

R² Data Labs

Recommended Actions
Data is generated in real-time and
can be used to optimize performance

Dublin Connolly	Belfast Central	length	Dublin Connolly	Belfast Central	length	Dublin Connolly	Belfast Central	length	Dublin Connolly	Belfast Central	length
07:55	09:40	02:05	07:55	09:40	02:05	07:55	09:40	02:05	07:55	09:40	02:05
08:30	11:40	02:05	08:30	11:47	02:12	08:30	11:25	02:15	08:30	11:25	02:15
11:00	13:00	02:00	11:00	13:15	02:15	11:00	13:25	02:15	11:00	13:25	02:15
13:30	15:25	02:00	13:30	15:35	02:15	13:30	15:35	02:15	13:30	15:35	02:15
15:30	17:25	02:00	15:30	17:29	02:09	15:30	17:25	02:15	15:30	17:25	02:15
18:30	18:40	01:10	18:30	18:05	02:15	17:30	18:25	02:15	17:30	18:25	02:15
19:00	21:00	02:00	19:00	21:05	02:05	19:00	21:25	02:15	19:00	21:25	02:15
20:45	22:50	02:05	20:50	22:58	02:08	21:00	23:25	02:15	21:00	23:25	02:15
Average		02:03			02:12	Average		02:15			
Overall average		02:04	Overall average		02:09	Overall average		02:15			



A Rolls-Royce
solution



Harnessing Data Analytics in Airline Safety

To enhance accuracy and enable better decision making in managing risk

Panayiotis (Panos) Nicolaou

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Agenda

01 **R² Data Labs**
Airline Digital Centre: Safety Analytics

02 **Pro-active vs. Predictive**

03 **Vision & Goals**

04 **Developments**



01

R² Data Labs

Airline Digital Centre - Safety Analytics



Today

Digital allows us to do things we could only dream of when we introduced TotalCare.

Product

Services

Digital



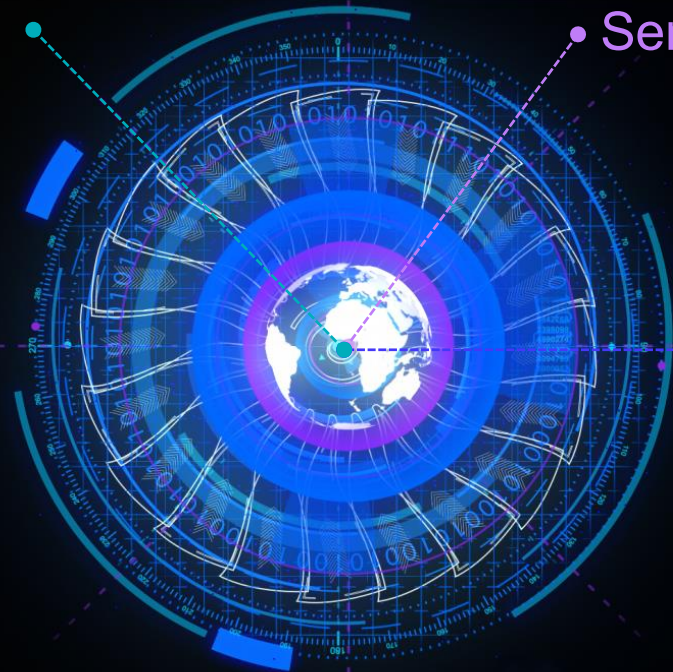
The future

We will design,
test and maintain
engines digitally.

