



Cpt. Mattias Pak MSc. FRAeS Vice President Aviation Safety







Overview of Cargolux



Fatigue Reporting



Biomathematical Model



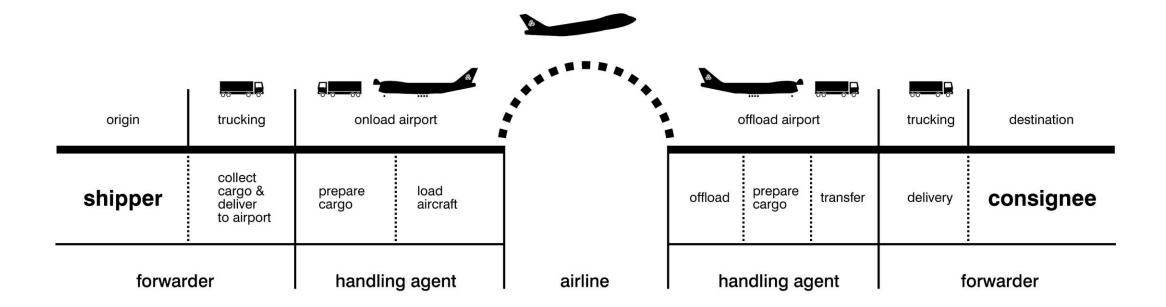
Data Analytics



Challenges



What is our role?













