





# FRM Mediated Derogation

**Robert KLEIN, Cargolux Airlines**

# Scope



- ▶ **Background**
- ▶ **LUX-TIP-JNB Derogation**
- ▶ **Areas of Uncertainty**
- ▶ **Summary**



Dec05 Fri	Dec06 Sat	Dec07 Sun	Dec08 Mon	Dec09 Tue	Dec10 Wed	Dec11 Thu	Dec12 Fri	Dec13 Sat	Dec14 Sun	Dec15 Mon	Dec16 Tue
VAC	VAC	FOD	7141	JNB	7153	NBO	7135		FOD	FST	FST
			05:00		13:45		05:15			08:00	08:00
			LUX		JNB		NBO			16:00	16:00
			JNB		NBO		STN				
			15:30		17:45		13:10				
							7135				
							14:40				
							STN				
							LUX				
							15:50				

[eCrew online](#)

Ignore

Comments: Please review airport and route qualification requirements in OM-A for airports and routes that you are rostered on.

**Cargolux FRM; EASA November 2014**

# CV FRM Background

## ► Standard elements

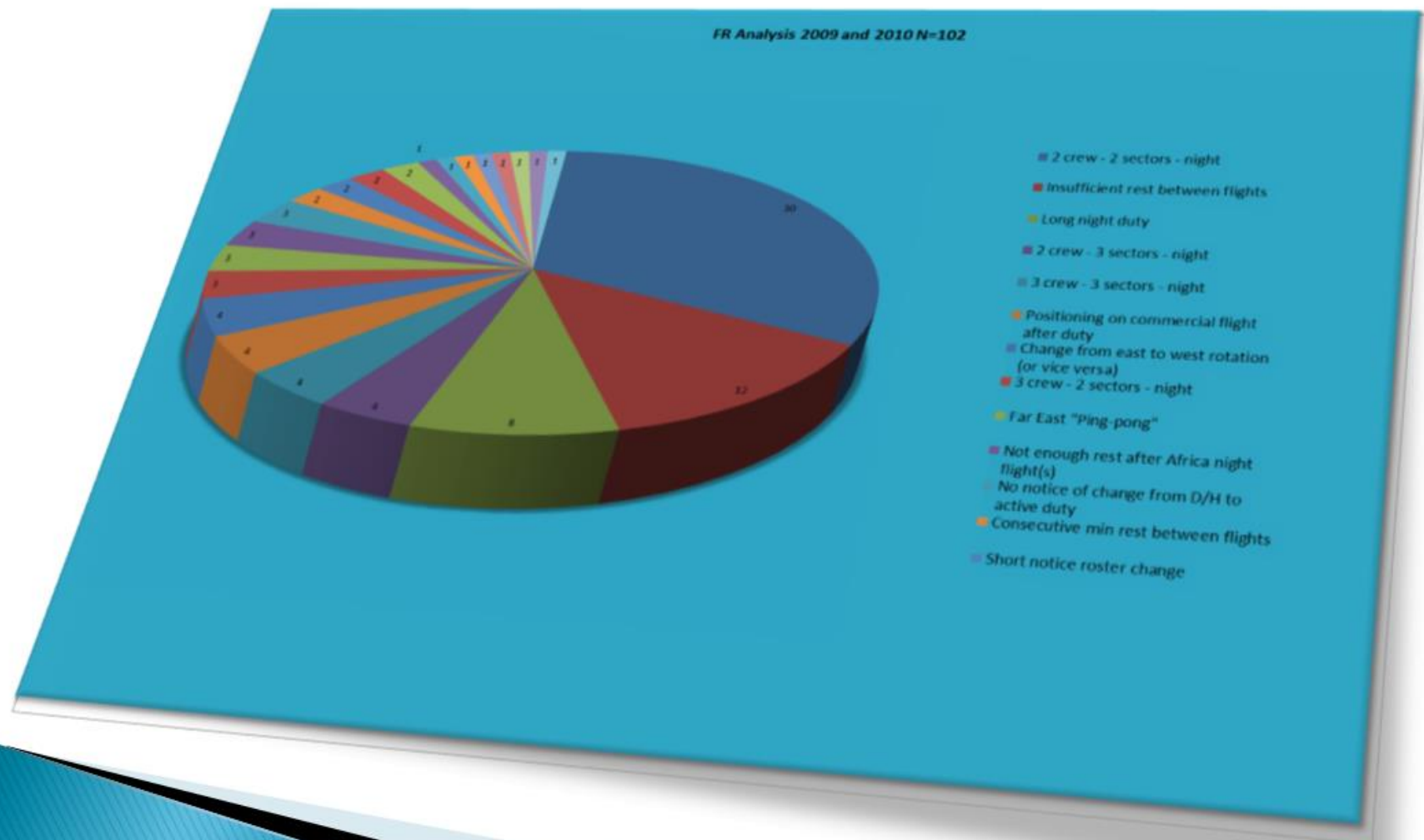


 <b>Fatigue Reporting Form</b> Nr. <span style="border: 1px solid black; padding: 0 20px;"> </span> (allocated by the ARO)																			
<small>THE INFORMATION PROVIDED REMAINS STRICTLY CONFIDENTIAL WITHIN THE CARGOLUX AVIATION SAFETY DEPARTMENT</small>																			
Name	<div> <div>3 Letter Code</div> <div>Rank</div> <div> <input type="checkbox"/> Captain <input type="checkbox"/> FO                             </div> </div>																		
Time event occurred	<div> <div>Date</div> <div>Time</div> <div>Sector(s) on which event occurred</div> </div>																		
Crew composition	<div> <div> <input type="checkbox"/> Basic <input type="checkbox"/> Augmented <input type="checkbox"/> Double                             </div> <div> <div>Function</div> <div> <input type="checkbox"/> Pilot Flying <input type="checkbox"/> Pilot Monitoring                                 </div> </div> </div>																		
Planned times (UTC)	<div> <div>On-duty</div> <div>Off-duty</div> <div>Planned duty time</div> </div>																		
Actual times (UTC)	<div> <div>On-duty</div> <div>Off-duty</div> <div>Actual duty time</div> </div>																		
Approx. how much actual sleep did you obtain in the ...	<div> <div> <input type="checkbox"/> hours before reporting for duty / Check in                          ... h ... min                     </div> <div> <input type="checkbox"/> hours before reporting for duty / Check in                          ... h ... min                     </div> </div>																		
Tick all factors you feel contributed to the event/your general concern	<div> <div> <input type="checkbox"/> Unable to get <u>good</u> rest  <input type="checkbox"/> Unable to get <u>in-flight</u> rest  <input type="checkbox"/> Insufficient rest before flight  <input type="checkbox"/> Insufficient rest before flight  <input type="checkbox"/> Unsuitable hotel room                          (please specify hotel name, room number and other relevant details)  <input type="checkbox"/> The pairing itself  <input type="checkbox"/> Roster disruption  <input type="checkbox"/> Delay(s)                     </div> <div> <input type="checkbox"/> Long duty  <input type="checkbox"/> Workload (e.g. due to weather, non-normals etc.)  <input type="checkbox"/> Long-term fatigue / exhaustion  <input type="checkbox"/> Home / Family issues  <input type="checkbox"/> Personal problems  <input type="checkbox"/> Other                          (please provide details in the space on the right)                     </div> <div>                         Use this space to provide further factors and/or details                     </div> </div>																		
