ITEC

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#ITEC2019

Flight Test for Simulator Development

Regine Pattermann, Head of Flight Test, RS Flight Systems GmbH

Flight Data Gathering for Simulation Purpose

Reiser Simulation and Training is a manufacturer of Full Flight Simulators Level D, mainly for rotary wing.
RS Flightsystems GmbH provides flight data, that is used for development.

- The approach for flight data gathering and challenges of such projects are the topic of this presentation.

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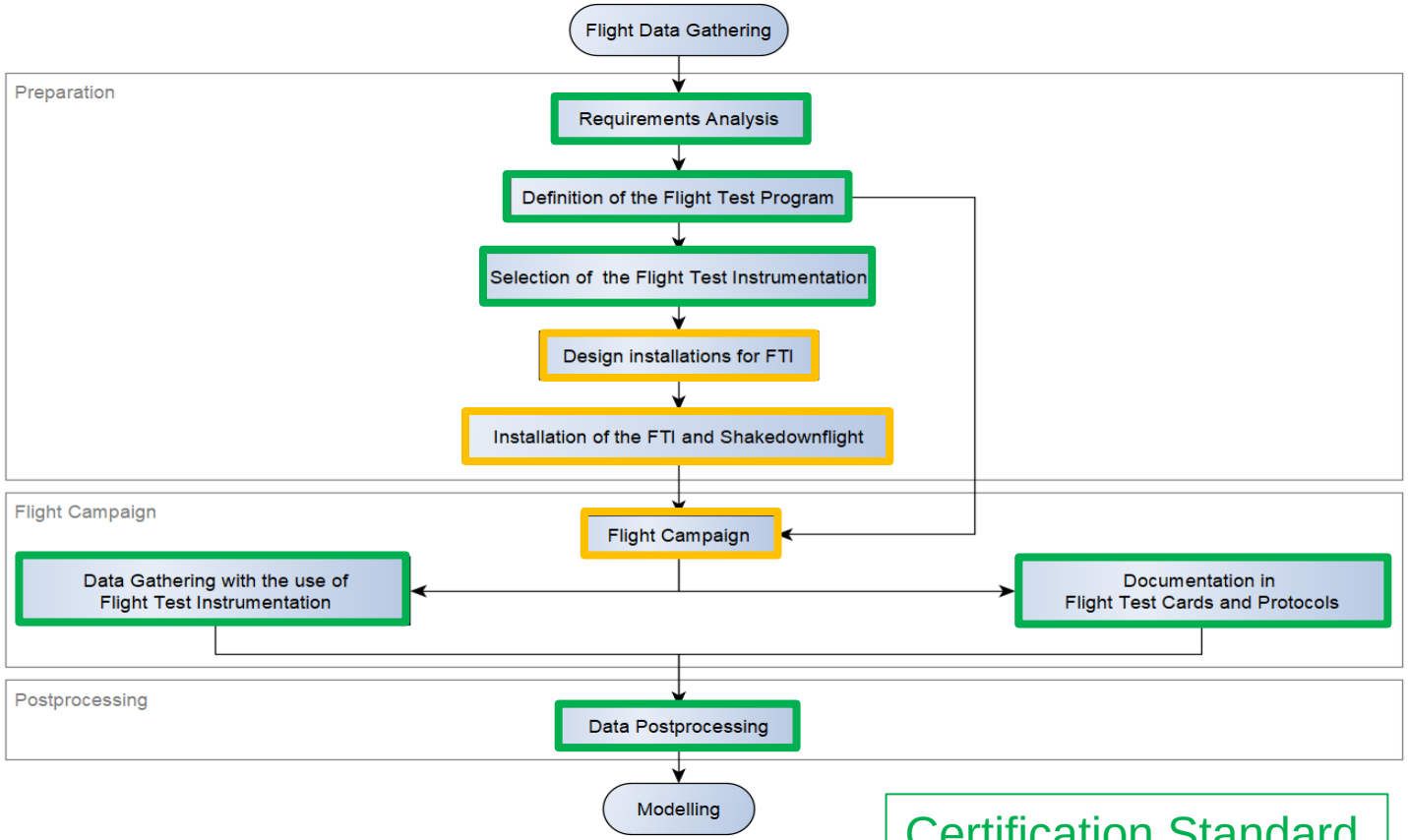
Process of Flight Data Gathering



Certification Standard

Part 21

Flight Test Program

General contents

- List of planned test points
- Aircraft configuration description
- Test site
- Crew
- …

Simulator specific contents

- Compliance with Simulator Certification Standard i.e. CS-FSTD(A)
- Definition of aircraft weight configuration
- Progress tracking and data storage and processing

Simulator Certification Standard

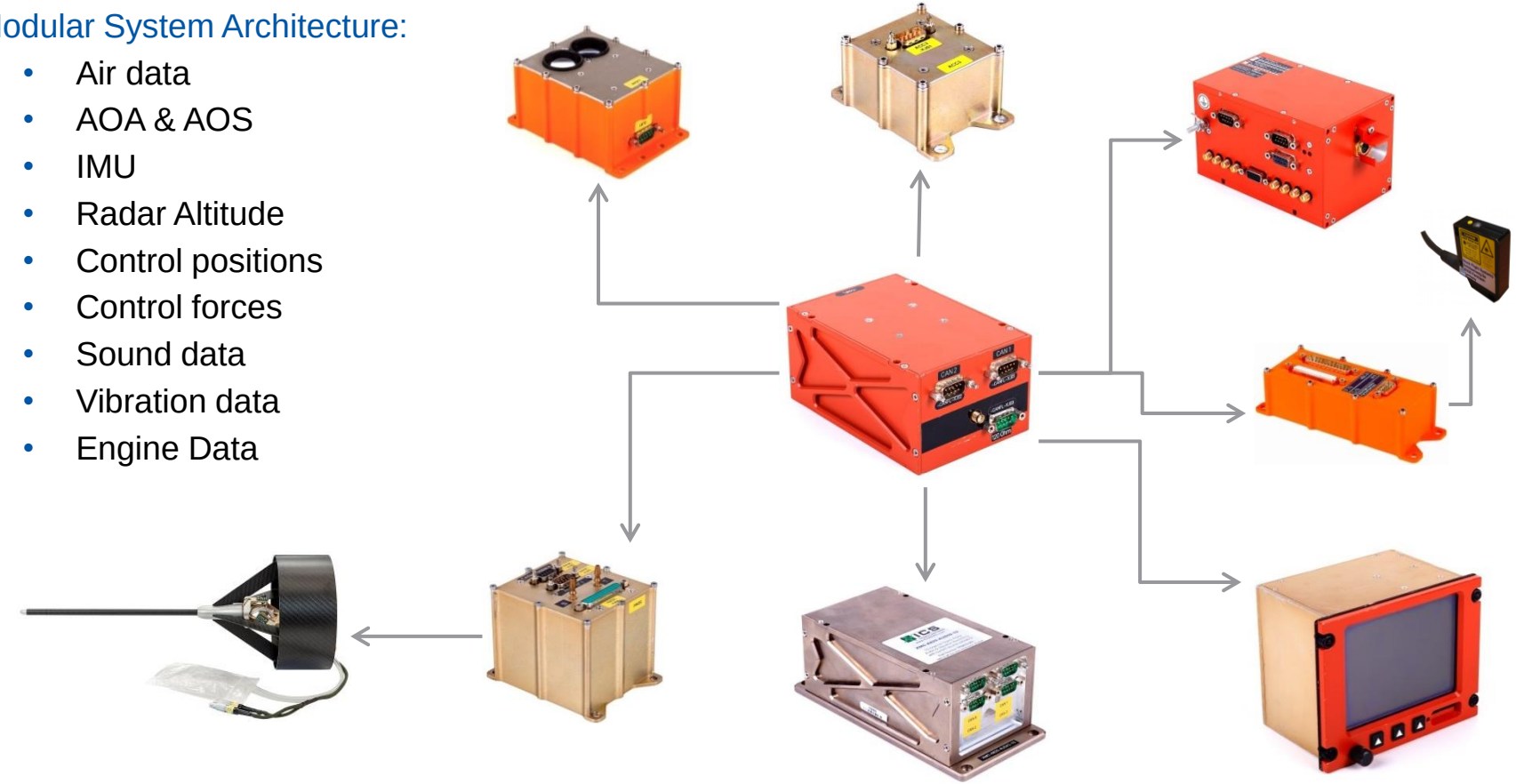
TESTS	TOLERANCE	FLIGHT CONDITIONS	FSTD LEVEL										COMMENTS
			FFS				FTD		FNPT			BITD	
			A	B	C	D	Init	Rec	I	II	MCC		
(4) Normal take-off.	± 3 kts airspeed ± 1·5º pitch angle ± 1·5º AOA ± 6 m (20 ft) height For aeroplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force	Take-off	C T & M	✓	✓	✓							Data required for near maximum certificated take-off weight at mid centre of gravity and light take-off weight at an aft centre of gravity. If the aeroplane has more than one certificated take-off configuration, a different configuration should be used for each weight. Record take-off profile from brake release to at least 61 m (200 ft) AGL. May be used for ground acceleration time and distance 1.b(1). Plotted data should be shown using appropriate scales for each portion of the manoeuvre.

CS-FSTD(A) Issue 2

Flight Test Instrumentation

Modular System Architecture:

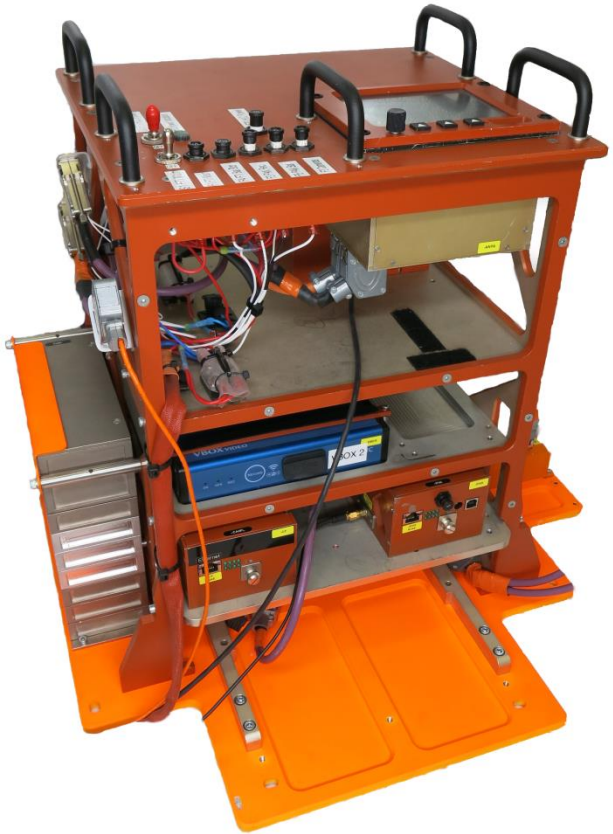
- Air data
- AOA & AOS
- IMU
- Radar Altitude
- Control positions
- Control forces
- Sound data
- Vibration data
- Engine Data



