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→ Treaties, laws and regulations (<https://www.canada.ca/en/government/system/laws.html>) → Canada Gazette (</accueil-home-eng.html>)

→ Publications (</rp-pr/publications-eng.html>) → Part II: Vol. 152 (2018) (</rp-pr/p2/2018/index-eng.html>)

→ December 12, 2018 (</rp-pr/p2/2018/2018-12-12/html/index-eng.html>)

Regulations Amending the Canadian Aviation Regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods): SOR/2018-269

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AERONAUTICS ACT

P.C. 2018-1536 December 6, 2018

Her Excellency the Governor General in Council, on the recommendation of the Minister of Transport, pursuant to section 4.9 ^a, paragraph 5(a) ^b, subsection 5.9(1) ^c and paragraphs 7.6(1)(a) ^d and (b) ^e of the *Aeronautics Act* ^f, makes the annexed *Regulations Amending the Canadian Aviation Regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods)*.

Regulations Amending the Canadian Aviation Regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods)

Amendments

1 (1) The definitions *flight deck duty time* and *flight duty time* in subsection 101.01(1) of the *Canadian Aviation Regulations* ¹ are repealed.

(2) The definition *local approprié* in subsection 101.01(1) of the French version of the Regulations is repealed.

(3) The definition *période de repos minimale* in subsection 101.01(1) of the French version of the Regulations is replaced by the following:

période de repos minimale Période qui ne peut être interrompue par l'exploitant aérien ou l'exploitant privé au cours de laquelle le membre d'équipage de conduite n'est pas en service et peut se voir accorder au moins huit heures de sommeil consécutives dans un poste de repos approprié en plus du temps requis pour s'y rendre et en revenir et pour les soins d'hygiène personnelle et les repas. (*minimum rest period*)

(4) Subsection 101.01(1) of the Regulations is amended by adding the following in alphabetical order:

fit for duty, in respect of a person, means that their ability to act as a flight crew member of an aircraft is not impaired by fatigue, the consumption of alcohol or drugs or any mental or physical condition; (*apte au travail*)

flight duty period means the period that begins when the earliest of the following events occurs 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 there is more than one flight during the flight duty period, 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*)

home base means the location where a flight crew member normally commutes to in order to report for a flight duty period or positioning; (*base d'affectation*)

medical evacuation flight means a flight that is carried out for the purpose of facilitating medical assistance and on which one or more of the following persons or things is transported:

- (a) medical personnel,
- (b) ill or injured persons,
- (c) human blood products or organs,
- (d) medical supplies; (*vol d'évacuation médicale*)

positioning means the transfer of a flight crew member from one location to another, at the request of an air operator, but does not include travel to or from suitable accommodation or the member's lodging; (*mise en place*)

rest period means the continuous period during which a flight crew member is off duty, excluding the travel time to or from suitable accommodation provided by a private operator or air operator; (*période de repos*)

(5) Subsection 101.01(1) of the French version of the Regulations is amended by adding the following in alphabetical order:

poste de repos approprié Chambre pour une personne qui est exposée à un bruit minimal, bien ventilée et dotée de dispositifs de contrôle de la température et de la lumière ou, lorsqu'une telle chambre n'est pas disponible, local qui est approprié au lieu et à la saison, est exposé à un bruit minimal et offre un confort et une protection convenables contre les éléments. (*suitable accommodation*)

2 The references "Subsection 700.14(1)" to "Subsection 700.21(2)" in column I of Part VII of Schedule II to Subpart 3 of Part I of the Regulations and the corresponding amounts in column II are replaced by the following:

Column I	Column II	
	Maximum Amount of Penalty (\$)	
Designated Provision	Individual	Corporation
Subsection 700.20(1)	3,000	15,000
Subsection 700.20(2)	1,000	5,000
Subsection 700.20(3)	1,000	5,000
Subsection 700.20(4)	1,000	5,000
Subsection 700.21(3)	1,000	5,000
Subsection 700.26(1)	5,000	25,000
Subsection 700.26(2)	1,000	5,000
Subsection 700.26(3)	1,000	5,000
Subsection 700.26(4)	1,000	5,000
Subsection 700.26(5)	1,000	5,000
Subsection 700.27(1)	5,000	25,000
Subsection 700.28(1)	5,000	25,000
Subsection 700.29(1)	5,000	25,000
Subsection 700.29(2)	3,000	15,000
Section 700.37	1,000	5,000
Subsection 700.40(1)	5,000	25,000
Subsection 700.41(1)	5,000	25,000
Subsection 700.42(1)	5,000	25,000
Subsection 700.42(2)	5,000	25,000
Subsection 700.43(1)	5,000	25,000
Subsection 700.43(3)	3,000	15,000
Subsection 700.51(1)	5,000	25,000
Subsection 700.52(4)	5,000	25,000
Section 700.61	5,000	25,000
Subsection 700.62(1)	5,000	25,000

Subsection 700.62(2)	5,000	25,000
Subsection 700.63(3)	5,000	25,000
Subsection 700.70(1)	3,000	15,000
Subsection 700.70(2)	3,000	15,000
Subsection 700.70(3)	3,000	15,000
Subsection 700.70(4)	3,000	15,000
Subsection 700.70(5)	3,000	15,000
Subsection 700.70(6)	3,000	15,000
Subsection 700.70(7)	3,000	15,000
Subsection 700.70(10)	3,000	15,000
Subsection 700.71(1)	3,000	15,000
Subsection 700.71(2)	3,000	15,000
Subsection 700.72(1)	3,000	15,000
Subsection 700.72(2)	1,000	5,000
Subsection 700.72(3)	1,000	5,000
Subsection 700.72(4)	1,000	5,000
Subsection 700.101(1)	3,000	15,000
Subsection 700.102(1)	5,000	25,000
Subsection 700.102(2)	1,000	5,000
Subsection 700.102(3)	1,000	5,000
Subsection 700.102(4)	1,000	5,000
Subsection 700.102(5)	1,000	5,000
Subsection 700.103(1)	5,000	25,000
Section 700.104	5,000	25,000
Subsection 700.116(1)	5,000	25,000
Section 700.117	5,000	25,000
Subsection 700.118(2)	5,000	25,000
Subsection 700.119(1)	3,000	15,000
Section 700.120	5,000	25,000
Subsection 700.131(4)	5,000	25,000
Subsection 700.132(1)	5,000	25,000
Subsection 700.132(2)	5,000	25,000
Subsection 700.133(3)	1,000	5,000
Subsection 700.134(1)	5,000	25,000
Subsection 700.134(2)	5,000	25,000
Subsection 700.135(1)	3,000	15,000
Subsection 700.135(2)	1,000	5,000

Subsection 700.135(3) 1,000 5,000

Subsection 700.135(4) 1,000 5,000

3 Subpart 2 of Part VII of Schedule II to Subpart 3 of Part I of the Regulations is amended by adding the following after the reference “Subsection 702.84(2)”:

Column I	Column II	
	Maximum Amount of Penalty (\$)	
Designated Provision	Individual	Corporation
Subsection 702.91(1)	3,000	15,000
Subsection 702.91(2)	1,000	5,000
Subsection 702.92(1)	5,000	25,000
Subsection 702.93(1)	5,000	25,000
Subsection 702.93(2)	5,000	25,000
Subsection 702.96(1)	3,000	15,000
Subsection 702.96(3)	1,000	5,000
Section 702.97	3,000	15,000

4 Section 602.02 of the Regulations is replaced by the following:

602.02 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 that 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.

5 (1) Paragraph 602.03(a) of the Regulations is replaced by the following:

(a) within 12 hours after consuming an alcoholic beverage;

(2) Paragraphs 602.03(b) and (c) of the French version of the Regulations are replaced by the following:

b) elle est sous l'effet de l'alcool;

c) elle fait usage d'une drogue qui affaiblit ses facultés au point où la sécurité de l'aéronef ou celle des personnes à son bord est compromise de quelque façon.

6 The reference “[602.47 to 602.56 reserved]” after section 602.46 of the Regulations is replaced by the following:

Suitable Accommodation

602.47 A private operator or an air operator, as the case may be, shall provide a flight crew member with suitable accommodation for rest periods away from home base.

[602.48 to 602.56 reserved]

7 Subsection 604.01(1) of the Regulations is amended by adding the following in alphabetical order:

flight deck duty time means the period spent by a flight crew member at a flight crew member position in an aeroplane during flight time. (**temps de service au poste de pilotage**)

8 Paragraph 604.100(b) of the French version of the Regulations is replaced by the following:

b) l'exploitant privé lui accorde une période de repos d'au moins quatre heures consécutives dans un poste de repos;

9 Paragraphs 604.102(1)(b) and (c) of the Regulations are replaced by the following:

(b) the flight duty period is extended as a result of an unforeseen operational circumstance that occurs after the beginning of the flight duty period;

(c) the next minimum rest period is extended by an amount of time that is at least equal to the length of the extension of the flight duty period; and

10 Section 700.01 of the Regulations is amended by adding the following in alphabetical order:

acclimatized describes a flight crew member whose biorhythm is aligned with local time; (*acclimaté*)

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 devices 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° from vertical and that has leg and foot support; (*poste de repos de classe 3*)

early duty means hours of work that begin between 02:00 and 06:59 at the location where the flight crew member is acclimatized; (*service de début de journée*)

late duty means hours of work that end between midnight and 01:59 at the location where the flight crew member is acclimatized; (*service de fin de journée*)

local night's rest means a rest period of at least nine hours that takes place between 22:30 and 09:30 at the location where the flight crew member is acclimatized; (*nuit de repos locale*)

night duty means hours of work that begin between 13:00 and 01:59 and that end after 01:59 at a location where the flight crew member is acclimatized; (*service de nuit*)

reserve availability period means the period in any period of 24 consecutive hours during which a flight crew member on reserve is available to report for flight duty; (*période de disponibilité en réserve*)

reserve duty period means the period that begins at the time that a flight crew member on reserve is available to report for flight duty and ends at the time that the flight duty period ends; (*période de service en réserve*)

single day free from duty means time free from duty from the beginning of the first local night's rest until the end of the following local night's rest; (*journée isolée sans service*)

window of circadian low means the period that begins at 02:00 and ends at 05:59 at the location where the flight crew member is acclimatized; (*phase de dépression circadienne*)

11 The reference “[700.12 and 700.13 reserved]” after section 700.11 of the Regulations is replaced by the following:

[700.12 reserved]

12 The Regulations are amended by adding the following before the heading “Monitoring System” before section 700.14:

Non-application

700.13 This Division does not apply to an air operator who operates an aircraft under Subpart 2 of Part VII or to a flight crew member who operates an aircraft under that Subpart.

13 Division III of Part VII of the Regulations is replaced by the following:

[700.12 to 700.18 reserved]

Division III — Flight Crew Member Fatigue Management

Non-application and Interpretation

700.19 (1) This Division does not apply

- (a) to an air operator who operates an aircraft under Subpart 2 of this Part or to a flight crew member who operates an aircraft under that Subpart; or
- (b) to an air operator who conducts a medical evacuation flight or to a flight crew member who operates an aircraft to conduct such a flight.

(2) For the purposes of this Division, references to a time of day are

- (a) if a flight crew member is acclimatized, references to the local time at their location; or
- (b) if a flight crew member is not acclimatized, references to the local time at the last location where the member was acclimatized.

Monitoring System and Records

700.20 (1) An air operator shall have a system that monitors the flight times, flight duty periods, hours of work and rest periods of each of its flight crew members and shall include in its company operations manual the details of that system.

(2) An air operator shall, for each flight crew member, keep a record of

- (a) all flight times;
- (b) the start and end times as well as the duration of each flight duty period;
- (c) the start and end times as well as the duration of each duty period;
- (d) the start and end times as well as the duration of each rest period; and
- (e) all time free from duty.

(3) An air operator shall keep a record of all notifications provided to it by a pilot-in-command under subsection 700.63(4).

(4) An air operator shall keep the records referred to in this section for a period of 24 months after the day on which they are made.

Air Operator Obligations — Scheduling

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

(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.

(3) If an air operator determines that more than 10% of a flight crew member's maximum flight duty 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 is 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.

[700.22 to 700.25 reserved]

Fitness for Duty

700.26 (1) An air operator shall not allow a flight crew member to begin a flight duty period if, before the beginning of the period, the member advises the air operator that they are fatigued to the extent that they are not fit for duty.

(2) A flight crew member shall advise every other flight crew member and the air operator as soon as the member becomes aware that they have become fatigued during a flight duty period to the extent that they are not fit for duty.

(3) If there is only one flight crew member on board the aircraft, and the member becomes aware during a flight duty period that they have become fatigued to the extent that they are not fit for duty, they shall advise the air operator immediately or, if the aircraft is in flight, as soon as possible after the aircraft has landed.

(4) If a person who is assigned by an air operator to act as a flight crew member, or any other person, becomes aware that the assignment would result in the maximum flight time, maximum flight duty period or maximum number of hours of work being exceeded, the member or other person shall advise the air operator as soon as possible.

(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 possible.

Maximum Flight Time

700.27 (1) An air operator shall not assign flight time to a flight crew member, and a flight crew member shall not accept such an assignment, if the member's total flight time will, as a result, exceed

- (a) 112 hours in any 28 consecutive days;
- (b) 300 hours in any 90 consecutive days;
- (c) 1,000 hours in any 365 consecutive days; or
- (d) in the case of a single-pilot operation, 8 hours in any 24 consecutive hours.

(2) For the purpose of subsection (1), a flight crew member's flight time includes

- (a) the flight time accumulated from other flight operations; and
- (b) the total flight time of a flight with an augmented flight crew.

Maximum Flight Duty Period

700.28 (1) An air operator shall not assign a flight duty period to a flight crew member, and a flight crew member shall not accept such an assignment, if the flight duty period exceeds the maximum flight duty period set out in this section.

(2) If the average duration of all scheduled flights is less than 30 minutes, the maximum period of a flight duty period that begins during a period set out in column 1 of the table to this subsection is the number of hours set out in column 2, 3 or 4, according to the number of flights scheduled during the flight duty period.

TABLE

MAXIMUM FLIGHT DUTY PERIOD — AVERAGE FLIGHT DURATION OF LESS THAN 30 MINUTES

	Column 1	Column 2	Column 3	Column 4
Item	Start Time of Flight Duty Period	1 to 11 Flights	12 to 17 Flights	18 or More Flights
1	24:00 to 03:59	9 hours	9 hours	9 hours
2	04:00 to 04:59	10 hours	9 hours	9 hours
3	05:00 to 05:59	11 hours	10 hours	9 hours
4	06:00 to 06:59	12 hours	11 hours	10 hours
5	07:00 to 12:59	13 hours	12 hours	11 hours
6	13:00 to 16:59	12.5 hours	11.5 hours	10.5 hours
7	17:00 to 21:59	12 hours	11 hours	10 hours
8	22:00 to 22:59	11 hours	10 hours	9 hours
9	23:00 to 23:59	10 hours	9 hours	9 hours

(3) If the average duration of all scheduled flights is 30 minutes or more but less than 50 minutes, the maximum period of a flight duty period that begins during a period set out in column 1 of the table to this subsection shall not exceed the number of hours set out in column 2, 3 or 4, according to the number of flights scheduled during the flight duty period.

TABLE**MAXIMUM FLIGHT DUTY PERIOD — AVERAGE FLIGHT DURATION OF 30 MINUTES OR MORE BUT LESS THAN 50 MINUTES**

	Column 1	Column 2	Column 3	Column 4
Item	Start Time of Flight Duty Period	1 to 7 Flights	8 to 11 Flights	12 or More Flights
1	24:00 to 03:59	9 hours	9 hours	9 hours
2	04:00 to 04:59	10 hours	9 hours	9 hours
3	05:00 to 05:59	11 hours	10 hours	9 hours
4	06:00 to 06:59	12 hours	11 hours	10 hours
5	07:00 to 12:59	13 hours	12 hours	11 hours
6	13:00 to 16:59	12.5 hours	11.5 hours	10.5 hours
7	17:00 to 21:59	12 hours	11 hours	10 hours
8	22:00 to 22:59	11 hours	10 hours	9 hours
9	23:00 to 23:59	10 hours	9 hours	9 hours

(4) If the average duration of all scheduled flights is 50 minutes or more, the maximum period of a flight duty period that begins during a period set out in column 1 of the table to this subsection shall not exceed the number of hours set out in column 2, 3 or 4, according to the number of flights scheduled during the flight duty period.

TABLE**MAXIMUM FLIGHT DUTY PERIOD — AVERAGE FLIGHT DURATION OF 50 MINUTES OR MORE**

	Column 1	Column 2	Column 3	Column 4
Item	Start Time of Flight Duty Period	1 to 4 Flights	5 or 6 Flights	7 or More Flights
1	24:00 to 03:59	9 hours	9 hours	9 hours
2	04:00 to 04:59	10 hours	9 hours	9 hours
3	05:00 to 05:59	11 hours	10 hours	9 hours
4	06:00 to 06:59	12 hours	11 hours	10 hours
5	07:00 to 12:59	13 hours	12 hours	11 hours
6	13:00 to 16:59	12.5 hours	11.5 hours	10.5 hours
7	17:00 to 21:59	12 hours	11 hours	10 hours
8	22:00 to 22:59	11 hours	10 hours	9 hours
9	23:00 to 23:59	10 hours	9 hours	9 hours

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

(6) For the purposes of subsections (2) to (4), positioning is not to be considered a flight.

(7) For the purposes of subsection (5), the Canadian time zones are Pacific, Mountain, Central, Eastern, and the Atlantic time zone, which includes Newfoundland and Labrador.

(8) The flight duty period for a flight crew member on standby begins at the time at which they report for duty at the location designated by the air operator.

(9) When all flights are conducted under day VFR, the maximum period of a flight duty period that begins during a period set out in column 1 of the table to this subsection shall not exceed the number of hours set out in column 2.

TABLE

MAXIMUM FLIGHT DUTY PERIOD — FLIGHTS CONDUCTED UNDER DAY VFR

	Column 1	Column 2
Item	Start Time of Flight Duty Period	Maximum Flight Duty Period
1	24:00 to 03:59	9 hours
2	04:00 to 04:59	10 hours
3	05:00 to 05:59	11 hours
4	06:00 to 06:59	12 hours
5	07:00 to 12:59	13 hours
6	13:00 to 16:59	12.5 hours
7	17:00 to 21:59	12 hours
8	22:00 to 22:59	11 hours
9	23:00 to 23:59	10 hours

Maximum Number of Hours of Work

700.29 (1) An air operator shall not assign a flight duty period to a flight crew member, and a flight crew member shall not accept such an assignment, if, as a result, the member's number of hours of work will exceed

- (a) 2,200 hours in any 365 consecutive days;
- (b) 192 hours in any 28 consecutive days;
- (c) 60 hours in any 7 consecutive days if the air operator has provided the member with the following time free from duty:
 - (i) 1 single day free from duty in any 168 consecutive hours, and
 - (ii) 4 single days free from duty in any 672 consecutive hours; or
- (d) 70 hours in any 7 consecutive days if the air operator has provided 120 consecutive hours free from duty, including 5 consecutive local nights' rest, in any 504 consecutive hours and if
 - (i) the member is not assigned early duty, late duty or night duty,
 - (ii) the member is not assigned a flight duty period greater than 12 hours, and
 - (iii) the member's maximum number of hours of work is 24 hours in any consecutive 48 hours.

(2) An air operator who has assigned to a flight crew member a flight duty period that will result in the member's number of hours of work exceeding those referred to in paragraph (1)(d) shall ensure that the member has 120 consecutive hours free from duty, including 5 consecutive local nights' rest, before assigning a flight duty period that will result in the member's number of hours of work exceeding those referred to in paragraph (1)(c).

(3) A flight crew member's hours of work are to include

- (a) in the case of a flight crew member on reserve, 33% of the time that they are in a reserve availability period; and
- (b) in the case of a flight crew member on standby, 100% of the time that they are on standby.

[700.30 to 700.35 reserved]

Home Base

700.36 An air operator shall assign a home base for each of its flight crew members.

Nutrition Break

700.37 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.

[700.38 and 700.39 reserved]

Rest Periods — General

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 and 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
- (b) if the flight duty period ends away from home base, 10 hours in suitable accommodation.

(2) If an air operator assigns a duty to a flight crew member for a period — excluding the time required for positioning — that exceeds by one hour or more the maximum flight duty period referred to in section 700.28, the rest period shall be the longer of

- (a) the maximum flight duty period plus the amount of time worked beyond the maximum flight duty period, and
- (b) the rest period referred to in subsection (1).

(3) An air operator shall have a means to determine the travel time referred to in subparagraph (1)(a)(i).

(4) An air operator shall provide a flight crew member with advance notice of the member's rest period and its duration.

Disruptive Schedules

700.41 (1) In addition to the rest periods required under 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.

Rest Periods — Time Zone Differences

700.42 (1) Despite section 700.40, an air operator shall provide a flight crew member with the following rest periods when their flight duty period 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 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 flight duty period begins at a location that is 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 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 4 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 nights' 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 nights' 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 nights' rest before the beginning of the next flight duty period.

Rest Period — Positioning

700.43 (1) 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 flight duty period plus the travel time required for positioning 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

(a) the number of hours of work, if the maximum flight duty period is exceeded by three hours or less; or

(b) the number of hours of work plus the amount of time by which the maximum flight duty period is exceeded, if the maximum flight duty period is exceeded by more than three hours.

(2) Despite subsection (1), the rest period provided to the member by the air operator before the beginning of the next flight duty period shall not be shorter than the rest period required under subsection 700.40(1).

(3) An air operator shall not require the positioning of a flight crew member if it would result in the member's maximum flight duty period being exceeded by more than three hours unless

(a) the member agrees to the positioning; and

(b) the member's flight duty period is not exceeded by more than seven hours.

(4) An air operator shall consider the time required for the positioning of a flight crew member, that is not immediately followed by the assignment of a flight duty period, as a flight duty period for the purpose of determining the duration of the rest periods in accordance with section 700.40.

[700.44 to 700.49 reserved]

Split Flight Duty

700.50 (1) A flight crew member's flight duty period may exceed the maximum flight duty period set out in section 700.28 by the following amount of time, if the air operator provides the member with a break, in suitable accommodation, of at least 60 consecutive minutes during the flight duty period:

(a) 100% of the duration of the break that is provided to the member during the period beginning at 24:00 and ending at 05:59;

(b) 50% of the duration of the break that is provided to the member during the period beginning at 06:00 and ending at 23:59; and

(c) in the case of an unforeseen operational circumstance, 50% of the duration of the break that is provided to the member in the case of the replanning of a flight duty period after it has begun.

(2) For the purposes of subsection (1), the duration of the break provided to the flight crew member is reduced by 45 minutes before the calculation is made.

(3) If a flight crew member is assigned to night duty, their flight duty period may only be extended under subsection (1) for three consecutive nights.

(4) The time referred to in paragraphs (1)(a) and (b) is the time at the location where the flight crew member is acclimatized.

(5) If a flight crew member on reserve is assigned to flight duty that includes split duty, the air operator may extend the reserve duty period by two hours if a break in accordance with this section is provided. There shall not be more than two flights during the flight duty period following the break.

Consecutive Flight Duty Periods

700.51 (1) An air operator shall not assign to a flight crew member more than three consecutive flight duty periods if any part of those periods falls between 02:00 and 05:59, unless the air operator provides the member with one local night's rest at the end of the third flight duty period.

(2) However, an air operator may assign to a flight crew member up to five consecutive flight duty periods even if any part of those periods falls between 02:00 and 05:59 if the member is provided with

- (a) a rest period of three hours in suitable accommodation during each flight duty period; and
- (b) 56 consecutive hours free from duty at the end of the last consecutive flight duty period.

Delayed Reporting Time

700.52 (1) If an air operator advises a flight crew member of a delay in the member's reporting time before the member leaves their suitable accommodation to report for duty, the duration of the flight duty period shall, for the purposes of determining the maximum flight duty period in accordance with section 700.28, be calculated starting from either the initial reporting time or the delayed reporting time, whichever results in the shorter period.

(2) Despite subsection (1), the flight duty period shall begin, if the delay in the reporting time

- (a) is less than four hours, at the delayed reporting time; or
- (b) is four hours or more but less than 10 hours, four hours after the initial reporting time.

(3) If the delay in the reporting time is 10 hours or more, the duration of the delay is considered to be a rest period if the air operator advises the flight crew member of the delay before they leave the suitable accommodation, and does not disturb their rest period before an agreed time.

