintain the required alertness and performance while at their duty stations. Principal tenets of this industry consensus are that airlines obtain approval for Ultra Long Range operational plans from civil aviation authorities and that the operational plans be developed using a scientifically based method.69

“Recommendations – Guidelines for Industry Best Practice for ULR Operations,” suggests70:

“For ULR operations, the flight crew complement will not be less than four (4) pilots, two (2) of whom shall hold pilot-in-command qualifications, and four (4) of whom should be qualified for the takeoff and landing phases of flight. A crewmember qualified as pilot-in-command shall be at the controls at all times.”

This consensus position on flight crew complement for ULR operations was reaffirmed by the Flight Safety Foundation in 200771.

IFALPA (International Federation of Airline Pilots Associations) has also endorsed the Flight Safety Foundation ULR recommendations72 by stating:

“IfALPA urges the promotion and adoption of the FSF ULR Crew Alertness Steering Committee recommendations and guidance material (Flight Safety Digest, August – September 2005) to all regulatory agencies that will be providing the oversight that is necessary to maintain standards of safety during these longer-range operations. Additionally, IFALPA has distributed the Foundation’s guidance material to all its member associations.”


69 (Flight Safety Foundation, 2003, p. 1)
70 (Flight Safety Foundation, 2003, p. 9)
71 (Flight Safety Foundation, 2005, p. 7)
72 (Flight Safety Foundation, 2006, p. 6)
Singapore, Hong Kong, India, United Arab Emirates, and the U.S. FAA have regulatory requirements vis a vis crew complement and qualification on ULR operations, particularly the requirement to have a minimum of Four (4) Pilots, with Two (2) of the Pilots being Captain qualified.

All STAR Alliance Airlines, all U.S. Airlines, and all “M3” Middle Eastern Airlines utilize a Two (2) Captain / Two (2) First Officer crew complement and qualification for ULR operations: Air India, Singapore, South African Airways, American, Delta, United, Emirates, Etihad, and Qatar. In addition, China Southern as a part of the SkyTeam Alliance also utilizes a Two (2) Captain / Two (2) First Officer crew complement and qualification. In aggregate, the airlines listed provide market evidence that over 80% of airlines conducting ULR operations worldwide utilize a Two (2) Captain / Two (2) First Officer crew complement and qualification as an industry best practice to ensure maximum crew alertness, performance, and margin of safety.
700.63 (1): Unforeseen Operational Circumstances

700.63 (1) If the pilot-in-command is of the opinion that an unforeseen operational circumstance that occurs after the beginning of the flight duty period could lead to a level of fatigue that may adversely affect the safety of the flight, the pilot-in-command may, after consulting with all crew members on their level of fatigue,

(a) reduce a flight crew member’s flight duty period;
(b) extend a flight crew member’s flight duty period by the following number of hours in excess of the maximum flight duty period set out in section 700.28 by
i. one hour for a single-pilot operation,
ii. two hours, if the flight crew is not augmented,
iii. three hours, if the flight crew is augmented and the scheduled flight duty period consists of one flight, and
iv. two hours, if the flight crew is augmented and the scheduled flight duty period consists of two or three flights; or
(c) extend a flight crew member’s rest period.

Issue
Proposed section 700.63 gives the pilot-in-command the discretion to extend a flight crew member’s flight duty period notwithstanding that the crew member may have reported a level of fatigue that could adversely affect the safety of the flight. The pilot-in-command should only have the option of extending a flight duty period in the event that he or she is of the opinion that an unforeseen operational circumstance will not adversely affect the safety of the flight.

This section should also give the pilot-in-command the option of reducing a flight crew member’s duty period or extending a flight crew members rest period in the event that he or she determines that a flight crew member is fatigued for reasons that would not qualify as unforeseen operational circumstances.

Resolution
The language should reflect the following changes:

(1) If the pilot-in-command is of the opinion that an unforeseen operational circumstance that occurs after the crew member leaves the rest facility on a layover or 60 minutes prior to checkin at home base and would not adversely affect the safety of the flight, the pilot-in-command may, after consulting with all crew members on their level of fatigue,

(a) reduce a flight crew member’s flight duty period;
(b) extend a flight crew member’s flight duty period by the following number of hours in excess of the maximum flight duty period set out in section 700.28 by:
i. one hour for a single-pilot operation,
ii. two hours, if the flight crew is not augmented,
iii. three hours, if the flight crew is augmented and the scheduled flight duty period consists of one flight, and
iv. two hours, if the flight crew is augmented and the scheduled flight duty period consists of two or three flights; or
(c) extend a flight crew member’s rest period.

Add the following new text:

If the pilot-in-command is of the opinion that a circumstance could lead to a level of fatigue that may adversely affect the safety of the flight, the pilot-in-command may, after consulting with all flight crew members on their level of fatigue,

a. reduce a flight crew member’s flight duty period; or
b. extend a flight crew member’s rest period.

Rationale
One of Transport Canada’s stated objectives of the proposed amendments is to “Enhance safety within flight operations by amending the current limitations associated with flight duty for crew members.” As it is currently drafted, proposed section 700.63 would weaken the current regulatory regime. This proposed section emphasizes the authority of the pilot in command, and requires the pilot-in-command to consult with crew members, but it allows the pilot-in-command to extend a crew member’s duty day regardless of whether or not the crew member reports high levels of fatigue. This is illogical. It is ostensibly positive to empower the pilot-in-command, but this suggests that it is in the pilot-in-command’s power to ignore the reported fatigue levels of his or her fellow crew members in the face of unforeseen operational circumstances. It should be clear that a crew member’s duty day cannot be extended if the pilot-in-command receives reports of fatigue levels that could adversely affect flight safety. This scenario is inconsistent with CAR 602.02. The proposed amendment to CAR 602.02 reads as follows:

An operator of an aircraft shall not require any person to act as a flight crew member or to carry out a preflight duty, and a person shall not act as a flight crew member or carry out such a duty, if the operator or the person has reason to believe that the person is not, or is not likely to be, fit for duty.

However, the proposed amendments should result in a regulatory regime that is clear and consistent. Therefore, we propose that proposed section 700.63 be revised to make it clear that if there is a level of fatigue that would impair performance, the pilot-in-command does not have the discretion to extend the flight duty period in question and may only reduce a flight crew member’s flight duty period or extend a flight crew member’s rest period, in order to return the crew member to a “fit for duty” state.

In addition, there are circumstances that are not unforeseen operational circumstances that would, nevertheless, result in crew members with a level of fatigue that would impair their performance and adversely affect the safety of the flight. Therefore, we recommend broadening proposed section 700.63 to make it clear that a pilot-in-command may take measures, such as extending a flight crew member’s
rest period and reducing a flight crew member’s flight duty period, in circumstances other than unforeseen operational circumstances.
700.70 (2): Flight Crew Member on Reserve

(2) An air operator shall not change the start time of a reserve availability period of a flight crew member by

- (a) more than two hours before, or four hours after, the start time that was communicated to the flight crew member under subsection (1); or
- (b) more than eight hours before or after the start time that was communicated to the member under subsection (1) in any period of 168 consecutive hours, unless the member is provided with two consecutive days free from duty within that period.

