



# Airbus's perspective as an Aircraft Manufacturer and Data Provider

**EASA UPRT Workshop**

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18 JUN 2019

**AIRBUS**

# Why Stall Buffet Modelling Matters...

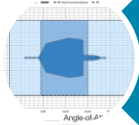
Airbus Stall Video, 2014 (extract)  
Real Flight – A330-200  
Experimental Test Pilots  
Subject Matter Experts



<https://www.youtube.com/watch?v=4WuPoVjOXLY>



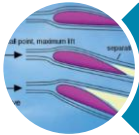
## Airbus as a Data Provider (GO5)



## UPRT



## Icing



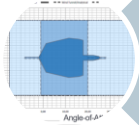
## Stall



## Role of Subject Matter Experts



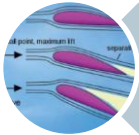
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Role of Subject Matter Experts

# GO5 and SimPack

ICAO 9625 ed4

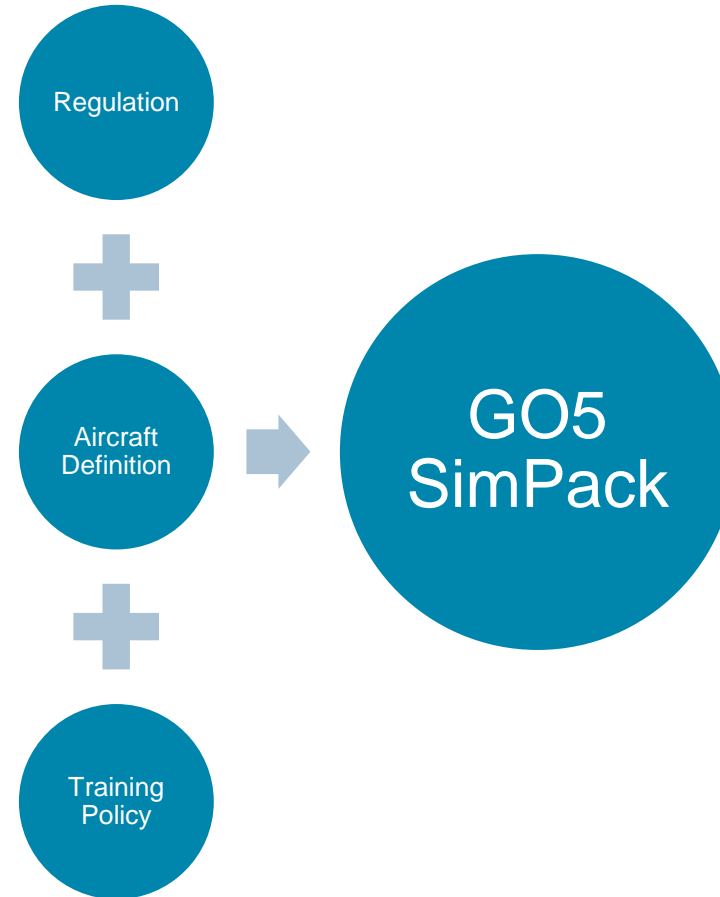
FAA 14 CFR Part 60 effective 2016

EASA CS-FSTD(A) Issue 2

Aircraft Type Specific  
Aircraft Modifications  
New Systems

Malfunctions needs  
Flight Crew Training

Operation Training Transmissions



Data Package (documents):

- Systems description
- Qualification Validation Source Data (QVSD)
- Validation Data Roadmap (VDR)
- Malfunctions Description Document

Simulation Software Package

Hardware

Simulation Product Operators  
Transmissions

# SimPack for UPRT and Stall Training

- Started in 2012-2013 with “in-house” work on stall buffet modelling
- Update mainly driven by ICAO 9625 ed4 and 14 CFR Part 60 change 2

- CS-FSTD(A) Issue 2 requirements are a subset of FAA’s
- SimPack is in line with the most restrictive requirements
- No specific “CS-FSTD(A) Issue 2” SimPack

