

On the other hand, Spaceframe construction and plastic panel technology must find the means of cost effectively increasing output to at least twice current levels, in order to approach the current economies of scale of the welded steel monocoque.

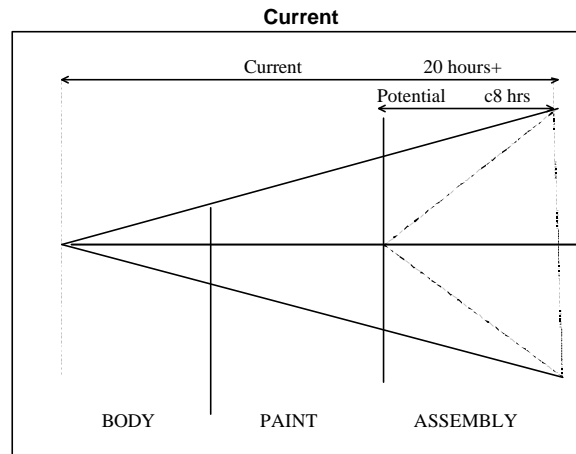
This is because the Spaceframe requires approximately one third more components during body frame construction and high levels of manual assembly. This means that the cost of vehicle assembly is likely to increase.

BENEFITS TO 3DAYCAR

12 hours or more of production order lead-time can be saved through the elimination of central Body & Paint shops. Developments such as solid-coloured plastic panels which can be hung on the spaceframe on the final vehicle assembly line point towards significant changes in conventional automotive manufacture. It is feasible to produce a spaceframe and only identify it against a retail order at the beginning of the vehicle assembly line.

Spaceframe production facilitates batch sizes of one: a particular challenge to conventional assembly where batches of identical body attributes are required in order to satisfy line-based process requirements such as welding and painting. The Spaceframe can break this dependence on a pre-set assembly sequence where, in theory, assisted by the modular frame, any combination of model variants could be built to order.

Order lead-time in production: current v potential



2000 - 2010

Further development is expected in Spaceframes and body construction throughout this decade and beyond. It is believed that true flexibility and order fulfilment must stem from changes to the integral construction and assembly of the vehicle itself, as opposed to merely re-configuring existing production methods.

For further information about the 3DayCar Programme or Executive Briefings, please contact the Project Office at:

5, The Hen House, Oldwich Lane West,
Chadwick End, Solihull B93 0BJ, UK
Telephone: + 44 (0) 1564 783111
Facsimile: + 44 (0)1564 782555
E-mail: 3DayCar@compuserve.com
Web: <http://www.cf.ac.uk/3DayCar>
John Whiteman, Project Director

Geoff Williams, Project Manager, Research



EXECUTIVE BRIEFING

Spaceframes

'The study of an emerging body construction technology'

by Mickey Howard

MBA BA(Hons)

The Spaceframe represents a flexible, low-weight means of body construction that provides maximum model variety from minimum investment in tooling.

Whilst in theory breaking the dependency on some aspects of conventional, line based production, to what extent can it be considered an enabler of the 3DayCar?

BODY CONSTRUCTION

Monocoque is defined as a *structural skin* where outer panels are welded together early in production, contributing to the overall structural integrity of the vehicle.

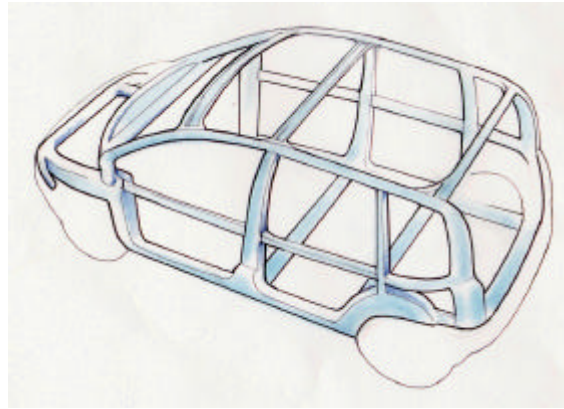
Around 95% of current automotive production world-wide uses the welded steel monocoque as the conventional form of body construction.

It has provided an efficient and cost-effective means of volume production since the 1950's.

However, in a period of European automotive history where over-capacity, flat demand and low profits are at present common-place, the introduction of a low investment, mid-volume means of vehicle production is perhaps a timely and appropriate strategy.

Vehicle manufacturers are in fact diversifying in their approach towards body construction, away from the conventional, welded steel monocoque towards the Spaceframe. This is particularly the case in Europe where at least two-thirds are actively engaged in Spaceframe development, which also originated from around the 1950s, with performance cars such as Lotus and Maserati.

Spaceframe is defined as a *structural frame with non load-bearing panels*. Body panels are attached or 'hung' on an extruded metal structure, offering greater flexibility in terms of production assembly and in the choice of materials.



The Spaceframe

Spaceframes are constructed from either aluminium extrusions, simple folded steel sheet or composite.

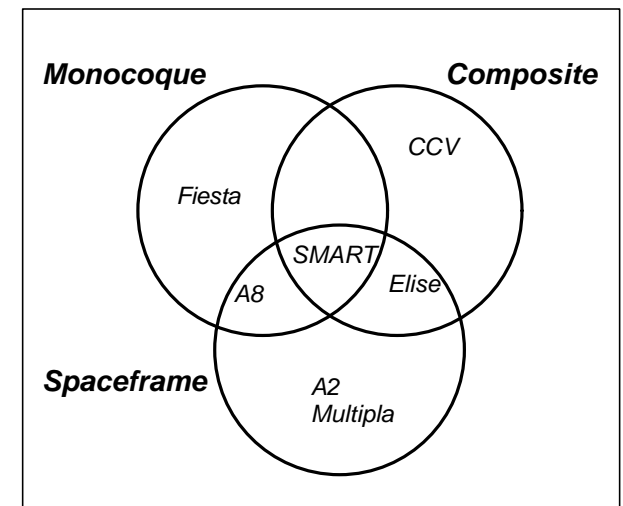
Extrusions are a particularly important feature as they represent a departure from the reliance on large, complex steel pressings as a means of achieving body stiffness and strength.

The key business drivers for introducing Spaceframes are:

- Low tooling costs
- Low body weight to meet the increased fuel efficiency requirements of legislation
- Low model change cost through the use of 'flexible platforms'
- Production flexibility

The arrival of the Fiat Multipla and Audi A2 challenges the generally accepted view of a technology associated with expensive, low volume cars:

- The overall tooling costs associated with extrusions and folded sheet in vehicle production are around half that of pressings.
- The simple, modular construction of the Spaceframe lends itself to parts commonisation and sharing across model ranges and could form the basis for a new type of 'flexible' platform strategy.
- For the first time Spaceframes are being used to build medium volume production runs of around 50,000 units a year.



The inter-relationship between current body construction