FRM(S) Setup

Reporting

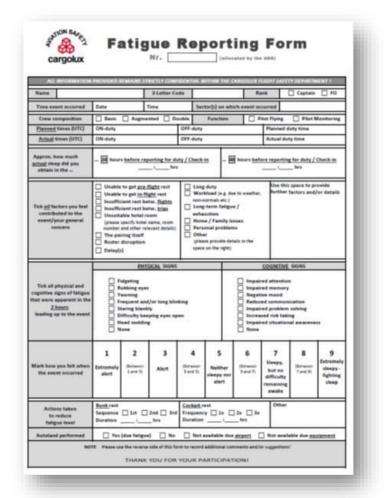
Biomathematical Model

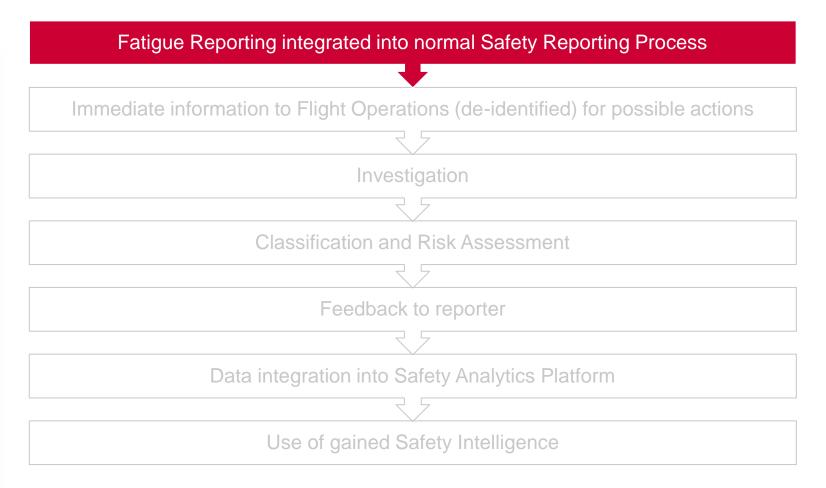
Data Analytics

Challenges













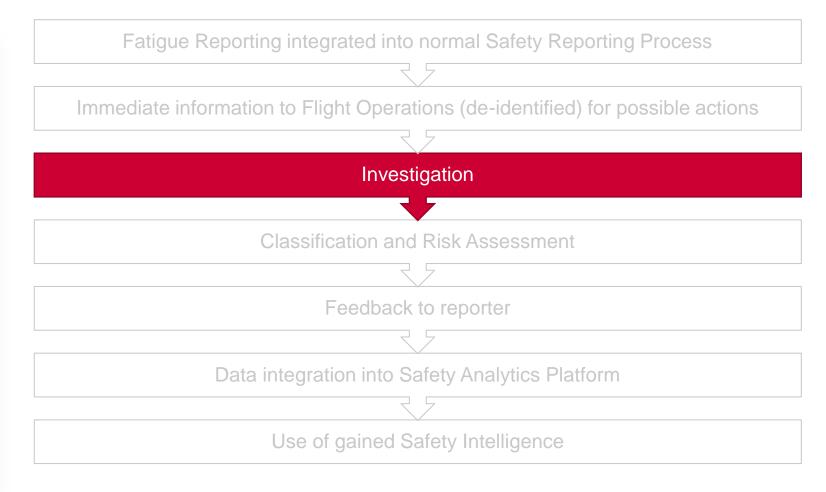
| ALI DEPOSIBATION | PROVIDED | Z MAJRO II | Blatter C | ZIERZENE MARIE | HERO, RAIG | CAMBOLON | and and | Captain | (1) to | | |
|---|--|---|--|-------------------|---|------------------------------|--|---|--|--|--|
| | _ | - | | | | | _ | | U 10 | | |
| Time event occurred | Date | | Time | Sec | Sector(s) as which event occurred | | | | | | |
| Crea composition | Besic | ented D | cybie | Function. | - C | Not Flying | | | | | |
| Planned times (UTC) | | | | OFF-duty | // | | Planned d | Planned duty time | | | |
| Actual times (UTC) | ON-duty | | | OFF-duty | | | Actual dut | Actual duty time | | | |
| Approx. how much actual cleep did you obtain in the _ | _ [iii] hour | | porting for d | | m - i | D bours bed | ora reporting | | Check-in | | |
| Taking factors you feel contributed to the event/your general contains | Chrashie Insueffic Insueffic Christie Interpretation | iant rapt to shis hortel r specify hone and other re iring itself disruption | ight rest etw. flights etw. triax oom I same, room levant details | Was | normals atc.) p-term fatigi sestion se / Family i onal proble | enses ma stalls in the | | Use this speix to provide further factors and/or details | | | |
| | | BO | YSICAL SHOWS | | | | COGNITIVE | SHOWS | | | |
| Tick all physical and cognitive signs of fatigue that were apparent in the Zhanes leading up to the event | 000000 | tering blani | d/or long bit kly eping eyes o | | ☐ Impaired problem solving | | | | | | |
| Mark how you felt when the exect occurred | 1 Extremely alert | 2 (belows) 1 per 1) | 3 Alert | 4 Security | S Neither sirepy nor slart | 6 Street | 7 Sheepy, but no difficulty remaining swake | B (between 7 and 10) | 9 Extremely sleepy- tighting sleep | | |
| Actions taken to reduce fatigue level | Bunkrest Sequence Duration | | 2md Sro _ hes | | | 2k 3k _hrs | Other | Other | | | |
| Autoland performed | п. | | -) [No | | | e sispect. | 7 | | | | |

Fatigue Reporting integrated into normal Safety Reporting Process Immediate information to Flight Operations (de-identified) for possible actions Investigation Classification and Risk Assessment Feedback to reporter Data integration into Safety Analytics Platform Use of gained Safety Intelligence





