

# Design of Displays



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# Displays

Displays can be of three basic types:

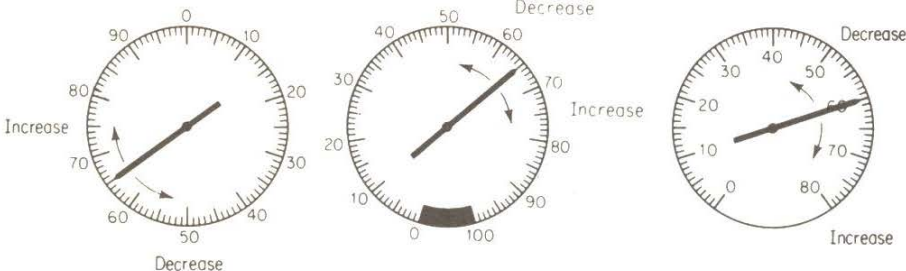
*Quantitative* readings of the numerical value of some parameter.

*Qualitative* readings some state such as high/low or up/down.

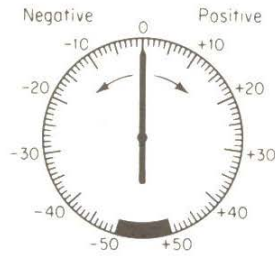
*Situation awareness* detection and meaning of elements in time and space.

# Displays

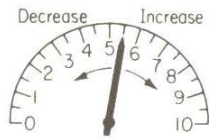
## Some common quantitative displays...