(4) Unless the air operator and flight crew member agree on a time when the air operator may disturb the member's rest period referred to in subsection (3), the air operator shall not interrupt the member's rest period other than

- (a) during the 30-minute period before the time the member was initially scheduled to leave the suitable accommodation; or
- (b) during the 60-minute period before the initial reporting time.

[700.53 to 700.59 reserved]

Maximum Flight Duty Period — Augmented Flight Crew and Rest Facilities

700.60 (1) Despite section 700.28, if the air operator assigns for a flight the number of additional flight crew members set out in column 2 of the table to this subsection and provides, for each additional member, the corresponding rest facility set out in column 3, the maximum flight duty period is the period set out in column 1.

TABLE

MAXIMUM FLIGHT DUTY PERIOD — AUGMENTED FLIGHT CREW AND REST FACILITY

	Column 1	Column 2	Column 3
Item	Maximum Flight Duty Period (Hours)	Additional Flight Crew Members	Rest Facility
1	14	1	class 3
2	15	1	class 1 or class 2
3	15.25	2	class 3
4	16.50	2	class 2
5	18	2	class 1

(2) The maximum flight duty period set out in subsection (1) applies only to a flight duty period during which there are three or fewer flights if

- (a) for a flight duty period during which there is one flight, all flight crew members are provided with in-flight rest in a rest facility; and
- (b) for a flight duty period during which there are two or three flights,
 - (i) the flight crew member who will be at the controls for the final landing is provided with two consecutive hours of in-flight rest in a rest facility; and
 - (ii) all other flight crew members are provided with 90 consecutive minutes of in-flight rest in a rest facility.

(3) A flight crew member's flight duty period shall include all of the time spent in the rest facility.

(4) The flight duty period for all flight crew members shall begin and end at the same location. However, for a period during which there is more than one flight and the first flight is scheduled to be less than 105 minutes long, an air operator may assign additional flight crew members to join a flight after the first flight, but all flight crew members shall end their flight duty period at the same location.

(5) At least one additional flight crew member shall be on the flight deck during all take-offs and landings, other than for the first flight, if additional flight crew members join the flight after the first flight in the case referred to in subsection (4).

- (6) In-flight rest shall occur between the time at which the aircraft reaches 3 048 m (10,000 feet) above aerodrome elevation and 15 minutes before the scheduled beginning of the descent.
- (7) If a flight duty period has been extended, an air operator shall provide each flight crew member with a rest period that is the longer of
- (a) the duration of the duty period just completed, and
 - (b) 14 hours in suitable accommodation, or 16 hours when the member's duty period ends at home base.

Long-range Flights

700.61 An air operator shall not assign a flight duty period to a flight crew member, and a flight crew member shall not accept such an assignment, if the flight duty period occurs within the member's window of circadian low and includes a flight that follows a scheduled flight of more than seven hours.

Ultra Long-range Flights

700.62 (1) An air operator shall not assign a flight duty period of more than 18 hours to a flight crew member and a member shall not accept such an assignment.

(2) An air operator shall not assign a flight crew member to a flight with a scheduled flight time of more than 16 hours, and a member shall not accept such an assignment.

Unforeseen Operational Circumstances — Flight Duty Period and Rest Period

700.63 (1) If the pilot-in-command is of the opinion that an unforeseen operational circumstance that occurs within 60 minutes of 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 or subsection 700.60(1) 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 there is one flight during the scheduled flight duty period, and
 - (iv) two hours, if the flight crew is augmented and there are two or three flights during the scheduled flight duty period; or
- (c) extend a flight crew member's rest period.

(2) If a further unforeseen operational circumstance arises after take-off on the final flight for which the maximum flight duty period was extended under subsection (1), the pilot-in-command may, despite that subsection, continue the flight to the destination aerodrome or to an alternate aerodrome.

(3) An air operator shall extend the rest period after a flight duty period is extended under this section by an amount of time that is at least equal to the extension of the flight duty period.

(4) At the end of a flight duty period, the pilot-in-command shall notify the air operator of any change to a flight duty period made under this section.

Unforeseen Operational Circumstances — Split Flight Duty

700.64 (1) In the event of an unforeseen operational circumstance that occurs after the beginning of the flight duty period, an air operator may change a flight crew member's flight duty period to include a split flight duty in accordance with section 700.50 if the pilot-in-command agrees and the change is made before the scheduled break on the ground.

(2) The pilot-in-command shall not agree to the change if they are of the opinion, after consulting with all other crew members, that a split flight duty period could lead to a level of fatigue that may adversely affect the safety of the flight.

[700.65 to 700.69 reserved]

Flight Crew Member on Reserve

700.70 (1) An air operator shall notify a flight crew member on reserve of the start and end times of the reserve availability period and the location where it will take place no later than

- (a) 12 hours before the start time of the reserve availability period, if no part of that period falls during the member's window of circadian low; or
- (b) 32 hours before the start time of the reserve availability period, if any part of that period falls during the member's window of circadian low.

(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.

- (3) If the start time of a reserve availability period is changed to a time after 02:00, the air operator shall not assign another reserve availability period to the flight crew member unless the member is provided with two consecutive days free from duty before the start time of that period.
- (4) An air operator shall not change the start time of a reserve availability period so that it falls in a flight crew member's window of circadian low unless the air operator notifies the member of the change at least 24 hours before the revised start time.
- (5) An air operator shall not assign to a flight crew member a reserve availability period that exceeds 14 consecutive hours.
- (6) An air operator shall provide a flight crew member with a rest period of at least 10 consecutive hours between reserve availability periods.
- (7) An air operator shall not assign to a flight crew member a reserve duty period that exceeds
- (a) 18 consecutive hours, if the period begins between 02:00 and 17:59;
 - (b) 17 consecutive hours, if the period begins between 18:00 and 18:59;
 - (c) 16 consecutive hours, if the period begins between 19:00 and 20:59;
 - (d) 15 consecutive hours, if the period begins between 21:00 and 22:59; and
 - (e) 14 consecutive hours, if the period begins between 23:00 and 01:59.
- (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;
 - (b) no more than 22 hours, when the reserve availability period begins between 21:00 and 03:00 at the location where the flight crew member is acclimatized, 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; or
 - (c) no more than 26 hours, when the reserve availability period begins before 21:00 or after 03:00 at the location where the flight crew member is acclimatized, if the flight crew is augmented by two additional flight crew members and a class 1 rest facility is provided for each of the members.
- (9) If the reserve availability period begins between 02:00 and 05:59 at the location where the flight crew member is acclimatized and the member is not contacted by the air operator during that period, the air operator may extend the reserve availability period by two hours or 50% of the reserve availability period that falls between 02:00 and 05:59, whichever is shorter.
- (10) An air operator shall not assign to a flight crew member a flight duty period that exceeds the maximum reserve duty period set out in subsection (7) or (8) or the maximum flight duty period set out in section 700.28, whichever is shorter, unless the air operator
- (a) provides the member with at least 24 hours' notice of the assignment before the beginning of the flight duty period;
 - (b) does not provide the notice during the period that begins at 22:30 and ends at 7:30; and
 - (c) assigns no duties to the member between the time the notice is provided and the beginning of the flight duty period.

Flight Crew Member on Standby

700.71 (1) The 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
 - (b) if the member is away from home base, 10 hours.

Controlled Rest on Flight Deck

700.72 (1) A flight crew member shall not take a controlled rest on the flight deck of an aircraft that is operated by an air operator unless

- (a) the rest is 45 minutes or less, is taken during the cruise portion of the flight and is completed at least 30 minutes before the scheduled beginning of the descent;
 - (b) no other flight crew member is taking a rest at that time; and
 - (c) at least two flight crew members remain on the flight deck.
- (2) Before taking a controlled rest on the flight deck, a flight crew member shall
- (a) transfer their duties to a flight crew member who is not taking a rest;
 - (b) review the status of the flight, including any specific duties to be performed during the rest;
 - (c) review the wake-up criteria; and
 - (d) advise the flight attendants of the start and end times of the rest.
- (3) A flight crew member who takes a controlled rest on the flight deck shall not assume any duties, and no other flight crew member shall transfer any duties to them, until 15 minutes after the end of the rest.

(4) When a flight crew member returns to duty, another flight crew member shall provide them with an operational briefing.

[700.73 to 700.99 reserved]

Division IV — Flight Crew Member Fatigue Management — Medical Evacuation Flights

Application and Interpretation

700.100 (1) This Division applies to an air operator who conducts a medical evacuation flight and to a flight crew member who operates an aircraft to conduct such a flight.

(2) This Division does not apply to an air operator who operates an aircraft under Subpart 2 of this Part or to a flight crew member who operates an aircraft under that Subpart.

(3) For the purposes of this Division, a flight to position an aircraft before or after a medical evacuation flight is considered to be a medical evacuation flight.

Monitoring System and Records

700.101 (1) An air operator shall have a system that monitors the flight times, flight duty periods and rest periods of each of its flight crew members and shall include in its company operations manual the details of that system.

(2) If a person who is assigned by an air operator to act as a flight crew member, or any other person, becomes aware that the assignment would result in the maximum flight time referred to in section 700.103 or the maximum flight duty period referred to in section 700.104 being exceeded, the person shall advise the air operator as soon as possible.

Fitness for Duty

700.102 (1) An air operator shall not allow a flight crew member to begin a flight duty period if, before the beginning of the period, the member advises the air operator that they are fatigued to the extent that they are not fit for duty.

(2) A flight crew member shall advise every other flight crew member and the air operator as soon as the member becomes aware that they have become fatigued during a flight duty period to the extent that they are not fit for duty.

(3) If there is only one flight crew member on board the aircraft, and the member becomes aware during a flight duty period that they have become fatigued to the extent that they are not fit for duty, they shall advise the air operator immediately or, if the aircraft is in flight, as soon as possible after the aircraft has landed.

(4) If a person who is assigned by an air operator to act as a flight crew member, or any other person, becomes aware that the assignment would result in the maximum flight time or maximum flight duty period being exceeded, the member or other person shall advise the air operator as soon as possible.

(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 possible.

Maximum Flight Time

700.103 (1) An air operator shall not assign a flight crew member for flight time, and a flight crew member shall not accept such an assignment, if the member's total flight time will, as a result, exceed

- (a) if the flight is conducted under Subpart 4 or 5 using an aircraft other than a helicopter, 40 hours in any 7 consecutive days;
- (b) if the flight is conducted under Subpart 3, or is conducted using a helicopter, 60 hours in any 7 consecutive days;
- (c) 120 hours in any 30 consecutive days or, in the case of a flight crew member on call, 100 hours in any 30 consecutive days;
- (d) 300 hours in any 90 consecutive days;
- (e) 1,200 hours in any 365 consecutive days; or
- (f) in the case of a single-pilot operation, 8 hours in any 24 consecutive hours.

(2) For the purpose of subsection (1), a flight crew member's flight time includes

- (a) the flight time accumulated from other flight operations; and
- (b) the total flight time of a flight with an augmented flight crew.

Maximum Flight Duty Period

700.104 An air operator shall not assign a flight duty period to a flight crew member, and a flight crew member shall not accept such an assignment, if the flight duty period exceeds 14 hours.

[700.105 to 700.115 reserved]

Rest Period — General

700.116 (1) An air operator shall provide a flight crew member, at the end of a flight duty period, with a rest period of 10 hours plus the travel time to and from the place where the rest period is taken.

(2) An air operator shall provide a flight crew member with advance notice of the member's rest period and its duration.

Rest Period — Positioning

700.117 If a flight crew member is required by the air operator to travel for the purpose of positioning after the completion of a flight duty period, the air operator shall provide the flight crew member with an additional rest period at least equal to one-half the time spent travelling that is in excess of the flight crew member's maximum flight duty period.

Split Flight Duty

700.118 (1) If a flight duty period includes a rest period, an air operator may assign to a flight crew member a flight duty period that exceeds the maximum flight duty period referred to in section 700.104, by one-half the length of the rest period referred to in paragraph (b), to a maximum of three hours, if

- (a) the air operator provides the member with notice, before the beginning of the flight duty period, of the extension of flight duty period;
- (b) the air operator provides the member with a rest period of at least four consecutive hours in suitable accommodation; and
- (c) the member's rest period is not interrupted by the air operator.

(2) An air operator shall extend the rest period after a flight duty period referred to in subsection (1) by an amount that is at least equal to the length of the extension to the flight duty period.

Time Free from Duty

700.119 (1) An air operator shall provide each flight crew member with the following time free from duty:

- (a) at least 36 consecutive hours in 7 days; and
- (b) at least 3 consecutive days in 17 days.

(2) An air operator shall provide a flight crew member with advance notice of the member's time free from duty and its duration.

Consecutive Flight Duty Periods

700.120 An air operator shall provide a flight crew member with at least 24 consecutive hours free from flight duty following three consecutive flight duty period assignments that exceed 12 consecutive hours unless the member has received a rest period of at least 24 consecutive hours free from flight duty between each flight duty period assignment.

Delayed Reporting Time

700.121 If an air operator advises a flight crew member, before the member leaves a rest facility, of a delay in excess of three hours in the member's reporting time, the member's flight duty period is considered to have started three hours after the original reporting time.

[700.122 to 700.130 reserved]

Maximum Flight Duty Period — Augmented Flight Crew and Rest Facility

700.131 (1) Despite section 700.104, if the air operator assigns an additional flight crew member to a flight and provides for the member the rest facility set out in column 2 of the table to this subsection, the maximum flight duty period is the period set out in column 1.

TABLE MAXIMUM FLIGHT DUTY PERIOD — AUGMENTED FLIGHT CREW AND REST FACILITY

	Column 1	Column 2
Item	Maximum Flight Duty Period (Hours)	Rest Facility
1	15	a flight deck observer seat
2	17	class 2
3	20	class 1

(2) The maximum flight duty period set out in subsection (1) applies only to a flight duty period during which there are three or fewer flights.

(3) A flight crew member's flight duty period shall include all time spent in the rest facility.

(4) If a flight duty period has been extended, an air operator shall provide each flight crew member with a rest period that is equal to the duration of the duty period just completed.

Long-range Flights

700.132 (1) A flight duty period during which there is one flight or a series of flights that ends more than four one-hour time zones from the point of departure, other than flights conducted entirely within Northern Domestic Airspace, shall be limited to three flights, in the case of a series of flights, and shall be followed by a rest period that is at least equal to the length of the flight duty period.

(2) If a flight referred to in subsection (1) is a transoceanic flight, the maximum number of flights that may be conducted after the transoceanic flight is one, excluding one unscheduled technical stop that occurs during the flight.

Unforeseen Operational Circumstances

700.133 (1) A pilot-in-command may, as a result of unforeseen operational circumstances, and after consulting with all crew members on their level of fatigue, extend a flight crew member's flight time and flight duty period in excess of the maximum flight time referred to in section 700.103 and the maximum flight duty period referred to in section 700.104.

(2) The pilot-in-command may extend the maximum flight time and maximum flight duty period by three hours if the pilot-in-command notifies the air operator of the length of and the reason for the extension. In the case of a flight duty period that is extended, the subsequent rest period shall be increased by an amount at least equal to the length of the extension of the flight duty period.

(3) An air operator shall keep a record of all notifications provided to it under subsection (2) for a period of 24 months after the day on which they are provided.

Flight Crew Member on Reserve

700.134 (1) An air operator shall provide each flight crew member on reserve with a rest period of at least 10 consecutive hours in any 24 consecutive hours if the air operator

- (a)** provides the member with 24 hours' notice of the start time and duration of the rest period;
- (b)** provides the member with a minimum of 10 hours' notice of the start time and duration of the rest period and the air operator does not assign any duty to the member during those 10 hours; or
- (c)** does not assign a flight duty period to the member and does not interrupt the member's rest period between 22:00 and 06:00 local time.

(2) Following a rest period provided under subsection (1), the start of a subsequent rest period cannot vary by more than three hours from the time of day that the preceding rest period started, or by more than a total of eight hours in any seven consecutive days.

(3) If an air operator is unable to provide a flight crew member with the rest period referred to in subsection (1) and the member is notified to report for flight duty or the reporting time occurs between 22:00 and 06:00 local time

- (a)** the maximum flight duty period shall be 10 hours; and
- (b)** the rest period following the flight duty period shall be increased by at least one-half the length of the preceding flight duty period.

Controlled Rest on Flight Deck

700.135 (1) A flight crew member shall not take a controlled rest on the flight deck of an aircraft that is operated by an air operator unless

- (a)** the rest is 45 minutes or less, is taken during the cruise portion of the flight and is completed at least 30 minutes before the scheduled beginning of the descent;
- (b)** no other flight crew member is taking a rest at that time; and
- (c)** at least two flight crew members remain on the flight deck.

(2) Before taking a controlled rest on the flight deck, a flight crew member shall

- (a)** transfer their duties to a flight crew member who is not taking a rest;
- (b)** review the status of the flight, including any specific duties to be performed during the rest;
- (c)** review the wake-up criteria; and
- (d)** advise the other crew members of the start and end times of the rest.

(3) A flight crew member who takes a controlled rest on the flight deck shall not assume any duties, and no other flight crew member shall transfer any duties to them, until 15 minutes after the end of the rest.

(4) When a flight crew member returns to duty, another flight crew member shall provide him or her with an operational briefing.

[700.136 to 700.199 reserved]

Division V — Exemptions — Fatigue Risk Management System

Initial Exemption

700.200 (1) Subject to subsections (3) and (4), an air operator and flight crew members to whom sections 700.20 to 700.72 or 700.101 to 700.135 apply are exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.206, if

- (a)** the air operator has sent to the Minister a notice of intent that complies with the requirements of section 700.206;
- (b)** the air operator has established and implemented the following components of the fatigue risk management system, referred to in

subsection 700.214(1):

- (i) the fatigue risk management plan, and
- (ii) the fatigue risk management process; and
- (c) starting on the date on which the flight is first conducted under the exemption in this subsection and ending when the exemption no longer applies, the air operator notifies the Minister that the analysis required by paragraph 700.225(2)(g) is available to the Minister for review
 - (i) every 90 days, or
 - (ii) if the period during which the flight is conducted is shorter than 90 days, at the end of the period.

(2) Subject to subsections (3) and (5), an air operator and flight crew members to whom sections 702.91 to 702.98 apply are exempt, in respect of a flight, from the application of the provisions set out in the notice of intent referred to in section 700.206, if

- (a) the air operator has sent to the Minister a notice of intent that complies with the requirements of section 700.206;
- (b) the air operator has established and implemented the following components of the fatigue risk management system, referred to in subsection 700.214(1):
 - (i) the fatigue risk management plan, and
 - (ii) the fatigue risk management process; and
- (c) starting on the date on which the flight is first conducted under the exemption in this subsection and ending when the exemption no longer applies, the air operator notifies the Minister that the analysis required by paragraph 700.225(2)(g) is available to the Minister for review
 - (i) every 90 days, or
 - (ii) if the period during which the flight is conducted is shorter than 90 days, at the end of the period.

(3) The exemptions referred to in subsections (1) and (2) continue to apply in respect of a flight as long as the air operator demonstrates compliance with the requirements of sections 700.213 to 700.225 but cease to apply, in respect of that flight, on the earlier of

- (a) the date on which the exemption referred to in section 700.234 comes into effect with respect to the same provisions and for the same flight, and
- (b) three years after the date on which the notice of intent was sent.

(4) The exemption referred to in subsection (1) may be in respect of any of the requirements set out in sections 700.27 to 700.72 except for the requirements set out in the following provisions:

- (a) paragraph 700.27(1)(c);
- (b) paragraph 700.29(1)(a);
- (c) section 700.36;
- (d) section 700.37; and
- (e) paragraph 700.103(1)(e).

(5) The exemption referred to in subsection (2) may be in respect of any of the requirements set out in sections 702.92 to 702.98 except for the requirements set out in paragraph 702.92(1)(a).

Series of Flights

700.201 In this Division, a reference to a flight is also a reference to a series of flights if

- (a) the flights in the series of flights are consecutive and are conducted by the same flight crew members; and
- (b) the flight crew members operate the flights during a single flight duty period or consecutive flight duty periods.

[700.202 to 700.205 reserved]

Notice of Intent

700.206 (1) An air operator shall send a notice of intent to the Minister that includes

- (a) a statement that the air operator has established and implemented a fatigue risk management plan and a fatigue risk management process — and maintains the fatigue risk management plan and the fatigue risk management process — and intends to establish, implement and maintain a program for fatigue risk management promotion and a quality assurance program for the fatigue risk management system in accordance with this Division;
- (b) a description of the flight that will be subject to an exemption referred to in section 700.200;
- (c) the provisions of these Regulations from which the air operator and flight crew members will be exempt;
- (d) a description of the manner in which the flight will be conducted results in a variance from the requirements of the provisions referred to in paragraph (c);
- (e) the scientific studies used to demonstrate that the variance referred to in paragraph (d) is not likely to have an adverse effect on the levels of fatigue and alertness of flight crew members;
- (f) the expected day on which the exemption referred to in section 700.200 will first apply to the flight and, in the case of a flight that is not conducted year-round, the expected period during which the exemption referred to in that section will apply to the flight;
- (g) a description of the safety case that will be developed for the flight;
- (h) a statement that the air operator intends to validate a safety case in accordance with subsection 700.225(3) and to ensure that an initial audit is conducted under subsection 700.231(1); and

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

(2) The air operator may include in the notice of intent more than one flight if

- (a) the duration of the flight duty period is the same for all flights;
- (b) all flights have the same number of consecutive flight duty periods;
- (c) the flight duty periods for the flights start within 60 minutes of each other;
- (d) the duration of any part of a flight duty period that occurs within the flight crew members' window of circadian low is the same for all flights;
- (e) all flights have the same number of consecutive flight duty periods that occur during any part of the flight crew members' window of circadian low;
- (f) the duration of the rest period before and after each flight duty period is the same for all flights;
- (g) the time of day during which each rest period is taken is similar for all flights;
- (h) the flights are conducted in the same time zone or across the same number of time zones in the same direction by flight crew members who are all acclimatized to the same time zone;
- (i) the flights are conducted with the same aircraft type;
- (j) the flights are conducted with the same number of flight crew members;
- (k) the operating environments are similar for all flights; and
- (l) the hazards and risks are similar for all flights.

700.207 Despite subsection 700.200(3), the initial exemption ceases to apply in respect of a flight if the analysis referred to in paragraph 700.200(1)(c) or (2)(c) does not show any progress in the development of the operator's safety case.

[700.208 to 700.212 reserved]

Fatigue Risk Management System — Establishment and Implementation

700.213 (1) An air operator shall establish and implement a fatigue risk management system.

(2) The operations manager appointed under paragraph 700.09(1)(a) shall ensure that the fatigue risk management system complies with the requirements of this Division.

(3) The operations manager shall, when a finding resulting from the quality assurance program for the fatigue risk management system referred to in section 700.219 is reported to them,

- (a) determine what, if any, corrective actions are required and take those actions; and
- (b) notify the accountable executive of any systemic deficiency and of the corrective action taken.

(4) The operations manager may assign the management functions for the fatigue risk management system to another person.

(5) The responsibility of the operations manager is not affected by the assignment of management functions to another person under subsection (4).

(6) If the operations manager assigns the management functions for the fatigue risk management system to another person under subsection (4), that other person shall report to the operations manager the fatigue-related hazards, risks and incidents identified under the fatigue risk management system.

Fatigue Risk Management System — Components

700.214 (1) An air operator shall have a fatigue risk management system that includes

- (a) a fatigue risk management plan;
- (b) a fatigue risk management process;
- (c) a program for fatigue risk management promotion; and
- (d) a quality assurance program for the fatigue risk management system.

(2) The air operator shall take into account, when establishing the fatigue risk management system, all of the duties performed in the operations of the air operator by flight crew members who are assigned duties on a flight that is the subject of an exemption under this Division.

(3) The air operator shall update its fatigue risk management system if

- (a) there is a change in the size and scope of its operations;
- (b) any action is taken as a result of an audit of the fatigue risk management system conducted under subsection 700.231(1) or section 700.247;
- (c) the air operator's validation of the safety case in accordance with subsection 700.225(3) establishes that there is an increase in the level of fatigue or a decrease in the level of alertness of flight crew members; or
- (d) a data analysis conducted in accordance with the process referred to in subsection 700.216(2) indicates that flight crew members are subject to an increase in their level of fatigue or a decrease in their level of alertness.

Fatigue Risk Management Plan

700.215 The air operator's fatigue risk management plan shall include

- (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 performance indicators to measure the attainment of the safety objectives;
- (d) defined responsibilities in relation to fatigue management for
 - (i) the air operator's managers,
 - (ii) the 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 700.218(4)(a) to (f) to flight crew members; and
- (g) a policy for the internal reporting of fatigue by flight crew members, without fear of reprisal.