Product

Services

Digital



R² Data Labs is central to the Rolls-Royce digital strategy

Responsible for
amplifying and
accelerating data
innovation



**Perfect the
digital twin**

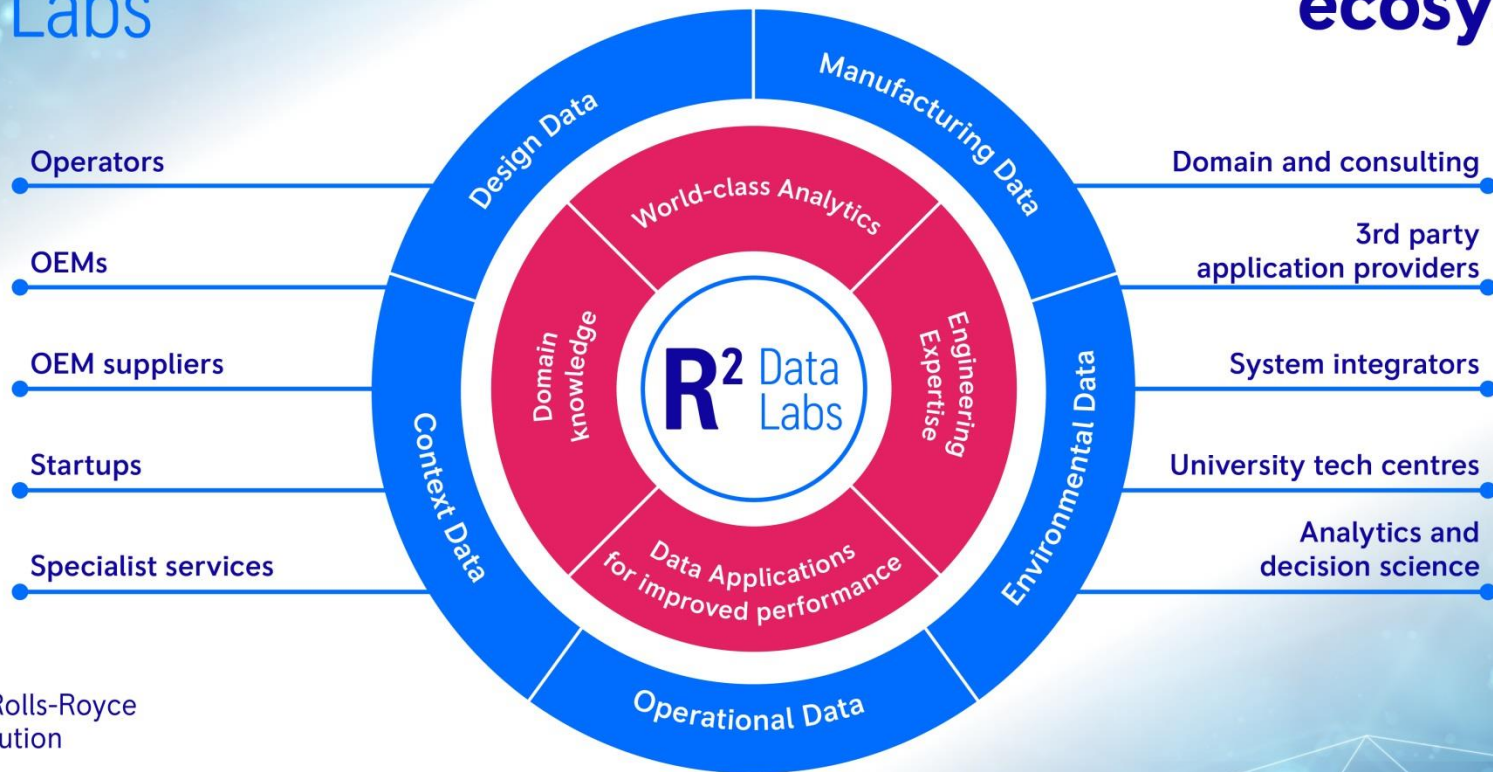
Improve and connect product,
production and service twins

