# 24 Computer Aided Design (CAD)

**This unit focuses on:**

- **listening to an interview for specific information**
- **expressing necessity with *have to, need (to),* and *must***

## Task 1 [p. 137]

1 Crane.
2 Forces and stress on each beam.
3 Computer commands.

## Task 3 [pp. 137–138]

1 can
2 have
3 look
4 having
5 eye
6 could
7 come

## Task 4 [p. 138]

Advantages of CAD
1 Three-dimensional image from the start.
2 Design can be edited easily.
3 Image can be viewed from any angle.
4 Scale can be changed.
5 Mirror image can be produced.
6 Repeated features need to be drawn once only.
7 Features can be stored for later use.
8 Can interface with other programs (such as stress analysis).
9 Same model can be used by the manufacturing engineer.
10 No inconsistent drawing.
11 No drawing errors.
12 Provides information on all major parameters continuously.

## Task 5 [p. 138]

Drawing
1 Difficult to edit: cannot change scale or produce a mirror image.
2 Need to spend a lot of time drawing repeated features.
3 Drawings can be misconstrued.
4 Mistakes occur in drawings.

Modelling
1 You cannot make changes easily.
2 They are cumbersome and inconvenient to transport.
3 You cannot make copies.
4 They have to be converted back into drawings for manufacture.

## Task 6 [pp. 138–139]

1 design
2 stress analyse
3 study results
4 modify design
5 stress analyse

## Task 7 [p. 139]

1 do not need to, need not
2 needs to, has to, must
3 have to, need to, must
4 have to, must
5 having to, needing to
6 have to, must/needn't, don't have to, don't need to
7 need not, does not need to

### Tapescript

I = *Interviewer*, D = *Designer*

I: What do you like about designing on computer?
D: The fact that you can get into three dimensions immediately. You don't have to imagine how a component will look from two-dimensional drawings. You can put your thoughts into the solid without having to go via paper. You can see, in the mind's eye, exactly how the components fit together or could fit, and you can modify, replace, and generally tailor parts very quickly as ideas come to you.
I: What are the advantages of CAD over traditional design methods using drawings?
D: There are many. An electronic image is much easier to edit. Changes are simple to make. You can turn the view and move the image about. This makes it very much easier to visualize. You can change the scale or produce a mirror

image. That's impossible with traditional drawing methods. Designers used to spend a considerable amount of time on drawing repeated features, features which occur again and again in a design – holes, for example. With CAD, you needn't describe such a feature more than once. It can then be copied as often as you like and stored for later use. Another major plus is that CAD can be interfaced to other programs.

I: Will drawings disappear totally from the design process?

D: Many concerns don't use engineering drawings at all. They use the model in the computer directly, so that no paper needs to be generated. It can all be done on the computer. The manufacturing engineer, the production planner, has access to the same model the designer has just created and can access this to decide what tools are needed, er ... what machining has to be done – all the practical details necessary for actually manufacturing the component.
Drawings will still retain a place if only for non-technical reasons, for instance for showing to the public, to clients, or for legal reasons.

I: And I suppose one virtue of CAD is that there's no possibility that you can have inconsistent drawing if everyone is working from the same model. Is that correct?

D: Well, that's the whole point of the exercise, of course, to capture the design as the designer is doing it so that there can be no doubt at all in downstream activities as to exactly what the product consists of. That's always been the problem with engineering drawings – that they can be misconstrued. And people can make mistakes in the actual drawings. There are very few, remarkably few engineering drawings which are entirely correct. They are nearly always, for example, over-dimensioned or under-dimensioned, apart from all the other drawing errors that can creep in.

I: And modelling? Does it have any future?

D: Designers used to model features such as car body trim in clay. Wooden models were used to style domestic appliances, such as electric kettles. The problem with all models is that you can't make changes easily, they are cumbersome and inconvenient to transport, you can't make copies, and at the end of the day they have to be converted back into drawings for manufacture.
However, there will always be a place for models to demonstrate a project to clients – for example, the scale models architects use.

I: In engine design, weight is critical. Can you see what weight savings you're making if you're working with CAD?

D: Yes, indeed. The program I use continuously computes all the major parameters of a solid part as it's designed – it works out the various moments of inertia, it works out the centre of gravity, it works out the weight, volume, etc., and these can be called onto the screen any time.

I: What about other forms of analysis?

D: Stress analysis programs allow one to design a part, then put the information directly and quickly into the stress analysis program, get a result, look at the result and then modify the model accordingly to reduce the stresses or to reduce weight or both and then go from that revised model back into the stress analysis again hence going round the circle. Normally one needs to go round the circle at least four times to get very near to the optimum design.

# 25 Supercar

**This unit focuses on:**

- **predicting using samples of a text**
- **expressing certainty**
- **writing a summary**

## Task 3 [p. 141]

1 The President of the USA.
2 The author.
3 By not polluting the air.
4 If it uses much less fuel than conventional cars.
5 To solve the three problems of pollution, fuel consumption and foreign competition.