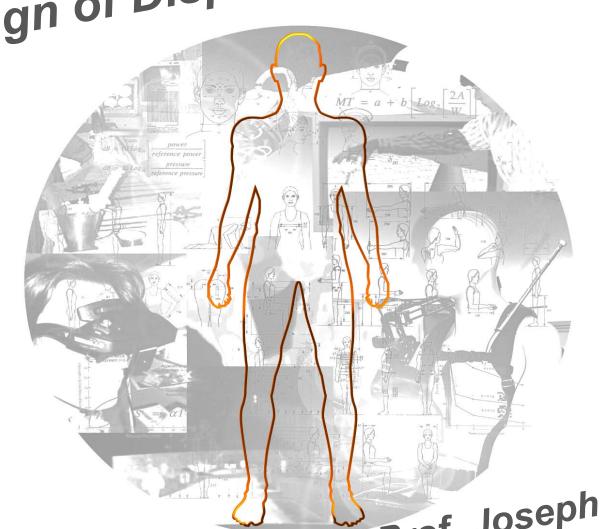
Design of Displays



Prof. Joseph Giacomin

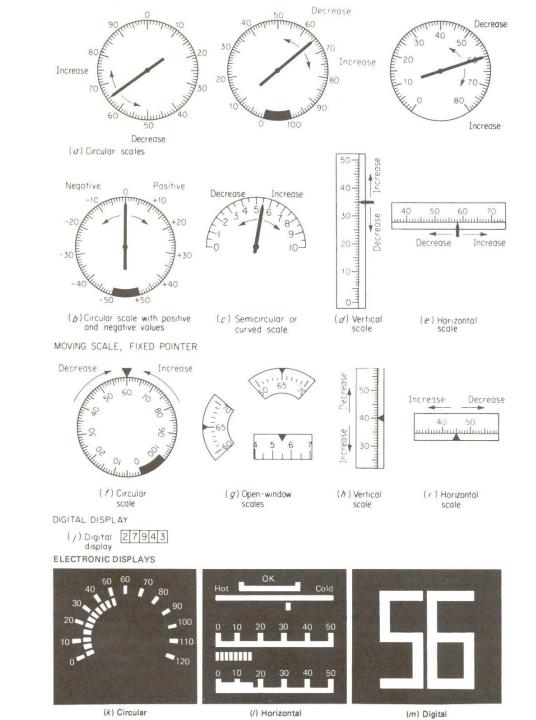
Displays can be of three basic types:

Quantitative readings of the numerical value of some parameter.

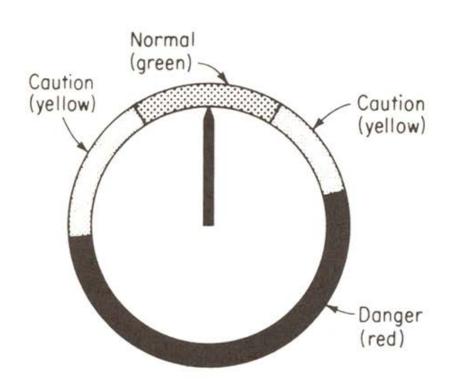
Qualitative readings some state such as high/low or up/down.

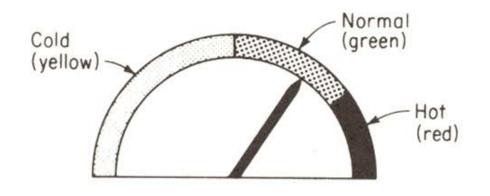
Situation awareness detection and meaning of elements in time and space.

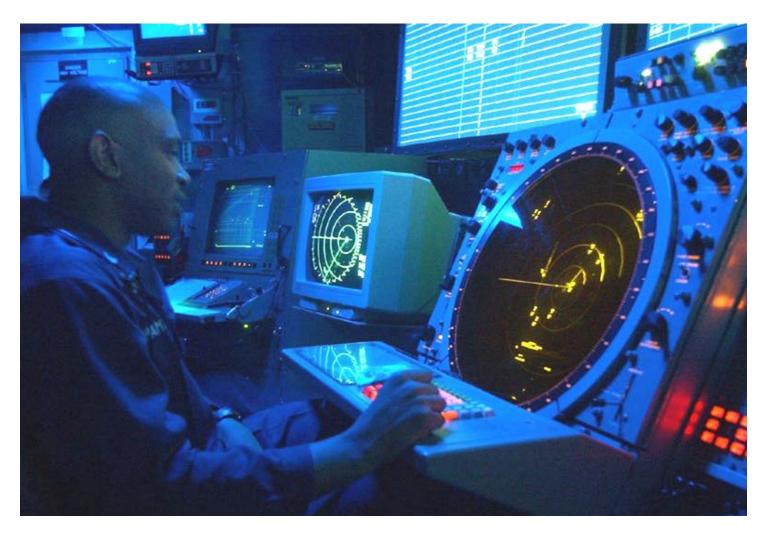
Some common quantitative displays...