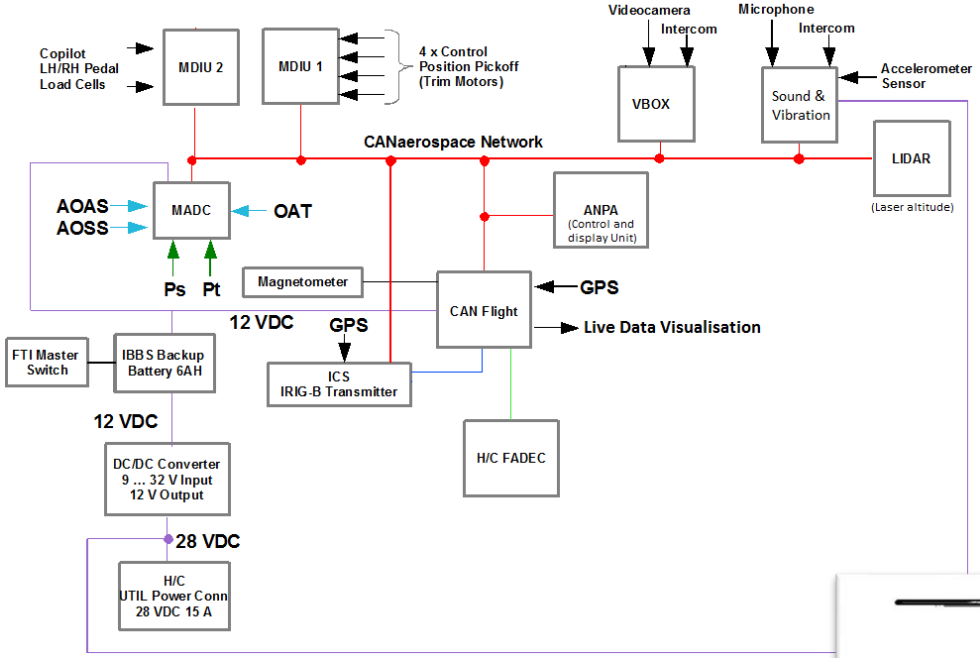
Flight Test Instrumentation

FTI-Rack:

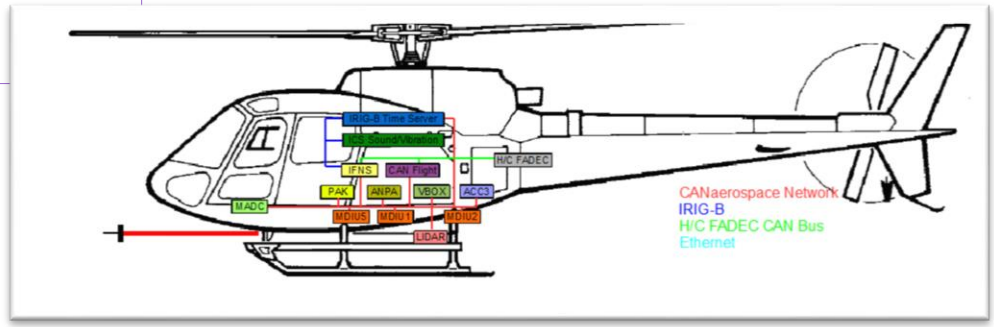
- Core-unit of the FTI
- Hosts most components of the flight test instrumentation
- Annunciator Panel
- Circuit Breakers
- Easy and safe installation



