Fatigue Risk Management Approaches for U.S. Flightcrew

Thomas E. Nesthus, Ph.D.

Engineering Research Psychologist

Civil Aerospace Medical Institute

Oklahoma City, OK

Federal Aviation Administration

Overview of Flightcrew FRM

- **Recently developed fatigue risk management approaches for U.S. flightcrew**
  - Fatigue Risk Management Plans (FRMP)
  - 14 CFR Part 117 Flightcrew Member Duty and Rest Requirements

  And,

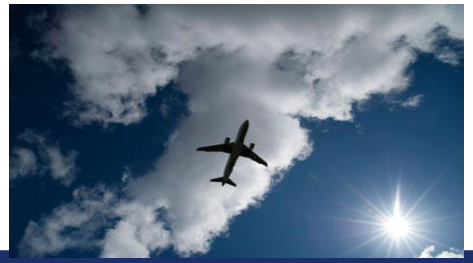
  - Optional Fatigue Risk Management System (FRMS)

Rulemaking Background

- FAA considered changes in 14 CFR part 121 flight, duty, and rest regulations in June 1992
- Aviation Rulemaking Advisory Committee (ARAC) could not agree but FAA issued an NPRM in 1995
- Industry stated FAA lacked safety data to justify the rulemaking, arguing that rules would be costly
- FAA never finalized the 1995 rulemaking

Rulemaking Background

- Following Feb 2009 Colgan Air crash FAA chartered an aviation rulemaking committee (ARC) June 2009
- ARC provided recommendations Sep 2009
- FAA released NPRM Sep 2010
- Final Rule published Federal Register Jan 2012
- 14 CFR part 117 implemented Jan 2014



Fatigue Risk Management Plan (FRMP)

- **Mandate** came from Airline Safety and FAA Extension Act of 2010

- **Public Law 111-216, § 212(B)**
  - *Required* by *ALL* part 121 air carriers

  - FRMP includes methodology to continually assess pilot fatigue and program effectiveness to improve alertness and mitigate performance errors from within the regulatory structure

New Regulation

- Part 117 considers natural circadian rhythms, workload, and theater of operations
- Varies daily FDP limits based on time of day, number of flight segments, acclimation to a new theater of operation, and the likelihood of being able to sleep under challenging circumstances

Federal Register / Vol. 77, No. 2 / Wednesday, January 4, 2012 / Rules and Regulations

117.1 Applicability.

117.3 Definitions.

117.5 Fitness for duty.

117.7 Fatigue risk management system.

117.9 Fatigue education and awareness training program.

117.11 Flight time limitation.

117.13 Flight duty period: Unaugmented operations.

117.15 Flight duty period: Split duty.

117.17 Flight duty period: Augmented flightcrew.

117.19 Flight duty period extensions.

117.21 Reserve status.

117.23 Cumulative limitations.

117.25 Rest period.

117.27 Consecutive nighttime operations.

117.29 Emergency and government sponsored operations.

Table A—Maximum Flight Time Limits for Unaugmented Operations

Table B—Flight Duty Period: Unaugmented Operations

Table C—Flight Duty Period: Augmented Operations

Flight Time Limitation

Circadian Rhythm/Time of Day

Table A to Part 117

Unaugmented Operations

Maximum Flight Time Limits

Time of Report (Acclimated)	Maximum Flight Time (hours)
0000-0459	8
0500-1959	9
2000-2359	8

Flight Duty Period Limitation

Time of Day/Workload

Table B to Part 117

Maximum Flight Duty Period Limits for Unaugmented Operations

Scheduled Time of Start (Acclimated Time)	Maximum Flight Duty Period (hours) For Lineholders Based on Number of Flight Segments						
	1	2	3	4	5	6	7+
0000-0359	9	9	9	9	9	9	9
0400-0459	10	10	10	10	9	9	9
0500-0559	12	12	12	12	11.5	11	10.5
0600-0659	13	13	12	12	11.5	11	10.5
0700-1159	14	14	13	13	12.5	12	11.5
1200-1259	13	13	13	13	12.5	12	11.5
1300-1659	12	12	12	12	11.5	11	10.5
1700-2159	12	12	11	11	10	9	9
2200-2259	11	11	10	10	9	9	9
2300-2359	10	10	10	9	9	9	9

Flight Duty Period Limitation

Time of Day/Time on Task

TABLE C TO PART 117 – FLIGHT DUTY PERIOD: Augmented Operations						
Scheduled time of start (acclimated time)	**Maximum flight duty period (hours) based on rest facility and number of pilots**					
	Class 1 rest facility		**Class 2 rest facility**		**Class 3 rest facility**	
	3 pilots	4 pilots	3 pilots	4 pilots	3 pilots	4 pilots
0000-0559	15	17	14	15.5	13	13.5
0600-0659	16	18.5	15	16.5	14	14.5
0700-1259	17	19	16.5	18	15	15.5
1300-1659	16	18.5	15	16.5	14	14.5
1700-2359	15	17	14	15.5	13	13.5

Fatigue Risk Management System (FRMS)