Tick all physical and cognitive signs of fatigue that were apparent in the 2 hours leading up to the event	<div> <div> <b>PHYSICAL SIGNS</b>  <input type="checkbox"/> Yawning  <input type="checkbox"/> Rubbing eyes  <input type="checkbox"/> Yawning  <input type="checkbox"/> Frequent and/or long blinking  <input type="checkbox"/> Staring blankly  <input type="checkbox"/> Difficulty keeping eyes open  <input type="checkbox"/> Head nodding  <input type="checkbox"/> None                     </div> <div> <b>COGNITIVE SIGNS</b>  <input type="checkbox"/> Impaired attention  <input type="checkbox"/> Impaired memory  <input type="checkbox"/> Negative mood  <input type="checkbox"/> Reduced communication  <input type="checkbox"/> Impaired problem solving  <input type="checkbox"/> Increased risk taking  <input type="checkbox"/> Impaired situational awareness  <input type="checkbox"/> None                     </div> </div>																		
Mark how you felt when the event occurred	<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td> </tr> <tr> <td>Extremely alert</td><td>(Between 1 and 2)</td><td>Alert</td><td>(Between 3 and 4)</td><td>Neither sleepy nor alert</td><td>(Between 5 and 6)</td><td>Sleepy, but no difficulty remaining awake</td><td>(Between 7 and 8)</td><td>Extremely sleepy - fighting sleep</td> </tr> </table>	1	2	3	4	5	6	7	8	9	Extremely alert	(Between 1 and 2)	Alert	(Between 3 and 4)	Neither sleepy nor alert	(Between 5 and 6)	Sleepy, but no difficulty remaining awake	(Between 7 and 8)	Extremely sleepy - fighting sleep
1	2	3	4	5	6	7	8	9											
Extremely alert	(Between 1 and 2)	Alert	(Between 3 and 4)	Neither sleepy nor alert	(Between 5 and 6)	Sleepy, but no difficulty remaining awake	(Between 7 and 8)	Extremely sleepy - fighting sleep											
Actions taken to reduce fatigue level	<div> <div> <b>Rest, rest</b>                          Sequence <input type="checkbox"/> 1st <input type="checkbox"/> 2nd <input type="checkbox"/> 3rd                          Duration ... h ... min                     </div> <div> <b>Lockout, rest</b>                          Frequency <input type="checkbox"/> 1x <input type="checkbox"/> 2x <input type="checkbox"/> 3x                          Duration ... h ... min                     </div> <div>                         Other                     </div> </div>																		
Action performed	<input type="checkbox"/> Yes (due fatigue) <input type="checkbox"/> No <input type="checkbox"/> Not available due airport <input type="checkbox"/> Not available due equipment																		
<small>NOTE: Please use the reverse side of this form to record additional comments and/or suggestions!</small>																			
THANK YOU FOR YOUR PARTICIPATION!																			