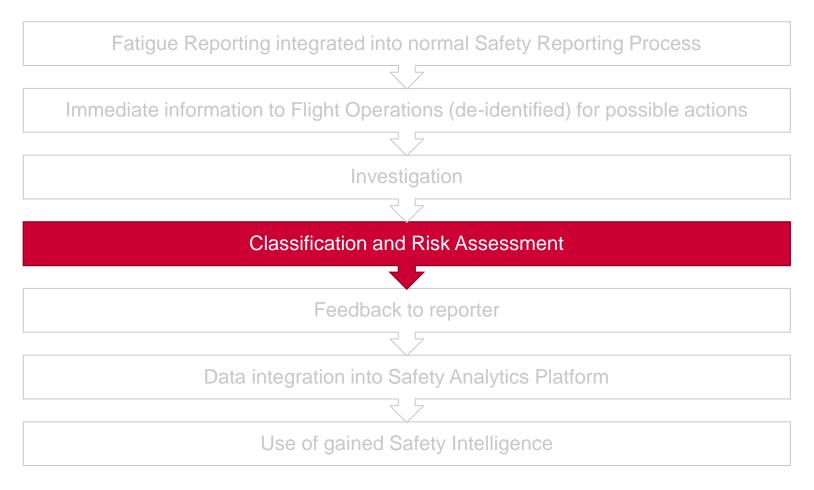
| ALI PETURBATION | PROVIDED A | MALES E | Blatter C | TERRITARES | 11011200 | CAMBOONY. | and and | Captain | (1) to | | |
|---|--|--|---|---------------------------|--|-------------------|--|---|--|--|--|
| Name | | _ | F-Cerner-C | 104 | | | | | | | |
| Time event occurred | Date | | Time | Sec | Sector(s) as which event occurred | | | | | | |
| Crea composition | - Besic | ented D | ouble | | | | | | | | |
| Planned times (UTC) | ON-duty | | | OFF-duty | 10 | | Planned d | Planned duty time | | | |
| Actual times (UTC) | ON-duty | | | OFF-duty | | | Actual dut | Actual duty time | | | |
| Approx. how much actual cleep did you obtain in the _ | - E how | | porting for d | | ty / Check in hours before reporting for the for | | | | | | |
| Taking factors you feel contributed to the event/your general contains | Chrabbs Security Security Chromity Chromity Security Security | to get in di ient rept in ient rept in shis hortel r specify hone and other re ring itself disruption | etw. flights etw. frigs room I name, room rievant details | | normals atc. g-term fatig scotion na / Family sonal proble | inners inne | | Use this spois to provide further factors and/or details | | | |
| | Q. | PIO. | YSICAL SIGNS | | | | COGNITIVE | SIGNS | | | |
| Tick all physical and cognitive signs of fatigue that were apparent in the \$2,0000 teading up to the event | 000000 | tering blani | d/or long bile kly eping eyes o | | ☐ Impaired problem solving | | | | | | |
| Mark how you felt when the exect occurred | 1 Extremely alert | 2 (brisent Lore 1) | 3 Alert | 4 Detection Tare to | S Neither sleepy no sleet | | 7 Steeps, but no difficulty remaining swake | Bitterior 7 and 10 | 9 Extremely sleepy- tighting sleep | | |
| Actions taken to reduce fatigue level | Bunkrest Sequence Duration | | žnd šrd _hrs | | | □ žs: □ šs hrs | Other | Other | | | |
| Autoland performed | D ver | San Busin | e) [Ne | Fig. 1 | | er nicport. | 7 | | Comment. | | |







