This project is part of the SILOET programme and aims to improve the design process for Additive Layer Manufacturing (ALM). Additive layered manufacturing (ALM) is a group of manufacture techniques able to build 3D parts layer-by-layer directly from a CAD file, by cutting the CAD geometry into 2D slices. While there are currently over 20 different ALM methods that exist, most of them can be grouped into three main categories as shown in Figure 1.

This project is focused on metallic powder-bed methods such as Direct Laser Deposition (DLD) and Electron Beam Melting (EBM), as these are currently the most mature and most suitable methods for production parts in aerospace.

Therefore, the top-level aims this project are to:
1. Formalise the design process to improve workflow and create reproducible parts, as well as to improve knowledge capture for ALM design.
2. Reduce manual intervention and related uncertainties.
3. Maximise ALM benefits by incorporating ALM considerations early in the design process and eliminating redundant geometry constraints imposed by traditional manufacture methods.

**Project Progress and Plan**
The first 12 months were spent on relevant training and literature review. The following 12 months will be dedicated to industrial research within Rolls Royce and specialist companies in the ALM field. A case study will be carried out within Rolls Royce, focusing on concept and detailed design stages of components for ALM.

The case study will be carried out on a gas turbine sub-system to highlight the benefits of Electron Beam Melting and to create a component design system for this process.

**Problem Outline**
Current design methods and tools are aimed at traditional manufacture techniques such as casting and machining. Due to the relative lack of experience and tools in designing parts for ALM, the current design procedure involves a lot of manual intervention making it labour-intensive, time-consuming and subjective to individual designers’ logic. Furthermore, the design rationale and production process of ALM parts are not properly recorded, adding to the problem of inefficiency and lack of understanding.


**Conclusion**
ALM has traditionally been viewed as only being suitable for rapid prototyping, however, it is now beginning to emerge as a competing end-product manufacturing method. In order to keep up with the ensuing production demands and to fully exploit the benefits offered by ALM a formal framework is required for the design process. The case study outlined above, aims to provide the required preliminary results to develop such a framework.