

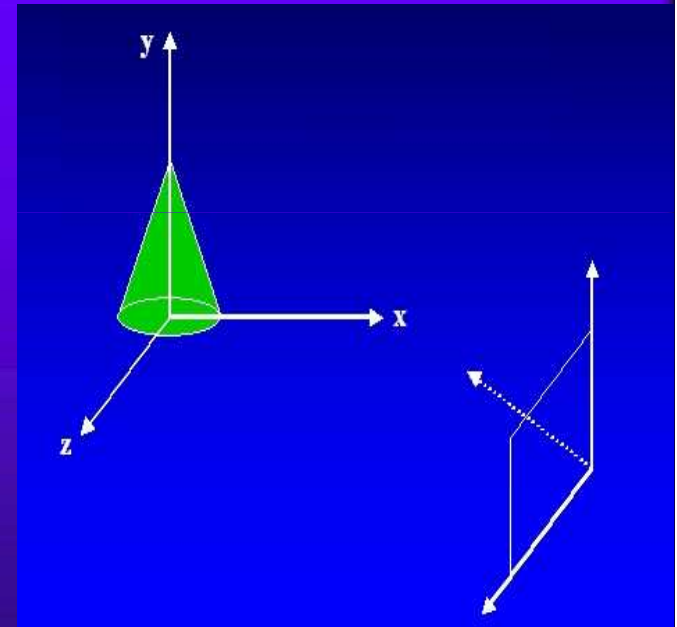


Three-Dimensional Concepts

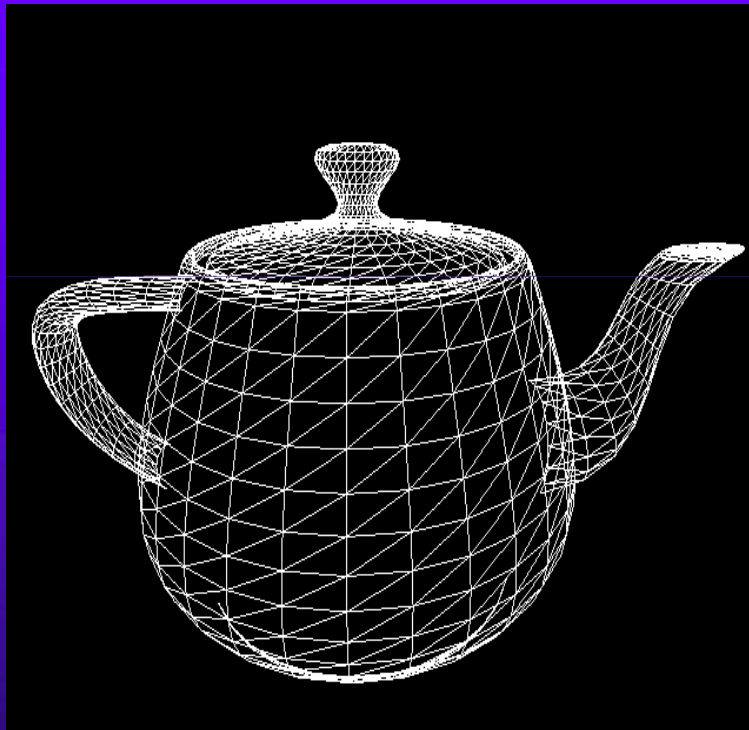


Coordinate Reference

- ◆ To obtain a display of 3d scene that has been modeled in world coordinates ,set up a coordinate reference for the camera.
- ◆ This coordinate reference defines the position and orientation for the plane of the camera film.
- ◆ Object descriptions are transferred to the camera reference coordinates and projected onto the selected display plane.
- ◆ We can display the objects in wireframe form or we can apply lighting and surface rendering techniques to shade the visible surfaces.



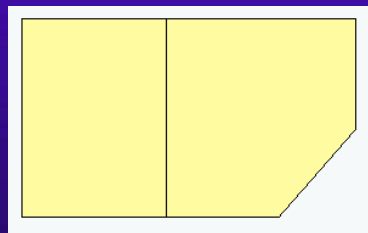
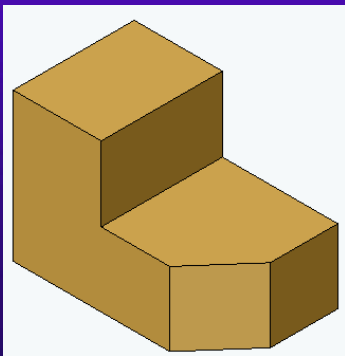
Wireframe



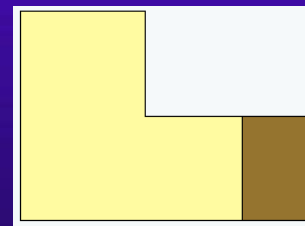
Three-Dimensional Display Methods

Parallel Projection

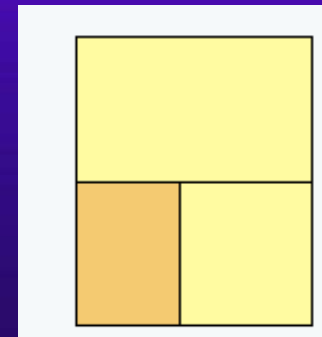
- Generates view of a solid object.
- Project visible points on the object surface along parallel lines onto the display plane to obtain 2d view.
- Parallel lines are still parallel after projection.
- Technique used in engineering and architectural drawings which maintain relative position of the object.



Top View



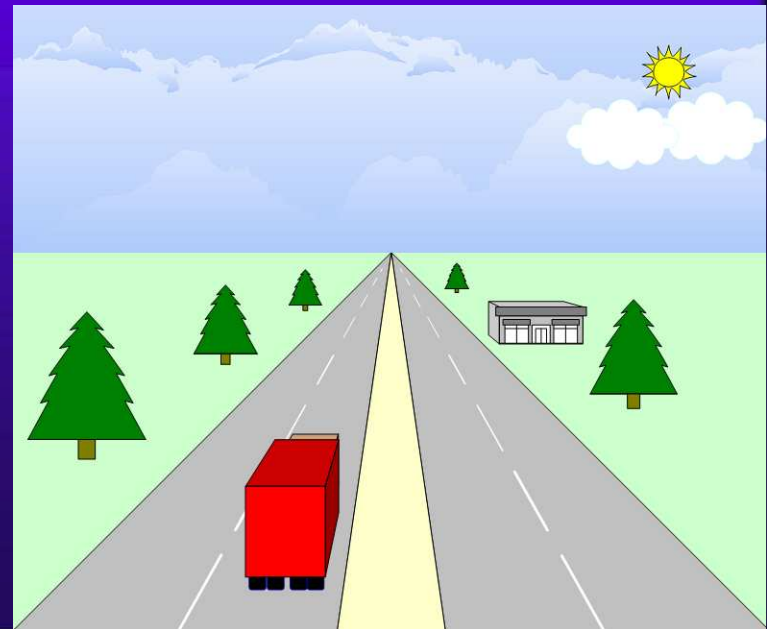
side



front

Perspective projection

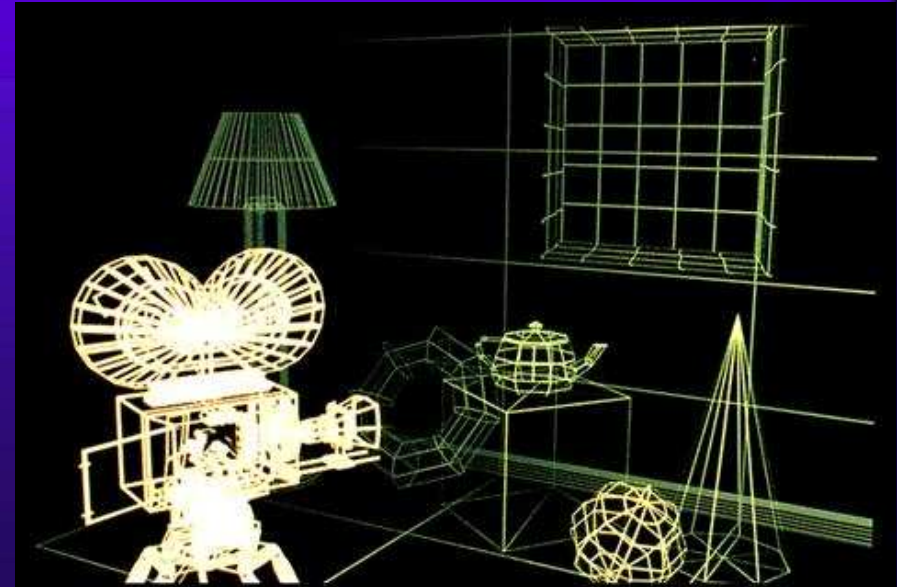
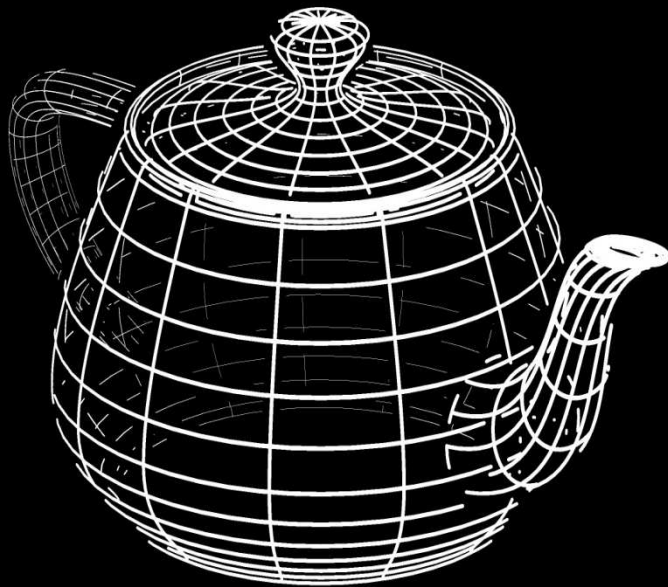
- Project points to the display plane along converging paths.
- This causes objects farther from the viewing position to be displayed smaller than the nearer objects.
- Parallel lines in a scene that are not parallel to the display plane are projected into converging lines.
- This is the way that our eyes and a camera lens form images.



Three-Dimensional Display Methods

Depth cueing

- Identify which is the front and which is the back of displayed objects
- For wireframe displays
 - Vary the intensity of objects according to their distance from viewing position
 - The line closest to the viewing position are displayed with the highest intensities than farther away

