NCSU/Aptima – NASA NRA-07 Research

5/1/07

Team Members: Alexander, Cowley, Hsiang, Kaber, Kaufmann, Kim, Stelzer

Guests: Bailey (FMP)

Agenda:

Review and discussion of experiment design:

- Fractional factorial design – 2^{5-1}, Resolution IV with ½ replicate
- Counter-block covered in experiment trials
- Main-block covered by bonus images.
- Alias structure and appropriate statistical model (main effects, two-way interactions)

Review of data collection at Langley

- Four subjects (Subject 1 – 2 trials; Subject 2 - 3 trials; Subject 3 – 2 trials; Subject 4 – 3 trials)
- Use of survey forms:
  - Eliminated ratings of descriptor terms for sample image.
  - Eliminated 14 page, open-ended questionnaire to be administered at close of trials (due to time constraints).
    - Substituted with request for subjects to define clutter.
    - Asked subjects to identify additional terms they might use to describe clutter.
- Collected anthropometric data (flight experience, etc.).
- Experiment trials and bonus images:
  - Ratings of utility of pairs of terms for describing clutter in display images (no lack of understanding among pilots on ratings).
  - Ratings of overall perceived clutter (each pilot used own scale).
  - Recorded whether pilot would use display as primary info source (during trials).

Discussion of preliminary data analyses:

- Summary on trial and subject effects in ANOVAs of overall clutter (Bailey):
  - General insignificance of trial.
  - Specific effects of subject term – Pervasive main effect. Interactions occurring with EVS manipulation for IN, MOC, RE, DI and UNG, the EVS, SVS and IMC factors for DU, the EVS and TCAS factors for UNS, and all factors (save SVS) for the overall ratings.
- ANOVAs – Display features and overall clutter (Bailey, Kim and Kaber).
  - Discussion of differences in observation counts across analyses (Bailey and Kim – 128 vs. 160)
- Regression analysis – Display features and overall clutter (Kim and Kaber).
  - Coefficient estimates for predictive model of perceived clutter in display features and identification of significant terms.
- Defining psychophysical transfer function – Use of survival function (Hsiang).
  - Distribution fitting of transfer function/response measure data.
  - Developing predictive models of likelihood of overall clutter ratings in perceived utility of pairs of descriptor terms (each subject, each trial).
  - Determining model parameter coefficients and eliminating insignificant or unimportant predictors (use of threshold value for model reduction).
  - Identification of most frequently used and important descriptor terms for used in Experiment #2.
- Preliminary factor analysis (Bailey):
  - 4 and 5 factor models.
  - Inter-correlations among ratings of pairs of terms.
  - Strength of pairs in each factor.
  - Description of factors as underlying dimensions of perceived clutter.
- Preliminary MDS analysis and pilot preference mapping in terms of overall clutter (practice for research team) (Kim and Kaber).
  - Factor analysis - 2 factors. (Coding of commonality and specificity.)
  - Identification of pairs of descriptors related to specific displays in terms of overall clutter.
  - Identification of common features of groups of displays.
  - Mapping of overall clutter vector on MDS.

Identification of preferred displays in terms of overall clutter.

(Actual MDS analysis is to be conducted after Experiment #2 with more data on select set of rating scales.)

Reviews of additional literature completed during period (Cowley).

Additional business from the floor

Issues/Tasks Addressed:

- Completed Experiment #1.
- Completed preliminary analysis of experiment data.
- Completed additional reviews of HUD literature.

Current Issues:

- Develop descriptive statistics on anthropomorphic data (means, standard deviations for flight experience, etc.). Need to characterize population for reporting (5/15-5/31) (Alexander, Stelzer).
- Complete spreadsheet compiling notes recorded by all experimenters during study (responses of subjects to specific questions and comments) (5/15-5/31) (Kim).
- Analysis of role of display features in perceptions of HUD as primary information source (5/15) (Cowley, Kaufmann, Kim)
    - Code data
    - Use same ANOVA model and regression procedure as above.
- Draft technical report on experiment (8/15/07) (All).
- Prepare journal manuscript based on first study as part of project (Target submission date – 8/15/07. Consider HF or ASEM.)
- Planning and preparation for Experiment #2 (8/15/07-10/15/07)