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PURDUE UNIVERSITY SCHOOL OF INDUSTRIAL ENGINEERING

MEMORANDUM

TO: D. Fischer, Staff Engineer, ACRS Subcommittee on Human Factors

FROM: Gavriel Salvendy, ACRS Consultant

DATE: September 9, 1982

SUBJECT: Comments from the September 7, 1982, Meeting



D. Ward requested that the ACRS consultants prepare a written report on their comments regarding the September 7, 1982, meeting and send them to you. The summary of my comments are as follows:

1. Generally speaking, I was most impressed with the planned NRC human factors program, but unless the program incorporates the suggestions made below the outcome from these studies would have little or dubious effects in improving the safety and health associated with nuclear power plant operations.

2. Only 5 percent of the total NRC budget is allocated for Human Factors. Yet, the NRC human factors program plan indicates that 50% of all health and safety related hazards in nuclear power plant operations are attributed to human factors problems. This inbalance between the allocated budget and the size of the problem is intolerable. Both the ACRS subcommittee on human factors and the NRC human factors directorate must do a better marketing job in increasing the percentage of allocated budget for human factors. To this end, a report would have to be prepared which demonstrates how, where and by how much, human factors research can improve the safety and health in nuclear power plant operation.

3. The objectives of the planned human factors research program have no operationally measurable criteria against which the effectiveness of the program can be evaluated. Thus, without an operationally measurable criteria it is not feasible to assess the effectiveness of the program. Since much of NRC planned human factors program is highly applied; hence, hypothesis could be stated regarding the expected contributions of each research program to improving the safety and health aspects of nuclear power plant operation. In those cases when such statements cannot be made, the research program probably has not been well thought out and; hence, they should not yet be conducted.

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4. The percentage of the total NRC's human factors budget allocated to each project area should be indicated. It would be reasonable to assume that these values will correlate with the anticipated percentage improvements, which each project will make to the safety and health of nuclear power plant operation.

5. Assuming that all of the NRC's human factors' research would yield most effective results even then with the current acute shortage in human factors personnel, there is no way that these results could be appropriately implemented across the nuclear power plant industry. Currently there is only one human factors specialist for each 350 engineers. If at the plant level human factors research is to be implemented, then university's would have to train more students in the decipline. In order to achieve this objective NRC should support the establishment of a number of human factors training centers in universities.

   The concept of establishing training centers in universities is not new. Much of the needed manpower in the clinical areas have been fostered this way. With the introduction of the Occupational Safety and Health Act of 1970, not enough manpower was available to implement safety and health requirements at the work place; hence, the National Institute of Occupational Safety and Health has established training centers at select universities within each geographical region.

   It is highly recommended that a position paper be prepared on this subject, which would also outline the creation of an office of "manpower training and education" within the human factors directorate of NRC. This document could be part of the proposed human factors plan and could be discussed at a meeting of the ACRS Human Factors Subcommittee meeting.

6. Much of NRC's planned human factors research is highly applied, which is predominantly aimed at transferring knowledge from other application areas of human factors to nuclear power plant operation. The planned research program completely lacks in basic generic research, which is crucial for the following reasons:

   (A.) With increased future emphasis on automation and computerization of nuclear power plant operations basic research must be focused on how human's operate in such conditions. What are their cognitive preferences, capabilities and limitations in such systems? The current literature does not provide answers to such questions.

   (B.) If the best academic institutions to get involved and if the significance and prestige of the NRC human factors research is to be elevated, then some meaningful emphasis must be placed on basic generic human factors research which are germane to the future safety and health operation of nuclear power plants, and

(C.) Traditionally NRC has supported basic engineering research, which is germane to effective nuclear power plant operation. Yet, so far, no basic research has been carried out throughout NRC's support in the human factors area. Thus, a major gap is being maintained between NRC germinated engineering advances and NRC related human factors progress. Plans should be formulated, throughout basic generic research, to close or narrow this gap.

7. The NRC's report on human factors research plans could be significantly enhanced by being cognizant of some of the above concerns. As an absolute minimum the report should include the following:

(A.) All pages should be numbered.

(B.) Should have a list of content.

(C.) Should have an abstract.

(D.) Should eliminate duplications.

(E.) Where appropriate, material should be cross-referenced to specific sections and pages of the report.

(F.) Should have a detailed chart, which conceptually integrates all the major tasks and sub-tasks of the planned research into a unified concept, which is aimed at improving the safety and health aspects of nuclear reactor operation.

(G.) The hypothesized significant contributions, which each project makes to achieving the goals of the overall research program should be operationally stated so that the outcome of NRC's research program could be objectively and quantitatively assessed -- this should be critical to ensure the future growth and existence of the human factors area in NRC operations, and

(H.) Either the percentage effort or the planned dollar amounts to be allocated to each major research area, and to specific projects, should be stated. It would be most helpful if there would be some relationship between these figures and those derived in "G" above.

Postcript: I thought that requesting a one page summary of the curriculum vita of the key human factors NRC person was a good idea. I would like to take this notion one step further and suggest the following:

(A.) That each person who will appear before the human factors

subcommittee, being either from NRC or from other organizations, that prior to their appearance before the subcommittee that they submit a one page copy of their resume. This could facilitate the subcommittee to better understand their presentation, and

(B.) That each ACRS subcommittee member on human factors and the consultants submit a one page resume. These resumes should become public documents and be easily excessable to all, and especially to those who plan to appear before the human factors subcommittee. This could facilitate the communication of the presenters before the human factors sub-committee.

GS: bes