Issue
Proposed subsection 700.70 (2) should provide that two consecutive days free from duty are required prior to shifting greater than eight hours.

Resolution
(2) An air operator shall not change the start time of a reserve availability period of a flight crew member by

- (a) more than two hours before, or four hours after, the start time that was communicated to the flight crew member under subsection (1); or
- (b) more than eight hours before or after the start time that was communicated to the member under subsection (1) unless the member is provided with two consecutive days free from duty prior to the shift.

Rationale
We proposed this amendment to proposed section 700.70 to make it clear that the two consecutive days free from duty must be provided prior to the start of the reserve availability period and must be contained within the rolling 168-hour period, in order to allow for proper rest.
700.70 (8): Flight Crew Member on Reserve

(8) Despite subsection (7), an air operator may assign to a flight crew member a reserve duty period of
(a) no more than 20 hours, if the flight crew is augmented by one additional flight crew member and a class 1 rest facility or a class 2 rest facility is provided for the member; and
(b) no more than 22 hours, if the flight crew is augmented by two additional flight crew members and a class 1 rest facility or a class 2 rest facility is provided for each of the members.

Issue
The proposed rule does not allow for enough of a window to assign flight crew members to a flight duty period within a reserve duty period, specifically on augmented long-range flights: i.e. a max FDP of 18 hrs with two augment pilots using a class 1 rest facility (bunk, such as on our B777/B787) would limit the pilot on reserve to 22 hrs.

Resolution
(8) Despite subsection (7), an air operator may assign to a flight crew member a reserve duty period of
(a) no more than 20 hours, if the flight crew is augmented by one additional flight crew member and a class 1 rest facility or a class 2 rest facility is provided for the member; and
(b) no more than 22 hours, if the Reserve Availability period begins between 2100 and 0300, if the flight crew is augmented by two additional flight crew members and a class 1 rest facility or a class 2 rest facility is provided for each of the members.
(c) No more than 26 hours, if the Reserve Availability period begins before 2100 or after 0300 and the flight crew is augmented by two additional flight crew and a class 1 rest facility is provided for each of the members.

Rationale
The most important aspect of reserve duty periods is the protection of rest.

The CARAC Working Group Final Report (Aug 2012) states: “the schedule must ensure adequate opportunity for rest and not permit excessive flight duty assignments”.

On a typical flight to Sydney, Australia, pilots work in a series of 3 hours and 30 min shifts thus creating more than adequate rest opportunities for pilots on reserve. This means the pilots typically work for a total of 8 hours at the controls.

There is no restriction in the proposed rules to drafting of pilots. With the restrictive nature of the scenario above, a legal alternative could be to draft a pilot. However, drafting removes any ability for
the company to manage and protect the pilot’s rest prior to duty. The reserve system is much more desirable in this regard because it protects rest and is therefore safety, but it must allow for reserve pilots to be used efficiently when safety objectives are also being met.

Reserves cannot not be expected to cover long flights starting at night and early in the morning simultaneously therefore the restriction to not start between 2100 and 0300 would prevents a pilot preparing for a midnight departure for a long-range mission, then going to bed and forced up at 0400 am after only a few hours of sleep then expected to fly up to 18 hours of duty.

Additionally, augmentation reserve rules need to follow time of day sensitivity and permit greater hours when sleep is not compromised and less hours when sleep is likely to be compromised.
700.70: Addition to the Proposed Regulations (flight crew member on reserve, release)

Issue
A subsection should be added to proposed section 700.70 to make it clear that once assigned a Flight Duty Period, a flight crew member on reserve must be released from their reserve assignment so that they can adapt their sleeping schedule to minimize fatigue during the Flight Duty Period assignment.

Resolution
Addition of the following:

(3) Once an air operator assigns a Flight Duty Period to a crew member on reserve, the crew member's reserve availability period ends.

Rationale
A flight crew member cannot effectively optimize his/her sleeping schedule to prepare for and minimize fatigue during a planned flight duty period and be continuously available on a reserve availability period. Once a flight crew member on reserve has received an assignment, it no longer makes sense to ask him or her to be continuously available to be reassigned. Instead, once a flight crew member receives an assignment, he or she should be given the opportunity to obtain rest and customize his or her sleep/wake schedule to fit the assigned flight duty period.
700.71: Flight Crew Member on Standby

(1) An air operator shall provide a flight crew member on standby with a place that provides adequate protection from the elements, where it is possible to sit and to access food and drink and, if possible, that is not accessible to the public.

(2) If the flight crew member on standby is not assigned to flight duty, the air operator shall provide them with the following rest periods:

(a) if the member is at home base,
   i. 12 hours, or 11 hours plus the travel time to or from the member’s lodging, or
   ii. if the air operator provides suitable accommodation, 10 hours in that suitable accommodation; or

Issue
The concept of keeping a flight crew member on standby should not be used to decrease the minimum rest periods that would otherwise be required, unless the flight crew member volunteers for the assignment. Air operators should be required to provide crew members with at least twelve hours between the end of a flight duty period and the beginning of another flight duty period regardless of their location.

Resolution
(1) An air operator shall provide a flight crew member on standby with a place that provides adequate protection from the elements, where it is possible to sit and to access food and drink and, if possible, that is not accessible to the public.

(2) If the flight crew member on standby is not assigned to a flight, the air operator shall provide them with the following rest periods:

(a) 12 hours, or

(b) if the member is away from home base, 10 hours.

12 hours between the end of Duty Period and the beginning of the Duty Period should be minimum, and should be extended at the discretion of the flight crew member, by an appropriate amount if the need arises.
Rationale
As drafted, this proposed section allows air operators to deprive crew members of the rest periods that they would normally be entitled to while potentially restricting their movement, i.e. whether or not they go home, at home base. This type of standby arrangement could be useful to air operators, but it should be entirely voluntary. Flight crew members already have very challenging schedules that make childcare and other personal obligations very difficult to fulfill. A standby arrangement should only allow air operators to reduce a crew members rest to 10 hours plus travel time in the event that the operator provides accommodation and meals and in the event that the standby assignment is assigned with the agreement of the flight crew member.

Scientific literature has determined that time on call has a cumulative impact on fatigue (as discussed in 700.29 (6)(a)), which recognizes that individuals in an on-call state suffer from fatigue, especially if a call-out occurs during normal sleeping hours73. Further, research also indicates that the unpredictability of on-call schedules can lead to sleep loss74.

This unexpected rule in CG1 would permit an air operator dictate what an employee can do on his/her time off and prevents them from going home.

Flight crews travel away from for extended periods of time every month. The air operators could and do on a regular bases assign flight crew on 4 /5+ day pairings away from home, and on a regular basis have 1 day at home, then be assigned another multi-day pairing.

On single day pairings, flight crews do not pack or travel with luggage.