Two common qualitative displays...







Radar screens are examples of a situation awareness displays.

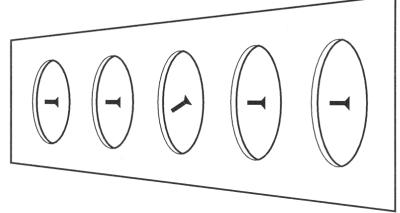
#### **Fundamental Rules**

There are four fundamental rules of display design:

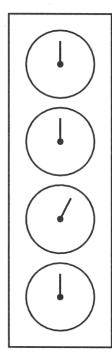
- Present information in such a way that failure or malfunction will be immediately obvious.
- Display only the information which is essential for adequate job performance.
- Display information only as accurately as is required for the operator's decisions and actions.
- Present information in the most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

#### **Failure Or Malfunction**

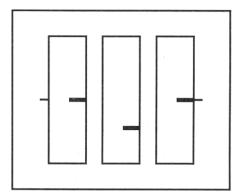
If possible instruments should be arranged such that all the pointers are aligned under normal operating conditions. If one then deviates it will be easily noticed.



9-o'clock pointer alignment for horizontal dial array



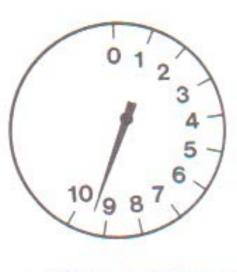
12-o'clock pointer alignment for vertical dial array



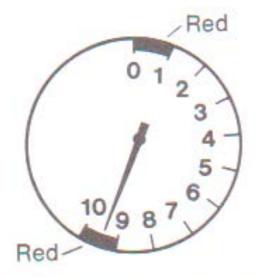
String-line scale format with nominal operating reference common among all displays at the mid-scale postion. Applicable also for moving-tape indicators

#### **Failure Or Malfunction**

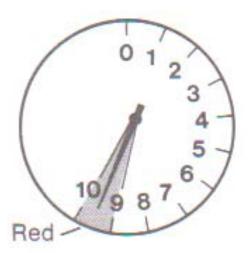
Important operating states such as safety critical conditions should be indicated in a simple and unequivocal manner, so as to speed operator detection and response times.



(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.

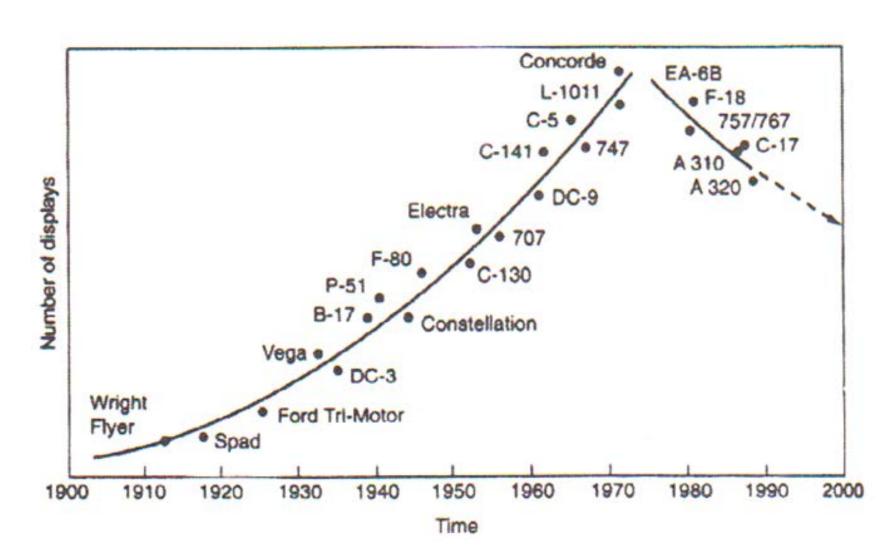
Yellow light advises that a marginal condition exists and that alertness and caution should be exercised.

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.



