abundance, that is the amount of Titanium which occurs in the surface of the earth, is quite high, which is one of the factors relating to the cost, but of course not the only one, since Titanium and Oxygen are very attracted to each other and it is difficult generally to get Titanium from its ore.

If we look at the effect of density on the total weight of a structure (fig. 3), a very important factor in the aerospace industry, then density directly gives you a reduction in weight as compared with strength and modulus which do not give this direct reduction in weight, so density is very important.

If we look at where Titanium is compared with some other materials (fig.4), both metallic materials and non-metallic, we can see that currently alloys like Aluminum are only useful up to perhaps 300 degrees Farenheit (300F) (like the 2219 alloy used on the leading edge of the Concorde wings), but there are developments there, rapid solidification in particular, which now allows to take Aluminum alloys to temperatures perhaps as high as 650 degrees Farenheit, lower density Aluminum alloys like the Aluminum - Lithium alloys which can be either Ingot Metallurgy alloys or again rapidly solidified alloys. There are also advances in the non-metals, both in the Thermoset resins and the Thermoplastic resins.

In advanced systems, in the United States and in other countries, like advanced fighters, (the ATF advanced tactical fighter) there will be a considerable percentage of these non-metals in use.
However Titanium is also showing advances which I will talk about today, both monolithic Titanium and Titanium Composites where we can now see the potential with using these materials beyond the conventional thousand degrees Farenheit, perhaps as high as thirteen degrees Farenheit and even higher. Even in composite airplanes we will see a lot of Titanium in a relative sense, because Titanium is very compatible with the composites: