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# Quality Assurance Workshop

## Whole process for IFP design and related validation

5-6 July 2022
Virtual meeting room

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

*A United Nations Specialized Agency*

# Improvement of ground validation Comprehensive verification methodology Pilot ground validation

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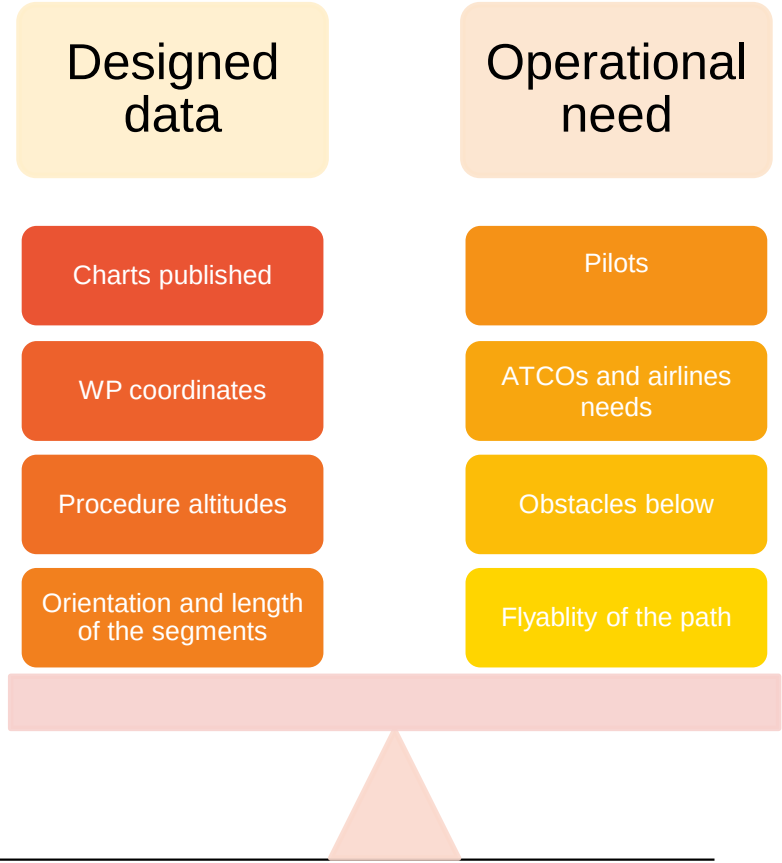
# 1. Why is flight validation required in the procedure design process?

# Why flight validation?

Mainly to check whether the data produced by the design process is in balance with:

- Aircraft performances,
- Airlines and ATCOs requirements,
- Obstacles,
- Local environmental constraints,
- Pilots understanding.