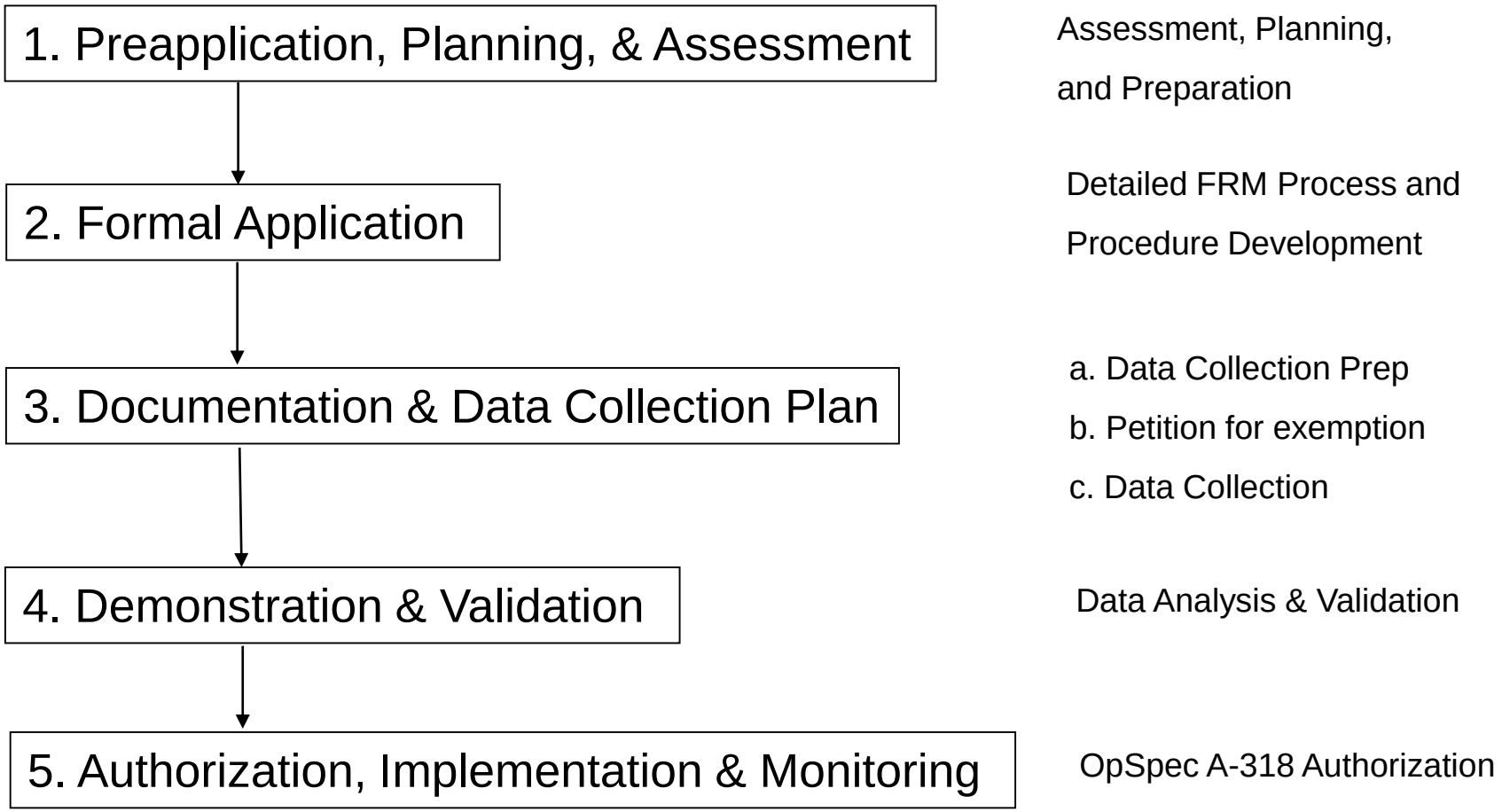
§ 117.7 describes an optional approach to safely conduct specific flight operations outside the limitations of the regulation

- Provides carrier with flexibilities not found within the prescriptive regulations
- Authorization “conditions and limitations” identify and reduce fatigue risk for these specific FRMS flight operations

FAA AC 120-103A: FRMS for Aviation Safety

- Outlines required procedures for proposing an alternative means of compliance (AMOC) to 14 CFR Part 117
  - Needs to be scientifically-based and data-driven
  - Must provide “at least an equivalent level of safety against fatigue-related accidents or incidents as the other provisions of this part”
  - Comparisons made with a Safety Standard Operation with similar flight operation elements

Overview of FRMS Approval Process



Summary

New approaches to flightcrew fatigue management were discussed, including:

- **New regulation implemented in 2014**
  - Integrated mitigations found in part 117

- **FRMP mandated in 2010**
  - Fatigue management within the regulations

  And,

- **§ 117.7 Fatigue Risk Management Systems**

  - Optional FRMS for fatigue management outside of the regulations

Introduction to Today's Discussion:

Part 117.17 (c) (1)&(2) introduces requirements on the distribution of in-flight rest breaks on flights with augmented crews. It requires that:

- the pilot flying (PF) during landing has at least two consecutive hours in the second half of the flight duty period (FDP) available for in-flight rest; and

- the pilot monitoring at landing (PM) must have a minimum break of 90 mins during the FDP.

Discussion Introduction (con't)

Allocation of In-Flight Rest Breaks for 3-Pilot Crews on Flights Less than 14 hours

Line-up

Capt Jim Mangie, Flight Operations, Delta Air Lines, Atlanta, GA

Professor Philippa Gander, Sleep/Wake Research Centre, Massey University, Wellington, New Zealand

Dr. Steve Hursh, Institutes for Behavior Resources, Inc., Baltimore, MD