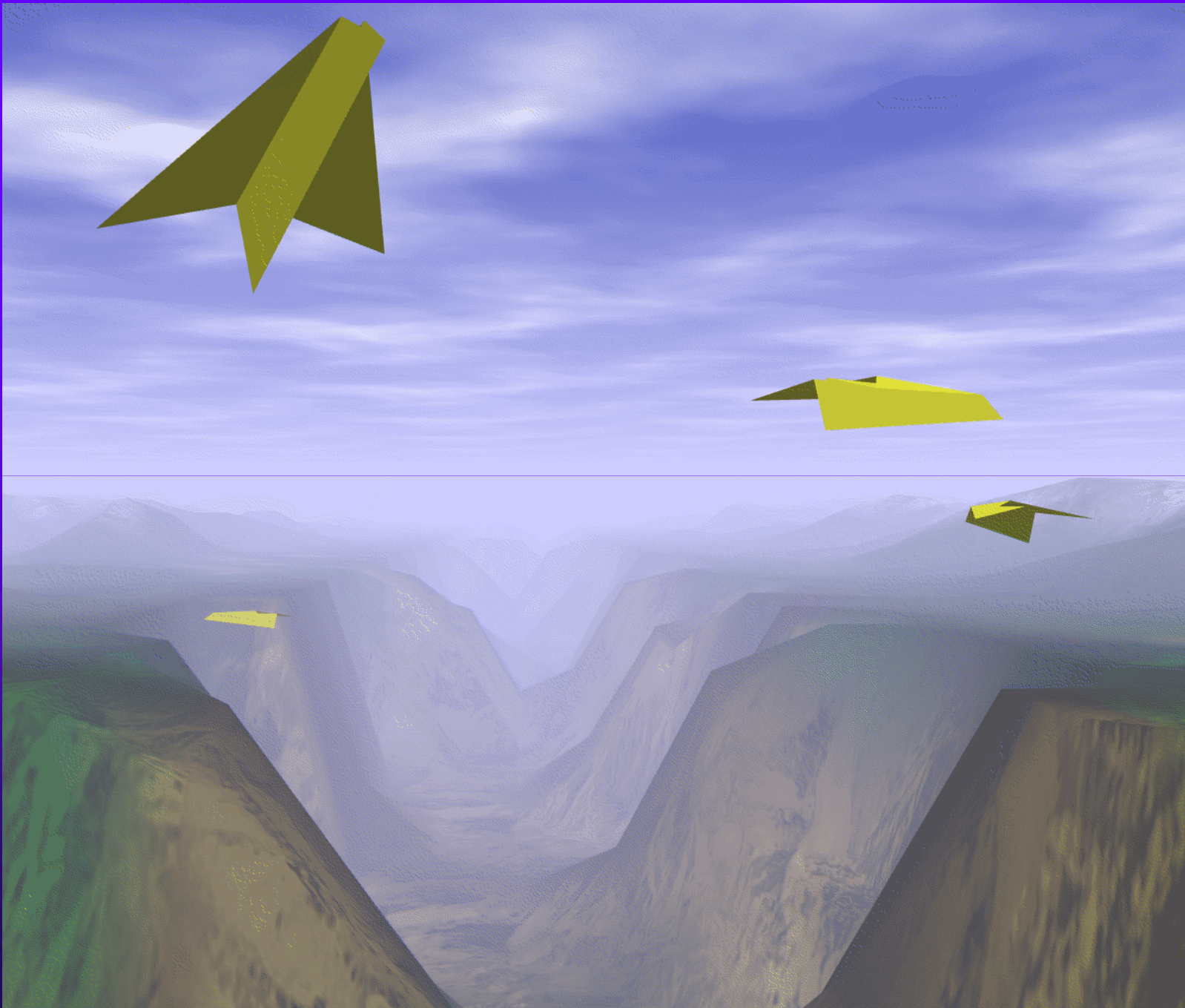




Three-Dimensional Display Methods

Depth cueing

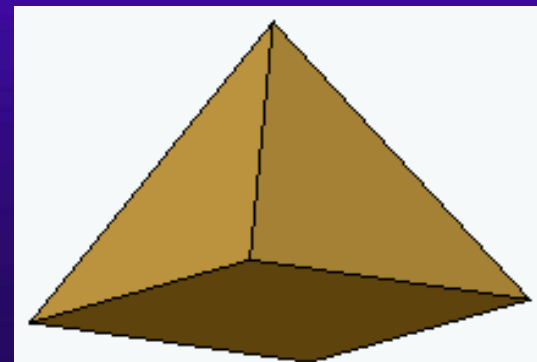
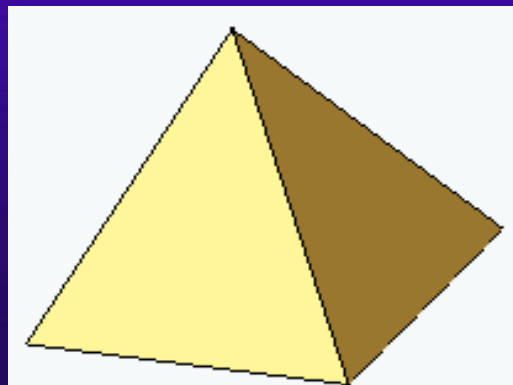
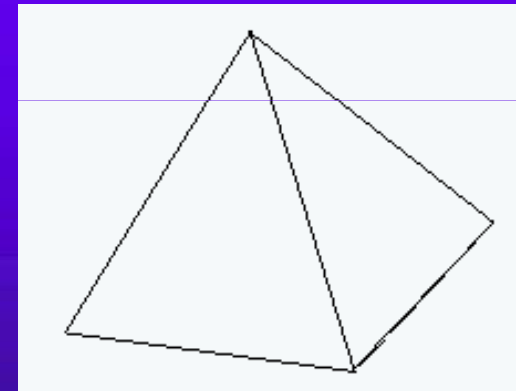
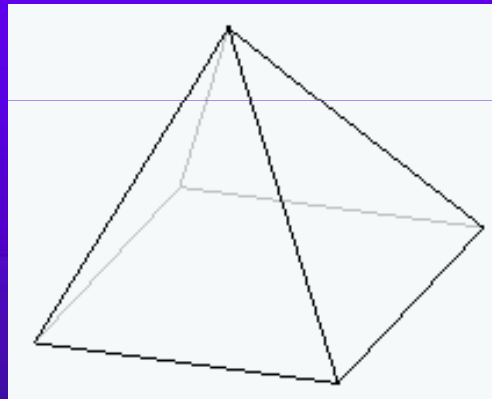
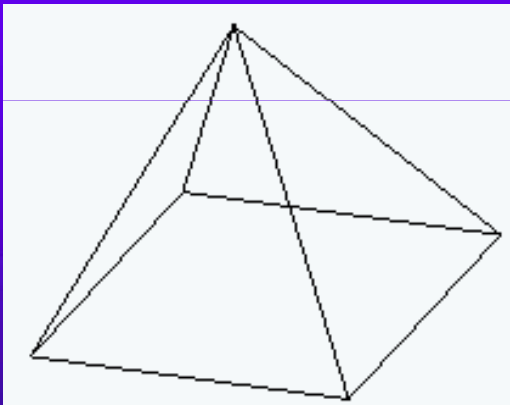
- ◆ Another application of depth cueing is modeling the effect of the atmosphere on the perceived intensity of objects.
- ◆ Distant objects appear dimmer to us than the nearer objects due to light scattering by dust particles, haze and smoke.
- ◆ Atmospheric effects can change the perceived color of an object and model.



Three-Dimensional Display Methods

Visible line and surface identification

- Highlight the visible lines or display them in different color
- Display nonvisible lines as dashed lines
- Remove the nonvisible lines