In either case (multi-day or a single day pairing), a pilot may need to go back to their home for several reasons, not limited to:

- May need to get their medication
- Would need a change of clothes (uniform)
- May need to go home to care for their children
- If the pilot is expecting to be home, overnight daycare would be a challenge for anyone, never mind trying to arrange it in minutes while away

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73 (Torsvall & Åkerstedt, 1988)8
74 (Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996)
700.100 (1): Initial Exemption

(1) Subject to subsections (3) and (4), an air operator to which sections 700.20 to 700.73 apply is exempt, in respect of a flight, from the application of the provisions set out in the notice of intention under section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intention that complies with section 700.101; and

(b) the air operator has established and implemented the following components of the fatigue risk management system:

i. the fatigue risk management plan, and

ii. the fatigue risk management process.

Issue

Nearly every prescriptive regulation (700.20 – 700.73) contained within the proposed regulations can be exempted, simply by an air operator sending a Notice of Intent to the regulator.

Resolution

An approval process for FRMS that meets ICAO standards must be established in the regulations. This is added to the proposed regulations as a new subsection (1).

700.100 (1) An air operator will apply for approval of the exemption required by sending a Notice of Intent to the Minister.

(2) Subject to subsections (4), an air operator to which sections 700.28, 700.29, 700.50, 700.51, 700.61 and 700.62 apply is exempt, in respect of a flight, from the application for approval of the provisions set out in the notice of intention under section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intent that complies with section 700.101; and

(b) the air operator has established and implemented all of the components of the fatigue risk management system.

(3) Subject to subsections (4) and (5), an air operator to which sections 702.91 to 702.98 apply is exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.101, if the following conditions are met:
(a) the air operator has sent to the Minister a notice of intention that complies with section 700.101; and

(b) the air operator has established and implemented all of the components of the fatigue risk management system.

(4) The exemptions in subsections (2) and (3) continue to have effect as long as the air operator demonstrates compliance with the requirements of sections 700.102 to 700.109 but cease to apply, in respect of a flight, two years after the date on which the notice of intent was sent.

(5) The exemption set out in subsection (3) may be in respect of any of the requirements set out in sections 702.92 to 702.98 except for paragraph 702.92(1)(a).

(6) The exemptions referred to in subsection (2) or (3) may apply to a series of flights if

(a) the flights in the series are operated by the same flight crew members; and

(b) the flight crew members operate the flights during the same flight duty period or during consecutive flight periods

Rationale
Without an approval process for the Notice of Intention, Transport Canada has abdicated its authority to oversee safety regulations and left the safety of Canada’s traveling public up to an honour system. This concept deviates from the principles set out in the ICAO\(^\text{75}\), meaning that Transport Canada’s proposed regulations are not in line with international best practices.

Such best practice, as delineated by the ICAO, explicitly requires that the regulator approve any variations, and that such approved variations provide a level of safety equivalent or better than the standard regulations\(^\text{76}\).

The figure below is an excerpt from ICAO Manual of the oversight required by the regulator; the model clearly depicts the requirement and expected process for approval from the state regulator (areas shaded in blue).

\(^{75}\) (International Civil Aviation Organization, 2011, pp. 4.10.3-4.10.5)

\(^{76}\) (International Civil Aviation Organization, 2011, p. 4.10.3)
The ICAO recommendations have been adopted by jurisdictions such as the United States’ FAA, which requires that any deviation from an American Fatigue Risk Management Plan receive approval from the regulator. Transport’s Regulatory Impact Analysis Statement makes clear that the Government has consciously rejected such an approval process, purposefully saddling the Canadian traveling public with substandard safety regulations in favour of “competitive advantage”.

Alarmingly, 700.100 (3)(b) permits air operators to circumvent requirements to provide data and documents to Transport Canada from the beginning of operations under an FRMS, further eroding the safety and integrity of air travel in Canada. This could result in a level of safety below the pre-existing CARS standard, seemingly on a blanket basis.

77 (Transport Canada, 2017, p. 2972)
700.100 (1)(b): Initial Exemption

(1) Subject to subsections (3) and (4), an air operator to which sections 700.20 to 700.73 apply is exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.101, if

(a) the air operator has sent to the Minister a notice of intent that complies with section 700.101; and

(b) the air operator has established and implemented the following components of the fatigue risk management system:

   i. the fatigue risk management plan, and

   ii. the fatigue risk management process.

Issue

A fully functioning FRMS program is not required for the initial exemptions to take effect and no regulatory approval for the FRMS program is required.

Resolution

700.100 (1) An air operator will apply for approval of the exemption required by sending a Notice of Intent to the Minister.

(2) Subject to subsections (4), an air operator to which sections 700.28, 700.29, 700.50, 700.51, 700.61 and 700.62 apply is exempt, in respect of a flight, from the application for approval of the provisions set out in the notice of intention under section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intent that complies with section 700.101; and

(b) the air operator has established and implemented all of the components of the fatigue risk management system.

(3) Subject to subsections (4) and (5), an air operator to which sections 702.91 to 702.98 apply is exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intention that complies with section 700.101; and

(b) the air operator has established and implemented all of the components of the fatigue risk management system.
The exemptions in subsections (2) and (3) continue to have effect as long as the air operator demonstrates compliance with the requirements of sections 700.102 to 700.109 but cease to apply, in respect of a flight, two years after the date on which the notice of intent was sent.

The exemption set out in subsection (3) may be in respect of any of the requirements set out in sections 702.92 to 702.98 except for paragraph 702.92(1)(a).

The exemptions referred to in subsection (2) or (3) may apply to a series of flights if

(a) the flights in the series are operated by the same flight crew members; and

(b) the flight crew members operate the flights during the same flight duty period or during consecutive flight periods

Rationale
In this proposal, by allowing air operators to exempt themselves, Transport Canada has abdicated its responsibility to approve the FRMS program. Effectively, the safety of Canada’s traveling public is protected by an honour system. Canada has deviated from the principles of Fatigue Management provided by ICAO\(^78\) by allowing an air operator to enact an FRMS program without regulatory oversight or approval.

\(^{78}\) (International Civil Aviation Organization, 2011, p. 4.10.1)
700.100 (3): Initial Exemption

(3) The exemptions in subsections (1) and (2) continue to have effect as long as the air operator demonstrates compliance with the requirements of sections 700.102 to 700.109 but cease to apply, in respect of a flight, on the earlier of

Issue

700.100 (1)(a) appears to be in conflict with 700.100 (3), as the former states that that an air operator can begin operation under an exemption so long as a Notice of Intent has been sent to the regulator, but 700.100 (3) states that all components from 700.102 to 700.109 must be in place for an exemption.

Accordingly, there is confusion as to whether an exemption can be in place with only a FRMS plan and policy, or whether all parts of FRMS (Plan, Policy, Promotion and Quality Assurance Program) must exist.

700.100 set out regulations for initial exemption, 700.112 set regulations for continuing exemption with varied conditions and time lines that are unclear.