| ALI PATOENATION | PROVIDED X | MAKE I | Blatter Co | MENTAL D | HISTON DIC | CAMBOURY | and . | Captain | (1) FO | |
|---|--|---|--|-----------------------------------|---|---|--|---|--|--|
| | | _ | | | | | | | | |
| Time event occurred | Date | | Time | Sector(s) on which event occurred | | | | | | |
| Cress composition | | ☐ Augme | otted Di | | | | | | | |
| Planned times (VTC) | ON-duty | | | OFF-duty | 1) | | - | Planned duty time | | |
| Actual times (UTC) | ON-duty | | | OFF-duty | | | Actual dut | Actual duty time | | |
| Approx. how much actual cleep did you obtain in the _ | - El hour | | oorting for do | | m - i | bours bed | | re reporting for duty / Check in | | |
| Talk <u>of</u> factors you feel contributed to the event/your general contains | Cheable Securities Cheable C | ient rept by shie hostel r specify hosel and ather re iring itself disruption. | ght rest res. flights res. bligs | Was | normals atc.) p-term fatigi sestion se / Family i onal proble | ore / | | New this space to provide Norther Eactors and/or details | | |
| | | Pict | SICAL SHOWS | | | | COGNITIVE | SIGNS | | |
| Tick all physical and cognitive signs of fatigue that were apparent in the \$2,0000 trading up to the event | 000000 | tering blank | I/or long bile by quing eyes op | | | Impaired attention Impaired immory Ingester mond Endezer mond Endezer communication Impaired profilem sulving Increased risk taking Impaired situational energies Stone | | | | |
| Mark how you felt when the exent occurred | 1 Extremely alert | 2 (between 1 per 1) | 3 Alert | 4 Street | S Neither sleepy nor sleet | 6 Street | 7 Siveyy, but no difficulty remaining exame | B (between 7 and 10) | 9 Extremely sleepy- tighting sleep | |
| Actions taken to reduce fatigue level | Bunkrest Sequence Duration | | 2nd Srd _brs | | | 2k 3k _hrs | Other | | | |
| Autoland performed | D | Lange Brain | - I No | ET ma | | | Not work | | Contract. | |





Classification

| Duty - Long Duty | Single Long Duty |
|---|---|
| | Consecutive Long Duties |
| Duty - Night Duty | Single Night Duty |
| | Consecutive Night Duties |
| Duty - All crew affected simultaneously | |
| Duty - Basic crew night duty >10h | Single Basic Crew Night Duty > 10h |
| | Consecutive Basic Crew Night duty > 10h |
| Rest - Insufficient Rest | Rest between Flights |
| | Rest between Trips |
| Rest - +/- 24h Rest | Single 24h Rest |
| | Consecutive 24h Rests |
| Rest - Minimum Rest | Single Minimum Rest |
| | Consecutive Minimum Rest |

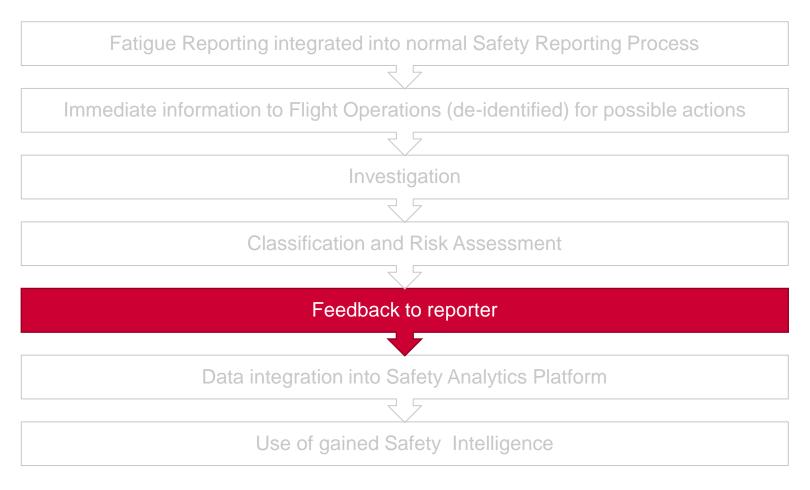
Total of 21 Level 1 Causes Divided into +/-50 Level 2 Causes Each Cause has a Value Addition of Values result in a RISK Value Value has an equivalent for Event Risk Classification in **ARMS**

(Examples)