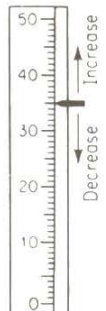
(a) Circular scales



(b) Circular scale with positive and negative values



(c) Semicircular or curved scale

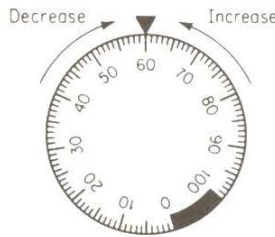


(d) Vertical scale

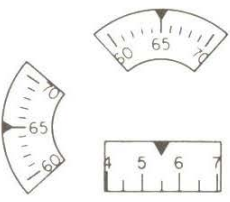


(e) Horizontal scale

MOVING SCALE, FIXED POINTER



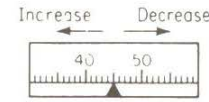
(f) Circular scale



(g) Open-window scales



(h) Vertical scale



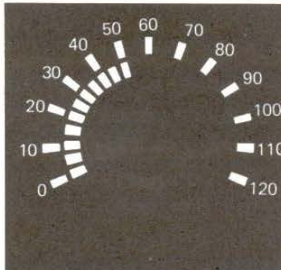
(i) Horizontal scale

DIGITAL DISPLAY

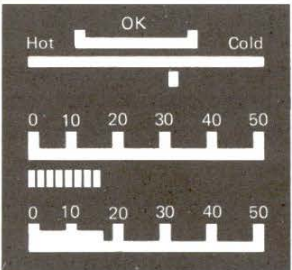


(j) Digital display

ELECTRONIC DISPLAYS



(k) Circular



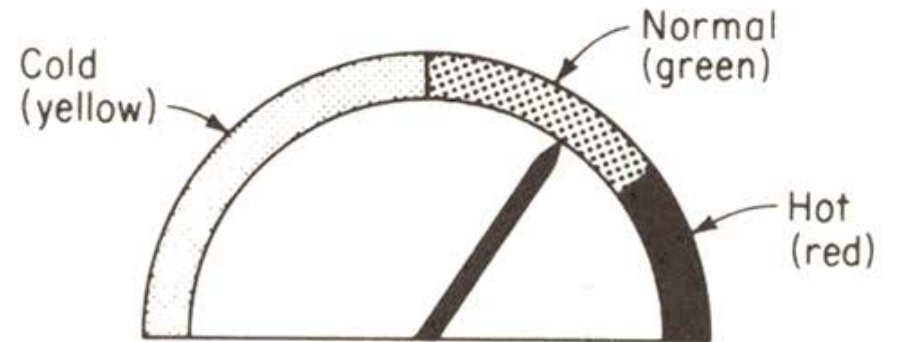
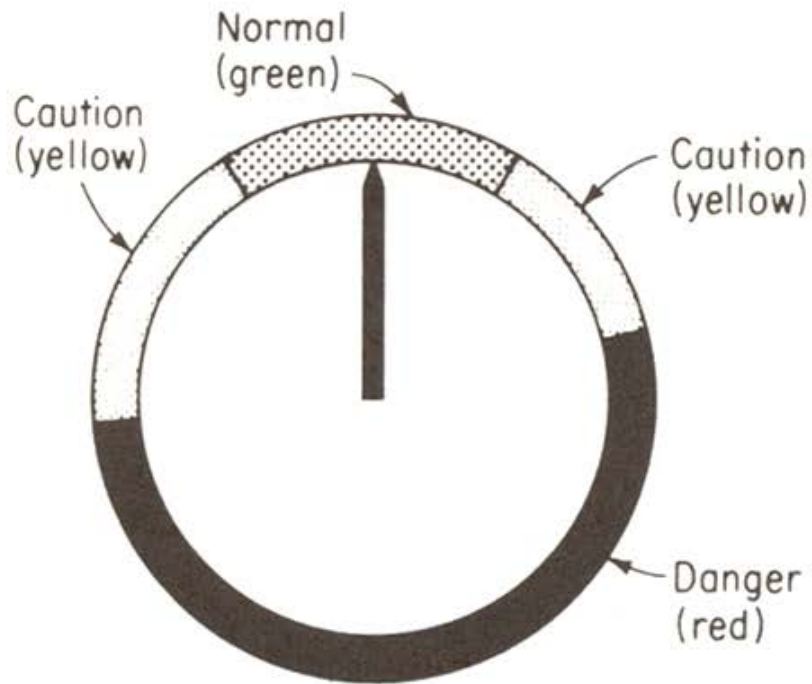
(l) Horizontal



(m) Digital

# Displays

Two common qualitative displays...



# Displays



**Radar screens are examples of a situation awareness displays.**

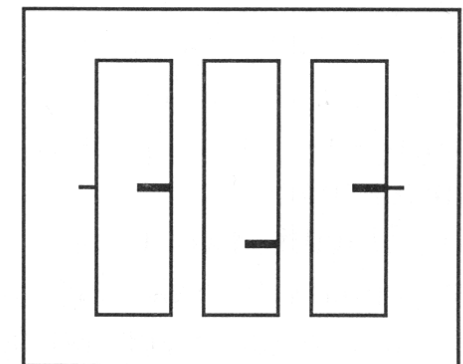
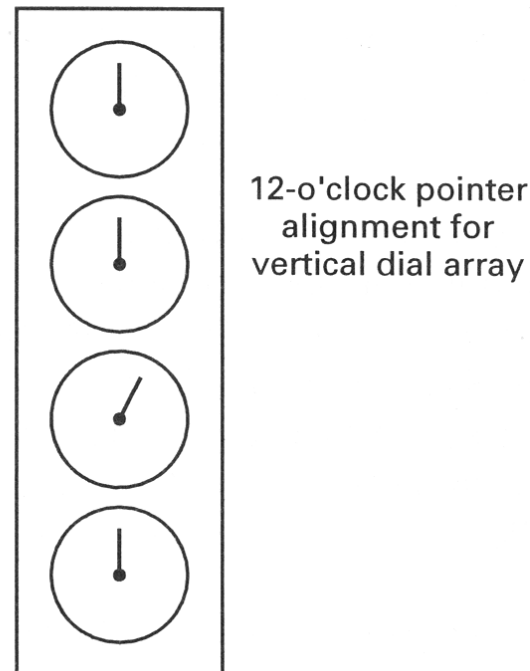
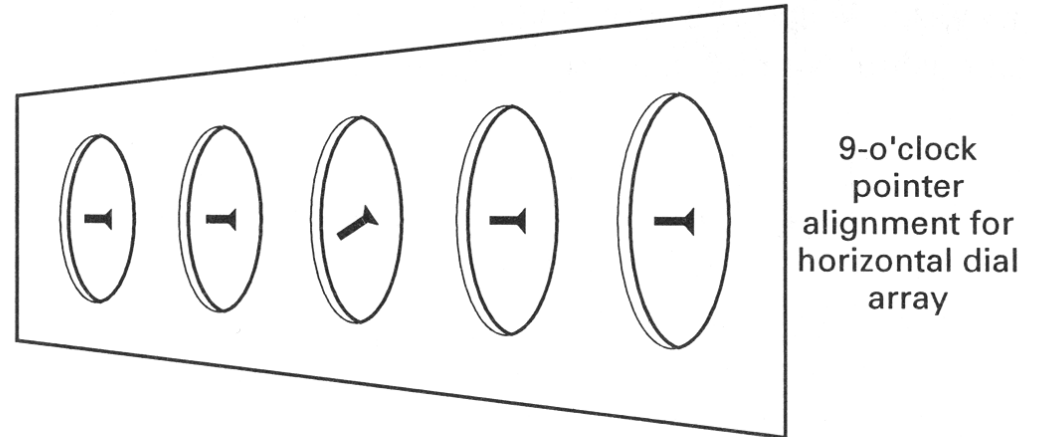
# Fundamental Rules

There are four fundamental rules of display design:

- **Present information in such a way that failure or malfunction will be immediately obvious.**
- **Display only the information which is essential for adequate job performance.**
- **Display information only as accurately as is required for the operator's decisions and actions.**
- **Present information in the most simple, direct and understandable way possible.**

# Failure Or Malfunction

If possible instruments should be arranged such that all the pointers are aligned under normal operating conditions. If one then deviates it will be easily noticed.





# Failure Or Malfunction

Important operating states such as safety critical conditions should be indicated in a simple and unequivocal manner, so as to speed operator detection and response times.



(a) No Target Zone



(b) Perimeter Target Zone  
(Can be read about 25% faster than the dial in a)



(c) Sector Target Zone  
(Can be read about 85% faster than the dial in a and is easier to interpret)



# Failure Or Malfunction

White or Grey light does not have a particular meaning but is often used to indicate that functions or systems are operative.

**Green** light indicates that the system is in satisfactory condition and that it is ok to proceed.

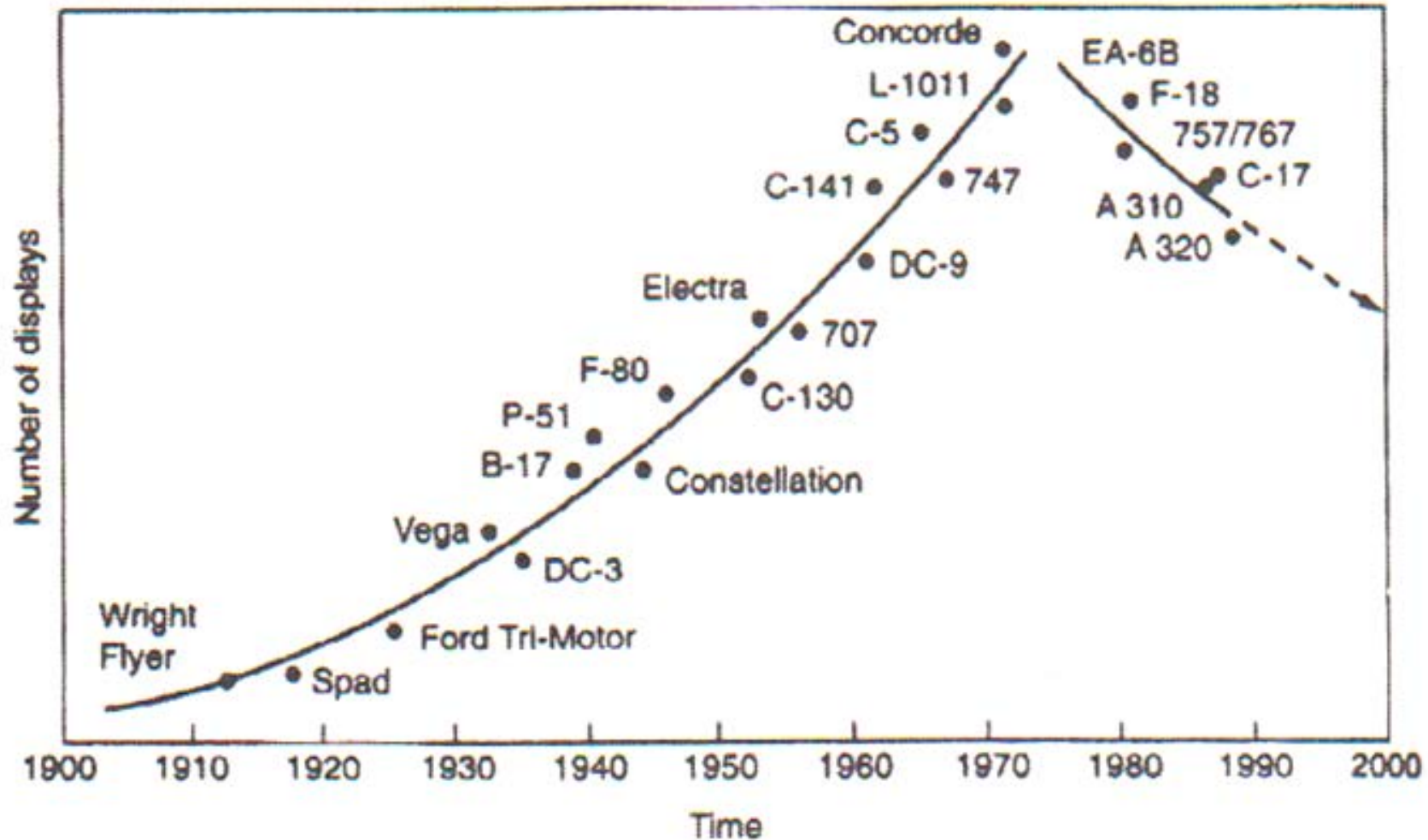
**Yellow** light advises that a marginal condition exists and that alertness and caution should be exercised.

**Red** light warns that some function or system is inoperative or that a failure condition exists.

**Flashing red** light is used in emergency situations that require immediate action to avoid damage or injury.

# Essential For Adequate Job Performance

Focussing on the essential information suggests reducing the number of displays.



# Accurately As Required For The Operator's Decisions

Adopting the minimum accuracy required by the operator to make decisions often leads to replacing quantitative displays with qualitative displays.



# Simple, Direct And Understandable

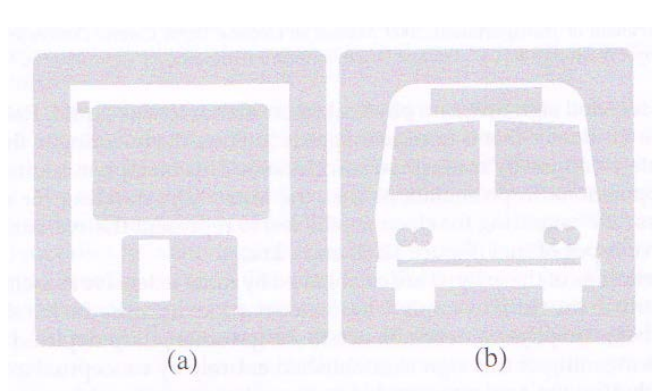
Photographs, pictograms and other forms of visual imagery are usually easier and faster to recognise than abstract representations such as text or numbers.

Newspaper editor Arthur Brisbane's 1911 quote "Use a picture. It's worth a thousand words." summarises the age-old difficulties associated with human communication.

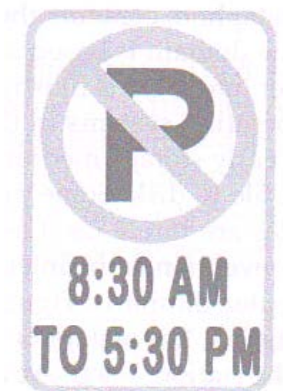


# Simple, Direct And Understandable

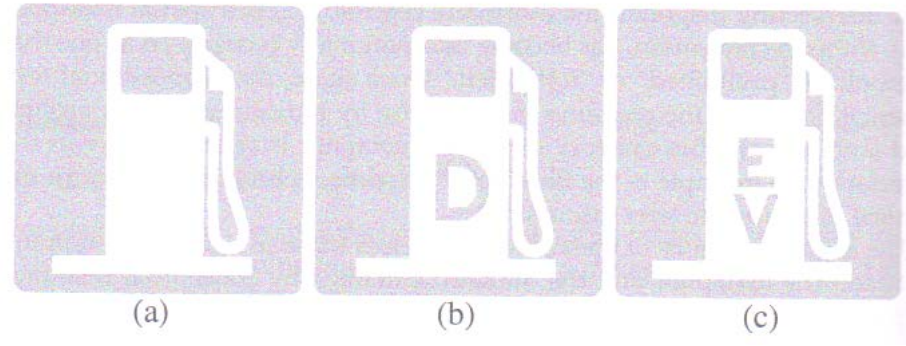
There are three approaches to representing an object or system on a display.



**Physical Similarity**



**Sign Established  
From Convention**

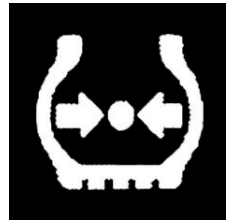


**Metaphor**

# Simple, Direct And Understandable

The US Dept. of Transport report “Evaluation of Existing Tire Pressure Monitoring Systems” summarised the effectiveness of different warning symbols to warn of an under-inflated tyre.

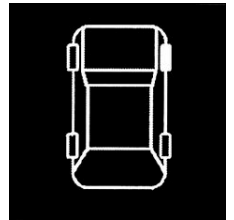
ISO symbol K11 for warning of incorrect tyre pressure was evaluated, but only 25% of the people understood that it warned of a tyre pressure problem. Some thought it warned of a problem with the airbag, lights or disengaged gearshift.



ISO symbol K10 for signalling tyre failure was evaluated, but was understood correctly by only 38% of the people.



A symbol of a car with a highlighted wheel was understood correctly by 81% of the people.



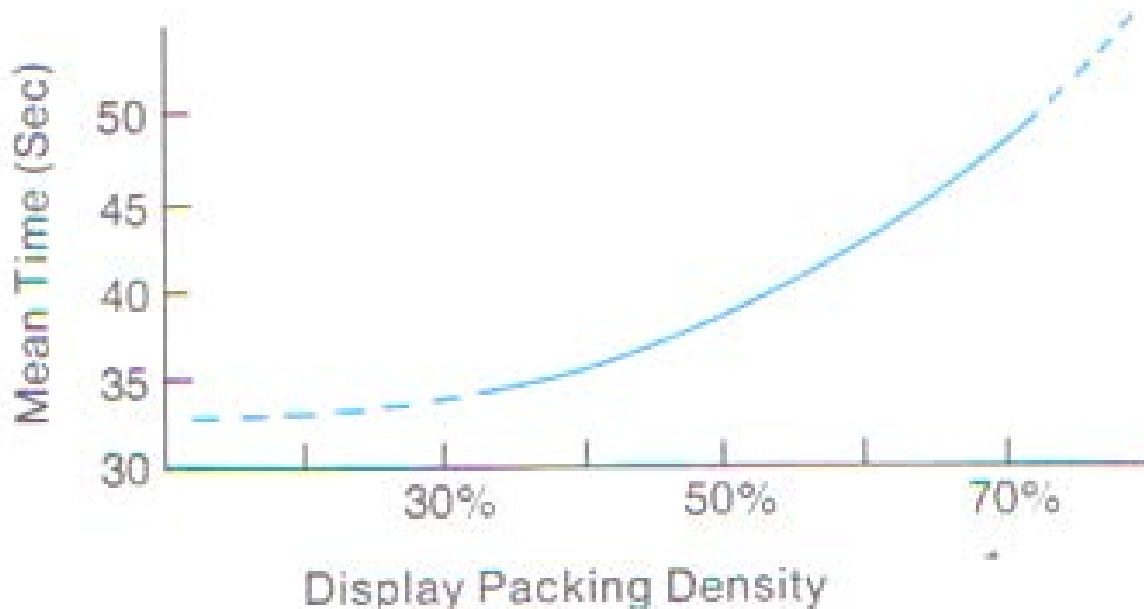
A symbol representing a flat tyre was correctly identified by all of the people.