- Communications:

DGAC 2017, 2019

RAeS 2015, 2016, 2018

FSEMC 2015, 2016, 2018

EFteG 2014 to 2018

GO5 customers event  
2015, 2017, 2019

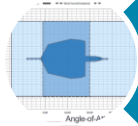
Airbus Flight Operations  
Symposium 2016

APATS 2016

STIG 2014 to 2019



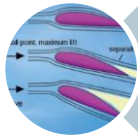
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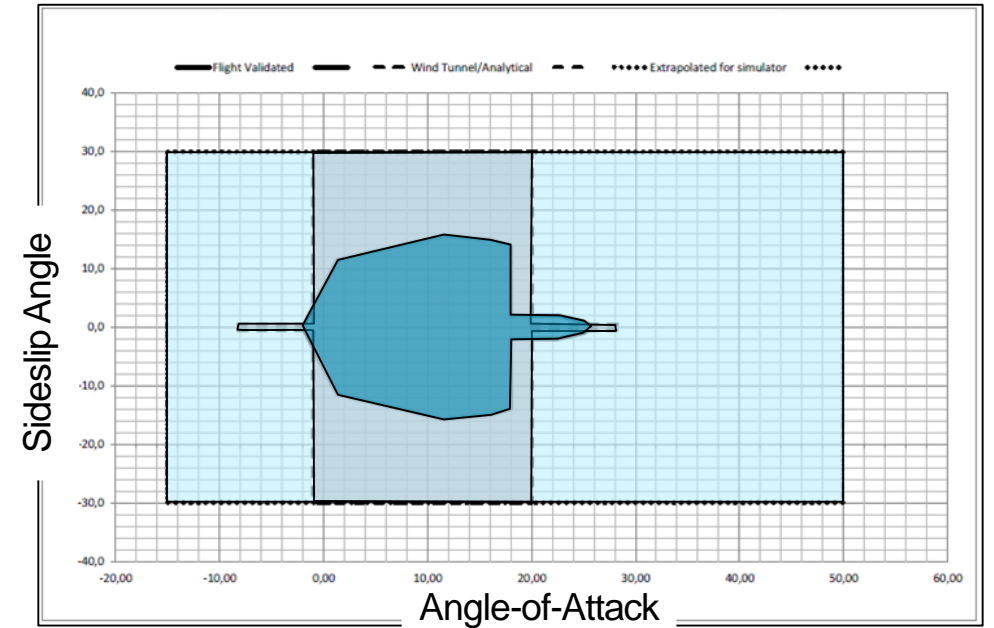
Stall



Role of Subject Matter Experts

# UPRT

- “Simulator Validated Envelope” document
  - FSTD validation envelope
  - 3 regions:
    - Flight test validated
    - Wind tunnel / analytical
    - Extrapolated for simulator

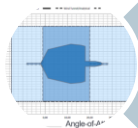


- No additional document to support V-n diagram: information already available





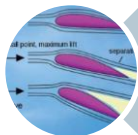
Airbus as a Data Provider (GO5)



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Stall



Role of Subject Matter Experts

# Icing

- Aerodynamics and buffet modelling
- “Ice mass estimation” document
- No additional engine effect
- QVSD for the 2.i QTG test

**AIRBUS**

**GO5 F00254700**

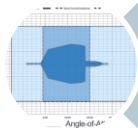
**Simulator Document**

**A330-A340**

**Title: MDL A330 FAMILY - ICE MASS ESTIMATION FOR  
SIMULATION PURPOSE**



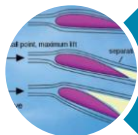
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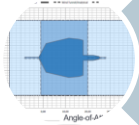
Role of Subject Matter Experts

# Stall

- Models of the Natural Flight Loop (NFL):
  - Aerodynamics (AER) – Enhanced
  - Roll-off (ROF) – Created
  - Stall buffet (BUF) – Created (replaces a legacy technical paper)
- Documents (status of compliance, stall characteristics assessment...)
- QVSD for 2.c.8 and 3.g.5 QTG tests