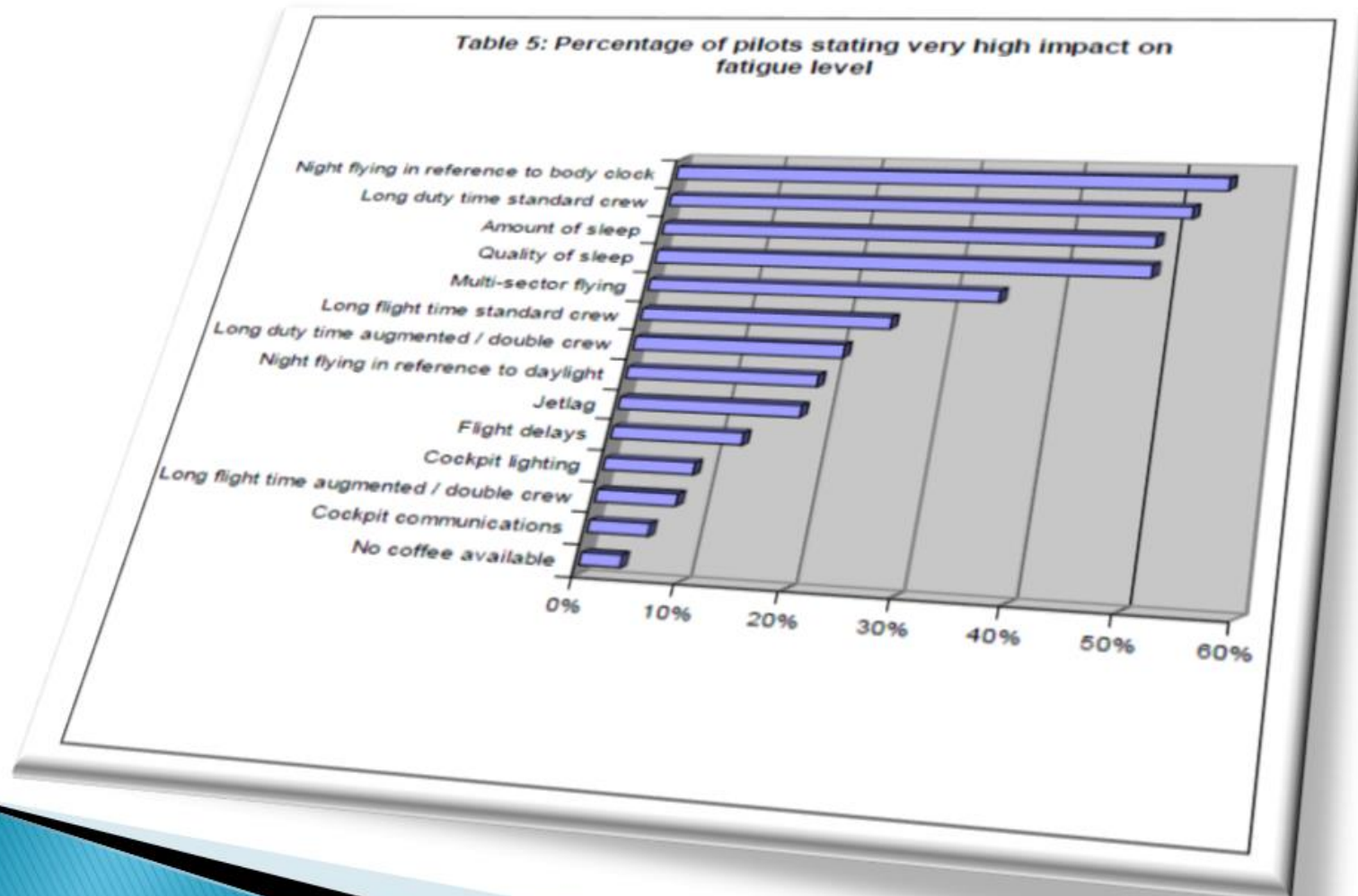
# CV FRM Background

## ► Standard elements



# CV FRM Background

## ► Standard elements



# CV FRM Background

## ► Standard elements



Cargolux Airlines International  
Airport Luxembourg  
L-2990 Luxembourg

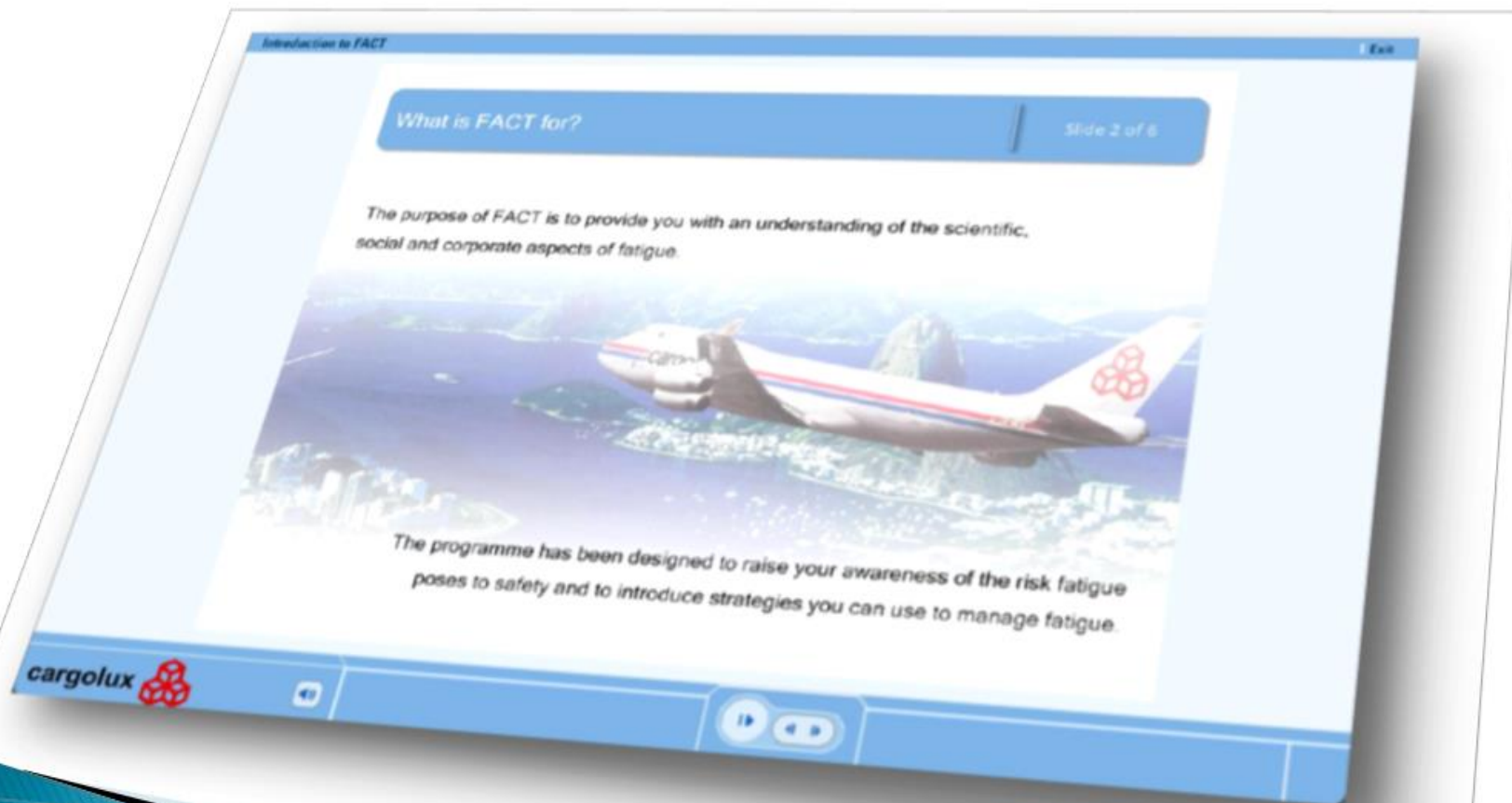
Fatigue Management  
for Long-Haul Pilots