Given that under 700.109 (4)(a), a safety case cannot be validated until a minimum of 1 years’ worth of data has been collected, with no time limit for collecting data to validate, validation can take an indefinite period of time.

Resolution

The proposed FRMS regulations need to be ICAO compliant and congruent with all aspects of suggested highest and best practice, along with strict approval and oversight from the regulator. Further, it should be clear that the prescribed limits provide a basic floor plan which may be adjusted, but only incrementally, with a proper FRMS – it should not negate the requirement for compliance with every prescribed rule immediately.

700.100 (1) An air operator will apply for approval of the exemption required by sending a Notice of Intent to the Minister.

(2) Subject to subsections (4), an air operator to which sections 700.28, 700.29, 700.50, 700.51, 700.61 and 700.62 apply is exempt, in respect of a flight, from the application for approval of the provisions set out in the notice of intention under section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intent that complies with section 700.101; and

(b) the air operator has established and implemented all of the components of the fatigue risk management system.
(3) Subject to subsections (4) and (5), an air operator to which sections 702.91 to 702.98 apply is exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intention that complies with section 700.101; and

(b) the air operator has established and implemented all of the components of the fatigue risk management system.

(4) The exemptions in subsections (2) and (3) continue to have effect as long as the air operator demonstrates compliance with the requirements of sections 700.102 to 700.109 but cease to apply, in respect of a flight, two years after the date on which the notice of intent was sent.

(5) The exemption set out in subsection (3) may be in respect of any of the requirements set out in sections 702.92 to 702.98 except for paragraph 702.92(1)(a).

(6) The exemptions referred to in subsection (2) or (3) may apply to a series of flights if:

(a) the flights in the series are operated by the same flight crew members; and

(b) the flight crew members operate the flights during the same flight duty period or during consecutive flight periods

Rationale
Contradiction between clauses for the FRMS leads to an unworkable regulation that will allow air operators to entirely bypass safeguards.

If under 700.112 or 700.109(4), a set time for validation is not specified, then this means an exceedance in a Notice of Intent can be operated without validation of its safety case for 2 years before the exceedance is considered invalid.

700.112 (1) An air operator who was exempt under section 700.100, for the purposes of preparing a safety case in respect of a flight, is exempt from the application of the same provisions for the same flight if the air operator

(a) conducts an initial audit in accordance with section 700.110;

(b) validates a safety case in accordance with subsection 700.109(4); and

(c) sends, at least 30 days before operating a flight under an exemption, a letter of confirmation to the Minister.

Under (a) an initial audit cannot happen until the Safety case has been validated as per 700.110:
700.110 (1) An air operator shall ensure that an initial audit of its fatigue risk management system is conducted after validation of the safety case in accordance with the process established under subsection 700.108(1).

However, under 700.109 Safety Case and as per 700.112 (1) (b) above:

700.109 (4)

A safety case is validated when the air operator meets the following conditions:

(a) fatigue and alertness data have been collected over a period of not less than one year, in respect of not less than 20 consecutive flights described in the notice of intent, of which not more than 5% of those flights have an adverse impact of more than 5% on the levels of fatigue and alertness determined by means of the methodology described in paragraph (2)(b);

The procedure set forth in the regulation has conflicting processes and is hard to follow. The lack of oversight and approval process combined with flawed procedure will lead to an ineffective FRMS system – a system that is intended to reduce fatigue, not provide for carte blanche air operator exemptions.
700.100 (4): Initial Exemption

(4) The air operator referred to in subsection (1) may be exempted from any of the requirements set out in sections 700.27 to 700.73 except for the following provisions:

(a) paragraph 700.27(1)(c); (1,000 hours in any 365 consecutive days; or)

(b) paragraph 700.29(1)(a); (2,400 hours in any 365 consecutive days; or)

(c) section 700.36; and (Home Base)

(d) section 700.37. (Nutrition)

Issue

The ICAO model contemplates a system where FRMS and FRMS deviations are rare and need approval by the regulator. However, as written in the proposed text, every new regulation can be bypassed, outside of the four exceptions listed in 700.100 (4).

This concept is dangerously flawed in its application as it means that the air operator, without any approval from Transport Canada, can exempt itself from sections including:

- 700.20 Monitoring System and Records
- 700.21 Air Operator Obligations — Scheduling
- 700.26 Fitness for Duty
- 700.27 Maximum Flight Time (except 700.27(1)(c))
- 700.29 Maximum Duty Time (except 700.29 (1)(a))
- 700.40 Rest Period — General
- 700.41 Disruptive Schedules
- 700.42 Rest Period — Time Zone Differences
- 700.43 Rest Period — Positioning
- 700.50 Split Flight Duty
- 700.51 Consecutive Night Duty Periods
- 700.52 Delayed Reporting Time
- 700.60 Flight Duty Period — Inflight Rest and Augmented Flight Crew
- 700.61 Long Range Flights
- 700.62 Ultra Long-Range Flights
- 700.63 Unforeseen Operational Circumstances — Flight Duty Period and Rest Period
- 700.64 Unforeseen Operational Circumstances — Split Flight Duty
- 700.70 Flight Crew Member on Reserve
- 700.71 Flight Crew Member on Standby
- 700.72 Flight Crew Member on Deployed Standby
- 700.73 Controlled Rest on the Flight Deck

This could result in a level of safety below that of the pre-existing CARS.
Resolution
Delete subsection (4) from the proposed text and amend subsection (2) as follows:

700.100 (1) An air operator will apply for approval of the exemption required by sending a Notice of Intent to the Minister.

(2) Subject to subsections (4), an air operator to which sections 700.28, 700.29, 700.50, 700.51, 700.61 and 700.62 apply is exempt, in respect of a flight, from the application for approval of the provisions set out in the notice of intention under section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intent that complies with section 700.101; and
(b) the air operator has established and implemented all of the components of the fatigue risk management system.

(3) Subject to subsections (4) and (5), an air operator to which sections 702.91 to 702.98 apply is exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.101, if the following conditions are met:

(a) the air operator has sent to the Minister a notice of intention that complies with section 700.101; and
(b) the air operator has established and implemented all of the components of the fatigue risk management system.

(4) The exemptions in subsections (2) and (3) continue to have effect as long as the air operator demonstrates compliance with the requirements of sections 700.102 to 700.109 but cease to apply, in respect of a flight, two years after the date on which the notice of intent was sent.

(5) The exemption set out in subsection (3) may be in respect of any of the requirements set out in sections 702.92 to 702.98 except for paragraph 702.92(1)(a).

(6) The exemptions referred to in subsection (2) or (3) may apply to a series of flights if

(a) the flights in the series are operated by the same flight crew members; and
(b) the flight crew members operate the flights during the same flight duty period or during consecutive flight periods

Rationale
There is no rationale, no industry best practice, nor check and balance that allow an air operator to exempt themselves from prescriptive regulations. That the aforementioned regulatory provisions,
almost in their entirety, can be exempted without formal approval or oversight is an incredibly dangerous abdication of duty on the part of the regulator.

