WHAT'S JMIA MONOCOQUE

日本自動車レース工業会
JAPAN MOTOR-RACING INDUSTRY ASSOCIATION

WHAT'S UOVA

New Concept Monocoque

The Japan Motor-Racing Industry Association (JMIA) has developed a monocoque based on a concept that is completely different from that of conventional racing cars. The major purpose of this development was to create a carbon composite monocoque priced as reasonably as an aluminum monocoque, to enable beginners to enjoy car racing more securely, by dramatically improving the safety of low-priced racing cars for beginners, which until now have commonly used a low-safety pipe frame and aluminum monocoque for cost reduction.

A conventional carbon composite honeycomb monocoque is light and strong, but expensive. It would be impossible to lower the price without compromising on its advantages. Because the main purpose of the development was to improve monocoque safety, we conducted research and development to realize equivalent safety while slightly compromising on weight and rigidity, eventually achieving a significant cost reduction. We thus developed the UOVA (UOVA).

Production of the UOVA Monocoque

The carbon composite honeycomb monocoque is expensive mainly because the production process is complicated—two carbon fiber reinforced plastic (CFRP) boards sandwich a honeycomb structure and components such as suspension brackets are inserted. The production process is also time-consuming and requires expensive supplementary material. The UOVA monocoque can be produced by a simple process, which covers the mold with prepregs, using a small amount of supplementary material. The time required for producing the UOVA is only 30% of the number of hours required to produce a honeycomb monocoque.

In the UOVA production process, the amount of prepreg that covers the mold can be adjusted, so that it is possible to produce products of varied rigidity and weight from the same mold.

However, producing a monocoque with a smooth exterior surface, which is prepared on the other side of the mold surface, requires special know-how. It cannot necessarily be produced at any ordinary car shop.

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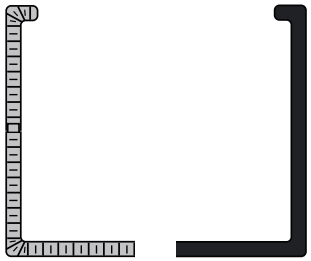

To lower weight and to ensure overall rigidity, the monocoque construction sandwiches a honeycomb structure with extremely thin carbon sheets(left). On the other hand, the UOVA adopts a simple, solid thick board structure (right).

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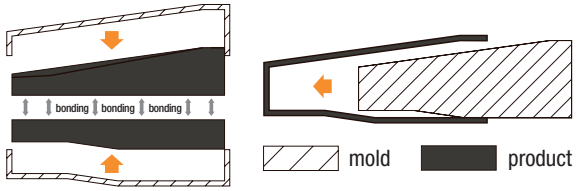


Conventional racing cars monocoques are produced by means of extremely complicated processes (left), while the UOVA (right) uses a simple production method, covering a tapered mold with prepreg.

3

The master model of the UOVA is required to have a draft angle, but the mold's production method is extremely simple and can be used for forming various shapes.

's Strengths

Low cost

The biggest strength of the is its low cost. However, it would be impossible to reduce cost without compromising on the characteristics of conventional monocoques. We designed the while ensuring essential characteristics, such as safety, and compromising on less critical factors, such as weight and torsional rigidity.

Formula 3 monocoque	3,500,000	Formula Renault monocoque	2,000,000
	1,000,000 -1,400,000	Small formula monocoque	1,350,000

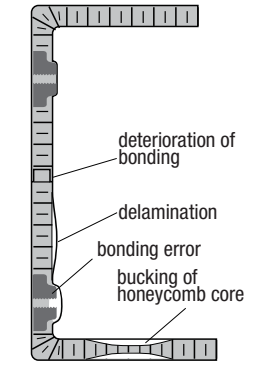
price(JPY)

Sophisticated safety design

Because its structure is completely different from conventional monocoques, the cannot be evaluated by the current safety standards of the Federation Internationale de L'Automobile (FIA). The is superior to conventional monocoques in some respects and inferior in other respects. We believe that the overall safety of the is equivalent to that of conventional monocoques. Verification of its safety will be explained later in this document.

Excellent durability

The major causes of fatigue in carbon composite honeycomb monocoques are deterioration in adhesion between CFRP boards and honeycomb structure, separation between the upper and lower parts, and the exfoliation of inserted metal components such as brackets. The 's solid structure means there is no possibility of these failures. Its resin material can deteriorate in strength, but the material is equivalent to those used for aircraft expected to be operated for several dozens of years. (Anyone concerned about the 's strength would have to quit flying!)