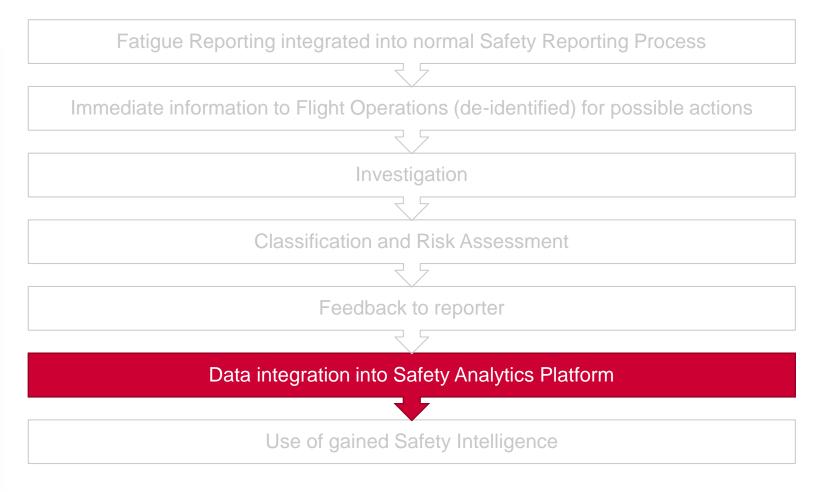
| ALI PETCHERATION | PROVIDED A | MALINET E | Blatter C | THE NUMBER | UTTOWN THE | CAMBOUR | and and | Captain | (I) FO | |
|---|---|---|--|----------------------------|---|---------------------------|--|---------------------------|---|--|
| | | \rightarrow | | | | | | Captain | D 10 | |
| Time event occurred | Date | | Time | Sec | Sector(s) on which event occurred | | | | | |
| Cress composition | - | C Augm | ented [] D | | Function | - 0, | Not Hying | | | |
| Planned times (VTC) | ON-duty | | | OFF-duty | 0 | | Planned d | Planned duty time | | |
| Actual times (UTC) | ON-duty | | | OFF-duty | | | Actual dut | Actual duty time | | |
| Approx. how much actual cleep did you obtain in the _ | - E how | | porting for d | | ty / Check on III hours before reporting for duty / | | | | | |
| Tak of factors you feel contributed to the event/your general contains | Cheable Securities Securities Cheable Securities Securities The pai | iant rapt to shis hortel r specify hone and other re iring itself disruption | ight rest etw. flights etw. triax com I same, room levent details | | Using divity Workfood in g. the to wanther, man normals stic.) Long term findings / senhanting senhanting senhanting senhanting beam findings / senhanting beam problems Other John problems Other grace on the right; | | | | | |
| | PRESIDAL SIGNS | | | | | | COGNITIVE | SIGNS | | |
| Tick all physical and cognitive signs of fatigue that were apparent in the \$2,0000 trading up to the event | 000000 | tering blani | d/or long bit kly eping eyes o | | | | Impaired attention Impaired memory Segette moved Sedecard communication Impaired problem solving Increased risk taking Increased risk taking Sone | | | |
| Mark how you felt when the exent occurred | 1 Extremely alert | 2 (brisen 1 per 1) | 3 Alert | 4 Detection Tarel II | S Neither sleepy no sleet | 6 Services Services | 7 Steepp. but no difficulty remaining gwate | B (between 7 and 10 | 9 Extremely sleepy tighting sleep | |
| Actions taken to reduce fatigue level | Bunk rest Sequence Duration | | Ind Sed _ hes | | | ⊒že □že _hrs | Other | | | |
| Autoland performed | D ver | San Barba | -) [No | Plan. | | e sispert. | 7 8 4 4 4 7 | | Comment. | |







