

sketching

drawing techniques for product designers

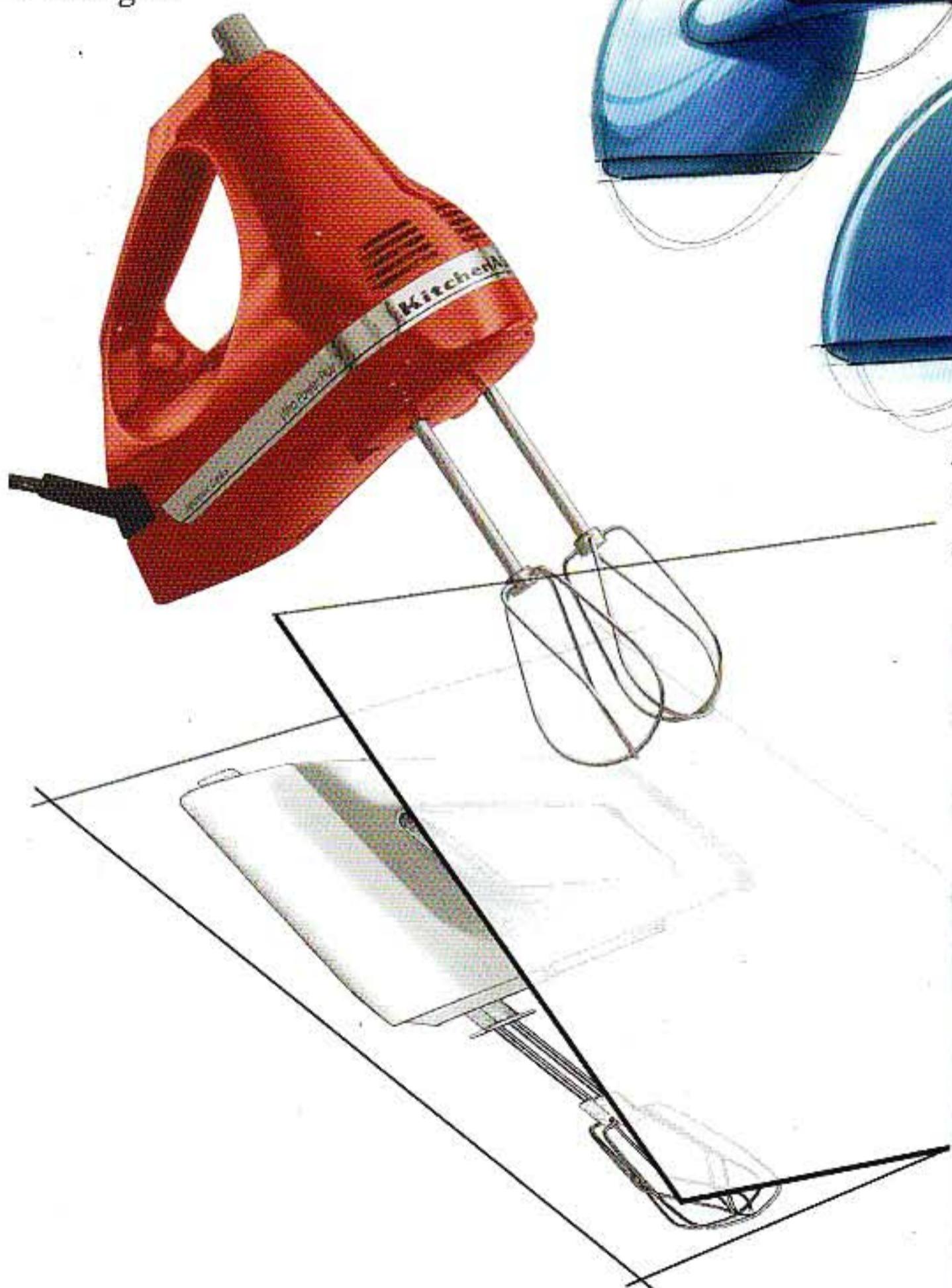
koos eissen and roselien steur

Getting started

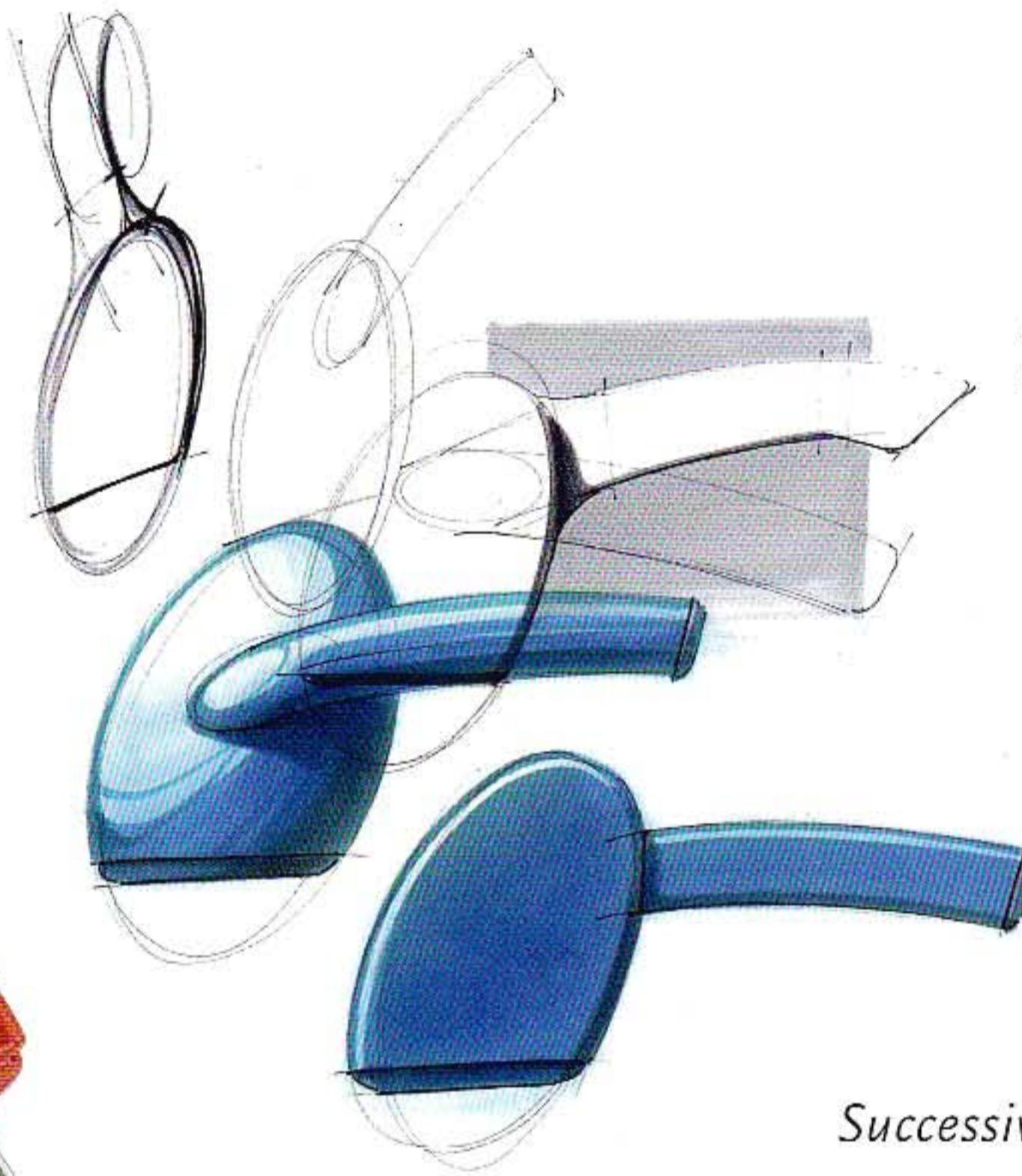
An underlay has several advantages for getting started. It speeds up the drawing process and gives a realistic sense of proportion, volume and size. When redesigning a handheld domestic food mixer, using a photo of an existing product, a 1:1 scale is most convenient because you can actually compare hand size and grip. Ergonomics and a realistic appearance can thus be integrated easily. By drawing archetypal mixer tools, the design proposal gains legibility and scale.

A line drawing leaves room for many interpretations, so shading is added to express volume. Choosing an appropriate light direction (coming from the top left, slightly away from you and going towards the object) makes volumes and shape transitions recognizable. When adding volume and colour to a line drawing, decisions about the look and feel have to be taken immediately. Clearly, shading is of paramount importance. Knowledge about light and shading will be a key issue throughout this book.

In a brainstorming session you don't immediately evaluate the results. It's important to just keep your freedom and stay open-minded about ideas, looking for other visual stimuli that offer new challenges.



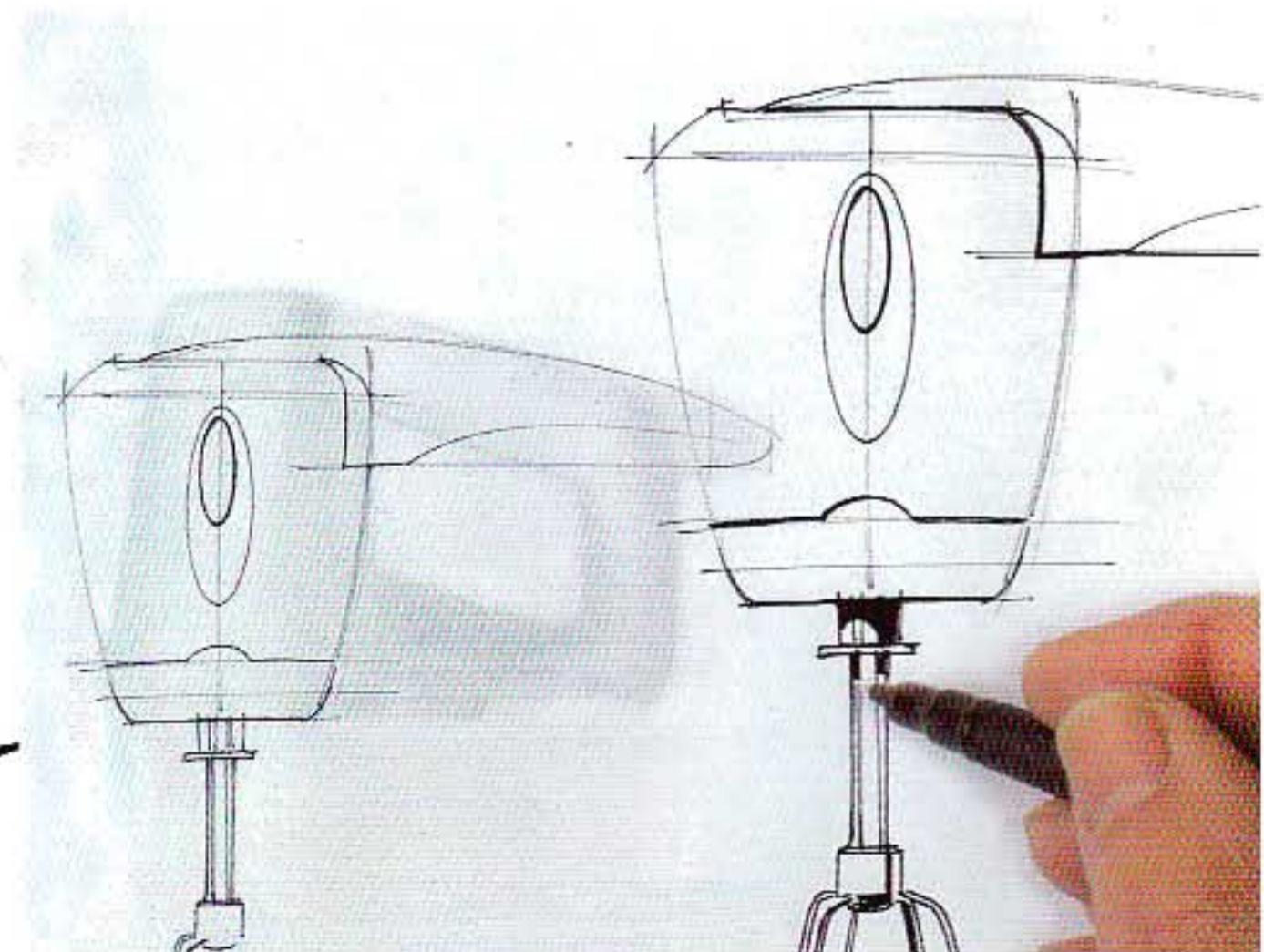
A contour in side view can represent various 3D forms.



Successive actions in sketching

Start drawing freely; the underlay is only a size reference.

Gradations in line thickness are added.



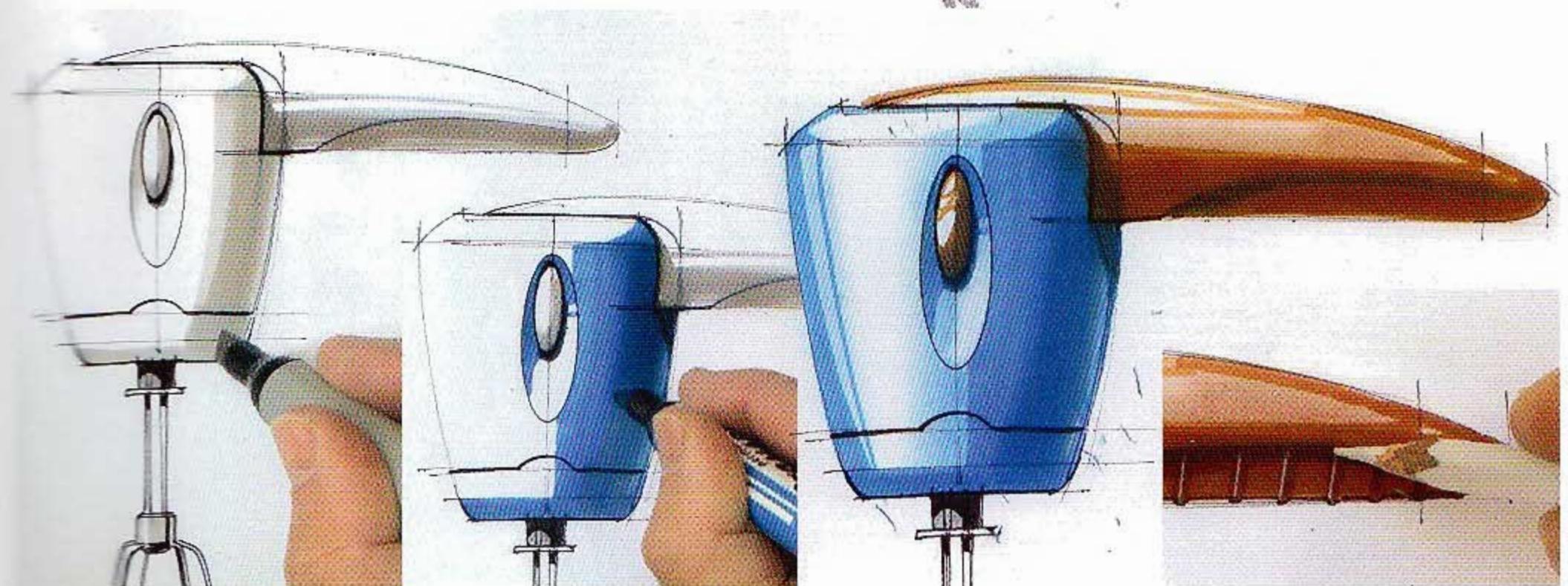


Shadows not only explain the forms that cause them, but also the forms upon which they are cast.

Depending on the brightness of the colour, a lighter or darker gray marker is chosen to darken it.

Colour marker and pastel give the suggestion of colour.

Collared pencil for highlights and details finishes the drawing.

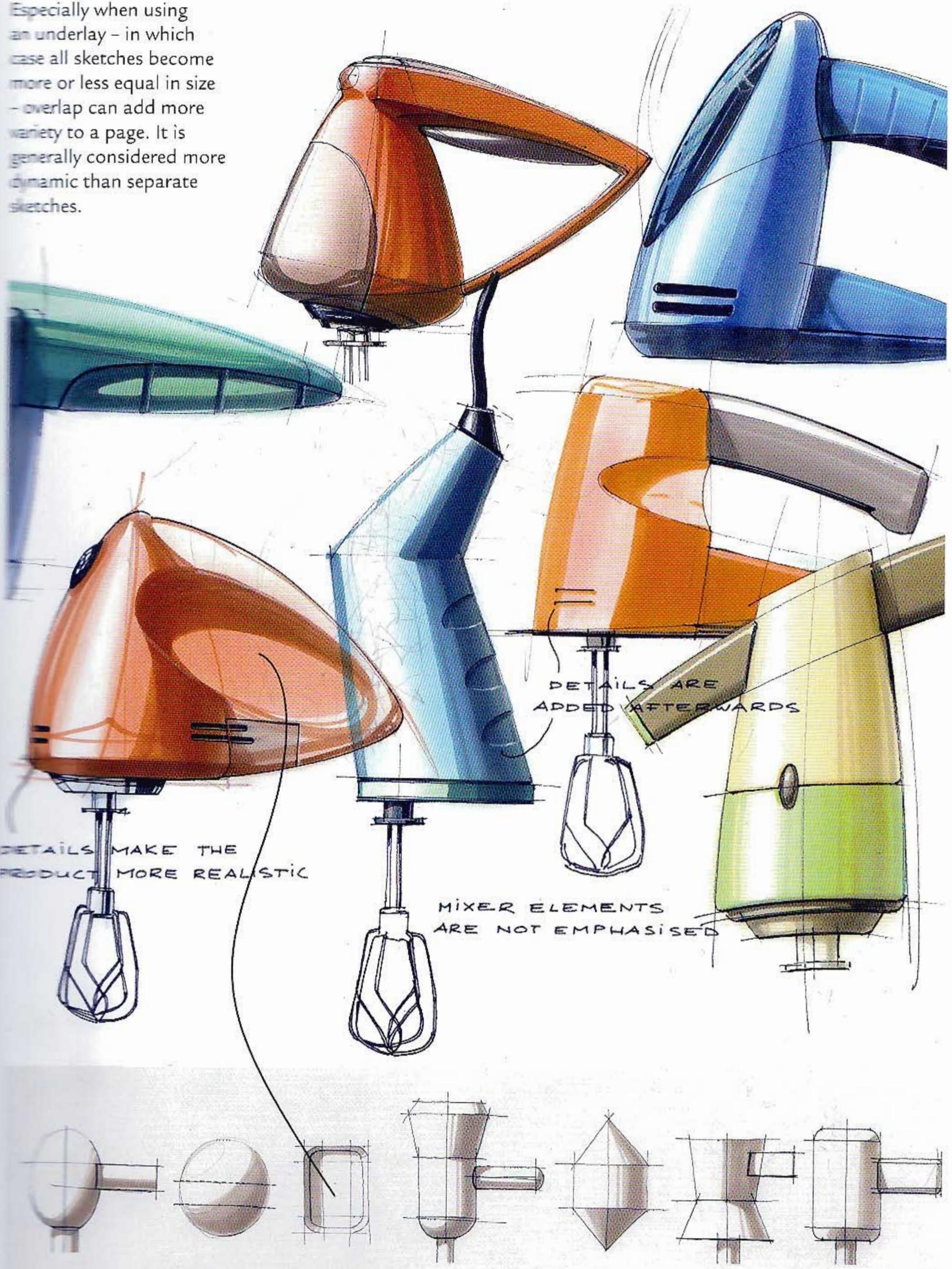


KitchenAid Ultra Power Plus Handmixer. Photography: Whirlpool Corporation

It is important to sketch freely, to look for proportion and balance and optimize each sketch accordingly. This can result in the overlap of drawings, especially in ideation. When this occurs it can be an opportunity. Here, overlap is used to emphasize certain sketches by bringing them to the front. It gives more depth to a page and at the same time adds value to the sketches.



Especially when using an underlay – in which case all sketches become more or less equal in size – overlap can add more variety to a page. It is generally considered more dynamic than separate sketches.





Side views are often used in Footwear Design because shoes are commonly displayed this way in a store to catch the consumer's eye. The drawings shown here cover the initial design process, from concept sketches to final renderings. Drawings are not only used to explore design solutions or to represent a

product realistically; their emotional aspect is also very important. They serve to get people excited about a project within the company. Some are also presented to athletes and consumers for feedback.



Adidas AG, Germany – Sonny Lim

Many Footwear Designers at Adidas are trained as Industrial Designers. However, there are also quite a number of Transportation and Media designers. The drawing

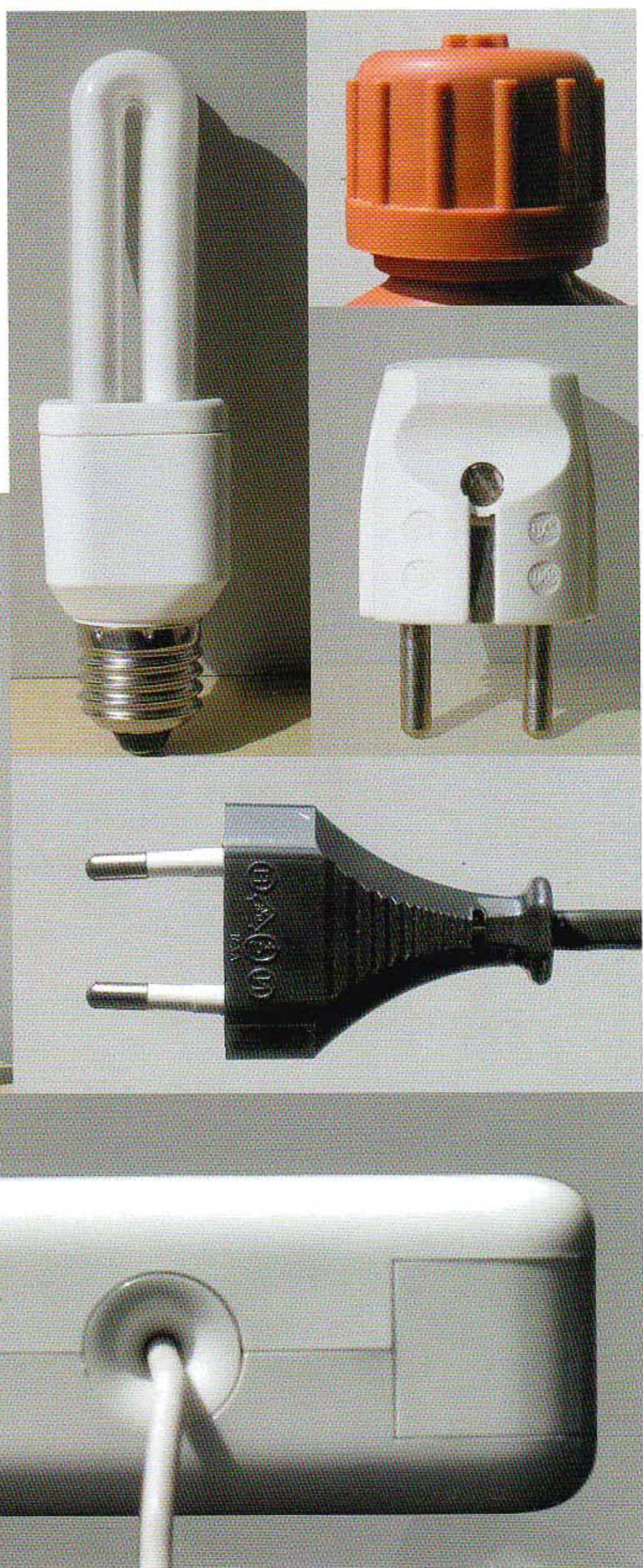
styles are different for every designer, and everyone uses a mixture of techniques. This creates a great cross-functional environment for exchanging visualization and sketching techniques.