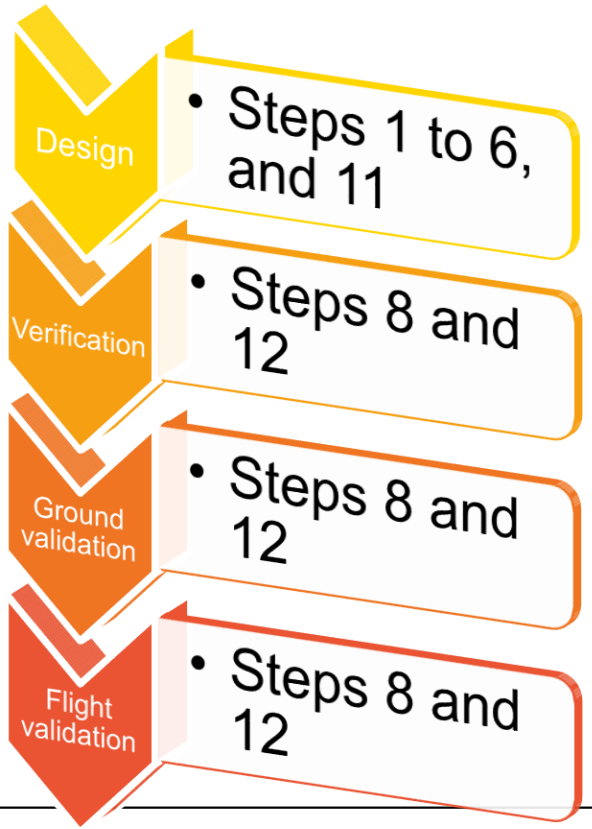


# 2. How to consolidate the designed data and make sure that balance is achieved?

# By using a robust Design Process

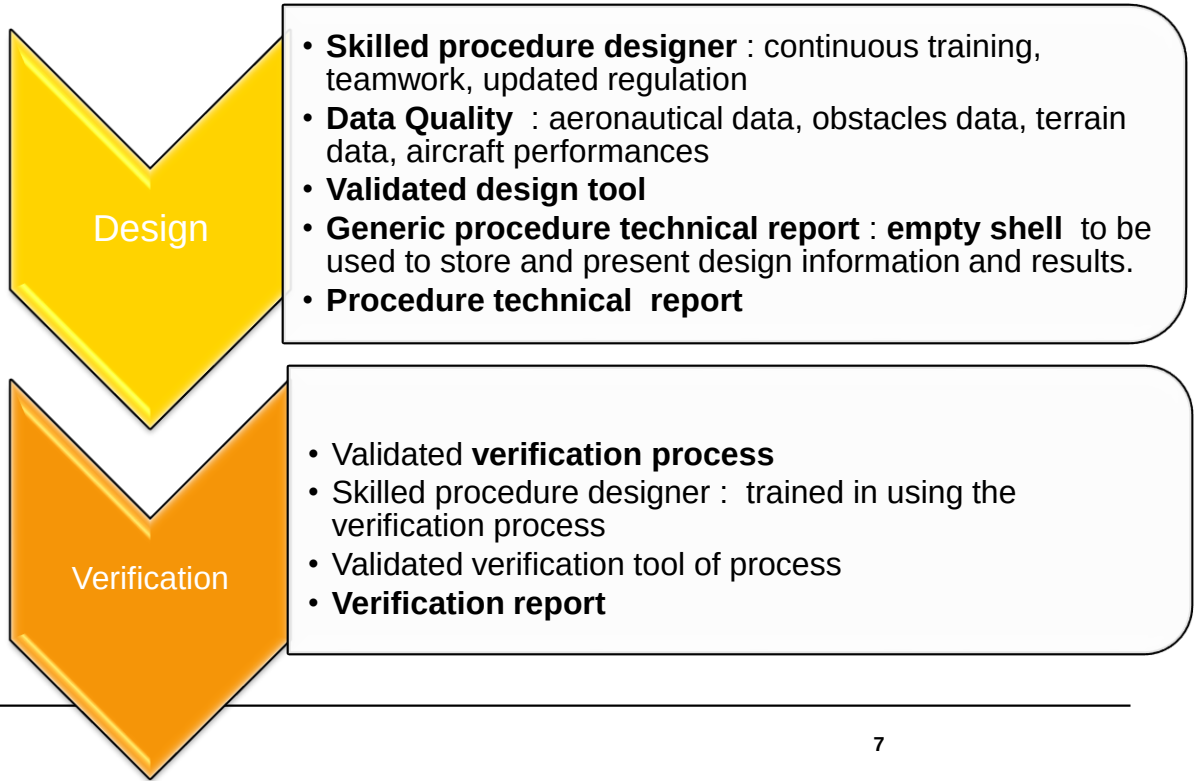
Well described in doc 9906
to seek and obtain balance
and safety of flight in four steps.