| ALL PATCHMATION | PASSYLKER | ALCOHOL: N | HEALTES. | TEINE | 4 1111 | HIEGA | ESCUT. | DESCRIPTION OF | TY STEELER | MENY | |
|--|--|---------------------------|---|-----------|------------------------------|---------------|-------------------------------------|--|----------------------------------|--|--|
| Name | | | 3-Letter-C | Cede | | | Ra | ink | Captain | ☐ f0 | |
| Time event occurred | Date Time | | | \neg | Sector(s) as which event occ | | | | | | |
| Crew composition | Basic Augmented Di | | | Double | uble Function Po | | | Out Flying Pilet Menituring | | | |
| Planned times (UTC) | ON-duty | | | OFF-6 | vity | | | Planned i | duty time | | |
| Actual times (VTC) | ON-duty | | | OFF-6 | OFF-duty | | | | Actual duty time | | |
| Approx. how much actual cleep did you obtain in the _ | _ Mi hour | | specting for a | | | | | | n reporting for shely / Check in | | |
| Tick of factors you feel contributed to the event/your general concern | Unable to get get fight rest Long duty Workload sq. dies to weather, has this open to the fight est on the fight of the fight est on t | | | | | | | | | | |
| | PHYSICAL SIGNS | | | | | | | COGNITIVE | SIGNS | | |
| Tick all physical and cognitive signs of fatigue that were apparent in the \$2.00000 leading up to the event | 000000 | taring blan | nd/or long bit skly reping eyes o | | | - Commontaine | Negati Reduc Impair Increa | ed attentioned memory the mood ed communication ed problem and risk tak red situation | nication solving | | |
| Mark how you felt when the excet occurred | 1 Extremely alert | 2 (between 1 are 1) | 3 Alert | d them | | her | 6 Driver 1 and Ti | 7 Siveys. but no difficulty remaining ewake | B densem 7 and 10 | 9 Extremely sleepy- tighting sleep | |
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| Autoland performed | □ ver | | el 🗆 No | | int months in | | man P | 7 Not work | able due pp | See and | |