Results suggest that job schedules with long working hours are not more risky merely because they are concentrated in inherently hazardous industries or occupations, or because people working long hours spend more total time ‘at risk’ for a work injury. Strategies to prevent work injuries should consider changes in scheduling practices, job redesign, and health protection programs for people working in jobs involving overtime and extended hours.\footnote{79}{Dembe, Erickson, Delbos, & Banks, 2005}

Caruso, et. al., found, “...a pattern of deteriorating performance on psycho physiological tests as well as injuries while working long hours was observed across study findings, particularly with very long shifts and when 12-hour shifts combined with more than 40 hours of work a week.” Four studies that focused on effects during extended shifts reported that the 9th to 12th hours of work were associated with feelings of decreased alertness and increased fatigue, lower cognitive function, declines in vigilance on task measures, and increased injuries. Two studies examining physicians who worked very long shifts reported deterioration on various measures of cognitive performance.\footnote{80}{Caruso, Hitchcock, Dick, Russo, & Schmmit, 2004}
An air operator shall send a notice of intent to the Minister that sets out the following elements:

(a) a statement that the air operator intends to establish, implement and maintain a fatigue risk management system in accordance with this Division;

(b) the description of the flight that will be operated under an exemption referred to in section 700.100;

(c) the provisions from which the air operator will be exempted;

(d) a description of the manner in which the flight will vary from the requirements of the provisions referred to in paragraph (c);

(e) the expected date on which the flight is operated under an exemption referred to in section 700.100;

(f) a description of the safety case that will be developed in respect of the flight;

(g) a statement indicating the air operator’s intention to validate the safety case in accordance with subsection 700.109(4) and to conduct an audit in accordance with subsection 700.110(1); and

(h) the name and contact information of the person who will be responsible for implementing the fatigue risk management system.

**Issue**

An air operator can exempt a regulation and start operating without Transport Canada approval after the Notice of Intent is sent. The air operator only has to show intent to implement a FRMS program, not actually have one in place.

**Resolution**

Follow ICAO guidelines that clearly state that to get approval, the air operator must demonstrate to the regulator that it has appropriate processes and mitigations to achieve an acceptable level of safety. A FRMS should be approved prior to any variance applications on a route by route basis to be in compliance with the ICAO Standards and Recommended Practices (SARPs).

Update 700.101 with the following:
700.101 An air operator shall send a notice of intent to the Minister that sets out the following elements:

(a) a statement that the air operator intends to establish, has established and maintains a fatigue risk management system in accordance with this Division;

(b) the description of the flight that will be operated under an exemption referred to in section 700.100;

(c) the provisions from which the air operator will be exempted;

(d) a description of the manner in which the flight will vary from the requirements of the provisions referred to in paragraph (c);

(e) the expected date on which the flight is operated under an exemption referred to in section 700.100;

(f) the safety case in accordance with 700.109 (1) and 700.109(2) for the flight;

(g) a statement indicating the air operator’s plan and procedure to validate the safety case in accordance with subsection 700.109(4) and to conduct an audit in accordance with subsection 700.110(1); and

(h) the name and contact information of the person who will be responsible for implementing the fatigue risk management system.

Rationale
International best practice clearly outlines the process for approval to set up, trial, and execute a FRMS program\(^\text{81}\). This includes a definite need for a risk analysis and a valid safety case to be completed before approval.

In (a) the air operator should show that a fully functioning approved FRMS program exist at the company.

(a) a statement that the air operator intends to establish, implement and maintain a fatigue risk management system in accordance with this Division;

This contradicts 700.100 (1)(b) and 700.100 (3).

\(^81\) (International Civil Aviation Authority, 2012, p. 6.2.2.2)
(f) a description of the safety case that will be developed for the flight;

(g) a statement that the air operator intends to validate a safety case in accordance with subsection 700.109(4) and to conduct an initial audit under subsection 700.110(1); and

**NO safety** case or procedure to conduct a safety audit is required, just a description of the safety case and promise to validate is enough to start operating outside of the prescriptive regulations.

In (f) a complete safety case should be included in the notice, not just a description. In (g) a plan and procedure to validate should be included in the Notice of Intend, not just an intent to validate the safety case.

The Notice of Intent should be a notice to advise the regulator of the intended exceedance of the regulation, not a notice of the intention to meet the conditions at some point in the future while the exceedance is occurring.
700.103 (2): Fatigue Risk Management System - Components

(2) The air operator shall update its fatigue risk management system in any of the following circumstances:

(a) a change in the size and scope of its operations;
(b) any action taken as a result of an audit of the fatigue risk management system conducted under subsection 700.110(1) or section 700.113;
(c) any finding of an increase in the level of fatigue or a decrease in the level of alertness of flight crew members resulting from the air operator’s validation of the safety under subsection 700.109(4); or
(d) when data collection and analysis conducted pursuant to the process set out in section 700.105 indicates that flight crew members may be subject to increases in their level of fatigue or decreases in their level of alertness.

Issue
Any finding of increase in fatigue or decrease in alertness should trigger an update in the mitigation for the exceedance, not the FRMS program.

Resolution

700.103

(2) The air operator shall update the fatigue risk management system in any of the following circumstances:

(a) a change in the size and scope of its operations;
(b) any action taken as a result of an audit of the fatigue risk management system conducted under subsection 700.110(1) or section 700.113;
(c) any finding of increases in the level of fatigue or decreases in the level of alertness of flight crew members resulting from the air operator’s validation of the safety case under subsection 700.109(4); or
(d) when data collection and analysis conducted pursuant to the process set out in section 700.105 indicates that flight crew members may be subject to increases in their level of fatigue or decreases in their level of alertness.

Rationale
Rule is confusing and conflicts with the basic principles of FRMS. There seems to no guidance on 700.103 (2) (c) or (d).
700.103 (2) (c) and (d) state an air operator has to update the FRMS program if a validation of a Safety Case or any data analysis shows an increase in fatigue levels or a decrease in alertness levels. This is a confusing regulation, if a validation or any data show an increase in fatigue then is the FRMS program working as intended? Then why would this trigger an update to the FRMS program?

This also would put pressure on an air operator to not find any increase in fatigue or decrease in alertness as this would create more work in the system. Any finding of increase in fatigue or decrease in alertness should trigger an update in the mitigation for the exceedance not the FRMS program itself.
700.104: Fatigue Risk Management Plan

A fatigue risk management plan shall include the following elements:

(a) a fatigue risk management policy — signed by the accountable executive — that establishes the shared responsibility of the air operator and flight crew members in managing fatigue;

(b) safety objectives, including the identification and reduction of fatigue related hazards and the effective management of fatigue in flight operations;

(c) safety indicators to measure the attainment of the safety objectives;

(d) defined responsibilities in relation to fatigue management for

i. management,

ii. persons managing the fatigue risk management system, and

iii. other employees;

(e) a training plan that identifies the content of the initial and annual training;

(f) a plan for communicating the information referred to in paragraphs 700.107(2)(a) to (f) to the flight crew; and

(g) a policy for the internal reporting of fatigue by flight crew members, without fear of reprisal.