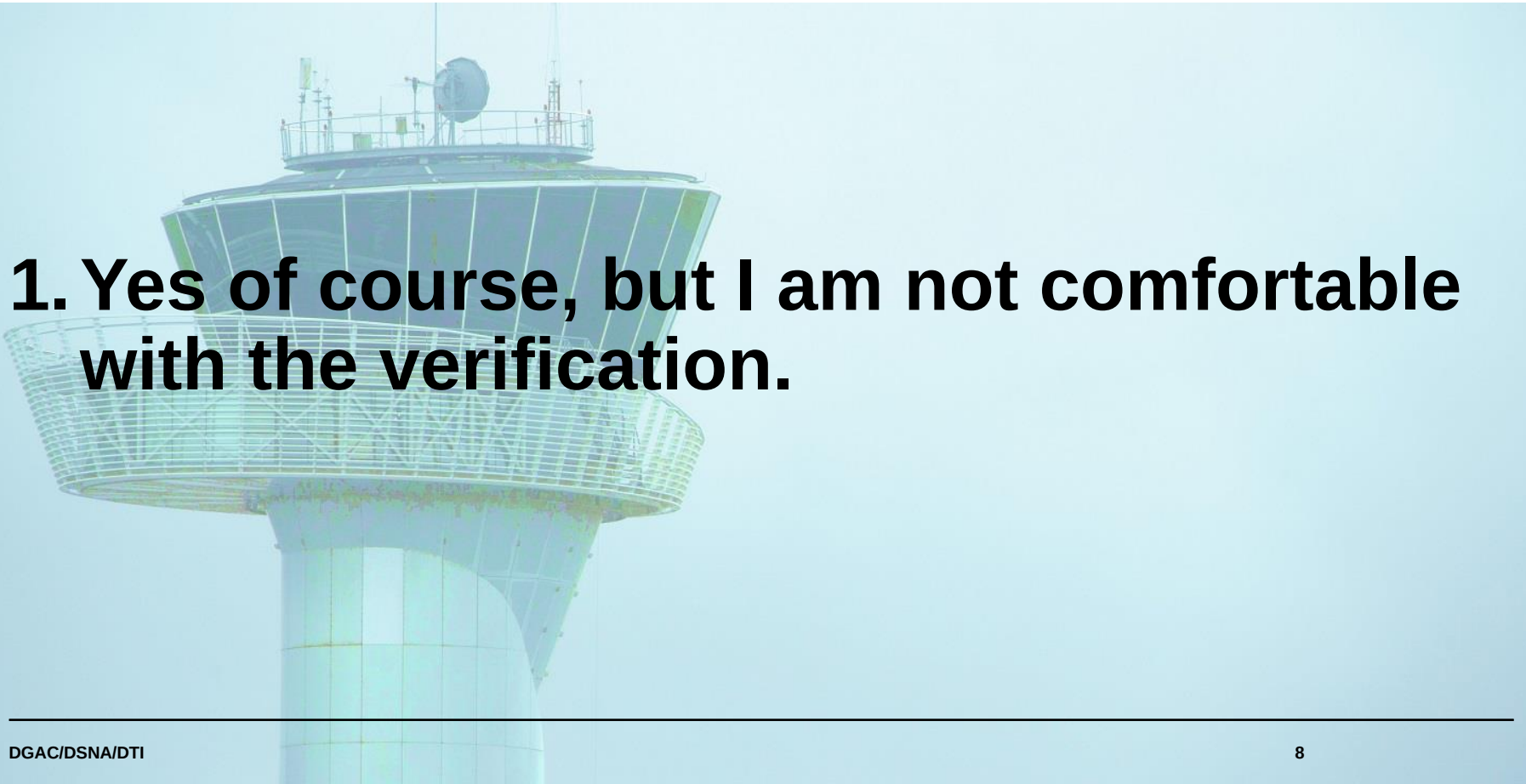
"*This process includes review, verification and validation processes which are necessary to minimize the possibility of errors*."



# Continuous improvement of the design process

**Design** and **Verification** steps are keystones of IFPD.
If they are robust enough, they reduce the weight of the next steps.