# Simple, Direct And Understandable

The readability of a display drops rapidly for screen packing densities greater than 50 percent. Where possible, displays should be relatively sparse.



## 70 Percent Density Display

```
XXXX XXXXXXXX          XX XXXXXXXX XXXX
X XXXXXXXXXXXX XXXXXXXXXX X XXXXXXXXXXXX
X XXXXX XXXXXXXXXXXXXX   X XXXXXXXXXXXX
X XX XXXXXXXXXXXXXXXX    X XXX XXXXXXXXXXXX
X XXXXXXXXXXXX          XXXX X XX XXXXXXXXXXXXXXXX
X XXXXXXXXXXXX          XX XXXXXXXXXXXXXXXX

XX XXXXXXXX XX XXXXXXXXXXXXXX XX XXXXXXXXXXXXXX
XX XXXXXXXX XX XXXXXXXXXXXXXX XX XXXXXXXXXXXXXX
XX XXXX    XX XXXXXXXXXXXXXX XX XXXXXXXXXXXXXX
XXXXXXXXXXXX XXXXXXXXXX XXXXXXXX
XX XXXXXXX XX XXXXXXXX    XX XXXXXXXXXXXXXX
XX XXXXXXX XX XX XXXX    XX XXXXXXX
XX XXXXXXX XX XX XXXX    XX XX XXXX XX
XX XXXXXXX XX XX XXXXXXX XX XXXXXXX
```

## 50 Percent Density Display

```
XXXX
X XXXX XXXXXXXX      X XXXXXXXXX
X XX XXXXXXXX      X XXXXXXXX
X XXXXXXXXXXXX      X XXX XXXXXXXXXXXX
X XXXXXXXXXXXX      X XXXXXX XXXXXXXX
X XXXXXXXXXXXX      XX XXXXXXXXXXXX

XX XX      XX XXXXXXXXXXXXXX XX XXXXXXXXXXXXXX
XX XXXXXXXXX XX XXXXXXXXXXXXXX XX XXXXXXXXXXXXXX
XX XXXXXXXXX XX XXXXXXXXXXXXXX XX XXXXXXXXXXXXXX

XX XXXXXXXX XX XXXXXXXX XX XXXXXXXXXXXXXX
XX XXXXXXX XX XX XXXX XX XXXXXXX
XX XXXXXXX XX XX XXXX XX XXX XXXXXXXXX
XX XXXXXXX XX XXXX XXXX XX
```

