

- Strategic Approach to Fatigue Risk Management Matt Humlie
- Enroute Fatigue Countermeasures Captain Matt Kalouner
- Cost/Benefit Case Study- Dr Daniel Mollicone



- Review Regulatory Fatigue Mitigations
- Phase I: Alaska Airlines Strategic Approach
- Phase II: Enhancements

	TABLE A TO PART 117-MAXIMUM FLIGHT TIME LIMITS FOR UNAUGMENTED OPERATIONS TABLE						
	Time of report (acclimated)		Ma	ximum flight (hours)	time		
	0000-0459			8			
	0500-1959			9			
	2000-2359			8			
TABLE	B TO PART	117-FLIGHT D	UTY PERIOI	: UNAUGME	NTED OPERA	TIONS	
Scheduled time of start	Maxin	um flight duty p	period (hours)	for lineholders	based on num	ber of flight se	gments
(acclimated time)	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
	12	13	13	13	12.5	12	11.5
1200-1259	13		10	12	11.5	11	10.5
1200-1259 1300-1659	12	12	12				
1200-1259 1300-1659 1700-2159	13 12 12	12 12	12	11	10	9	9
1200-1259 1300-1659 1700-2159 2200-2259	12 12 12 11	12 12 11	11 11 10	11 10	10 9	9 9	9 9

REGULATORY REQUIREMENTS TO ADDRESS FATIGUE IN THE US

- FAR 117 , Flight and Duty Limitations and Rest Requirements
- Implemented in January 2014
- Fatigue Risk Mitigation Designed Into Regulation
 - •Flight Duty Period Limits Based On Fatigue Science
 - "Hard" Flight Hour Limits
- Regulation removed 7 day cumulative Flight Hour limits



But, we are still receiving fatigue reports so the

•Regulatory Requirements Are Not Sufficient •Airline Expected to Address Gaps



Tools to help identify and manage fatigue risk

<u>Fatigue Reports –</u>

- High Level of Variance in Fatigue Reports
 - Pairing Attributes Impact Individuals Differently
 - "Quality of Life Issues" Included in Fatigue Reports
- FSAG Recognized Need for Strategic Approach to Manage Risk
- Use Filtered Data to Identify Issues
 - Data Supported by Fatigue Science
 - Validated by Subject Matter Expertise

Fatigue Assessment Model

Fatigue Safety Action Group-Subject Matter Expertise

- Chief Pilot Representative
- ALPA Scheduling Committee Representative
- ALPA Safety Representative
- Flight Safety Representative
- Crew Planning Representatives
- Pilot Scheduling Representative
- Flight Operations Management



- Fatigue Assessment Scale: Higher Number– Higher Fatigue Risk
- Guide not Gospel: Provides Insights

Fatigue Assessment Scale

Measure	Hours Continuously Awake	Regular Sleep/Night
15	22.5	5
13	21	5.2
11	19	5.5
9	18	6
7	16	7
5	14	8

Assessment of Designed Pairings									
	Rase	Flights	Pairings	Ανα	Med	75%	90%	Max Eta	
	ANC	2559	548	5.8	5.3	6.4	8.7	12.1	_
		1767	485	5.2	4.9	5.7	6.5	11.6	-
	SEA	2865 8403	2282	5.2	4.9 5.1	5.9 6.0	6.5 7.2	11.2	-
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- Fatigue Assessment Model Indicated Fatigue Was An Issue
- Fatigue Reports Confirmed Fatigue Was An Issue





- When Possible—Design Pairings to Limit Fatigue Risk
- When Not Possible—Educate to Manage Risk
- Identify and Implement Other Mitigation Opportunities
 - **Consistent** Lines—Consistent Duty Start Times
 - Adjust Hotel Locations to Maximize Rest Opportunity
- Question: Can Our Data Help Us Determine How to Limit Risk?

Hybrid Strategic Approach

- When Possible—Design Pairings to Limit Fatigue Risk
- When Not Possible—Educate to Manage Risk
- Identify and Implement Other Mitigation Opportunities
 - Consistent Lines—Consistent Duty Start Times
 - Adjust Hotel Locations to Maximize Rest Opportunity
- Question: Can Our Data Help Us Determine How to Limit Risk?