**Amplify &
accelerate
data
innovation**

Generate value through
new insights, new
solutions and new
opportunities

Digital first

Establish organisational
competences and values
which support data innovation



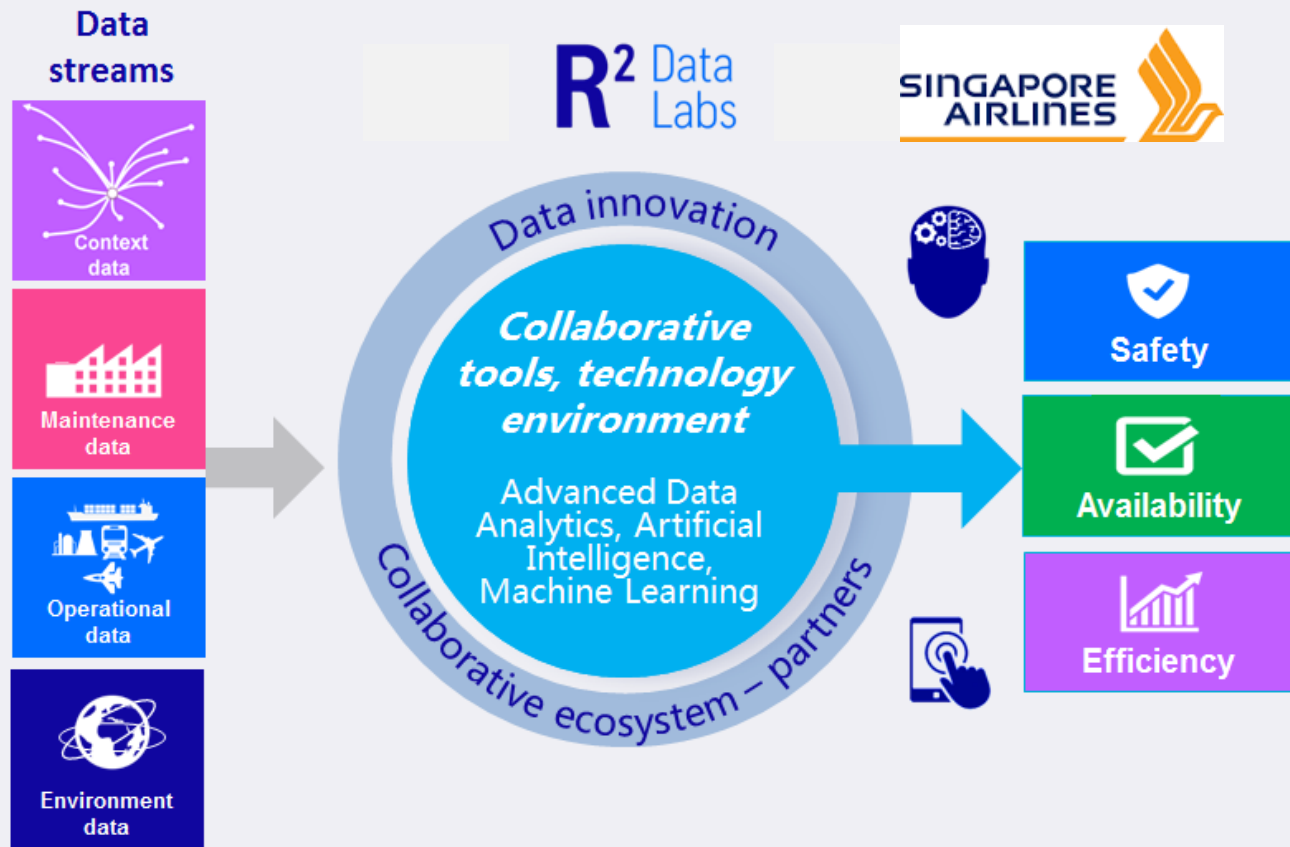
Data & Perspective

Collaborate across the skies

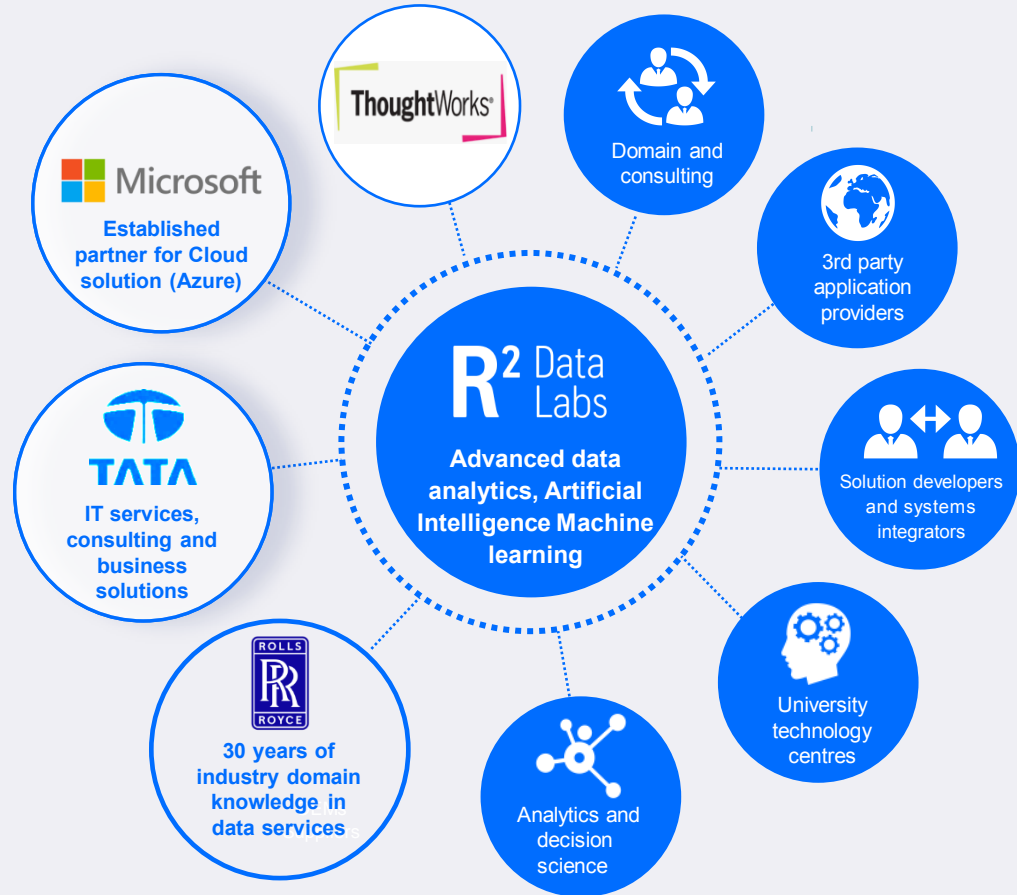


- **Can we give more to individual Airlines**
 - Improve accuracy in managing operational risk
 - Really finding useful insight ... emerging trends

Can we share data and insights to save lives...



