

Development of Design for Realization of New Value Motorcycle “DN-01”

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ABSTRACT

The new value motorcycle DN-01 is a product resulting from “bottom-up” proposals. The DN-01 represents an entirely new design that was sketched out beginning from the rider rather than the bike, making the rider the main focus, and was created to incorporate a new transmission system and to realize an “easy,” “relaxed,” and “comfortable” model concept. In order to create a design that did not fit into any existing category, the project approached the external design arrangement of the bike from the perspective of a four-wheel vehicle. The DN-01 was displayed at the 2005 Tokyo Motor Show as a show model, after which it went into mass production with the design image unchanged. This resulted in the realization of a long-nosed bike with long and low styling.

1. Introduction

The DN-01 motorcycle is provided with Human Friendly Transmission (HFT), an entirely new transmission system. With the comfort provided by the transmission shock-free HFT system as a central concept, “easy,” “relaxed,” and “comfortable” were established as the keywords for the development of the DN-01. An entirely new and unprecedented design was also needed in order to realize these goals. Drawings for the new bike commenced from images of riders stretching out their arms and legs in a natural posture. Approaching the external design arrangement of the bike from the perspective of a four-wheel vehicle to achieve an enclosed feeling resulted in the creation of a new-value design that did not correspond to any existing category. The new design, incorporating HFT to help prevent transmission shock from resulting in the bumping of helmets when carrying a pillion passenger, and a seat with a lower difference in level than a scooter seat, creates a comfortable space for two, enabling face-to-face conversation between rider and passenger. These elements are packaged using a design with outstanding presence, which catches the attention of even people who are not motorcycle enthusiasts. The packaging of the DN-01 enables its users to spend quality time together, presenting a new lifestyle option not previously available from a

motorcycle.

This paper will describe the development of the design of the DN-01 from the stage of proposal of the concept of a new-value motorcycle, to its presentation as a show model and subsequent mass production.

2. Product Out

In addition to a “market in” process, in which thorough market surveys are conducted to enable the development of a product matched to the requests of target users, motorcycle development often employs a “product out” process, in which Honda creates and offers new value to customers. The development of the BIG-1, the V-Twin Magna, and the Valkyrie Rune, for example, was based on the latter process. The development of the DN-01 was also a “product out” development, and presented the unique challenges for product realization that are associated with this approach.

At the initial stage of development, the concept of the bike stressed the use of existing sports bike layouts as a base to produce an entirely new styling that would be suitable for the employment of the HFT. However, few epoch-making ideas eventuated based on existing layouts, and the project became bogged down. It was the sketch, shown in Fig. 1, which opened a crack as the designers were groping in the dark.

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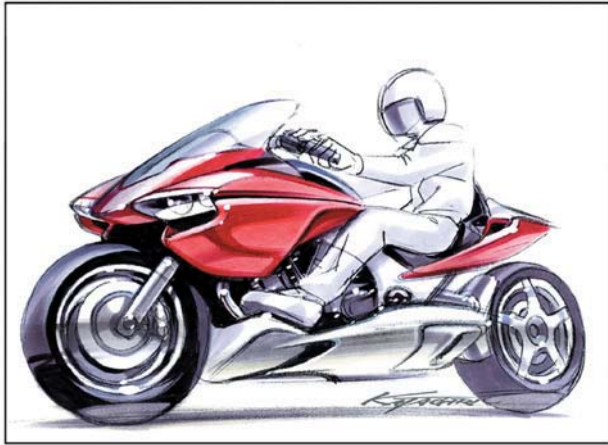


Fig. 1 Idea sketch

3. Sketches beginning from the Rider

In the majority of cases, the external design arrangement of a motorcycle is sketched on the side-on layout diagram in which the wheel base, engine positioning, the positioning of the seat, steering handles, and step, and the like, are determined. However, in order to produce an entirely new design for the DN-01, a method was adopted in which the design process commenced with sketches of riders in postures illustrating the design keywords “easy,” “relaxed,” and “comfortable,” and the external design arrangement of the bike was sketched later.

To express the “easy” concept, a wrap-around-style body cowl that would not interfere with the rider’s arms or legs when naturally stretched out was sketched. Sketches in which the rider’s extended arms were stretched out further were employed to express the “relaxed” concept, resulting in a long-nose design. In order to express the “comfortable” concept, sketches were made in which the cabin was slimmed down to help prevent interference with the rider’s arms and legs when naturally stretched out in front. In addition, the elegant flow of the surface of a long-nosed sports car was used to express the concept of “majestic.” As a result, the front and rear wheels were further separated in order to help prevent interference with the rider’s legs, which were stretched out with the rider seated in a low position, and the wheel base became longer than it had been when the concept was initially proposed (Fig. 1).