Version 1.4 - October 2014



# CV FRM Background

## ► Standard elements



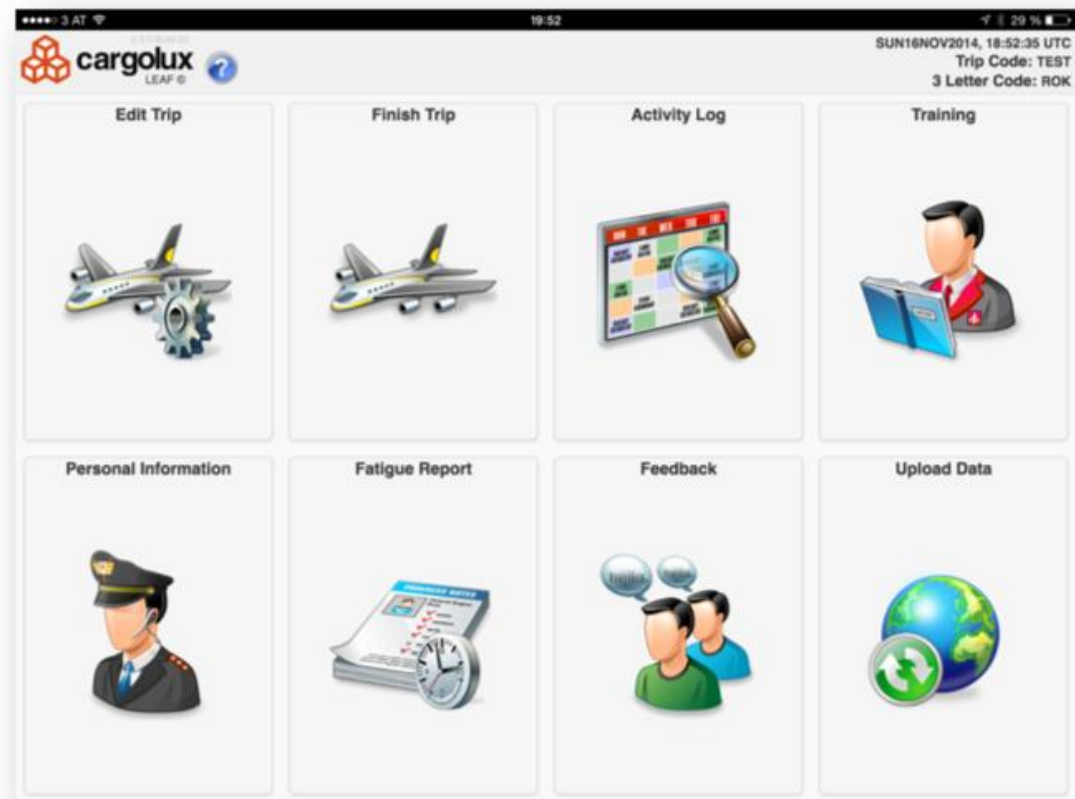
# CV FRM Background

## ► Standard elements



# CV FRM Background

## ► Standard elements



# CV FRM Background

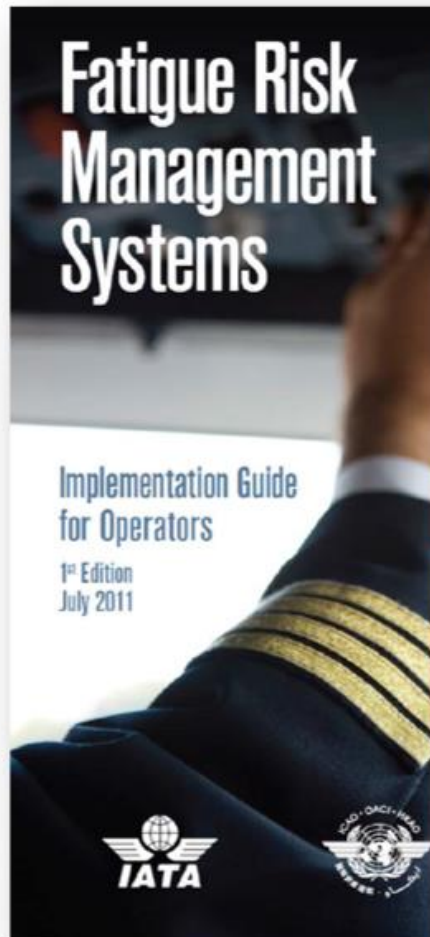
## ► Standard elements





# CV FRM Background

## ► Practicable FRM



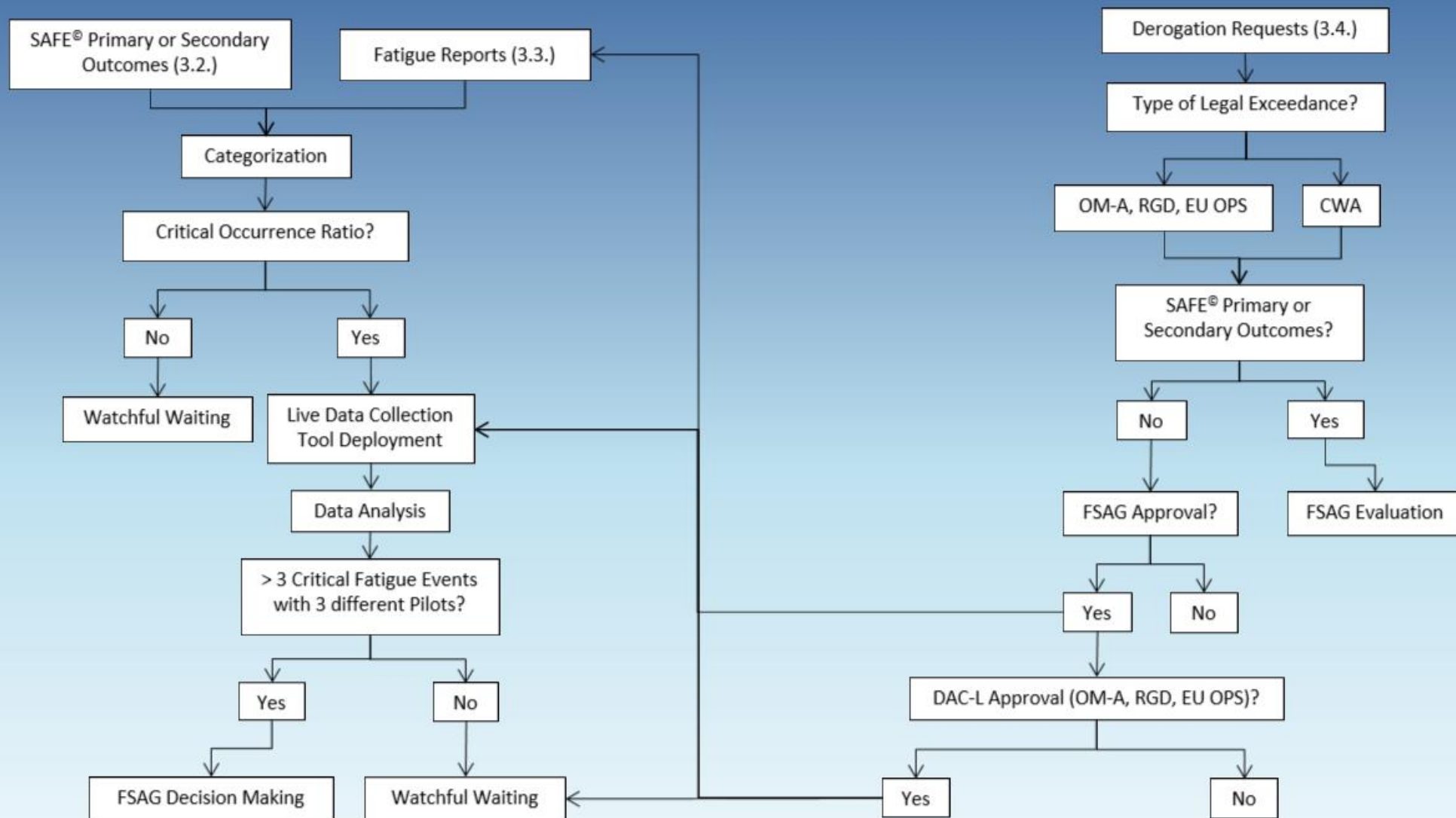
### ORO.FTL.120 Fatigue risk management (FRM)

