Stand Out Themes from LMD Strategy Meeting on 12/12/13

Overall the requirement for lightweight structures in all forms of transport means there is a massive opportunity for light metals, particularly for automotive and aerospace applications. The size of the potential market over the next few short years is larger than the market in these areas to date. The opportunities in automotive and aerospace are particularly strong for aluminium and titanium.

The requirements for aluminium in the automotive and aerospace markets are much more similar than have previously been identified and there is significant potential for synergy between these two markets and technologies. Closed-loop recycling as demonstrated by the aluminium beverage can must be realised for end-of-life automotive vehicles and aeroplanes. Aluminium alloys must be developed that are suitable for closed-loop recycling and can tolerate impurities. Common themes between the two markets also include affordable lightweighting, low maintenance costs (corrosion resistance), low cost of manufacture, sustainable manufacture and resistance to threats from substitutes such as CFRP (Carbon Fibre Reinforced Polymers).

The opportunities for titanium are in powders for additive manufacturing and for the aerospace industry, both for structures in composite aircraft and for lightweight, fuel-efficient engines. If the price of titanium could be halved, this would generate at least a tenfold volume growth as was seen with aluminium.

Magnesium has a new potential market in medical applications, and magnesium diecastings are still growing strongly in automotive applications. However, the use of wrought products still remains hampered by enabling technologies (joining and corrosion control) and by cost. The positive amendment of flammability regulations by the FAA (Federal Aviation Authority) means that the use of both wrought and cast alloys for secondary aerospace applications (e.g. seats and trolleys) is likely to see a resurgence.

The major area of concern highlighted was the urgent requirement for a UK-based metallic wing project. Presently, although the composite wing programme is strongly supported in the UK, this is far from the case for the metallic wing. Most significantly, the aluminium metallic wing shows no sign of saturation in structural efficiency. New alloy systems have been developed and new processing technologies are available to improve the buy-to-fly relationship and the wings are fully closed-loop recyclable. These aluminium metallic wing structures offer opportunities and a family of key properties beyond those which can be achieved with composite structures.

<u>Issues and Opportunities</u>

Collaboration and communication amongst the key players in light metals is an issue. There should be more collaboration between aluminium, magnesium and titanium to address issues that are common to all the three metals, such as recycling and sustainability. Furthermore, there are synergies between the aerospace and automotive markets, such as lightweighting strategies, that are not being exploited.

There needs to be regular communication between the IOM3 Light Metals Division (LMD) and TSB/EPSRC so that the latter have the right information to make decisions. Questions were raised about the proposal review process, and whether the panel really understands the industry and whether the TSB is ruling out certain technologies by their selection criteria? For example, for aluminium rolling it is critical that fundamental research is continued but work in this area could be ruled out as further capital investment in rolling mills in the UK is unlikely.

There isn't a centre in the UK for recycling mixed Al alloys like there is for mixed polymers. This means they are sent overseas for sorting which results in a poor carbon footprint and the loss of a valuable resource in an economy that no longer produces a significant volume of primary aluminium. The government policy on, for example, carbon credits does not help us to develop our own recycling industry. Is this something the TSB can influence though further discussions with the LMD?

High temperature capability (200-250^{o}C) is required for the use of aluminium in aerospace engines. This is also something JLR have expressed an interest in. Work in this area, for example at Oxford (Maria Galeano), requires further support.

There is not a satisfactory recycling route for magnesium. Presently magnesium scrap is refined in the Czech Republic. The application of melt conditioning to the recycling of both aluminium and magnesium is an interesting area for further investment in the UK.

With titanium, the buy-to fly cost is the key issue and research should be supported to provide near-net shape components. Currently, 75% losses are produced at the component machining stage promoting the strong case for additive manufacture.

There is a need to develop the UK titanium supply chain.

There are not enough metallurgists and there is no metallurgy training in the UK. As a result, the light metals expertise in the UK has degenerated and there's a serious concern that this will affect the ability to carry out vital projects like the metallic wing programme.

The Composite Leadership Forum has been remarkably successful in promoting polymer matrix composites. The obvious question is whether this model can be transferred and copied by the Light Metals Sector?

A concern was raised that representatives from construction and packaging should be represented at the LMD meetings as these are large markets. However, it is clear that most of the new technology and high value is in transportation which is led by aerospace and automotive. However, the construction and packaging sectors especially for electronics (phones and tablets) should not be neglected

Companies like JLR, RR, Airbus etc should be encouraged to be more actively involved with fundamental work on light metals in the UK science base.