Fatigue Risk Management Process

700.216 (1) The air operator's fatigue risk management process shall include procedures for

- (a) the internal reporting of fatigue by flight crew members;
- (b) acknowledging in writing, to flight crew members, receipt of each fatigue report and advising of any follow-up action;
- (c) collecting information to identify fatigue-related hazards, including
 - (i) flight crew member performance data,
 - (ii) accident and incident information,
 - (iii) data from work schedules,
 - (iv) data from 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 levels of fatigue and alertness through modelling with respect to flight crew members' schedules; and
- (g) analyzing planned schedules in relation to time worked in order to assess whether fatigue is being managed.

(2) The air operator's fatigue risk assessment process shall be based on the information referred to in subsection (1) and shall include procedures for

- (a) identifying the cause of fatigue-related hazards;
- (b) assessing the likelihood that a fatigue-related event will occur and the severity of its consequences;
- (c) identifying and prioritizing the risks that need to be managed;
- (d) creating and updating a record of the risks that are identified;
- (e) determining the actions to be taken to manage the risks referred to in paragraph (c), including the preventive measures or corrective actions; and
- (f) developing safety performance indicators to measure the effectiveness of the measures and actions taken under paragraph (e).

Collaboration with Employees

700.217 The air operator shall have a process to collaborate with employees in the development of the policy and procedure for the internal reporting of fatigue.

Fatigue Risk Management Promotion

700.218 (1) In the case of an air operator to whom sections 700.20 to 700.72 or 700.101 to 700.135 apply, its program for fatigue risk management promotion shall include training for its employees on the following subjects:

- (a) the components and functioning of the fatigue risk management system and the employees' responsibilities with respect to the system;
- (b) the actions to be taken with respect to fatigue-related risks; and
- (c) the requirements of these Regulations with respect to fatigue management.

(2) In the case of an air operator to whom sections 702.91 to 702.98 apply, its program for fatigue risk management promotion shall include training for its employees on the following subjects:

- (a) the components and functioning of the fatigue risk management system and the employees' responsibilities with respect to the system;
- (b) the actions to be taken with respect to fatigue-related risks;
- (c) the requirements of these Regulations with respect to fatigue management;
- (d) personal fatigue management strategies relating to
 - (i) sleep hygiene,
 - (ii) lifestyle, exercise and diet, and
 - (iii) the consumption of alcohol and drugs;
- (e) the impact of fatigue on aviation safety;
- (f) sleep requirements and the science relating to fatigue;
- (g) the causes and consequences of fatigue;
- (h) how to recognize fatigue in themselves and in others;

- (i) sleep disorders, their impact on aviation safety and treatment options; and
- (j) human and organizational factors that may cause fatigue, including
 - (i) sleep quality and duration,
 - (ii) the effect of shift work and overtime,
 - (iii) the circadian rhythm, and
 - (iv) the effects of changes of time zones.

(3) The programs set out in subsections (1) and (2) shall include

- (a) competency-based training for persons who have been assigned duties in respect of the fatigue risk management system; and
- (b) means of measuring the level of competency attained by each person who receives the training.

(4) For the purposes of promoting fatigue risk management, an air operator shall have a procedure for communicating the following information to its employees:

- (a) industry reports on fatigue;
- (b) industry best practices in respect of fatigue risk management;
- (c) advancements in the science relating to fatigue;
- (d) the results of the data analysis conducted in accordance with the process referred to in subsection 700.216(2);
- (e) updates to the fatigue risk management system; and
- (f) the results of the review of the fatigue risk management system.

Quality Assurance Program for the Fatigue Risk Management System

700.219 (1) The air operator's quality assurance program for the fatigue risk management system shall include a process for the audit of the fatigue risk management system that includes procedures for

- (a) auditing the extent to which the air operator has implemented its fatigue risk management system, including
 - (i) a checklist setting out all of the components of the air operator's fatigue risk management system that are to be audited, and
 - (ii) a plan establishing the frequency of the audits and the manner in which they will be conducted;
- (b) auditing the fatigue risk management system in the event of an accident or incident;
- (c) analyzing the findings of the audit and determining the contributing factors of those findings;
- (d) developing, implementing and monitoring preventive measures and corrective actions to address the findings of the audit; and
- (e) keeping and updating records, including the findings of the audit, the preventive measures and corrective actions to address those findings and any follow-up taken in respect of those measures and actions.

(2) The air operator's process for the periodic review of the effectiveness of its fatigue risk management system shall include procedures for the assessment of

- (a) the fatigue risk management process;
- (b) the reliability of the safety performance indicators; and
- (c) the attainment of the safety objectives.

(3) An air operator shall have procedures for the ongoing monitoring of the effect of the variance described in the notice of intent on the flight crew members' levels of fatigue and alertness.

[700.220 to 700.224 reserved]

Safety Case

700.225 (1) The air operator shall ensure that a safety case is established in respect of a flight subject to an exemption referred to in section 700.200 to demonstrate that the variance described in the notice of intent does not increase the level of fatigue or decrease the level of alertness of the flight crew members.

(2) The safety case shall consist of

- (a) a description of the flight in respect of which an exemption set out in section 700.200 applies;
- (b) the provisions of these Regulations from which the air operator and flight crew members are exempt;
- (c) a description of the manner in which the flight is conducted results in a variance from the requirements of the provisions referred to in paragraph (b);
- (d) the data collection methodology and data used initially to establish, in respect of the flight, the baseline levels of fatigue and alertness of the flight crew members and to identify fatigue-related hazards and risks;
- (e) the data collection methods used to evaluate the safety case on an ongoing basis;
- (f) the scientific studies used to demonstrate that the variance referred to in paragraph (c) is not likely to have an adverse effect on the flight crew members' levels of fatigue and alertness;
- (g) an analysis of the effect of the variance on the levels of fatigue and alertness of flight crew members that takes into account the flight crew members' schedule before and after the flight in respect of which the exemption applies and the findings of the fatigue risk assessment;
- (h) the fatigue risk controls that are implemented to address the findings of the risk assessment;
- (i) procedures to measure the effect of the variance on the levels of fatigue and alertness of the flight crew members;

- (j) the preventive measures or corrective actions that are taken to remedy any adverse effect of the variance on the levels of fatigue and alertness of the flight crew members; and
- (k) the means that will be used to monitor the effectiveness of the fatigue risk management system in managing the safety case.

(3) A safety case is validated when the following conditions are met:

- (a) fatigue and alertness data have been collected during a period of not less than one year and not more than two years starting on the day on which the flight is first conducted under an exemption referred to in section 700.200, for not less than 20 consecutive flights identified in the notice of intent, and the data shows that not more than 5% of those flights have an adverse effect of more than 5% on the baseline levels of fatigue and alertness of the flight crew members determined by means of the methodology described in paragraph (2)(d);
- (b) the fatigue risk assessment has been conducted and the findings of the assessment have been analyzed;
- (c) mitigation measures have been implemented to manage the hazards and risks related to the variance to remedy increases in the level of fatigue and decreases in the level of alertness of flight crew members;
- (d) the mitigation measures have been monitored to determine their effect on the flight crew members' levels of fatigue and alertness;
- (e) corrective actions have been taken if the mitigation measures monitored under paragraph (d) do not achieve the desired effect on the flight crew members' levels of fatigue and alertness; and
- (f) the effectiveness of the mitigation measures and, if applicable, the corrective actions in maintaining the established levels of fatigue and alertness of the flight crew members is shown.

[700.226 to 700.230 reserved]

Fatigue Risk Management System – Initial Audit

700.231 (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 700.219(1).

(2) The air operator shall analyze the findings of the audit and shall, if deficiencies are identified,

- (a) investigate and analyze their cause and contributing factors; and
- (b) develop and implement preventive measures and corrective actions to address the findings.

(3) The air operator shall assess the preventive measures and corrective actions to ensure that they are effective and are used on an ongoing basis to improve the fatigue risk management system.

(4) Subsection (1) does not apply if the air operator has already implemented a fatigue risk management system and validates a safety case for a subsequent variance for the purposes of an exemption referred to in subsection 700.234(1) or uses an approved safety case in respect of another flight for the purposes of an exemption referred to in subsection 700.240(1) if an audit has already been conducted.

Submission of Safety Case for Approval

700.232 The air operator shall submit the validated safety case to the Minister for approval along with a statement that the initial audit has been conducted in accordance with section 700.231 and that the fatigue risk management system meets the requirements of this Division.

Approval of the Safety Case

700.233 The Minister shall approve the safety case of an air operator if the Minister determines, on the basis of the information provided by the operator, that the conditions of subsection 700.225(3) are met and that the initial audit has been conducted.

Continuing Exemption

700.234 (1) An air operator and a flight crew member who are exempt under section 700.200 from the application of certain provisions in respect of a flight continue, on receipt of the approval of the safety case by the air operator, to be exempt from the application of the same provisions for that flight and, if applicable, for any other flight described in the notice of intent under section 700.206.

(2) The exemption referred to in subsection (1) continues to have effect as long as

- (a) the air operator maintains the fatigue risk management system in accordance with the applicable conditions of this Division;
- (b) the air operator monitors the effectiveness of the safety case in managing the fatigue and alertness of the flight crew members in accordance with section 700.248; and
- (c) the air operator remedies any adverse effects of the variance on the flight crew members' levels of fatigue and alertness no later than 60 days after the date on which the adverse effect is identified in the course of monitoring.

[700.235 to 700.239 reserved]

Exemption for Other Flights

700.240 (1) An air operator and flight crew members who are exempt under section 700.234 from the application of certain provisions in respect of a flight on the basis of an approved safety case are exempt from the application of the same provisions, on the basis of the same approved safety case, in respect of another flight if

- (a) the air operator has provided the Minister a letter of confirmation in accordance with subsection (2);
- (b) the duration of the flight duty period for the other flight is not longer than the duration of the flight duty period of the flight;
- (c) the number of consecutive flight duty periods for the other flight does not exceed the number of consecutive flight duty periods for the flight;
- (d) each flight duty period for the other flight starts within 60 minutes of each corresponding flight duty period for the flight;
- (e) the other flight is conducted in the same time zone or across the same number of time zones in the same direction as the flight and is conducted by flight crew members who are all acclimatized to the same time zone;
- (f) any part of the flight duty period for the other flight that occurs within the flight crew members' window of circadian low does not exceed the duration of the flight duty period for the flight that occurs within the flight crew members' window of circadian low;
- (g) the other flight is conducted using aircraft of the same type as that used to conduct the flight;
- (h) the other flight is conducted with the same number of flight crew members on board as the flight;
- (i) the operating environment of the other flight is similar to the operating environment of the flight;
- (j) the hazards and risks associated with the other flight are similar to those of the flight;
- (k) the duration of each rest period before and after each flight duty period associated with the other flight is not shorter than each rest period associated with the flight;
- (l) the time of day of each rest period of the other flight is similar to the time of day of each rest period of the flight; and
- (m) the number of consecutive flight duty periods occurring during any part of each flight crew member's window of circadian low for the other flight does not exceed the number of such consecutive flight duty periods for the flight.

(2) The air operator shall provide the Minister a letter of confirmation for the other flight that will be conducted under an exemption referred to in subsection (1) that sets out

- (a) a description of the other flight that will be subject to the exemption on the basis of the approved safety case;
- (b) the provisions of these Regulations from which the air operator and flight crew members will be exempt in respect of the other flight;
- (c) a description of the manner in which the other flight will be conducted results in a variance from the requirements of the provisions referred to in paragraph (b) in respect of the other flight;
- (d) a statement that the conditions in paragraphs (1)(a) to (m) are met; and
- (e) the date on which the exemption will apply to the other flight for the first time.

(3) An approved safety case in respect of a flight shall not be used for another flight unless

- (a) the provisions of these Regulations from which the air operator is exempted are the same for all the flights; and
- (b) the manner in which the flights are conducted results in a variance from the requirements of the provisions referred to in paragraph (a) is the same for all the flights.

(4) The exemption referred to in subsection (1) continues to have effect as long as

- (a) the air operator maintains the fatigue risk management system in accordance with the applicable conditions of this Division;
- (b) the air operator monitors the effectiveness of the safety case in managing the fatigue and alertness of the flight crew members in accordance with section 700.248; and
- (c) the air operator remedies any adverse effects of the variance on the flight crew members' levels of fatigue and alertness no later than 60 days after the date on which the adverse effect is identified in the course of monitoring.

[700.241 to 700.245 reserved]

Non-availability of Exemption

700.246 An air operator who was exempt from the application of provisions in respect of a flight under section 700.200 and who has not validated a safety case in the period set out in paragraph 700.200(3)(b) shall not be exempted from the application of the same provisions and in respect of the same flight for a period of two years after the expiry of that period.

Fatigue Risk Management System – Audit

700.247 The air operator who has implemented a fatigue risk management system in accordance with this Division shall ensure that an audit of its system is conducted, in accordance with the process referred to in subsection 700.219(1),

- (a) within 12 months after the day on which the initial audit is completed under subsection 700.231(1);
- (b) within 12 months after the day on which the previous audit was completed;
- (c) after an incident or accident; and
- (d) after a major change in the air operator's activities that could affect the levels of fatigue or alertness of the flight crew members.

Variance – Monitoring of Effects

700.248 (1) The air operator shall monitor, in accordance with the procedures referred to in subsection 700.219(3), the effects of the variance described in the approved safety case on the flight crew members' levels of fatigue and alertness for each period of six months during which the flight that is subject to the exemption referred to in section 700.234 is conducted.

- (2) The air operator shall collect data in respect of a representative number of flights conducted over each period of six months in accordance with the methodology set out in the approved safety case.
- (3) If the monitoring shows that the variance described in the approved safety case has an adverse effect on the flight crew members' levels of fatigue or alertness, the air operator shall develop and take corrective actions to remedy the adverse effect of the variance.
- (4) If corrective actions are taken, the air operator shall assess their effectiveness.
- (5) If the corrective actions remedy the adverse effect of the variance, the air operator shall modify the safety case to take into account the corrective actions and inform the Minister of the modification within 60 days after it is made.

Fatigue Risk Management System — Review

700.249 (1) The air operator shall conduct a review of its fatigue risk management system, in accordance with the procedures referred to in subsection 700.219(2), at least once every 12 months after the initial audit required by subsection 700.231(1) is conducted.

- (2) The review of the fatigue risk management system shall assess
 - (a) the fatigue risk management process;
 - (b) the reliability 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 remedy any deficiency identified by the review and take 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) An air operator shall not assign a duty relating to the quality assurance program for the fatigue risk management system 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 who is responsible for carrying out the task or activity will not result in an increased risk to aviation safety; and
 - (c) the audit of the fatigue risk management system will not be compromised.

[700.250 to 700.254 reserved]

Training

700.255 (1) The air operator shall ensure that training is provided to its employees every 12 months and covers the subjects set out in section 700.218.

- (2) The air operator shall ensure that there is a training record that includes
 - (a) a description of all the training that each employee has received in accordance with this section; and
 - (b) evaluation results for each employee who has received training in accordance with this section.

Documentation — Keeping up to Date

700.256 (1) The air operator shall ensure that the fatigue risk management system documentation reflects the procedures and processes that have been established and implemented.

- (2) The air operator shall notify the Minister of any changes to the fatigue risk management system within 60 days after the change is made.

Data and Documentation

700.257 (1) The air operator shall collect data in respect of flight crew members on the following:

- (a) the fatigue model used to assess the levels of fatigue and alertness of the flight crew members;
 - (b) records of testing for fatigue and alertness;
 - (c) the evaluation of the level of fatigue against the baseline level established for comparative analysis.
- (2) The air operator shall keep the following documentation:
 - (a) records and documents created in the course of conducting an audit or a review under this Division; and
 - (b) any other material created under the fatigue risk management system.

Preservation of Information

700.258 The air operator shall keep the information collected and created under this Division for five years after the day on which the information was collected or created.

Access to Documentation

700.259 The air operator shall make available to the Minister on request any documentation that it is required to collect or create under this Division.

14 Part VII of the Regulations is amended by adding the following before Subpart 3:**Division X — Flight Time, Flight Duty Period Limitations and Rest Periods****Monitoring System**

702.91 (1) An air operator shall have a system that monitors the flight time, flight duty periods and rest periods of each of its flight crew members and shall include in its company operations manual the details of that system.

(2) If a person who is assigned by an air operator to act as a flight crew member, or any other person, becomes aware that the assignment would result in the maximum flight time referred to in section 702.92 or the maximum flight duty period referred to in section 702.93 being exceeded, the person shall advise the air operator as soon as possible.

Maximum Flight Time

702.92 (1) Subject to subsection (2), an air operator shall not assign flight time to a flight crew member, and a flight crew member shall not accept such an assignment, if the member's total flight time will, as a result, exceed

- (a)** 1,200 hours in any 365 consecutive days;
- (b)** 300 hours in any 90 consecutive days;
- (c)** 120 hours in any 30 consecutive days or, in the case of a flight crew member on call, 100 hours in any 30 consecutive days;
- (d)** 60 hours in any 7 consecutive days; or
- (e)** if the member conducts single-pilot IFR flights, eight hours in any 24 consecutive hours.

(2) However, an air operator may assign flight time to a flight crew member, and a member may accept such an assignment, even if the member's flight time will, as a result, exceed the flight time referred to in subsection (1) if

- (a)** the extension of flight time is authorized in the air operator certificate; and
- (b)** the air operator and the member comply with the *Commercial Air Service Standards*.

(3) Subject to section 702.94, a flight crew member who reaches a flight time limitation established by this section shall not remain on flight duty or be reassigned to flight duty until the member has been provided with the rest period required by section 702.93 or the time free from duty required by section 702.96.

Maximum Flight Duty Period and Rest Periods

702.93 (1) Subject to subsections (3) and (5), an air operator shall not assign a flight duty period to a flight crew member, and a flight crew member shall not accept such an assignment, if the member's flight duty period will, as a result, exceed 14 consecutive hours in any 24 consecutive hours.

(2) Following a flight duty period, an air operator shall provide a flight crew member with the minimum rest period and any additional rest period required by this Subpart.

(3) When a flight duty period includes a rest period, the flight duty period may be extended beyond the maximum flight duty period referred to in subsection (1) by one-half the length of the rest period referred to in paragraph (b), to a maximum of three hours, if the air operator

- (a)** provides the flight crew member with advance notice of the extension of the flight duty period;
- (b)** provides the member with a rest period of at least four consecutive hours in suitable accommodation; and
- (c)** does not interrupt the member's rest period.

(4) An air operator shall extend the rest period that follows the flight duty period referred to in subsection (3) and that is provided before the next flight duty period by an amount of time that is at least equal to the length of the extension of the flight duty period.

(5) An air operator may assign a flight duty period to a flight crew member, and a flight crew member may accept such an assignment, even if the flight duty period will, as a result, exceed the maximum flight duty period referred to in subsection (1) if

- (a)** the extension of the flight duty period is authorized in the air operator certificate; and
- (b)** the air operator and the member comply with the *Commercial Air Service Standards*.

Unforeseen Operational Circumstances

702.94 The total flight time referred to in subsection 702.92(1) and the maximum flight duty period referred to in subsection 702.93(1) may be exceeded if

- (a)** the flight is extended as a result of an unforeseen operational circumstance that occurs after the beginning of the flight duty period;
- (b)** the pilot-in-command, after consulting with the other flight crew members, considers it safe to exceed the total flight time and maximum flight duty period; and
- (c)** the air operator and the pilot-in-command comply with the *Commercial Air Service Standards*.

Delayed Reporting Time

702.95 If a flight crew member is notified of a delay in reporting time before leaving a rest facility and the delay is in excess of three hours, the member's flight duty period is considered to have begun three hours after the original reporting time.

Time Free from Duty

702.96 (1) An air operator shall provide each flight crew member with the following time free from duty:

- (a) at least 24 consecutive hours 13 times within any 90 consecutive days and 3 times within any 30 consecutive days; and
- (b) when the member is a flight crew member on call, at least 36 consecutive hours within any 7 consecutive days or at least 3 consecutive days within any 17 consecutive days.

(2) However, an air operator may provide a flight crew member with time free from duty other than as required by paragraph (1)(a) if

- (a) the time free from duty is authorized in the air operator certificate; and
- (b) the air operator and the member comply with the *Commercial Air Service Standards*.

(3) An air operator shall notify a flight crew member on call of the start and duration of the member's time free from duty.

Flight Crew Member Positioning

702.97 If a flight crew member is required by an air operator to travel for the purpose of positioning after the completion of a flight duty period, the air operator shall provide the member with an additional rest period that is at least equal to one-half the time spent travelling that is in excess of the member's maximum flight duty period.

Long-range Flights

702.98 (1) A flight duty period during which there is one flight or a series of flights and that ends more than four one-hour time zones from the point of departure, other than a series of flights that is conducted entirely within Northern Domestic Airspace, shall be limited to three flights, in the case of a series of flights, and shall be followed by a rest period that is at least equal to the length of the flight duty period.

(2) If a flight referred to in subsection (1) is a transoceanic flight, the maximum number of flights that may be conducted after the transoceanic flight is one, excluding one unscheduled technical stop that occurs during the flight.

15 Section 703.98 of the Regulations is amended by adding the following after subsection (3):

(4) An air operator shall have a fatigue management training program for its flight crew members that contains

- (a) personal fatigue management strategies relating to
 - (i) sleep hygiene,
 - (ii) lifestyle, exercise and diet, and
 - (iii) the consumption of alcohol and drugs;
- (b) the impact of fatigue on aviation safety;
- (c) sleep requirements and the science relating to fatigue;
- (d) the causes and consequences of fatigue;
- (e) how to recognize fatigue in themselves and in others;
- (f) sleep disorders, their impact on aviation safety and treatment options; and
- (g) human and organizational factors that may cause fatigue, including
 - (i) sleep quality and duration,
 - (ii) the impact of shift work and overtime,
 - (iii) the circadian rhythm, and
 - (iv) the effects of changes of time zones.

16 Section 704.115 of the Regulations is amended by adding the following after subsection (3):

(4) An air operator shall have a fatigue management training program for its flight crew members that contains

- (a) personal fatigue management strategies relating to
 - (i) sleep hygiene,
 - (ii) lifestyle, exercise and diet, and
 - (iii) the consumption of alcohol and drugs;
- (b) the impact of fatigue on aviation safety;
- (c) sleep requirements and the science relating to fatigue;
- (d) the causes and consequences of fatigue;
- (e) how to recognize fatigue in themselves and in others;
- (f) sleep disorders, their impact on aviation safety and treatment options; and
- (g) human and organizational factors that may cause fatigue, including

- (i) sleep quality and duration,
- (ii) the impact of shift work and overtime,
- (iii) the circadian rhythm, and
- (iv) the effects of changes of time zones.

17 Section 705.124 of the Regulations is amended by adding the following after subsection (3):

(4) An air operator shall have a fatigue management training program for its flight crew members that contains

- (a)** personal fatigue management strategies relating to
 - (i)** sleep hygiene,
 - (ii)** lifestyle, exercise and diet, and
 - (iii)** the consumption of alcohol and drugs;
- (b)** the impact of fatigue on aviation safety;
- (c)** sleep requirements and the science relating to fatigue;
- (d)** the causes and consequences of fatigue;
- (e)** how to recognize fatigue in themselves and in others;
- (f)** sleep disorders, their impact on aviation safety and treatment options; and
- (g)** human and organizational factors that may cause fatigue, including
 - (i)** sleep quality and duration,
 - (ii)** the impact of shift work and overtime,
 - (iii)** the circadian rhythm, and
 - (iv)** the effects of changes of time zones.

18 The Regulations are amended by replacing “flight duty time” with “flight duty period”, with any necessary modifications, in the following provisions:

- (a)** the heading of Division VI of Subpart 4 of Part VI;
- (b)** subsection 604.98(2);
- (c)** the heading before section 604.99;
- (d)** the portion of subsection 604.99(1) before paragraph (a) and subparagraph 604.99(1)(b)(i);
- (e)** the heading before section 604.100;
- (f)** the portion of section 604.100 before paragraph (a) and paragraphs 604.100(a) and (c);
- (g)** the heading before section 604.101;
- (h)** the portion of section 604.101 before paragraph (a);
- (i)** the portion of subsection 604.102(1) before paragraph (a) and paragraph 604.102(1)(d);
- (j)** the portion of section 604.103 before paragraph (a);
- (k)** section 604.105;
- (l)** paragraph 604.197(1)(l); and
- (m)** the heading of Division III of Part VII.

Transitional Provision

Subparts 3 and 4 of Part VII

19 The references “Subsection 700.14(1)” to “Subsection 700.21(2)” in column I of Part VII of Schedule II to Part I of the *Canadian Aviation Regulations* and the corresponding amounts in column II, and Division III of Part VII of the *Canadian Aviation Regulations*, as they read on the day before the day on which these Regulations come into force continue to apply to an air operator who operates an aircraft under Subpart 3 or 4 of Part VII of the *Canadian Aviation Regulations* and to a flight crew member who operates an aircraft under either of those Subparts until four years after the day on which these Regulations are published in the *Canada Gazette*, Part II.

Coming into Force

20 (1) Subject to subsection (2), these Regulations come into force on the day on which they are published in the *Canada Gazette*, Part II.

(2) Sections 2, 10 and 13 come into force on the second anniversary of the day on which these Regulations are published in the *Canada Gazette*, Part II.

REGULATORY IMPACT ANALYSIS STATEMENT

(This statement is not part of the Regulations.)

Executive summary

Issues: Between 2006 and 2015, there were 249 fatalities and 182 serious injuries due to incidents involving Canadian-registered aircraft. While a given incident can be caused by multiple, overlapping factors (e.g. weather, mechanical failure, human error), an international study shows that flight crew member ² fatigue is a contributing factor in 15 to 20% of aviation accidents. Recognizing this relationship, the International Civil Aviation Organization (ICAO) published Standards and Recommended Practices (SARPs) for fatigue risk management in 2009, and since then, other jurisdictions, including the United States (U.S.), the European Union (EU), Australia and India, have taken steps to strengthen their flight crew fatigue risk management requirements. The previous Canadian regulatory regime did not reflect the current and growing knowledge of fatigue impacts on flight crew performance and did not adequately address the risks posed by fatigue to flight crews and passengers.

Description: The amendments to the *Canadian Aviation Regulations* (CARs) strengthen Canada's flight crew fatigue risk management requirements for air transport services in Canada (excluding private air operators) via enhanced prescriptive regime and an optional, more flexible Fatigue Risk Management System (FRMS) exemption mechanism. The prescriptive regime applies to air operators who are subject to Subparts 703 *Air Taxi Operations*, 704 *Commuter Operations* and 705 *Airline Operations* of the CARs. Medical evaluation (Medevac) flights ³ will continue to follow the prescriptive regime that was in effect prior to the coming into force of the amendments. The FRMS provisions can be used by air operators who are subject to Subparts 702 *Aerial Work*, ⁴ 703, 704 and 705.

Air operators who are subject to Subpart 705 will have two years after the publication of the amendments in the *Canada Gazette*, Part II, to comply with the new requirements, while air operators subject to Subparts 703 and 704 will have four years. For air operators who are subject to Subpart 702, the optional FRMS provisions come into force two years from the date of publication of the amendments in the *Canada Gazette*, Part II.

Cost-benefit statement: Transport Canada estimates that the amendments will result in a reduction in accidents, with benefits to passengers, flight crew members, air operators, and the Government of Canada valued at approximately \$409.38 million over 20 years. The amendments will also result in unquantified benefits for flight crews, due to an improved quality of life.

The amendments are estimated to result in costs to industry of \$397.32 million over the same period, mainly due to the changes to flight crew scheduling requirements. The costs to the Government of Canada are estimated at \$406,298. Overall, the amendments are expected to result in a monetized net benefit of \$11.65 million; however, given other non-quantified benefits, Transport Canada anticipates that the amendments will result in a significant overall benefit to Canadians.

"One-for-One" Rule and small business lens: The "One-for-One" Rule does not apply to the amendments, as there are no incremental administrative burden costs for business as defined under the "One-for-One" Rule. The small business lens applies and the amendments include several flexibilities that will mitigate potential disproportionate impacts on small businesses, including a four-year phase-in period for smaller Subpart 703 air operators.

Domestic and international coordination and cooperation: The amendments modernize Canada's fatigue risk management regime with requirements that are consistent with the ICAO SARPs, and generally aligned with U.S. and EU requirements. Canada-unique requirements were included in collaboration with stakeholders (e.g. air operators and pilots), and to address Canada-specific risks.

Background

It is recognized that fatigue has a significant, detrimental impact on health and behaviour. Fatigue negatively affects memory, concentration, reaction time, decision making, risk perception and emotions ⁵ (see Box 1). For flight crews, fatigue can degrade performance and lead to piloting errors that may have major consequences, including aircraft damage or loss, and injury or death. There is evidence that, after 12 hours of work, human performance begins to exponentially degrade (the previous provisions in the CARs allowed a maximum flight duty period [FDP] of up to 14 consecutive hours in a 24-hour period). After flying for an extended period during the night, the impairments a pilot experiences, landing a plane at 5 a.m., are equivalent to having a blood alcohol level of 0.08%, ⁶ the legal limit for drivers in Canada.

Investigations of civil aviation accidents have identified flight crew fatigue as a contributing factor in a number of accidents and incidents.

- On February 12, 2009, a Colgan Air aircraft, flight 3407, crashed into a house in Clarence Center, New York, U.S., after experiencing an aerodynamic stall. All 49 people on board were killed, along with one person in the house. The aircraft was destroyed by the force of the impact and a post-crash fire. This disaster brought flight crew member fatigue to the forefront as an international air safety issue. When the accident investigation was complete, the U.S. National Transportation Safety Board (NTSB) stated that "the pilots' performance was likely impaired because of fatigue." Although the NTSB confirmed that the extent of their impairment and the degree to which it contributed to performance deficiencies during the flight could not be conclusively determined, tiredness was cited as one of the factors in the crew's failure to respond quickly and appropriately to the aircraft's loss of speed.
- The Transportation Safety Board of Canada (TSB), which has only recently started to take fatigue specifically into account during investigations (fatigue was previously grouped under "human factors"), has nevertheless documented 2 Canadian accidents in the last 10 years, which resulted in injuries or fatalities, in which fatigue has been attributed as a factor: (1) on October 14, 2004, an international cargo aircraft (MK Airlines, flight 1602) crashed while attempting to take off from Halifax International Airport, and seven crew members were killed; and (2) on January 14, 2011, a passenger aircraft (Air Canada, flight 878) dropped 400 feet in altitude over the Atlantic Ocean then rose 800 feet before levelling off at the assigned altitude, resulting in injuries to 16 people. There have been additional incidents and near misses involving Canadian aircraft to which fatigue was a contributing factor.

The effect of fatigue on flight crew members has been well documented and there is growing evidence that flight crew fatigue is prevalent in the aviation industry.

- The TSB notes that “fatigue is pervasive throughout society, and this has important implications for the highly safety-sensitive transportation industry.”
- In 2017, the Air Line Pilots Association (ALPA) conducted a survey of over 1 906 pilots, in Canada, which found that 56% of pilots reported that sleep occurred on the flight deck on their last pairing, and that one in five pilots reported that sleep on the flight deck was involuntary or unplanned. On average, the surveyed pilots experience fatigue on 36% of their duty days, and report fatigue on only 3% of duty days (and did not work). Furthermore, 82% of pilots believe that pilot fatigue is a major or moderate safety problem, 41% believe the problem of fatigue is getting worse, while just 4% think it is getting better.
- The U.S. National Sleep Foundation found that 23% of pilots admit that sleepiness has affected their job performance at least once a week compared to 17% of non-transportation workers, and that 20% of pilots admit that they have made serious errors due to sleepiness.⁷
- A 2003 study⁸ found exponential increases in risk across successive night shifts. “The frequency of incidents on each night was summed across the studies and then expressed relative to that on the first night shift. On average, risk was approximately 6% higher on the second night, 17% higher on the third night and 36% higher on the fourth night.” This risk compounds over successive nights and may result in a significant decrease in performance.
- A 2003 study⁹ found that a disproportionate share of accidents, in the U.S., occurred when flight crews had accumulated 13 or more hours on duty. Five percent of accidents occurred after 13 or more hours on duty which only accounted for 1% of pilot duty hours.

Box 1: Scientific Principles of Fatigue

World-renowned sleep scientist, Dr. Philippa Gander,¹⁰ summarizes the four principles of fatigue management science as follows:

Scientific Principle 1: Getting enough sleep (both quantity and quality) on a regular basis is essential for restoring the brain and body.

- Even partial sleep deprivation can lead to serious consequences.
- Most people need between 6 and 10 hours of sleep.
- The average adult requires eight hours.
- Regularly sleeping less than six hours can reduce performance.

Scientific Principle 2: Reducing the amount or the quality of sleep, even for a single night, decreases the ability to function and increases sleepiness the next day.

- Hours of continuous wakefulness is another factor related to fatigue.
- The longer you go without sleep, the worse your alertness and performance become.
- Sleep is the only way to restore alertness.

Scientific Principle 3: The circadian body clock affects the timing and quality of sleep and produces daily highs and lows in performance on various tasks.

- Humans are hard-wired to experience two periods of physiological sleepiness each day: during the middle of the night (defined as the period that begins at 2:00 a.m. and ends at 5:59 a.m. the Window of Circadian Low [WOCL]¹¹) and during the middle of the afternoon (i.e. nap window).

Scientific Principle 4: Workload can contribute to an individual's level of fatigue. Low workload may unmask physiological sleepiness while high workload may exceed the capacity of a fatigued individual.

- The nature and amount of work to be done (including time on task, task difficulty and complexity, and work intensity).
- Time constraints (including whether timing is driven by task demands, external factors, or by the individual).
- Factors relating to the performance capacity of an individual (e.g. experience, skill level, effort, sleep history, and circadian phase).

An international consensus to combat flight crew fatigue

ICAO defines fatigue as a physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a flight crew member's alertness and ability to safely operate an aircraft or perform safety-related duties. ICAO further identifies fatigue as a major human-factor safety hazard because it affects most aspects of a flight crew member's ability to perform their duties.

Subsequent to the Colgan Air accident, ICAO amended the SARPs associated with Annex 6 (Operation of an Aircraft)¹² of the Convention on International Civil Aviation, Part I (International Commercial Air Transport — Aeroplanes, chapter 4, section 10) in 2009, to include a series of standards for fatigue management requirements. The standards include

- a requirement that member states establish regulatory requirements for flight time, ¹³ FDPs, duty periods and rest periods ¹⁴ limitations based on scientific principles and knowledge (see Box 1) to enable flight crew members to perform at an adequate level of alertness; and
- a requirement that member states consider scientific principles which include the effects of working at different times of the day (i.e. circadian body clock); factors such as sleep hygiene (habits and practices necessary to sleep well, e.g. avoiding stimulants close to bedtime) and sleep quality; and the effects of cumulative fatigue due to workload or operational context.

ICAO further updated the SARPs in 2011 to require state members to establish performance-based FRMS regulations as an alternative to prescriptive provisions respecting fatigue for those air operators authorized to use an FRMS. Using an FRMS allows air operators certain flexibility to be exempted from the prescriptive regime while ensuring that the level of fatigue and alertness of flight crew members is at least equivalent to the prescriptive regime.

On January 4, 2012, the U.S. Federal Aviation Administration (U.S. FAA) issued a final rule, which came into force on January 4, 2014, that modernized the U.S. FAA's existing flight, duty and rest regulations to address the risk that fatigue poses to passenger operations ¹⁵ (a comparison of the amendments, and U.S. and EU requirements is provided in the Regulatory cooperation section below).

The European Aviation Safety Agency (EASA) amended the EU regulations governing flight and duty time limitations in 2014, and the amendments were implemented on February 18, 2016. It includes FRMS and flight time specification schemes that allow air operators to deviate slightly from required flight and duty time limitations in certain circumstances.

Many other civil aviation authorities, including those of Australia and India, have enacted new regulations that meet the ICAO SARPs.

Previous Canadian regulatory requirements and gaps

The previous Canadian regulatory regime for flight duty time was established in the 1970s, with adjustments in 1996. The regime was based on a basic model of managing flight crew fatigue: limiting daily hours of work, providing regular time off, and limiting the number of flight hours per week, month and year. The previous regime

- allowed pilots to work up to 14 hours in certain situations, beginning at any time of day;
- required that only eight hours be provided for sleep;
- did not account for the incremental fatigue associated with workload (multiple takeoffs and landings);
- took into consideration overall flight time during the year, but not additional duties, such as passenger/cargo loading and unloading, which can result in significant additional workload; and
- did not reflect the impact, on fatigue, associated with the time of day, sleep hygiene, sleep quality, and how to mitigate the effects of cumulative fatigue.

Issues

Flight crew fatigue is widely recognized as a risk to the safety of air transportation. Flying (piloting) is a highly psychomotor and cognitively demanding job. Pilots, who are responsible for the safe operation of an aircraft, face long workdays, often during night time or early morning hours. Working multiple long duty days consecutively without adequate rest and recovery will degrade human performance over time. Because flight crew members must sometimes rest or sleep away from home, conditions for rest and sleep quality may not be conducive to restorative sleep.

Between 2006 and 2015, there were 249 fatalities and 182 serious injuries due to incidents involving Canadian-registered aircraft, including 155 fatalities (62.2% of all fatalities) and 105 serious injuries (57.7%) due to incidents involving Subpart 703 air operators. A given incident can be caused by multiple, overlapping factors (e.g. weather, mechanical failure, human error) and, although it can be difficult to attribute a given past incident in Canada to fatigue, an international study shows that flight crew fatigue is a contributing factor in 15 to 20% of aviation accidents.

Recognizing this relationship, ICAO published SARPs for fatigue risk management in 2009, and since then, other jurisdictions, including the U.S., the EU, Australia and India, have taken steps to strengthen their flight crew fatigue risk management requirements. The previous Canadian regulatory regime, originally established in the 1970s, did not reflect the current and growing knowledge of fatigue impacts on flight crew performance, and did not adequately address the risks posed by fatigue to flight crews, passengers and Canadians.

Objectives

The objectives of the *Regulations Amending the Canadian Aviation Regulations (Parts I, VI and VII — Flight Crew Member Hours of Work and Rest Periods)* [the "amendments"] are to

- enhance safety within flight operations by improving the human performance of flight crew members, by reducing their levels of fatigue;
- update the CARs based on ICAO SARP ¹⁶ relating to flight duty limitations and rest periods, based on scientific principles and knowledge, and allow for the use of FRMS; and
- reduce existing gaps with respect to maximum flight duty and rest time, and ensure better alignment with other jurisdictions such as the U.S. and the EU.

Description

Applicability

The amendments will modify Canada's prescriptive fatigue management requirements and introduce FRMS provisions to allow exemptions from the prescriptive regime for air transport services in Canada (see Table 1). The prescriptive regime will apply to air operators who are subject to Subparts 703 *Air Taxi Operations*, 704 *Commuter Operations*, and 705 *Airline Operations* of the CARs. Medevac flights will continue to follow the prescriptive regime that was in effect prior to the coming into force of the amendments. However, the FRMS provisions can be used by air operators who are subject to Subparts 702, 703, 704 and 705 of the CARs, including air operators who conduct Medevac flights.

Table 1: Applicability of the amendments to Subparts 702, 703, 704 and 705 of the CARs

	Prescriptive regime	FRMS
Subpart 702	Not applicable (N/A) [previous requirements continue to apply]	Optional
Subpart 703	Applicable	Optional
Subpart 704	Applicable	Optional
Subpart 705	Applicable	Optional
Medevac Flights	N/A (previous requirements continue to apply)	Optional

1. *Maximum flight time*

Flight time means the time from the moment an aircraft first moves under its own power for the purpose of taking off until the moment it comes to rest at the end of a flight. The amendments reduce the maximum annual flight time limit from 1 200 to 1 000 hours in any consecutive 365 days.

2. *Maximum flight duty period*

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

- 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;
- the member reports for a flight or, if there is more than one flight during the flight duty period, reports for the first flight;
- the member reports for positioning; ¹⁷ and
- the member reports as a flight crew member on standby. ¹⁸

The amendments introduce a range of daily FDPs that vary depending on three factors: the average flight duration, the number of flights and the start time of the FDP. The FDPs are shown in Table 2, and a given FDP is calculated as follows:

- In Table 2 — Part A, determine the average flight duration for all flights in a day, and identify the appropriate row (A, B or C) in column 1;
- In the appropriate row (A, B or C), identify the column (2, 3 or 4) that contains the correct number of flights (e.g. with an average flight duration of 25 minutes, and 13 flights in a day, column 3 would be identified);
- Flights operating under day visual flight rules (VFR) will use column 2 to determine the maximum FDP — the number of flights flown and the duration of these flights will not be considered;
- In Table 2 — Part B, determine the FDP start time, and identify the appropriate row in column 6;
- In the appropriate row, find the intersection with the column identified in step 2 above (e.g. with an FDP start time of 9 a.m., a flight crew member would have an FDP limit of 12 hours — with an FDP start time of 1 a.m., the FDP limit would be 9 hours); and
- FDPs can be extended if there are in-flight rest facilities and additional flight crew members (see section 6 below: *FDP extensions — In-flight rest and augmented flight crew*).

Table 2: Maximum daily FDP calculation

Table 2 — Part A			
Average Flight Duration	Number of Flights		
Column 1	Column 2	Column 3	Column 4
Row A — 50 minutes or more	1–4	5–6	7+
Row B — 30 minutes or more, but less than 50 minutes	1–7	8–11	12+
Row C — less than 30 minutes	1–11	12–17	18+

Table 2 — Part B

Item	Start of FDP	Maximum FDP (hours)		
		Column 2	Column 3	Column 4
Column 5	Column 6	Column 2	Column 3	Column 4
1	24:00–03:59	9	9	9
2	04:00–04:59	10	9	9
3	05:00–05:59	11	10	9
4	06:00–06:59	12	11	10
5	07:00–12:59	13	12	11
6	13:00–16:59	12.5	11.5	10.5
7	17:00–21:59	12	11	10
8	22:00–22:59	11	10	9
9	23:00–23:59	10	9	9

3. Maximum number of hours of work and time free from duty

The amendments introduce a new concept of maximum hours of work to address cumulative fatigue due to flight time and other duties (section 700.29 of the amendments). The yearly maximum number of hours of work limit was calculated based on the *Canada Labour Code's* maximum hours of work requirements, which results in a limit of 2 200 working hours in any 365 consecutive days. The amendments also introduce weekly (7 days) and monthly (28 days) maximum number of hours of work limits.

The previous provisions required at least 36 consecutive hours of time free from duty in each week (7 days) [paragraph 700.19(1)(a) of the CARs]. The amendments allow for two options to accommodate two types of regular operations currently permitted under the CARs.

- Option 1 (weekly): The amendments allow for one single day free from duty per seven days (over two local nights' rest). This provides the flight crew with two consecutive sleep opportunities per week during the night and provides an opportunity to recover from the effects of cumulative fatigue.
- Option 2 (21-day rotations): The amendments allow for a 21-day period of work at a deployed location and mandate 5 consecutive days free from duty for recovery. The amendments also permit more weekly hours of work by restricting flight operations to the daytime only (beginning after 7 a.m.).

The weekly, monthly and annual hours of work limits for options 1 and 2 are outlined below in Table 3.

Table 3: Time free from duty and maximum number of hours of work

	Maximum Number of Hours of Work			Required Time Free from Duty
	7 days	28 days	365 days	
Option 1 (weekly)	60	192	2 200	1 single day free from duty per 7 days
Option 2 (21-day rotations)	70	192	2 200	5 days off/ 21 days on

4. Rest period

After completing an FDP, a pilot had to receive a rest period of eight hours plus time for travel, meals and personal hygiene under the previous requirements. This rest period was not long enough. On average, eight hours of sleep per day is required to sustain human performance and to avoid acute fatigue.

The amendments (section 700.40) will require that flight crew members be provided sufficient rest time as follows:

- When the flight duty period ends at home base, ¹⁹
 - a period of 12 hours or 11 hours plus travel time to and from the place where the rest period is taken; or
 - if the air operator provides suitable accommodation, a period of 10 hours in that suitable accommodation; ²⁰
- When the flight duty period ends away from home base, a period of 10 consecutive hours in suitable accommodation will be required.

5. Rest period: Disruptive schedules, consecutive night duty periods, time zone differences and positioning

The amendments provide additional rest in the following circumstances: disruptive schedules (e.g. transitioning from working days to working nights and vice versa); consecutive night duty periods (e.g. working consecutive night duty periods and difficulty obtaining sleep during the day); time zone differences (e.g. recovering from jet lag); and positioning (e.g. extended hours of work travelling after operating an aircraft).

(a) Disruptive schedules

Dramatic changes in duty start times will disrupt a flight crew member's circadian cycle (i.e. disrupt sleep patterns, which results in fatigue). The amendments (section 700.41) introduce a requirement for a local night's rest to prevent or reduce fatigue associated with the circadian cycle disruption. An air operator will have to provide a flight crew member one local night's rest when transitioning from an early duty ²¹ to a night duty ²² or a late duty, ²³ or vice versa. This provides the opportunity to recover from acute fatigue associated with the transition in the schedule.

(b) Consecutive flight duty periods

The previous provisions in the CARs allowed pilots to work up to five consecutive night duty periods. As performance significantly degrades over successive nights of work, the amendments introduce restrictions on consecutive night duty periods. Two options have been introduced:

- Flight crew members can work up to three consecutive night duty periods; or
- When a 3 consecutive hour break in suitable accommodation during each night duty period is provided and they receive 56 hours free from duty at the end of the last consecutive night period, flight crew members are allowed to work up to 5 consecutive night duty periods.

(c) Time zone differences

Crossing multiple time zones induces fatigue for a few reasons. In order to cross many time zones, a long work day is required (resulting in extended wakefulness) and this work day may occur at night (e.g. flights to Europe). After arriving at the destination, a flight crew member experiences jet lag. ²⁴ Therefore, the further away (in time zones) a flight crew member moves from his or her acclimatized ²⁵ time, and the longer time he or she spends away from that acclimatized time, the more fatiguing it is when returning to the starting point. To compensate for this, a longer rest period is provided after the flight away from home base; and on return to home base, one, two or three additional local nights' rest to recover must be provided. For example, a pilot who flies from Toronto to Beijing and spends 30 hours in Beijing before returning to Toronto must be provided with 2 local nights' rest upon return.

(d) Positioning

Positioning occurs when a flight crew member must travel at the request of the air operator from one point to another before or after a flight. The amendments set out the conditions under which an air operator may require the positioning of a flight crew member and how to address the fatigue resulting from the positioning flight.

Where positioning follows an FDP and the duration of the hours of work exceeds the duration of the permitted maximum FDP by

- (1) three hours or less — the air operator must provide a rest period that is equal to the duration of the hours of work; and
- (2) more than three hours — the air operator must provide a rest period that is equal to the duration of the hours of work plus the time spent positioning in excess of the FDP.

For example, if a flight crew member with an FDP of 13 hours is subsequently required to travel for 3 hours on a positioning flight, in total, they would have worked 16 hours, including 3 hours over their maximum FDP, and must be provided a 16-hour rest period. Had the positioning flight been 5 hours in duration, they would have worked 18 hours, including 5 hours over their maximum FDP, and must be provided a 23-hour rest period (18 hours of work plus 5 hours of positioning time).

6. FDP extensions — In-flight rest and augmented flight crew ²⁶

The amendments provide criteria for permitting extensions to FDPs as a result of in-flight rest. The amendments also provide extensions to the FDP based on the quality of the rest facility and whether there are one or two additional flight crew members available (i.e. on an augmented flight) [see Table 4].

Table 4: Maximum FDPs with in-flight rest facilities and additional flight crew members

	One additional flight crew member	Two additional flight crew members
Class 1 rest facility ²⁷	15 hours	18 hours
Class 2 rest facility ²⁸	15 hours	16.50 hours
Class 3 rest facility ²⁹	14 hours	15.25 hours

7. Long-range flights

Under the amendments a pilot cannot operate an additional flight following a flight with a planned flight time greater than 7 hours if the additional flight occurs within the flight crew member's WOCL (i.e. if a pilot flies for 7 hours, they cannot operate an additional flight if that flight takes place between 2 a.m. and 5:59 a.m. at the location to which the pilot is acclimatized).

8. Ultra long-range flights

The international Flight Safety Foundation conducted an extensive research into ultra long-range flight operations. This research resulted in an ultra long-range flight being defined as an FDP of over 18 hours or a flight time of over 16 hours. Under the prescriptive amendments, there can be no FDPs over 18 hours and no flight time over 16 hours. Air operators seeking to conduct flights with such extended FDPs will therefore be required to establish, implement and maintain an FRMS that complies with the amendments.

