



# DATA SHEET No 10

## Aerospace Alloys & Applications

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The high strength and low density of titanium and its alloys have from the first ensured a positive role for the metal in aero-engine and airframe applications. It is difficult to imagine how current levels of performance, engine power/ weight ratios; airframe strength; aircraft speed, range and other critical factors could be achieved without titanium.

Titanium alloys capable of operating at temperatures from sub zero to 600°C are used in engines for discs, blades, shafts and casings from the front fan to the last stage of the high pressure compressor, and at the rear end of the engine for lightly loaded fabrications such as plug and nozzle assemblies.

Alloys with strength up to 1200 MPa are used in a wide variety of airframe applications from small fasteners weighing a few grams to landing gear trucks and large wing beams weighing up to 1 ton. Currently titanium makes up close to 10% of the empty weight of aircraft such as the Boeing 777.

Alloys available:

### More widely used alloys

Ti-6Al-4V  
 Ti-6Al-2Sn-4Zr-2Mo (6-2-4-2)  
 Ti-6Al-2Sn-4Zr-6Mo (6-2-4-6)  
 Ti-3Al-8V-6Cr-4Zr-4Mo (Beta C)  
 Ti-10V-2Fe-3Al (10-2-3)  
 Ti-15V-3Cr-3Sn-3Al (15-3-3-3)  
 Ti-3Al-2.5V  
 Ti-4Al-4Mo-2Sn (550)  
 Ti-5.5Al-3.5Sn-3Zr-1Nb (829)  
 Ti-5.8Al-4Sn-3.5Zr-0.7Nb (834)

### Attribute/applications

Workhorse general purpose high strength alloy  
 Creep and oxidation resistant engine alloy  
 Creep and oxidation resistant engine alloy  
 Beta alloy with established spring applications  
 Beta forging alloy used for 777 landing gear  
 High strength heat treatable beta sheet alloy  
 Medium strength alloy used for hydraulic tubing  
 Higher strength heat treatable airframe and engine alloy  
 Advanced engine alloy, creep and oxidation resistant  
 Advanced engine alloy, creep and oxidation resistant

The following alloys are of increasing importance:

Ti-6Al-2Zr-2Sn-2Mo-2Cr-0.25Si (6.22.22)	Airframe alloy for F22 and JSF projects
Ti-4.5Al-3V-2Mo-2Fe (SP 700)	Competitor for Ti-6-4 for SPF and general use

The remaining alloys tend to be less widely used but are none the less important and may be critical in their application to specific fully validated components.

Ti-2Cu (230)	Heat treatable sheet alloy
Ti-4Al-4Mo-4Sn-0.5Si (551)	High strength airframe alloy, very limited availability
Ti-8Al-1Mo-1V (8-1-1)	Early alloy now mainly for spares and replacements
Ti-6-6-2	High strength alloy with specific earlier applications
Ti-11Sn-5Zr-2.5Al-1Mo-0.2Si (679)	Earlier engine alloy rarely specified in new programmes
Ti-6Al-5Zr-0.5Mo-0.25Si (685)	Engine alloy now mainly for spares and replacements

Development of existing and new alloys continues with the object of obtaining further benefits in terms of overall performance, extended life and reduced cost per component. This data sheet is intended to be no more than an introduction to the subject of aerospace applications.

### **FOR FURTHER INFORMATION CONTACT**

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