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FRM(S) Setup

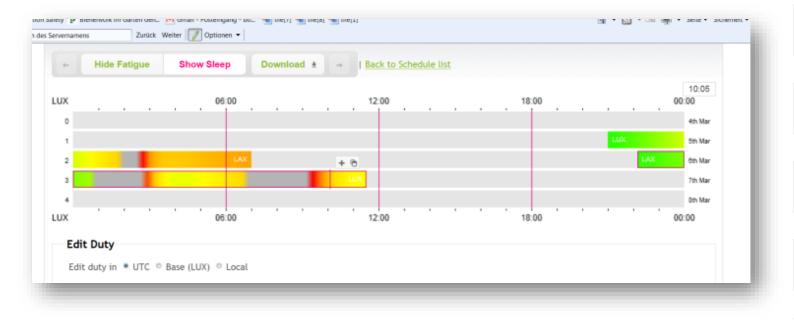
Reporting

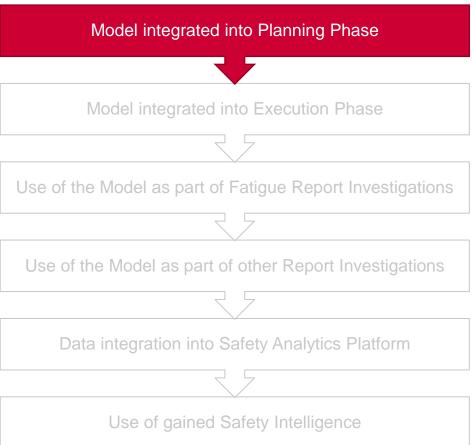
Biomathematical Model

Data Analytics

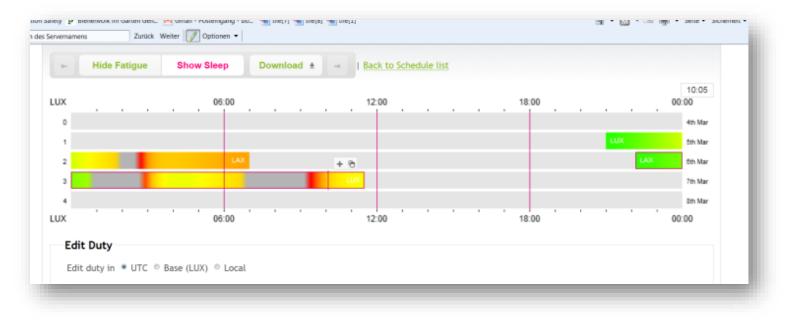
Challenges





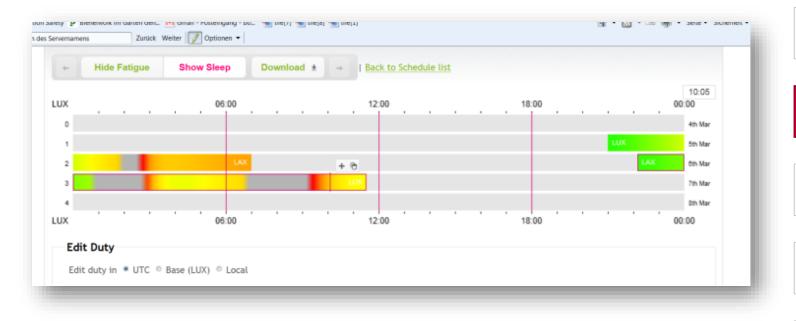






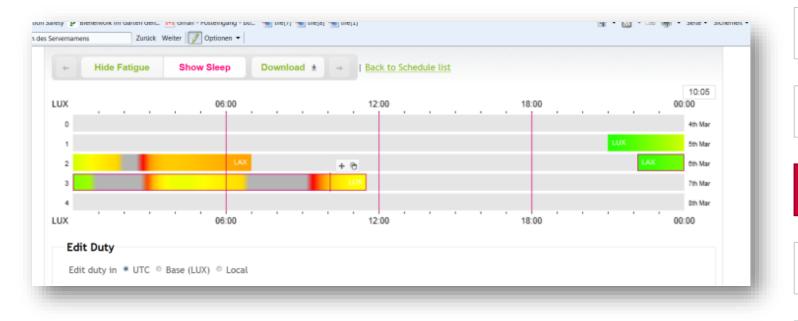
Model integrated into Planning Phase Model integrated into Execution Phase Use of the Model as part of Fatigue Report Investigations Use of the Model as part of other Report Investigations Data integration into Safety Analytics Platform Use of gained Safety Intelligence





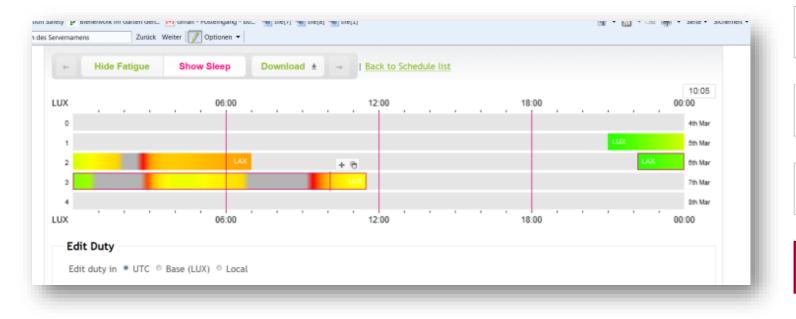








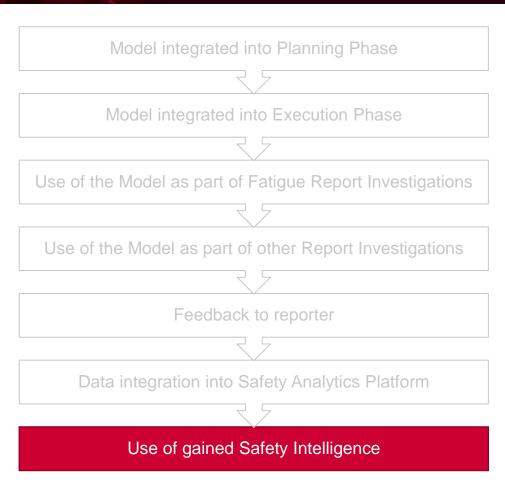
















FRM(S) Setup

Reporting

Biomathematical Model

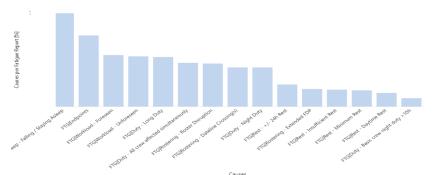
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Challenges