Three-Dimensional Display Methods

Surface Rendering

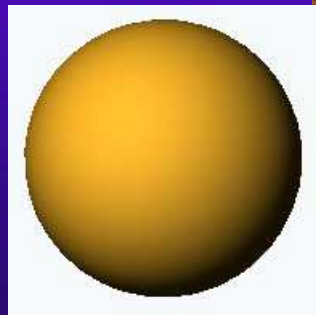
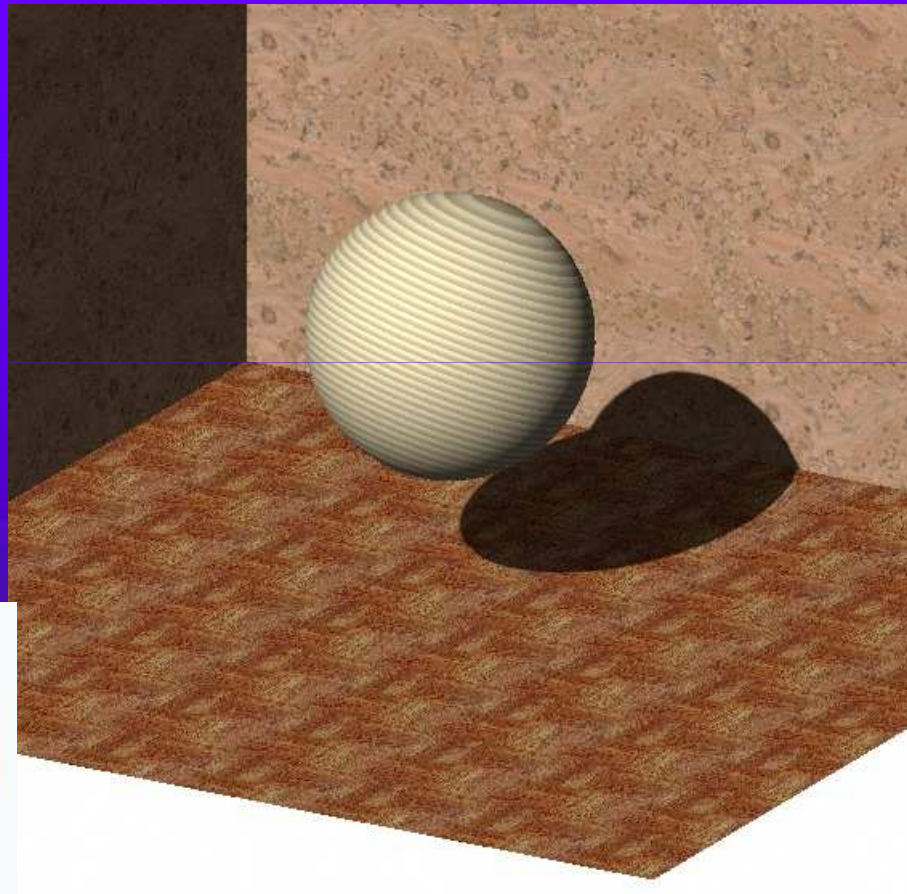


— Apply Surface rendering procedures to visible surfaces so that the hidden surfaces are obscured.

— Added Realism by setting the surface intensity of objects according to

- Lighting conditions in the scene (position of light sources, background illumination)
- Assigned surface characteristics (degree of transparency, rough or smooth surfaces)
- Procedures can be applied to correct illumination and shadow regions for the scene.