Conventional C_rbon Honeycomb Monocoque

Easy checking for failure or deterioration

A honeycomb-structure monocoque is made of two entirely closed cross sections when finished. The adhesion of the honeycomb structure and inserted components cannot be checked. In case of the , which has a solid structure, there is no possibility of the exfoliation of the honeycomb, and all components such as brackets are installed with bolts and can be checked at any time.

High versatility

uses a solid structure and metal parts, such as brackets, which are installed so as to pinch the board. Therefore the bracket installation positions are flexible, cowls can also be changed and suspension can be renovated easily.

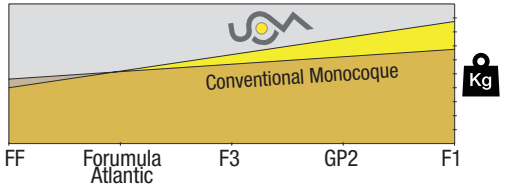
Low development cost with easy original monocoque development

has a solid structure; its design is simple and only one mold is necessary. An original monocoque can be developed at low cost.

's limitations

Finishing the surface smoothly requires special know-how and techniques; therefore, the is not necessarily produced at any ordinary car shop (although it is not known whether it would be an advantage if any shop could produce it).

In cars of up to the Formula class for beginners, the remains equivalent to a honeycomb monocoque in rigidity and weight, but for high-power racing cars of the F3 class or up, its weight must be about 15% heavier to ensure equivalent rigidity. There seems to be room for future improvement, but at present the is only used in construction of small racing cars.



This represents necessary weight to ensure equivalent stiffness.

UOVA's Applications

As already explained, the UOVA is easy to develop, inexpensive and high in versatility, safety and durability. It is an epoch-making racing component. It can be used in a wide range of applications.
In addition, because Japan has F4 racing using 2,000-cc class engines for beginners and due to the availability of various kinds of peripheral components that comprise the chassis, such as cowls, it is easy to use a new racing car using those components.
Technical information concerning peripheral components, including monocoque, is available from the JMIA. The JMIA can help design and produce cowling. Using the UOVA, you can easily manufacture your chosen racing car, whether 500-cc, 2,000-cc, Formula car or sports car.

• Cowling

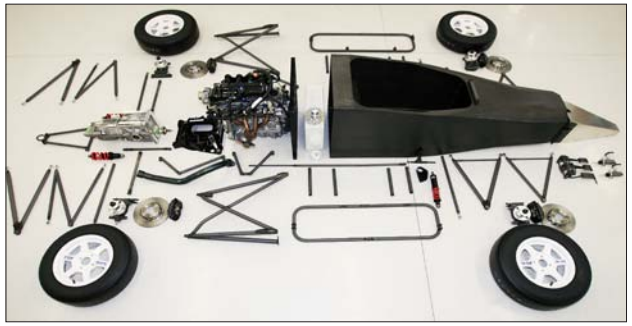
Currently there are several kinds of Formula-style cowls that can be used on the UOVA without any adjustment. Original cowls can also be easily produced.

• Finished cars

In Japan's national F4 race, using 2000-cc engines, many models of chassis using the UOVA are available. Regulations specify its price limit. The UOVA from Toda Racing that is fitted with a 2000 cc engine costs 7.35 million yen.

• Chassis components

Various components produced for use in Japan's national FJ and F4 races, can be used on the UOVA without any modification. However, for these components, whose development is rather time-consuming, commercial products can be used, while only simple parts can be internally produced, allowing flexible production. The JMIA can supply inexpensive gearboxes.



• Engines

Basically any engine can be installed on the UOVA. Engines for motorcycles or cars can be used. JMIA supplies various high-performance racing engines.

• TODA TR-FX01
1,998cc / inline 4 / 250Hp / 8,500rpm / 87kg / price not yet decided
TODA TR-FX01 is a racing engine with all of its components newly developed for racing by TODA RACING.

• TOM'S 1KR-FE
996cc / inline 3 / 120Hp / 6,500rpm / 60kg / price not yet decided
TOM'S 1 KR-FE is a racing engine suitable for smaller formula cars of biginners.

• TODA RACING B18
1,796cc / inline 4 / 170Hp / 6,600rpm / 105kg / price JPY 2,000,000
TODA RACING B18 is a racing engine that has performed well in F4 racing until 2009 and is well known for its high stability. It has been highly regarded with longtime achievements in racing field.