Issue
As per ICAO guidelines, there needs to be a method for allowing flight crew members to report fatigue hazards throughout the organization.

Resolution

700.104 A fatigue risk management plan shall include the following elements:

(a) a fatigue risk management policy — signed by the accountable executive — that establishes the shared responsibility of the air operator and flight crew members in managing fatigue;
(b) safety objectives, including the identification and reduction of fatigue related hazards and the effective management of fatigue in flight operations;

(c) safety indicators to measure the attainment of the safety objectives;

(d) defined responsibilities in relation to fatigue management for
   i. management,
   ii. persons managing the fatigue risk management system, and
   iii. other employees;

(e) a training plan that identifies the content of the initial and annual training;

(f) a plan for communicating the information referred to in paragraphs 700.107(2)(a) to (f) to the flight crew; and

(g) a policy for the internal reporting of any hazard of fatigue by flight crew members, without fear of reprisal.

(h) Policy for internal Fatigue reports for all parts of an operation whether included in the FRMS program or prescriptive regulations which shall be confidential but provided to Company and Association representation who are part of the FRMS process;

Rationale
The ICAO calls for a self-reporting system for all aspects of the operation be available and clearly communicated to the pilots of an operation.

ICAO: Self-Reporting of Fatigue Risks

Crewmembers’ reports about high fatigue levels or fatigue-related performance issues are vital to keep the Fatigue Safety Action Group informed about fatigue hazards in the day-to-day running of an operation. A series of fatigue reports on a particular route can be a trigger for further investigation by the Fatigue Safety Action Group.

An effective fatigue reporting system requires an effective reporting culture. It needs to:

1. Use forms that are easy to access, complete, and submit;
2. Have clearly understood rules about confidentiality of reported information;

82 (International Civil Aviation Organization, 2011)
3. Have clearly understandable voluntary reporting protection limits;
4. Include regular analysis of the reports; and
5. Provide regular feedback to crewmembers about decisions or actions taken based on the reports, and lessons learned.
700.105 (1): Fatigue Risk Management Process

(1) An air operator shall have a fatigue risk management process that includes procedures for

(a) reporting fatigue internally by flight crew members;

(b) confirming in writing, to flight crew members, receipt of the fatigue report and to advise of any follow-up action;

(c) collecting information to identify fatigue-related hazards, including
   i. flight crew member performance data,
   ii. accident or incident information,
   iii. data from work schedules,
   iv. comparisons of planned schedules in relation to time worked, and
   v. data from a review of operational or administrative duties;

(d) developing a list of the safety data and scientific studies used in support of the processes that form part of the fatigue risk management system;

(e) managing the data and information referred to in this subsection;

(f) identifying and assessing the level of fatigue through modelling with respect to flight crew schedules; and

(g) analyzing planned schedules in relation to time worked in order to assess whether fatigue is being managed.

Issue
There are no defined requirements in the proposed regulations for the management of secure data, nor provisions that require the protection of privacy and confidentiality.

Resolution
New language be added:

700.105 (1)
(h) The air operator will develop a process to manage and secure the storage of all data collected in order to uphold privacy and confidentiality. However, such data will be provided to any relevant association representative who is part of the FRMS process.

Rationale
As stated above, similar to 700.104 and because the regulation language only addresses how the FRMS program will be used to get exemptions from the prescriptive rules, it is unclear if 700.105 (1)(a) will be a procedure just for the exemptions emphasized by the regulations or will be a procedure that contemplates addressing fatigue hazards in all aspects of the operation.

Language in both 700.104 and 700.105(1)(c) does not provide any rule indicating the confidentiality of the data collected. 700.104(g) states that the report will be subject to no reprisal, but there is no language on confidentiality.

700.105 (1)(c)(d)(e)(f) are rules governing a process to handle data, but again there is no regulation stating the data would be confidential.

FRMS guidance RDIMS no.12181964-V23 Article 5.1.7 gives guidelines and reasoning for a confidential reporting system.

ICAO 5.3.2 Fatigue Hazard Identification

There are ethical considerations around issues such as the privacy of crewmembers, confidentiality of data, and whether crewmembers are really free to refuse to participate (voluntary participation is a requirement in scientific studies involving human participants). Many countries have specific legislation around privacy and workplace responsibilities for safety that may need to be considered, in addition to conditions specified in industrial agreements.
700.106: Collaboration with Employees

The air operator shall develop the policy and the procedure allowing flight crew members to internally report situations that could lead to fatigue in collaboration with the bargaining agents or, if there is no bargaining agent, with its employees or a representative selected by its employees.

Issue
The new regulations have almost no requirement for employees to be involved in the FRMS program. This is not ICAO compliant, which envisions flight crew members having an equal voice in the FRMS event review team.

Resolution
700.106

(1) The air operator shall develop the policy and the procedure allowing flight crew members to internally report situations that could lead to fatigue in collaboration with the bargaining agents or, if there is no bargaining agent, with its employees or a representative selected by its employees.

(2) The air operator FRMS policy shall include a “Fatigue Safety Action Group” (FSAG) which will be tasked with the administration of FRMS components. The Fatigue Safety Action Group shall include representatives of all stakeholder groups (management, scheduling, and flight crew members).

Rationale

ICAO

Figure 1.1 shows a basic framework linking the required components of an FRMS. For ease of explanation, Figure 1.1 presents a single, central, functional group, designated as the “Fatigue Safety Action Group”, responsible for all of these FRMS components. The Fatigue Safety Action Group includes representatives of all stakeholder groups (management, scheduling, and crewmembers) and other individuals as needed to ensure that it has appropriate access to scientific and medical expertise.
Figure 5 - FRMS Implementation Guide for Operators (1.4 Pg. 6)
(3) A safety case established in respect of a flight may be used in respect of another flight if the following requirements are met:

(a) the difference in the duration of the flights does not exceed 30 minutes;

(b) the flights are operated in the same time zone or across the same number of time zones in the same direction;

(c) the flights are operated with aircraft of the same type and configuration;

(d) the flights are operated with the same number of flight crew;

(e) the operating environments of the flights are similar;

(f) the flights are operated at the same time of day or within 30 minutes of the start time; and

(g) other hazards or risks associated with the flights are similar.

(4) A safety case is validated when the air operator has met the following conditions:

(a) fatigue and alertness data has been collected over a period of not less than one year, in respect of not less than 20 consecutive flights described in the notice of intention, of which not more than five percent of the samples have a negative impact on the levels of fatigue and alertness determined by means of the methodology described in paragraph (2)(b) of more than five percent;

(b) the fatigue risk assessment has been conducted and the findings of the assessment have been analyzed;

(c) mitigation measures have been put in place to manage the hazards and risks related to the variance to correct increases in the level of fatigue or decreases in the level of alertness of flight crew members;

(d) the mitigation measures have been monitored to ensure that they have the desired effect on the levels of fatigue and alertness of flight crew members;

(e) corrective measures have been put in place to address the findings obtained under paragraph (d) if the mitigation measures do not achieve the desired effect on the levels of fatigue and alertness of flight crew members; and

(f) the effectiveness of the mitigation measures and, if applicable, the corrective measures in maintaining the established levels of fatigue and alertness of flight crew members is demonstrated.