Flight Test Instrumentation



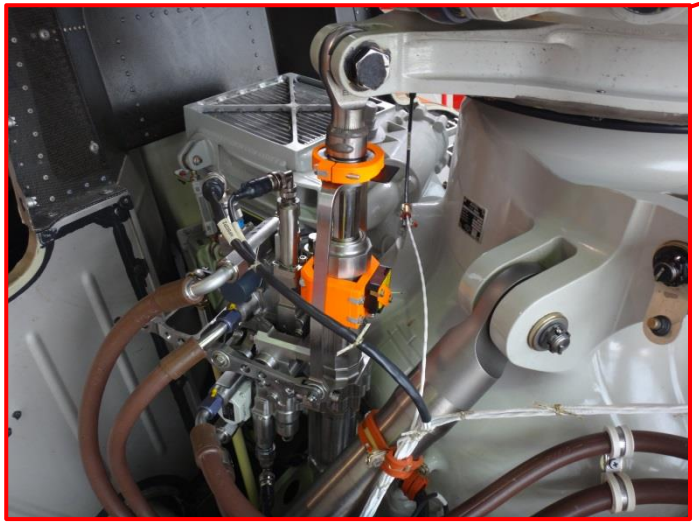
EXAMPLE FOR CDARS SYSTEM ARCHITECTURE

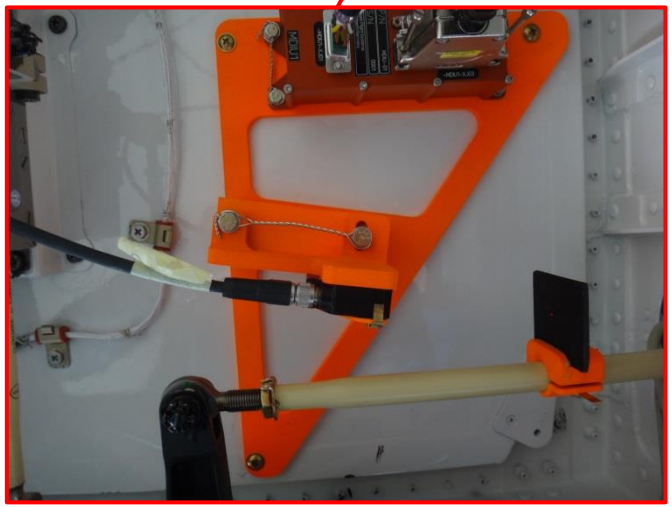


FTI Installation Example

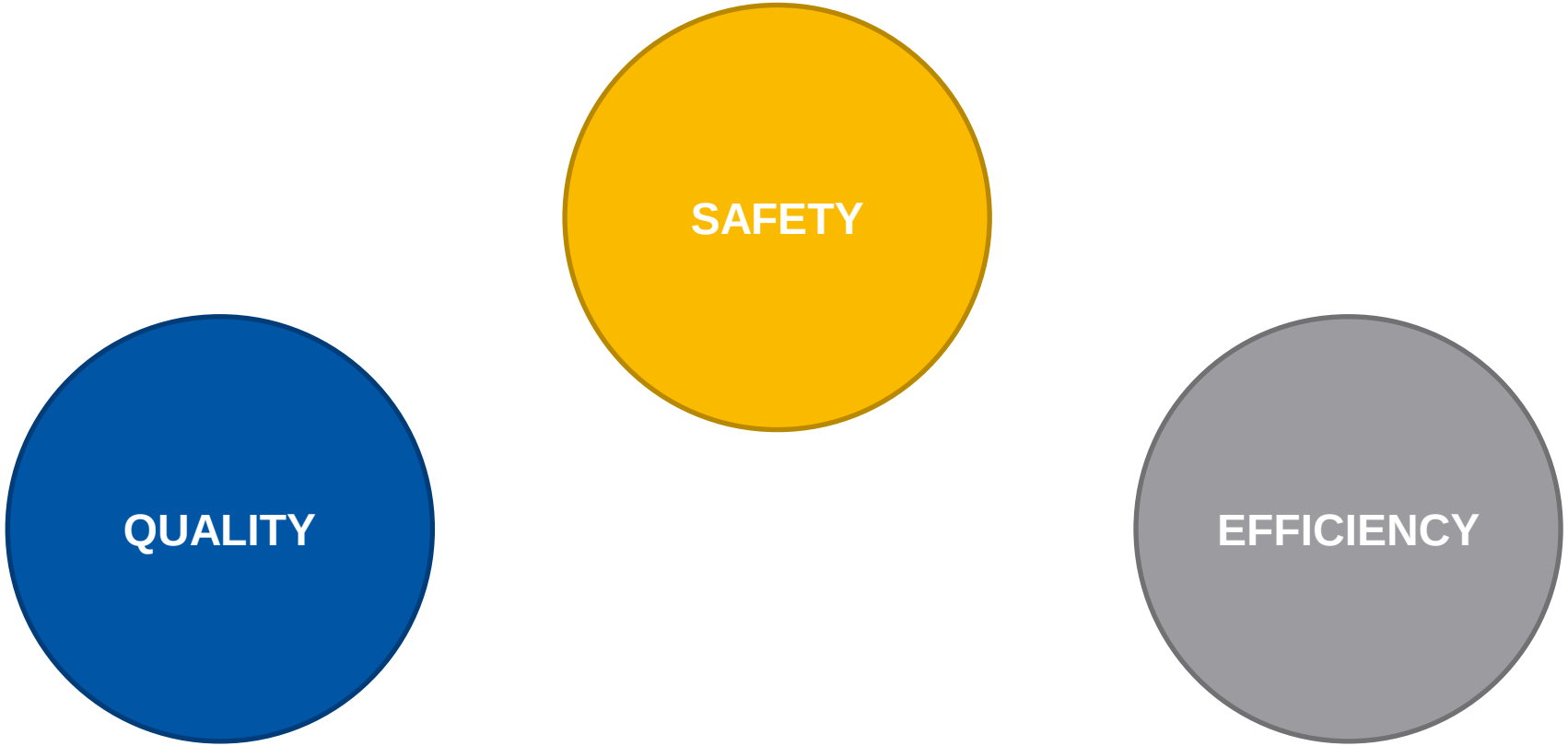
- Control Input Measurement
- Laser Sensor Technology

© HeliService





Main Requirements on Flight Data Gathering



Safety during Flight Data Gathering

Flight Test
for Aircraft Certification

- Safety is the main topic during flight test
- Data recording is a support for proof or detailed analysis after flight

Flight Data Gathering
for Simulator Development

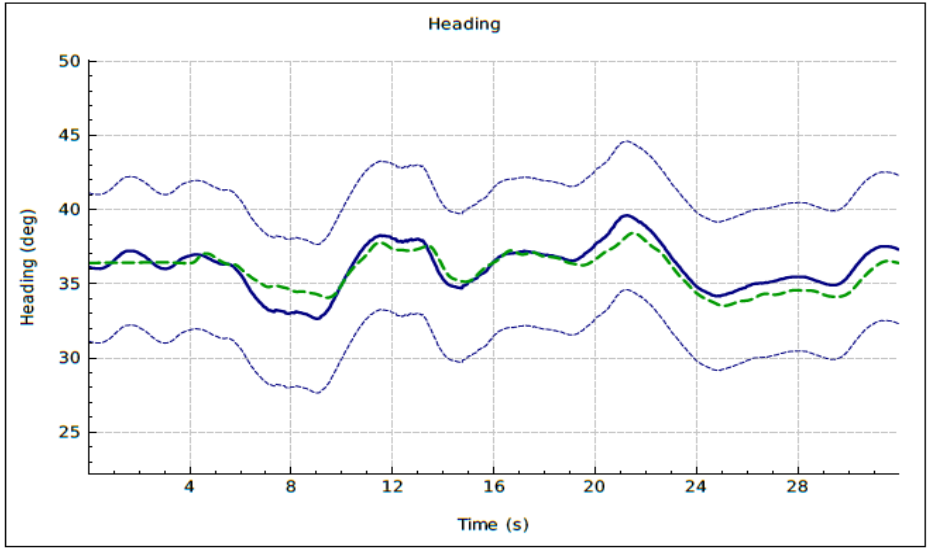
- Data recording is the main purpose
- All flights within the envelope – automatically safe?