• TODA RACING L15A
1,496cc / inline 4 / 125Hp / 6,200rpm / 83kg / price JPY 760,000
TODA RACING L15A is a reasonably prided racing engine for super FJ, formula racing for beginners in Japan. Many drivers started his racing with this engine.

• TODA RACING K20A
1,998cc / inline 4 / now developing and details to be decided
price JPY 2,100,000
TODA RACING K20A is a racing engine for F4 racing from 2010.

Now developing

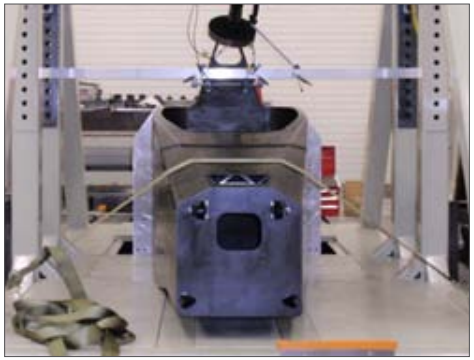
UOM's Safety

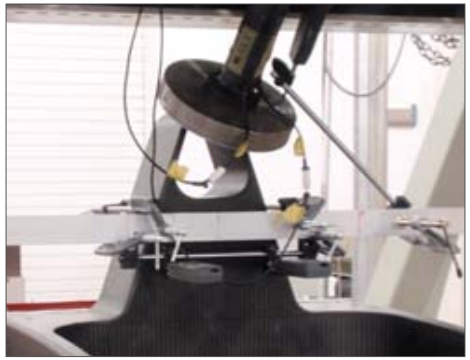
The chief reason behind production of the UOM was to improve safety of the Formula cars for inexperienced drivers. However, its construction is special, and FIA's currently-specified safety standards for honeycomb monocoques cannot be applied. No testing methods adequate for the UOM have yet been established and experimentation and improvement are being repeated so as to satisfy testing requirements based on the FIA's F3 regulations.

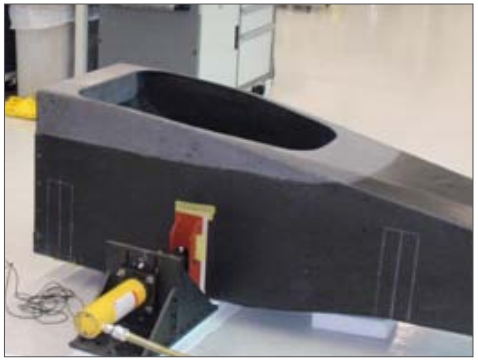
The UOM and honeycomb monocoque are completely different in both materials and construction. Physical properties and characteristics are different and cannot be simply compared.

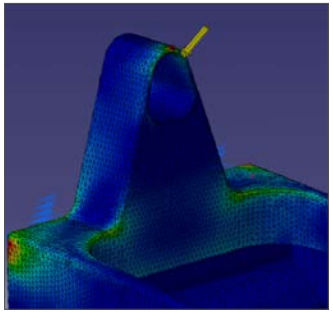
For example, in the case of a honeycomb structure, relatively thin CFRP sheets of 1 mm to 3 mm in thickness sandwich an aluminum honeycomb, and if a suspension arm or sharp object punctures it from the side, it is relatively easily holed and allows intrusion.

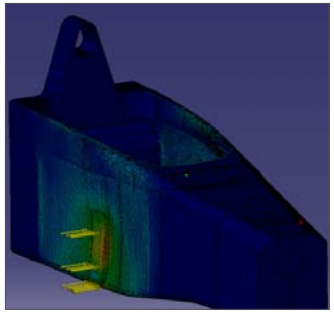
The solid construction uses a single thick board of 5 mm to 7 mm in thickness and does not bend easily. However, in the case of a honeycomb structure, because of the high cross-sectional coefficient, the shape is retained up to a certain level of shock, and the shape of the cockpit (life guard) can be retained. In the case of solid construction, when directly impacted, it is subject to elastic deformation which can instantaneously change the shape of the cockpit. We will examine the advantages of both types, investigating their disadvantages and characteristics, and for the future, we intend to ensure safety that is superior to the honeycomb structure in all aspects.











