

M19 Concept Question 1

An aerospace component will experience a uniform maximum tensile stress of 200 MPa. It is made of 7075 T6 Aluminum with a fracture toughness of $24 \text{ MPa}\sqrt{\text{m}}$ and a yield stress of 500 MPa. What is the largest surface crack (i.e. length a) that can be present in the component?

1. 76 mm
2. 38 mm
3. 18 mm
4. 4.5 mm
5. 0.15 mm
6. Some other answer
7. I don't know/don't understand

M18 Concept Question 2

An aerospace component is made of Al 2024 T3 with a fracture toughness of $44 \text{ MPa}\sqrt{\text{m}}$ and a yield stress of 350 MPa . A 4 mm surface crack (i.e. length a) is found in the component, what is the maximum uniaxial tensile stress it can carry?

1. 12 MPa
2. 278 MPa
3. 350 MPa
4. 393 MPa
5. 500 MPa
6. Some other answer
7. I don't know/ I don't understand

M19 Concept Question 3

Comment on your level of confidence to explain the phenomena and underlying mechanisms behind the following ideas to freshmen in 16.00?

1) Metals tend to be tougher than glasses or ceramics .

2) In choosing an alloy we often have to trade off (compromise) between strength and toughness.

3) The difference between stiffness, strength and toughness (or fracture toughness) for a material

1. Supremely confident
2. Somewhat confident
3. Could do it on a good day
4. Uncertain
5. Utterly confused