Quality in Flight Data Gathering

Certification Standard
i.e. CS-FSTD(H)

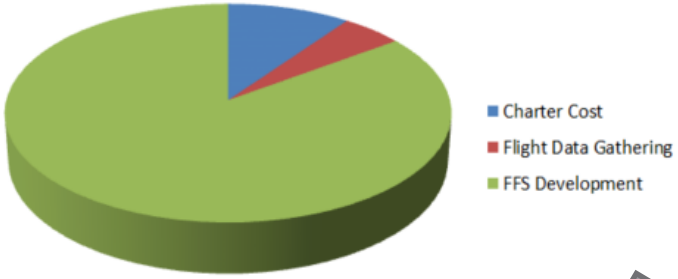
Model requirements

Quality
Requirements



Efficiency in Flight Data Gathering

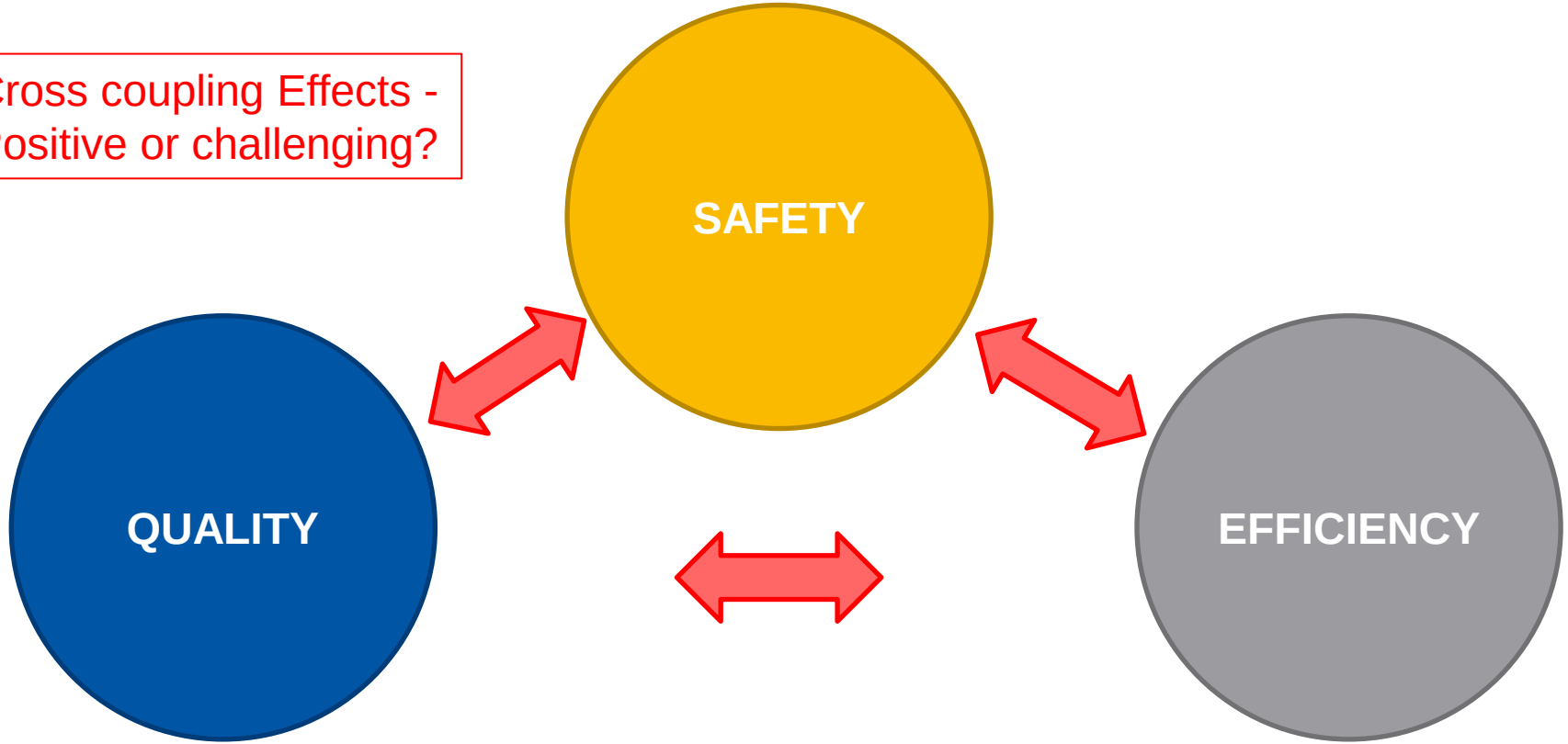
High Charter Cost → Financial challange



- Clever workshare and processes have to be defined
- Tools can support and relieve from workload
- ➢ Shorten Charter period and flights to a minimum

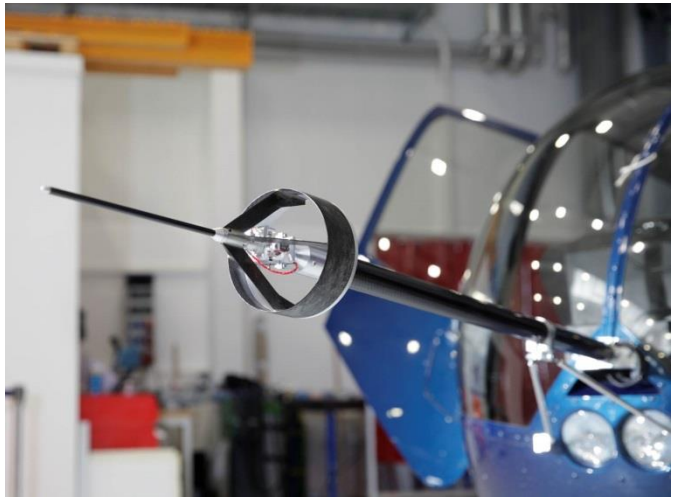
Main Requirements on Flight Data Gathering

Cross coupling Effects -
Positive or challenging?