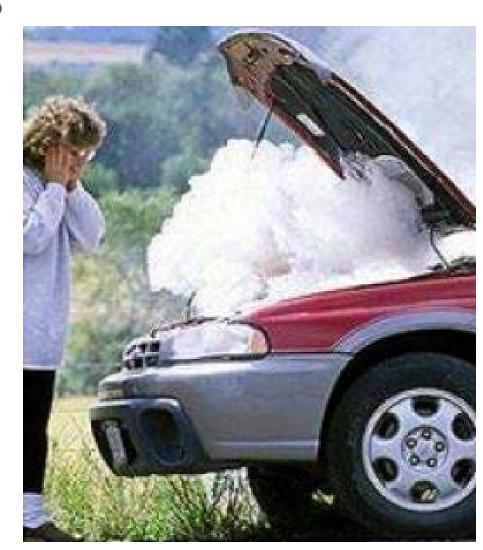
## Accurately As Required For The Operator's Decisions

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

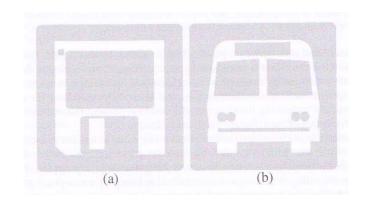


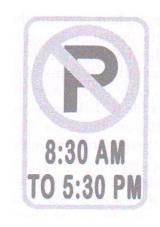
Photographs, pictograms and other forms of visual imagery are usually easier and faster to recognise than abstract representations such as text or numbers.

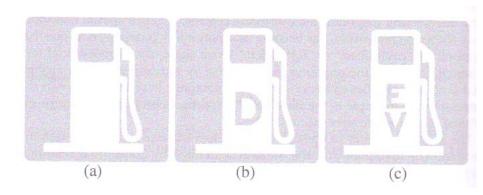
Newspaper editor Arthur Brisbane's 1911 quote "Use a picture. It's worth a thousand words." summarises the age-old difficulties associated with human communication.



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







**Physical Similarity** 

**Sign Established From Convention** 

Metaphor

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.



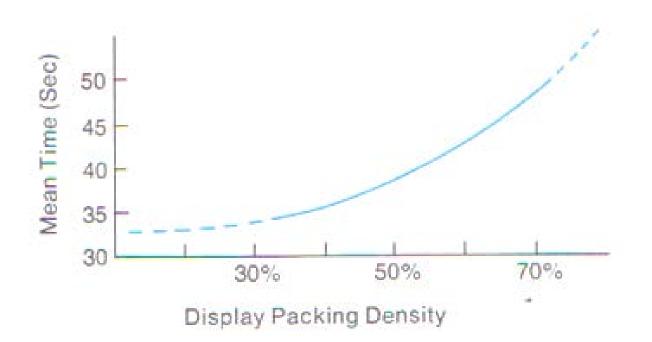
A symbol of a car with a highlighted wheel was understood correctly by 81% of the people.



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



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

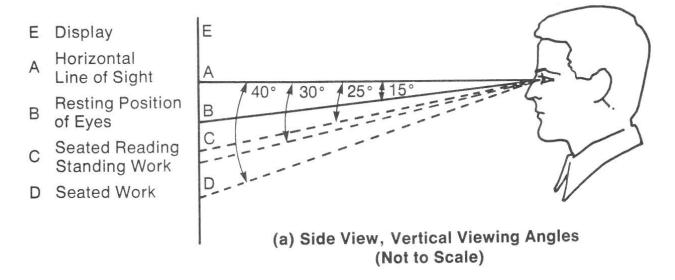
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#### 50 Percent Density Display

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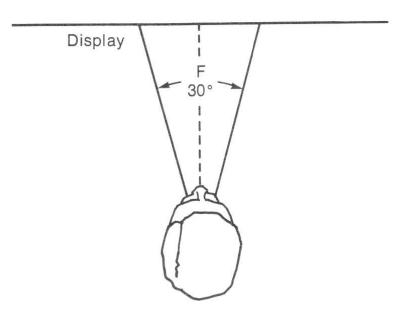
#### 30 Percent Density Display

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## **Viewing Angles**

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



(b) Top View, Lateral Viewing Angles

## **Viewing Angles**

The Eastman Kodak В **Company (1983)** Secondary Maximum Height suggested guidelines Visual Displays 20° of Workplace for the preferred 165 cm (65 in.) heights of displays. Viewing Distance-50 cm (20 in.) Top of Primary Displays 114 cm (45 in.) Primary Visual -A-10° Displays Top of Keyboard 76 cm (30 in.) Work Surface 66 cm (26 in.)

# 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.