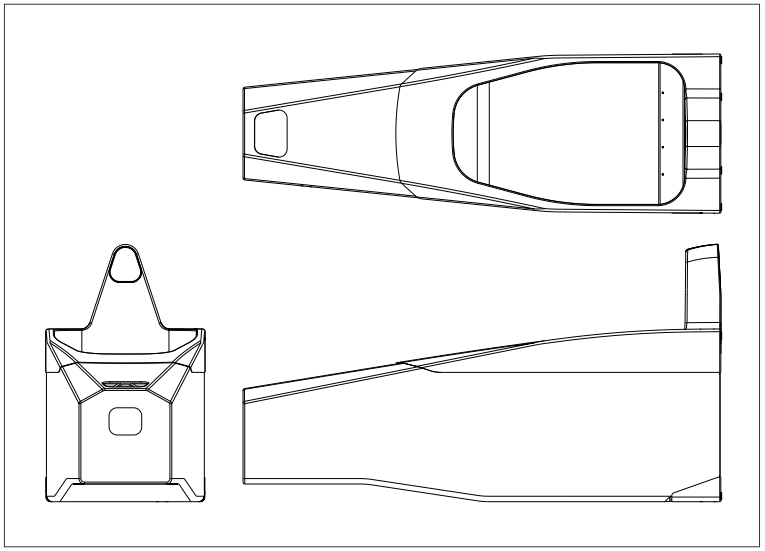
• Safety Verification

Experimentation is currently under way to satisfy the FIA's F3 safety standards. In static load tests, the targets have been almost achieved.

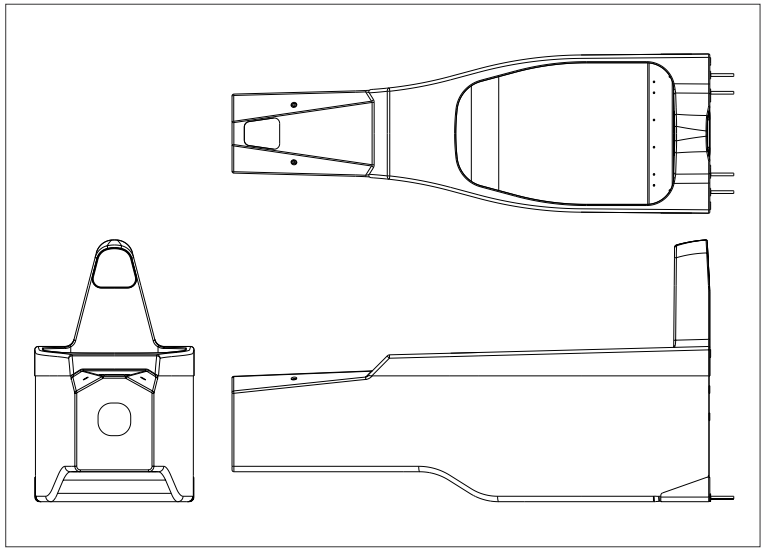
We plan to start dynamic tests. We have not established testing standards adequate to the UOM, and intend to perform tests as specified in conventional testing methods.

Specifications and Prices

UOVA 20 JPY 1,220,000



UOVA 4 JPY 1,400,000



	UOVA 20	UOVA 4
Weight	43kg	46kg
Dimensions (Length x Width x Height)	1,758x585x962	1,758x585x962
Thickness of side face	4.9mm	6.7mm
Supposed fuel tank capacity	35~40ℓ	35~40ℓ

Models

As catalog models, we supply the UOVA 20, suited to 1000 cc class engines and the UOVA 4, suited to 2000 cc class engines. The UOVA 20 is the most reasonably priced model, maintaining a degree of simplicity, and the UOVA 4 has higher overall rigidity, with a double-layered, reinforced cockpit opening, and a large inner bulkhead that protects the driver's knee area. The exterior shape is an aerodynamically advantageous, sophisticated design.

Development of Original

Because, compared with the honeycomb monocoque, the UOVA design is relatively easy and the only molds are for manufacture, an original monocoque can be developed and produced at an extremely low cost.
However, it tends to be heavier when rigidity is increased for high-power engines. Currently it is only used for smaller Formula cars.
Because of the production method, only overall tapered shapes can be produced. The UOVA is not suitable for producing roofed sports cars, which have openings for getting in and out.

Optional Components

- **Front crushable structure**
  To ensure sufficient safety of the carbon composite monocoque, a special structure is necessary to absorb shock before it reaches the body.
- **Fuel tank**
  Bladder safety tank only for UOVA; 34-litter capacity

These optional components are produced to order. As for the lead time, price and other specifications, please specify when ordering UOVA.

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