The blue and red Football boots were drawn by hand, using blue pencil, markers, fineliners and a Pantone marker airbrush. The drawings were scanned in and the highlights added in Photoshop. The computer renderings were

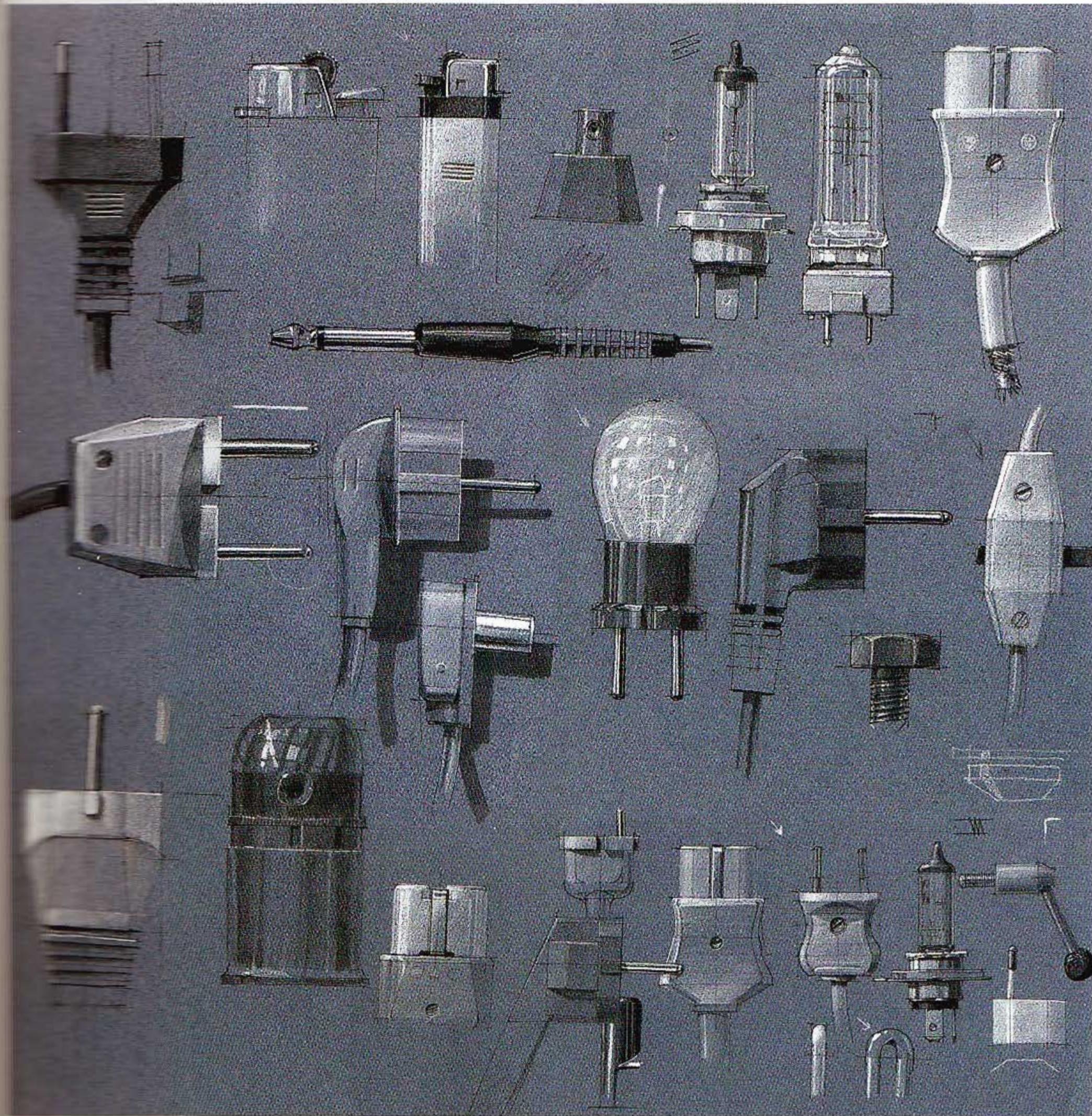
entirely done in Photoshop and Painter, although a hand sketch was still often used as an underlay to get the proper silhouette. Logos and other details, like stitches, were drawn in Illustrator and again imported into Photoshop.

Light and shading

Just like in photography, choosing the most informative viewpoint and a suitable light direction is essential in creating an optimal 3D illusion. By adding tonal values (light and shading), one can express volume. A cylinder should look round, a flat surface flat. Analyzing objects and light conditions is very helpful in understanding the relations between shapes and shadings, and offers basic information suggesting the volumes and combinations needed for creating depth in a two-dimensional sketch. Some products, like clock radios, microwave ovens, and washing machines, clearly have a side that is most informative. In other cases, one has to decide which viewpoint contains the most of a product's (shape) characteristics.



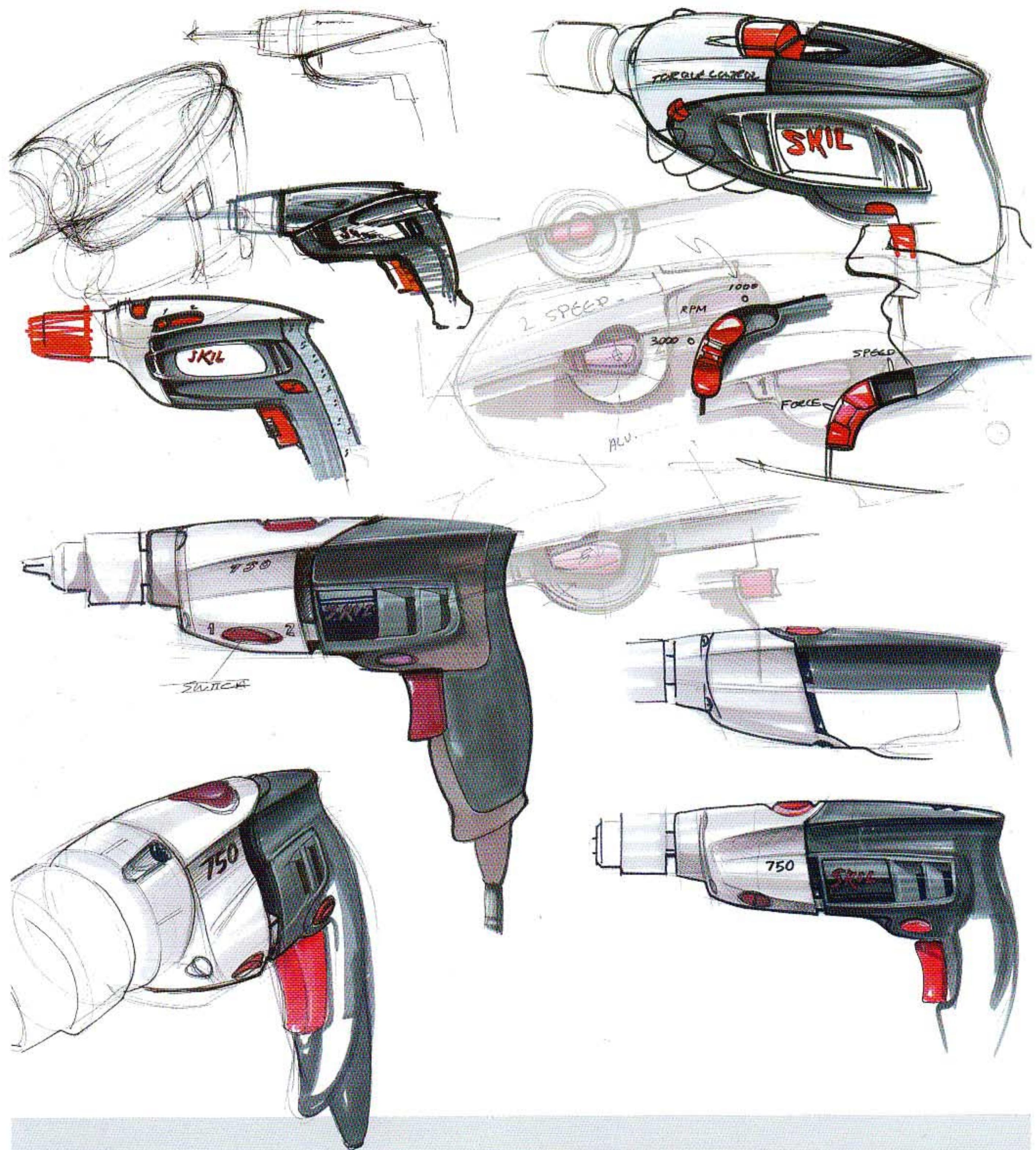
Choosing an angle of light steeper than 45°, coming from a direction slightly away from you and going towards the object, not only results in a clearer distinction between the two shaded (and highlighted) sides, but also in a more distinctive cast shadow.



Using collaged paper instead of white is an attractive alternative for monochrome sketches. Taking the colour of the paper as the midtone,

white colour pencil can be added for the lighter tones and highlights, and black colour pencil for the darker areas.

Drawing from nature, in other words, translating reality on paper, is a useful exercise in creating shading effects. This stimulates you to make a 'visual library of shading situations' and will in time enable you to apply shading without having to think about it.



Different designers worked together on this project. Visual language and handwriting should be compatible. In addition to drawings, 1:1 models were made to carry out specific ergonomic studies.

These models then served as a starting point for more elaborated drawings. Although most drawings are in side view, three-dimensional approaches are also necessary to determine shape transitions and connections that would otherwise stay hidden.

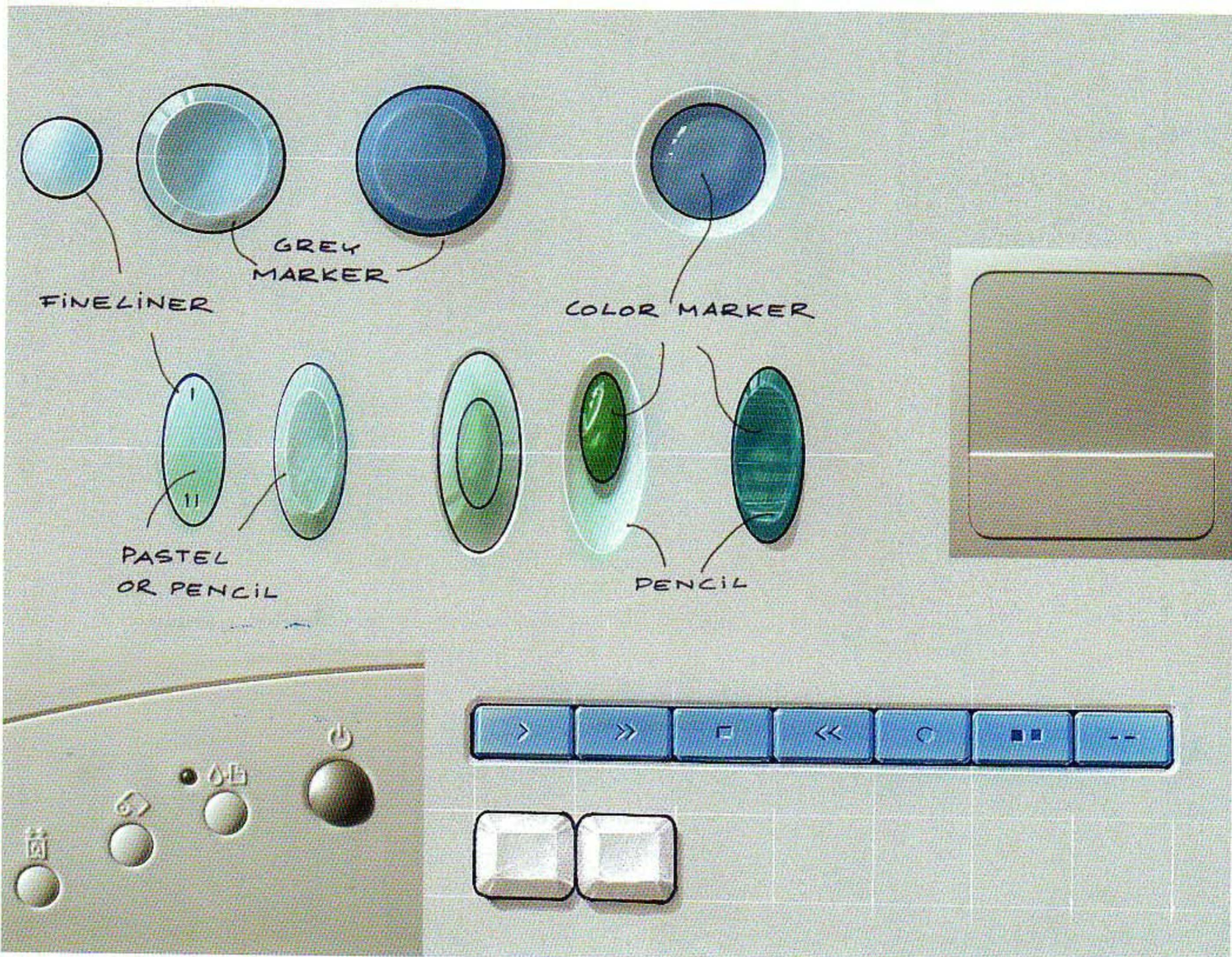


npk | industrial design

npk industrial design

The Two Speed Impact Drill for Skill (2006) is the start of a new product line that focuses on ergonomics and styling. In this shape strong lines and

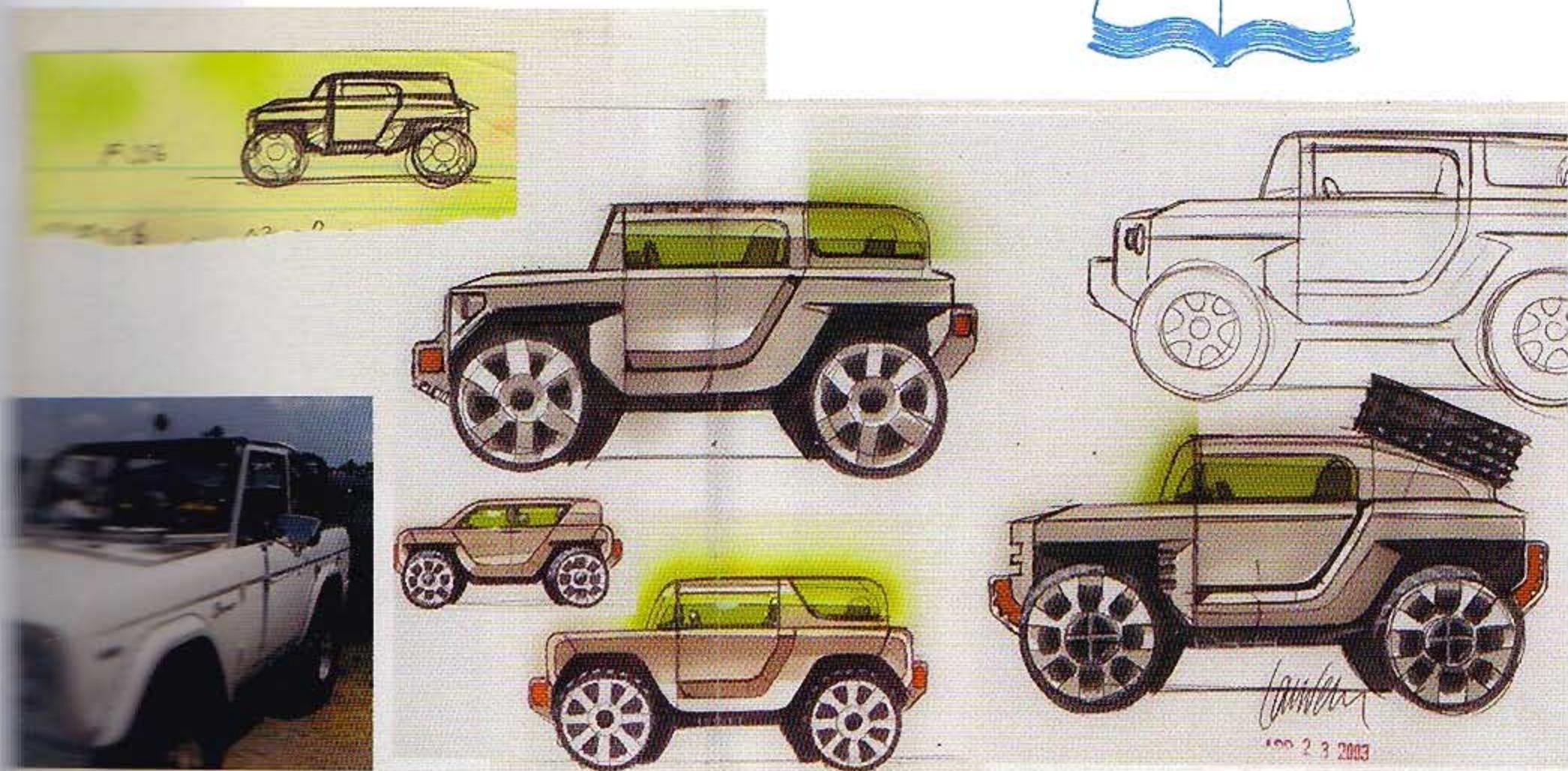
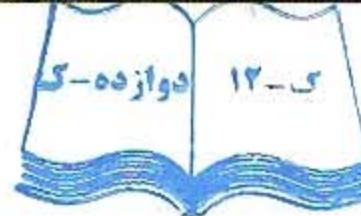
soft grips were applied in accordance with the Skill corporate identity. Npk developed the housing, mock-ups and product graphics.



Details

Adding some details to a sketch can give it a far more realistic appearance. Details can also indicate the overall size of an object. Studying pictures of product details will reveal the basic principles of shading.



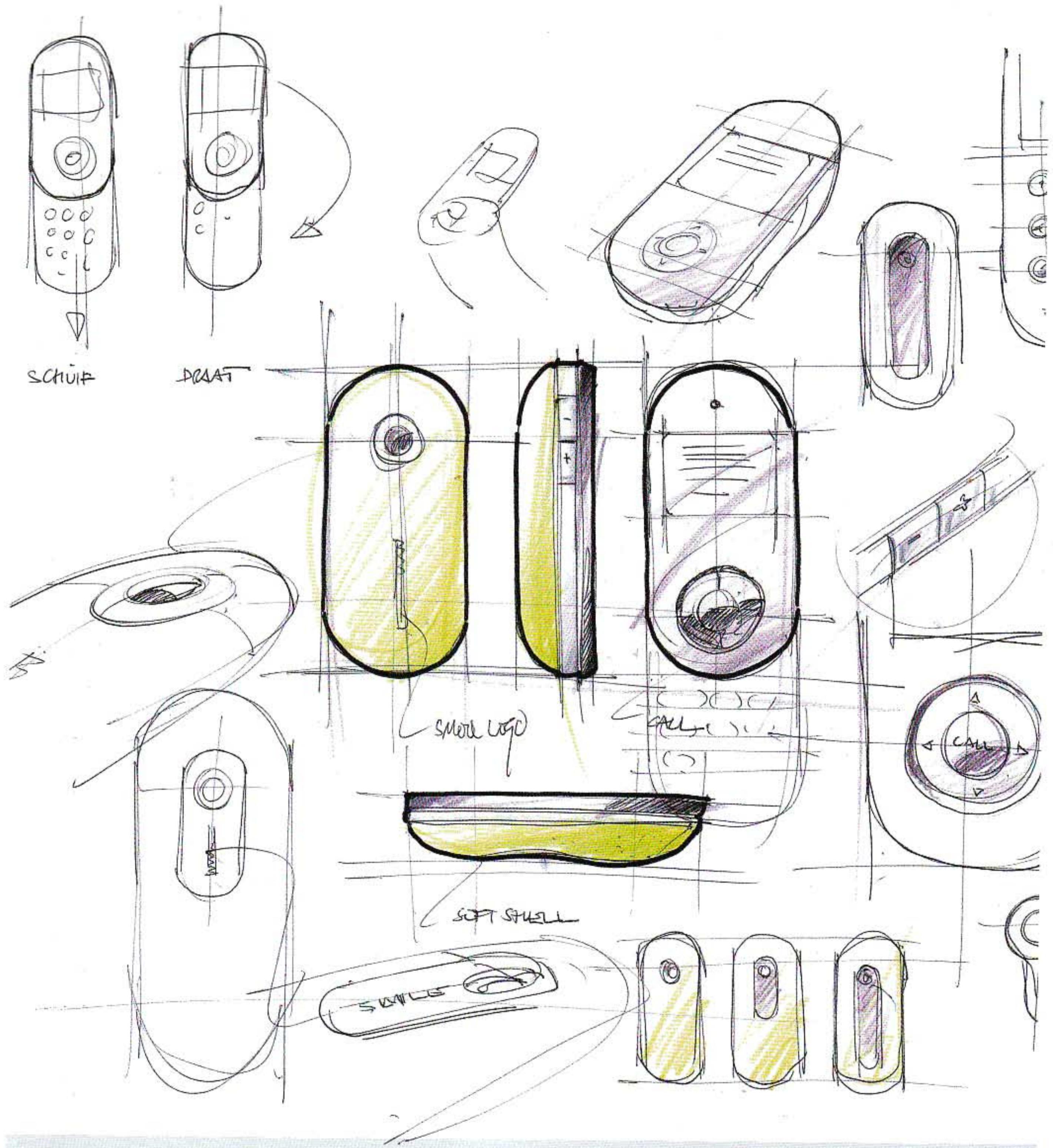


Ford USA – Laurens van den Acker

Sketches drawn in side view give the first impression and basic layout of the SUV. The car's appearance should convey advanced simplicity and power. Every detail added must underline these aspects. With a simple shape such as a car, early sketches in side view speed up the design process and visualize a clear statement about the design.

The Ford Bronco SUV concept of 2004 was inspired by its predecessor, the famous 1965 original Bronco (designed under engineer Paul Axelrad). Simplicity and economy were the main issues, translated in flat glass,

simple bumpers and a box-section ladder frame. It turned out to be a popular off-roader. In the 2004 Bronco concept, Ford re-explored this authentic spirit, but added advanced powertrain technologies.



SMOOL Designstudio

For designer Robert Bronwasser, handmade sketches are the basis of each design. Sketching stimulates creativity and offers a very quick way to explore design possibilities, study proportions and try out details. By varying the sketches in size, viewpoint, perspective

and colour, the design opportunities become clearer. Sketching and designing in side view requires imagination and knowledge of how to visualize in 3D.



smool

For a period of time, SMOOL Designstudio advertised in the leading Dutch design magazine *Items* with a redesign of an existing product. With these recognizable designs,

Robert Bronwasser showed his vision of today's design by applying his own design idiom. The final and detailed side views are made with Adobe Illustrator. *Items*/2, 2006

Drop shadows

Cast shadow can be needed for other reasons than expressing depth. In this case it is used to suggest the transparency of parts of the coffee machine. This shadow is simplified; the contour of the product is the outline of this 'drop shadow', which is cast on an imaginary surface behind the product. It is far easier to manage than constructing a perspective correct one.



Notice that the light direction has been chosen for an effect of optimal transparency

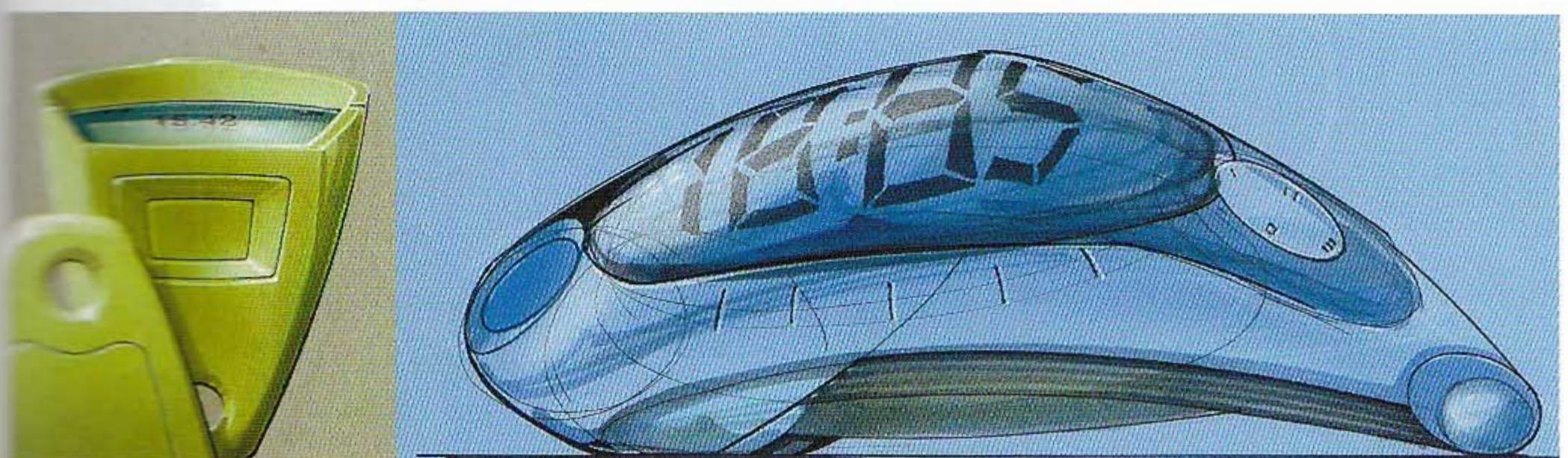
and that a more or less realistic distance from the background surface is suggested.



Displays

Displays are details commonly seen in products. To suggest them, we draw the characters in the display and add some depth through cast shadow. Reflections can be added afterwards with white chalk.

In most cases, the difference in transparency is more important than the exact location of the reflections that cause it.





WeLL
welldesign.com

WeLL Design

When asked by the Princess corporation to perform a study on their personal care products, WeLL came up with the idea of adding glamour, symbolized by Swarovski crystals. To

obtain maximum effect at a reasonable price, existing Princess hairdryer models were taken as the starting point. Subsequently the Crystal Hairdryer, the Royal Bling Hairdryer (photo) and the Super Bling Hairdryer were

introduced. Potential sketches were selected and used as an underlay for line drawings. These were then scanned into the computer and finished in Photoshop.

Designers: Gianni Orsini and Mathis Heller. Product Photography: Princess



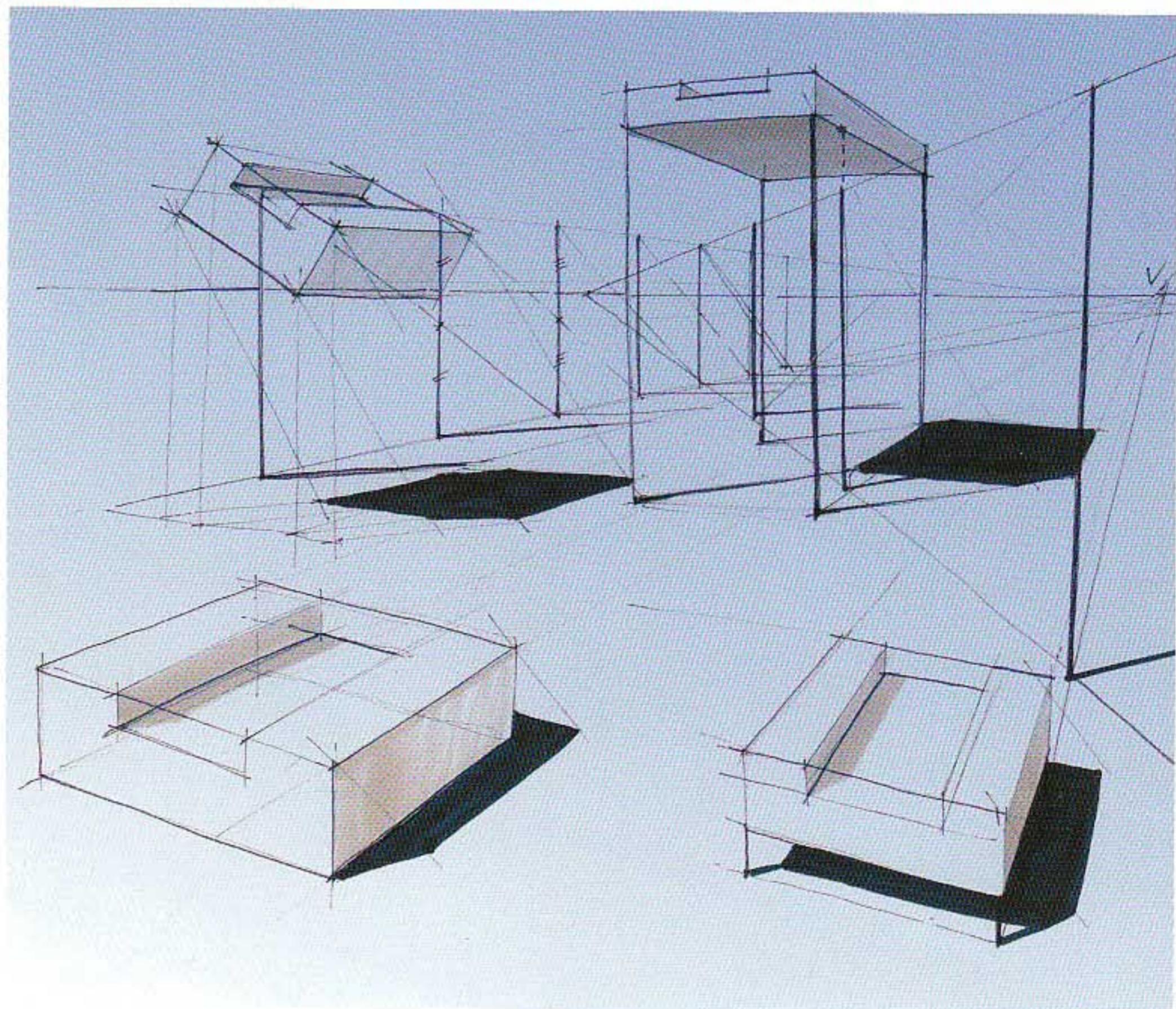
Perspective drawing

Knowledge of basic perspective rules is of course needed to start drawing in perspective. But the same object can be presented in various ways; a sketch can communicate information about the shape of a product as clearly as possible. A sketch can also be used to emphasize an object as being tiny or big and impressive. The visual information conveyed by sketching is highly influenced by the choice of viewpoint, scale elements and use of perspective rules. Managing these effects allows various suggestions of reality.

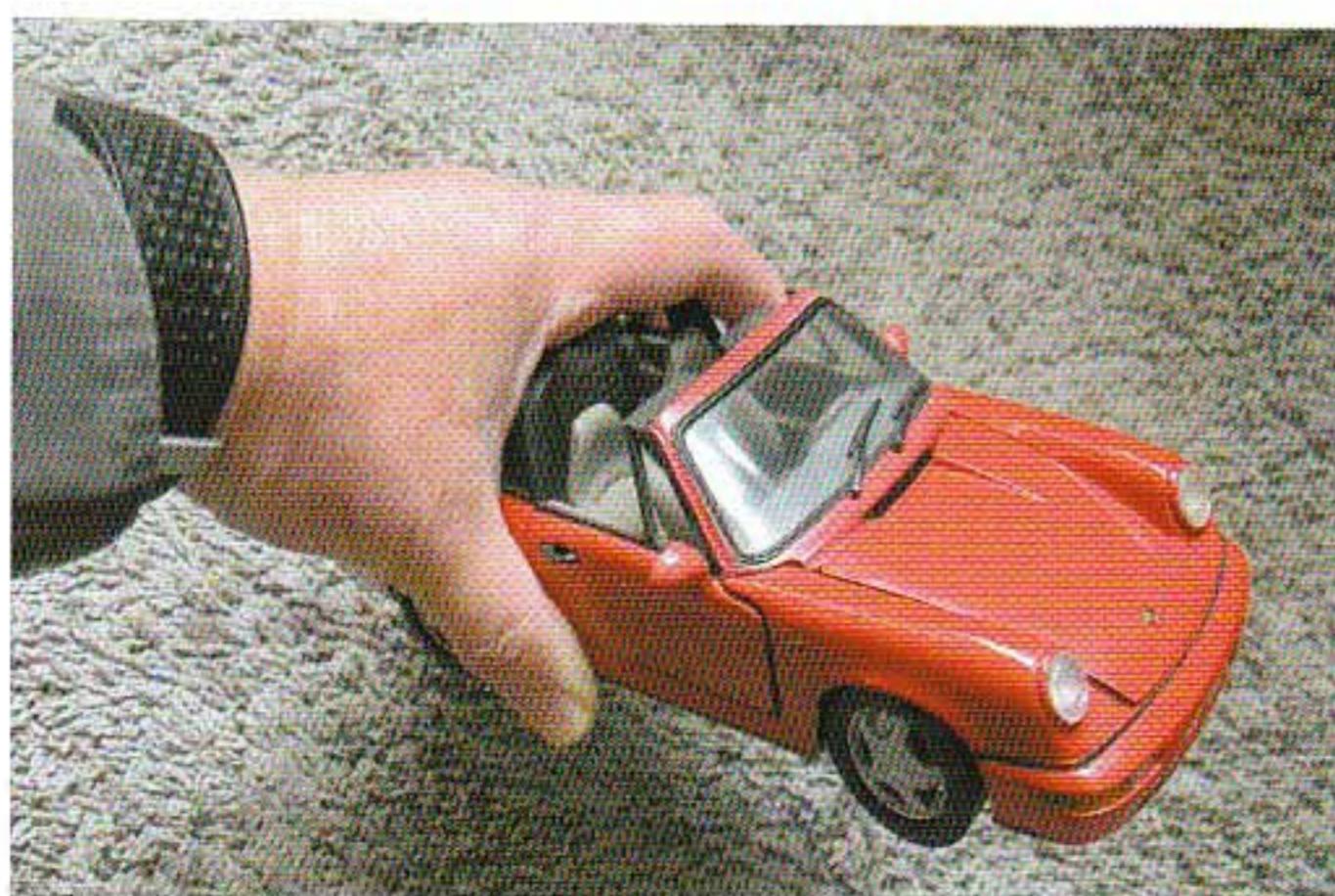
Scale

Scale is a very influential factor. Human size is regarded as the standard in scale elements. Everything can be related to human size and perception. Something above the horizon, for example, is above normal eye-level, and must be bigger than human height (if perceived while standing). Another way to estimate size, or scale an object, is to compare it with

familiar surrounding objects. These 'scale elements' can make something look relatively small or big. Cats, people, hands or matches represent a predictable size, so they can explain the size of a product next to them. The clothespins at the right, for example, scale down the size of the kit.



Scale is always related to what we know and what we sense by comparison.

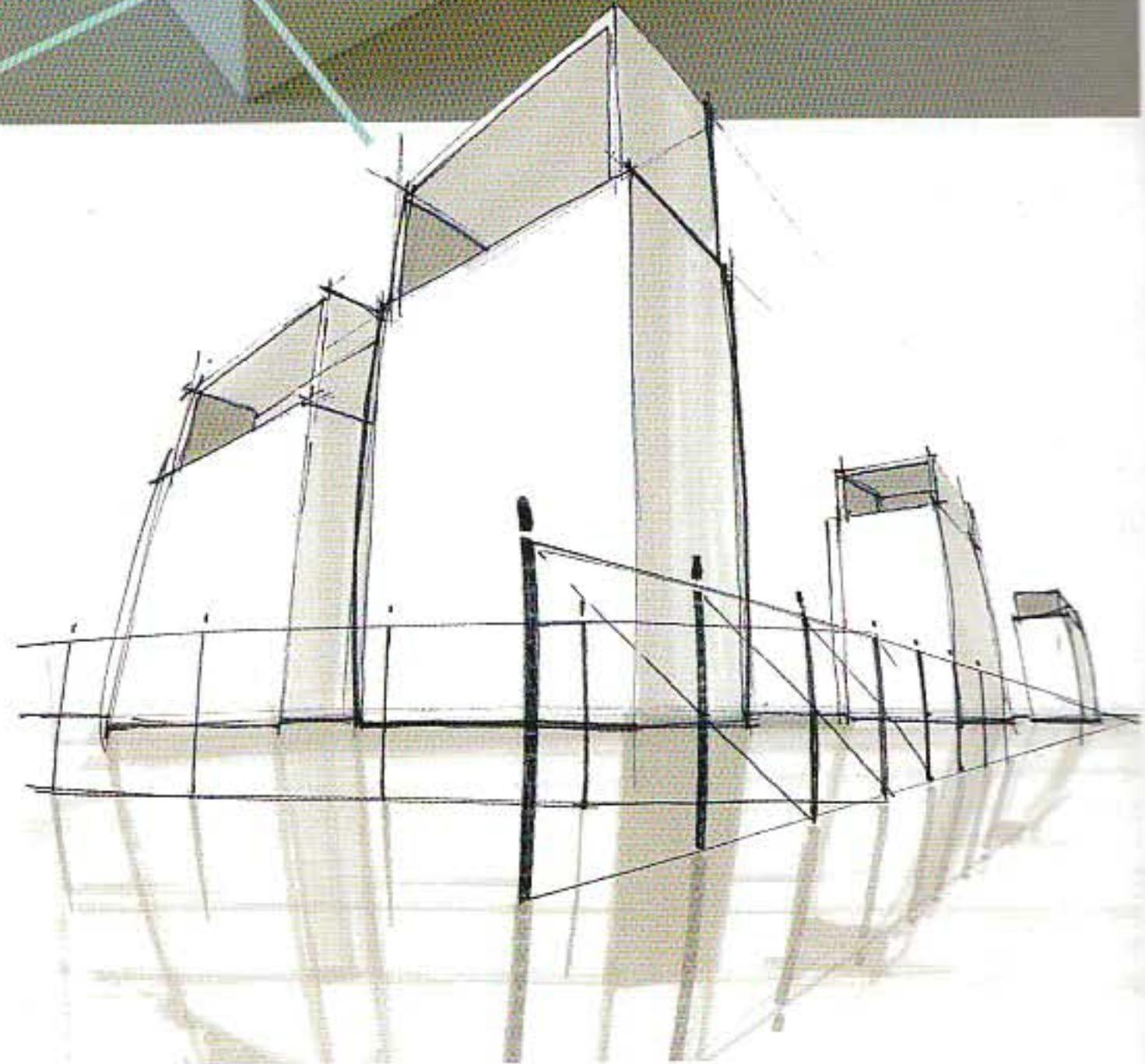
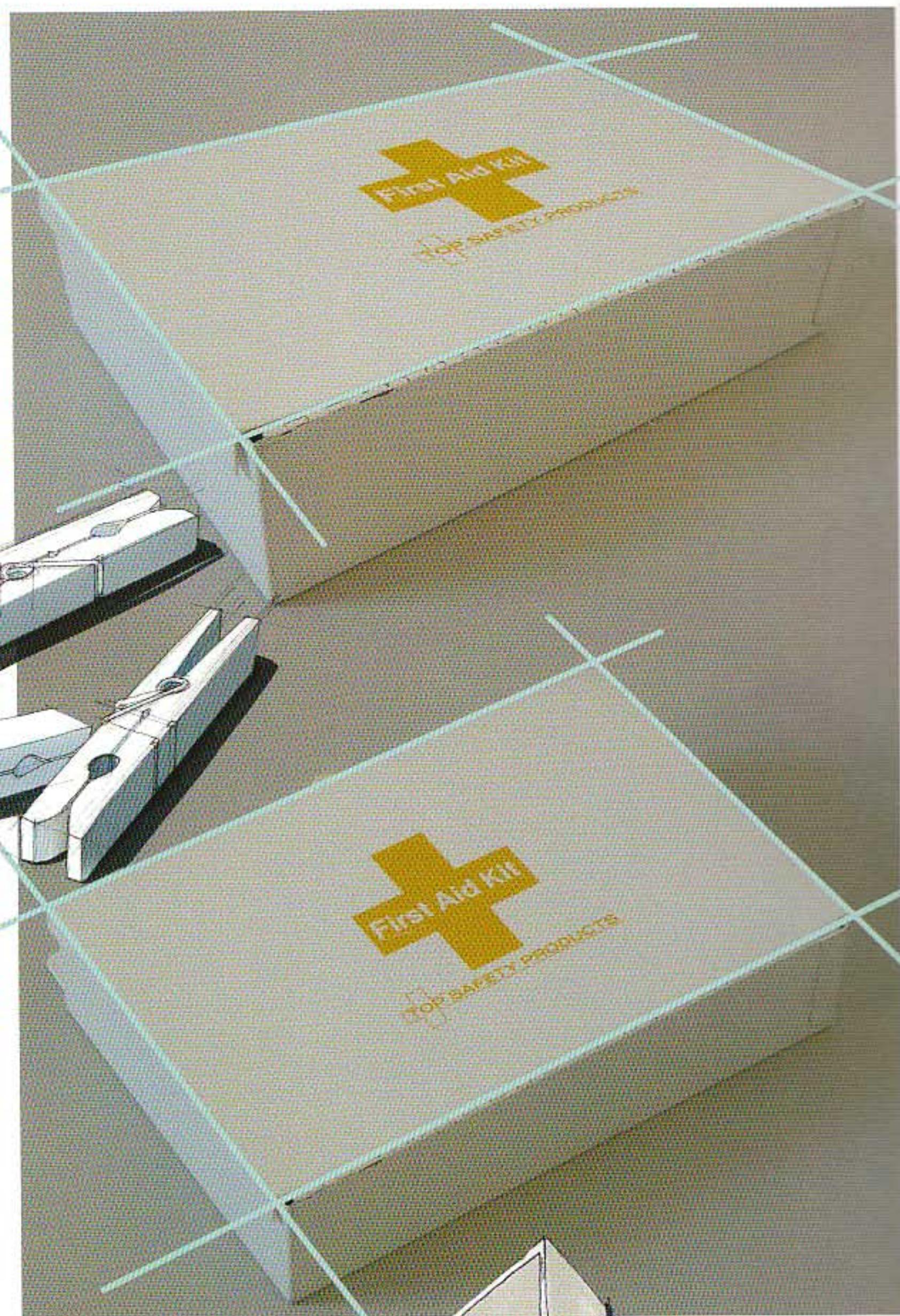


A remarkable visual effect, the third vanishing point (of the vertical lines), can be seen in pictures of buildings. The buildings seem to be falling backwards. It is more difficult to see this effect in real life, for our minds correct our perception – vertical shapes are supposed

to be perceived as vertical. Taking this effect into account, vertical lines are generally kept vertical in drawings. However, introducing the third vanishing point or slightly curved lines can give more dramatic expression to a drawing.

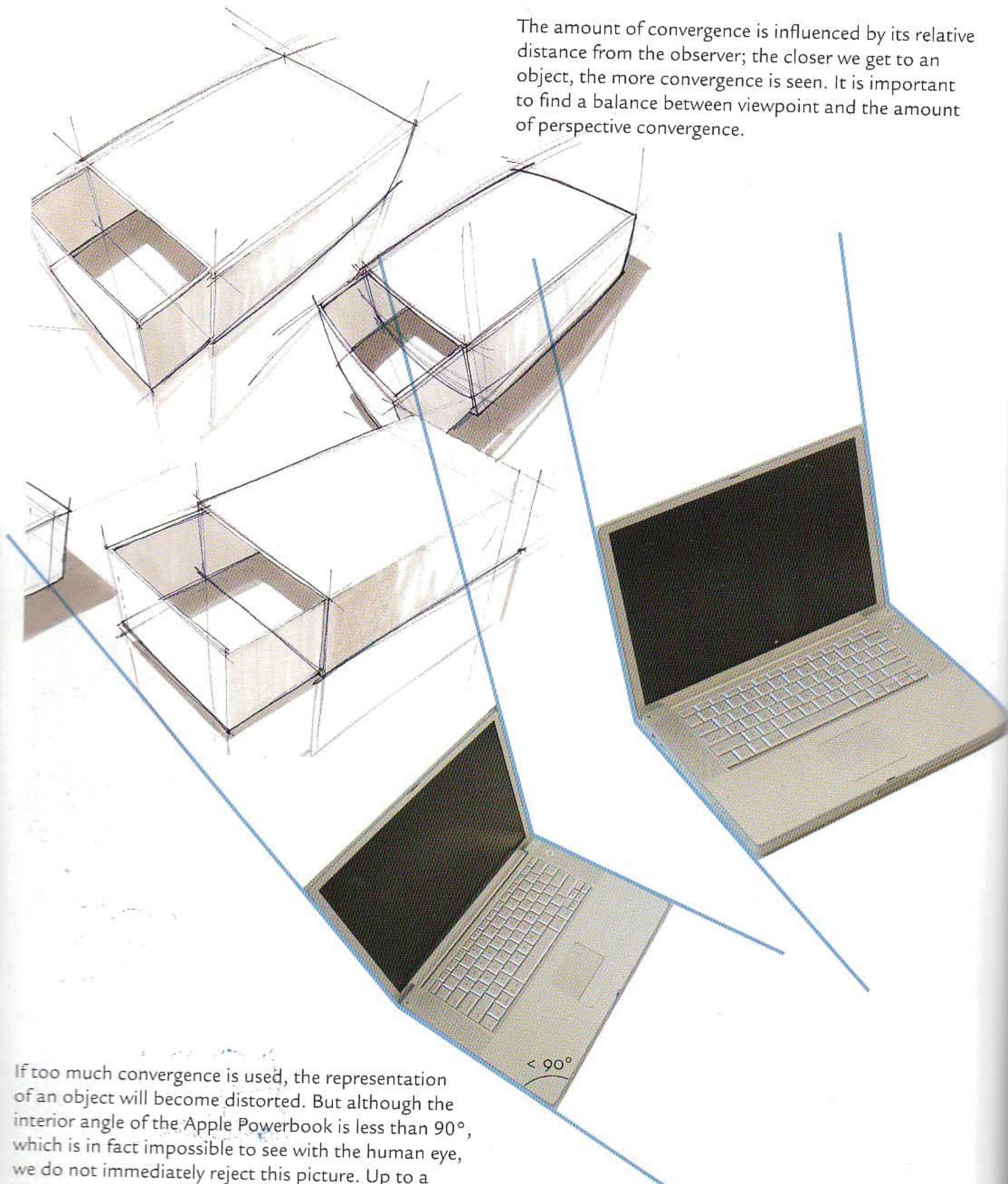
Perspective convergence

The apparent size of an object is also influenced by the amount of convergence. In the top right picture of the first aid kit, the use of too much convergence causes a misrepresentation of its size; it appears to be huge. When less convergence is used, the object tends to look more natural.



Distortion

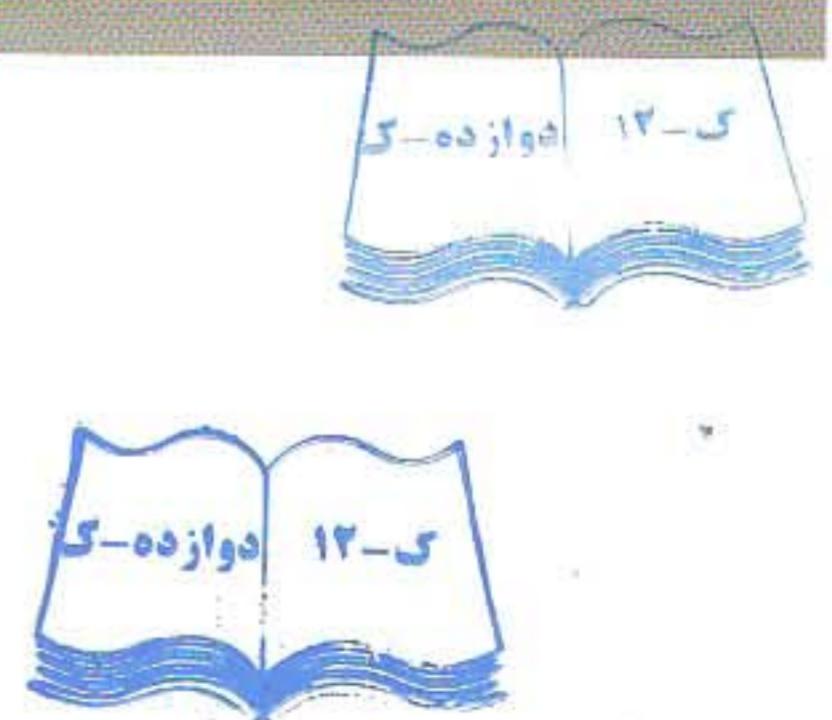
The amount of convergence is influenced by its relative distance from the observer; the closer we get to an object, the more convergence is seen. It is important to find a balance between viewpoint and the amount of perspective convergence.



If too much convergence is used, the representation of an object will become distorted. But although the interior angle of the Apple Powerbook is less than 90° , which is in fact impossible to see with the human eye, we do not immediately reject this picture. Up to a certain point, we 'correct' the image in our minds. Of course the recognition of shapes helps, too.

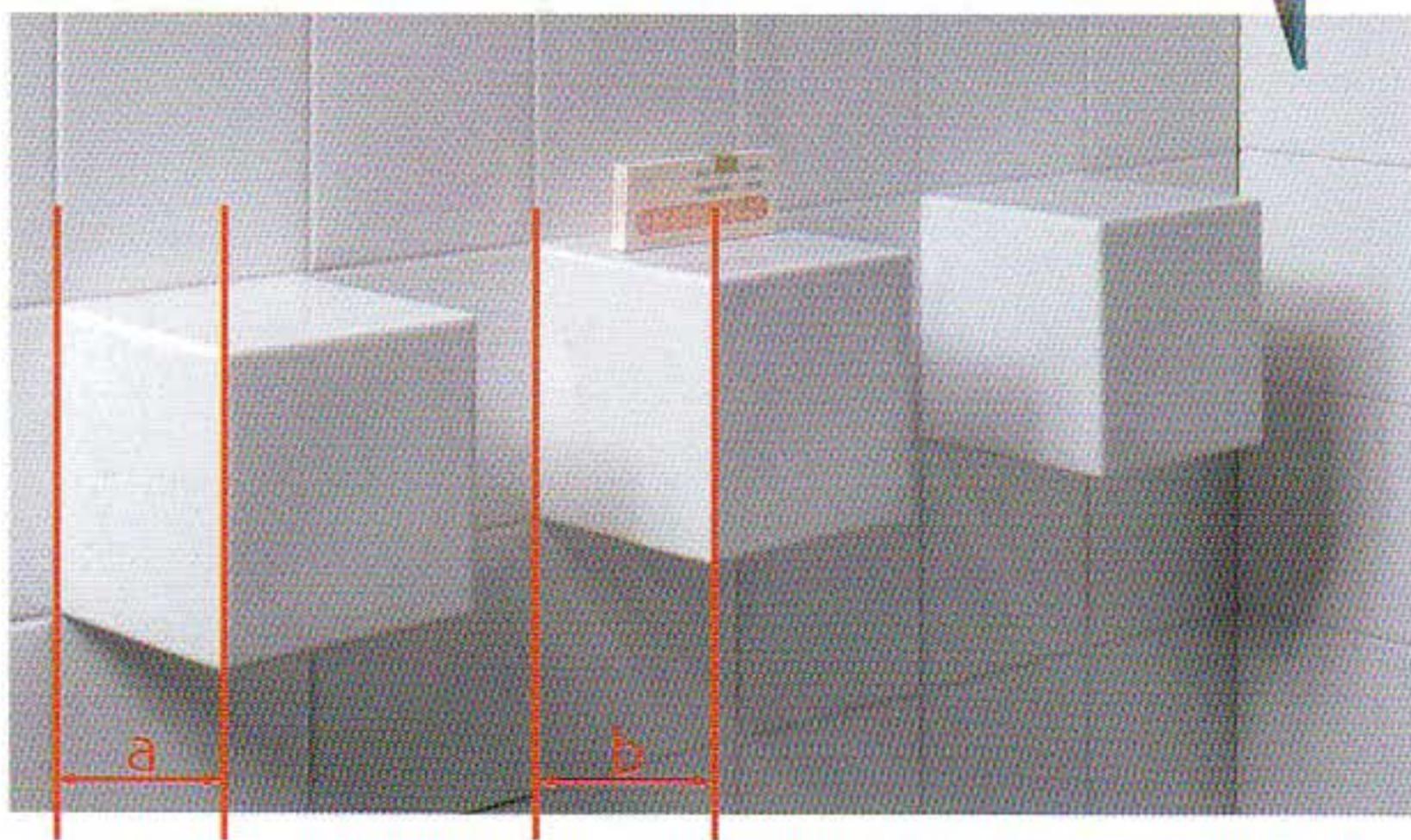
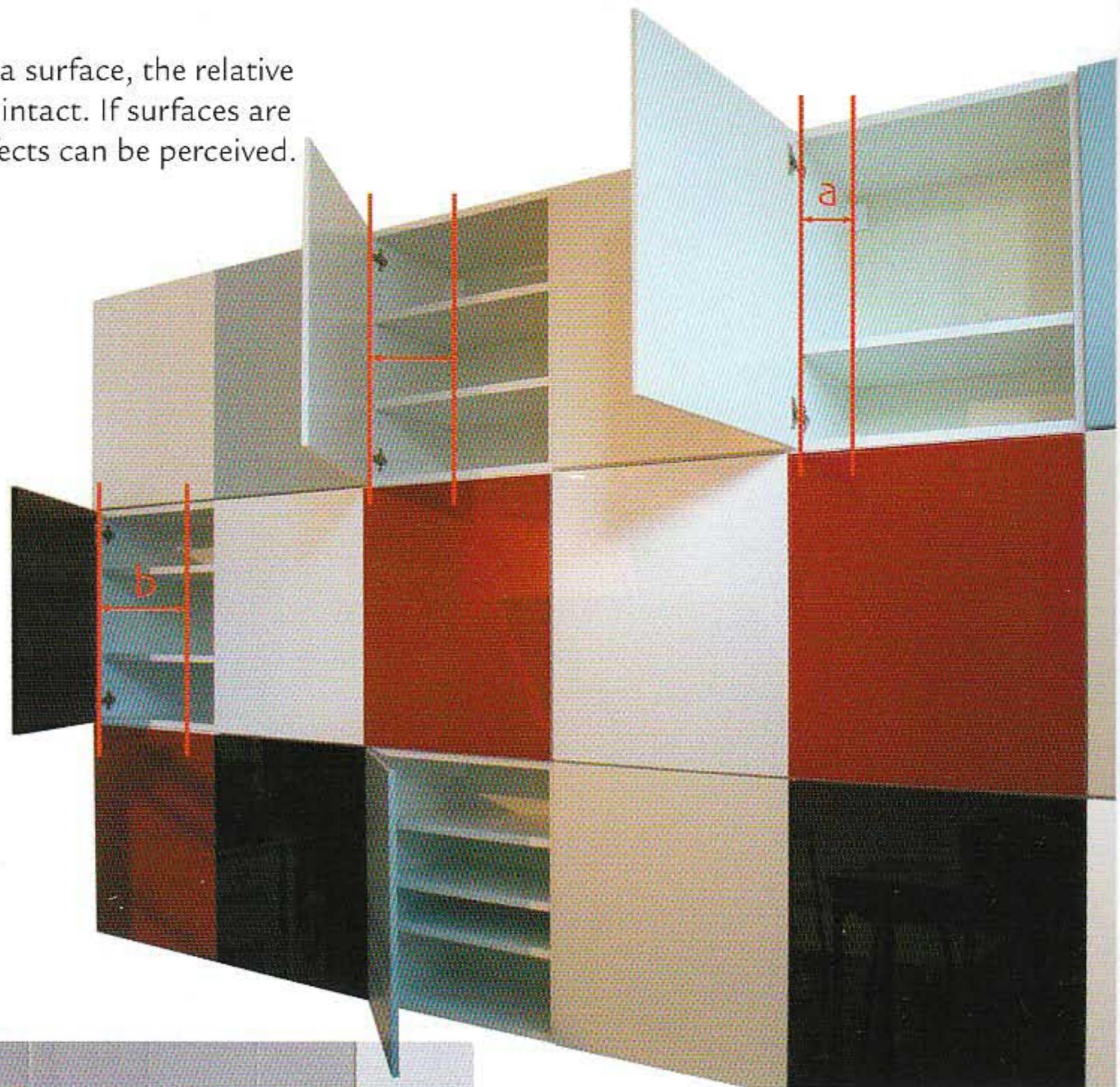


The distortion of the above ellipses is also the result of much convergence. Even the horizontal surface upon which the bowls are standing seems to curve. Distortion can also be seen in the huge difference in size between the green and pink bowls. A circle in perspective is represented by an ellipse, which is a mathematical shape.



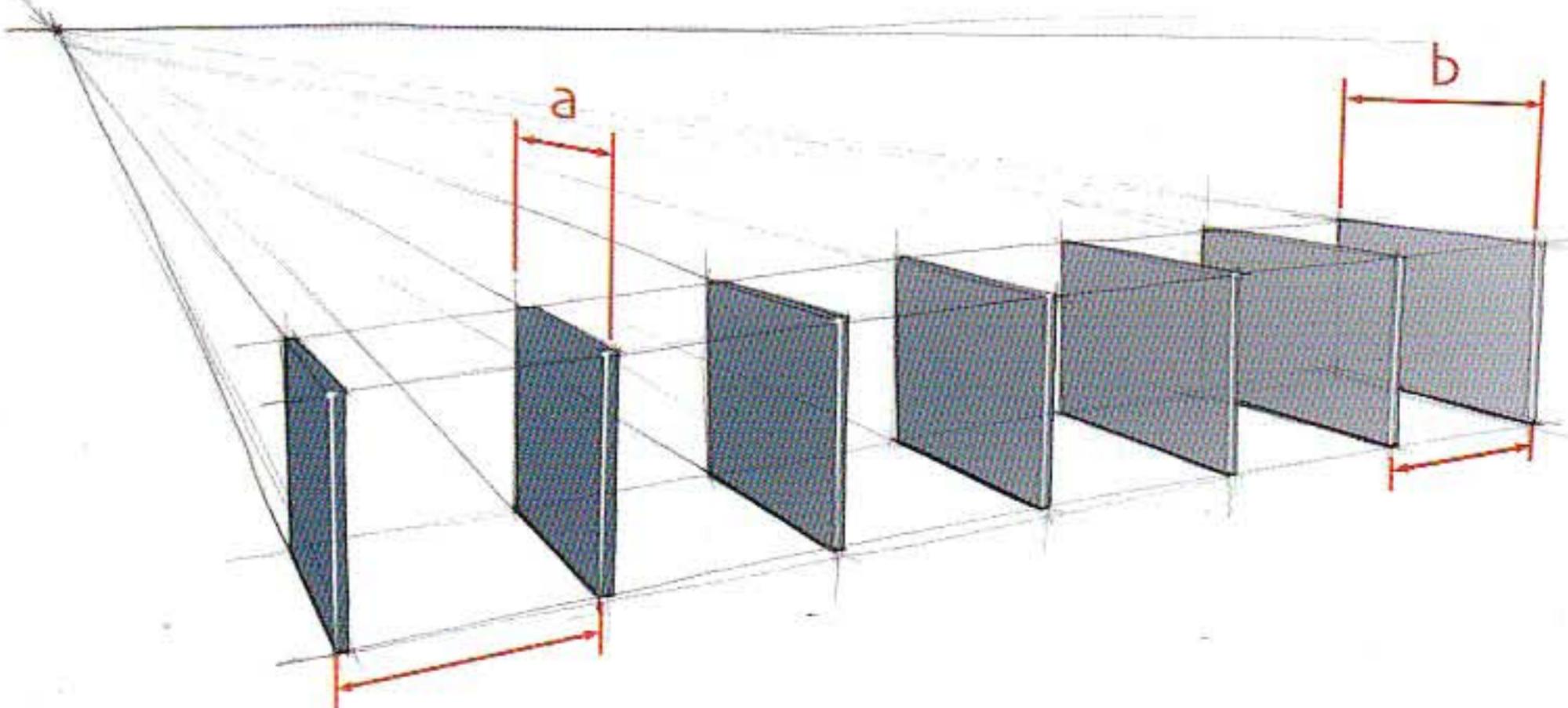
Foreshortening

When looking perpendicular at a surface, the relative dimensions of that surface stay intact. If surfaces are angled away, foreshortening effects can be perceived.



Focusing on the distance between the red lines, size *a* is smaller than *b*, as its surface is more angled away. As a result, size *b* appears bigger although it is further away.

Detail, Functional Bathroom Tiles – Arnout Visser, Erik Jan Kwakkel and Peter vd Jagt

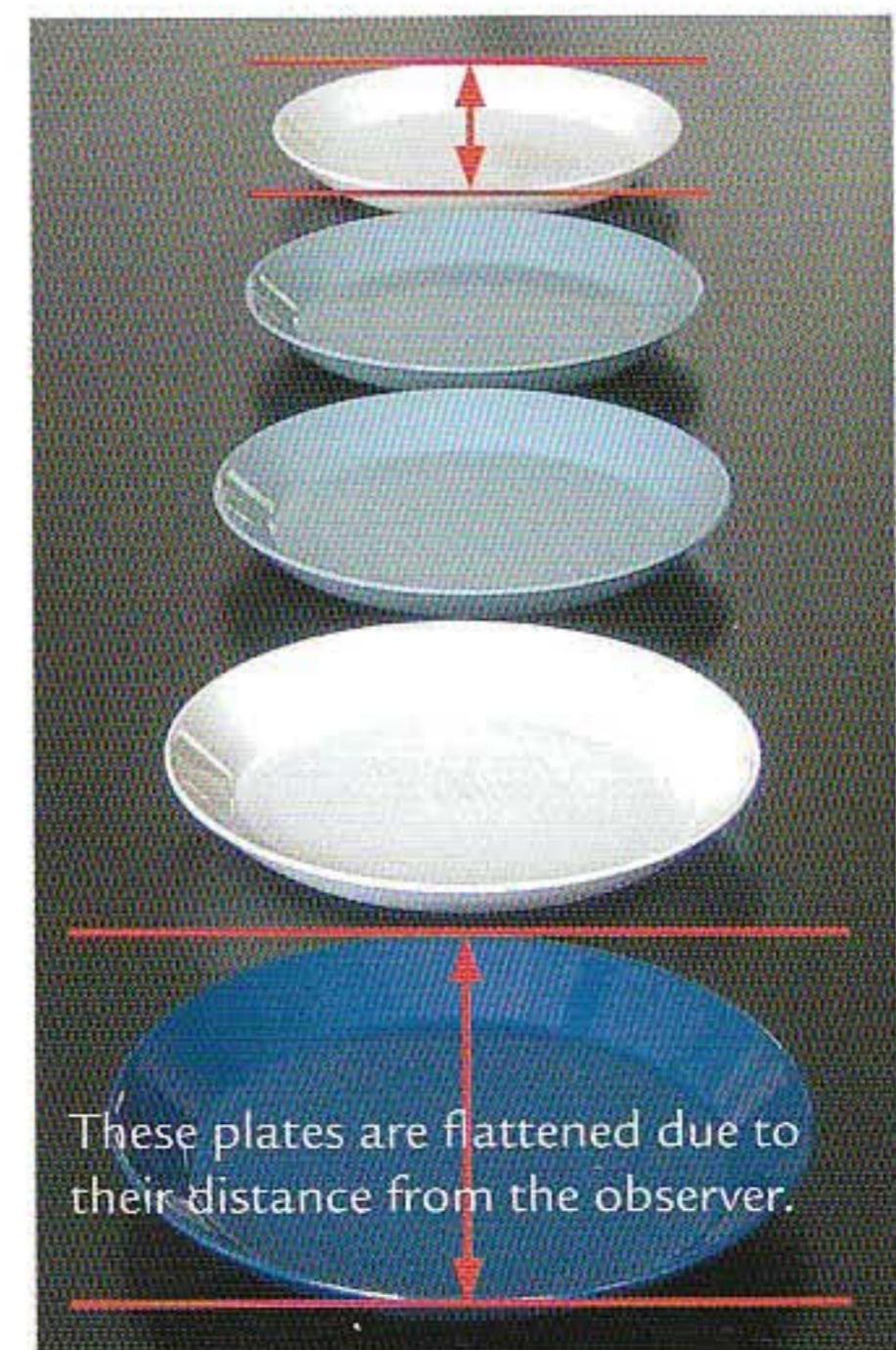




Kitchen Tiles – Arnout Visser,
Jeroen van Vugt and Peter vd Jagt



At each orientation, the tiles' dimensions are seen as different in size, but perceived as equal in size. Different viewpoints show that a higher point of view makes a surface less foreshortened. A circle in perspective then looks rounder.





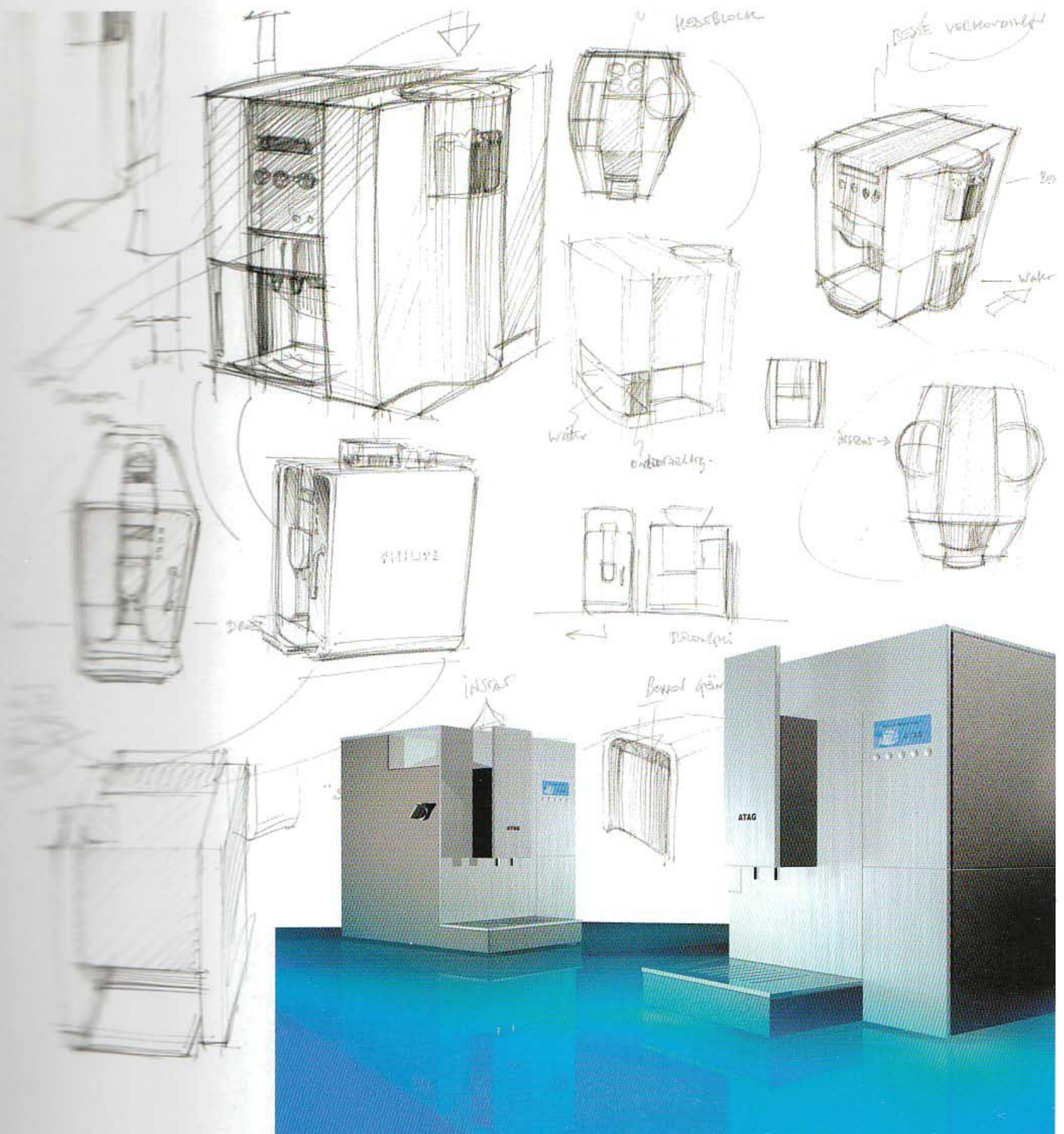
WeLL
welldesign.com

WeLL Design

For Etna Vending Technologies, a series of fully automatic espresso machines was developed by designers Gianni Orsini and Mathis Heller. After a thorough strategic

analysis of the market, the conceptual phase was carried out in competition with two other major Dutch design studios. The aim was a more luxurious design than dozens of other machines at the same price level.

Another challenge was to come up with designs that would suit their own brand and two unspecified global brands. Finally, it should be possible to fit three different structural components within the same housing design.

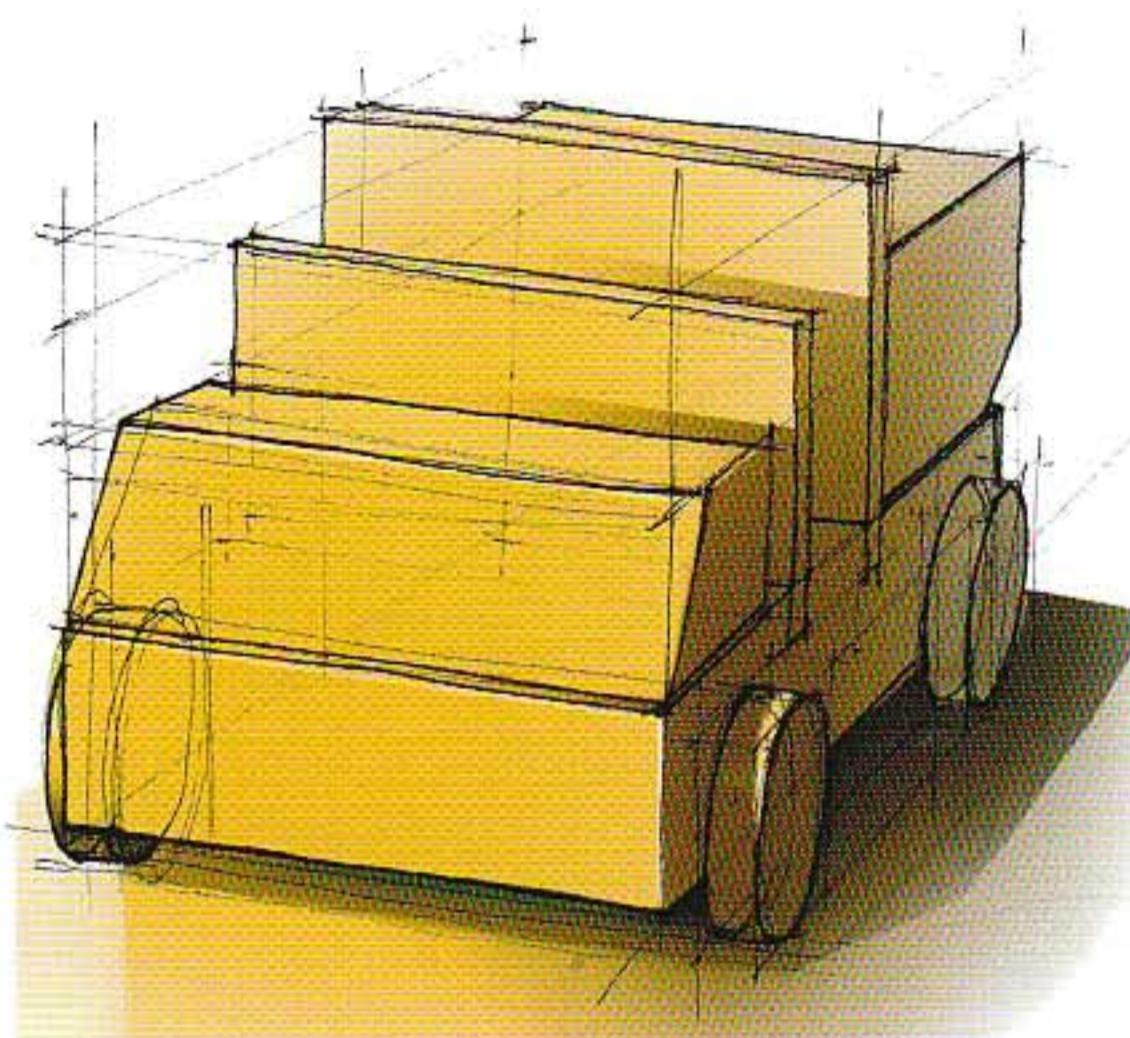


Numerous sketches were made to explore and visualize product ideas, not only to generate a flow of ideas, but also to be able to discuss them later or be stimulated to react to them with another drawing. Emphasizing potential ideas in sketches also maps the design process.

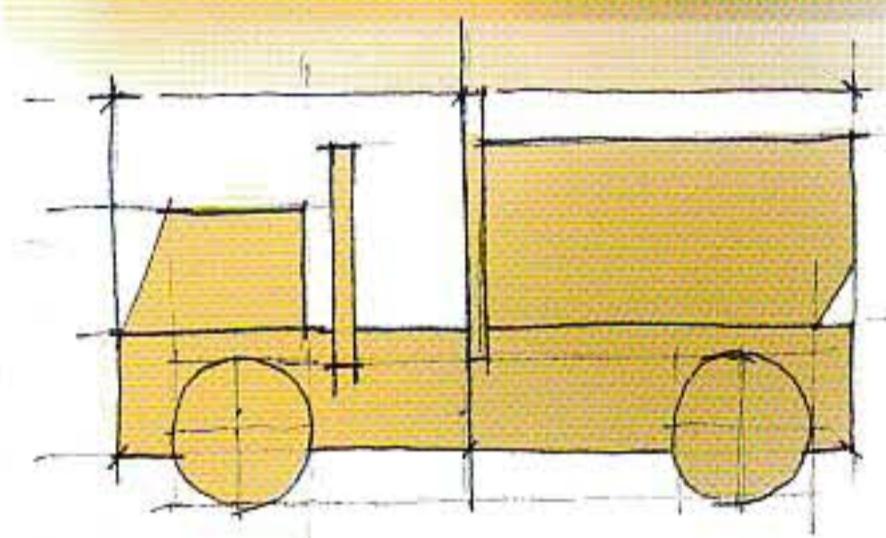
Viewpoint

Finding the best angle of view for a complete and informative representation of an object is sometimes difficult. One can look at an object from different heights, and from different directions. The choice of viewpoint causes certain parts and details to be hidden or revealed.

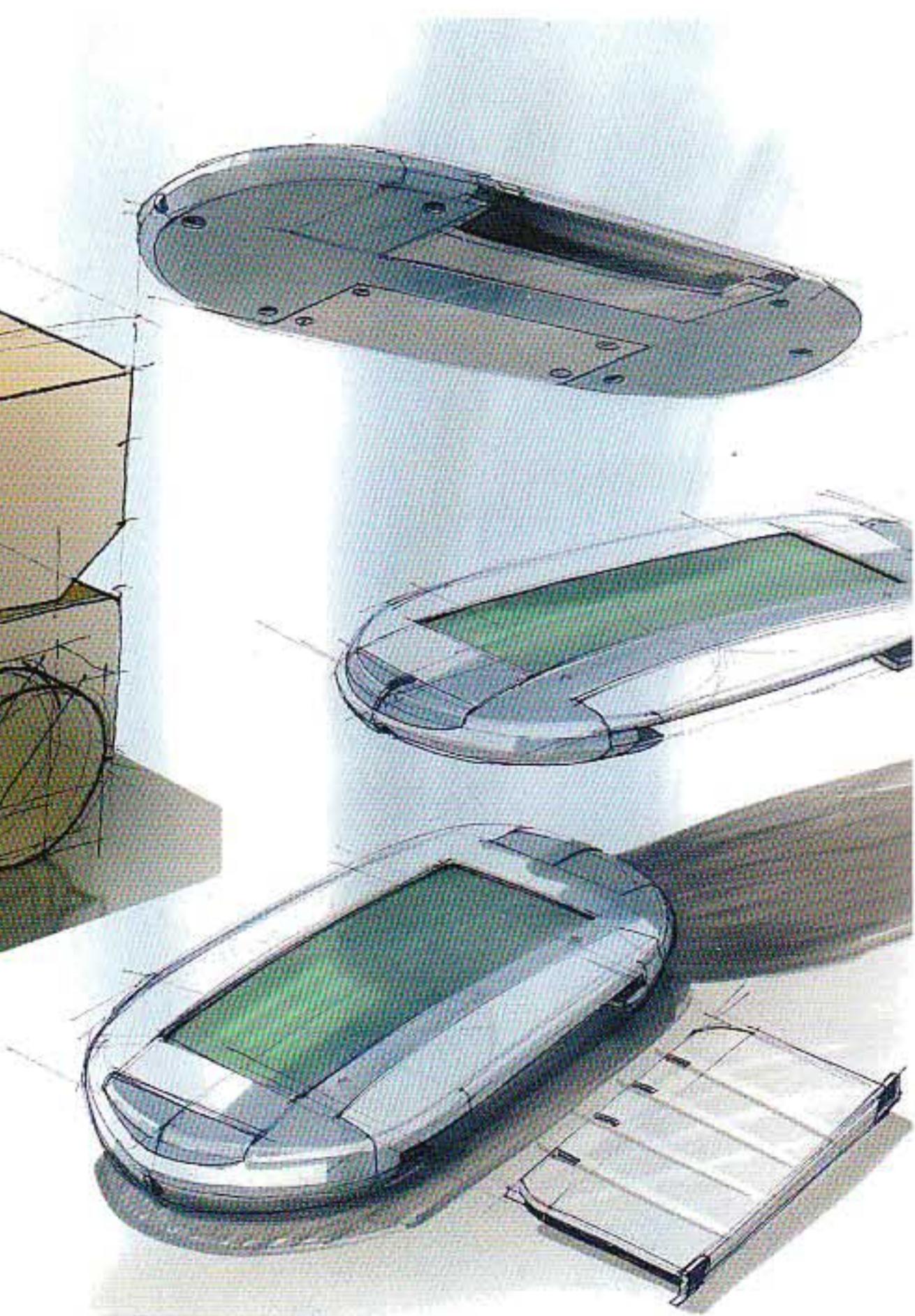
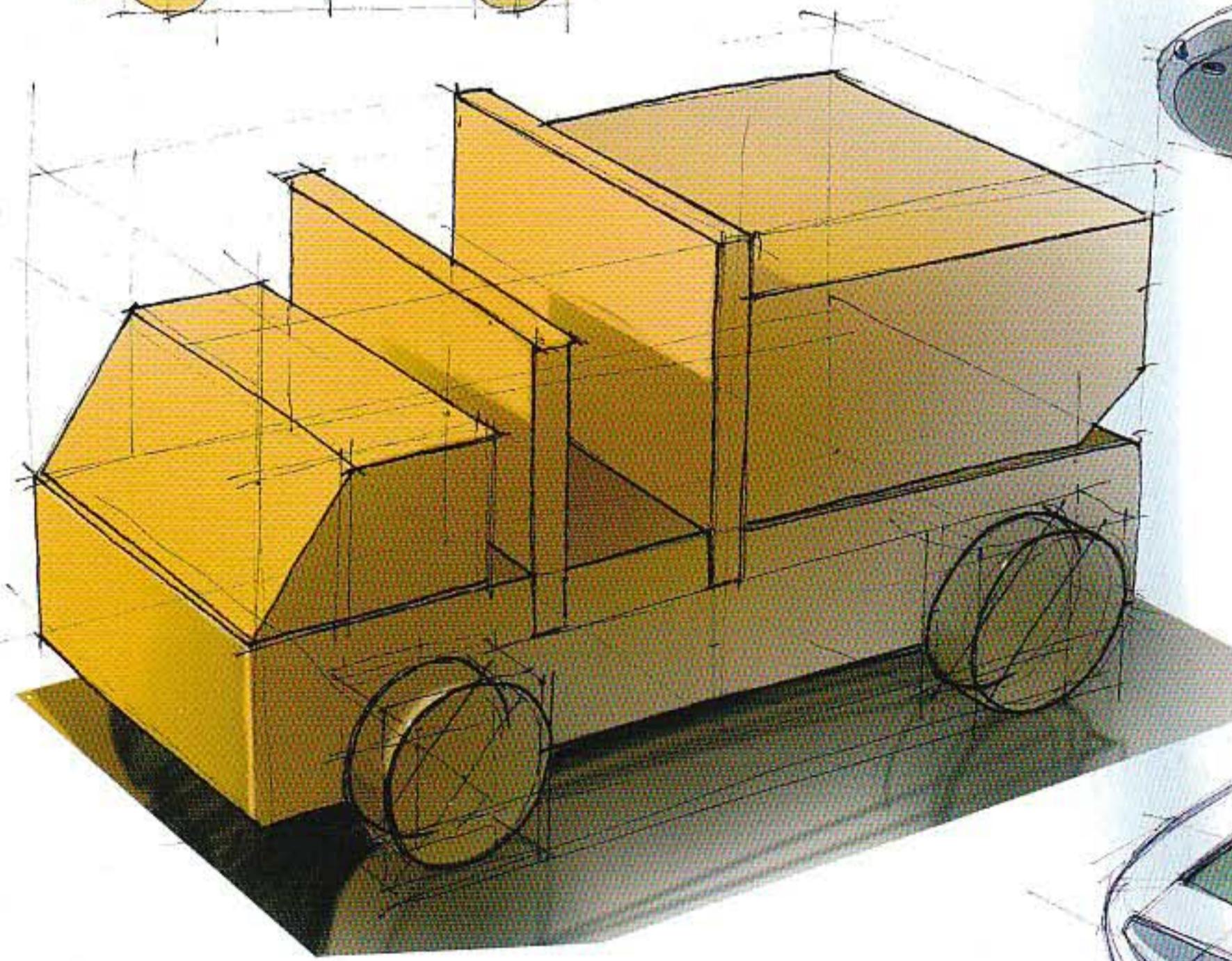
Objects usually have a side view that is most informative. In general, a drawing will be more characteristic (and informative) when this side view is only slightly foreshortened.



The more foreshortened a surface is, the less information it can display.

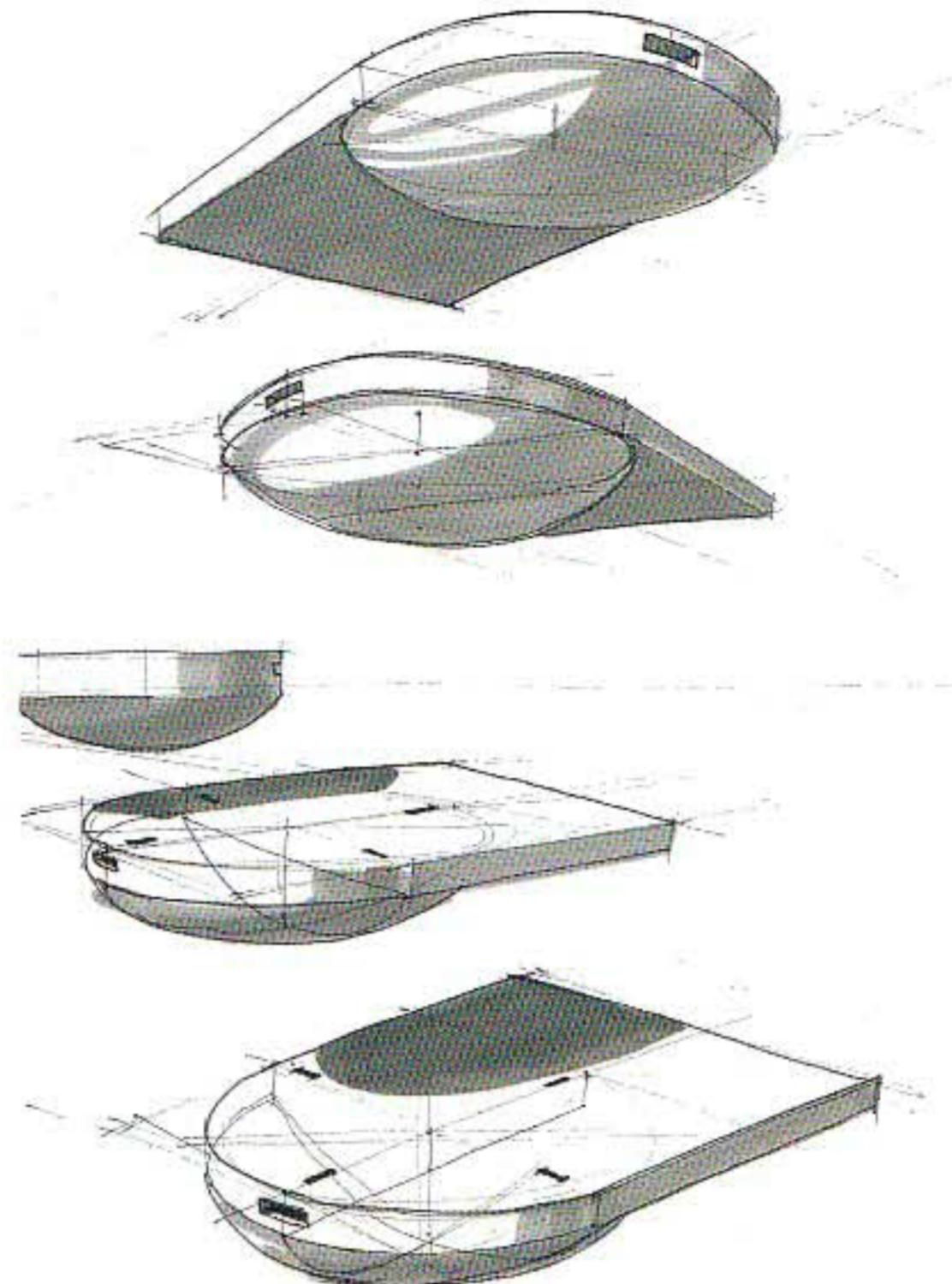


A design proposal usually needs more than one drawing to give enough information.

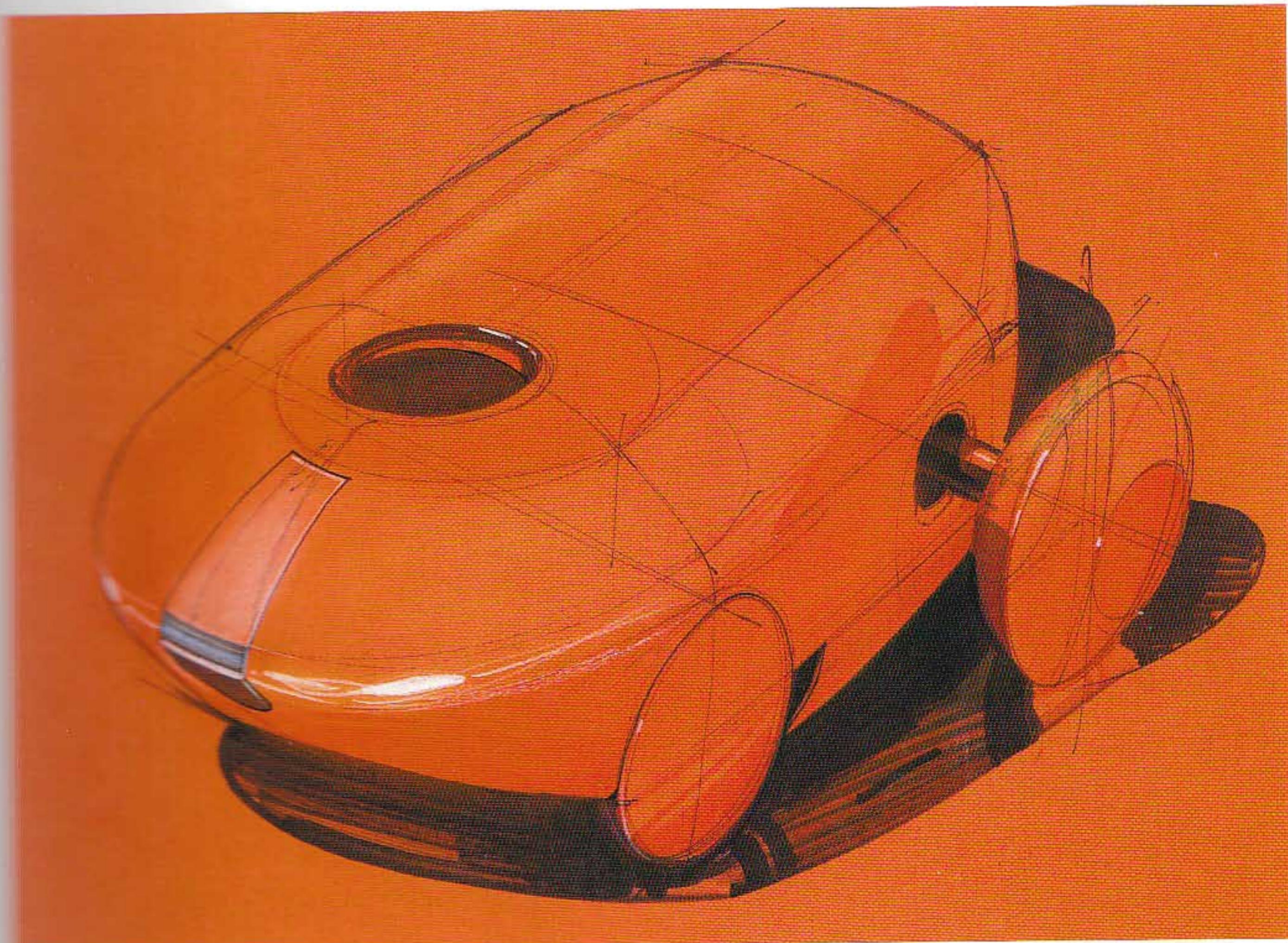


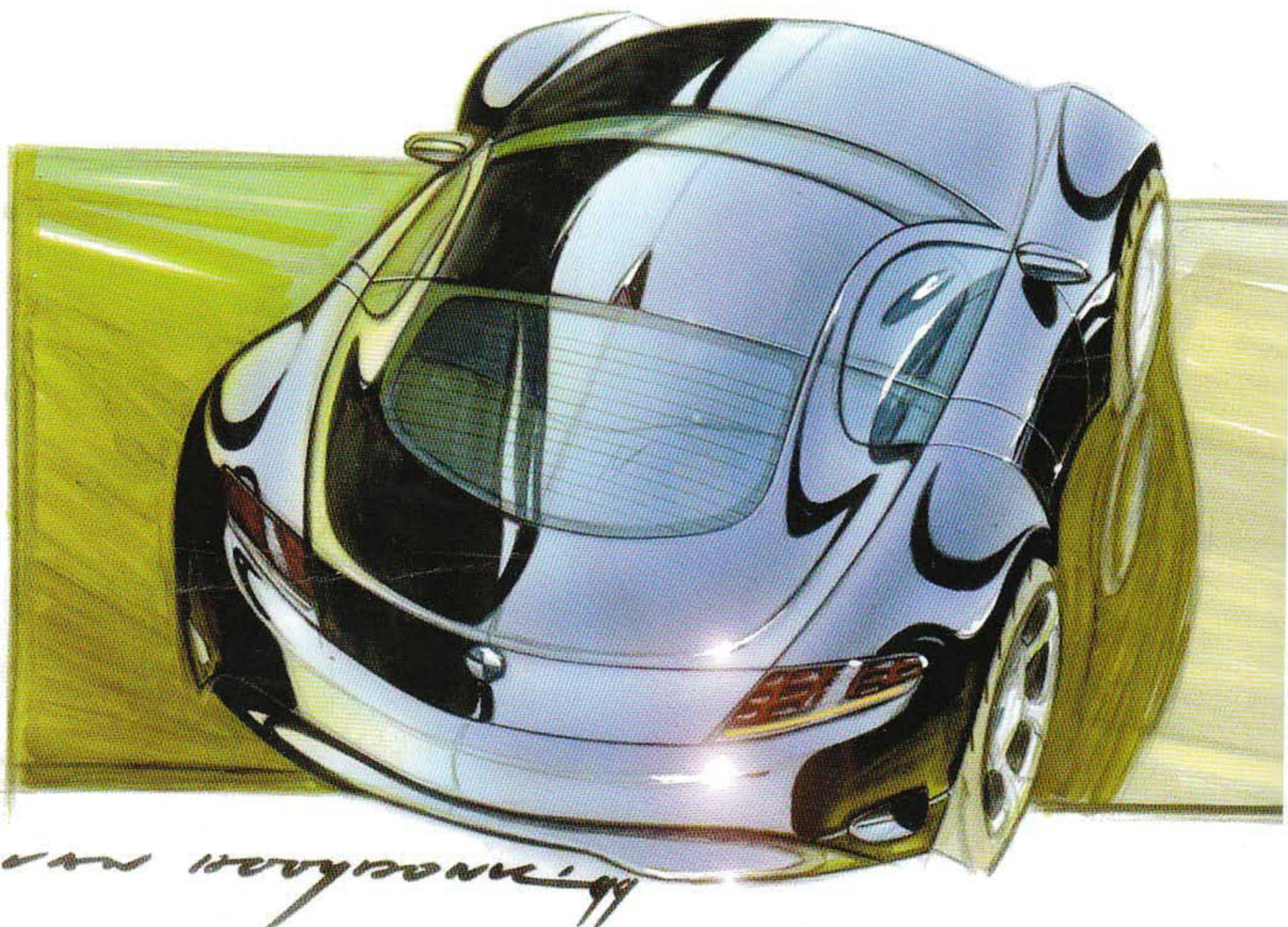


Look at the differences in visual information about the remote control. Both the overall curved shape and the details are more emphasized in the bottom picture. A relatively high viewpoint will normally be more adequate for exploring shapes, because it creates a sufficient and informative overview. Choosing a



viewpoint that resembles the user's point of view, also enables the viewer to relate to the object.

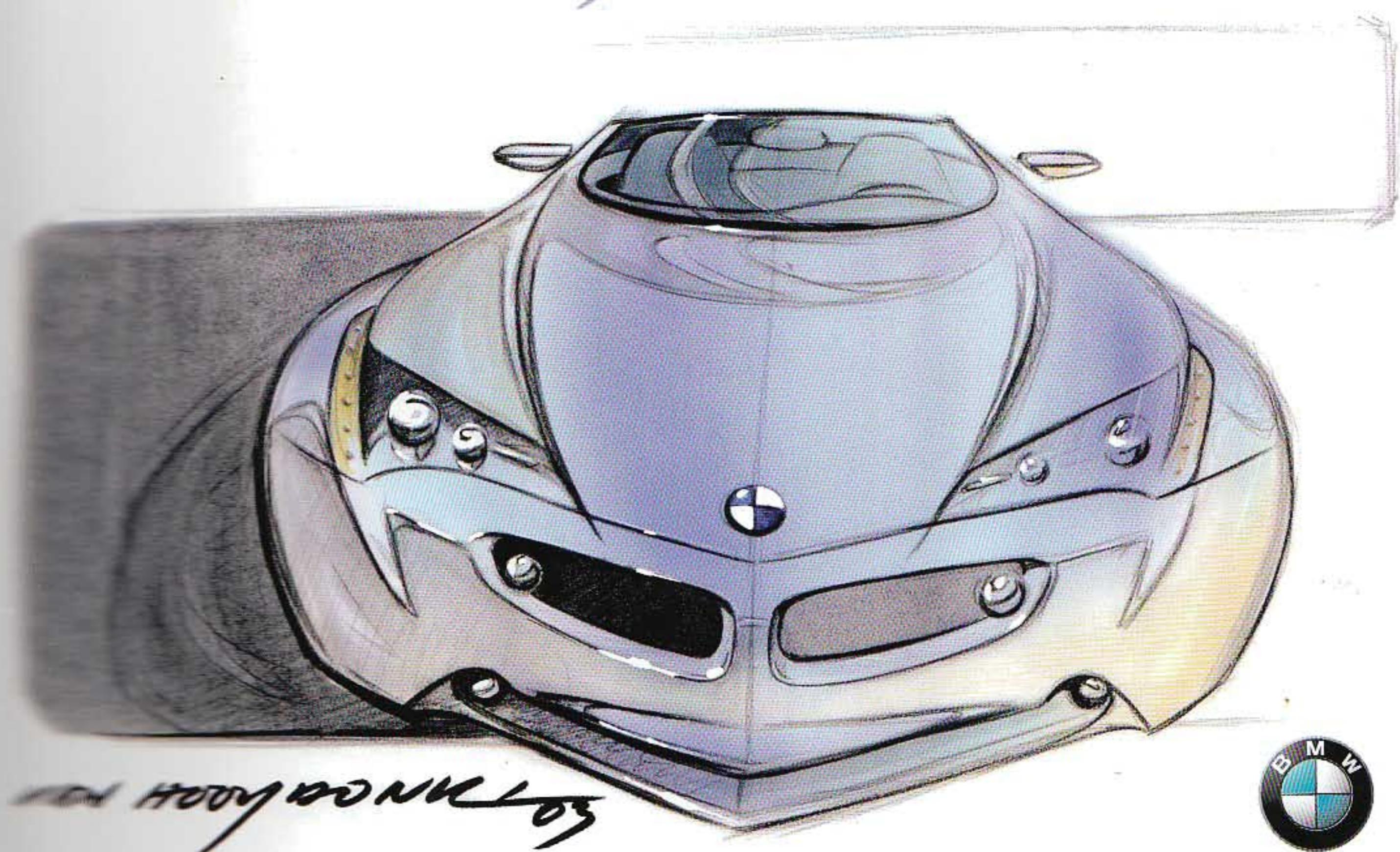
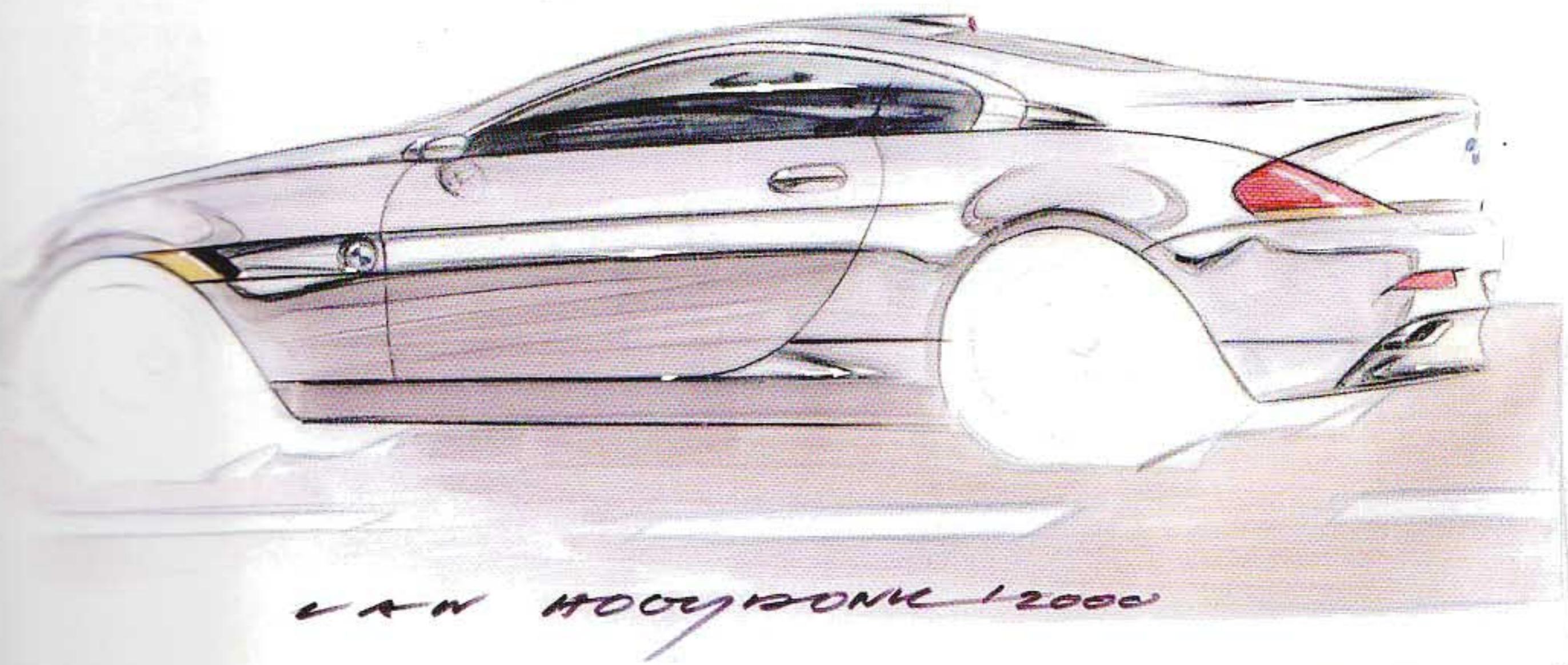




BMW Group, Germany – Adriaan van Hooydonk

This sketch for the BMW-Z9 concept car is drawn from an interesting angle. The choice of viewpoint highly influences the feeling of the vehicle, adding power. This viewpoint best shows the influence of the wheel arches in relation to the body of the car.

Actually, every aspect of this drawing is aimed at achieving this feeling, by using strong lines and the effect of highly polished surfaces. The sleek look of the BMW Z9, a show car sport coupé, hints at future automotive design.



the lightweight construction, the interior shows an interesting new philosophy about communication and driving comfort.

Two sketches by Adriaan van Hooydonk showing different angles of view: a sketch of the BMW 6-series and an impression of a Roadster. Both sketches

are made by starting with a pencil, adding marker and, in the case of the drawing below, pastel on both sides of Vellum.



DAF Trucks NV

DAF Trucks is part of PACCAR, a leading company in the transportation industry. The DAF Design Center is located in Eindhoven, the Netherlands, and is

responsible for the design of all DAF Trucks.

In 2006, DAF launched its new flagship, the XF105, and was awarded as 'International Truck of the year 2007'.

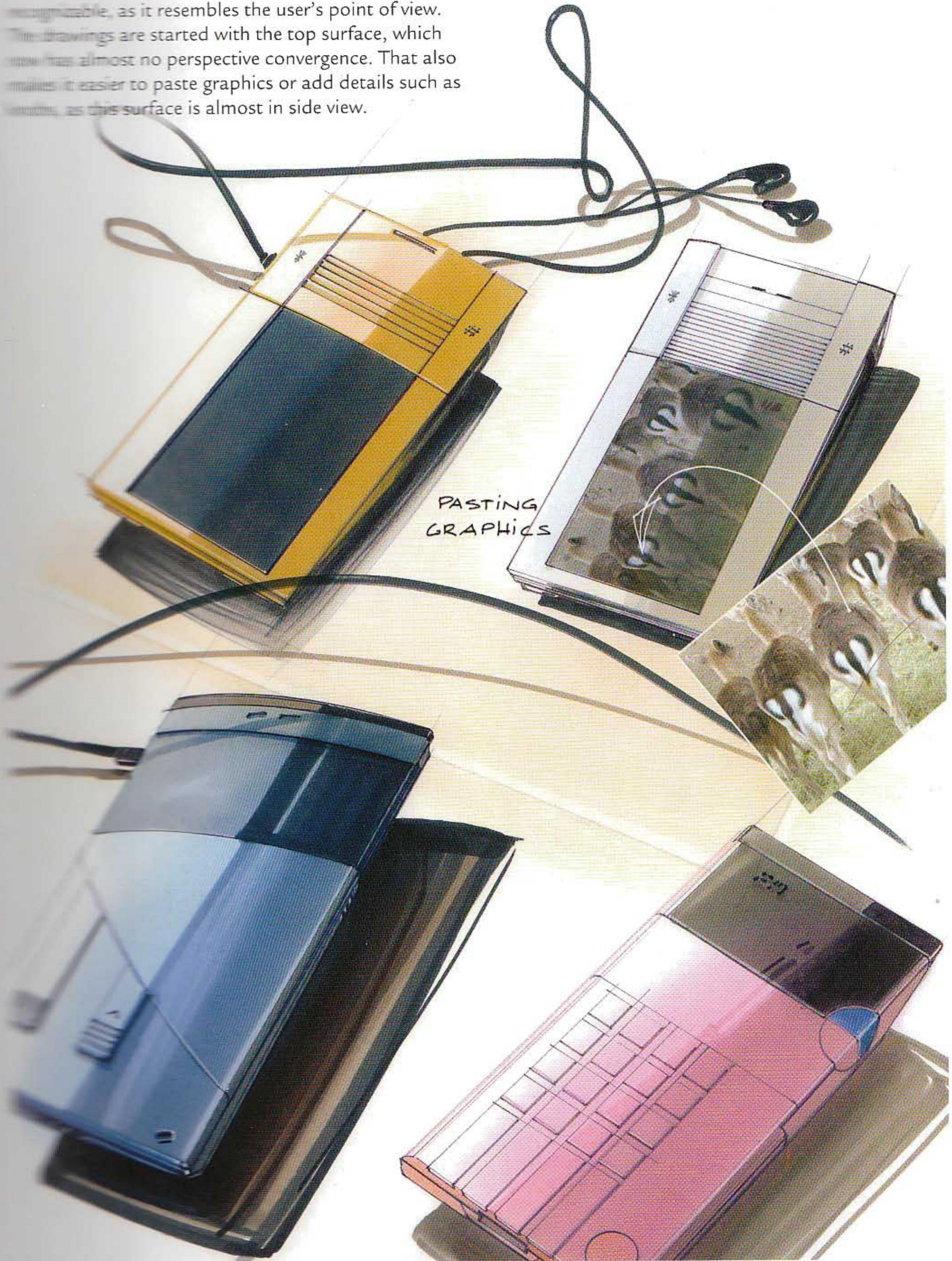
Comparing the actual DAF XF105 to the drawings

shows a remarkable coherence in feel and character. In each drawing, viewpoint and perspective are carefully chosen for a specific reason. An extreme low angle of vision provides an even more dramatic feeling of the impressive

length of this long-range truck. A tilted drawing can give a more dynamic sensation. Extreme perspective can produce effects such as these and can also emphasize particular details, such as rooftop lights.

Designers: Bart van Lotringen, Rik de Reuver

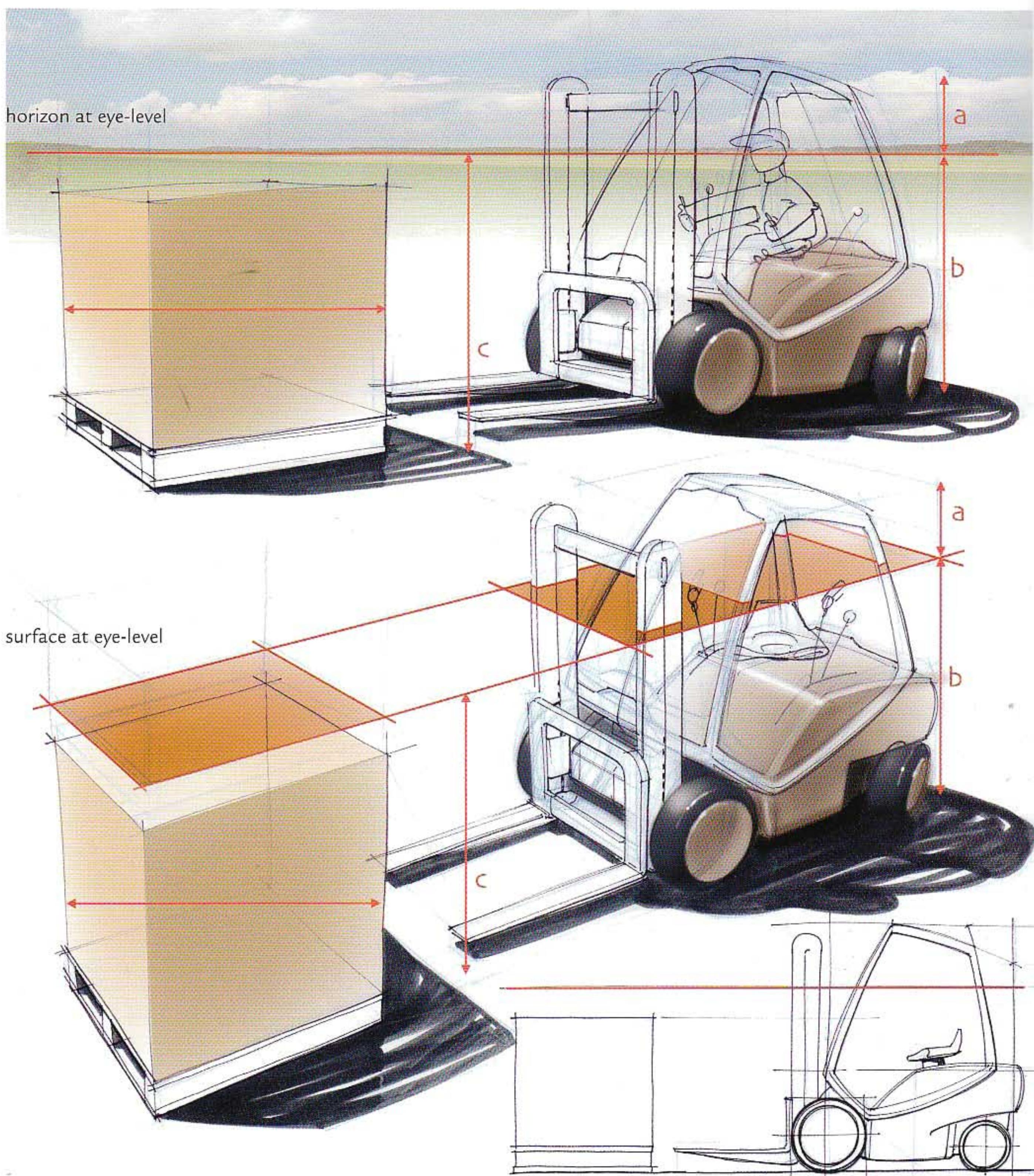
In the case of these handhelds, a very high viewpoint is recognizable, as it resembles the user's point of view. The drawings are started with the top surface, which has almost no perspective convergence. That also makes it easier to paste graphics or add details such as textures, as this surface is almost in side view.



Eye-level perspective

Whereas bird's-eye perspective can create an overview and enriches shape information, eye-level perspective suggests human-related size. Of course, one can directly sketch in eye-level perspective with the aid of the horizon. But it can also be easily derived from a drawing in bird's-eye perspective. A surface is drawn

at eye-level, intersecting the object. Lines above this surface will be above the horizon. All vertical lengths stay intact, as does their horizontal position, e.g. the width of the drawing; lines are only rearranged vertically.

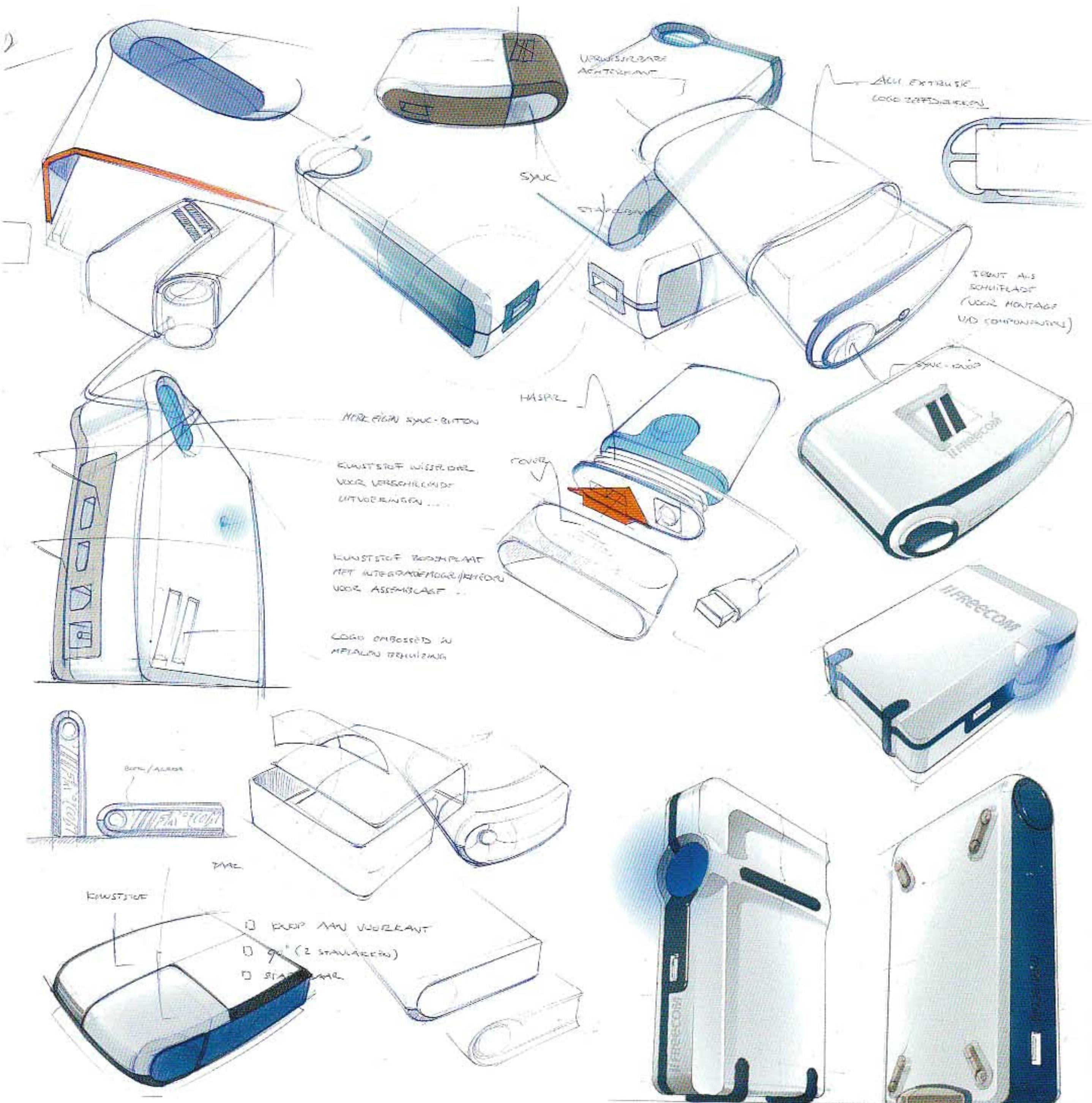




Extreme perspective

This perspective consists of an unusual viewpoint together with an exaggeration of perspective. A very low standpoint, where the surface of the ground meets the horizon (frog-eye perspective), can make objects appear impressive. A third vanishing point, for vertical lines, is introduced together with a lot of convergence.



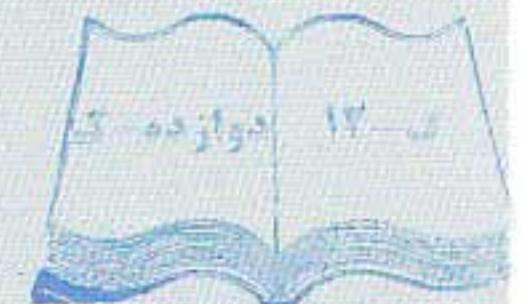


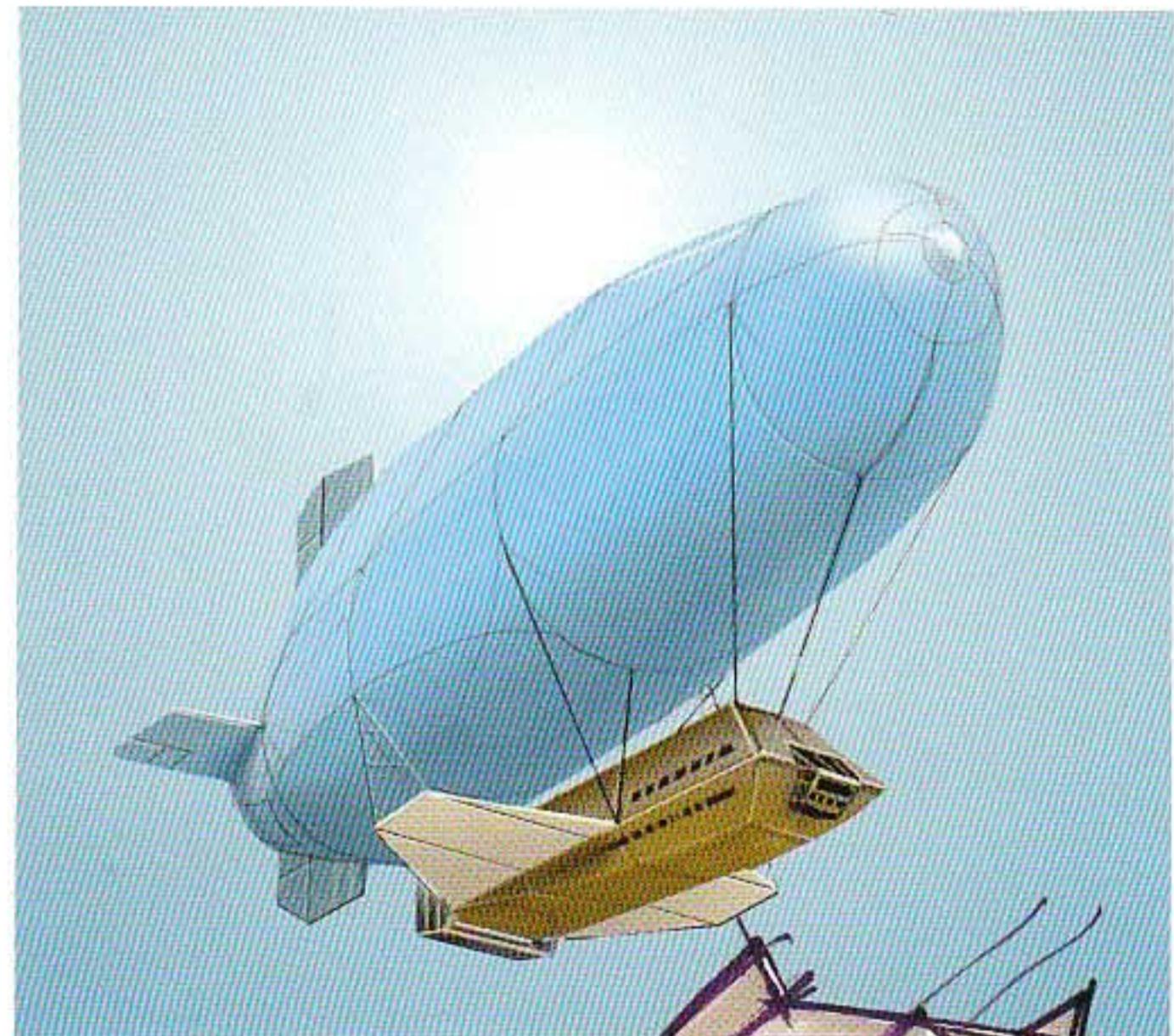
FLEX/theINNOVATIONLAB®

Portable hard disk for Freecom, 2004. The product has a clear identity, and serves as a design flagship for the entire Freecom product range. The use of extreme viewpoints and the accent on material reflection and light effects creates a clear idea of the design concepts.