**A collaborative
platform
will help us
accelerate the
delivery of
value**





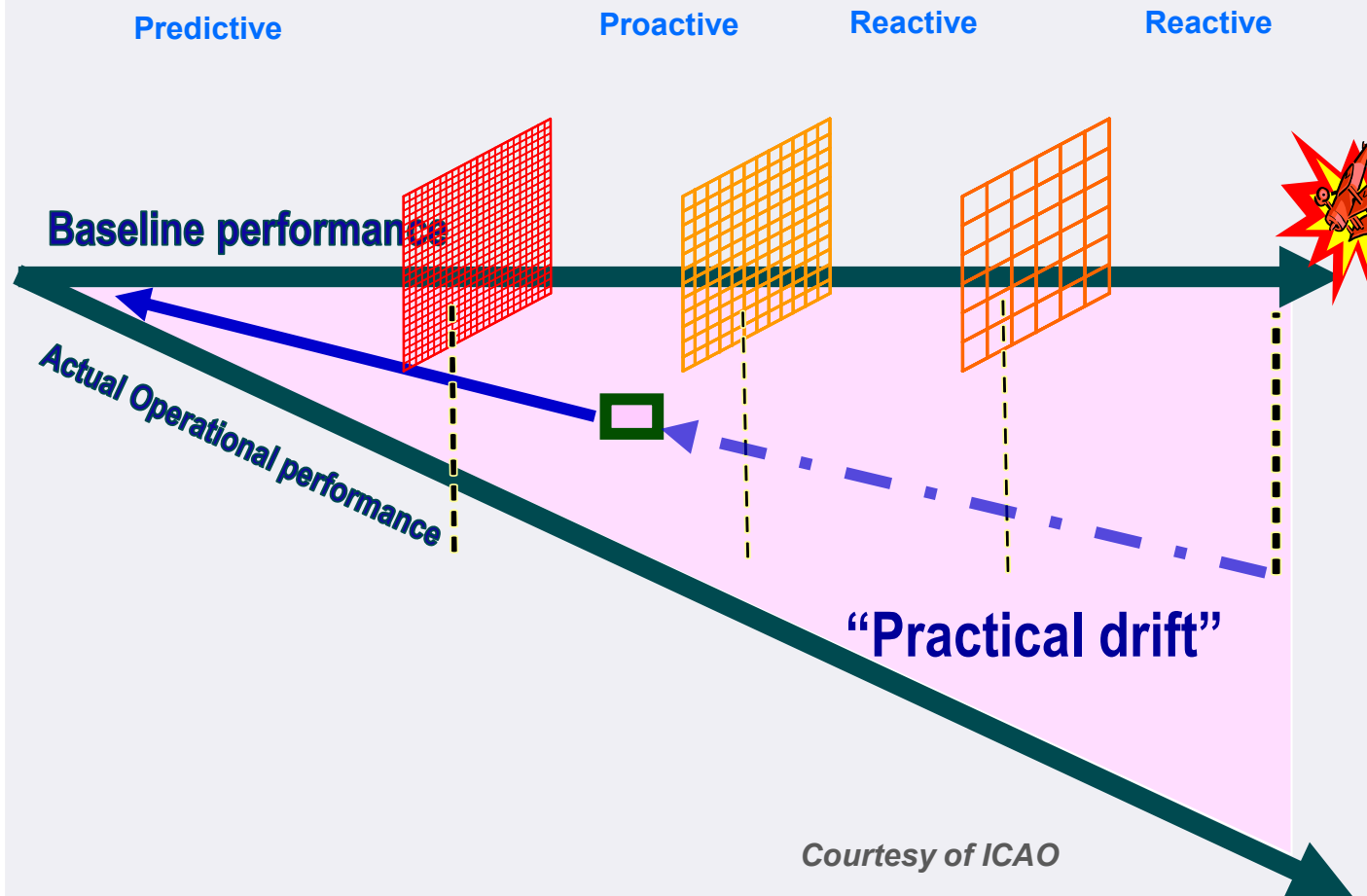
02

Pro-active vs. Predictive

Why we do what we do

Is becoming harder and harder to derive the reason for the next accident so we must use all data available in conjunction with analytical capability.