- (a) When FRM is required by this Subpart or an applicable certification specification, the operator shall establish, implement and maintain a FRM as an integral part of its management system. The FRM shall ensure compliance with the essential requirements in points 7.f, 7.g and 8.f of Annex IV to Regulation (EC) No 216/2008. The FRM shall be described in the operations manual.
- (b) The FRM established, implemented and maintained shall provide for continuous improvement to the overall performance of the FRM and shall include:
- (1) a description of the philosophy and principles of the operator with regard to FRM, referred to as the FRM policy;
  - (2) documentation of the FRM processes, including a process for making personnel aware of their responsibilities and the procedure for amending this documentation;
  - (3) scientific principles and knowledge;
  - (4) a hazard identification and risk assessment process that allows managing the operational risk(s) of the operator arising from crew member fatigue on a continuous basis;
  - (5) a risk mitigation process that provides for remedial actions to be implemented promptly, which are necessary to effectively mitigate the operator's risk(s) arising from crew member fatigue and for continuous monitoring and regular assessment of the mitigation of fatigue risks achieved by such actions;
  - (6) FRM safety assurance processes;
  - (7) FRM promotion processes.
- (c) The FRM shall correspond to the flight time specification scheme, the size of the operator and the nature and complexity of its activities, taking into account the hazards and associated risks inherent in those activities and the applicable flight time specification scheme.
- (d) The operator shall take mitigating actions when the FRM safety assurance process shows that the required safety performance is not maintained.

# CV FRM Background

- ▶ Three column model





# LUX-TIP-JNB Derogation

- ▶ Augm. crew double sector ops.



## Règlement Grand Ducale

*(2) An augmented flight crew is scheduled to carry out no more than 3 landings within a flight duty period or, at the option of the Authority 4 landings, provided that at least the following conditions are met.*

*(i) The block time for one sector is 2 hours or less; and*



# LUX-TIP-JNB Derogation

## ► Mathem. Model Pre-Screening

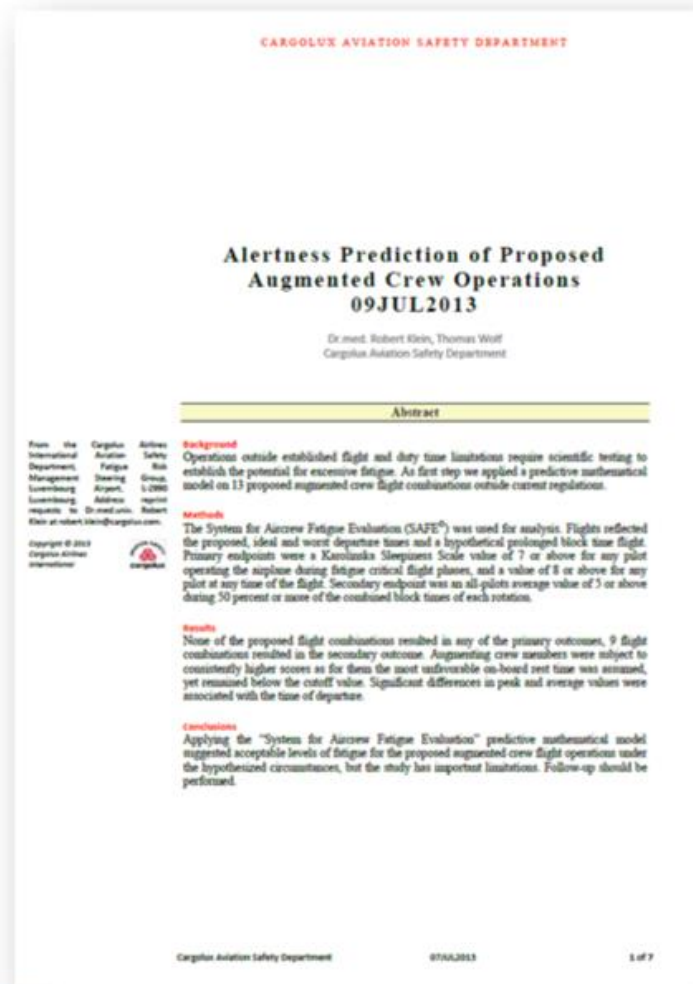


**Table 2. Proposed Augmented Crew Double Sector Flight Combinations. Karolinska Sleep Scale Values**

N°	Times	Sector 1	Sector2	Totals	Crew	Schedule <sup>1</sup>	KSS Crit.Flt.Ph.*		KSS Max	Block Time Percentage with KSS ≥ 5 <sup>~</sup>	
							Oper <sup>†</sup>	Augm <sup>‡</sup>		Oper <sup>†</sup>	Augm <sup>‡</sup>
		<b>LUX-TIP</b>	<b>TIP-JNB</b>								
1)	Block	02:50	08:00	10:50	3	Original	5,4	6,4	6,0	26	26
						Ideal (-10h)	3,7	4,6	5,0	1	1
						Worst (±0h)	5,4	6,4	6,0	26	26
	Duty			14:00		2 <sup>nd</sup> Sect.+1h	5,5	6,4	6,3	27	27

# LUX-TIP-JNB Derogation

## ► Mathem. Model Pre-Screening



## A white cargo plane with 'cargolux' written on its side, flying through a blue sky with clouds. The plane has four engines and a red and blue stripe along its fuselage. The tail features a red logo.