9. Unforeseen operational circumstances

The amendments include provisions respecting unforeseen operational circumstances that reflect modern fatigue science. The amendments emphasize the authority of the pilot-in-command to reduce or extend the flight crew member's FDP, in consultation with all crew members. ³⁰ The pilot-in-command may increase the FDP by

- one hour for a single-pilot operation;
- two hours for non-augmented flight crew (two-pilot operation);
- three hours for augmented flight crew if operating a single flight during the FDP; and
- two hours for augmented flight crew if operating two or three flights during the FDP.

10. Fitness for duty

Several factors may affect fitness for duty, including consumption of alcohol or drugs; mental and physical condition; and fatigue. Amendments to section 602.02 of the CARs will prohibit the operator of an aircraft from requiring any person to act as a flight crew member or to carry out any pre-flight duties, if the operator or the person is not, or is not likely to be, fit for duty. ³¹

The amendment to paragraph 602.03(a) of the CARs will prohibit a crew member from working within 12 hours after consuming an alcoholic beverage (an increase from the previous limit of 8 hours).

11. Fatigue risk management system

An FRMS is a management system that air operators can use to identify and minimize the acute and chronic sources of fatigue and manage the potential risks associated with fatigue. An FRMS is a holistic risk management approach, in which air operators

- identify hazards;
- assess risk;
- develop mitigation strategies;
- provide fatigue management training and education;
- use fatigue monitoring systems; and
- apply continual improvement processes to reflect changing circumstances and feedback.

From an operational perspective, an FRMS serves as a fatigue prevention, prediction, detection, and intervention regime.

An FRMS allows an air operator to tailor its fatigue management policies, procedures, and practices to those specific conditions and unique operational demands that induce fatigue. In general terms, an FRMS allows the air operators to

- base their operations on scientific fatigue knowledge;
- test FRMS effectiveness through fatigue modelling software, ³² pilot surveys, monitoring and other alertness testing; and
- demonstrate that pilot fatigue is not increased and alertness levels are maintained, relative to the prescriptive regime described above.

An FRMS is comprised of four required components: a Fatigue Risk Management Plan (FRMP), process, promotion program, and quality assurance program (see Table 5).

Table 5: Components and elements of an FRMS

Component	Elements
1. FRMP	Fatigue risk management policy, safety objectives, safety indicators, fatigue management responsibilities, fatigue reporting policy, training plan and communication plan
2. Fatigue Risk Management Process	Fatigue reporting procedure, identification of fatigue-related hazards, data collection and analysis, method to analyze planned work schedules, fatigue modelling of flight crew schedules, fatigue risk assessment and management process, fatigue data and information management
3. Fatigue Risk Management Promotion Program	Training program for FRMS components and functions, employee responsibilities, impact of fatigue on aviation safety, how to recognize fatigue, sleep disorders, human and organizational factors that may cause fatigue, actions to be taken for fatigue-related risks, personal fatigue management strategies, and means to measure competency attainment Communication procedure to inform employees of FRMS- and fatigue-related information
4. Fatigue Risk Management Quality Assurance Program	FRMS audit process, FRMS effectiveness review process, variance monitoring procedures for effect on flight crew fatigue and alertness

The amendments will provide, to Subparts 702, 703, 704 and 705 air operators, the possibility to be exempted from the prescriptive regime (except for maximum annual flight time, maximum annual number of hours of work, designation of home base, and nutrition break) if they can demonstrate through the validation of their safety case that the level of fatigue and alertness of flight crew members is not adversely impacted by being exempted from the prescriptive regime introduced in the amendments. For Subpart 702 air operators, the prescriptive regime is not changing; however, the FRMS option will remain available to these air operators, as an alternative to the prescriptive regime.

In order to be exempted from specific provisions of the prescriptive regime, an air operator must submit a notice of intent to Transport Canada identifying the prescriptive provision(s) from which the air operator will vary to operate specific flight(s), and establish and implement a fatigue risk management plan, and fatigue risk management process.

The air operator can then use an initial exemption, from the prescriptive regime, to establish and validate a safety case. An air operator must complete the implementation of their FRMS while collecting and analyzing information to validate a safety case. This information could include, but is not limited to, the following:

- (a) flight crew member performance data and fatigue reports;
- (b) fatigue survey results and audit findings;
- (c) aircraft flight data monitoring and analysis of operational errors;
- (d) accident or incident investigation results;
- (e) fatigue modelling of flight crew schedules;
- (f) comparisons of planned schedules in relation to actual time worked; and
- (g) a review of operational or administrative duties performed by flight crew members in addition to FDPs.

An air operator must notify Transport Canada at 90-day intervals, or at the end of the period during which the flight is operated if that period is shorter than 90 days, that updates of the analysis of this data are available for inspection, to demonstrate progress in the development of their safety case.

Once the safety case is validated and the air operator has conducted an initial audit of its FRMS, the air operator must submit the safety case to Transport Canada for approval. A continuing exemption from the prescriptive regime will take effect upon Transport Canada's approving the safety case, and remain valid as long as the air operator maintains their FRMS and ensures that the safety case continues to effectively manage the level of fatigue and alertness of flight crew members. Table 6 below provide further information on the FRMS process.

The amendments also provide the possibility for an air operator to use an approved safety case for obtaining an exemption for other flights that meet similarity criteria with the flights already conducted under the approved safety case.

Table 6: Overview of the FRMS process

Steps an air operator must follow to use an initial exemption to develop a new safety case	
1. Prepare and Start FRMS Implementation	<ul style="list-style-type: none"> • Review flights/routes/schedules to determine need for exemption(s) • If exemption(s) needed, perform FRMS gap analysis • Implement FRMS components 1 and 2 (FRMP and Fatigue Risk Management Process — see Table 5) • Send notice of intent to Transport Canada for review before planned use of initial exemption to operate first flight
2. Start Initial Exemption	<ul style="list-style-type: none"> • Develop safety case for each exemption: <ul style="list-style-type: none"> ◦ Collect and analyze flight crew fatigue data to determine effect of variance ◦ Develop and implement fatigue risk controls ◦ Develop safety performance indicators ◦ Implement corrective measures • Notify Transport Canada during operation of exempted flight that an update of the variance impact analysis is ready for inspection (every 90 days, or if the period during which the flight is conducted is less than 90 days, at the end of the period)
3. Complete FRMS implementation and Safety Case Development	<ul style="list-style-type: none"> • Implement FRMS components 3 and 4 (Fatigue Risk Management Promotion Program & Fatigue Risk Management Quality Assurance Program — see Table 5) • Conduct initial FRMS audit and correct any deficiencies • Validate safety case within two years of first flight flown under initial exemption • Send validated safety case to Transport Canada for review and approval as per section 700.232, with letter confirming audit was conducted and FRMS is compliant
4. Start Continuing Exemption	<ul style="list-style-type: none"> • Monitor variance effects at least every six months to confirm flight crew fatigue and alertness is not adversely impacted

	<ul style="list-style-type: none"> • Implement corrective measures if required and assess their effectiveness • Modify safety case if required to take corrective measures into account and notify Transport Canada within 60 days • Transport Canada will review the notification of modified safety
5. Monitor Variance Effects and Maintain FRMS	<ul style="list-style-type: none"> • Monitor effectiveness of FRMS in managing the safety case • Correct any adverse impacts of the variance on flight crew fatigue • Conduct annual fatigue management training • Conduct annual FRMS audits and reviews, and implement corrective measures • Keep records of all material created under the FRMS for five years
Steps an air operator must follow to use their existing safety case for new similar flights	
1. Expansion of existing safety case	<ul style="list-style-type: none"> • Send letter of confirmation to Transport Canada for review before planned use of continuing exemption to operate similar flights based on approved safety case

Regulatory and non-regulatory options considered

Voluntary approach

Through labour agreements and internal risk management, some Canadian air operators may have already begun adapting their operations to more effectively prevent and mitigate flight crew fatigue.

The cost of continuing with this voluntary approach will be lower than a regulatory approach due to lower overall adoption by air operators, and little to no intervention by the Government of Canada. However, the benefits will also be lower as not all air operators will increase safety through fatigue risk management methods equivalent to the amendments, and some will likely not make any changes. As a result, fewer safety benefits will be attained with a voluntary approach.

Regulatory approaches

Option 1: Prescriptive regime

A number of regulatory options were considered at an early stage in the development of the amendments. One of the options was the application of a prescriptive regime that would apply to air operators who are subject to Subparts 703, 704 and 705.

Option 1 would enhance safety in particular for smaller air operators (Subparts 703 and 704) and would increase the CARs compliance with ICAO SARPs. This option, by excluding the Subpart 702 *Aerial Work* air operators, also takes into account the economic hardship and operational restraints that this proposal may cause for those air operators, as the prescriptive regime may be too rigid and less appropriate to the small-scale operations of these air operators.

A cost-benefit analysis performed by Transport Canada has shown that the costs of a prescriptive regime would exceed the benefits by about \$36.83 million (present value). However, Option 1, which addresses flight crew fatigue solely through prescribed limits on maximum flight time and maximum number of hours of work, is less cost-effective than a more flexible option where air operators can comply with either the prescriptive regime or benefit from an exemption from certain requirements of the prescriptive regime in respect of a flight, provided the conditions associated with the exemption are met, depending on the air operator's and cost structure.

Option 2 (adopted): Prescriptive regime and FRMS option

Through the consultations, industry has raised objections to the "one-size-fits-all" nature of the prescriptive regime described under Option 1. Option 1 does not take into consideration the operational differences between air operators, and does not allow for flexibility on how flight crew fatigue can be managed.

FRMS allows an air operator the flexibility to tailor their approach to fatigue management to their operations, while providing at least the same safety level as Option 1. Depending on the complexity and/or size of their operations, an air operator may choose to place only certain flights or routes in their operations under an FRMS, and others may be managed under the prescriptive regime. Alternatively, air operators may choose not to implement an FRMS and instead manage all of their operations under the prescriptive regime.³³ Therefore, Option 2 offers greater flexibility than Option 1.

The adopted option will result in a combined regulatory approach including both the new prescriptive regime and FRMS provisions. A combined regulatory approach provides flexibility, which may allow the reduction of costs associated with crew member fatigue risk management.

Option 3: Amended prescriptive regime for Subparts 704 and 705 air operators only

Following prepublication of the proposed amendments, stakeholders noted that the amendments will apply the prescriptive regime to Subpart 703 air operators, and a potential for significant impacts on the viability of some air operators, and on the northern and/or remote communities that they serve.

This option would decrease safety since Subpart 703 accounts for a high number of accidents involving Canadian-registered aircraft. According to the TSB, between 2006 and 2015, there were a total of 488 aircraft accidents involving aircraft of all sizes. The majority of these accidents (54.5%) involved aircraft operated by Subpart 703 air operators. Additionally, over the same period, TSB has determined that 62% of fatalities and 57.7% of injuries involve Subpart 703 air operators.

Benefits and costs

Adopting the amendments will cost industry about \$397.32 million ³⁴ over 20 years, mainly due to the changes to flight crew scheduling requirements. The costs to the Government of Canada are estimated at \$406,298. Flight crew member fatigue has been linked to accidents and incidents. Estimates show that a potential reduction in accidents will benefit passengers, flight crew members, air operators, and the Government of Canada by approximately \$409.38 million.

Costs

Compliance with the prescriptive regime and FRMS will result in incremental costs to air operators and to the Government of Canada.

1. Costs to air operators

Transport Canada is expecting that the following proportions of flights will be operated under the prescriptive regime (the remainder being operated under an FRMS): Subpart 705: 80%; Subpart 704: 98%; Subpart 703: 84%; Subpart 702: 97%. Costs to air operators associated with the prescriptive regime fall into three main categories: flight operations, fatigue training, and rest facilities and are estimated at \$363,664,588.

FRMS costs include operational costs as well as implementation costs. For operational costs, air operators will need to adjust their business strategy and operations to meet regulatory requirements, and manage flight crew member fatigue. In addition to the change in operational costs, air operators using an FRMS will incur FRMS implementation costs, which include developing notices of intent; establishing, maintaining, implementing and monitoring FRMS; building safety cases; performing audits; and keeping records. Overall, adopting an FRMS will lead to incremental costs to industry, which are expected to be \$33,657,875.

2. Costs to the Government of Canada

Government of Canada costs will be split between administration and compliance promotion, while incremental enforcement costs will be negligible. The regulatory administration is comprised of the review and approval process for FRMS safety cases. Compliance promotion will require guidance materials to be updated, internal training to be developed and delivered, and external briefings to be delivered to stakeholders. The total costs to the Government of Canada are estimated to be \$406,298.

Benefits

The amendments will benefit passengers, commercial air operators, crew members and the Government of Canada. The monetized benefits of the amendments include avoided fatalities, injuries, property damages, investigations, and improved flight crew welfare as measured by decreased sick leave. Data scarcity did not allow the monetization of benefits due to reduced incidents, ³⁵ (e.g. avoided medical costs, environmental damage, third party damage, on-ground fatalities, loss of reputation, airline and airport delay, rescue costs, cargo and passenger luggage damage and loss), as well as improved flight crew members' welfare.

1. Benefits for passengers

New prescriptive regime and FRMS provisions for air operators are expected to result in fewer fatalities and injuries. Using TSB historical data, a fatigue contribution rate of 17.5%, an annual passenger growth rate of 4.47%, ³⁶ and an effectiveness rate of the amendments of 52.5%, ³⁷ the present values of the avoided fatalities and injuries are estimated at \$206,895,444 and \$18,551,028, respectively.

2. Benefits to commercial air operators

The amendments will result in avoided property damage and/or commodity loss for air operators. The expected aircraft damage avoided was determined by multiplying the calculated residual value with the average annual probability of an aircraft accident. The present value of avoided property damage is estimated at \$168,367,708. The amendments will result in an estimated avoided commodity loss of \$1,047,216.

3. Benefits to flight crew members

Reducing flight crew members' exposure to fatigue may result in better health conditions and, therefore, flight crew welfare is expected to be improved. Transport Canada has been able to value the benefit related to reduced sick leave only ³⁸ at \$13,147,164 total.

4. Benefits to the Government of Canada

To estimate the avoided TSB investigation costs, Transport Canada used budget data from the TSB's *Plans and Priorities*, 2016–2017. The amendments will result in \$1,369,660 in avoided investigations.

Summary of costs and benefits

Over the 2018–2037 period of analysis, Transport Canada estimates the present value of the costs of the amendments to be \$397.73 million and the benefits to be \$409.38 million. Overall, the net benefits of the amendments will be \$11.65 million. The results are presented in Table 7.

The changes, while bringing Canada in line with ICAO's SARPs for flight crew fatigue management, will be beneficial to various stakeholders, mainly to air passengers, and also to flight crew members, although that benefit is not fully monetized. The analysis shows that benefits to passengers will represent more than 55% of the total monetized benefit. Considering many benefits that Transport Canada was unable to quantify, it is possible that the amendments will result in a larger net benefit to Canadians.

Table 7: Results of the cost-benefit analysis of the amendments (2016 CAD\$, 7% discount rate)

Benefits and Costs	2018	2020	2022	2037	Total present value
Monetized benefits					
Benefits to passengers					
Avoided fatalities	0	878,749	13,361,675	10,738,283	206,895,444
Avoided injuries	0	131,303	1,198,987	956,116	18,551,028
Benefits to industry					
Avoided property damage	0	5,526,833	14,473,569	5,641,829	168,367,708
Avoided commodity loss	0	84,280	86,146	31,223	1,047,216
Benefits to flight crew members (decreased sick leave)	0	753,565	1,060,594	446,700	13,147,164
Benefits to government (avoided accident investigation)	0	19,823	116,972	48,098	1,369,660
Total benefits	0	7,394,553	30,297,943	17,862,249	409,378,220
Monetized costs					
Costs to industry					
Flight operations	0	22,619,122	43,855,667	11,638,245	351,600,365
Fatigue training	0	966,179	460,827	35,899	2,336,910
Rest facilities	0	9,727,312	0	0	9,727,312
FRMS operational	0	4,164,077	3,187,645	942,992	31,150,334
FRMS implementation	0	8,479	39,583	89,040	2,507,542
Costs to government					
Administration	0	0	0	0	173,041
Compliance promotion	218,134	8,073	7,051	0	233,258
Enforcement	0	0	0	0	0
Total costs	218,134	37,493,242	47,550,774	12,706,176	397,728,761
Net benefits	(218,134)	(30,098,689)	(17,252,830)	5,156,074	11,649,459
Qualitative and non-monetized benefits					
Improved flight crew welfare, i.e. improved quality of life					
Decreased flight crew medical costs as fatigue-related health issues may be lessened					
Improved passenger and flight crew welfare through reduced incidents					
Avoided site contamination and environmental cleanup					

Avoided third party damage and on-ground fatalities
Avoided loss of reputation
Avoided airline delay and rescue costs
Avoided cargo and passenger luggage damage and loss

*Due to rounding, some of the columns may not add up exactly.

Overall, the benefit-cost ratio is estimated to be 1.03 for the amendments. As shown in Table 8, Subparts 705 and 704 air operators will incur higher costs for the amendments relative to their monetized benefits, whereas Subparts 703 and 702 air operators will have higher benefits than their incurred costs. Had all benefits been monetized, the ratios would all be higher.

Table 8: Benefit-cost ratio by air operator group

705	704	703	702
0.52	0.56	2.59	5.98

Sensitivity analyses

Sensitivity analyses were also performed to measure the impact of uncertainty for some key variables on the amendments' net benefit value and benefit-cost ratio. The sensitivity analyses considered changes in the following variables: crew scheduling cost, effectiveness rate of fatigue management measures, discount rate, timeframe, FRMS operational cost saving factor, proportion of flights adopting FRMS, and split of the Subparts 703 and 702. The highest benefit-cost ratio found was 3.766 and the lowest was 0.840.

Distributional analyses

Attention was paid to how the costs will affect air operators on average and by flight crew member. The analyses found that Subpart 705 air operators will carry the highest cost per operator (\$4.97 million) and Subpart 702 air operators will carry the lowest (\$2,556). By flight crew member, Subpart 703 air operators will carry the highest cost (\$57,008), and Subpart 702 air operators will carry the lowest (\$382).

The analysis also considered how the regulatory changes might affect provinces and territories and found that estimated costs are well distributed across the country. Ontario will bear the highest total costs in Subparts 705, 704, and 702 air operators, while British Columbia will see the largest costs for Subpart 703 air operators.

In order to assess the costs to consumers, Transport Canada looked at the possible costs passed on through passenger plane tickets. The maximum that could be passed on to consumers is \$0.29 per passenger per flight.

“One-for-One” Rule

The “One-for-One” Rule does not apply to the amendments. The amendments result in administrative costs only for those businesses that implement an FRMS. However, given that air operators can follow the prescriptive regime, costs associated with the FRMS provisions are not considered an administrative burden for the purposes of the “One-for-One” Rule. Transport Canada has sought to minimize these costs so that the requirements on air operators are manageable and adopting an FRMS is cost-effective.

Small business lens

The amendments will affect 605 Canadian air operators including 40 Subpart 705 air operators, 71 Subpart 704 air operators, and 494 Subparts 703 and 702 air operators. Most of Subparts 703 and 702 air operators have 100 employees or fewer and therefore are considered as small businesses. In comparison with the large/medium businesses, Canada will allow two more years for small businesses to comply with the amendments. Table 9 compares the total costs between the flexible and initial options.

Table 9: Comparison between flexible and initial options (2012 CAD\$, 7% discounted, 10-year timeframe)

	Flexible option	Initial option
<i>Number of small businesses impacted</i>	Subpart 703 air operators: 4 years to comply	Subpart 703 air operators: 2 years to comply
	Subpart 702 air operators: 2 years to comply	Subpart 702 air operators: 2 years to comply
	<i>Subparts 703 and 702 (494)</i>	<i>Subparts 703 and 702 (494)</i>

	Annualized average	Present value	Annualized average	Present value
Total costs for all small businesses	4,643,801	32,616,118	6,394,655	44,913,383
Total costs to 703	4,617,114	32,428,679	6,367,968	44,725,944
Total costs to 702	26,687	187,439	26,687	187,439

In comparison to the initial option, the flexible option will reduce the annualized average cost for Subpart 703 air operators by roughly 27.38%. Due to Transport Canada not imposing the proposed prescriptive regime on Subpart 702 air operators, there is no difference between the two options for those small businesses. The costs listed for Subpart 702 air operators are FRMS only. Overall, the flexible option will save Canadian small businesses roughly \$12.30 million over the 10-year timeframe.

Consultation

Transport Canada conducted extensive consultations prior to and during the development of the amendments. Many stakeholders were consulted throughout the process, including air operators, associations, pilots and pilots' unions. These consultations were conducted in different fora, including a joint working group, face-to-face meetings, online notices, conference calls and technical briefings.

Initial consultations aimed to

- identify the stakeholder groups (including both air operators and pilots);
- inform the current stakeholder community about the amendments;
- build stakeholder support for the amendments;
- gather relevant information (i.e. for the cost-benefit analysis); and
- gauge stakeholder reactions to changes to the regulatory landscape.

Flight Crew Fatigue Working Group, August 2010 to December 2011

In 2010, Transport Canada created a working group of pilots, industry associations and Transport Canada employees. The Working Group chose Dr. Gregory Belenky, a research professor at the Sleep and Performance Research Center at Washington State University, as its scientific advisor. The Working Group

- met for approximately 43 days over the course of 18 months;
- reviewed and considered about 190 data sources; and
- published a final report ³⁹ in August 2012, which addressed various discussion topics and provided recommendations.

The Helicopter Association of Canada (HAC) indicated that for their operations, access to a 14-hour duty day was non-negotiable. Initially, the other representatives for air operators, including the Air Transport Association of Canada (ATAC), the Northern Air Transport Association (NATA), the Manitoba Aviation Council (MAC), and the Canadian Business Aviation Association (CBAA) were willing to discuss the issues. However, once it became apparent that the amendments would be more substantive, as supported by the science, all of the representatives for air operators opposed the Working Group report and the resulting proposals.

The National Airlines Council of Canada (NACC), representatives of the pilots' associations (Air Canada Pilots Association [ACPA], WestJet Pilots Association [WJPA], and ALPA) and Teamsters Canada accepted the science but did propose several compromises in the hopes of gaining wider support.

Notice of Proposed Amendment (NPA), September 2014

As a result of the Working Group recommendations, Transport Canada published an NPA on September 15, 2014, for consultation.

During this consultation period, Transport Canada received 83 unique submissions ⁴⁰ on the NPA through the Canadian Aviation Regulation Advisory Council (CARAC) consultation process:

- 32 submissions (39%) supported the changes;
- 35 submissions (42%) partially supported the changes, and made suggestions on areas of improvement; and
- 16 submissions (19%) opposed the changes.

Opposing respondents included several individual pilots as well as small to large air operators. Generally, the following issues created the most opposition:

- the maximum FDP table under consideration at that time;
- more restrictive duty lengths based on start times; and
- the implementation period under consideration (one year for all air operators).

Following the NPA consultation period, Transport Canada held face-to-face meetings with stakeholders, from January 19 to 23, 2015, to seek more information on their comments. The first three days consisted of meetings with air operator associations (ATAC, CBAA, HAC, NACC and NATA), while pilot associations (ACPA, ALPA and WJPA) attended the last two days.

Consultation — May 2015

On May 20, 2015, Transport Canada organized another face-to-face meeting with the associations representing stakeholders directly impacted by the changes. ALPA, ACPA, HAC, NACC, Teamsters Canada, ATAC, NATA, and WJPA attended the meeting. During the meeting, Transport Canada proposed additional changes based on the submissions received during the NPA consultation.

Many of the comments Transport Canada received reiterated the concerns that stakeholders had previously raised. Additional concerns arose regarding the consultation process, perceived industry hardship, and implementation timelines.

A lack of consensus between stakeholders emerged, during consultations, on key considerations. For example, while unions and associations representing pilots (specifically ALPA and ACPA) advocated for the same implementation timeframe for air operators who operate aircraft under Subparts 705, 704, and 703 of the CARs, the air operators supported a delayed implementation for Subparts 704 and 703.

1. Implementation timeframe

Transport Canada took the two points of view into consideration, analyzed the impacts on small and medium businesses (mostly Subpart 704 and 703 air operators) and recommended the following new implementation timeframes for the prescriptive regime:

- Subpart 705: 12 months (this subsequently was changed to 24 months) from the date of registration of the amendments; and
- Subparts 704 and 703: 48 months from the date of registration of the amendments.

