Human Factors Issues in the Support of Collaborative Decision Making in the National Airspace System – Final Report

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Purpose and Rationale:
The primary focus of this project has been to provide design input for the implementation of a suite of Reroute Advisory Tools (RAT), which was recommended for implementation earlier in this project. The goal of this suite of tools is to enhance the dissemination and use of ATCSCC Reroute Advisories to NAS Users.

Two smaller tasks were also completed over the course of this project. The first was the development of a proposal for the design of Web-based summary reports for POET (the Post-Operations Evaluation Tool). The second was to provide design input to the CDM Program on the CCFP (Collaborative Convective Forecast Product).

All three of these focus areas support the development of new tools that offer the potential to significantly reduce departure delays, improve the planning and implementation of responses severe weather, better accommodate the priorities and constraints of NAS users, and reduce the workload of FAA traffic managers, freeing them up for other tasks.

Methodology:

Four approaches have been used: Structured interviews with FAA and airline staff to conduct needs assessments; POET analyses to provide objective data about scenarios that arise in the NAS and that offer insights into problematic or successful responses to weather and traffic constraints; analytical evaluations of proposed tool designs to assess potential usefulness and usability; and the design and implementation of prototype tools to explore and communicate alternative designs to meet identified needs.

Results:

During the first half of FY03, we provided initial input for the design of the suite of RAT tools. In addition, we documented the need for better tools to provide feedback to FAA operational staff and to the NAS users, and developed a prototype system (Web POET) to demonstrate how to meet this need. Based on these contributions, Web POET is now in Beta-testing as an operational system. The reports and papers on these accomplishments, which have been previously submitted, are listed below.

Smith, P.J., Klopfenstein, M., Jezerinac, J., Spencer, A., (In Press). Distributed Work in the National Airspace System: Providing Feedback Loops Using the Post-Operations Evaluation Tool (POET). In B. Kirwan, M. Rodgers and D. Schaefer (eds.), Human Factors Impacts in Air Traffic Management. Ashgate.
Smith, P.J. (2003). Use of the Reroute Advisory Tool (RAT) to Support Coordination in the Use of Coded Departure Routes. Institute for Ergonomics Technical Report #2003-18. Ohio State University, Columbus OH.
Smith, P.J. (2003). Benefits from the Use of Coded Departure Routes. Institute for Ergonomics Technical Report #2003-17. Ohio State University, Columbus OH.

Smith, P.J., Beatty, R., Campbell, K., Murphy, M., Jezerinac, J. and Behbehani , T. (2003). Design and evaluation of tools for the creation, dissemination of and response to reroute advisories to enhance coordination in traffic flow management. Proceedings of the 2002 Aviation Psychology Symposium, Dayton, OH.

Obradovich, J. Heintz and Smith, P.J. (2003). Problem solving in a distributed collaborative environment: The necessity of shared knowledge within the air traffic management system. Proceedings of the 2003 Aviation Psychology Symposium, Dayton, OH.

Chapman, R. and Smith, P.J. (2003). The impact of communications mode on asynchronous collaboration in the NAS. Proceedings of the 2003 Aviation Psychology Symposium, Dayton, OH.

Obradovich, J. Heintz and Smith, P.J. (2002). Distributed collaborative problem solving in the NAS: Building shared knowledge between the partners with relevant knowledge and those making decisions. In S. Chatty, J. Hansman and G. Boy, Proceedings of the International Conference on Human-Computer Interaction in Aeronautics. Cambridge, MA: AAAI Press, 100-104.

Chapman, R. and Smith, P.J. (2002). Asynchronouscommunications to support distributed work in the National Aviation System. Proceedings of the 46th Annual Meeting of the Human Factors and Ergonomics Society, Baltimore.

During the latter part of FY03 and the first part of FY04, we continued working with FAA staff and NAS Users to improve the design of the suite of reroute advisory tools. A slideshow is attached that summarizes the goals of RAT and provides an update on its design and use. This work has contributed to the design and implementation of two operational tools, the TSD Create Reroute Tool (used by ATCSCC to create RAT advisories) and the CCSD Reroute Advisory Dissemination Tool (for NAS users to display RAT advisories). The success of this effort is captured by the following two quotes:

ATCSCC Severe Weather Specialist: "The Create Reroute Tool is very easy to use. Our staff is using it more and more. We're now using it to create 90% of the reroute advisories and hope to get that up to close to 100%."