# LUX-TIP-JNB Derogation

## ► Live Data Collection






# LUX-TIP-JNB Derogation

## ► Live Data Collection



**cargolux** LEAF  **Personal Information** SAT15NOV2014, 05:20:18 UTC  
Trip Code:  
3 Letter Code: ROK

Commuting to work ☐ No ☒ Yes

Average time to commute ☐ 1-2 ☐ 2-3 ☐ 3-4 ☒ 4-5 ☐ 5-6 ☐ 6-7 ☐ 7+

Commuting by ☐ Car ☐ Train ☒ Airplane

Exercise regularly ☐ No ☒ Yes

Diet ☐ Rather unhealthy ☒ Rather healthy



Average daily sleep required (h) ☐ <5 ☒ 5-6 ☐ 6-7 ☐ 7-8 ☐ 8-9 ☐ 9-10 ☐ >10

Sleep Type ☒ Lark (go to bed usually before midnight) ☐ Owl (go to bed usually after midnight)

Average time to fall asleep ☒ <30min ☐ 30-60min ☐ >60min

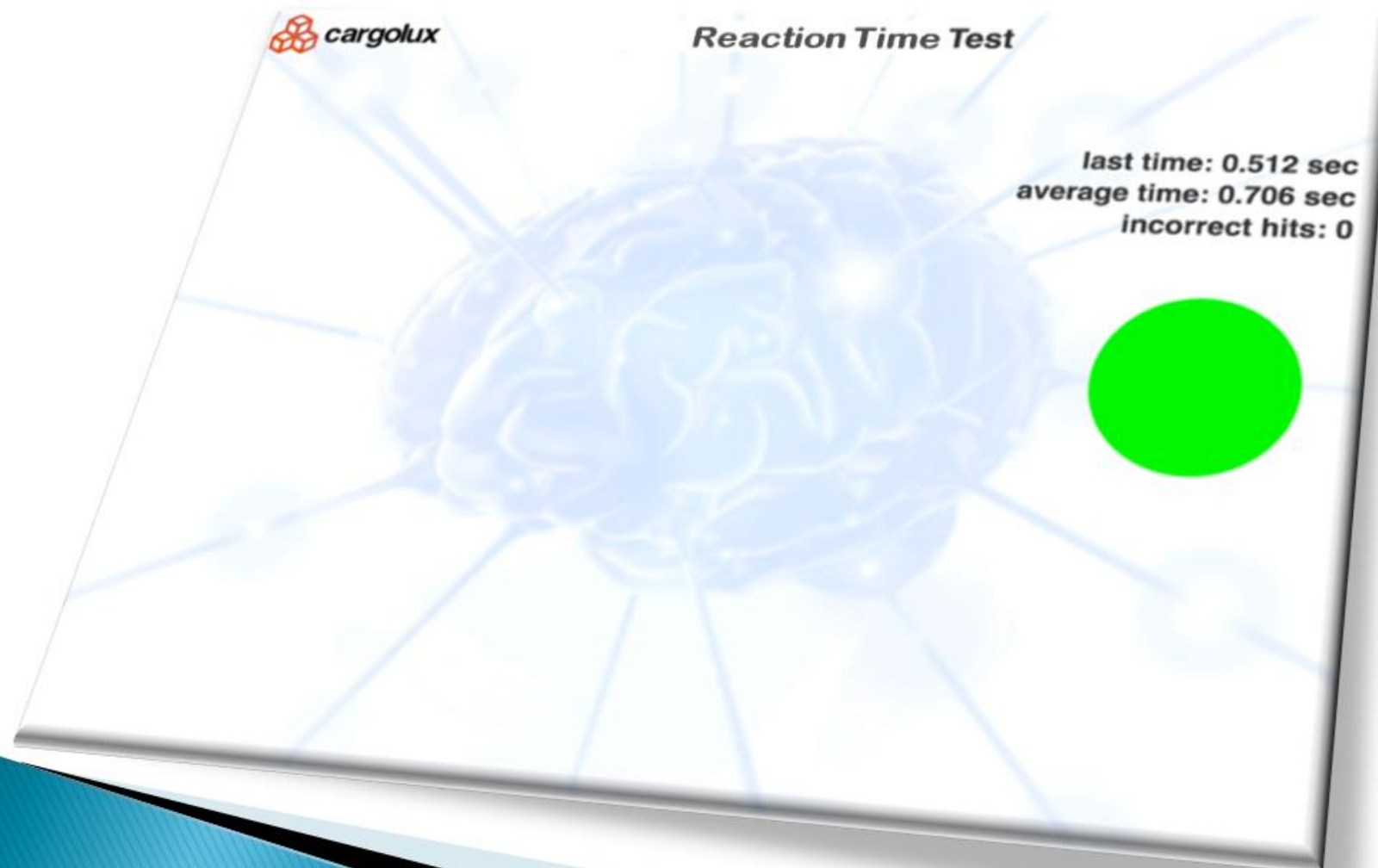
What helps falling asleep ☒ Read ☐ TV ☐ Meditation ☐ None ☐ Other

Alcohol to fall asleep ☒ No ☐ Yes

 Back  Save Data

# LUX-TIP-JNB Derogation

## ► Live Data Collection



# LUX-TIP-JNB Derogation

## ► Live Data Collection



**cargolux** LEAF

### Edit Activity Details

SAT15NOV2014, 05:23:36 UTC  
Trip Code: TEST  
3 Letter Code: ROK

**KSS**  
Karolinka Sleepiness Scale Self Rating

Start Time  
15NOV2014 00:00

KSS Visual Analog Scale:

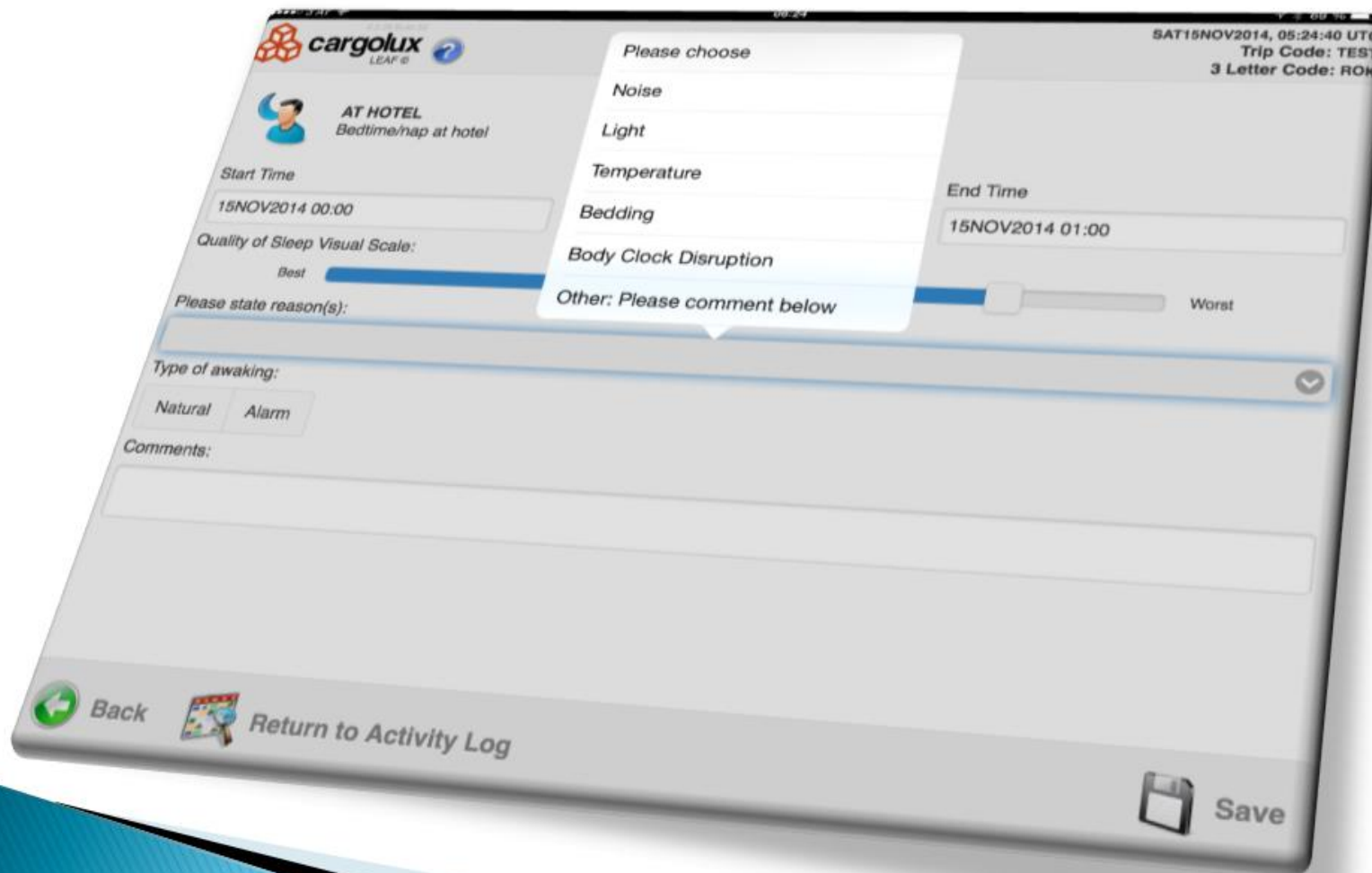
Extremely alert Extremely sleepy

Comments:

Back Return to Activity Log Save

# LUX-TIP-JNB Derogation

## ► Live Data Collection



The screenshot shows the Cargolux LEAF 6 mobile application interface. At the top left is the Cargolux logo and a user icon. The main header area displays "AT HOTEL" and "Bedtime/nap at hotel". Below this, there are input fields for "Start Time" (15NOV2014 00:00) and "End Time" (15NOV2014 01:00). A "Quality of Sleep Visual Scale" is shown with a slider from "Best" to "Worst". A dropdown menu is open, listing options: "Please choose", "Noise", "Light", "Temperature", "Bedding", "Body Clock Disruption", and "Other: Please comment below". Below the scale, there is a "Please state reason(s):" text area. Further down, "Type of awaking:" is set to "Natural" with an "Alarm" option also visible. A "Comments:" text area is at the bottom. Navigation buttons at the bottom left include "Back" and "Return to Activity Log". A "Save" button with a floppy disk icon is at the bottom right. The top right corner shows the date and time: "SAT15NOV2014, 05:24:40 UTC", "Trip Code: TEST", and "3 Letter Code: ROK".



# LUX-TIP-JNB Derogation

## ► Live Data Collection



**cargolux** LEAF **Edit Sector** SAT15NOV2014, 05:26:18 UTC  
Trip Code: TEST  
3 Letter Code: ROK

Flight Number	From	To	Positioning Crewmember	Crew Composition
CLX123	LUX	LAX	<input type="checkbox"/> Positioning Crewmember	Augmented <input checked="" type="checkbox"/>

Wake Up Call: 15NOV2014 05:26  
Check In: 15NOV2014 06:26  
Body Clock De-Sync at Check In: UTC+01:00 ☒

OUT (Block Off):

Log Report  
Raise ☒


Return to Activity Log


UTC-04:00  
UTC-03:00  
UTC-02:00  
UTC-01:00  
UTC  
UTC+01:00 ☒  
UTC+02:00  
UTC+03:00  
UTC+04:00  
UTC+05:00  
UTC+06:00

# LUX-TIP-JNB Derogation

## ► Live Data Collection




**cargolux** LEAF  **Edit Sector** SAT15NOV2014, 05:26:59 UTC  
Trip Code: TEST  
3 Letter Code: ROK


Flight Number	From	To	Positioning Crewmember	Crew Composition
CLX123	LUX	LAX	<input type="checkbox"/> Positioning Crewmember	Augmented 