Compromise between Safety and Quality

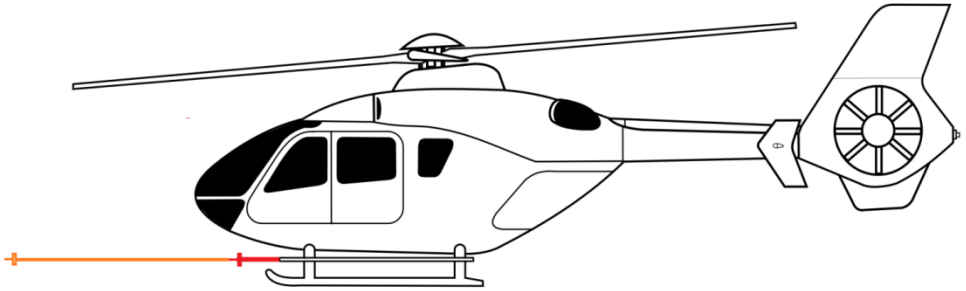
AOA & AOS at low airspeed



Flightlog on Noseboom:

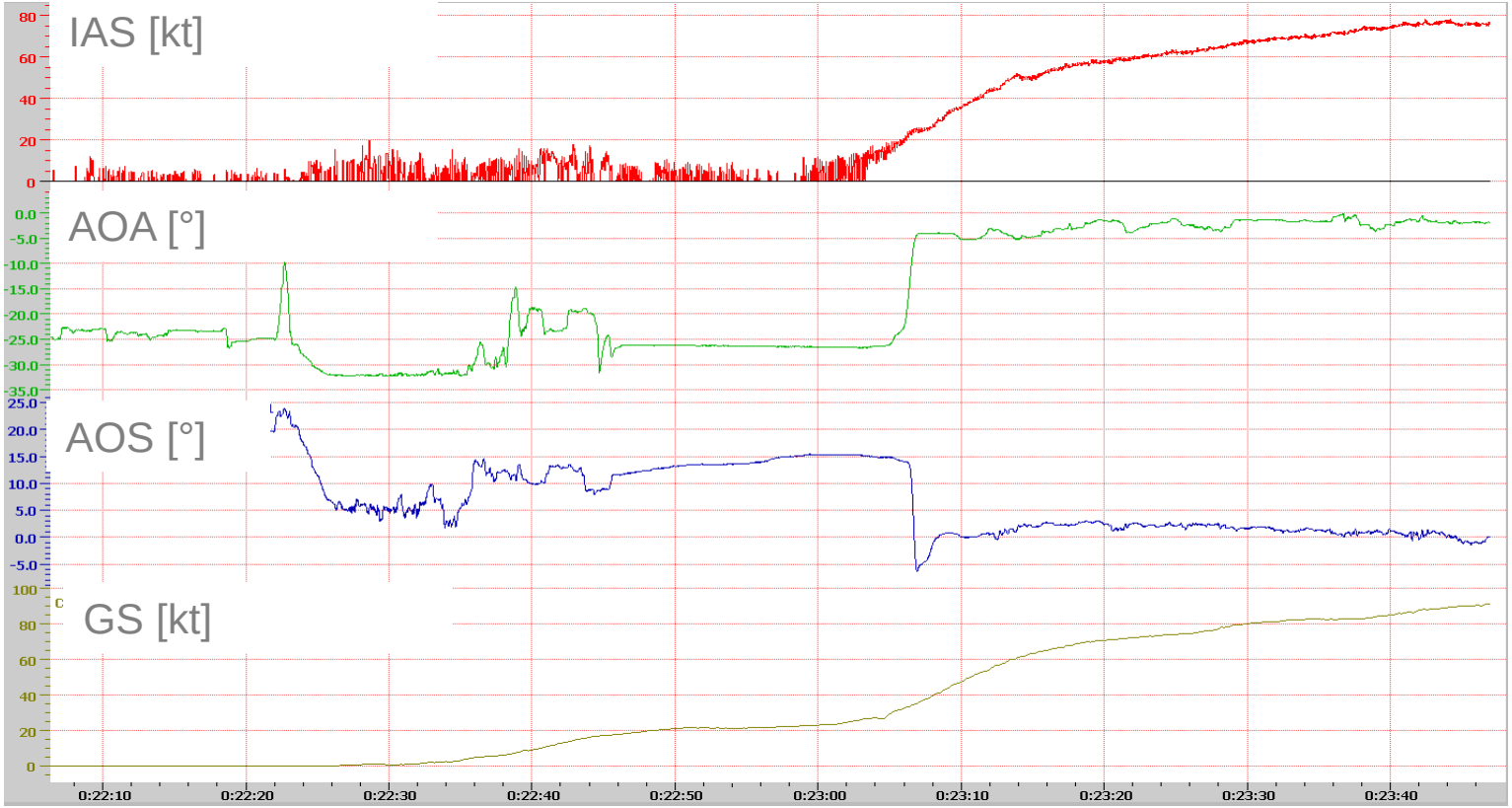
- AOA
- AOS
- Pitot-static tube

Quality ↔ Safety



Compromise between Safety and Quality

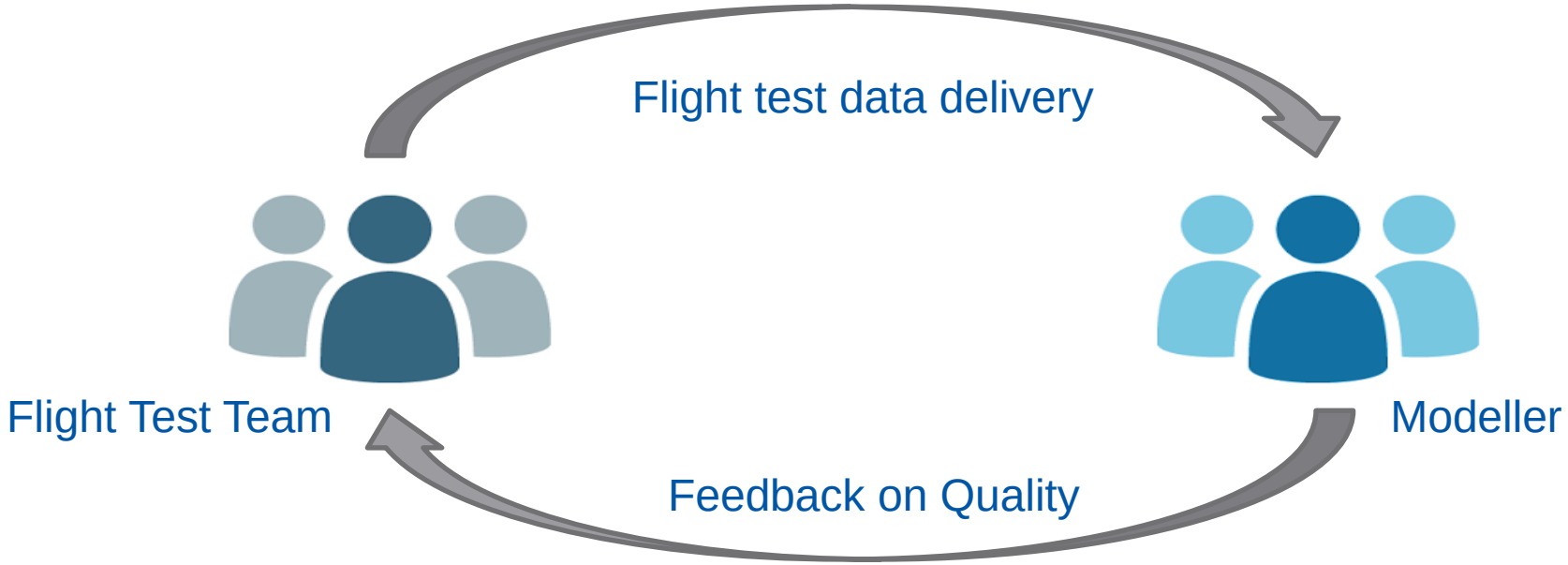
AOA & AOS at low airspeed



AFLS during take-off

Support of quality via increased efficiency

Process of data review



Support of quality via increased efficiency

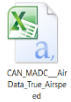
Process of data review

How can we increase efficiency?

➡ Provide data to the modeller in their desired format

DAT_000B.CAN

convert

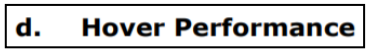


CAN_MADC__Air Data_True_Airspeed