Proactive vs. Predictive





Our team looks to harnessing data analytics enable SMS to **become more predictive** and improve safety **through resilience**

Safety Management System

Commitment & Responsibility

- Accountability
- Appoint key safety personnel
- Coordinate emergency response planning
- SMS documentation

Safety Risk Management

- Hazard identification
- Risk Assessment & mitigation

Safety Assurance

- Safety Performance monitoring & measurement
- The management of change
- Continuous improvement of SMS

Safety Promotion

- Training and education
- Safety communication



03

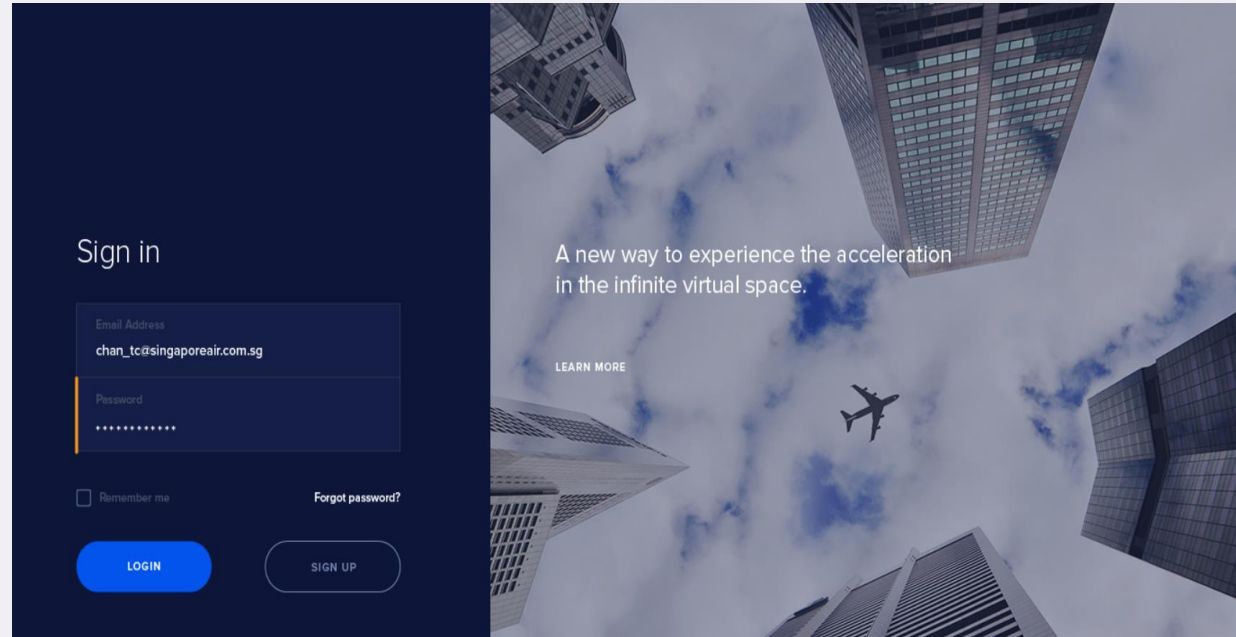
Vision & Goals

QAR

- Modelling pilot competencies (EBT)
- Identify and learn from resilient safety behaviors
- Safety Awareness

RR SMS

- Discover new causal factors
- Safety Hazard Awareness
- Identify emerging risks



04

Developments

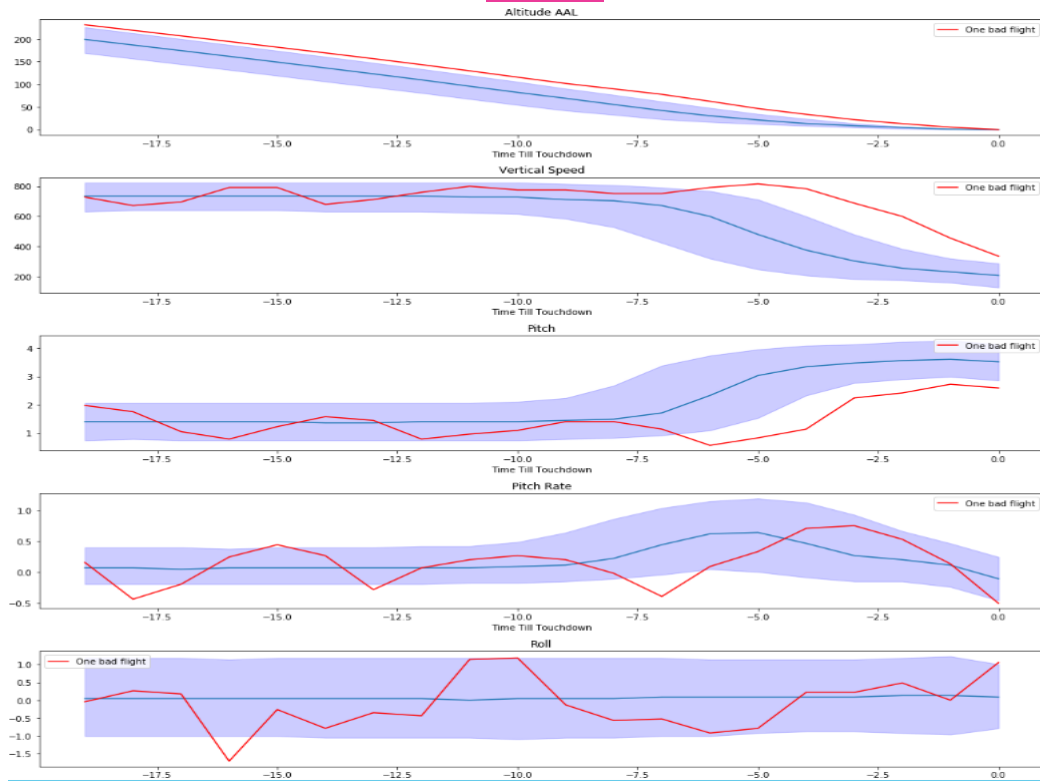
- i) Flight Path Management Assessment
- ii) Situational Awareness
- ii) SMS Analytics