## 30 Percent Density Display

```
XXXX XX
X XXXX XXXXXXXX

X XXXXXXXXXXXX
X XXXXXXXX

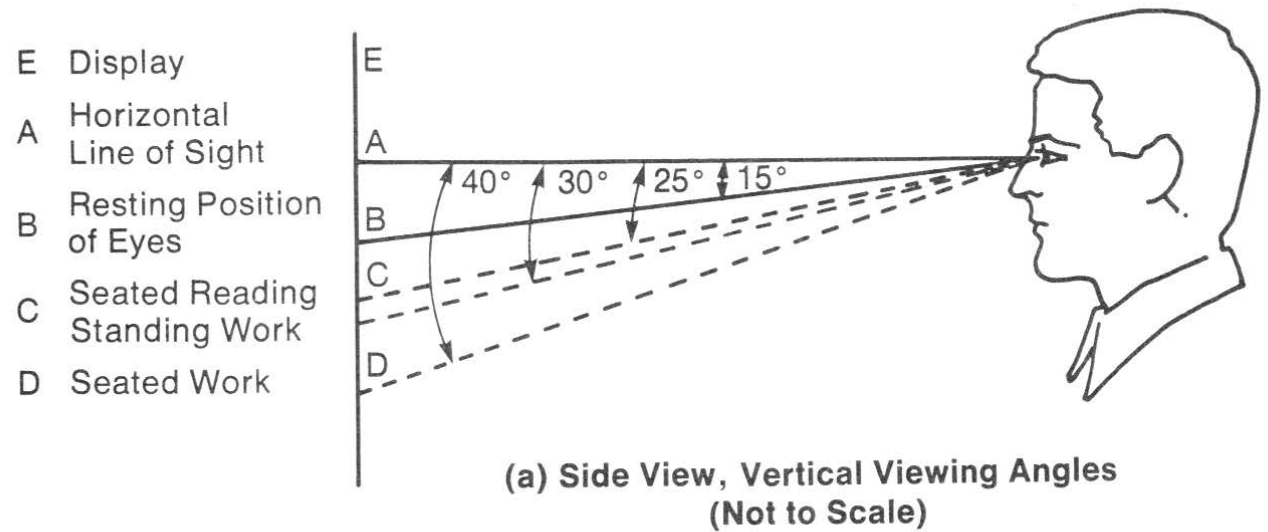
XX XX

XX XXXXXXXXXXXXXX
XX XXXXXXXXXXXXXX

XXXX

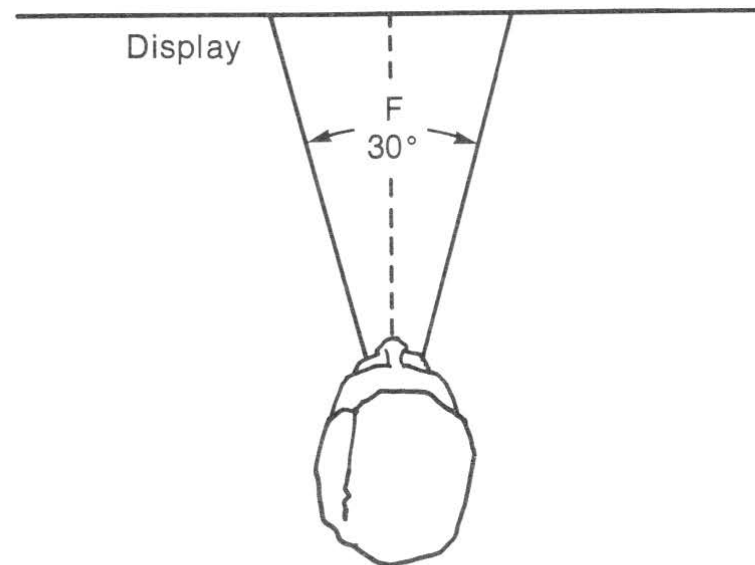
XXXXXX
XXXXXX
XXXXXXXXXXXXXX
XXXX

XX XXXXXXX XX XXXXXXX XX XXXXXXXXXXXXXX
XX XXXXXXX XX
XX XXXXXXX XX XXX XXXXXXXX
```



