Summary Status 10/17/79 (1)

Findings

Broad

Systems Engineering approach to design and operations has not been applied.

- Recognized as appropriate to complex man-machine situation
- DOD regs. require its use, NASA uses

Specific

Design:

- 90% of display, inst. & controls in CR fail HE criteria
  - Information display — location of info in relation to controls, ability to see, avail of info, scaling confusing
  - Workstation design — inconsistency of display in relation to control; excessive reach envelopes ~42"; controls out of sequence for task; poor functional grouping
  - Display design — changing light cells afraid of short, No color coding for ranges.
  - Control design — inconsistencies in functions (left and/or right), some critical controls unguarded

lighting — glare, no lamp test
annunciator unsat.

8001220755

- Labeling – very poor in general; inconsistent placement, not consistant with control positions;

Critical Points

- Onset of Accident – annunciators saturate & become unusable to operators.
- EMOV failure to close – Operator relies on lights. RCOT outside operating area.
- 2nd Boil dry on SG-A 11 min. – Proximity of controls, inadequate labeling –
- HPI shutoff – Misinterpretation of PZR level indication – training

Model CR HF design

Should be involved in entire process - conception to decommissioning

Systems Engineering — HF, TA

~~HF~~

HF Criteria or Industry

1. Existing at time of TMI-2

Nothing — ~~HE~~ 3279, 308 ESF display irregular

Manual must have pos indicator

GDC — general.

2. Current — More now on HE, but nothing on resp. org., sys integration

no HE from HE standpoint.

To days criteria would probably not improve performance

HF End of TMI-2 development Process

None — minimal ~~HE~~ attention to operator

Did not take any standard HE approaches to design of CR — Task anal, mockup — no coordination among parties.

HF Reviews Some Vintage Plants

Oconee – Mgmt committed to the
Mockup S+R procedures
minimal reach & visibility problems
good displays & alarms
control & display consistent

Calvert Cliffs – looked at HF
research work done at Detroit Edison
& lighting work. Mockup
~~and~~ system integration approach –
all parties involved. Component selection
excellent. Good alarm display.
SG EE management were very
much training-oriented.

* TMI problem seems to be a human
background

Trainers —

NRC Training Adequacy

Procedures —

Precursors — Ornstein (Several)

1. Swain Report
2. EPRI Reports
3. Michelan
4. BSAR
5.

Actions/Inactions before Accident Snell