

Material Properties

Presentation by:

Aiko Dühne

Rotorcraft Structures Workshop
18-19 February 2025

Your safety is our mission.

Disclaimer

The content of this presentation is for information purposes only. All information provided is of a general nature only and is not intended to address the circumstances of any particular project, individual or entity. Any time there is a conflict or discrepancy between the information provided in this presentation and information in an official regulation or EASA document, the latter prevails.

Despite every effort to ensure the accuracy of the information provided, it may contain occasional inadvertent inaccuracies or typographical errors. Any error brought to our attention (vtol@easa.europa.eu) will be promptly corrected. In no event shall EASA be liable for any incidental or consequential damages, even if EASA has been informed of the possibility thereof.

The content may be subject to changes at any time without prior notice. To the maximum extent permitted by law, EASA is not liable (whether in contract, negligence or otherwise) for any loss or damage arising from the use of these materials. The information contained in this presentation should not be construed as legal advice.

All presentation material and other information provided by or on behalf of EASA are furnished on an "as-is" basis, without warranty of any kind, whether express, implied, statutory or otherwise especially as to its quality, reliability, currency, accuracy or fitness for purpose.

Ownership of all copyright and other intellectual property rights contained within the EASA presentation material, including any documentation, data, technical information and know-how provided as part of the presentation, remain vested in EASA. Reproduction is authorised, provided the source is acknowledged, except where otherwise stated. All logos, copyrights, trademarks and registered trademarks in these presentations are the property of their respective owners.

easa.europa.eu/connect



Your safety is our mission.

27/29.613: Material strength properties and design values

- Material strength properties must be based on enough tests of material **meeting specifications** to establish **design values** on a **statistical basis**.
- The design values must be chosen to **minimise** the probability of **structural failure** due to **material variability**
- The design of structure must **minimise** the probability of **catastrophic fatigue failure**
- **Thermal effects** must be considered where **significant**

Values to be used / A- and B-Values

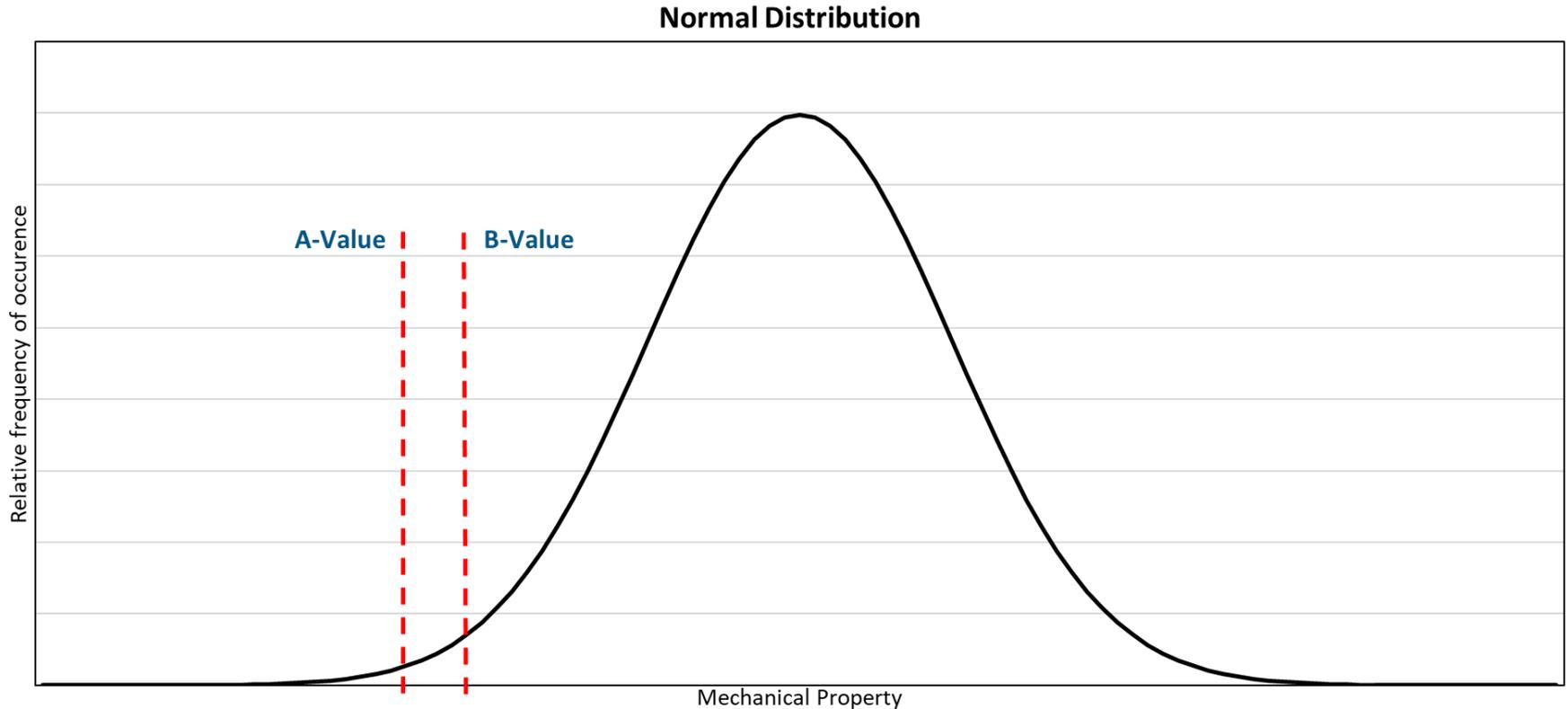
- “A-values”: Single load path
At least **99 percent** of the population of values are expected to equal or exceed the A-Value, with a confidence of **95 percent**.
- “B-values”: Multiple load path:
At least **90 percent** of the population of values are expected to equal or exceed the B-Value mechanical property allowable with a confidence of **95 percent**.



Values to be used for AM / C- and D-Values

- For additive manufacturing
- C-Values
 - Are essentially the same as A-Values (T99)
- D-Values
 - Are essentially the same as B-Values (T90)
- The data requirements for additive manufacturing focus more on the built-to-built variation

Values to be used – A- and B-Values



Values to be used – S-Values

- The S-value is based on the minimum property value
- Statistical assurance associated with S-Basis values are only established since 1975 within limitations
- Within these limitations values since 1975 can be considered as estimated A-values
- The use of S-Value should be done **carefully** and needs to be **agreed with EASA**
- Level of justification depends on the criticality of the part

Premium Selection

- Premium selection allows using design values greater than the guaranteed minimum
- A specimen of **each individual** item to be installed on the aircraft has to be tested to determine the **actual strength properties**
- Part has to have areas to obtain test specimen without destroying the part
- **Test procedures** and **acceptance** criteria must be specified on the design drawing

Fatigue Data

- Fatigue data plotted in e.g. MMPDS may not apply directly to the design of structures
 - Fatigue curves are mean curves, **not** A- or B-basis
 - Fatigue data is based on smooth specimen
 - Fatigue data may not take into account specific stress concentrations unique to any given structural design.
 - Localized high stresses may be induced during the fabrication
 - All fatigue data require modification into allowables for design use.



Join at
slido.com
#RSW2025



easa.europa.eu/connect



Rotorcraft Structures Workshop 18-19
February 2025

Your safety is our mission.

An Agency of the European Union 

Thank you for your attention!

easa.europa.eu/connect



Rotorcraft Structures Workshop 18-19 February 2025

Your safety is our mission.

An Agency of the European Union 