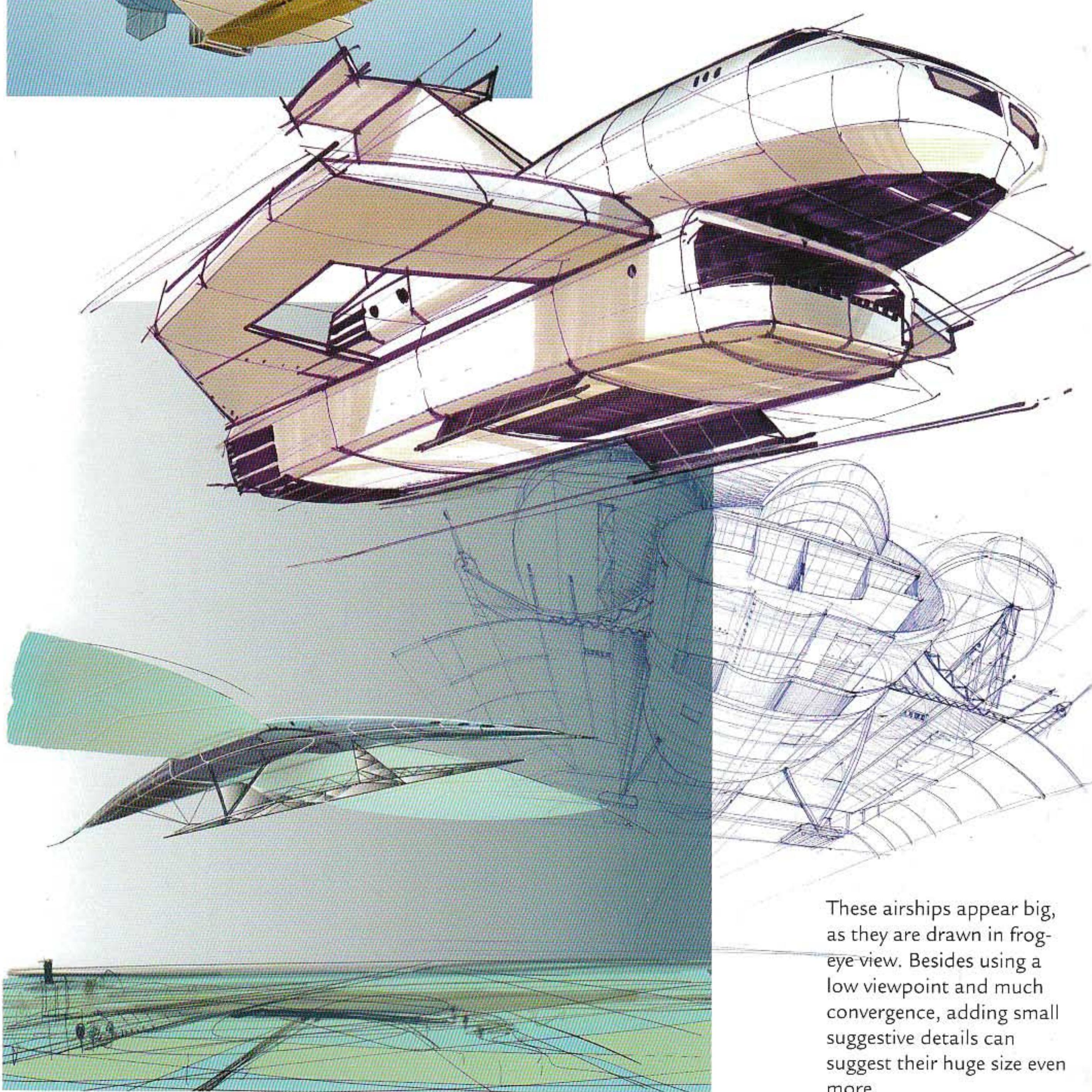


In the first instance, sketches were used to explore the possibilities of a new design language for Freecom. The next step was to define three different concepts and communicate the look & feel of the products.

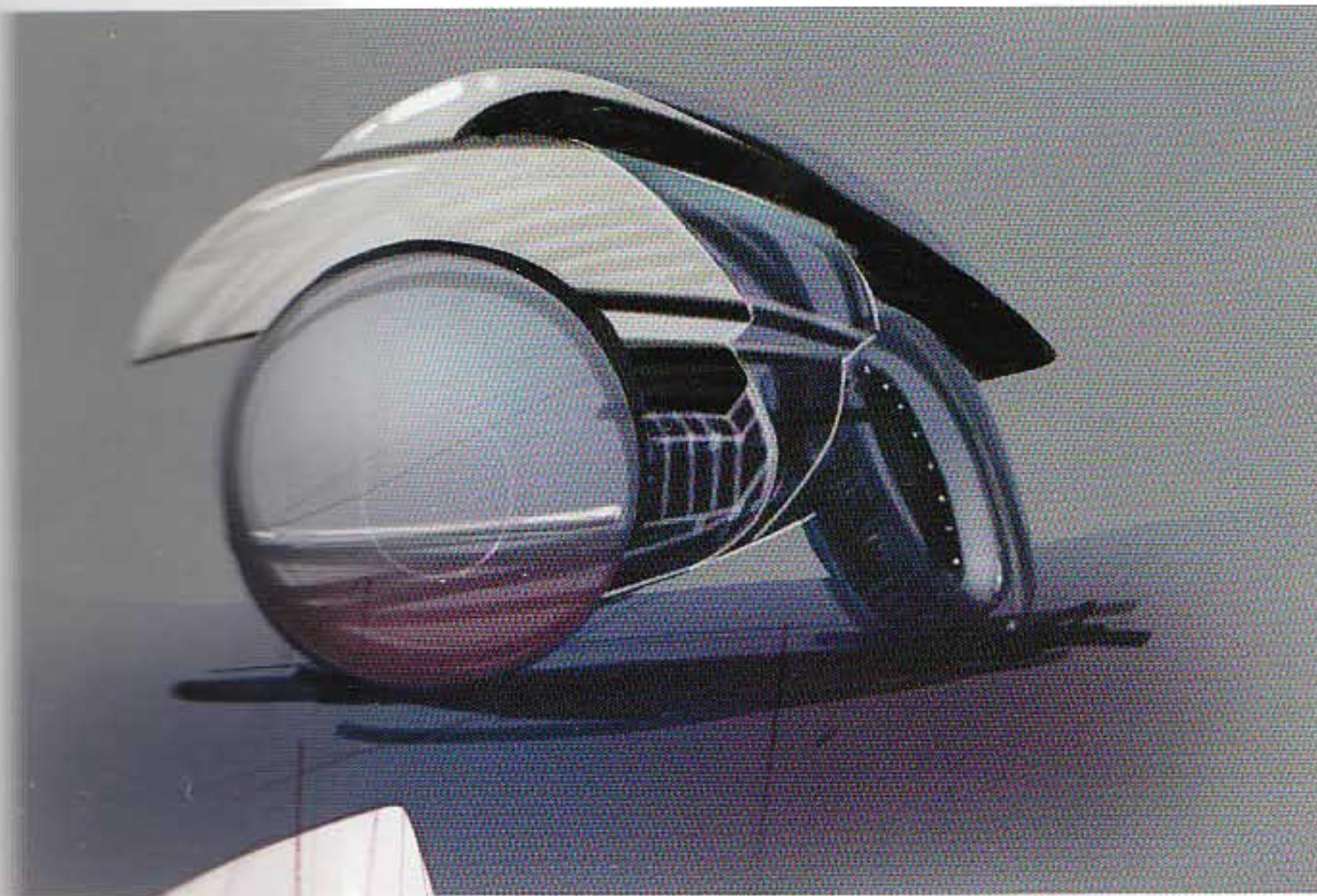




In extreme perspective, the object is deliberately distorted. The expression of the drawings is more important than the exact shape of the objects. It is generally used to impress, to underline a feel of drama, speed, or power. In the suitcase sketches, extreme perspective was chosen to communicate strength and durability.



These airships appear big, as they are drawn in frog-eye view. Besides using a low viewpoint and much convergence, adding small suggestive details can suggest their huge size even more.





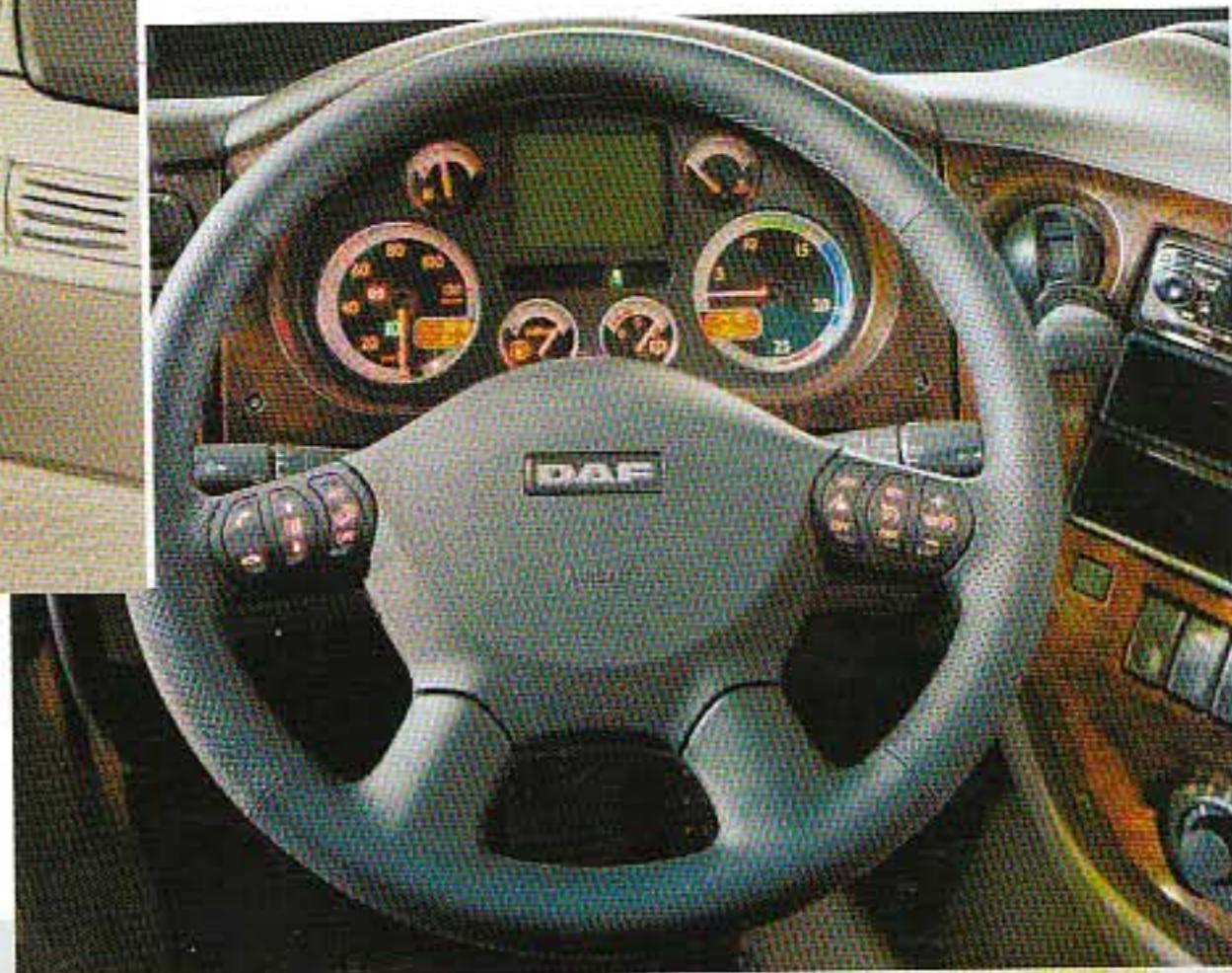
DAF

A PACCAR COMPANY

DAF Trucks NV

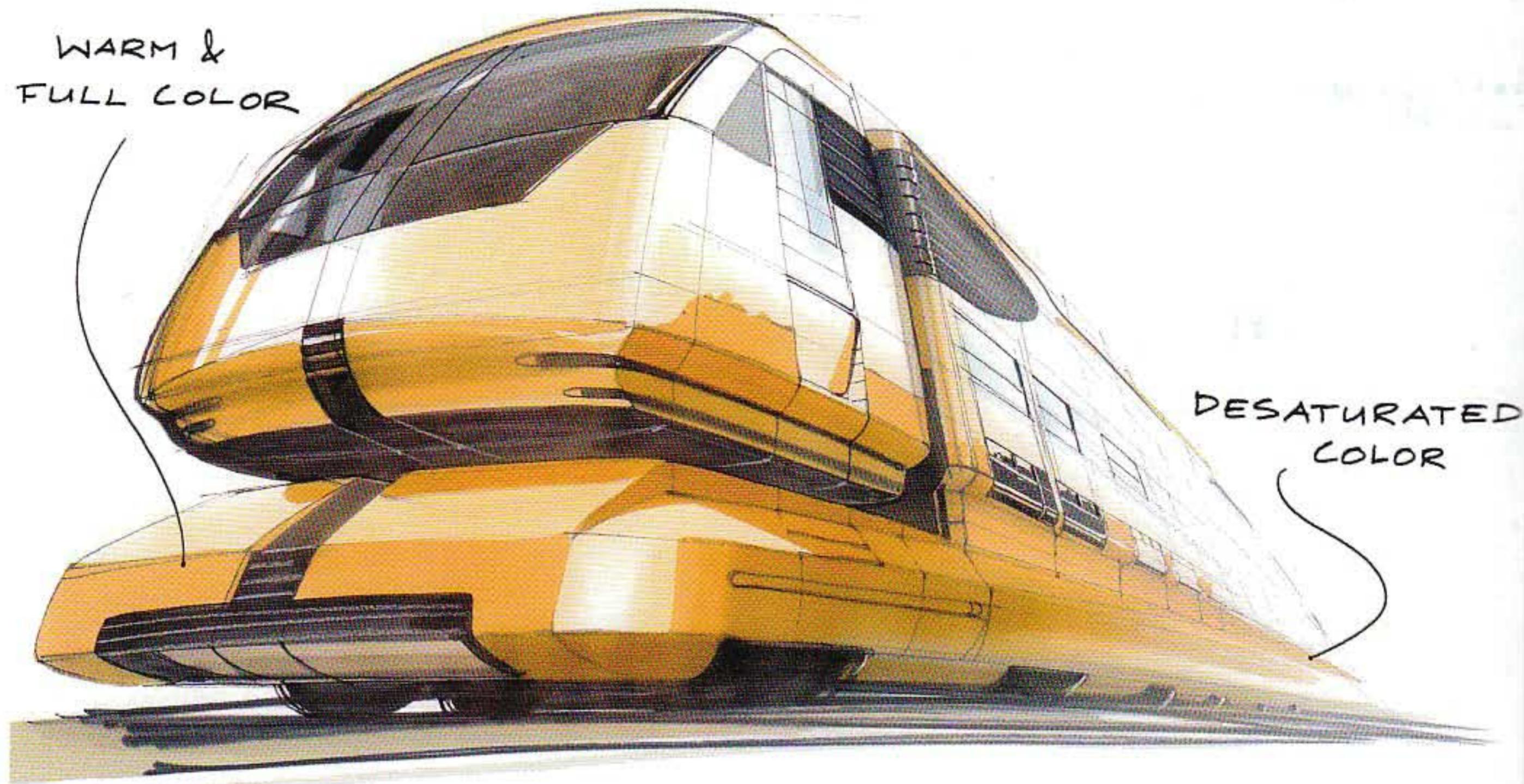
DAF XF105 / CF / LF Truck interior, 2006. In drawing interiors, choosing an appropriate viewpoint is crucial. To give an overview of the interior and at the same time create a feeling of being inside a truck, the perspective is sometimes exaggerated.

Designers: Bart van Lotringen, Rik de Reuver, Gerard Batem



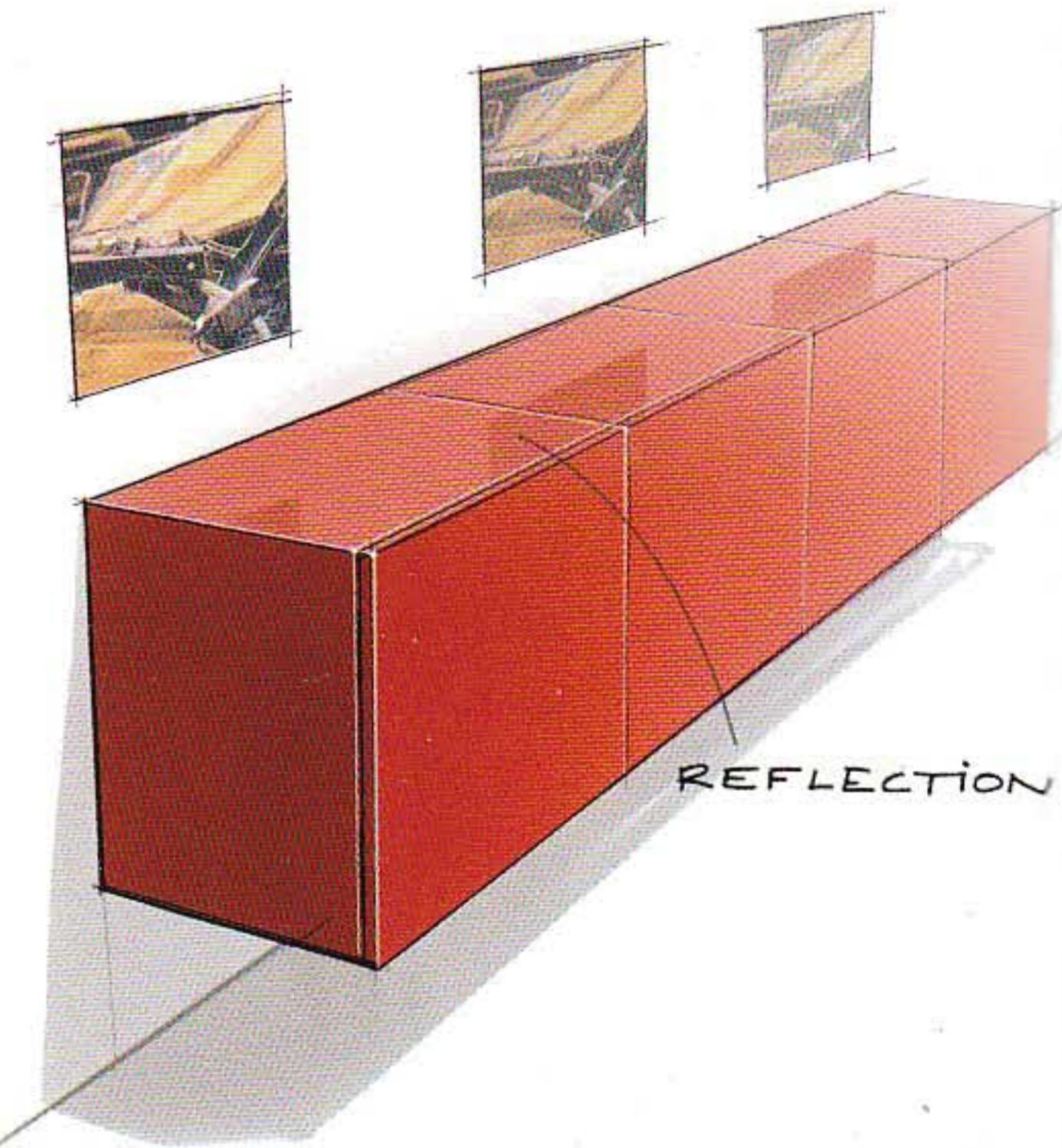
The point is chosen from, or near to, the driver's position. Here, exploratory sketches of the position of the control panel and handles were necessary to examine the layout of the cockpit itself. The resulting details were drawn separately and

emphasize the precision look of the instrument panel. A transparent circle visualizes the driver's reach. Pictures taken afterwards are used to analyze the design process, so as to learn from it and look for new challenges.

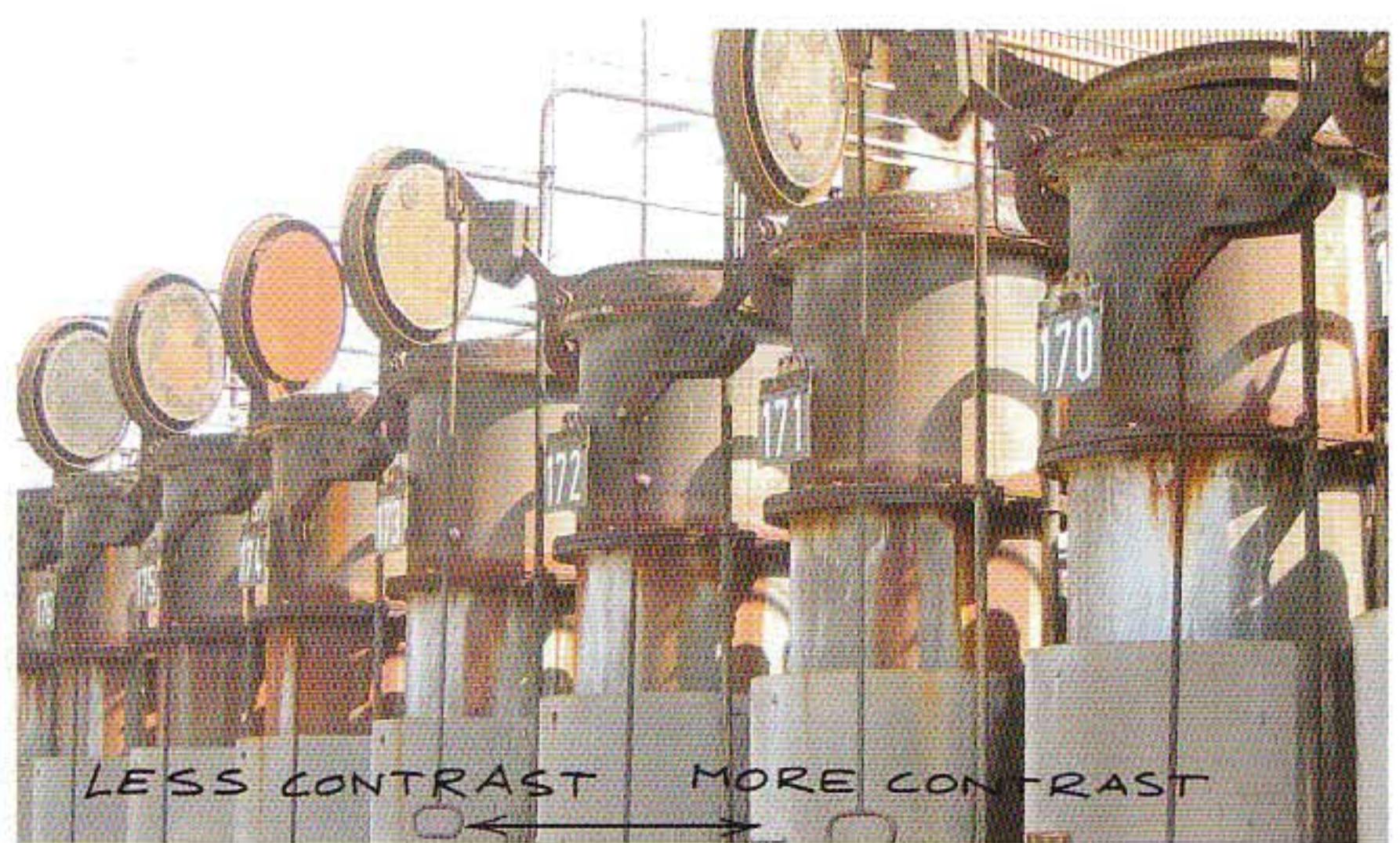
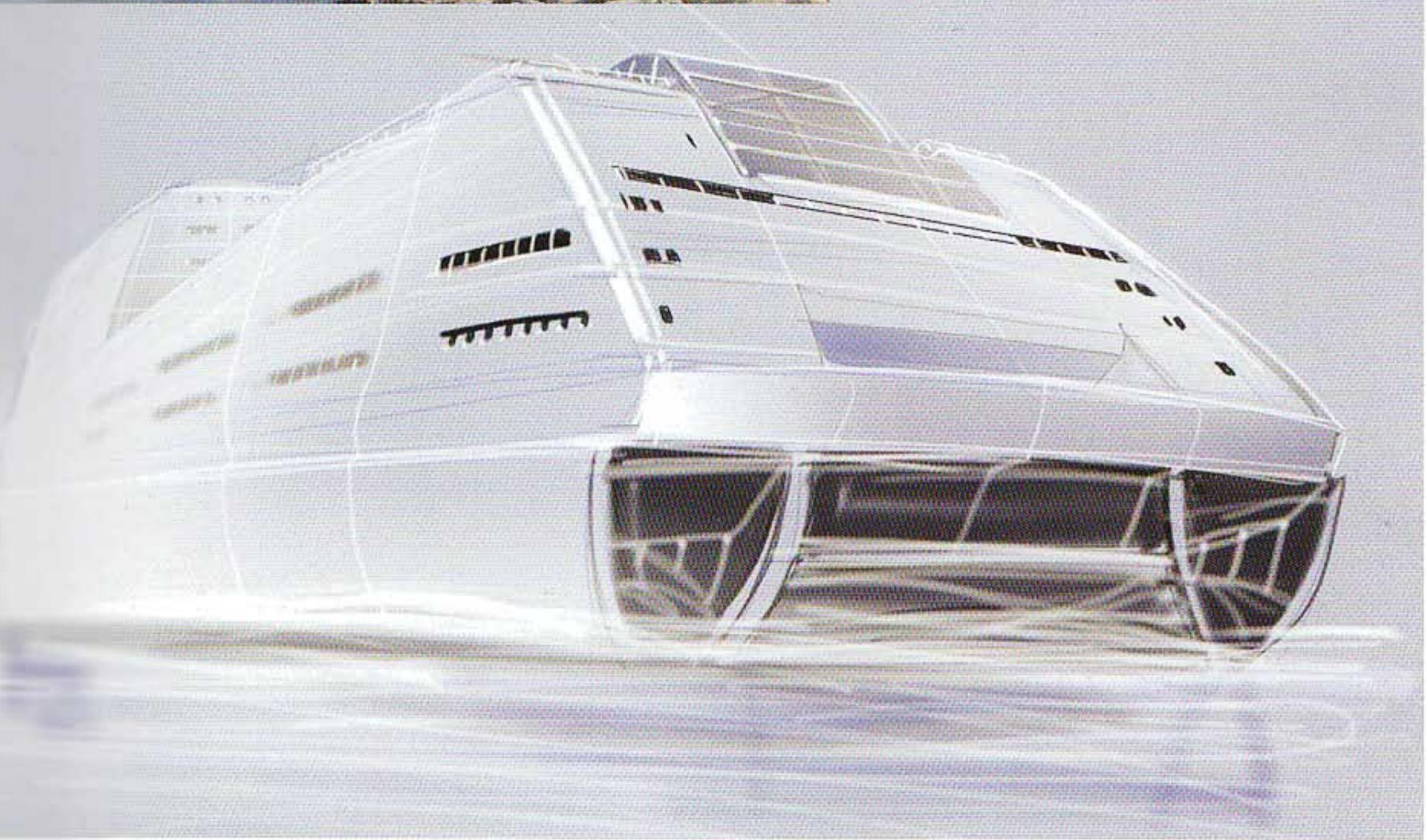


