INTRODUCTION. Flight crews must make decisions and take action when systems fail or emergencies arise during flight. These situations may involve high levels of risk, information uncertainty, and time pressure, factors that contribute to stress. Full-flight simulation studies have shown that crews differ in how effectively they cope in these circumstances, judged by operational errors and crew coordination. The present study analyzed the problem solving and decision making strategies used by crews in high-stress situations. The data included scenarios that tested the crews' ability to make decisions during high-workload periods. Transcripts of video recordings were analyzed to describe decision making strategies. The results of this study provide insights into how crews solve problems and make decisions in high-stress environments.

METHODS. Twelve 3-member B-727 crews flew a 5-leg full-flight simulation per month for 125 days. The simulation was designed to include abnormal events that required decisions during high-workload periods. The data were collected by video recording and analyzed by trained observers.

RESULTS. Based on a median split of crew performance scores, analyses to date indicate a difference in general strategy between crews who make more or less errors. Higher-performing crews showed greater situational awareness, planning, constraint sensitivity, and coordination. The major differences between higher and lower-performing crews were that the lower-performing crews made quick decisions and then collected information to confirm their decision. The higher-performing crews were able to gather information in a frame-based language, taxonomies of the conceptual, relational, and procedural constraints, and the procedural representation is being linked to models of human decision making processes that include temporal reasoning, and constraint checking for partial ordering of procedures. Finally, the attempt is being made to link the procedural representation to models of cognitive function to establish task-analysis. The representation supports developed methods of intent inference, and is an executable representation of crew/avionics information sources and crew information requirements. The system provides a flexible, extensible, manipulable and modifiable framework for crew selection and training.

CONCLUSION. Differences in overall crew performance were associated with differences in situational awareness, information management, and decision strategy. Captain personality profiles were associated with these differences, a finding with implications for crew selection and training.