

## 'Human factors' and military decisions

On July 3, the U.S. warship *Vincennes* shot down an Iranian passenger jet in the Persian Gulf. The tragedy might have been averted had the Navy trained the ship's crew based on research revealing ways to make decisions when using complex technology in stressful situations, representatives of the American Psychological Association told Congress last week.

"There is much knowledge about how decisions go wrong and how they can be improved that is not being put to use in military decision making," Paul Slovic of the University of Oregon in Eugene told the House Armed Services Committee. "There is no serious commitment to decision-making research in Department of Defense agencies."

A Navy spokesman disputed the psychologist's testimony.

Slovic and four other psychologists involved in "human factors" research, which focuses on how people can best interact with sophisticated machinery, based their comments on a review of the Navy's official report of the Iranian airliner shootdown.

A striking error identified in the Navy investigation is the crew's judgment that the jet was descending as if to attack, when actually it was ascending, said psychologist Richard E. Nisbett of the University of Michigan in Ann Arbor. The computerized surveillance system on the *Vincennes* first misread the plane's altitude and identified it as an F-14 fighter jet, but then corrected itself. The Navy report concludes crewmen responsible for evaluating surveillance data did not closely analyze the initial computer mistake. Furthermore, the skipper paid more attention to their increasingly heated reports of an emergency than to new displays generated by the computer.

Crew expectations of an imminent attack likely played a major role in their inability to reevaluate early signs of attack on the computer, Nisbett said. Research suggests expectations pervasively affect what people think they see and remember. Even in a simple, non-stressful task, subjects shown playing cards with a black ace of diamonds consistently and confidently identify it as either an ace of spades or a regular ace of diamonds, Nisbett explained.

In the case of crewmen dealing with a potential battle situation, advanced automated surveillance systems are a "mixed blessing," psychologist Richard W. Pew of BBN Systems & Technologies Corp. in Cambridge, Mass., told the committee. Such systems ease workload and time pressures, but operators tend to put too much faith in the computer's judgment and take a relatively passive role in

analyzing and integrating new data.

"Research is badly needed to understand when and just how much automation to introduce in situations where the ultimate control and responsibility must rest with the human operators," Pew asserted.

Communication and crew coordination problems on the *Vincennes* parallel those uncovered in analyses of the causes of civilian and military plane crashes, said psychologist Robert L. Helmreich of the University of Texas at Austin. Ongoing research is being sponsored by NASA and the National Transportation Safety Board, but similar research is largely ignored by the Navy, Helmreich charged.

"Each branch of the military supports research on human-factors issues," responded Stephen F. Zornetzer of the Office of Naval Research in Washington, D.C. The Navy now has a \$4.5 million research program on tactical decision making, Zornetzer said. The surveillance system on the *Vincennes* was designed 20 years ago, he added; better systems are now under development.

It remains to be seen if the House committee, chaired by Rep. Les Aspin (D-Wis.), abides by the Navy view or urges more funding of human-factors research in the military.

— B. Bower

## Surfactant therapy: New questions arise

In the final weeks before birth, a human fetus makes a variety of preparations for life outside the womb. Among these last arrangements is the production of surfactants inside the lungs. These soap-like compounds help break surface tension along the inner linings of the lungs, ensuring the delicate membranes will inflate and not stick together with the first breaths of air.

Infants born several weeks early, or those who for some other reason have yet to begin producing sufficient quantities of surfactants, are at risk of dying from respiratory distress syndrome in their first days of life. Several studies in the past four years have demonstrated increased survival rates when these high-risk infants are given an experimental treatment in which a surfactant is "blown" into their lungs immediately after birth. But the therapy has not gained Food and Drug Administration (FDA) approval, in part because few data exist about its long-term effects.

A new study described in the October *PEDIATRICS* provides one of the few looks so far at the cognitive and neurological development of surfactant-treated children. The results are not critical of the treatment, but fall short of encouraging—and may have the FDA demanding more safety studies.

Michael S. Dunn and his colleagues at

the Women's College Hospital in Toronto performed a blinded, two-year follow-up study of children born at gestational age 30 weeks or less—including 30 children who had received surfactant therapy at birth and 25 controls who had not. The children were checked for neurological handicaps by a variety of measures, including the Bayley Scale of Infant Development, which assesses cognitive development.

"The rate of major neurodevelopmental handicap in the surfactant group is noticeably higher than that in either the control group or the nursery population in general," the researchers report, noting five children with major handicaps in the surfactant group compared with two in the control group. "These differences are not statistically significant because of the small numbers," they add, "but the trend is disturbing."

Major handicap was defined in part by a Bayley score of less than 50—the type of score that would be expected from a functionally very limited 4-year-old with the cognitive development of a 2-year-old. Dunn believes the disconcerting trend is probably due to chance alone, but "is of sufficient concern that we should keep looking at it."

The study, which used surfactant purified from cow lungs, follows two other recent reports that showed no differences in developmental problems in surfactant-treated and untreated survivors of premature birth.

"The real critical question is whether the use of surfactants is increasing the survival of babies who are destined to be handicapped," says Allen Merritt of the University of California, San Diego, who recently coauthored a follow-up study of 61 surfactant-treated babies. Moreover, he adds, "one critical question that remains to be answered is whether some surfactants are better than others."

The San Diego team—now in the midst of a 200-infant clinical trial—is using human surfactant, which lacks the traces of bovine proteins that some researchers theorize may make bovine surfactants less than ideal. But human surfactant "is more difficult to obtain and process and produce, so its possibility for widespread distribution is less," Merritt notes. Other researchers are experimenting with synthetic surfactants.

Preliminary studies reported by Dunn and his colleagues suggest that no allergic or other immunological ill effects resulted from the bovine proteins in their surfactant.

If further tests indicate increased survival of severely handicapped children following surfactant treatment, Dunn says, neonatologists will be faced with "an ethical can of worms, in which we have to deal with our feelings about the value of a handicapped life. There's a definite quality-of-life question."

— R. Weiss