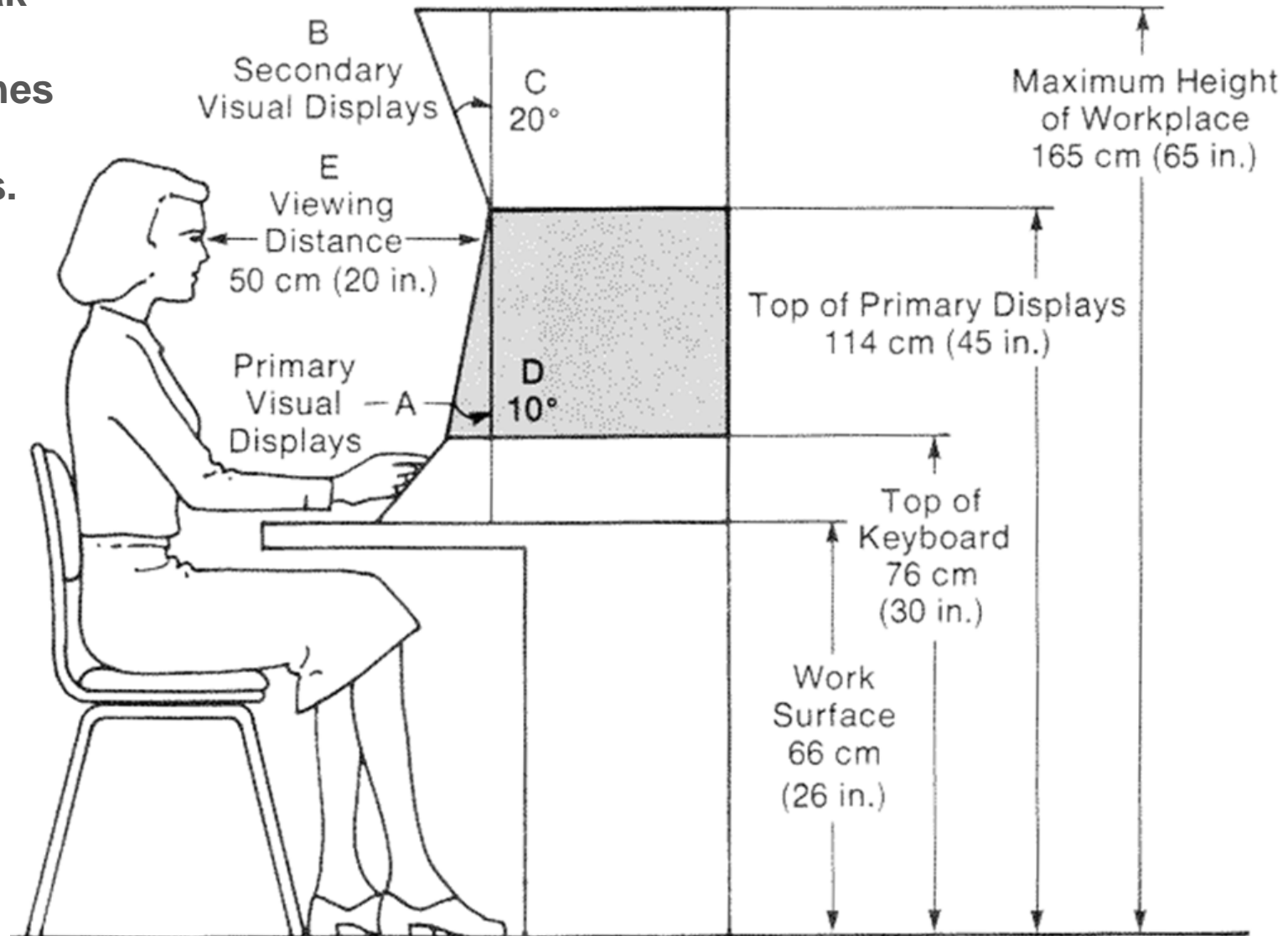
## Viewing Angles

The Eastman Kodak Company (1983) suggested guidelines for the preferred viewing angles for displays.



# Viewing Angles

The Eastman Kodak Company (1983) suggested guidelines for the preferred heights of displays.



# Design Classic: The Analogue Speedometer

Introduced on some cars by 1900, an advantage of analogue displays is that the use of a pointer and scale provides both the instantaneous value (the speed) and its time rate of change (the acceleration).



# Design Classic: Google homepage

In 1999 Google introduced the now iconic homepage, a classic example of simplicity and functionality.



*Thank you.*