4. Design-focused Layout Changes

A low riding position and proud riding posture was also projected as being suitable for the DN-01 engine. Such a riding position and riding posture with long-nosed styling—the proportions—were thought to be appropriate for its realization. However, the dimensions that had been

projected up to that point were a wheel base of around 1450 mm, similar to a sports tourer. Moreover, the distance between the front and rear wheels in the design for the projected rider posture was well over 1600 mm, and turnability also differed entirely from the initial concept. To enable the realization of the design, it was necessary to reexamine the layout from the beginning. Having discussed the issues, the project team’s direction was fixed – the new design would be used even if this necessitated a circuitous process.

5. Employment of Four-wheel Vehicle Elements

While the concept had been accepted, the design was still in the idea sketch stage. With the design judged as lacking in originality, the process of design refinement commenced. The involvement of a large number of veteran designers was sought in order to develop the idea sketch shown in Fig. 1 into a more precise design, and the development of the design took place in a semi-competitive atmosphere.

The design of a bike in an entirely new category commenced with the designers forgetting the bike design know-how that they had attained up to that point. To express the “majestic” concept, this motif was identified with large vehicles with long noses, and the design process commenced attempting without use of bike styling and to seek a styling closer to that of a four-wheel vehicle.

The feel of a long-nosed and short-decked bonnet, a sense of large-diameter wheels obtained using a cantilevered rear fork, indicators integrated with body-mounted mirrors, thin and wide lights with a beltline extending from them, a sit-in riding position, and the like. With the team using four-wheel vehicle terminology not normally associated with bikes during the design review process, entirely new design ideas emerged (Fig. 2).

6. Challenges of “Design Out” Process

However, there were concerns about whether bikes for which the dimensions were determined prior to the design process were more stable and enjoyable to ride, and whether the sketched out design image would still be appealing when presented at full scale. A preliminary model was therefore produced, based on the current Shadow 750, in order to enable the team to get an idea of the feel of the bike.

A 1/10-scale clay model was produced, and a full-scale model of the cowl was produced from the sketches using Fiber Reinforced Plastic (FRP) based on measurements and 3D data, and fitted on the bike (Fig. 3). The riding feel of the bike was judged to be entirely new, different from any other existing model, and the development team expressed a strong desire to move ahead with the development on the basis of the current dimensions.

However, the designers were concerned that the bike had insufficient bulk, and that its imbalance would make the rider seem to have a big presence. This lessened the bold sense of presence shown in Fig. 2 and the sense of integration between rider and vehicle that results from the feeling of being enveloped, as in an automobile, reducing the appeal of this design. However, if the wheel base was extended any further, the bike would not turn easily. The responsibility for achieving the sense of presence illustrated in the design sketch while limiting the size of the bike lay heavily on the proposers of the concept.

7. Accentuating Dynamism

The designers and modelers continued their discussions while studying the prototype. “Low and long” designs are also used in some scooters. The characteristics of this design are a long nose and short deck. It was decided that the team would move in the direction of attempting to create the feeling of being enveloped, characteristic of an open sports car, by further accentuating the sense of a “bonnet” on the bike (Fig. 4). Specifically, the section that interfered with the tank when the steering handle was

turned was not rendered concave, and the bulges in other sections were designed to resemble a vehicle fender. This produced the sense of a continuous single unit extending from the nose of the bike. The sense of continuity of this feature has previously not been attained in a motorcycle. In addition, making this concave section continuous with the meter panel produced a sense of being enveloped that was close to that provided by a vehicle instrument panel. Attention was focused on these features when a rider was seated on the full-scale clay model, enabling the realization of the sense of rider balance that had previously represented a concern. As a result of accentuating the sense of a “bonnet,” the overall design took on a strongly assertive quality (Fig. 5).