Airline ATC Coordinator: "These structured advisories with flight lists are great. When you've to the call sign and the flight list, it makes it so much easier for the dispatcher. As we develop automation to support the use of these structured advisories, it will become an even more powerful tool to help us comply with reroute advisories."

In addition to work on the RAT suite of tools, in the latter part of FY03 and the first part of FY04 we developed a prototype version of WebPOET, a tool for producing summary reports based on POET analyses. This prototype of the Web-POET Summary Report capability was designed and implemented by OSU (see the figures below). The initial summary reports focus on airport departures and specific flights, as meetings with ZNY, ZOB and FedEx staff indicated that such particular reports would be very useful to them. Later discussion have indicated that reports on airport arrivals would also be of particular value.

More specifically, Web-POET has the ability to automatically generate summary reports based on a scripted set of POET commands at times requested by users (such as generating a daily departure report summary for EWR at 0500Z each day for review later that morning by ARTCC staff). The summary report is placed on a Web page and the link is emailed to those email addresses specified by the user.
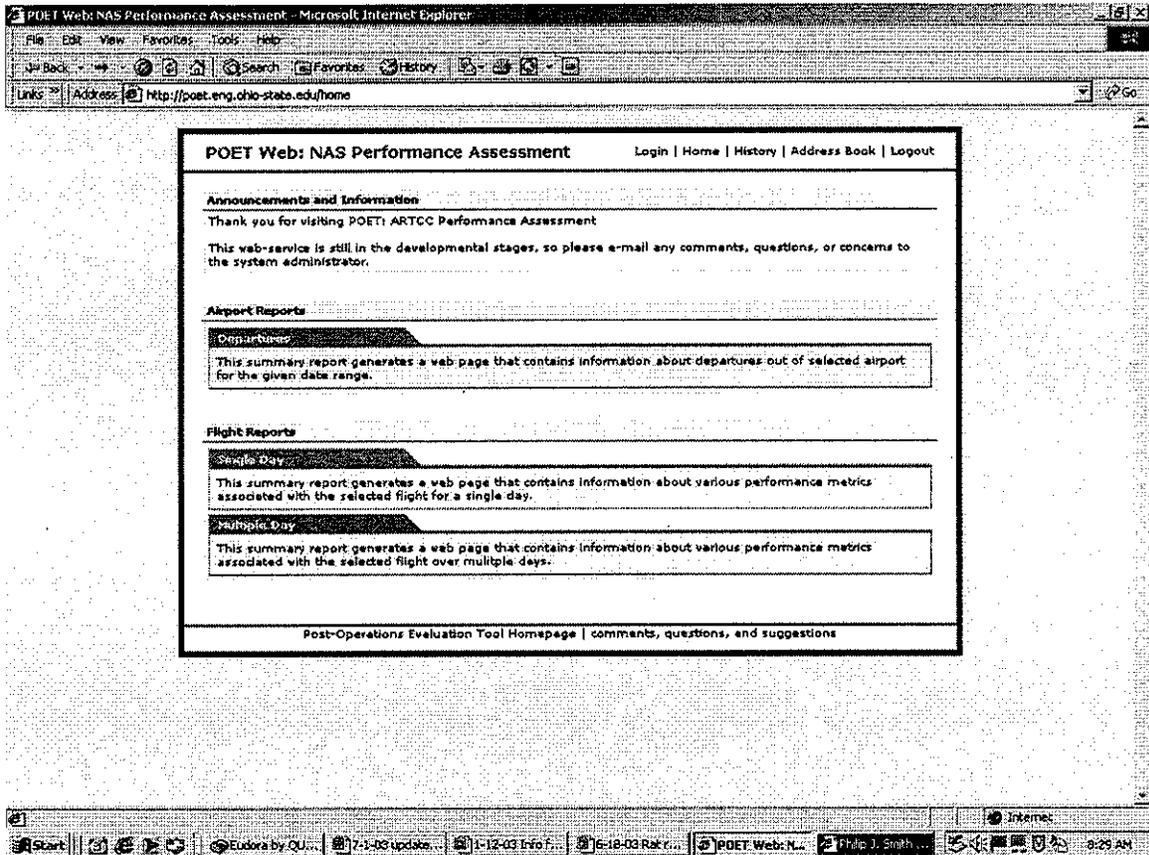
Figure 1. Web-POET screen for requesting summary reports.
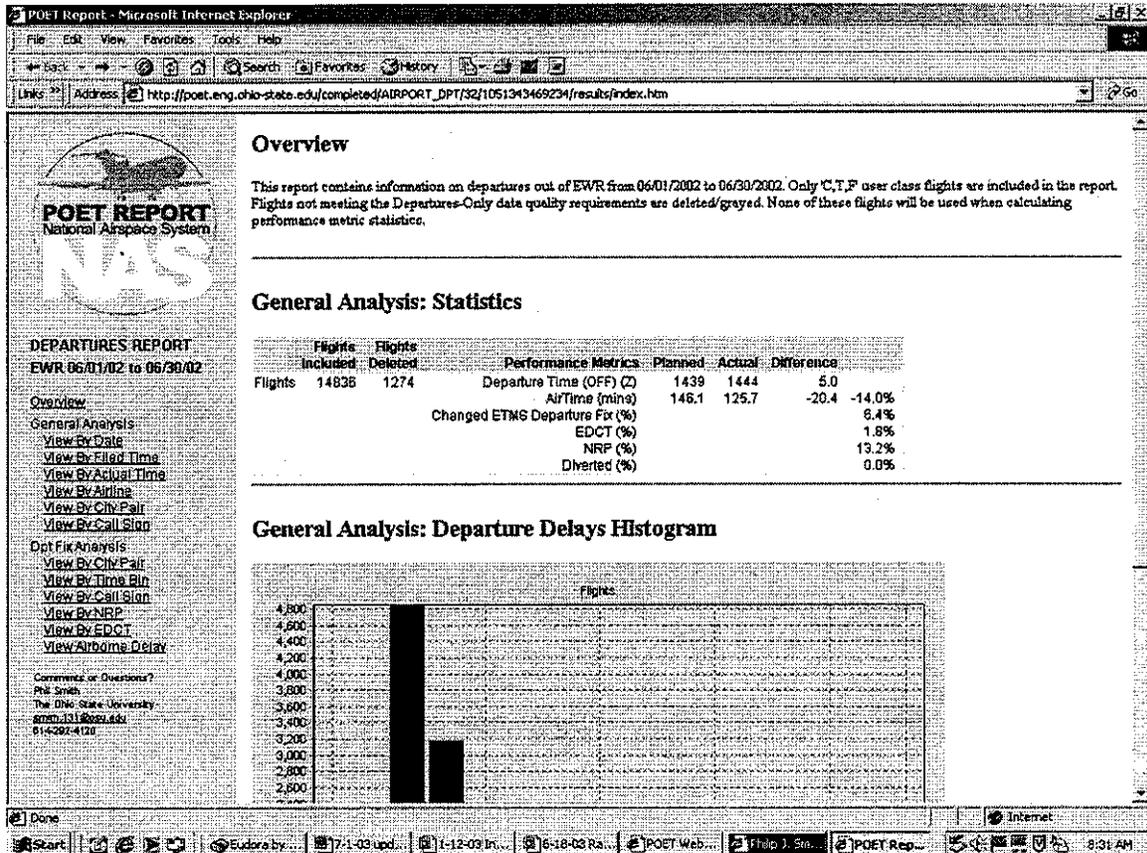
Figure 2. Home page for a summary report on all departures out of EWR from 6-1 to 6-30

Our original plans were to conduct an evaluation of this prototype with one ARTCC and one airline. However, because of security issues, internet access to POET was discontinued by the FAA, making it impossible to conduct this evaluation of the prototype. This evaluation was therefore deferred to a future time.In spite of this delay, the FAA made the decision to implement an operational version of WebPOET. It would now be possible to conduct such an evaluation, as a beta version of an operational implementation of WebPOET is now available access by FAA facilities and NAS users over CDMNet.

In place of the evaluation of WebPOET, we were asked by the CDM Program to provide design input on revisions of the CCFP (Collaborative Convective Forecast Product). Two reports are attached that document our contributions to this design activity.

Summary:

This project has identified two major operational needs for improving performance within the NAS. The first was the need to improve the processes and tools for the creation, dissemination and use of ATCSCC reroute advisories. The second was the need to improve feedback to traffic managers and NAS users regarding the impact of their flight and flow planning decision on performance in the NAS.

In both of these areas, our work has not only identified these needs and provided a deeper understanding of the underlying problems, we have also proposed design solutions that have led to the implementation of new FAA software tools that are now operational.

Finally, as a side project, we have also contributed expertise to improving the design of the CCFP displays.