

focus will be on the general techniques used for analysing the interface between human beings and other complex systems. An attempt has been made to concentrate on aviation interface issues as most informative to HCI. Even with this limited definition, it is hard to review the vast amount of available material and so specific focus will be made on a series of very general 'lessons' which would be well drawn from aviation considered in this narrow sense. Many of these 'lessons' have been hard won so ignoring them might well seem extremely parochial and ungracious.

It is important to make clear that this is not anything remotely like the claim that aviation has found all the answers to the problems of HCI. As is so often the case in science, answering one question tends to generate five further questions and the aviation field remains full of difficult HCI related issues. In illustration of this, an example of a current aviation interface debate is given in the penultimate section of this paper.

The claim made is not the simplistic one that aviation studies have solved difficult HCI questions. It is rather that long term changes in methodology which have been prompted by the need to improve aviation safety, have important lessons for other disciplines in general and HCI in particular.

one genuinely moves to the goal of preventing recurrence there can be no such thing as unforeseeable circumstances. The historical fact that they were not foreseen by the relevant people in this case is a human error which can now be rectified. To prevent recurrence one analyses the circumstances that obtained and makes the necessary interventions to prevent that particular set of circumstances (and maybe sets closely resembling it) from recurring. Of course, aviation had a strong advantage over many other areas of human activity in learning that blaming the user is unhelpful. Of course, pilots (like all human beings) are error prone. Pilots undoubtedly do make many errors. However, captured in grim aviation slogans such as 'They bury pilots with their mistakes' are at least two important truths. The first is that pilots are very strongly motivated not to make mistakes. The second is that they are highly unlikely to make a serious mistake more than once (in sharp contrast to spreadsheet users or doctors, for example). These two truths provided a motivation for looking beyond the dismissive 'pilot error'. However, the advocates of 'pilot error' did not give up so easily. In commercial terms it is usually much cheaper to blame a pilot than to alter an aircraft design for example. Also there are many accidents where little else seems involved but an obvious error by the pilot. In these cases, relapse to

headers That's not a bug, that's pilot error His 'sendmail.cf' is hosed

This is computing mimicking 4 s aviation attitudes It's time to move on

Of course, this sort of lesson is beginning to permeate other areas. It is not unknown for IT companies to claim that they have a 'no blame culture'. Medicine in particular has deliberately sought to imitate aviation practice. What the aviation experience suggests is that this process will be extremely difficult and that much, much more than pious hopes will be required to move from a blame model. Determined conviction to eliminate the 'blame

numerical data are out An example of instruments shown at
 various readability levels is shown below. For the first set of
 instruments shown a pressure attitude of 1000 ft is indicated.

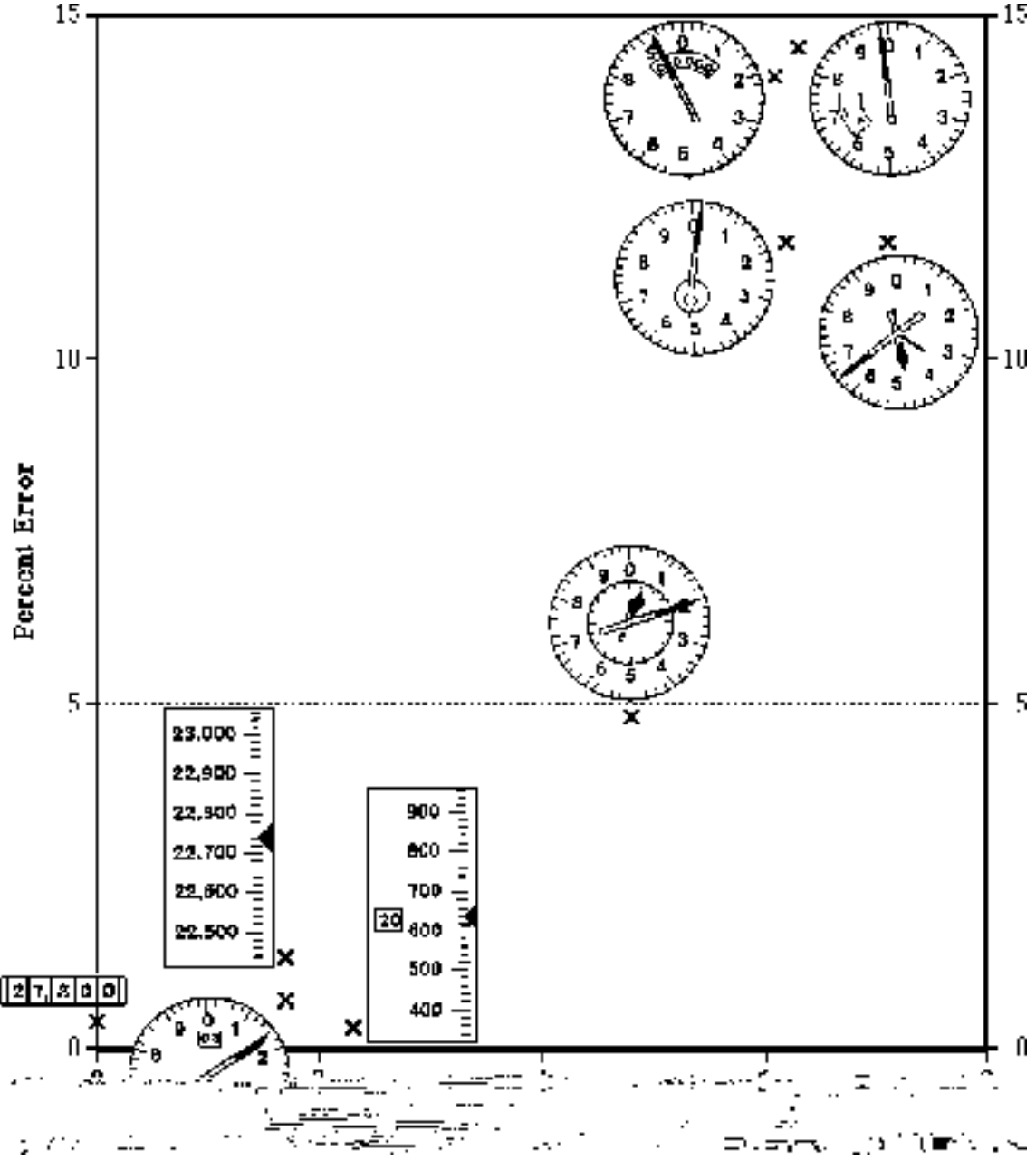


Fig Interpretation times and error rates for various types of display

ments that have a certain amount of overlap with HCI. It's important to
remember that this basic association is a tool, not a starting point and
that these associations are not static.

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each other. In this association, the two things are associated with
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exists to solve a particular problem. In some cases, these associations
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Conc us ons

This paper began with a quotation stating that aviation is not inherently dangerous; this is perhaps the time to state that it is certainly not inherently safe either. It is a relatively new field and full of new challenges which require new techniques. Do the lessons outlined above work? Well they certainly worked in aviation. The fact that aviation has become, in three to four decades, such a safe way to travel is a tribute, I would argue, mainly to the way these lessons have been thoroughly learned and applied. Other fields, and I have mind medicine and law just as much as HCI, ignore such lessons at their peril.

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<http://www.airworld-top.com/ulrichhoppe/homepage.htm>

Bibliography