Overview

1. Identify resilience behaviours that led to good outcomes i.e. reducing the risk of bad outcome
2. Aggregate, trend and mitigate risky behaviours that may lead to bad outcome(s).

i) Data-driven Approach for Flight Path Management

Data



Initial interpretation

Consistently high slope to landing

High vertical speed during last few seconds.

Late change in pitch.

Further work needed to understand relationships among signals to translate this into competencies





Concept workflow for Flt Path Management

Approach

Landing

Taxi-in

Pilot Factors
/Environment

Pilot Factors
/ Environment

Pilot Factors
/ Environment

High energy

Unstabilized

Normal

High vertical
energy

High lateral
energy

Hard
landing

Normal

5000 ft.

2000 ft.

1000 ft.

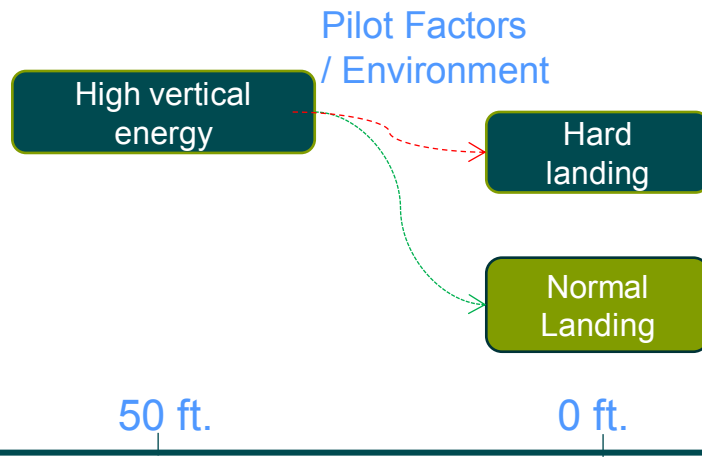
50 ft.

0 ft.