1. Yes of course, but I am not comfortable with the verification.

# Verification process

Procedure Technical Report

**Doc 9906 describes the basis of the verification process** :

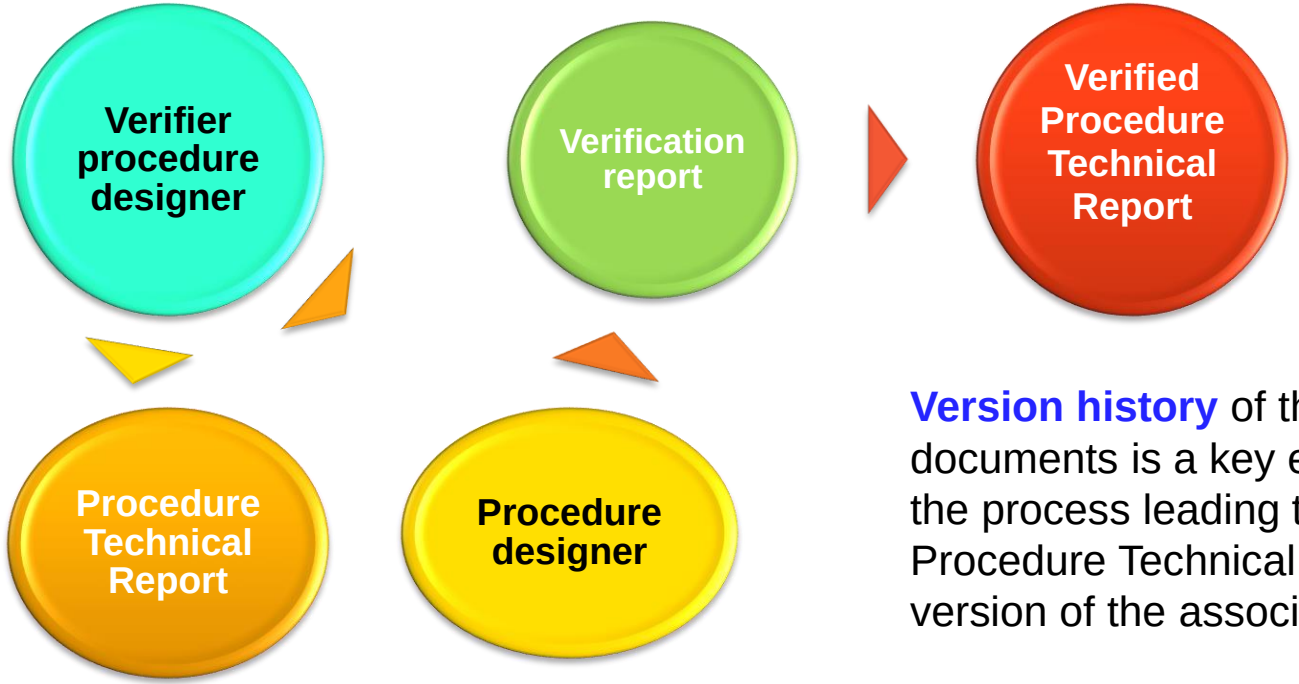
*7.5.3.1 Documentation*

*On the basis of these activities, the resulting FPD usually comprises one or several draft procedure layouts, a textual description of the procedures as well as calculations and coordinates.*

*These documents are then used as a basis for the design verification and are the input for the determination of the level-of-safety impact of the design.*

*All aspects of the FPD process should be documented including*: …/…

# Verification : Actors? Inputs? Outputs?




**Version history** of the exchanged documents is a key element of the process leading to the final version of Procedure Technical Report **WITH** the final version of the associated Verification Report

# An example of verification process

**Procedure designer**

**Verifier procedure designer**

Procedure Technical Report
RNP Rwy 28 LFXX
Vx.X.a

First versions of documents

Verification Report
RNP Rwy 28 LFXX
V1V

# An example of verification process

| | points to be checked | VX.Xa Verifier's comments | VX.Xa Designer's feedback | VX.Xb OK/NOK | VX.Xb Paragraph concerned | VX.Xb Verifier's comments | VX.Xb Designer's feedback |
|---|---|---|---|---|---|---|---|
| Criteria | Regulatory criteria considered (list of documents and orders used ) | | | | | | |
| | Proper consideration of the different criteria authorized (if applicable) | | | | | | |
| Infrastructure data | Verifying runway data (Alt THR/DTHR, AD, threshold coordinates) | | | | | | |
| | Navaid verification (if applicable) | | | | | | |
| | | | | | | | |
| | AIP release | | | | | | |
| | Runway certification | | | | | | |
| Obstacles data | Digital terrain model used | | | | | | |
| | List of obstacles affecting air navigation | | | | | | |
| | Obstacle Survey Validity | | | | | | |
| Conceptual design | Compliance with approved conceptual design document | | | | | | |
| Airspace | AIP release | | | | | | |
| Design tools | release | | | | | | |
| Other | request for flight validation | | | | | | |

Context | basic assumption | departure | arrival | holding | approach | IAC | FASDB | coding table | data | SID STAR chart | SID instruction

Verification report V1V

1V means First version written by Verifier

Version of Procedure Technical Report proposed to Verification step

# An example of verification process

| Vx.X.a | | | VX.Xb | | | |
|---|---|---|---|---|---|---|
| Paragraph concerned | Verifier's comments | Designer's feedback | OK/NOK | Paragraph concerned | Verifier's comments | Designer's feedback |
| § 3.5.3 | the final segment length is not compliant with minimum regulatory length : 4.5NM | | | | | |
| §4.1.2 | Max IAS for missed approach is not mentioned | | | | | |
| | | | | | | |
| | | | | | | |