8. Objective Opinions

This strong assertiveness certainly matched the goal of creating a design that had never previously been seen, but at the same time, as a commercial product, the appearance of the bike could not seem overly “self-satisfied.” Sketches showing different variations were created based

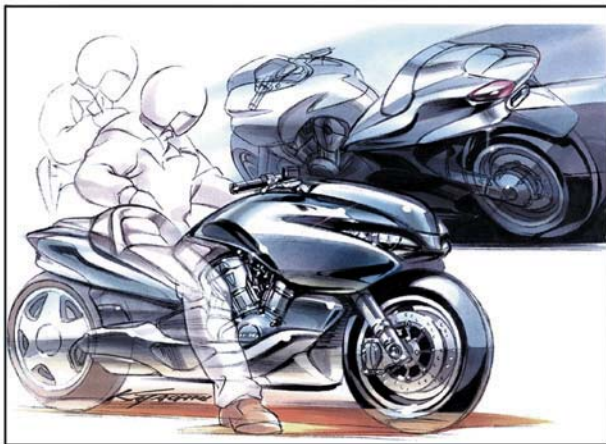


Fig. 2 Key sketch

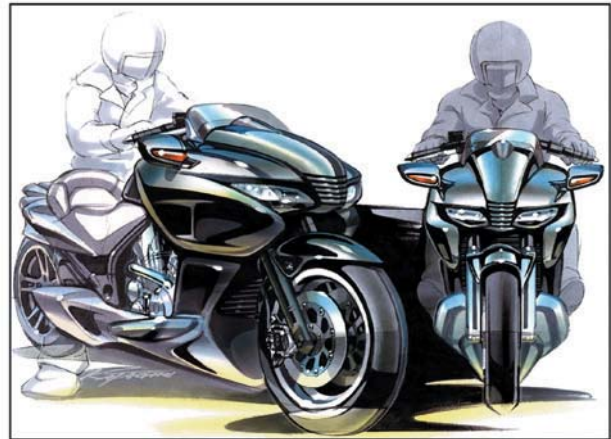


Fig. 4 Second design



Fig. 3 First FRP model



Fig. 5 Second model

on the sketch shown in Fig. 4, and feedback on the different designs was solicited by conducting a broad-based in-house survey to enable the team to review the styling again from an objective viewpoint. As a result, the headlight “grille” was eliminated and the right and left headlights were more closely integrated to provide a more relaxed impression with a sharper image around the front.



Fig. 6 Third design



Fig. 7 Third model



Fig. 8 Forth design

The conclusion was also reached that the bodywork surface quality, which had a strong organic feeling overall, should be given an appropriately sharp impression, and a third clay model was created on this basis (Figs. 6, 7).

This model was displayed at the 2005 Tokyo Motor Show, and on the Press Day, Honda's President Fukui himself unveiled the model and promised the release of the bike in the near future.

9. Development of Mass Production Bike

Thereafter, full-scale development commenced with a view towards mass production, but of course there were still various hurdles that had to be cleared in order to realize mass production. Therefore, the clay model was refined for the fourth time in order to address these mass production issues while retaining the attractive image of the show model (Fig. 8).

First, a variety of issues came to light in the running tests. In the show model, the main seat had been designed low to produce a low riding posture. The team gave consideration to togetherness when a rider and a passenger were using the bike, and lowered the rear seat.

In addition, the instrument panel was distant from the rider's line of sight, and it was judged necessary to increase its readability. The liquid crystal negative display employed in the show model was therefore replaced with a positive, concentrated display, increasing visibility and at the same time realizing a more fitting display for an automatic bike in an entirely new category (Figs. 9, 10).

From a design perspective, the specifications of each



Fig. 9 Display of show model



Fig. 10 Display of mass product model

part were reviewed to achieve the target cost; lamps and other parts were brought into compliance with laws and regulations; and the ABS unit, parking brake and other auxiliary units that had been left off the show model were incorporated into a superb body layout, while finely adjusting the cover shape, to retain as much of the show model image as possible. This involved substantial efforts on the part of both designers and modelers. With all of the team members generating ideas—dividing the fuel tank in two to balance slimness with the necessary fuel capacity, creating a path to guide air from the radiator under the engine to attempt to help ensure that it does not reach the rider’s feet, and the like—a mass production design model was completed while maintaining the design of the show model.

10. Conclusion

Honda pioneered “low and long” proportions in the Fusion. In order to build on that proud record of achievement, the mass production of the DN-01 was to be achieved at all costs. The author had nurtured the dream of a long-nosed bike for more than 10 years, even before joining the Honda team, and that dream was realized precisely because of Honda’s spirit of challenge. The author wishes to express his sincere thanks to all the team members who worked tirelessly to bring the DN-01 to mass production while remaining true to the initial design image, and hopes sincerely, in addition, that the new bike will contribute to offering new lifestyle choices to its users.

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