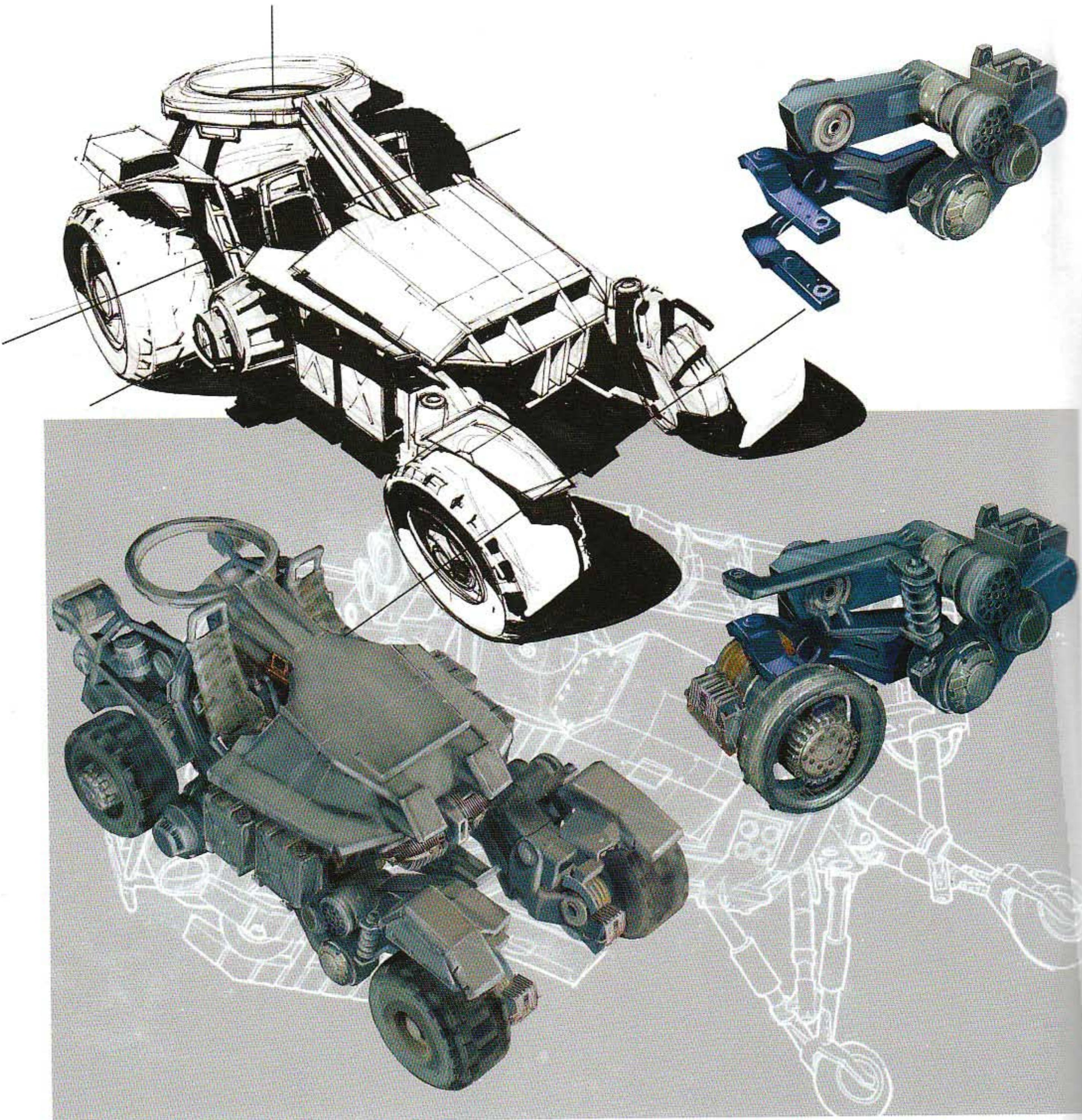
Aerial perspective

In order to suggest depth, colour values are important. Nearby objects are seen as having more contrast and more saturated colours. As the distance of an object increases, its colour and shading will be perceived with less contrast and less saturation. Eventually, objects will appear bluish. As a result, rich and warm colours are generally perceived as being closer than cool colours. Objects with much contrast tend to appear closer than objects with little contrast.



When drawing large products, the phenomenon known as aerial perspective can emphasize their size. But a feeling of depth can also be added in a drawing of smaller objects. Letting an object 'fade out' towards the back can be a combination of several effects, resembling aerial perspective but also the 'out of focus' effect seen in photography. At the same time, light reflections on shiny surfaces also cause a whitening of the object towards the back.

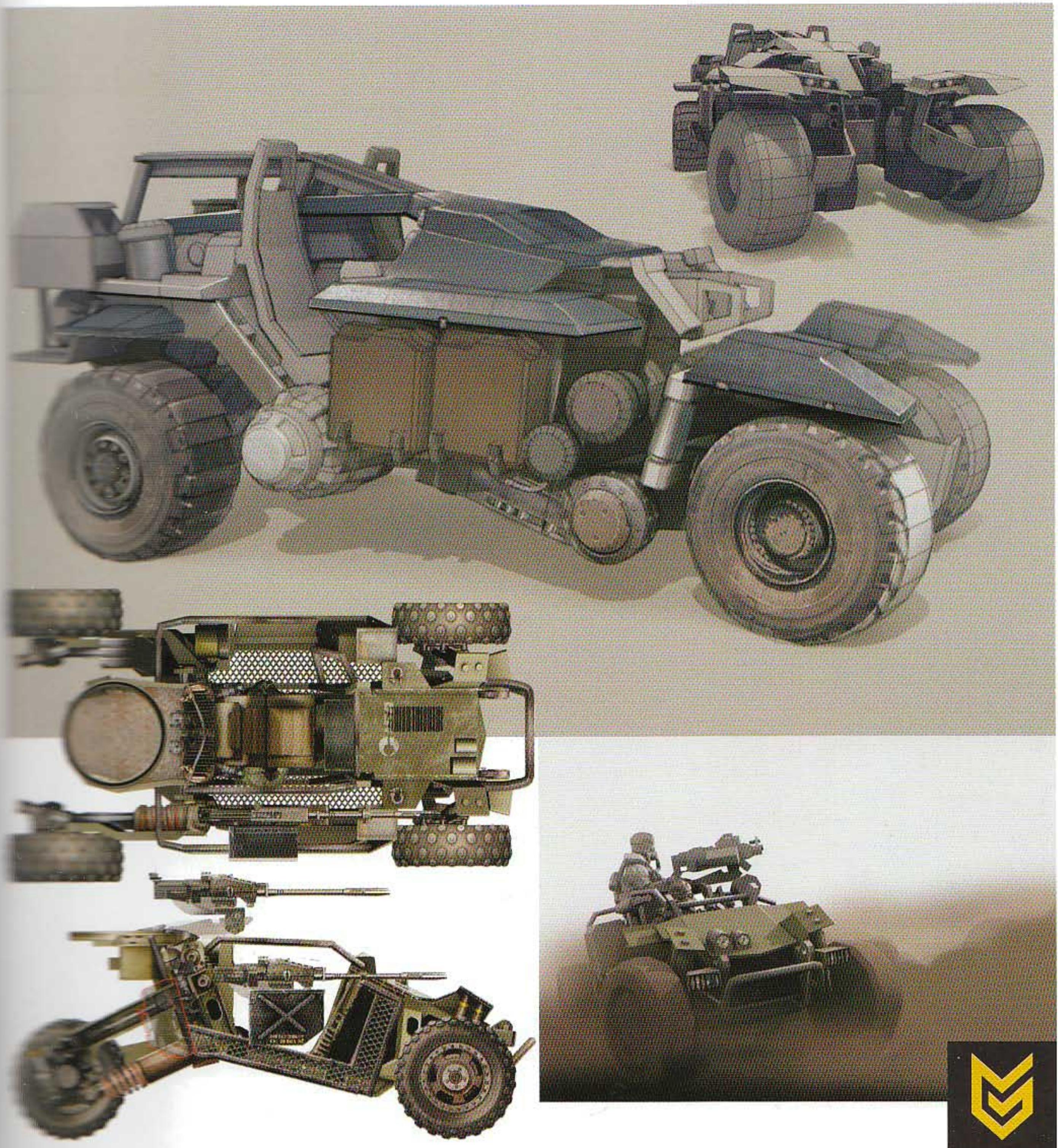




Guerrilla Games

This young but rapidly expanding studio has a growing reputation as one of Europe's leading game developers. As a result of its successful release of *Killzone*, the company was acquired by Sony Computer Entertainment in 2005. Guerrilla produces its games

in-house and designs them from the ground up. Its relatively large concept art department designs and visualizes the different surroundings, characters and vehicles in its games. In comparison to other game studios, Guerrilla puts extra effort into creating concepts that have functional credibility. Because of the virtual nature of the games, it is not necessary



For these concepts to be fully functional but simply provide that impression, adding to immersion in the overall game environment. These pages show examples of concept work created for the trailer of *Doom 3*, Guerrilla's game for Sony's Playstation 3. Although the end products of the gaming industry are computer-generated realities, a large amount of the

visuals in their development is drawn by hand – not only in the early stages of preproduction, but also later on in the design process, where shape optimizing and detailing, for example digital sketching techniques, are applied.



One of the gaming industry's goals is to render with a minimum amount of memory use but with a maximum suggestion of realism. Before making the final in-game models, visuals like the ones above are used to find the optimal utilization of textures. These drawings are digitally painted, using 3D models and photos as reference. They are utilized to show both the design and its placement within the game

environment. Based on these types of paintings, concepts are evaluated as to whether or not they fit the overall mood and style of the game. The use of exaggerated aerial perspective can also be seen in the previous drawings. In the gaming industry, aerial perspective is regarded as a tool. It creates more depth and realism, and requires less computer memory for rendering.



Simplifying shape

Learning to effectively draw complex shapes has a lot to do with the ability to simplify. When drawing a complex shape, understanding the underlying structure of a product's physical appearance is as important as learning about perspective.

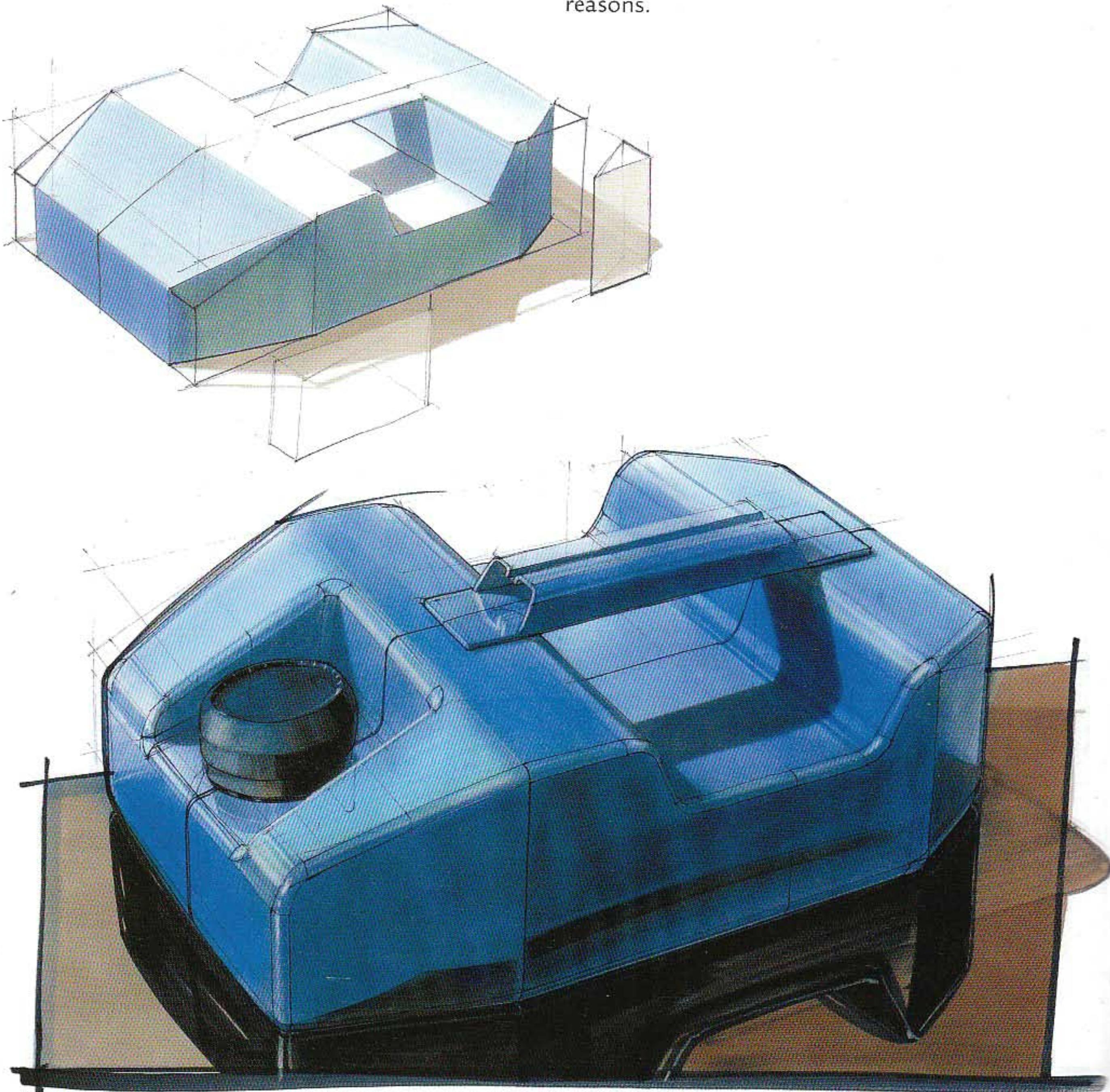
Drawing decisions are closely related to the ability to deconstruct and restructure, which is also a common approach to design, embedded in various design methods such as design thinking. Learning to see or analyze helps you to break down complex situations into understandable,

straightforward steps. Every product can be structurally analyzed: What is its basic shape or shapes, how are parts connected and what are the relevant details? Making a plan by deciding what is essential and what is not shows you how to start, what to do next and how to finish a drawing. This analysis defines your drawing approach. An effective analysis results in an effective drawing. In this chapter, complex and simple drawings are compared to emphasize this effective approach to drawing.

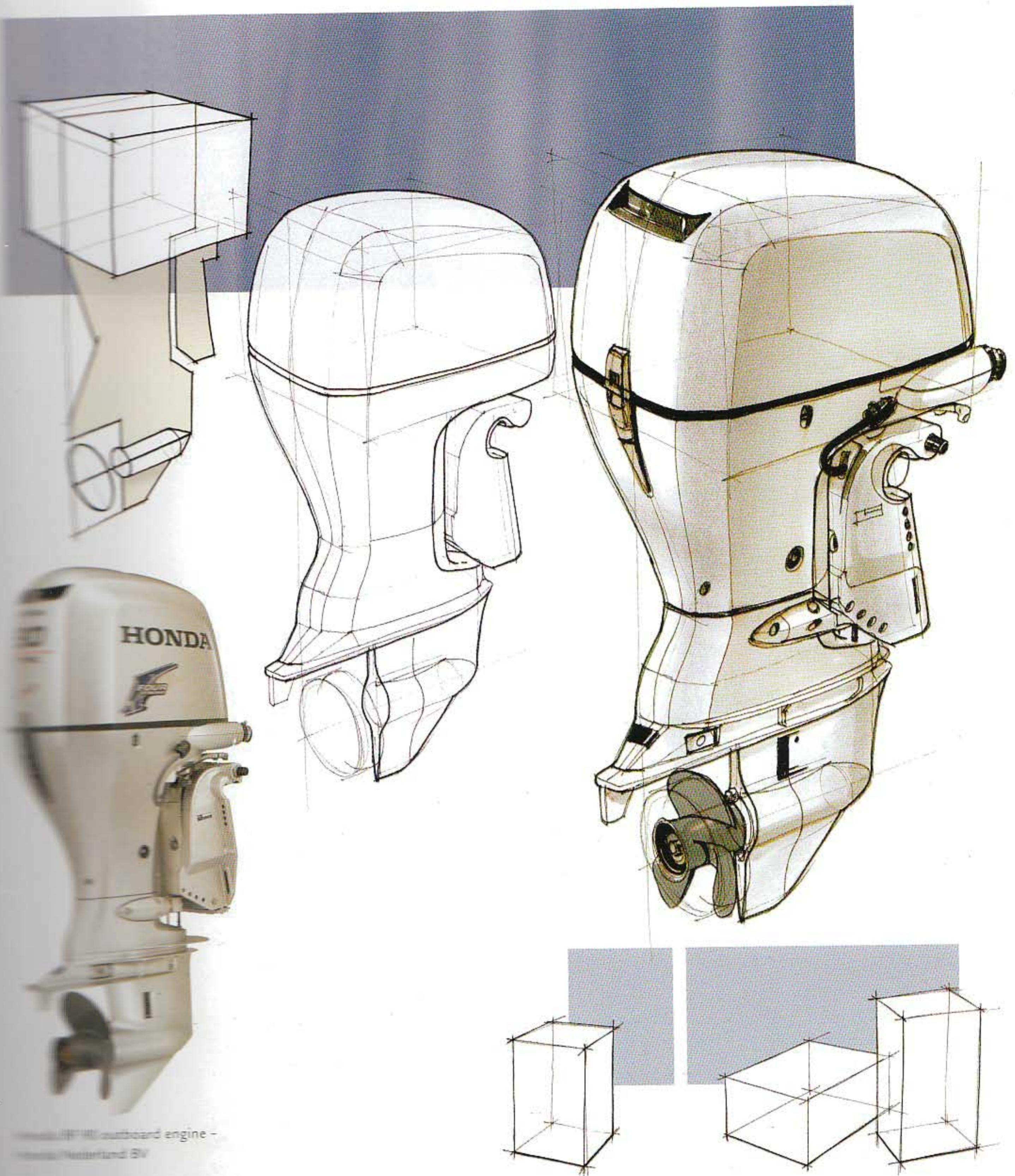


Analyzing

Having an effective plan will greatly simplify and speed up the drawing process. Finding efficient ways to make a simple representation of a complex shape by analyzing its shape and characteristics can be a helpful exercise. Spatial effects in general can be taken into consideration in the same way, for various reasons.



A simplified surrounding, for example, can emphasize a sketch, as seen above. It can also add more depth, or influence overall aspects of the layout, such as contrast or composition.

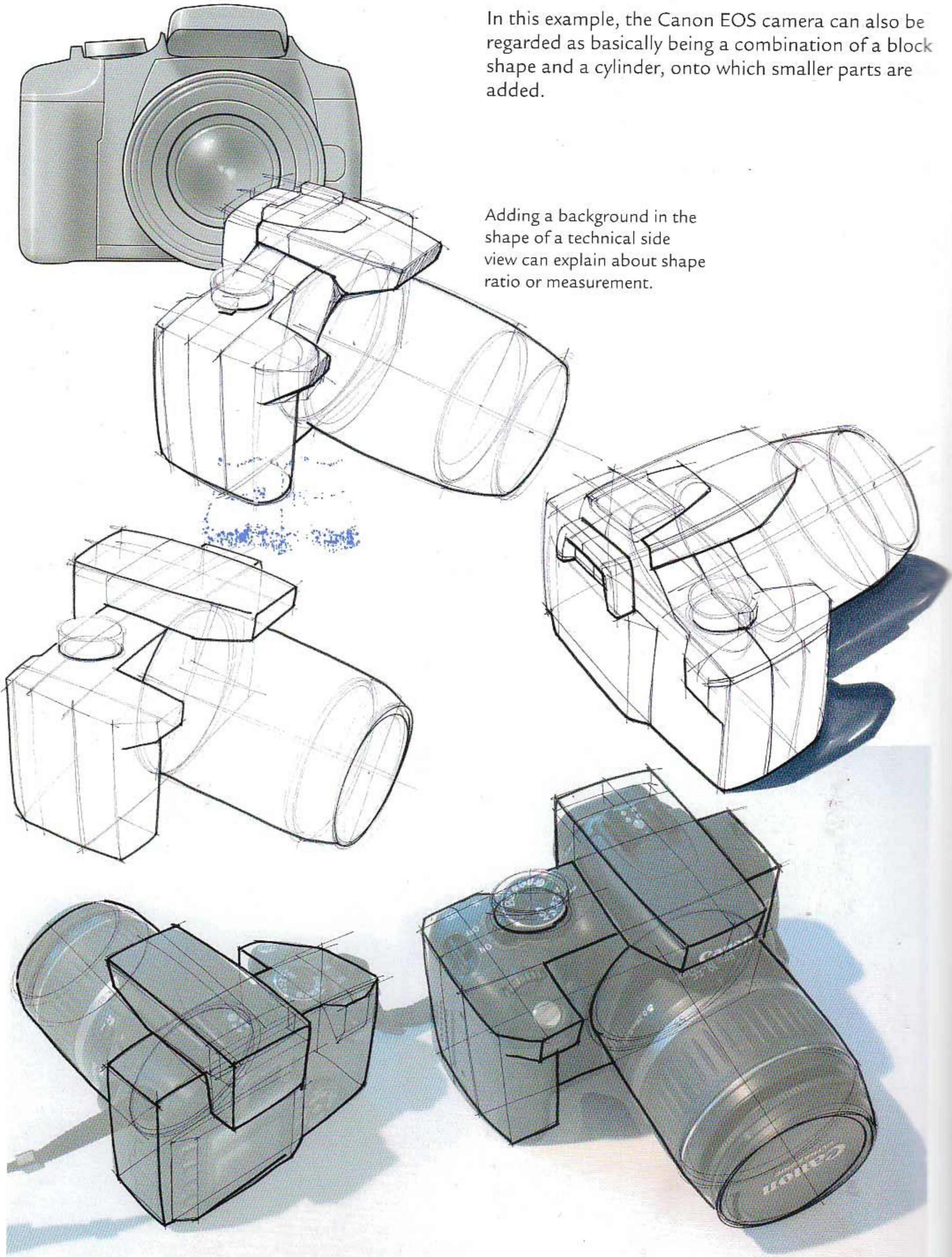


Honda F150 outboard engine –
© Honda Motor Co., Ltd.

The basic shape of this Honda outboard engine can be simplified as a block shape and a vertical plane or two planes. The cover is wrapped around the hardware like a glove. The shape transitions are smooth and gradual. You can see these transitions better if the details and graphics are left out.

The rectangular background here is based upon the principle of overlap. It adds more depth to the drawing by representing a further distance away

and causes the sketches to stand out more, especially when a cool or desaturated colour is used. In this case, it is also a way to group sketches together.



In this example, the Canon EOS camera can also be regarded as basically being a combination of a block shape and a cylinder, onto which smaller parts are added.

Adding a background in the shape of a technical side view can explain about shape ratio or measurement.