(5) For the purposes of paragraph (4)(a), an air operator may use not more than 25% of the required data respecting a flight from a flight operated by another air operator if the flights meet the requirements of paragraphs (3)(a) to (g).
Issue
By allowing the air operator to apply data from one flight’s safety case to another without a) requiring that the safety case be approved by the regulator, and b) allowing the safety case of a shorter flight to be used for a longer flight, the proposed regulations allow air operators to bypass the regulatory process, thereby eroding aviation safety.

Resolution

(3) A safety case established in respect of a flight may be used in respect of another flight if the following requirements are met:

(a) the difference in the duration of the flights does not exceed the original FDP or flight times;

(b) the flights are operated in the same time zone or across the same number of time zones in the same direction;

(c) the flights are operated with aircraft of the same type and configuration;

(d) the flights are operated with the same number of flight crew;

(e) the operating environments of the flights are similar;

(f) the flights are operated at the same time of day or is not earlier than the original; and

(g) other hazards or risks associated with the flights are similar.

(5) For the purposes of paragraph (4)(a), an air operator may use not more than 25 percent of the required data respecting a flight from a flight operated by another air operator if the flights meet the requirements of paragraphs (3)(a) to (g).

Rationale

Safety Case Reuse

International best practice, as dictated by the ICAO, requires that a new safety case be submitted for approval for every variance sought. And that a safety case has to be sent to the regulator for approval prior to any exceedance being operated.

ICAO has procedures for applying data from different flights and air operators but within a very stringent and controlled environment. With approval needed from the regulator and review of data from an expert scientific team83.

83 (International Civil Aviation Authority, 2012)
The operator generously makes these findings available for use in the A-B-A safety case, through an independent scientific team who were involved in the C-D-C data collection and analysis. (The expertise of the scientific team ensures that the findings are interpreted and applied to the A-B-A route in an appropriate manner.)

Also, when ICAO contemplates sharing data for a different safety case it does not allow for the new approval flight to exceed the original flight times or the time of day operations.

**Safety Case Extension**

Contrary to international best practices, 700.109(3)(a) allows an existing safety case to apply to a flight with greater flight time than the original flight the safety case. For example, if the safety case was built to support a flight that had a 0700 start with the FDP extended from 13 hours to 14.5 hours.

700.109(3)(a) would allow the same safety case to be applied to a 15-hour FDP which would mean a 30 minute longer flight. Science shows us a longer period at work or awake equates to an increased fatigue level and therefore contributes to a decreased level of alertness.

**Safety Case Reuse May Infringe on Window of Circadian Low**

700.109(3)(f) allows an existing safety case to be applied to a flight with a different time of day start.

Using the same example above, if the safety case had a 0700 start and 700.109(3)(f) was applied the start time could be modified to 0630.

This would mean a flight crew’s wake-up time would intrude into the WOCL and science indicates WOCL intrusion would affect the fatigue and alertness levels. Applying the rules in 700.28 table the FDP should be 12 hours an hour less than the original safety case was meant to apply to. All science would show an increase to the fatigue level and a decrease to the alertness levels.

Add to this rule 700.109(3)(a) and the safety case originally applied to a 0700 start for 14.5-hour FDP, would be applied to a 0630 start for 15-hour FDP with corresponding increase in fatigue and decrease in alertness.

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84 (Caruso, Hitchcock, Dick, Russo, & Schmmit, 2004; Dawson & McCulloch, 2005; Belenky G. , 2012, p. 2; Dinges, Graeber, Rosekind, Samel, & Wegmann, 1996, p. 6)
### 700.112: Continuing Exemption

An air operator who has been exempted pursuant to section 700.100, for the purposes of preparing a safety case in respect of a flight, is exempted from the same requirements for the same flight if the following conditions are met:

(a) the air operator performs an audit in accordance with section 700.110;

(b) the air operator validates a safety case in accordance with subsection 700.109(4); and

(c) the air operator sends, at least 30 days before operating a flight under the exemption, a letter of confirmation.

(2) The exemption in subsection (1) takes effect 30 days after the date that the letter of confirmation is sent to the Minister and continues to have effect as long as the following conditions are met:

(a) the air operator maintains the fatigue risk management system in accordance with this Division;

(b) the air operator monitors the effectiveness of the safety case in managing fatigue and alertness of the flight crew in accordance with section 700.114; and

(c) the air operator corrects any adverse effects of the variance on the levels of fatigue and alertness on the flight crew no later than 60 days from the time the adverse effect is identified in the course of monitoring.

(3) The letter of confirmation shall set out

(a) a confirmation that a safety case has been validated for the flight and that any variance from the requirements set out in sections 700.27 to 700.73 has no adverse effect on the levels of fatigue and alertness;
700.112 (2) The exemption in subsection (1) takes effect 30 days after the date that the letter of confirmation is sent to the Minister and continues to have effect as long as the following conditions are met:

(a) the air operator maintains the fatigue risk management system in accordance with this Division;

(b) the air operator monitors the effectiveness of the safety case in managing fatigue and alertness of the flight crew in accordance with section 700.114; and

(c) the air operator corrects any adverse effects of the variance on the levels of fatigue and alertness on the flight crew no later than 28 days from the time the adverse effect is identified in the course of monitoring.

(3) The letter of confirmation shall set out

(a) a confirmation that a safety case has been validated for the flight and that any variance from the requirements set out in sections 700.27 to 700.73 has no adverse effect on the levels of fatigue and alertness;

(b) a confirmation that the fatigue risk management system has been audited under section 700.110;

(c) a statement that the fatigue risk management system meets the requirements of this Division; and

(d) the date on which the flight is operated under an exemption referred to in section 700.112.

(6) A copy of a validated safety case for the flight that any variance from the requirements set out in sections 700.27 to 700.73 or in sections 702.91 to 702.98, as the case may be, has been mailed to Minister

(7) A copy of the fatigue risk management system audit under section 700.110, has been mailed to Minister

Rationale

Language in 700.112 differs from other proposed regulations in its approach to compliance: permitting 60 days or air operators to implement fixes rather than 28 days\(^8\). Errors in flight times or FDP are required to be corrected within 28 days but errors causing fatigue hazards seem to have a more relaxed standard.

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\(^8\) As required by 700.28 (3)
700.113: Fatigue Risk Management System - Audit

700.113 The air operator shall ensure that an audit of its fatigue risk management system is conducted, in accordance with the process established under subsection 700.108(1),

(a) within twelve months after the initial audit conducted under subsection 700.110(1);

(b) within 12 months after the day on which the previous audit was completed;

(c) after a major incident where fatigue was a contributing factor; and

(d) a major change in the air operator’s activities that could impact the levels of fatigue or alertness of the flight crew.

Issue
700.113 (c) should feature an “or” instead of an “and.”