Wake Up Call 15NOV2014 05:26  
OUT (Block Off) 15NOV2014 07:36  
Top of Descent


Check In Body Clock De-Sync at Check In

**Please rate the complexity of the departure airport:**





ATC:  
Least demanding  Most demanding

Airport/Departure:  
Least demanding  Most demanding

Weather:  
Least demanding  Most demanding

General Workload:  
Least demanding  Most demanding


☒ OK

 Return to Activity Log  Flight Sectors  Delete  Save

# LUX-TIP-JNB Derogation

## ► Live Data Collection



**cargolux** LEAF  **Edit Activity Details** SUN16NOV2014, 07:07:19 UTC  
Trip Code: TEST  
3 Letter Code: ROK

Factor remarks

Short notice changes

*If you are reporting a specific event rather than a general concern, please tick all physical and cognitive signs of fatigue that were apparent in the last 2 hours leading up to the event*


**Physical signs:**




- ☐ Fidgeting
- ☐ Rubbing eyes
- ☐ Yawning
- ☐ Frequent and/or long blinking
- ☒ Staring blankly
- ☐ Difficulty keeping eyes open
- ☐ Head nodding
- ☐ None

**Cognitive signs:**

- ☐ Impaired attention
- ☐ Impaired memory
- ☐ Negative mood
- ☐ Reduced communication
- ☒ Impaired problem solving
- ☐ Increased risk taking
- ☐ Impaired situational awareness
- ☐ None

Please enter your KSS Rating at the time the event occurred:

Extremely alert  Extremely sleepy

 **Back**  **Return to Activity Log**  **Save**







# LUX-TIP-JNB contd.

## ► Data Analysis



**Table 3. Characteristics of Study Participants.**

Rank	No. (%)	Sleep latency (min)	No. (%)	Wake up frequency	No. (%)
Captain	13 (44.8)	<30	13 (44.8)	None	12 (41.4)
F/O	16 (55.2)	30-60	4 (13.8)	1-2	13 (44.8)
Total flight time (h)		Unknown	12 (41.4)	>2	4 (13.8)
>7.000	21 (72.4)	Induces sleep		Unknown	12 (41.4)
3000-7000	8 (27.6)	Read	13 (44.8)	Commuting status	
Gender		TV	1 (3.4)	Commute	13 (44.8)
Male	29 (100)	None	7 (24.1)	Non commute	16 (55.2)
Age (y)		Unknown	8 (27.6)	Diet	
30-40	13 (44.8)	Average sleep required (h)		Rather healthy	21 (72.4)
40-50	13 (44.8)	5-6	1 (3.4)	Rather unhealthy	4 (13.8)
50-60	3 (10.3)	6-7	3 (10.3)	Unknown	4 (13.8)
Sleep type		7-8	16 (55.2)		
Lark (go to bed before midnight)	18 (62.1)	8-9	4 (13.8)		
Owl (got to bed after midnight)	8 (27.6)	9-10	2 (6.9)		
Unknown	3 (10.3)	Unknown	3 (10.3)		

# LUX-TIP-JNB contd.

## ► Data Analysis



**Table 4. Primary and Secondary Outcome, Average KSS Score.**

Total no. of primary outcomes detected	2 (6.9%)
Departure phase	1
Approach phase	
Total number of secondary outcomes	
Average flight duty period overall KSS	

**Table 5. Roster Stability of the Flight Duty LUX-TIP-JNB.**

SBT <sup>‡</sup> LUX-TIP	2:50h	ABT <sup>§</sup> LUX-TIP	02:48h
SBT TIP-JNB	8:00h	ABT TIP-JNB	8:17h
SFDP <sup>**</sup>	14:00h	AFDP <sup>*</sup>	14:50h
OVN <sup>†</sup>	16,0%	AGT <sup>~</sup> TIP	01:41h

‡ Scheduled Block Time

§ Average Block Time

\*\* Scheduled Flight Duty Period

\* Average Flight Duty Period

† Overnight Delay

~ Average Ground Time

# LUX-TIP-JNB contd.

## ► Final Report





# LUX-TIP-JNB contd.

## ► Continued Monitoring



**cargolux** LEAF 6 **Edit Activity Details** SAT15NOV2014, 05:32:54 UTC  
All information provided remains strictly confidential within the Cargolux Flight Safety Department! Trip Code: TEST  
3 Letter Code: ROK

Name: Klein Robert 3 Letter Code: ROK Rank: Captain First Officer

On what sector(s) did the event occur? CLX123 (LUX-LAX) Other: enter no.

Crew composition: Augmented Function: Pilot Flying Pilot Monitoring

Days since you left home: 1 Time since starting duty: 08:05

Rostered ON-duty time: 15NOV2014 06:20 Actual ON-duty time: 15NOV2014 06:26 Rostered OFF-duty time: 15NOV2014 18:02 Actual OFF-duty time: 15NOV2014 17:56

Approx. how much total sleep did you obtain before the incident/concern (excluding naps) in the last 24 hours: 05:24 in the last 48 hours: 13:06

Tick all factors you feel contributed to the event/your general concern

Back Return to Activity Log Save



# Areas of Uncertainty

## ► Accuracy Limited



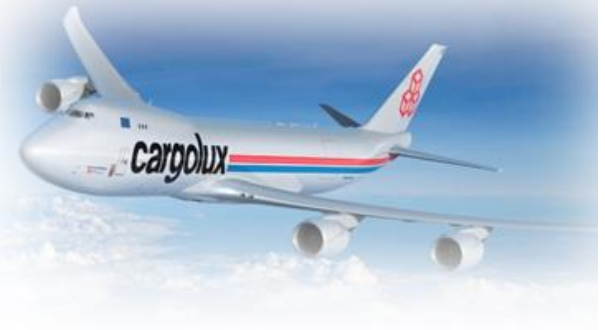
# Areas of Uncertainty

- ▶ Politics a threat to FRM



# Areas of Uncertainty

- ▶ Participation, Data Quality:  
Room for improvement



*Data quality was usable but less than ideal in 14% of all data sets received, showing evidence of inadequate use of equipment. Factors contributing to this are not entirely clear but there are indications that some pilots do not wish to participate in data collection but seem to be uncomfortable refusing evaluation by not collecting the tool kit. Confidence building is suggested by integrating information about in-house FRM procedural principles, equipment use and underlying technology into recurrent class room training.*





Thank you for your attention!