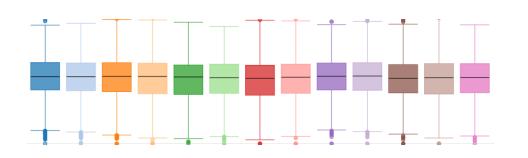


Other Data Integration (FDM/Survey)

Use of gained Safety Intelligence







Fatigue Reporting Data

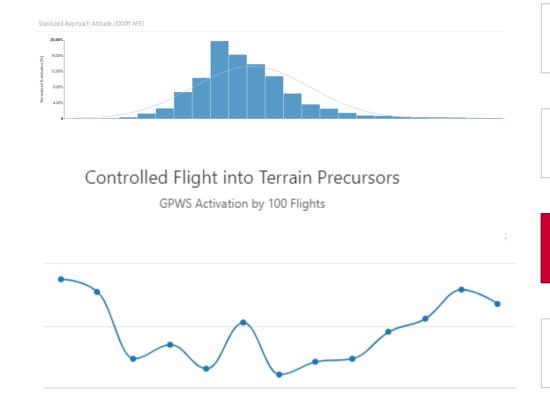
Bio Mathematical Model

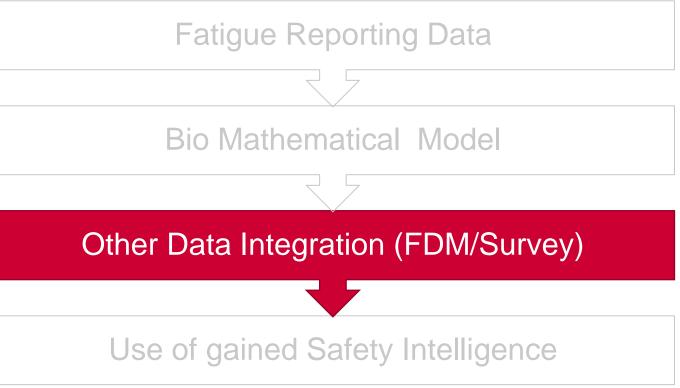
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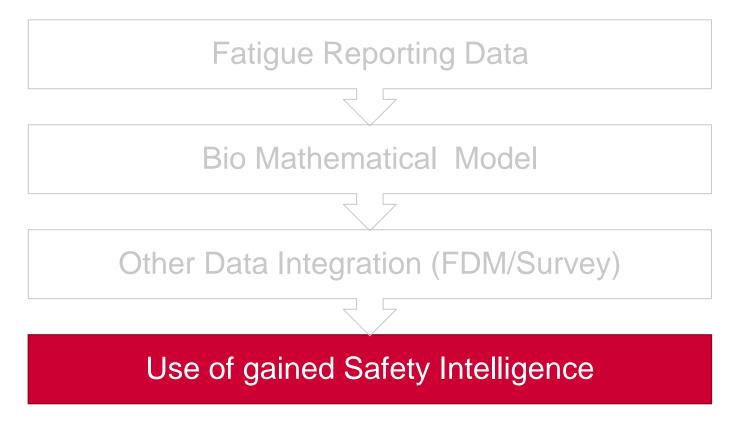


(Examples)









(Examples)





Reporting

Biomathematical Model

Data Analytics

Challenges





24/7

Multipoint rotations

Long and short-haul

Basic and augmented crewing

Complex time zone transitions

Multitude of post-flight rest variants

At times highly complex airports

Short term changes





Under / Over Reporting

Biomathematical Sleep patterns

Weakness of Biomathematical Model

Subjectivity

Differences in Reporting vs.
Biomathematical Model

Human Diversity

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Summary

Fatigue Reporting

Biomathematical Model

Data Analytics