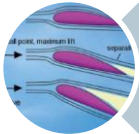
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Role of Subject Matter Experts

# Principles: One Team of SMEs on One FSTD

- We refer to AMC10 and AMC11: assessment on an engineering/development simulator (without motion system)

**... the stall characteristics have been subjectively assessed by an SME pilot on the engineering/development simulator ...**

- For stall buffet model, we need to use a simulator with motion system: level D FFS used “as an engineering simulator” (once for each aircraft type)
- A team of SMEs: Flight test engineer + Flight test pilot + Modelling experts

# Documents


- “Stall characteristics assessment”:
  - Configurations
  - Maneuvers
- SME Assessment Recordings (flight and vibration parameters)

### 3- Results and conclusion


In all tested cases with the last tuning of stall models,

- triggering of the buffeting, its amplitude, its frequency range, and its evolution while the Angle Of Attack was increasing up to the stall
- and
- the simulation of the roll-off phenomenon
- and
- the aerodynamic stall modelling


were judged representative of the real aircraft by the AIRBUS Subject Matter Expert pilots.



Stéphane VAUX  
Flight Test Engineer  
EVTD



Peter CHANDLER  
Experimental Flight Test Pilot  
EV



Xavier LESCEU  
Flight Test Pilot  
Head of Operational  
& Training Policy  
STLP

Test points:

Item	CONF	Roll-off	A320 CEO CFM		A320 CEO IAE		A320 NEO PW and CFM LEAP	
			$\alpha_{STALL}$	THS	$\alpha_{STALL}$	THS at VLS	$\alpha_{STALL}$	THS at VLS
1	CLEAN/UP	OFF	13°	2.1°UP at VLS	13.5°	2.6°UP at VLS	13.5°	2.3°UP
2		ON						
3	2/UP	OFF	23°	6.2°UP at VLS-10	23°	6.0°UP at VLS-10	23°	4.0°UP
4		ON						
5	3/DN	OFF	22°	6.2°UP at VLS-10	21°	7.5°UP at VLS-10	21°	4.7°UP
6		ON						

# Assessment Progress

Aircraft	Date	Status	Place	Operator / TDM
A300-600 PW	10 JUL 2018	Done	Louisville	UPS / TRU
A320 ceo/neo	29 JAN 2018	Done	Montréal	CAE / CAE
A320 ceo/neo	05 SEP 2018	Done	Toulouse	Airbus / L3
A330-200 GE/RR	04 OCT 2018	Done	Atlanta	DAL / CAE
A330-200 GE/PW/RR	20 MAR 2019	Done	Toulouse	Airbus / CAE
A330-300 PW	06 NOV 2018	Done	Charlotte	AAL / CAE
A350	20 JUN 2018	Done	Miami	Airbus / FSI
A380 RR/EA	20 NOV 2018	Done	Toulouse	Airbus / CAE



# Conclusion

Aircraft	Data	Qualified	Comments
A300-600 PW	Add-on to Aero rev5	Yes	
A320 ceo/neo	Standard 2.0.0	Yes	
A330-200 GE/RR	Standard 2.6.0	Yes	
A330-200 GE/PW/RR	Partial update to Standard 2.5.0	Yes	
A330-300 PW	Customized	Yes	
A350	Standard 1.1.0	Yes	
A380 RR/EA	Partial update to Standard 1.4.0	Yes	
<i>A330 neo</i>	<i>Standard 3.0.0</i>	<i>N/A</i>	<i>SimPack delivery: 2019</i>
<i>A340-300, A340-600, A300-600 GE, A310</i>	<i>On customer's request</i>	<i>N/A</i>	

# Why Stall Buffet Modelling Matters...

JUL 2018

FFS session – A350-900

Experimental Test Pilots

Subject Matter Experts

Not available on Youtube



High levels of vibrations... For short periods of time  
Please do not tune down, this is a matter of training value

Thank you