Verification report
RNP Rwy 28 LFXX
V1V

# An example of verification process

**Verifier procedure designer**

**Procedure designer**

Verification report
RNP Rwy 28 LFXX
V1V

Verification report
RNP Rwy 28 LFXX
V1D

1D means First version written by Designer

| Vx.X.a | | | VX.Xb | | | |
|---|---|---|---|---|---|---|
| Paragraph concerned | Verifier's comments | Designer's feedback | OK/NOK | Paragraph concerned | Verifier's comments | Designer's feedback |
| § 3.5.3 | the final segment length is not compliant with minimum regulatory length : 4.5NM | this is due to an environmental constraint . It cannot be 5NM. It cannot be changed. | | | | |
| §4.1.2 | Max IAS for missed approach is not mentioned | modified Max IAX 185kt | | | | |
| | | | | | | |
| | | | | | | |

Verification report
RNP Rwy 28 LFXX
V1D

Context | basic assumption | departure | arrival | holding | approach | IAC | FASDB | coding table | data | SID STAR chart | SID instruction

# An example of verification process

**Verifier procedure designer**

Verification report
RNP Rwy 28 LFXX
V1V

**Procedure designer**

Verification report
RNP Rwy 28 LFXX
V1D

Procedure technical report
RNP Rwy 28 LFXX
Vx.X.b

**Verifier procedure designer**

Second version of Procedure Design Report

# An example of verification process

| Vx.X.a | | | VX.Xb | | | |
|---|---|---|---|---|---|---|
| Paragraph concerned | Verifier's comments | Designer's feedback | OK/NOK | Paragraph concerned | Verifier's comments | Designer's feedback |
| § 3.5.3 | the final segment length is not compliant with minimum regulatory length : 4.5NM | this is due to an environmental constraint . It cannot be 5NM. It canno be changed. | OK | §3.5.3 | the length of the final segment is maintained at 4.5NM | |
| §4.1.2 | Max IAS for missed approach is not mentioned | modified Max IAX 185kt | OK | § 4.1.2 | the speed is now clearly expressed | |
| | | | | | | |
| | | | | | | |

Verification report
RNP Rwy 28 LFXX
V2V

Version of Procedure Technical Report proposed to Verification step

# An example of verification process

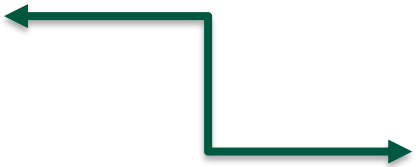
| Vx.X.a | | | VX.Xb | | | |
|---|---|---|---|---|---|---|
| Paragraph concerned | Verifier's comments | Designer's feedback | OK/NOK | Paragraph concerned | Verifier's comments | Designer's feedback |
| § 3.5.3 | the final segment length is not compliant with minimum regulatory length : 4.5NM | this is due to an environmental constraint . It cannot be 5NM. It cannot be changed. | NOK | §3.5.3 | the length of the final segment shall be 5NM | |
| §4.1.2 | Max IAS for missed approach is not mentioned | | OK | § 4.1.2 | the speed is now clearly expressed | |
| | | | | | | |
| | | | | | | |