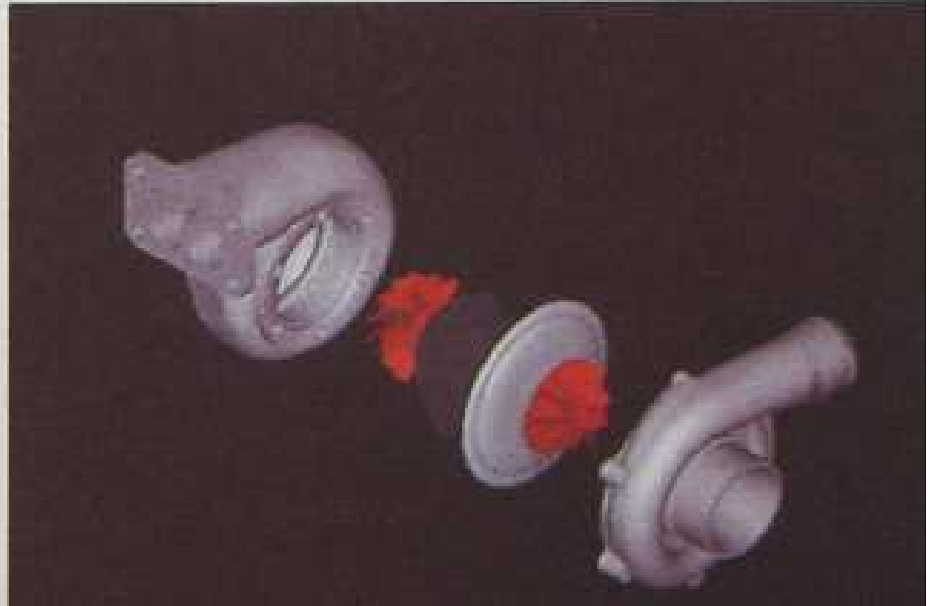
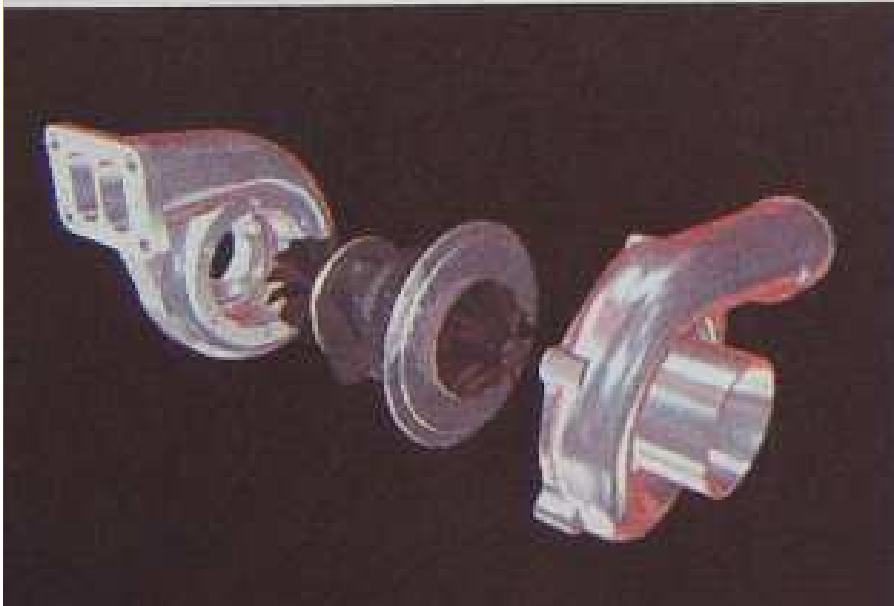
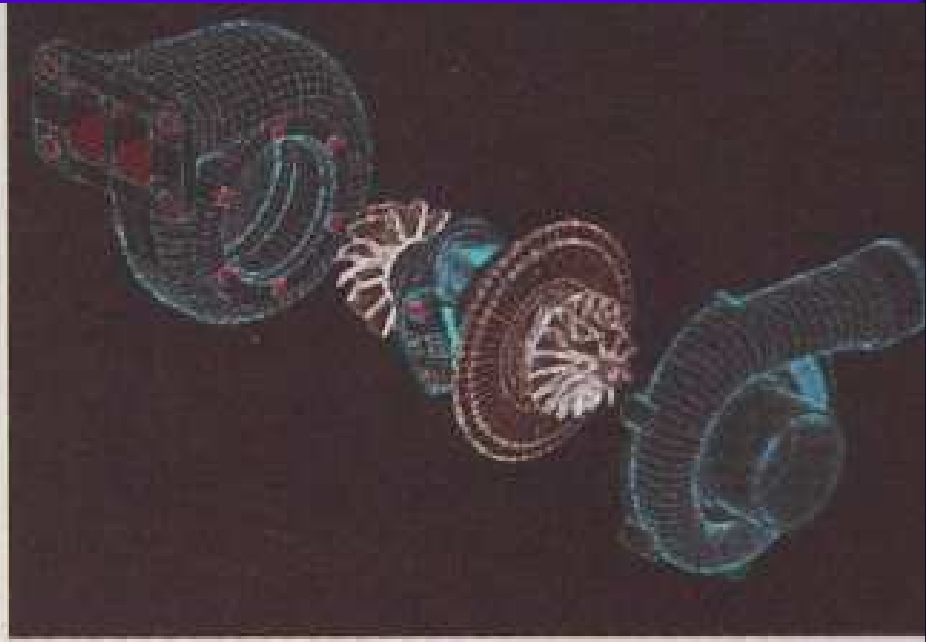
Surface Rendering





Three-Dimensional Display Methods

- **Exploded view**
 - Show the internal structure and relationship of the object parts





Three-Dimensional Display Methods

- **Cutaway view**
 - **Remove part of the visible surfaces to show internal structure.**

