Rapid Prototyping

JH May

Rapid Prototyping techniques allow cost effective models and prototype parts to be produced in a few days.

# Contents

## Introduction

Rapid prototype techniques have revolutionised the model making, industrial prototype and concept prototype industry. Layer technology methods are available to suit a variety of requirements. SLS (Selective Laser Sintering) produces functional nylon, glass filled nylon and composite metal/nylon parts ideal for functional prototype components and concept models.

Sewing machine made entirely from SLA parts

SLA (Stereo Lithography) produces resin parts to a high degree of accuracy which are capable of demonstrating mechanical fit and function.
SLA prototypes are ideal for a whole range of model making and prototype purposes including industrial prototypes, architectural models and concept models.

Rapid Prototype SLA model car wheel & tyre.

These rapid prototype techniques also form the basis of our vacuum casting, RIM moulding (Reaction Injection Moulding) and rapid metal casting.

The SLA and SLS parts are finished to a high standard to create tooling masters.
From these, polyurethane functional parts can be produced in a wide variety of materials from rubber to fire retardant plastics and metals.

SLS Architectural Model

# Case Study 1

## Project

**Submarine Towed Array Wind Tunnel Model**

## Client

Thales Underwater Systems

## The Brief

To produce a scale model of a prototype submarine towed array suitably robust to withstand wind tunnel testing.

Prototype to be completed within 10 days.

## The Solution

With such a tight delivery requirement we had to rely on a mixture of CNC machining and rapid prototyping to meet the deadline. The main body and wing were CNC machined from solid model board directly from the 3D CAD data.

The modules on the wing were produced using the SLA (Stereo Lithography) process in resin, again directly from the clients 3D CAD data. The SLA modules were fixed to the wing section using stainless steel fasteners and delivery was made in time to meet a wind tunnel testing slot.

3D CNC machine employed to create main body

SLA wing modules created from 3D model data

Aluminium adjustable mount CNC machined from 3D model data

# Case Study 2

## Project

**Sigmund Freud Chess Set**

## Client

Machine Shop Special Effects

## The Brief

To produce copies of ancient artefacts collected by Sigmund Freud over his lifetime and used as a chess set. The artefacts could not be removed from the Freud museum in London and each piece was the only one of its kind in existence.

## The Solution

Each piece was laser scanned in situ. From this 3D data STL files were created from which the models could be re-produced.

The clear pieces were CNC machined from clear acrylic and polished. The coloured pieces were SLA rapid prototypes (Stereo Lithography) and filled with resin to give weight. The rapid prototypes were then hand painted by our client's artist.

Pieces CNC machined in clear acrylic and polished

SLA rapid prototype models painted to represent originals

CNC Machined and Rapid Prototype models assembled in the set

# Case Study 3

Rapid cast aluminium main housing with CNC Machining

## Project

**Prototype Automotive Gearbox**

## Client

Getrag Ford Transmissions

## The Brief

To produce 2 prototype gearbox castings machined and ready for assembly and test by the client.

CNC machined prototype extension housing

## The Solution

Using the clients 3D CAD data SLS models were printed of the gearbox housing. Following a comprehensive CMM (Co-ordinated Measuring Machine) check to confirm dimensions the rapid prototype models were used to make ceramic moulds from which the prototype gearboxes could be cast in aluminium.

The castings were then CNC machined from the clients 3D CAD model.

Assembly of the rapid prototype parts ready for fitting of the internal mechanical parts

# Case Study 4

Tooling master model during the CNC machining process

## Project

**Ejector Seat Presentation Model**

## Client

Martin Baker

## The Brief

To produce a run of 25 scale models of the clients latest ejector seat. To show a high level of detail and be suitable for presentation to high level fighter jet customers who specify Martin Baker ejector seats.

Painted vacuum cast polyurethane model mounted on a CNC engraved acrylic base

## The Solution

A master model was CNC machined from the client's 3D CAD model. This master was then used to create silicone tooling from which multiple parts could be re-produced in polyurethane using the vacuum casting technique.

The model was completed by painting and mounting on a clear acrylic base.

MCP Vacuum casting chamber