2. Cargo air operators

One Subpart 705 cargo air operator voiced concerns with respect to the inclusion of cargo-only operations, given that these operations were excluded, by the U.S. FAA, from their 2012 Final Rule.

Although U.S. air cargo carriers were excluded from the application of the U.S. FAA's new flight and duty time rules (Part 117 ⁴¹), they must follow the *Airline Safety and Federal Aviation Administration Extension Act of 2010*, ⁴² in which U.S. Congress mandated that all Part 121 air carriers (large air carriers), in both passenger and cargo operations, develop and use an FRMP. ⁴³ In addition, neither EASA nor the Australian Civil Aviation Safety Authority exempted cargo-only operations from their fatigue risk management requirements.

The U.S. FRMP requires that the air cargo carriers to analyze their schedules and adjust them where fatigue is found to be a problem. This has resulted in U.S. air cargo carriers reducing FDPs, increasing rest periods and making sleep rooms available for use while aircraft are being loaded and unloaded at cargo hubs during the night.

Transport Canada, after consulting union members (some representing cargo operations), recognized that all pilots (both passenger-carrying and cargo flight crew members) experience fatigue. Cargo air operators are more likely to fly during the night, when the body naturally wants to sleep — which creates risk in cargo operations due to human physiology.

Consultation — June 2016

On June 21, 2016, Transport Canada held a face-to-face CARAC briefing with stakeholders to update them on the path forward, timelines, implementation periods and guidance materials. Transport Canada confirmed that the amendments under consideration at that time would apply to all air cargo operations. The stakeholders were supportive of Transport Canada's decision not to include air operators who operate aircraft under Subpart 702 *Aerial Work* and 604 *Private Operators* under the prescriptive regime, both types of operations being governed by their own requirements on flight crew fatigue management.

Notice of Intent — March 2017

On March 25, 2017, a notice of intent ⁴⁴ was published in the *Canada Gazette*, Part I, to communicate to stakeholders Transport Canada's policy direction on these amendments. Transport Canada chose to publish a notice of intent before engaging the stakeholders in the formal *Canada Gazette*, Part I, consultation process so as to give Canadians and impacted stakeholders an opportunity to better understand and comment on Transport Canada's policy direction on flight crew fatigue management.

Transport Canada received a total of 15 comments from various groups: four from individual pilots, four from air operators, five from industry associations, one from an aircraft manufacturer, and one from a pilot college. Most of the comments reiterated previous concerns and centered on the themes of implementation periods, FRMS, and the financial and operational impacts.

1. Implementation timeframe and applicability

A number of stakeholders expressed their concerns with the relatively short compliance period under the new prescriptive regime for Subpart 705 air operators and conversely the long compliance period for Subpart 703 and 704 air operators, and recommended a number of modifications, including

- extending the implementation of the regulatory amendments for Subpart 705 air operators from one year to two years, so as to provide them with sufficient time to introduce in their operations the changes required to support the implementation of the new requirements;

- reducing the four-year implementation period for Subpart 703 and 704 air operators; and
- making FRMS available to Subpart 702 air operators.

The implementation periods were discussed extensively with stakeholders. Excluding Subpart 702 air operators from the prescriptive regime takes into account the operational constraints that this proposal may result in for aerial work air operators, as the prescriptive regime may be less appropriate to the scale of their operation and uniqueness of their operations (e.g. firefighting occurs on an emergency basis). Although the new prescriptive regime does not apply to Subpart 702 air operators, Transport Canada agreed that the FRMS provisions will be available to Subpart 702 air operators. This combination of regulatory instruments provides flexibility and reduces the costs associated with flight crew member fatigue risk management.

2. Fatigue Risk Management System (FRMS)

Stakeholders made a number of comments and recommendations regarding FRMS:

- FRMS requires strong regulatory supervision to be truly effective;
- more consultation is needed for some newly introduced provisions on FRMS;
- FRMS has been promoted by Transport Canada to avoid developing new regulations that are industry-segment specific;
- the implementation of FRMS will be a costly and complex exercise that is beyond the capability of many air operators in Canada; and
- FRMS is most suited to the scheduled airlines operational context and does not provide sufficient mechanisms to adapt to other types of flight operations, such as Medevac; thus compromising the ability for an operator to realize either a monetary or safety return on the significant investment in establishing an FRMS.

Transport Canada is of the view that both the FRMS regime and the new prescriptive regulations need to be promoted to the industry. Of primary importance to the success of an FRMS is the close collaboration between an air operator and its pilots. Transport Canada is working with four large air operators, who operate aircraft under Subparts 705, 704, 703 and 702, and who are voluntarily implementing FRMS, to identify lessons learned and best practices in operationalizing fatigue risk management. Transport Canada will undertake further pilot projects with smaller air operators (who operate aircraft under Subparts 704 and 703) within the four-year implementation period.

Developing segment-specific prescriptive regulations to address every possible scenario is not a practical option. An FRMS offers the scientific support and flexibility to tailor a solution that is specific to the needs of an individual air operator regardless of the Subpart under which it operates. Even within the same Subpart, the nature of the different operations can vary significantly. For example, among Subpart 705 air operators, the number of pilots for each company ranges from 28 to over 3 500. The FRMS provides the flexibility to be exempted from some provisions of the prescriptive regime using information specific to an operation. In addition, the implementation period will give stakeholders the time required to determine which option is best suited to their operation.

Consultation sessions on guidance materials, February — June 2017

On February 8 and 16, April 5 and 6, and June 5, 2017, Transport Canada held consultation sessions with stakeholders on guidance material to support the flight crew fatigue management amendments. The purpose of the consultation sessions was for stakeholders to provide improvements to the guidance material to address the needs of large and small air operators. Both union representatives and air operators representatives agreed to work together to develop suggestions to help Transport Canada improve the guidance materials.

Prepublication in the *Canada Gazette*, Part I — July 2017

On July 1, 2017, the proposed amendments were published in the *Canada Gazette*, Part I, ⁴⁵ and provided a 90-day comment period to allow interested persons to submit comments. Transport Canada received 69 comments from individuals and organizations, including 44 from air operators (including associations and coalitions of air operators) and 23 from individual pilots, pilot associations and pilot unions.

1. Implementation period

Some stakeholders expressed concerns related to the short length of the implementation period and their ability to comply with the new requirements with the timelines set out. Stakeholders also commented that the implementation period should be the same for all subparts. A software developer indicated that a one-year implementation period would be too short to develop and implement the necessary modifications to flight crew management optimization software.

Transport Canada acknowledges that there are technical impediments and other issues that will make implementation within one year difficult. After considering the impacts on air operators of different sizes and the other issues that affect the ability of air operators to comply within the implementation period, the amendments have been revised to provide an implementation period of 24 months for Subpart 705 air operators (and for Subpart 702 FRMS), and will retain the 48-month implementation period for Subparts 704 and 703 air operators.

2. Applicability — cargo-only operations

Stakeholders reiterated that cargo-only operations should be exempt from the amendments, given that the U.S. FAA has exempted cargo operations. They also indicated that including cargo operations may result in a disadvantageous position for Canadian cargo operations by decreasing their international competitiveness.

Acknowledging the continued concerns expressed by cargo air operators, Transport Canada commissioned a third-party consultant to study the potential competitiveness impacts on the Canadian air cargo sector imposed by the proposed amendments. After briefly outlining the approach taken by three countries (U.S., Australia and Canada), the study examined three metrics deemed crucial to the competitiveness of the air cargo industry: value of goods transported by air, air cargo capacity and air cargo pricing. The study concluded that there would be little to no risk that the implementation of the proposed amendments would lead to reduced access to air cargo services in the international market.

As indicated above, in 2010 the U.S. FAA introduced a requirement that all Federal Aviation Regulations (FARs) 121 air operators (including cargo-only operations) develop an FRMP. Transport Canada is of the view that Canadian air cargo operators that adopt an FRMS regime could obtain some flexibility by being exempted from some of the prescriptive rules through effective management of fatigue risks, and given that significant competitiveness impacts are not anticipated, no changes to the amendments were made, and they will apply to cargo-only air operators.

3. *Applicability — Medevac*

Stakeholders indicated that Medevac flights should not be subject to the new requirements, given the unique nature of medical emergencies and their unpredictability.

There are many variables in Medevac flights, including on-board medical staff availability, patient condition and their suitability for air transport, admitting doctor/hospital bed availability, in addition to crew members' conditions which make it a challenging and unique operation. Medevac flights are used during medical emergencies which often cannot be predicted or scheduled, and a delay in the dispatch of a Medevac flight could lead to medical consequences and possibly loss of life. Given the "on-call" nature and urgency associated with Medevac flights, Transport Canada agrees with stakeholders, and the prescriptive regime of the amendments will not apply to Medevac flights. Medevac flights will still be required to follow the provisions in effect prior to the coming into force of the amendments.

4. *Pilot shortage*

Canadian air operators and associations have raised concerns about a pilot shortage for several years, and have voiced concerns that the amendments, by reducing the amount of time and the circumstances under which a pilot can fly, may increase the demand for pilots, exacerbating this shortage. Stakeholders further indicated that the pilot shortage has a greater impact on regional/small air operators, as large airlines target their pilots for hiring.

Transport Canada is also concerned about the issue of pilot shortage in Canada. There are several factors that are contributing to Canada's pilot shortage.

- *High level of retirements.* Many pilots of the baby-boomer generation in Canada and the U.S. are reaching the retirement age of 65, which is leading to a reduced supply of experienced pilots while the industry is quickly expanding. According to the U.S. FAA, large American airlines will have to replace over 18 000 pilots over the next three years due to the mandatory retirement age of 65, along with hiring additional pilots as operations expand.
- *Global aviation growth — emerging markets.* The pilot shortage is more notable across the Middle East and Asia. Airlines in this part of the world are expanding rapidly and do not have enough experienced local pilots. These airlines are forced to recruit pilots, with significant financial incentives, from parts of the world where aviation has been established for a longer period, such as Canada and the U.S., driving up demand for these pilots. According to Canadian Aviation Electronics, nearly 10% of Asian Pacific airline pilots are expatriates. In some instances, airlines in the Middle East source over half of their pilots from outside their region.
- *High cost of a pilot's licence.* The costs associated with obtaining each class of pilot's licence is often a prohibiting factor in pursuing a career in aviation, and it should be noted that students are only eligible for student loans if training is taken through a provincially recognized college program. A new pilot may have invested over \$100,000 into their training by the time they achieve an airline transport pilot licence (ATPL).
- *Time required for pilot training.* The time required in completing each requirement for an ATPL, specifically gaining the necessary number of flight hours, is also a limiting factor for prospective pilots. This entire process may take over seven years to complete.
- *Low appeal of remote training and operation.* The time taken away from family, friends and community while training and gaining on-the-job hours, such as bush piloting in remote areas, is not attractive to many young pilots. Currently, Canada has 182 flight training units (FTUs) that offer pilot licence training on aeroplanes and helicopters, approximately half of which are based in Ontario and Quebec. This imposes a significant challenge for many prospective pilots residing in other provinces.
- *Lack of flight instructors.* The pilot shortage has also affected the available pool of flight instructors, which FTUs depend on for training, further limiting the number of prospective pilots. A working group, convened by industry, conducted a survey of ATAC's flight school and carrier members to quantify flight training capacity in Canada. Of 20 FTU respondents, all said that they are not training at full capacity, mainly due to a lack of flight instructors.
- *Low starting wages.* One impediment to recruiting aspiring pilots is the relatively low starting wages which typically start at approximately \$20,000 for a new pilot with a commercial pilot licence (CPL), and \$50,000 for a new pilot with an ATPL.

Transport Canada is assessing the full scope and nature of the current and forecasted shortage of aviation professionals, is considering a variety of strategies to address this issue, and is committed to working directly with stakeholders and, Canadian universities and colleges, in order to better address the needs of Canada's aviation industry, especially the needs of small and/or regional air operators. Notwithstanding the pilot shortage, however, Transport Canada views the risks associated with fatigued flight crews as unacceptable.

5. *Northern operations concerns*

Stakeholders expressed strong concerns regarding the impact of the proposed amendments, as published in the *Canada Gazette*, Part I, on northern air operators and the communities they serve. Northern air operators tend to fly more during the summer as the days are very long and the weather is more temperate. Some air operators may only have one pilot (i.e. no possibility of replacing flight crew members) and the limitation on the number of hours that pilot can fly, especially in the summer, may result in flights being delayed or cancelled. Many operations in the North provide on-demand services for both cargo and passenger services. At times, flights are required on an urgent basis and may require flexibility in the number of hours a pilot can fly, especially given the shortage of pilots in the North. Some air operators have indicated that it may not be feasible to operate in the North under the new requirements.

Although the summer in northern Canada has extended hours of daylight (long days and short nights), it can result in pilots sleeping for a shorter amount of time than their bodies require. Whereas in the winter when days are shorter people sleep more than required.

Transport Canada acknowledges the concerns raised with regard to northern air operators and the communities they serve. Several modifications to the amendments were made in response to these concerns, to mitigate the risk of significant financial impacts on air operators and northern and/or remote communities. The amendments were modified by

- modifying the definition of “local night’s rest” to at least nine hours of rest falling between 10:30 p.m. and 9:30 a.m. at the location where a flight crew member is acclimatized, to provide more flexibility to all air operators, including those operating to and from northern communities (i.e. to allow for more flexible start and end times);
- allowing Medevac flights to follow the provisions in effect prior to the coming into force of the amendments, to ensure that critical medical transport services can continue to operate according to the previous requirements; and
- modifying the amendments to clarify when an air operator is required to provide suitable accommodation for a flight crew member (i.e. when away from home base).

In addition, Transport Canada is taking steps to facilitate compliance with the amendments, including via the development of new guidance material to clearly differentiate aerial work operations (Subpart 702) from air taxi operations (Subpart 703), in the context of worker movements from campsites to work sites in rural areas, to provide greater certainty to northern air operators when interpreting the relevant requirements.

Transport Canada also intends to develop a government-backed pilot training program, with a focus on groups currently under-represented in Canadian aviation, such as women, Indigenous peoples and those living in northern communities, to enlarge the pool of new pilots and boost local economic development.

Transport Canada is committed to continuing to work with Canada’s northern communities to help facilitate the prosperity of the northern region. Transport Canada will continue to engage in open dialogue with those stakeholders involved in northern operations, with a view to mitigating any unforeseen effects.

However, aircraft operated under Subpart 703 accounts for the majority of accidents. According to the TSB, between 2006 and 2015 there were a total of 488 aircraft accidents involving aircraft from operations of all sizes. The majority of these accidents (54.5%), as well as the associated fatalities (62%) and serious injuries (57.7%), involved aircraft operated by Subpart 703 air operators. The risks to pilots, passengers and Canadians, due to flight crew fatigue, are in fact most significant for these operations.

6. Regulatory approach

Several stakeholders observed that the amendments are “one size fits all” and do not address the individual needs of air operators and pilots across Canada (e.g. seasonal operations, irregular flights, on-demand services, Medevac flights), nor the differences between different segments of the industry (Subparts 703, 704 and 705 operations).

Transport Canada determined that segment-specific prescriptive regime to address every possible scenario may not be practical. The Canadian aviation landscape is very broad and ranges from large airlines to cargo-only operations to on-demand operations to remote operations, among others. Given the unique operating environment of each of these operations, it would be impossible to regulate each segment separately with individual requirements. FRMS will allow air operators to be exempted from some provisions of the prescriptive regime based on information specific to their unique operations (also see 14 — *Safety cases for on-demand operations*).

The amendments are based on the reality that all pilots experience the detrimental effects of fatigue, irrespective of the type of operation. The amendments include flexibilities to suit different operational needs while respecting the available scientific evidence, including

- staggered implementation dates (two years for Subparts 705 and 702 and four years for Subparts 704 and 703);
- exclusion of Medevac flights from the new prescriptive regime (Medevac flights will continue to follow the provisions that were in effect prior to the coming into force of this amendment), while providing access to the FRMS regime for those flights; and
- FRMS availability for air operators operating aircraft under Subparts 705, 704, 703 and 702 to allow tailoring of fatigue management to air operators’ specific operational needs, provided that they ensure the level of flight crew fatigue and alertness is not adversely impacted in comparison to operating under the prescriptive rules.

In addition, Transport Canada is working with four large air operators on FRMS pilot projects, including a firefighting air operator (Subpart 702), a cargo-only air operator, an airline (Subpart 705), and an air operator conducting flights under Subparts 705, 704, 703 and 702. These pilot projects are expected to provide lessons learned and best practices in operationalizing FRMS that will make it more viable for a greater number of air operators.

7. Flight crew member responsibility

Industry stakeholders stressed the importance of reinstating in the CARs the obligation for flight crew members to use rest periods so as to obtain the necessary rest.

Transport Canada recognizes that flight crew members' and air operators' responsibilities are both important elements of the amendments. Collaboration is needed from both sides to effectively reduce the fatigue level so as to enhance aviation safety. Transport Canada agrees in principle that flight crew members should be aware of their responsibility to rest during their rest periods and show up to work "fit for duty."

8. Maximum (cumulative) duty time (now maximum number of hours of work)

Stakeholders had several comments regarding maximum number of hours of work, including

- retention of the resetting of monthly and quarterly flight time limits ("zeroing") for a flight crew member regardless of whether they are operating an aircraft under Subpart 703 or 702;
- clarification of the division between Subpart 702 and Subpart 703, when it relates to transporting Subpart 702 workers to and from campsites, and to and from work sites; and
- better alignment with the best practices established by the EU of 1 900–2 000 hours of work in 365 days.

Transport Canada consulted with key stakeholders about the "zeroing" provision. It was agreed that the issue as to whether or not flights that reposition aerial workers between camps are to be conducted under Subpart 702 or 703 should be clarified. Therefore, Transport Canada will develop guidance material to clarify the distinction between Subparts 702 and 703.

Transport Canada consulted Labour Canada, which recommended reducing the mandated annual hours of work limit from 2 400 hours to 2 200 hours, to be more consistent with the *Canada Labour Code*.

9. Maximum flight duty period table

There were varying opinions regarding the maximum FDP table (see Table 2 above). Some of the air operators commented that the table is too complicated while others indicated that the proposed matrix is mathematically unworkable. In general, air operators were of the opinion that the maximum FDPs are too short and the table is too complicated.

Pilots and unions representing pilots commented that the maximum FDP table does not adhere to science or international best practices. The concern was expressed that the adequate level of fatigue was not reflected for FDPs commencing after 21:00. Stakeholders indicated that the National Aeronautics and Space Administration's (NASA) Ames Research Center recommends no more than 10 hours of work at night, while the U.S. stipulates no more than 8 hours of flying to prevent fatigue on long-range flights at night.

Transport Canada understands the concerns raised and has clarified the description of the maximum FDP table in this Regulatory Impact Analysis Statement (RIAS). According to the experience and feedback from other jurisdictions such as U.S. FAA and EASA, science is one of many factors that will affect maximum FDPs. Other factors could include labour/union agreements, financial impacts, air operators' operational needs, and employee working environment. Developing a maximum FDP table is a complex process that requires the reconciliation of numerous variables and stakeholder perspectives. Transport Canada's approach to the development of the maximum FDP table therefore depended on the input of the Working Group and is aligned, as much as possible, with the fatigue scientific principles and international practices in other jurisdictions. In addition, flexibility is provided via the FRMS option, allowances for unforeseen operational circumstances, and ultra long-range flights.

10. Local night's rest

Stakeholders raised concerns regarding the definition of "local night's rest" in the proposed amendments. Local night's rest was defined, at prepublication, as a rest period which begins at 10:30 p.m. and ends at 7:30 a.m. at the location where a flight crew member is acclimatized. Stakeholders indicated that the proposed definition was too restrictive and did not provide enough flexibility to accommodate established flights to and from the northern regions where air travellers must take connecting flights to reach their final destination. Stakeholders believe that the science supports a length of time for sleep and supports avoiding the WOCL; however, there is no evidence to support the defined period of between 10:30 p.m. and 7:30 a.m. Stakeholders expressed support for amending the definition so it is similar to other jurisdictions.

Transport Canada carefully analyzed the situation. The local night's rest definitions from other jurisdictions are as follows:

- U.S. FAA: Physiological night's rest means 10 hours of rest that encompasses the hours of 1 a.m. and 7 a.m.; and
- EASA: Local night means a period of 8 hours falling between 10 p.m. and 8 a.m. local time.

Transport Canada agrees with the suggestion to provide more flexibility in terms of the local night's rest definition to better align with EASA and U.S. FAA as well as provide flexibility to northern operations. The amendments, therefore, define a local night's rest as a rest period of at least nine hours that takes place between 10:30 p.m. and 9:30 a.m. at the location where the flight crew member is acclimatized.

11. Home base definition

Stakeholders indicated that the provisions related to home base are vague and contradictory. Section 101.01 read as follows: "home base means the location where a flight crew member normally begins and ends its FDP," while section 700.36 reads: "an air operator shall assign a home base for each of its flight crew members."

Transport Canada agrees with this concern. To avoid ambiguity, the amendments were revised to include the following definition of home base: "the location where a flight crew member normally commutes to in order to report for an FDP or for positioning." The amendments were also modified to clarify when an air operator is required to provide suitable accommodation for the flight crew member (i.e. when away from home base).

12. Approval of FRMS

Some stakeholders indicated that approval of the FRMS should be required to better align with the ICAO requirement. Stakeholders also indicated that the use of FRMS should be controlled and that simply requiring them to notify Transport Canada of their FRMS may result in abuse of the system.

Transport Canada agrees in principle with an approval mechanism and has established an approval process for safety cases in order for an air operator to be able to use an exemption from the prescriptive limits.

13. Criteria to use a safety case for similar flights

The FRMS provisions, at prepublication, restricted the use of a safety case for a flight to another flight with start times and flight durations within 30 minutes of the safety case flight, among other similarity criteria, including that the flights are operated in the same time zones in the same direction; they operate aircraft of the same type and configuration; and flights are operated with the same number of flight crew members. Some stakeholders indicated that the process should be more flexible so flights can be grouped together under the same safety case.

Transport Canada acknowledged this suggestion and has made changes to improve flexibility while respecting the principles of fatigue science. The changes focus the similarity criteria on the timing, duration, and number of consecutive FDPs; ⁴⁶ and rest periods, rather than on individual flight segments.

14. Safety cases for on-demand operations

Stakeholders have indicated that it is a challenge to collect predictive fatigue data in ad hoc operations to validate safety cases (e.g. charter services), and recommended that third parties should be able to develop safety cases as they can facilitate data collection and analysis.

Transport Canada acknowledged this challenge and agreed to allow centrally managed validation of safety cases by a third party on behalf of an air operator, as is being done by some industry associations to facilitate data analysis capability in support of safety management system requirements. However, Transport Canada agrees with other civil aviation authorities, including EASA and the U.S. FAA, that safety cases are not "one size fits all" due to operational differences and flight crew commuting differences, for example. Therefore, fatigue data used to validate an operator's safety case must originate from the exempted flights and the flight crew members operating those flights.

15. Use of fatigue data collected from pilots

Some stakeholders indicated that pilots should be given protection from reprisal when reporting fatigue. Procedures need to be established to ensure the confidentiality of the information submitted by pilots, and to manage and secure the information appropriately.

The confidentiality of information is protected under the *Personal Information Protection and Electronic Documents Act* (PIPEDA). The PIPEDA applies when personal information, including opinions, evaluations, comments, and employee files, is collected, used or disclosed in the course of a commercial activity. The amendments will require air operators to have a process to collaborate with employees in the development of the fatigue reporting policy and procedure. The FRMS provisions as published in the *Canada Gazette*, Part I, already contained provisions requiring the air operator's FRMS to have a policy for the internal reporting of fatigue by flight crew members without fear of reprisal.

16. Consultation process

Some stakeholders indicated that further consultation was needed, and expressed concerns regarding the quality and quantity of past consultations.

With the emergence of an international consensus regarding the risks associated with flight crew fatigue, and clear evidence that Canada's existing flight crew fatigue risk management regime is inadequate, action is needed. Transport Canada had made every effort to consult and communicate with stakeholders over the past eight years, as described in this RIAS. However, stakeholders have divergent views on this issue within stakeholder groups (i.e. between different air operators) and between stakeholder groups (i.e. air operators and pilots/unions), and Transport Canada was not able to obtain a consensus on all aspects of the fatigue risk management regime. Transport Canada has made some adjustments to the amendments based on stakeholder feedback. However, given that fatigue plays a central role in many accidents and incidents, it is imperative that Transport Canada regulate this issue to protect flight crew members and passengers, as well as people and infrastructure on the ground.

17. Comments on the benefits and costs

A number of comments were received that are specific to the cost-benefit analysis.

(a) Inclusion of the consultation data in the analysis

Several air operators sought clarification on how figures collected through the consultations have been considered in the cost-benefit analysis. They also expressed concerns regarding the magnitude of costs associated with fatigue training for crew members, computer updating and programming, and crew rescheduling as well as the difference between costs they provided and those in the RIAS.

Prior to the prepublication, Transport Canada surveyed affected air operators through the use of a questionnaire. Responses received were checked for validity (addressing logical errors), analyzed and complemented by expert opinion. Because not all the stakeholders responded to the survey, data were extrapolated to the whole industry to obtain cost figures for fatigue training, computer updating and programming, and crew rescheduling. Subject matter expert opinion was also used to estimate costs where necessary. In summary, Transport Canada used a mix of survey replies, experts' opinion and relevant studies to estimate the costs.

(b) Fairness of industry data

One stakeholder questioned the fairness of data from consulting with air operators and recommended that Transport Canada be independent and base the cost-benefit analysis on its own findings and research.

As indicated above, the cost assessment was not solely based on the result from consultations with air operators, but also on expert opinion. Transport Canada's costing approach was similar to that of the U.S. FAA to some extent. For example, to assess the costs associated with flight crew scheduling, air operators were asked to provide their estimated incremental crew members needed to fulfill the new prescriptive regime. Responses were analyzed and complemented by expert opinion. Hence, Transport Canada did conduct a critical review and assessment of air operators' responses to its survey.

(c) Homogeneity of carrier group

One air operator stated that not all Subpart 705 air operators are alike. It mentioned that not all Subpart 705 air operators are in the same operational market and, consequently, the type of operation has different effects on the pilots flying the aircraft.

Transport Canada agrees with the fact that not all Subpart 705 air operators are alike. Hence, the effects may be different in various markets in which carriers operate. Due to the absence of carrier-level data, Transport Canada used averages to represent air operators operating under each Subpart.

(d) Proportion of flights breakdown into FRMS and prescriptive measures

One air operator asked how Transport Canada derived the figures used to determine the proportion of flights within the prescriptive regime versus FRMS. The air operator believed their own operations were not accurately reflected by these proportions.

The proportions used to break flights into prescriptive measures and FRMS were developed by subject matter experts within Transport Canada. These proportions were developed to represent the air operators operating under Subparts 705, 704, 703 and 702 as a whole, and therefore may not align exactly with each individual air operator. For that reason, sensitivity analyses were done for additional scenarios. The effects on the overall result are negligible.

(e) Pilot average career

One air operator questioned the assumption that the average pilot career is approximately 20 years. More specifically, the stakeholder stated that the average years of service of its flight crew members is less than the 20 years used in the cost-benefit analysis.

In considering the stakeholder's comment, Transport Canada wants to clarify that the scenario put forward by the stakeholder is for a pilot working for a given operator. Career length in the cost-benefit analysis includes working for any operator. That being said, sensitivity analyses were also performed for this variable to account for the uncertainty, using 15- and 25-year careers. The effects on the overall result, which can be seen in the sensitivity analyses section of the cost-benefit analysis, were negligible.

(f) Links between crew member fatigue and TSB data

A stakeholder argued that the monetized avoided fatalities, injuries, property damages, and investigations are all tied to TSB aviation investigation reports, which have not identified fatigue as a systemic issue and have not made any link between fatigue and accidents/incidents.

Many studies have shown a significant relationship between commercial airline accidents and human error. According to the European Cockpit Association, about 70% of fatal accidents are related to human error. It has been recognized that fatigue (due to long hours of work, insufficient rest opportunities, etc.) can impair a pilot's performance, contributing to human error. Transport Canada agrees that TSB has rarely quoted fatigue in past reports, but tended to generally cite human error. However, the TSB has been clear in their inclusion of human fatigue as one of the major aspects of human error and more recently, have begun quoting it directly in reports. Recognizing the research-based link between fatigue and human error, it is therefore logical and sound that TSB air accident and incident casualty statistics be one of the most relevant data sources to be used as inputs for the benefits quantification.

(g) Link between sick leave and crew member pay

An air operator rejected the assumption that sick leave represents 5% of the annual crew member pay, indicating that sick leave per year is less than 2% of the crew member pay.

Transport Canada agrees with the fact that sick leave is unlikely to be comparable across the industry. That means that in some cases sick leave will be more or less than 5% of the crew member pay. The average 5% value used in the analysis is similar to the one used by the U.S. FAA. According to the U.S. FAA, this value has been verified with U.S. labour representatives. Sensitivity analyses over this parameter using 2% and 8% were also performed and led to negligible differences in the overall result.

(h) Miscellaneous qualitative benefits and costs

Several stakeholders suggested specific benefits and/or costs to add to the analysis. Those recommendations included a possible loss of revenue due to the in-flight crew rest facilities, fewer hours paid out to pilots, decreased insurance premiums, the benefits of reducing long-range flights at night, and the benefits of reducing flight delays.

Transport Canada agrees that some of these suggestions are relevant to the analysis of these amendments. However, many of the costs and benefits suggested by stakeholders are very difficult to estimate. For this reason, some of these costs and benefits were added to the qualitative analysis section.

(i) Applying air passenger growth rate to cargo air operators

A cargo operator questioned several assumptions that have been made to derive the benefits pertaining to cargo air operators, including the passenger growth rate. The operator suggested that the passenger growth rate has no direct application to cargo-only air operators.

Transport Canada agrees that the passenger growth rate is not the appropriate input in assessing the avoided fatalities and injuries related to cargo air operators. Instead, the value of commodities expected to be transported by a cargo operator per year is now quantified. Transport Canada revised its approach to modelling cargo-only air operators in the benefit-cost analysis. Since there are only a few cargo-only air operators, to avoid confidentiality issues, the outcome derived from the cargo analysis is combined with the Subpart 705 result.

(j) Fatigue contribution to accidents

There were two comments related to the fatigue contribution factor. The first comment stated the 17.5% fatigue contribution rate to accidents is derived from a single study. The second one indicated that a contributing factor is not a causal factor, and reducing crew member's fatigue would not necessarily prevent an accident.

The fatigue contribution rate to accidents is not derived from a single study. In fact, it is based on many studies ⁴⁷ and it is a shared view among fatigue scientists. Therefore, different internationally recognized sources quoted fatigue as a contribution factor to accidents. According to the U.S. NTSB, fatigue contributes to 20–30% of transport accidents (air, sea, road, and rail). A European Transport Safety Council study, ⁴⁸ using different sources, concluded that crew member fatigue contributes to about 15–20% to the overall accident rate in commercial aviation. For the purpose of the analysis, Transport Canada used the mid-point of 17.5%.

As indicated in the cost-benefit analysis accompanying these amendments, many studies have shown a significant relationship between commercial airline accidents and human error, including flight crew fatigue. ICAO also identifies fatigue as a major human-factor safety hazard because it affects most aspects of a flight crew member's ability to perform their duties (see Background section above).

(k) Crew scheduling cost quantification process

Two stakeholders requested clarification on how the additional crew scheduling cost was quantified. One of them also indicated the costs simply encompass the scheduling costs, and ignored other costs such as the associated crew member training costs.

Through consultations with air operators, Transport Canada received responses to a number of costing questions, including the number of additional crew members needed to fulfill the new prescriptive regime. As indicated in this RIAS, using the survey replies and expert opinion to extrapolate to all air operators, it is estimated that the incremental flight crew scheduling costs will increase by 3.97% for Subpart 705 air operators, 12.96% for Subpart 704 air operators, and 17.53% for Subpart 703 air operators, on average. These estimates have been used to derive the total crew scheduling costs for each air operator's Subpart. Other costs, such as crew management computer system costs, initial and recurrent fatigue training costs, and rest facility costs have been quantified and included in the analysis.

(l) Timeframe

One stakeholder refuted the use of a 15-year analysis timeframe, and questioned why Transport Canada deviated from the 10-year analysis timeframe used by the U.S. FAA for their *Flightcrew Member Duty and Rest Requirements* regulations. The stakeholder indicated that using the 15-year timeframe magnifies the cost to major airlines.

As Transport Canada explains in this RIAS, due to the 4-year transitional period for certain air operators, a 10-year timeframe will not effectively capture the impact of these amendments. While the 15-year timeframe increases the total costs in the analysis, it also increases the associated benefits. As the sensitivity analyses show, the benefit-cost ratio increases as the analysis timeframe is extended.

(m) Implementation dates

A stakeholder suggested the requirement of a one-year implementation period across all air operators, rather than delaying implementation for some portions of the industry.

Moving up the implementation date for smaller carriers to match those for Subpart 705 would put undue pressures on small businesses. As such, this option is not being considered.

Consultations following prepublication, July 2017 to March 2018

Recognizing the concerns raised by stakeholders before and after prepublication, in particular the concerns regarding potential financial impacts on stakeholders, Transport Canada held additional consultation sessions beginning in July 2017, many led by a senior departmental official, to analyze the comments received and exchange ideas on how to improve the amendments. As a result, significant changes were made to the amendments to address the

practical operational difficulties and financial burdens while maintaining aviation safety.

On March 16, 2018, Transport Canada hosted an industry briefing with stakeholders to update them on the comments received during the *Canada Gazette*, Part I, comment period. Major associations, air operators and pilot unions attended the briefing. Transport Canada provided information on how the major comments were addressed and outlined changes that would be made to the amendments subsequent to prepublication. Stakeholders presented some concerns with the aspects of the amendments that were discussed and indicated that not enough detail was provided regarding some of the possible amendments to provide meaningful feedback, in particular stakeholders raised concerns regarding the long regulatory development process and the maximum FDP table. Transport Canada maintains its position that the maximum FDP table was developed with the input of the Working Group, in an effort to balance the competing positions of air operators and pilots, and is better aligned with international standards, relative to past flight duty limits. Approval mechanisms under the FRMS regime was another focus of the discussion (see section 12 — *Approval of FRMS* above). After the session, each attendee received a summary of the briefing session and was asked to validate the content to ensure that the discussion was captured accurately.

Comments were received from 13 stakeholders. Stakeholders expressed strong opinions regarding several modifications to the amendments, namely

(1) *Implementation periods*. Many stakeholders welcomed the extended implementation periods. However, some stakeholders voiced concern over the extended implementation periods and indicated that these changes need to come into effect as soon as possible. Additionally, the length of the regulatory process has already delayed the implementation of fatigue regulations. The extended implementation periods will be included in the amendments to allow all air operators the time needed to implement the Regulations and develop safety cases.

(2) *Maximum annual number of hours of work*. Some stakeholders indicated that lowering the annual number of hours of work to 2 200 (from 2 400 hours) does nothing for fatigue as the limit remains ineffectual; while others indicated that reducing the maximum number of hours of work to 2 200 is a substantive change made after the publication in the *Canada Gazette*, Part I, and would require a second publication in the *Canada Gazette*, Part I to allow stakeholders to provide comments. The amendments will include an annual number of hours of work limit of 2 200 hours to be consistent with the *Canada Labour Code*.

(3) *Maximum flight duty period table*. Some stakeholders voiced their concern that this approach would not do enough to reduce fatigue occurrences and had strayed from the science. For example, with respect to flights starting in late afternoon (between 5 p.m. and 11:59 p.m.), some stakeholders feel that a maximum FDP of 12 hours is too long and it should be reduced to 10 hours which is supported by science. The table was developed based on the Working Group recommendations and is consistent, as much as possible, with international standards.

(4) *Approval of FRMS safety cases* (not part of the *Canada Gazette*, Part I, consultation). The proposed amendments, as published in the *Canada Gazette*, Part I, did not include a requirement for FRMS safety cases to be approved by Transport Canada. Some stakeholders requested that the FRMS safety cases be approved by Transport Canada to be consistent with the ICAO requirement (i.e. safety cases would need to be approved before air operators would be allowed to exceed the prescriptive limits). At the meeting, Transport Canada indicated that it would explore how an approval process would operate. Some stakeholders felt that this change should be considered a substantive change from the *Canada Gazette*, Part I, and would, therefore, require the amendments to be published in the *Canada Gazette*, Part I, a second time.

(5) *Using a safety case for similar flights*. While most stakeholders support the idea of grouping similar flights under a safety case, some stakeholders thought that it could undermine FRMS and increase risk to passengers and crew. The amendments contain criteria for determining if the flights can be considered similar (e.g. the same aircraft type, the same number of flight crew members, etc.). Since the flights will be considered to be similar, grouping them into a safety case will not have an impact on safety.

(6) *Safety cases for on-demand operations*. Stakeholders expressed concern with respect to building a safety case for on-demand operations in light of their unique operations, including the lack of data available to aid in building a safety case. Stakeholders also pointed out that building safety cases for these types of operations was not discussed by the Working Group. Some stakeholders did support this change. Transport Canada recommends allowing centrally managed validation of safety cases by industry associations or third parties on behalf of air operators.

Regulatory cooperation

Comparison of applicability

On January 4, 2012, the U.S. FAA published a final rule ⁴⁹ related to flight crew member duty and rest requirements in the Federal Register. The Regulations, which only apply to passenger operations conducted under 14 CFR 121 (part 121 includes Subparts 705 and 704 of the CARs, but does not include Subpart 703), became effective on January 4, 2014. On December 21, 2011, the U.S. FAA also issued a Regulatory Impact Analysis (original RIA) dated November 18, 2011. ⁵⁰ The original RIA provides the basis for the U.S. FAA's decision to (1) promulgate the final rule establishing new flight, duty, and rest requirements for flight crews in passenger operations; and (2) exclude flight crews in cargo-only operations from the new mandatory requirements. While cargo-only operations are not required to meet the new Regulations, the rule permits these air operators to opt in to the rule. When the final rule was published in 2012, the U.S. FAA determined that air operators who operate aircraft under part 135 (equivalent to Subpart 703) warranted special consideration because of their unique operating environment. However, the U.S. FAA is in the process of developing rules for these air operators.

The U.S. FAA requires air carriers to have an FRMP (approximately two thirds of a complete FRMS). The FRMP must include current flight time and duty period limitations; a rest scheme to manage pilot fatigue; annual training to increase awareness of fatigue-related issues; and methodology to assess the effectiveness of the program. The FRMP is also reviewed and accepted or rejected by the U.S. FAA. The U.S. FAA's regulations also allow for the voluntary adoption of a

complete FRMS approach. A U.S. FAA-approved safety case allows certificate holders to exceed required flight time and duty period limitations on specific flights.

EU regulations governing flight and duty time limitations were amended in 2014, and were implemented on February 18, 2016. They include FRMS/flight time specification schemes that allow air operators to deviate slightly from required flight and duty time limitations in certain circumstances. EASA's rules apply to air operators that are equivalent to Subparts 705 and 704 of the CARs. Although EASA's rule does not currently apply to air operators equivalent to Canada's Subpart 703, in 2016, EASA published an NPA for air taxi operations, emergency medical services, helicopters, and single pilot commercial air transport operations (for smaller air operators). On October 30, 2017, EASA published another NPA with a three-month comment period which was extended to February 28, 2018.

Although these amendments, by including Subpart 703 air operators, apply to a broader range of air operations than in the U.S. and the EU, Transport Canada concluded that smaller air operators (Subpart 703) should be included in the amendments due to their higher accident rate and higher benefit to cost ratio. Additionally, the U.S. FAA is in the process of developing requirements for the equivalent of Subpart 703 air operators.

Cooperative activities

Since the U.S. FAA introduced new requirements in 2014, Transport Canada has had the opportunity to learn from the U.S. FAA experience. The U.S. FAA decided to deviate from the ICAO requirements by exempting cargo-only operations (however, U.S. Congress mandated, in accordance with the *Airline Safety and Federal Aviation Administration Extension Act of 2010*, that all large air carriers, in both passenger and cargo operations, develop and use an FRMP). Transport Canada, after studying the regulatory impact, decided to take a different approach from U.S. FAA by requiring cargo air operators to comply with ICAO SARPs of 2009.

The amendments will ensure that Canada is meeting its ICAO obligations. Transport Canada will continue to advance the promotion and pursuit of international cooperation, collaboration, sharing of best practices, and the negotiation of mutual recognition arrangements between key trading partners in order to have in place a safe and efficient aviation industry and supporting regulatory framework.

Cooperation activities related to FRMS implementation and regulating fatigue in general currently include

- cooperating with key countries such as the U.S., Australia and the EU;
- collaborating with international organizations, including ICAO; and
- collaborating with various federal departments and agencies.

Transport Canada has consulted with the EU, the U.S. and Australia, and received favourable feedback. Transport Canada endeavours to create amendments that adopt the best practices of its international partners.

Comparison of limits

Although ICAO supports two distinct methods⁵¹ for managing fatigue, the ICAO SARPs do not identify the actual limits. In addition, ICAO requires states to base their regulatory proposal on fatigue science. ICAO also requires, as per Annex 6 of the *Convention on International Civil Aviation*, that member states apply fatigue management regulations to all air carriers that travel across state boundaries, regardless of the nature of their operations (i.e. cargo versus passenger carrying).

Transport Canada used the U.S. FAA and EASA regulations as a model for regulatory development. Like Canada, EASA generally complies with the ICAO SARPs and applies fatigue management regulations to the equivalent of Subparts 705 and 704. EASA is in the process of developing requirements for the equivalent of Subparts 702 and 703. The U.S. FAA, on the other hand, has chosen to exempt cargo operations from their requirements (and has no plans to regulate cargo-only operations) and is now in non-conformance with the ICAO SARPs, with which the U.S. FAA has filed a difference notice. The U.S. FAA is in the process of developing requirements for the equivalent of Subparts 702 and 703.

The amendments are still less restrictive than the U.S. regulations. The U.S. still maintains their daily flight time limitations and requirements for large air operators to have an FRMP.

The amendments will bring Canada into compliance with the ICAO SARPs and better align with the regulatory scheme of other major jurisdictions. Annex B compares the Canadian requirements with those of the U.S. FAA and EASA.

Rationale

Flight crew members have cognitively demanding jobs. Fatigue degrades performance and affects memory, concentration, reaction time, decision making, risk perception and emotions. Working multiple long duty days consecutively without adequate rest and restoration will degrade human performance over time. The previous Canadian regulatory regime did not reflect current scientific principles and knowledge on fatigue. In addition, the previous Canadian requirements did not align with those of international partners.

Transport Canada recognizes that fatigue management is a complex issue and that the prescriptive limitations may not be the optimal solution in all instances. As a result, Transport Canada has provided some flexibility in these amendments to address unique situations and to minimize the impact on certain types of operations, while maintaining an acceptable level of safety.

Transport Canada based the amendments on scientific knowledge and principles as well as the accepted practices of other international civil aviation authorities, such as the U.S. FAA and EASA. The amendments will meet Canada's ICAO obligations and, more importantly, address the fatigue issue and enhance aviation safety.

1. Maximum flight time

The amendments reduce the maximum annual flight time (current paragraph 700.15(1)(a) of the CARs) from 1 200 to 1 000 hours in 365 days. The reduction aligns Canadian requirements with Part 117, Subchapter G, Chapter I, Title 14 of the U.S. *Code of Federal Regulations* (CFR) which imposes a 1 000-hour annual limit. The U.S. FAA has administered these cumulative flight time limits based on its operational experience, has found that cumulative flight time that falls within these limits is safe.

2. Maximum flight duty period

There is an FDP limit of 14 hours in a 24-hour period under subsection 700.16(1) of the CARs. A 14-hour day is considered too long an FDP to maintain performance.

Transport Canada has studied the range of FDP developed and implemented by both the U.S. FAA and EASA, based on the start time of the FDP and the number of flights. EASA has a maximum FDP of 13 hours. The U.S. FAA has permitted a maximum FDP of 14 hours. The amendments include a range of FDPs from 9 to 13 hours similar to the ones developed by the U.S. FAA, after taking into account the Working Group's recommendations and consultation with stakeholders.

3. Rest periods

Science shows that people need a regular rest period to avoid acute fatigue. Under the previous provisions, after completing an FDP, the pilot received a rest period of eight hours (section 101.01 of the CARs) plus time for travel, meals, and personal hygiene. Scientific research found that an 8-hour sleep opportunity was not long enough to sustain performance over a 32-day period.⁵² Studies have shown that people need nine hours in bed to obtain eight hours of sleep⁵³ which will maintain safe levels of human performance. The previous rest period was not long enough to obtain eight hours of sleep.

Section 700.40 of the amendments introduces a new requirement to provide flight crew members with sufficient rest periods, as follows:

- When the flight duty period ends at home base:
 - a period of 12 hours or 11 hours plus travel time to and from the place where the rest period is taken; or
 - if the air operator provides suitable accommodation, a period of 10 consecutive hours in suitable accommodation will be required.
- When they are away from home base, a period of 10 consecutive hours in suitable accommodation will be required.

If the flight duty period ends at home base, the air operator is not responsible for the transportation of the flight crew member. Research shows that 8 hours of sleep require 9 hours in bed; plus 1 hour before and after to get ready and another hour to commute which equals 12 hours. Transport Canada provided the option for air operators to provide a rest period of 12 hours at the end of the FDP or to provide a rest period of 11 hours plus the time taken to commute (the travel time to and from the place where the rest period is taken).

If the flight duty period ends away from home base, the air operator is required to provide 10 hours in suitable accommodation. Ten hours in suitable accommodation is a compromise reached through consultations.

The amendments place Canada between the U.S. FAA (10-hour rest period) and EASA, which requires the longest period of either the duration of the previous duty period or 12 hours at home base or 10 hours if the flight duty period ends away from home base.

4. Consecutive flight duty periods

This new section (section 700.51) addresses the required additional rest and ways to counteract fatigue resulting from multiple consecutive flight duty periods if any part of the periods falls between 2 a.m. and 5:59 a.m. Academics have found exponential increases in risk across successive night shifts. This risk compounds over successive nights and leads to a significant decrease in performance.

These statistics apply to night workers who do not have the opportunity to sleep during their night shifts. The amendments will permit up to five consecutive flight duty periods, provided there is a three-hour rest period during each flight duty period in suitable accommodation which allows the pilot to sleep. Two to three hours of sleep obtained during this rest period is combined with their daytime sleep which should be in the range of five to six hours. As long as 8 hours of sleep is achieved in a 24-hour period, performance can be sustained.

5. Fitness for duty

Although airlines are taking appropriate actions to encourage flight crew members to report suspicions related to substance abuse, there remains a strong need for regulations to proactively address alcohol, drug, mental health, physical condition and fatigue issues to promote flight crew fitness for duty and to mitigate the risk to aviation safety.

Given the safety-related functions a flight crew performs, and the decrease in cognitive and psychomotor abilities that alcohol, drugs or fatigue can cause, the consequences of not strengthening the previous regulations could affect the safety and confidence of the travelling public.

6. Implementation

An extended implementation period is required to ensure that air operators are ready to implement the new requirements.

Subpart 705 air operators require time to upgrade software (tracking, scheduling, etc.), update procedures and subsequent training.

After consultation with stakeholders, the implementation period for Subparts 704 and 703 air operators was increased to four years. A four-year implementation period is required for Subparts 704 and 703 air operators since air operators will need to purchase or upgrade scheduling software. Additionally, all air operators will be required to adjust how they schedule pilots, conduct training and implement new procedures.

Moving Forward

In general, the amendments take an approach that will align Canada with its international trading partners, create a performance-based FRMS option for air operators, and benefit Canadians overall, both in terms of the Canadian economy and in terms of aviation safety.

As Transport Canada was developing the amendments, numerous options were considered, including maintaining the status quo. Maintaining the status quo presents the least amount of burden and lowest costs for businesses and the Government of Canada. However, the status quo would result in a potentially unsafe aviation industry and Canada would continue to not be aligned with our international partners. A safe aviation industry cannot improve without implementing robust regulations that allow all air operators and flight crew members to operate in a healthy and safe environment. In this context, the amendments include two distinct approaches.

1. The prescriptive regime set out maximum flight duty and minimum rest requirements for flight crew members. The prescribed limits are essentially informed boundaries Transport Canada has identified, inside which the air carriers must manage their fatigue-related risks as part of their existing safety management processes.

2. The performance-based FRMS will allow air carriers to be exempted from the prescribed limits. This approach is focused on managing the actual fatigue risk in the operations to which it applies (rather than addressing the predicted fatigue risk in general, which is the basis of prescriptive regime). An FRMS approach will represent an opportunity for air carriers to use advances in scientific knowledge to improve safety, use resources more efficiently and increase operational flexibility.