Example: In a High Vertical Energy profile

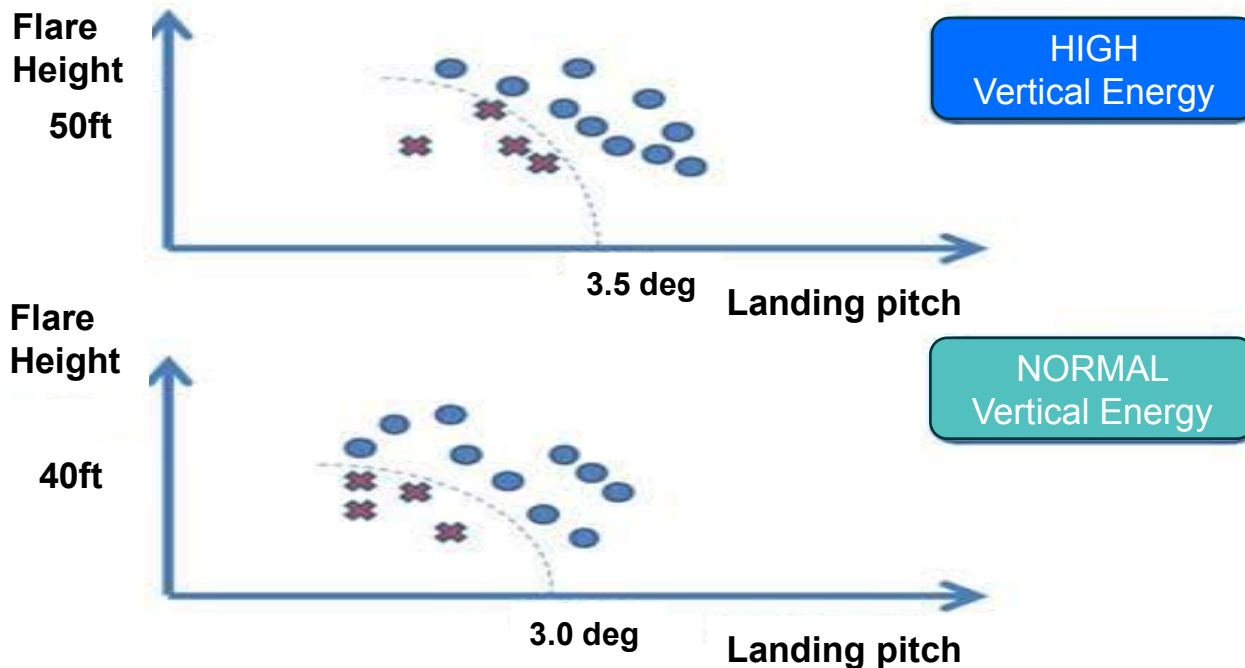
Landing



- How can we **use data** to **derive** a set of **pilot factors** that can then be used **to determine** different competency levels of e.g. Flight Path Management



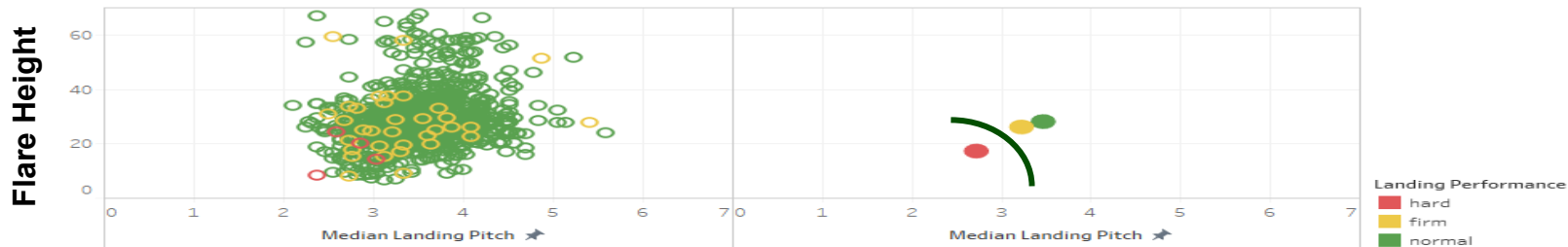
Identify Optimal Behaviours in Different Situations