Alaska Airlines Approach to Managing Fatigue Risk

- Reviewed Fatigue Reports for 12-Month Period
 - Limited Data To Systemic Reports Submitted By Line Holders
 - 248 Reports
 - Reviewed Fatigue Assessment Metrics



Actions to Achieve Goal—Reduce Fatigue Risk

- Plan Pairings To Limit Fatigue Assessment <=11
- Write Optimizer Rules
- Addressed Pairing Attributes Increasing Fatigue
 - If Pairing Operates Over 02:30-03:30 Local--One Flight Segment
 - Lock Transcon/Midcon Rotations that Include WOCL Flight & Short Day Sleep
 - Limit FDP Segments In Challenging Environment (SE Alaska)
- Line Consistency Consistent FDP Start/End Times
- Flight Time Limits 32 hours / 7 days



Compare Pre Action Fatigue reports/Calls to Post Action Reports/Calls

Current Pairing Design Process Can Be Improved

- Rest is Only a Bi-Product of Pairing Design
 - Rest <> Sleep
 - Sleep Should Be a Goal
- Specific, City-Pair, Rules to Manage Fatigue Overly Constrain Pairing Design

- Result in Increased Costs
- Impact Flight Crew Quality of Life
- Multiple Goals are Needed





Phase II: Enhanced Pairing Design Optimization

- Goal: Efficient Pairings & Rested and Alert Crews
- Relax City-Pair Specific Rules Designed to Manage Fatigue Risk

- Introduce General Rules for Pairing Design
 - Rules Designed to Keep Crews Rested and Alert
 - Rules are Based on Sleep Not Just Rest

Phase II: Enhanced Pairing Design Optimization

- Initial Tests Have Been Performed
- Predicted Sleep Data Provided by Pulsar-Informatics
 - Data Provided To Optimizer As "Look-Up" Table
- Relaxed Some Specific Rules Designed to Manage Fatigue
- General Rules Applied:
 - 1. If predicted sleep < 6 hours, limit following duty to predicted sleep + 4 hours.

- 2. If predicted sleep < 6 hours, following rest must provide predicted sleep >= 8 hours
- Initial Results Indicate:
 - General Rules are Being Applied
 - Overall Fatigue Risk Metrics Show Improvement
 - Planning Costs Are Comparable to Current Solutions

- Continue Efforts to Generalize Rules for Optimizer
- Address Reserve Scheduling
- Improvements in Line Development
- Improve Fatigue Management Tools
 - Individual Crew Members
 - Schedulers



Summary

- Strategic Approach to Fatigue Management is Possible
- Data Can Tell You Where Action Is Needed
- Necessary Tools
 - Fatigue Assessment Model
 - Fatigue Working Group
 - Willingness to Make Changes
- Hybrid Approach is Probably Best
- Goal: Efficient Pairings & Managed Fatigue Risk Is Possible

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• Much More Work Needs to be Done





I appreciate all that Matt and his team have done and the data and number crunching is important and it is making us safer. The problem is....all this happens on the ground in a static environment

As these folks go home...pilots go to work. Our pilots are operating in the air...in a dynamic environment.



We have a lot of things we are dealing with in this dynamic environment of aviation and fatigue is just one of the threats we might face, but if you asked our crews right now what they think the biggest threat they are facing is on a daily basis, it is Fatigue



And the big problem with fatigue is that it hampers our ability to do our job. When it all boils down to it, being tired makes us a little, well, stupid. I see Dr. Mollicone looking at me from behind and he probably can't believe that I am boiling all this science down to that statement, but once again...pilot...PhD.

And the NTSB agrees, the NTSB says fatigue and alertness level are a contributing factor in 23% of all of its aviation investigations. That is almost 1 in 4!

Because the real threat from fatigue is a degraded mental status. We aren't thinking clearly, we can show poor decision making skills, bad judgement, lack of motivation, acceptance of poor performance.

How do we cope with that mental degradation? So far all that has been covered has been how to make trips better, but we live in the real world, with kids, delays, red eye flights...



How do I deal with fatigue – here?

I felt okay to start the flight and now I am over the middle of the country and I am dropping fast.



At Alaska, we have formalized procedures that we train in the classroom and available as a reference card while airborne that gives our pilots management strategies for how to operate in a degraded mental condition.

And they are pretty simple, but remember you aren't thinking clearly when you are fatigued.

- Review the card -

We still have a long way to go and the best method of fatigue management is to keep it out of the flight deck, but in the real world, we know we have to develop countermeasures to address it when it does appear in flight.

