Aerostructure and aeroengine design objectives drive their respective material usage

Aerospace Design Considerations

Cost

Strength/stiffness vs. Weight

Thermal resistance vs. Weight

Decreasing Importance

Aerostructure (labor intensive)

Aeroengine (material intensive)

Manufacturability

Maintenance

Source: analysis
Aircraft Design Substantiation

- Certification is process of substantiating both aircraft design and production
- Engineering proves structure can withstand anticipated static and dynamic loads
- Testing begins with material samples to identify basic material properties
- In certain cases, full-scale testing is required – expensive both in time and money
SAE is one such Standards Development Organization (SDO) responsible for driving aeromaterial advancement.

SAE Aerospace Material Specifications (AMS) Timeline

SAE AMS:
- First AMS published: 1925
- 1000th AMS published: 1950
- Perry Reform & Transfer of DoD Specs to SDOs: 1975
- FAA memo for additive mfg: 2000
- 2025

Aero materials:
- Aluminum
- Superalloys
- Titanium
- Thermoset composites
- Metal add mfg
- Thermo-plastics & Ceramics

Source: secondary (SAE), analysis