Considering the uniqueness of Subpart 702 operations and Medevac flights, excluding them from the new prescriptive regime will reduce the adverse cost impacts the proposal may cause. Additionally, capturing air operators who operate aircraft under Subparts 703 and 704 will address the risks associated with the flight crew member fatigue issue proportionally as accidents tend to occur more with smaller commercial air operators.

Although the existing prescriptive regime will essentially remain the same for Subpart 702 air operators and Medevac flights, having the FRMS option available to them will bring further net benefits to the economy especially for those Subpart 702 air operators whose main business is firefighting. Those Subpart 702 air operators previously applied for exemptions on an annual basis to justify operations under emergent firefighting situations. Including air operators who are subject to Subpart 702 under FRMS will help to reduce the administrative burden of those air operators who are seeking an exemption from the flight duty and rest requirements. The amendments will not be too costly for those Subpart 702 air operators with data collection mechanisms already in place and those who have begun using safety management systems to manage the additional risk associated with their operations. Once they meet the FRMS requirements, these air operators will only have to successfully validate and maintain their safety case.

Administrative burdens are minimized since the amendments simply update the prescriptive regime, they do not add new administrative requirements. Industry can continue to use its established mechanism for managing flight crew hours of work. To operate under FRMS, a carrier will need to submit a Notice of Intent to use an initial exemption while they validate a safety case to demonstrate that flight crew fatigue is not increased and alertness levels are not reduced. Transport Canada will review the safety case, and upon approval, the continuing exemption will take effect and remain valid as long as the air operator maintains their FRMS and ensures that the safety case continues to effectively manage the levels of fatigue and alertness of flight crew members.

Introducing the FRMS will better align Canada with the U.S. FAA and EASA, as both civil aviation authorities include FRMS in their regulations. Both the U.S. FAA and EASA offer the FRMS as an alternative (not mandatory) means for air operators to manage fatigue. Similar to the U.S. FAA and EASA, Canada will also approve FRMS safety cases in order to operate any flights under a continuing exemption from prescriptive limits.

Implementation, enforcement and service standards

These amendments will come into force:

For prescriptive rules:

- Two years from the date of publication of the amendments in the *Canada Gazette*, Part II, for air operators subject to Subpart 705 of the CARs; and
- Four years from the date of publication of the amendments in the *Canada Gazette*, Part II, for air operators subject to Subparts 703 and 704 of the CARs.

For FRMS:

- Two years from the date of publication of the amendments in the *Canada Gazette*, Part II, for air operators subject to Subparts 702 and 705 of the CARs; and
- Four years from the date of publication of the amendments in the *Canada Gazette*, Part II, for air operators subject to Subparts 703 and 704 of the CARs.

Between the publication of the amendments in the *Canada Gazette*, Part II, and their coming-into-force date, Transport Canada will communicate with affected air operators to promote the amendments and outline the FRMS option. Specific actions at this time may include

- meeting with affected air operators including unions and industry associations;
- working with air operators who are participating in FRMS pilot projects to identify and share best practices;
- answering enquiries;
- updating and publishing guidance materials; and
- organizing information sessions to explain the amendments.

With respect to the alternative FRMS exemption mechanism, once an air operator submits a Notice of Intent, they can operate under an initial exemption for up to two years while validating a safety case, during which period they must report to Transport Canada at periodic intervals that an update of their progress is available for inspection. Once an air operator has validated their safety case, they must submit it to Transport Canada for approval before they can use a continuing exemption to operate specific flights while varying from the prescriptive regime. If an air operator does not maintain their FRMS and does not ensure that the safety case continues to effectively manage the levels of fatigue and alertness of flight crew members, they must revert to prescriptive rules.

Transport Canada will enforce these amendments by

- imposing monetary penalties under sections 7.6 to 8.2 of the *Aeronautics Act*, which carry a maximum fine of \$5,000 for individuals and \$25,000 for corporations;
- suspending or cancelling a Canadian aviation document; or
- taking legal action by way of indictable offence or summary conviction, as applicable under section 7.3 of the *Aeronautics Act*.

Transport Canada will conduct its implementation, compliance promotion and enforcement activities with existing resources, within the existing departmental reference level.

Performance measurement and evaluation

The performance measurement criteria will be closely linked to the objectives to see if the implementation of the amendments will reach the goals that have been set up at the outset of the regulatory development. Therefore, Transport Canada selected the following performance measures subject to consultation results:

- Increase the CARs compliance with the ICAO SARPs relating to flight duty limitations and rest time, based on scientific principles and knowledge, and allow for the use of FRMS.
- Align and reduce existing gaps associated with maximum flight duty and rest time with other jurisdictions such as the U.S. and the EU.
- Enhance safety within flight operations. This could be measured by the following:
 - Total incident and accident rate comparison;
 - Pilot fatigue survey report; and
 - One-on-one fatigue management interviews with flight crew members.

Contact

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Annex A: Summary of previous and new limits in nine areas

Amendments	Previous limits	Limits in Amendment
1. Maximum Flight Time	<ul style="list-style-type: none"> • 40–60 hours / 7 days • 120 hours / 30 days • 300 hours / 90 days • 1 200 hours / 365 days 	<ul style="list-style-type: none"> • 112 hours / 28 days • 300 hours / 90 days • 1 000 hours / 365 days

2. Maximum FDP	<ul style="list-style-type: none"> • 13 hours 45 minutes or 14 hours 	<ul style="list-style-type: none"> • Maximum 9–13 hours — based on start time of day and the sectors flown 																									
3. Maximum Number of Hours of Work																											
3(a) Maximum Number of Hours of Work	Nil	<table border="1"> <thead> <tr> <th></th> <th>Hours Per 7 days</th> <th>Hours Per 28 days</th> <th>Hours Per 365 days</th> </tr> </thead> <tbody> <tr> <td>Option 1</td> <td>60</td> <td>192</td> <td>2 200</td> </tr> <tr> <td>Option 2</td> <td>70</td> <td>192</td> <td>2 200</td> </tr> </tbody> </table>		Hours Per 7 days	Hours Per 28 days	Hours Per 365 days	Option 1	60	192	2 200	Option 2	70	192	2 200													
	Hours Per 7 days	Hours Per 28 days	Hours Per 365 days																								
Option 1	60	192	2 200																								
Option 2	70	192	2 200																								
3(b) Time Free From Duty	<ul style="list-style-type: none"> — 36 hours / 7 days; or — 3 days / 17 days; or — 3 periods x 24 hours / 30 days — 13 x 24 hours / 90 days. 	<table border="1"> <tbody> <tr> <td>Option 1</td> <td>1 single day free from duty per 7 days 4 single days free from duty per 28 days</td> </tr> <tr> <td>Option 2</td> <td>5 days off per 21 days</td> </tr> </tbody> </table>	Option 1	1 single day free from duty per 7 days 4 single days free from duty per 28 days	Option 2	5 days off per 21 days																					
Option 1	1 single day free from duty per 7 days 4 single days free from duty per 28 days																										
Option 2	5 days off per 21 days																										
4. Rest Periods	8 hours plus time for travel, meals and hygiene	At home — 12 hours or 11 hours plus travel time, or 10 hours in suitable accommodation provided by the air operator Away from home — 10 hours in suitable accommodation																									
5. Rest Periods:		<table border="1"> <thead> <tr> <th>Additional Rest Period due to:</th> <th>Local night's rest required</th> </tr> </thead> </table>	Additional Rest Period due to:	Local night's rest required																							
Additional Rest Period due to:	Local night's rest required																										
5(a) Disruptive Schedules	Nil	<table border="1"> <tbody> <tr> <td>Disruptive Schedules</td> <td>1</td> </tr> </tbody> </table>	Disruptive Schedules	1																							
Disruptive Schedules	1																										
5(b) Time Zone Differences	Nil	<table border="1"> <tbody> <tr> <td>Time zone difference</td> <td>1, 2 or 3</td> </tr> </tbody> </table>	Time zone difference	1, 2 or 3																							
Time zone difference	1, 2 or 3																										
5(c) Consecutive Flight Duty Periods	Nil	<table border="1"> <tbody> <tr> <td>3 Consecutive night duty periods</td> <td>1</td> </tr> <tr> <td colspan="2">Allow 5 consecutive nights with a rest period of 3 hours during each FDP</td> </tr> </tbody> </table>	3 Consecutive night duty periods	1	Allow 5 consecutive nights with a rest period of 3 hours during each FDP																						
3 Consecutive night duty periods	1																										
Allow 5 consecutive nights with a rest period of 3 hours during each FDP																											
5(d) Positioning	Half of the time in excess of maximum flight duty period is calculated into the following rest period	If positioning 3 hours or less in excess of maximum FDP, the rest period must equal hours of work (FDP plus positioning); If positioning greater than 3 hours in excess of maximum FDP, the rest period must be equal to hours of work plus positioning; More than 7 hours of positioning — FRMS required.																									
6. FDP due to In-Flight Rest and Augmented Flight Crew	Pilots 1 more	<table border="1"> <thead> <tr> <th>Seat</th> <th>Bunk</th> <th>Pilots</th> <th>1 more</th> <th>2 more</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>Class 3 rest facility</td> <td>14 hours</td> <td>15.25 hours</td> </tr> <tr> <td></td> <td></td> <td>Class 2 rest facility</td> <td>15 hours</td> <td>16.5 hours</td> </tr> <tr> <td></td> <td></td> <td>Class 1 rest facility</td> <td>15 hours</td> <td>18 hours</td> </tr> <tr> <td colspan="5">>18 hours extension requires an FRMS</td> </tr> </tbody> </table>	Seat	Bunk	Pilots	1 more	2 more			Class 3 rest facility	14 hours	15.25 hours			Class 2 rest facility	15 hours	16.5 hours			Class 1 rest facility	15 hours	18 hours	>18 hours extension requires an FRMS				
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		Class 1 rest facility	15 hours	18 hours																							
>18 hours extension requires an FRMS																											
7. Long-Range Flights		No additional FDP following a flight greater than 7 hours, if it occurs within the WOCL																									
8. Ultra Long-range Flight	Permitted (standard 720.16(3))	Permitted only under an FRMS																									
9. Unforeseen Operational Circumstance	Add 3 hours to FDP	<table border="1"> <thead> <tr> <th>Number of flight crew members</th> <th>Permitted additional FDP</th> </tr> </thead> <tbody> <tr> <td>1 pilot</td> <td>1 additional hour</td> </tr> <tr> <td>Non augmented (2 pilots)</td> <td>2 additional hours</td> </tr> <tr> <td></td> <td>If 1 flight, 3 additional hours;</td> </tr> </tbody> </table>	Number of flight crew members	Permitted additional FDP	1 pilot	1 additional hour	Non augmented (2 pilots)	2 additional hours		If 1 flight, 3 additional hours;																	
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1 pilot	1 additional hour																										
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		Augmented	If 2 or 3 flights, 2 additional hours
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Annex B: Comparison of the CARs requirements with those of the U.S. FARs and EASA

	CARs	U.S. FARs Part 117	EASA
Flight Time Limitations			
365 consecutive days	1 000 hours	1 000 hours	900 hours per calendar year 1 000 hours in 12 consecutive months
90 consecutive days	300 hours	N/A	N/A
28 consecutive days	112 hours	100 hours	100 hours
24 consecutive hours	N/A	8 or 9 hours	N/A
Rest Periods			
Daily	12 hours at home base or 11 hours plus travel time or 10 hours rest in suitable accommodation away from home base	10 hours	Longest period of either the duration of the previous duty period or 12 hours at home base or 10 hours away from home base
Recurrent	31 to 33 hours in 7 days (single day free from duty) ⁵⁴ and 4 single days free from duty per 28 days or 120 hours per 21 days	30 hours in 7 days	36 hours in 7 days (single day free from duty) and 192 hours per 28 days EU Directive (2000/79/EC (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0079:EN:NOT)) ⁵⁵ requires 7 days per month off and 96 days per year off
Hours of Work Limitations			
365 consecutive days	2 200 hours	N/A	2 000 hours EU Directive (2000/79/EC (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0079:EN:NOT))
28 consecutive days	192 hours	190 flight duty hours	190 hours
14 consecutive days	N/A	N/A	110 hours
7 consecutive days	60 hours or 70 hours Includes all hours of work	60 flight duty hours Work assigned without a flight being involved is not counted	60 hours Includes all hours of work
Daily Flight Duty Time Limitations			
Based on start time of day — reduced at night and reduced by number of flights flown	13–9 hours	14–9 hours Restricted by 8 or 9 hour daily flight time limitation	13–11 hours
With additional pilots and rest facilities onboard	14–18 hours All regulators permit longer FDPs with the use of an FRMS — ultra long-range operations	13–19 hours	14–17 hours

Consecutive Nights

	No more than 3 in a row if any part falls between 02:00 and 05:59	No more than 3 in a row that infringe on 02:00–05:59	Restricted to no more than 4 flights per night
	If a 3 hour rest is provided each night and 56 hours free from duty are provided after the last consecutive night — up to 5 in a row.	If a 2 hour rest is provided each night — up to 5 in a row.	N/A

Footnotes

a S.C. 2014, c. 39, s. 144

b S.C. 1992, c. 4, s. 8

c S.C. 2004, c. 15, s. 9

d S.C. 2015, c. 20, s. 12

e S.C. 2004, c. 15, s. 18

f R.S., c. A-2

1 SOR/96-433

2 **Flight crew member** means a crew member assigned to act as pilot or flight engineer of an aircraft during flight time.

3 **Medical evacuation flight** means a flight carried out for the purpose of facilitating medical assistance and that transports (a) medical personnel; (b) ill or injured persons; (c) human blood products or organs; or (d) medical supplies.

4 **Aerial work** means a commercial air service other than an air transport service or a flight training service (e.g. firefighting or aerial advertising).

5 International Air Transport Association (IATA) FRMS Training Book, Session 3, slide 24 (Why sleep is so important).

6 <https://aviationvoice.com/pilot-fatigue-a-matter-threatening-aviation-safety-201706291722/> (<https://aviationvoice.com/pilot-fatigue-a-matter-threatening-aviation-safety-201706291722/>).

7 2012 Sleep in America® Poll — Planes, Trains, Automobiles and Sleep: Summary of Findings (<https://sleepfoundation.org/sites/default/files/2012%20Sleep%20in%20America%20Poll-%20Summary%20of%20Findings.pdf> (<https://sleepfoundation.org/sites/default/files/2012%20Sleep%20in%20America%20Poll-%20Summary%20of%20Findings.pdf>)).

8 Folkard S, Tucker P, "Shift work, safety and productivity," *Occupational Medicine* Vol. 53, No. 2 (February 1, 2003): 95–101.

9 Goode J.H. "Are pilots at risk of accidents due to fatigue?" *Journal of Safety Research*, Vol. 34, No. 3 (2003): 309–313.

10 https://www.icao.int/Meetings/fmas/Documents/Presentations/Philippa%20Gander_Scientific%20Principles.pdf (https://www.icao.int/Meetings/fmas/Documents/Presentations/Philippa%20Gander_Scientific%20Principles.pdf).

11 **Window of circadian low** means the period that begins at 2 a.m. and ends at 5:59 a.m. at the location where a flight crew member is acclimatized.

12 https://www.icao.int/safety/fatiguemanagement/Fatigue%20Management%20Docs/FM_Annex%206%20Pt1.pdf (https://www.icao.int/safety/fatiguemanagement/Fatigue%20Management%20Docs/FM_Annex%206%20Pt1.pdf).

13 **Flight time** means the time from the moment an aircraft first moves under its own power for the purpose of taking off until the moment it comes to rest at the end of the flight.

- 14 **Rest period** means the continuous period during which a flight crew member is off duty, excluding the travel time to or from suitable accommodation provided by a private operator or an air operator.
- 15 The final rule was published in the Federal Register as Flight Crew Member Duty and Rest Requirements (77 FR 330–403) under parts 117, 119 and 121, title 14 of the *Code of Federal Regulations* and became effective on January 4, 2014.
- 16 Which the ICAO Council adopted at the fifth meeting of its 186th Session on March 2, 2009.
- 17 **Positioning** means the transfer of a flight crew member from one location to another, at the request of the air operator, but does not include travel to or from suitable accommodation or the member's lodging.
- 18 **Flight crew member on standby** means a flight crew member who has been designated by an air operator to remain at a specified location in order to be available to report for flight duty on notice of one hour or less.
- 19 **Home base** means the location where a flight crew member normally commutes to in order to report for an FDP or for positioning.
- 20 **Suitable accommodation** means a single-occupancy bedroom that is subject to a minimal level of noise, is well ventilated and has facilities to control the levels of temperature and light or, where such a bedroom is not available, an accommodation that is suitable for the site and season, is subject to a minimal level of noise and provides adequate comfort and protection from the elements.
- 21 **Early duty** means hours of work that begin between 2 a.m. and 6:59 a.m., at the location where the flight crew member is acclimatized.
- 22 **Night duty** means hours of work that begin between 1 p.m. and 1:59 a.m., and that end after 1:59 a.m. at a location where the flight crew member is acclimatized.
- 23 **Late duty** means hours of work that end between midnight and 1:59 a.m. at the location where the flight crew member is acclimatized.
- 24 **Jet lag** is a temporary disruption of the body's biological clock experienced by persons who travel across several time zones. The effects of jet lag may include fatigue and irritability.
- 25 **Acclimatized** describes a flight crew member whose biorhythm is aligned with local time.
- 26 **Augmented flight crew** means a flight crew that comprises more than the minimum number required to operate the aeroplane and in which each flight crew member can leave his or her assigned post and be replaced by another appropriately qualified flight crew member for the purpose of in-flight rest (ICAO Annex 6).
- 27 **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 devices to control the temperature and light; and (c) is subject to a minimal level of noise and other disturbances.
- 28 **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.
- 29 **Class 3 rest facility** means a seat that reclines at least 40° from vertical and that has leg and foot support.
- 30 **Crew member** means a person assigned to duty in an aircraft during flight time (e.g. flight, technical, or cabin crew member).
- 31 **Fit for duty**, in respect of a person, means that their ability to act as a flight crew member of an aircraft is not impaired by fatigue, the consumption of alcohol or drugs or any mental or physical condition.
- 32 Fatigue modelling software: mathematicians have taken the decades of available data related to human performance and fatigue (time awake, time of day, sleep opportunity data, and measured performance under different circumstances) and written algorithms to reflect this data. With fatigue modelling software, a schedule may be analyzed and used as a predictor of human performance, determining whether the schedule is good or bad from a fatigue perspective.

- 33 *FRMS Implementation Guide for Operators*, July 2011, International Air Transport Association (IATA), ICAO, International Federation of Air Line Pilots' Associations (IFALPA).
- 34 Unless otherwise noted, all figures in the "Benefits and costs" section are in present value, using a 7% discount rate.
- 35 An accident is assumed to cause at least one fatality or one serious injury or significant structural damage to an aircraft. An incident is a less severe occurrence such as an engine failure or precautionary shutdown, or a threat to safety that arises when a crew member, whose duties are directly related to the safe operation of the aircraft, is unable to perform their duties as a result of a physical incapacitation. For the full list of reportable incidents, refer to <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2014-37/page-1.html> (<http://laws-lois.justice.gc.ca/eng/regulations/SOR-2014-37/page-1.html>) (accessed March 17, 2017).
- 36 Statistics Canada: Based on data from Statistics Canada, the number of air passengers at Canadian airports has increased by 4.47% per year, on average, from 2010 to 2016.
- 37 U.S. FAA: *Flight Crew Member Duty and Rest Requirements*, 2012 (https://www.faa.gov/regulations_policies/rulemaking/recently_published/media/2120-AJ58-FinalRule.pdf (https://www.faa.gov/regulations_policies/rulemaking/recently_published/media/2120-AJ58-FinalRule.pdf)).
- 38 The willingness of flight crew to pay to avoid fatigue is at least as high as the salary portion of their sick leave due to fatigue.
- 39 Report of the Canadian Aviation Regulation Advisory Council Flight Crew Fatigue Management Working Group, <http://wwwapps.tc.gc.ca/Saf-Sec-Sur/2/NPA-APM/tcctr.aspx?id=240&lang=eng> (<http://wwwapps.tc.gc.ca/Saf-Sec-Sur/2/NPA-APM/tcctr.aspx?id=240&lang=eng>).
- 40 Eleven submissions were duplicates.
- 41 The rule, found under 14 CFR 117, 119 and 121 came into effect on January 4, 2014.
- 42 Public Law 111-216-Aug. 1, 2010 (<https://www.gpo.gov/fdsys/pkg/PLAW-111publ216/pdf/PLAW-111publ216.pdf> (<https://www.gpo.gov/fdsys/pkg/PLAW-111publ216/pdf/PLAW-111publ216.pdf>)).
- 43 An FRMP requires an air carrier to manage fatigue and assess the ability of the program to improve alertness and mitigate performance errors. This is not quite an FRMS, but approximately two thirds of an FRMS.
- 44 <http://www.gazette.gc.ca/rp-pr/p1/2017/2017-03-25/html/notice-avis-eng.html#na5> (<http://www.gazette.gc.ca/rp-pr/p1/2017/2017-03-25/html/notice-avis-eng.html#na5>).
- 45 <http://www.gazette.gc.ca/rp-pr/p1/2017/2017-07-08/html/index-eng.html> (<http://www.gazette.gc.ca/rp-pr/p1/2017/2017-07-08/html/index-eng.html>).
- 46 **Consecutive FDPs** refers to FDP assignments occurring on consecutive days, when the flight crew member has only the required rest period between the FDP assignments.
- 47 Examples of studies citing fatigue as a contributory to accidents:
- Goode J.H., "Are pilots at risk due to fatigue?," *Journal of Safety Research*, 2003, 34, 309-313.
 - Velazquez J. "The presence of behavioral traps in U.S. airline accidents: A qualitative analysis," *Safety*, 2018, 4.
- 48 Akerstedt T. and al.: Paper prepared for the European Transport Safety Council "Meeting to discuss the role of EU FTL legislation in reducing cumulative fatigue in civil aviation" in Brussels on Wednesday, February 19, 2003 — <https://www.eurocockpit.be/pages/fatigue-in-accidents> (<https://www.eurocockpit.be/pages/fatigue-in-accidents>) and <https://www.eurocockpit.be/sites/default/files/Akerstedt-Mollard-Samel-Simons-Spencer-2003.pdf> (<https://www.eurocockpit.be/sites/default/files/Akerstedt-Mollard-Samel-Simons-Spencer-2003.pdf>) accessed March 17, 2017.
- 49 <https://www.gpo.gov/fdsys/pkg/FR-2012-01-04/pdf/2011-33078.pdf> (<https://www.gpo.gov/fdsys/pkg/FR-2012-01-04/pdf/2011-33078.pdf>).
- 50 FAA-2009-1093-2477

- 51 The amendments are consistent with ICAO SARPs for flight crew fatigue management. ICAO requires that (a) the two fatigue-management approaches (prescriptive regulations and performance-based FRMS) be based on scientific principles, knowledge, and operational experience; and (b) fatigue management be a shared responsibility between the State, service providers, and individuals.
- 52 Wright KP, Hughes RJ, Hull JT, Czeisler CA, "Cumulative Neurobehavioral Performance Deficits on a 24-hr Day with 8-hr of Scheduled Sleep," *Journal Of Sleep And Sleep Disorders Research, Abstract Supplement 2*, Vol. 23 (April 15, 2000): 36.
- 53 Belenky G, Wesensten N, Thorne D, Thomas M, Sing H, Redmond D, Russo M, Balkin T, "Patterns of performance degradation and restoration during sleep restriction and subsequent recovery: a sleep dose-response study," *Journal of Sleep Research*, Vol. 12 (December 11, 2003): 1-12.
- 54 **single day free from duty** means time free from duty from the beginning of the first local night's rest until the end of the following local night's rest.
- 55 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32000L0079&from=EN> (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32000L0079&from=EN>)

Government of Canada activities and initiatives

#YourBudget2018 – Advancement



(https://www.budget.gc.ca/2018/docs/themes/advancement-en.html?utm_source=Canada&utm_medium=Activities_e&utm_content=AdvancingOurSharedValues) Advancing our shared values

#YourBudget2018 – Reconciliation



(https://www.budget.gc.ca/2018/docs/themes/reconciliation-en.html?utm_source=Canada&utm_medium=Activities_e&utm_content=AdvancingReconciliationWithIndigenousPeoples) Advancing reconciliation with Indigenous Peoples

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(https://www.budget.gc.ca/2018/docs/themes/progress-en.html?utm_source=Canada&utm_medium=Activities_e&utm_content=SupportingCanadasResearchersToBuildAMoreInnovativeEconomy) Supporting Canada's researchers to build a more innovative economy