**TOT for high strength beta Titanium alloys for aerospace structural forging application**

1. Description of the technology:

An indigenous development of high strength beta titanium alloys was taken up by DMRL for aircraft structural applications which were funded by ADA, Bangalore. As is known, the high strength beta titanium alloys due to their higher strength, ductility, fatigue and fracture toughness are used for aircraft structural applications and can replace steel and lead to considerable weight saving. Although costly, their lifetime costs are lower due to their superior corrosion resistance as compared to steel. Industrial scale manufacturing technology was established for the alloy, Ti-10V-2Fe-3Al.

Ti-10V-2Fe-3Al is a high strength beta titanium alloy which has one of the lowest flow stresses amongst the titanium alloys in the temperature range of 700-800 °C and can be widely used for manufacturing different complicated shapes by closed die forging. The full manufacturing technology for raw material selection, alloy melting, thermo-mechanical processing, a new ultrasonic evaluation technique, heat treatment, mechanical property evaluation and type certification for 100 mm dia forged and 60 mm dia hot rolled bars were established with DMRL know-how, processing schedule and hand-holding. The various stages in processing this alloy is given in Figure 1.

2. Application areas:

Ti-10V-2Fe-3Al is high strength beta titanium alloy for forging applications. This alloy can be easily forged into complicated shapes and can replace NCM steel forgings in aircrafts and other aerospace vehicles leading to weight reduction. Some of the components which can be forged from this alloy are slat/flap tracks, landing gear, drop link in landing gear and various other components of the aircraft. ADA has already identified about 15 components which are made of steel presently and can be replaced by this alloy forging. Image of a drop link forged from 100 mm dia bar of the alloy developed in this project is given in Figure 2





Figure-1 a)1.4 T electrode prepared by plasma welding of compacts. b) Machinig of secondary ingot before forging c) Forging of ingot in 1500 T press d) 120 mm dia intermediate billets for producing 100 mm dia finish product