Data

correlate

Test Name



➡ Automated Data Handling Process

Manual Steps:

- Set event button to mark start and end of manoeuvre in flight
- Write flight test cards (digital)

Automated steps:

- Postprocess raw format
- Cut data to manoeuvres
- Create correlating data base

Improved Safety leading to better Quality

Crew Communication

In Flight:

- Well prepared prior to campaign
- Wording adapted to checklist procedures of normal operation
- Reflects roles and responsibilities
- Well structured communication leads to improved data quality

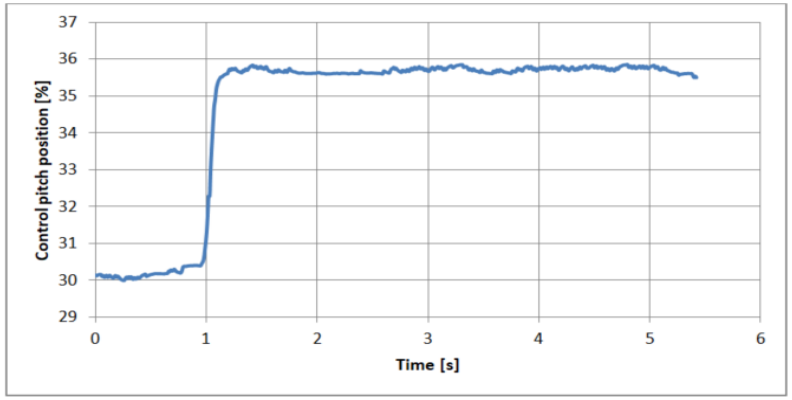
Improved Safety leading to better Quality

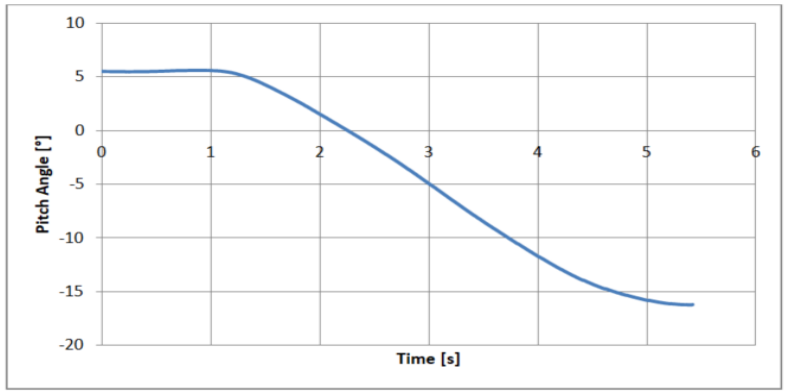
Crew Communication

On Ground:

- No predefined communication
- Conscious selection of the wording required
- Possible consequences for flight safety

Defined control step inputs

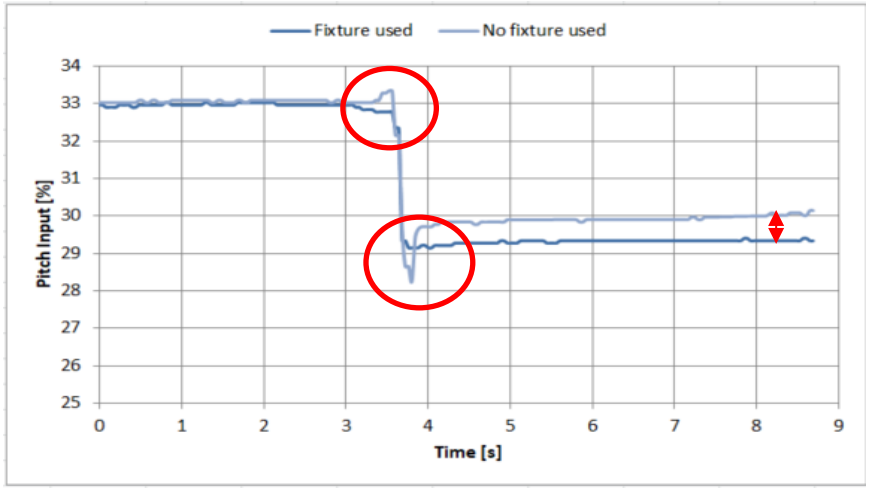




Control step inputs:

- Steady initial state
- Clean control input in only one direction
- Helicopter reaction often fast and possibly hazardous

Defined control step inputs

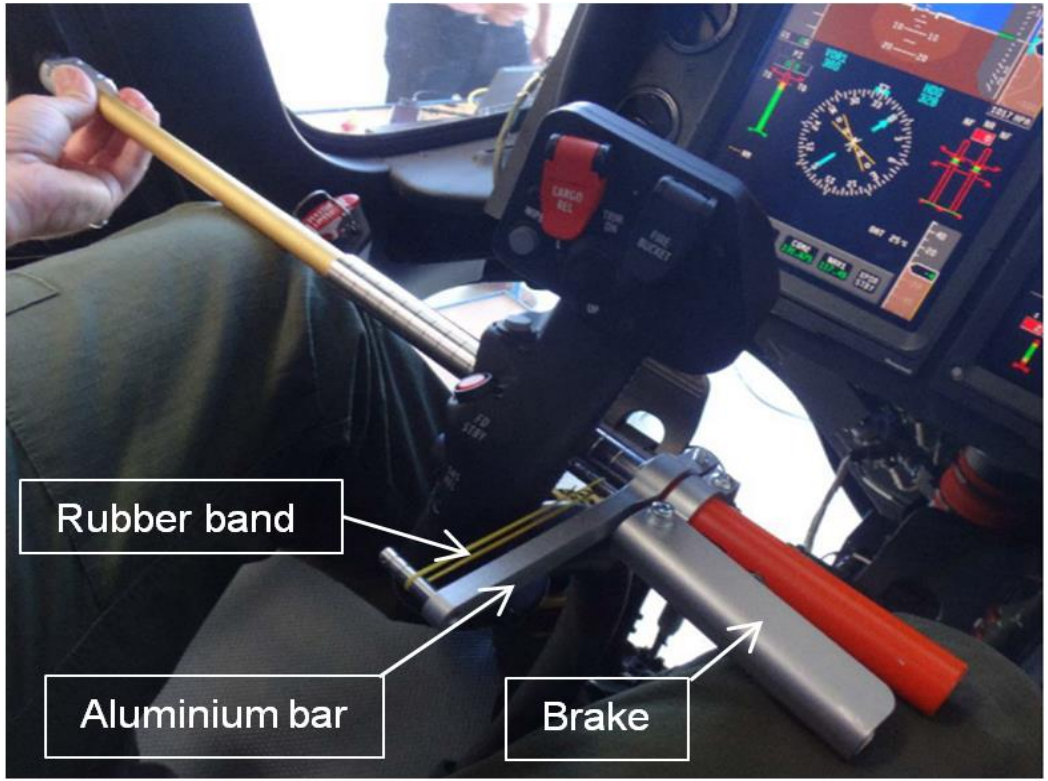


Quality aspects:

- Step input – fast
- No overshoots
- No drift after input

Achieving higher efficiency and quality but safe

Defined control step inputs



Control fixture use in Hover

Achieving higher efficiency and quality but safe

Defined control step inputs

Safety aspects:

- Training:
  1. Explain principle on ground
  2. Procedure Training on ground
  3. Training in a simulator
  4. Training in a flight not dedicated to step inputs
- Procedures and wording
- Helicopter reaction often not known
  - In Hover: select a high altitude above landing area
  - Start with very small inputs maybe even without control fixture
  - Agree on maximum angles prior to a flight

Achieving higher efficiency and quality but safe

Defined control step inputs

Higher input quality

Quickly achievable positive result

Quality → Efficiency

Efficiency → Safety

→ Safety has to remain always the high level requirement

Summary and Outlook

Summary:

- Approach of specific data gathering is beneficial for simulator development
- Flight data gathering has its own challenges compared to flight testing

- Cross effects between the three main requirements are complex

Outlook:

- Study to evaluate positive effects possibly in cooperation with a research institute
- Make use of developments from a big variety of flight tests with different purpose
- Further optimization with tools and adapted processes

Thank you for your interest!

RS Flight Systems GmbH
Oberer Luessbach 29-31
82335 Berg, Germany
www.rs-flightsystems.com | contact@rs-flightsystems.com

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