Verification report
RNP Rwy 28 LFXX
V2V

# An example of verification process

Verified Procedure Technical Report

Verification report



Procedure technical report
RNP Rwy 28 LFXX
VxRXy

Verification report

RNP Rwy 28 LFXX
V5V

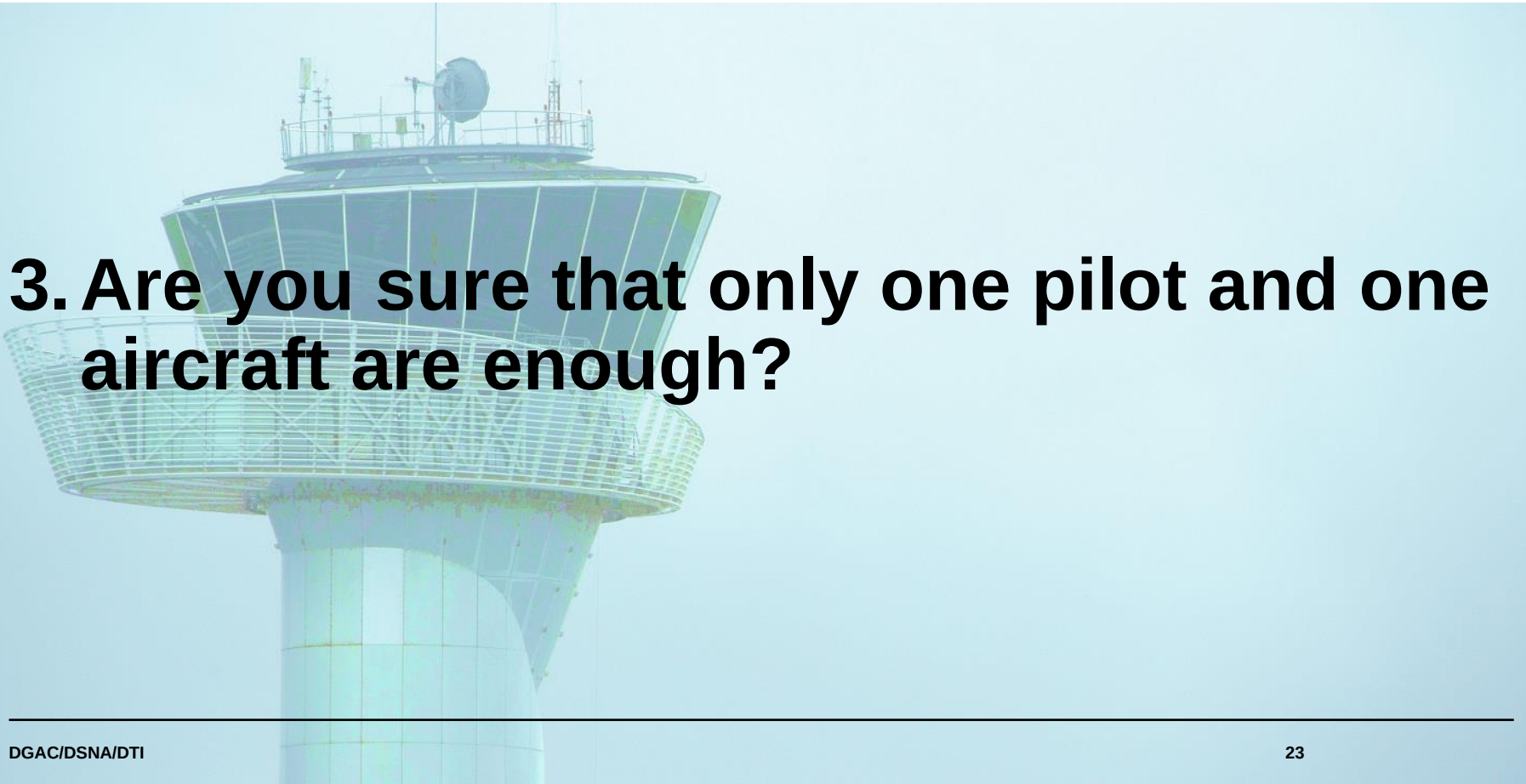
# 3. Yes, but do I need a pilot in the loop after a solid verification process?

# Yes Pilots should be in the loop from ground

- With a pilot to **check from charts** :
  - **path flyability** and
  - information published on chart **clear and complete**
- Ground validation report

# Yes Pilots could be in the loop from flight deck

- With a plane
- With a flight simulator
- With IAC (for the pilot) and navigation data in the navigation data base (for the navigation system)
- Flight validation report



# 3. Are you sure that only one pilot and one aircraft are enough?

# End of the story

Verified Procedure Technical Report

Procedure technical report
RNP Rwy 28 LFXX
VxRXy

Verification report

Verification report

RNP Rwy 28 LFXX
V5V

Ground validation report

Ground validation report
RNP Rwy 28 LFXX
VxRXy

Flight validation report

Flight validation report
RNP Rwy 28 LFXX
VxRXy

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# Conclusions

Consolidation of the design process by increasing the strength of the verification step is mandatory.

Pilots are requested to look at the procedure from an operational point of view to check flyablity and information displayed on the IAC.

Pilots might be requested from a flight validation point of view in specific situations (new criteria, special procedure, difficult environment ...)

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DSNA

# THANK YOU FOR YOUR ATTENTION
# ANY QUESTIONS?