700.113 (d) does not provide for a definition or example of what a major change entails.

Resolution
Change language in (c), (d) to:

(c) after a major incident where fatigue was a contributing factor; and or

(d) a major change in the air operator’s activities that could impact the levels of fatigue or alertness of the flight crew.

Rationale
The “and” clause in (c) means that all four conditions must be met before an air operator is required to conduct an audit, a confluence of which will become impossible to achieve following 12 months of the initial audit as per clause (a). Similarly, with the “and” clause present, unless a major incident where fatigue was a contributing factor has occurred, an audit will never be required.
700.114: Variance - Monitoring of Effects

(1) The air operator shall monitor, in accordance with the procedures established under subsection 700.108(3), the effect of the variance described in the notice of intent on the levels of fatigue and alertness of the flight crew for each period of six months over which the flight subject to the exemption referred to in subsection 700.112(1) is operated.

(2) The air operator shall collect data in respect of a representative number of flights conducted over the period of six months in accordance with the method set out in the validated safety case.

(3) If the monitoring referred to in subsection (1) reveals that the variance described in the notice of intention has an adverse impact on the levels of fatigue and alertness of the flight crew, the air operator shall develop and implement corrective measures to eliminate the adverse impact of the variance.

(4) If corrective measures are developed and implemented, the air operator shall assess the effectiveness of the corrective measures in eliminating the adverse impact of the variance on the levels of fatigue and alertness.

(5) If the corrective measures eliminate the adverse impact of the variance on the levels of fatigue and alertness, the air operator shall modify the safety case to take into account the corrective measures and inform the Minister of the modification within 60 days after the change is made.

Issue
There is a lack of clarity as to what constitutes a “representative number of flights conducted over the period of six months.” There is also a lack of clarity as to the time period and timeliness of applying corrective action to a known fatigue risk.

Resolution
(1) The air operator shall monitor, in accordance with the procedures established under subsection 700.108(3), the effect of the variance described in the notice of intent on the levels of fatigue and alertness of the flight crew for each period of six months over which the flight subject to the exemption referred to in subsection 700.112(1) is operated.
(2) The air operator shall collect data in respect of **50%** of flights conducted over the period of six months in accordance with the method set out in the validated safety case.

(3) If the monitoring referred to in subsection (1) reveals that the variance described in the notice of intention has an adverse impact on the levels of fatigue and alertness of the flight crew, the air operator shall develop and implement corrective measures **immediately** to eliminate the adverse impact of the variance.

(4) If corrective measures are developed and implemented, the air operator shall assess the effectiveness of the corrective measures in eliminating the adverse impact of the variance on the levels of fatigue and alertness.

(5) If the corrective measures eliminate the adverse impact of the variance on the levels of fatigue and alertness, the air operator shall modify the safety case to take into account the corrective measures and inform the Minister of the modification within 60 days after the change is made.

**Rationale**

The 50% requirement is necessary in order to ensure a sufficient sample size for data collection.

In order to validate a safety case, data can be attained from a small sample size – as little as 20 flights in a year. 700.114 refers to monitoring in a 6-month period:

(2) **The air operator shall collect data in respect of a representative number of flights conducted over the period of six months in accordance with the method set out in the validated safety case.**

Given the frequency mentioned in 700.109 (validating a safety case) this could be as low as 10 flights in 6 months, where 50% requires sample data from 5 flights in 6 months or 10 flights in a year. Smaller sample size gives rise to a greater chance of failure and unusable data.
(1) The air operator shall conduct a review of the fatigue risk management system, in accordance with the procedures established under subsection 700.108(2), at least once every twelve months after the initial audit required by section 700.114 is conducted.

(2) The review of the fatigue risk management system shall assess the following:

(a) the fatigue risk management processes;

(b) the accuracy of the safety performance indicators; and

(c) the attainment of the safety objectives.

(3) The air operator shall

(a) determine what corrective actions are necessary to address any deficiency identified by the review, and carry out those actions;

(b) keep a record of any determination made under paragraph (a) and the reason for it; and

(c) if the air operator has assigned management functions to another person, provide that person with a copy of the determination.

(4) No air operator shall assign a duty relating to the program for fatigue risk management system quality assurance to a person who is responsible for carrying out a task or an activity evaluated by that program unless

(a) owing to the size, nature and complexity of the air operator’s operations and activities, it is impractical to assign the duty to a person who is not responsible for carrying out the task or activity;

(b) based on a risk analysis, assigning the duty to a person responsible for carrying out the task or activity will not result in an increased risk to aviation safety; and

(c) the audit of the program for fatigue risk management system quality assurance will not be compromised.
**Issue**
The regulator should be responsible for conducting reviews.

Additionally, 700.115 (4)(a) deviates from international best practices by allowing an air operator to designate that a person conduct a review on themselves. Permitting self-review compromises public safety.

**Resolution**
700.115 (1), 700.115 (2), 700.115 (3), and 700.115 (4) should all require that results of the review be sent to the regulator.

Rather than allowing self-review under 700.115 (4)(a), Transport Canada should send personnel to conduct the review, as it does when it dispatches personnel to conduct Pilot Proficiency Checks in those cases where the air operator is too small to conduct its own checks.

**Rationale**
Recommendations from the ICAO, IATA, and IFALPA require the air operator to send a copy of the review to the regulator. Because the proposed regulations do include this requirement, they are not compliant with the ICAO and international best practices.

When an air operator is too small to conduct its own Pilot Proficiency Checks, Transport Canada sends personnel to conduct the checks. Transport Canada should use the same service standard when it comes to fatigue reviews.

**ICAO**
The FRMS policy needs to be reviewed periodically by the operator, to ensure that it is adequate to meet changing operational demands. In addition, it should be subject to periodic review by the regulator.

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86 (International Civil Aviation Authority, 2012, p. 43)
### Issue

No protocol, policy or procedure exists for confidentiality or management and securing of data submitted by flight crews.

### Resolution

The regulations need to set process and procedure for self-reporting of fatigue hazards, as well as provide requirements for securing data collected from its pilots, while ensuring the privacy of individuals providing the reports.

### Rationale

International best practice, as described by the ICAO, requires safeguards on employee privacy and security of data for fatigue programs.\(^\text{87}\)

ICAO Annex 6 Part 1 Appendix 8 also addresses the need for self-reporting of fatigue hazards in a FRMS program: **Crewmembers’ reports about high fatigue levels or fatigue-related performance issues are vital to keep the Fatigue Safety Action Group informed about fatigue hazards in the day-to-day**

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\(^\text{87}\) (International Civil Aviation Authority, 2012, p. 12)
**running of an operation.** A series of fatigue reports on a particular route can be a trigger for further investigation by the Fatigue Safety Action Group.
References


Federal Aviation Administration. (10). Advisory Circular 120-100. US Department of Transportation.


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## Appendix: Formatting

<table>
<thead>
<tr>
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<th>Intent</th>
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<tr>
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<td>Denotes language to delete from regulations</td>
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