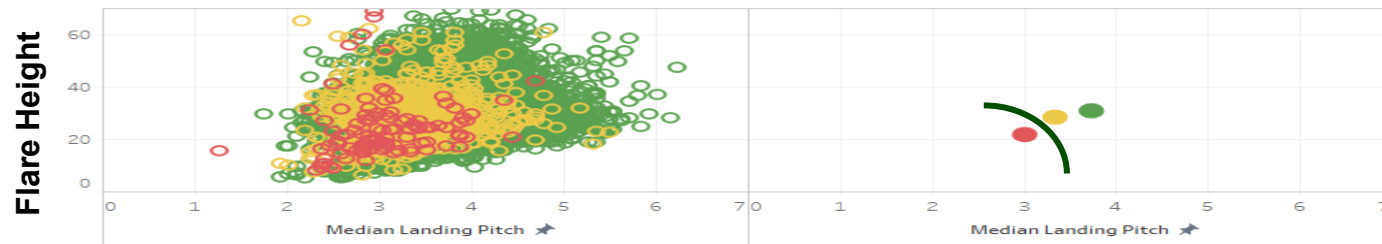


Identify Optimal Behaviours in Difference Situations

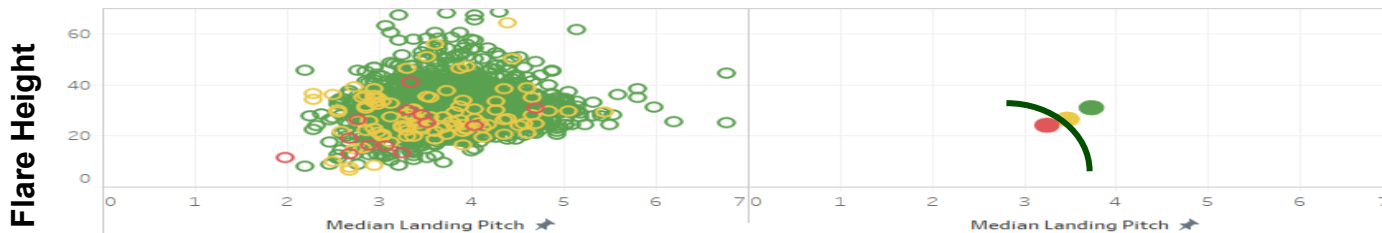
Vertical Speed At 50ft is Low



Vertical Speed At 50ft is Normal



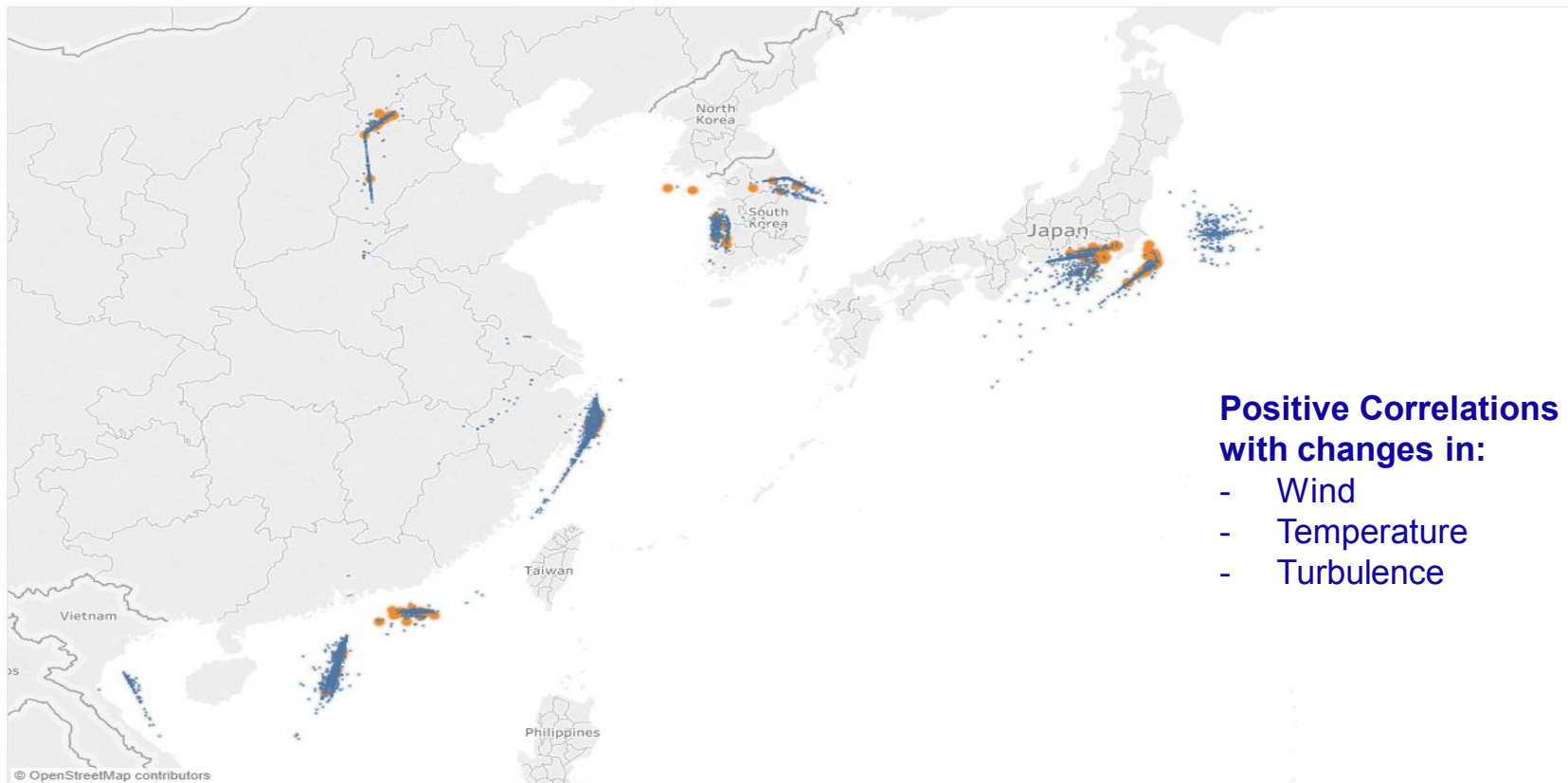
Vertical Speed At 50ft is High



Landing Pitch Attitude



ii) Situational Awareness for Overspeed



MS Overspeed Flag

0
1

**Positive Correlations
with changes in:**

- Wind
- Temperature
- Turbulence

iii) SMS Analytics

Analytics in development

Investigating areas of concern:

- Orient focus
- Emerging trends

Areas of Concern

Bird Strikes in *ABC*

DETAILS



Loading events on XYZ

DETAILS



Pallett Make-up

DETAILS



TCAS events

DETAILS



THANK YOU!



For questions or suggestions:

Panayiotis (Panos) Nicolaou – panayiotis.nicolaou@rolls-royce.com