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**Professor**  
Department of Integrated  
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The Ohio State University

Dr. Philip J. Smith is a Professor in the Department of Integrated Systems Engineering.

### **Teaching**

- Cognitive systems Engineering
- Design of distributed work systems
- Design-induced error
- Artificial intelligence
- Human-automation interaction
- Intelligent information systems
- Intelligent tutoring systems

### **Research**

- Design of distributed work systems
- Verification and validation of complex systems
- Human-automation interaction
- Intelligent information systems
- Continuous adaptive planning
- Interactive critiquing systems
- Intelligent tutoring systems
- Representation aiding

### **Applications**

- Aviation
  - ATC & air traffic flow management
  - airline operations control
  - airport surface management
  - human/automation interaction
  - unmanned aerial systems
  - flight deck automation
  - visual analytics
  - required navigational performance
- Education and training
  - medicine
  - high school biology
  - general aviation
- Healthcare
  - immunohematology
  - orthopedics
- Military planning

## Education

1979 Ph.D., Industrial and Operations Engineering and Cognitive Psychology, University of Michigan (Ann Arbor)

1976 M.S., Industrial and Operations Engineering, University of Michigan (Ann Arbor)

1975 B.A., Psychology, University of Michigan (Ann Arbor)

## Awards

- OSU College of Engineering MacQuigg Award for Outstanding Teaching, 2012
- Air Traffic Control Association David J. Hurley Memorial Award for Research in Collaborative Decision Making, 2009  
“This is a Medallion Award presented to an individual working in the field of Aviation Traffic Management for outstanding achievement or contribution in the area of ATC collaborative decision making, balancing traffic demand and capacity, or maximizing airspace and airport use, which has added to the quality, efficiency and/or safety of the National Airspace System.”
- Best Paper Award, Proceedings of 2008 Air Traffic Control Association Annual Meeting
- Fellow, Human Factors and Ergonomics Society, 2001
- National Aviation Safety Award, Airline Dispatchers Federation, 2001
- Airline Dispatchers Federation "National Aviation Safety Award" for 2001
- Award for “Best Paper” in Human Factors in 1999, (Jerome H. Ely Human Factors Article Award)  
“This paper is recognized for its unique application to a significant human factors problem in medical systems. A new and outstanding use of artificial intelligence technology is studied in a real decision support application, with real experts, and with objective outcome measures. The paper serves as a benchmark for the design and use of artificial intelligence in human decision support systems.”
- Advisor for student winning award for “Best Paper submitted to the Training Systems Technical Group” at the Annual Meeting of the Human Factors and Ergonomics Society, 1996
- Advisor for student winning award for “Best Paper” at the Annual Meeting of the Human Factors and Ergonomics Society, 1995
- Advisor for student winning award for “Best Paper” at the Annual Meeting of the IEEE Society on Systems, Man and Cybernetics, 1995
- Award for “Best Publication”, American Society for Information Science, 1994
- Kleiner Award for “Best Paper” in Clinical Laboratory Science, 1993
- Advisor for student winning award for “Best Paper” at the Annual Meeting of the Human Factors and Ergonomics Society, 1993
- Award for “Most Innovative Software”, National Library and Information Technology Association Conference, 1992
- Award for “SIG of the Year” to SIG-Classification Research from ASIS (for role as program chair), 1992
- "Best Paper" Award, SIGIR '89
- Collaborative Research Award, The Ohio State University, 1988

## Publications - Phil's Favorites

Smith, P. J. (2017). Making brittle technologies useful. In P.J Smith and R.R. Hoffman (eds). Cognitive Systems Engineering: The Future for a Changing World. Boca Raton, FL: CRC Press, 181-208.

Smith, P. J. and Hoffman, R. R. (eds.) (2017). Cognitive Systems Engineering: The Future for a Changing World. Boca Raton, FL: CRC Press.

Rinehart, D., Smith, P. J., Spencer, A., Peters, M., Young, S. (2016). Structured expert scenario methodology for autonomous system validation applied to a multi-UAS ground control station design. Proceedings of the 2016 Digital Avionics Systems Conference (DASC).

Smith, P.J., Johnson, D., Pruchnicki, S., Schimmel, J., Spencer, A. and Young, S. (2016). Cognitive engineering considerations in the development of an information retrieval system: Avoiding fixation on technological substitutes. Journal of Cognitive Engineering and Decision Making.

Spencer, A., Smith, P. J., Evans, M. & Durham, K. (2015). Effective Collaborative Design: Human Factors Lessons Learned for the Design and Implementation of RNAV Procedures. Technical Report 2015-16. The Ohio State University.

Smith, P.J., Abbott, K., Prinzel, L., Pritchett, A. and Yuditsky, T. (2015). Techniques for the human centered evaluation of designs for the future aviation system. Proceedings of the 2015 International Symposium on Aviation Psychology, Dayton, OH.

Fernandes, A., Smith, P.J., Durham, K. and Evans, M. (2015). Individual problem representations in distributed work. Proceedings of the 2015 International Symposium on Aviation Psychology, Dayton, OH.

Rinehart, D., Hunter, G., Smith, P.J. and Spencer, A. (2014). SME-defined scenarios for autonomy (SDSA): A method for exploring complex aviation system safety and performance. Proceedings of the 2014 AIAA Digital Avionics Systems Conference, Colorado Springs.

Smith, P.J., Weaver, K., Fernandes, A., Spencer, A., Evans, M. and Durham, K. (2013). Collaboration, coordination and information requirements for the support of an airport departure metering program. Proceedings of the 2013 International Aviation Psychology Symposium, Dayton OH.

Smith, P.J., Weaver, K., Fernandes, A., Durham, K., Evans, M., Spencer, A. and Johnson, D. (2012). Supporting distributed management of the airport surface. Proceedings of the 2012 AIAA Digital Avionics Systems Conference, Williamsburg, VA.

Smith, P.J., Beatty, R., Hayes, C., Larson, A., Geddes, N. and Dorneich, M. (2012). Human-centered design of decisions-support systems. In J. Jacko (ed.), *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications*, 3rd Edition, 589-621.

Smith, P.J., Fernandes, A.B., Durham, K., Evans, M., Spencer, A., Beatty, R. Wiley, E. & Spencer, A. (2011). Airport Surface Management as a Distributed Supervisory Control Task. Proceedings of the 2011 AIAA Digital Avionics Systems Conference, Orlando.

Fernandes, A. and Smith, P.J. (2011). Tools to Support Distributed Adaptive Planning: Airport Surface Displays for Collaborative Departure Management. Proceedings of the 10th International Conference on Naturalistic Decision Making, Orlando, 87-94.

Borgman, A., Smith, P.J., Evans, M., Beatty, R., Durham, K., Billings, C., Wiley, E. and Spencer, A. (2010). Integrated management of airport surface and airspace constraints for departures: An operational sequence. Proceedings of the AIAA 2010 Digital Aviation Systems Conference, 108-112.

Smith, P.J., Spencer, A.L. and Billings, C. (2010). The Design of a Distributed Work System to Support Adaptive Decision Making Across Multiple Organizations. In Kathleen L. Mosier and Ute M. Fischer, (Eds.), *Informed by Knowledge: Expert Performance in Complex Situations*. New York: Taylor and Francis.

Smith, P.J. and Billings, C. (2009). Layered resilience. *Resilience Engineering Perspectives-Volume Two*. Hampshire England: Ashgate, 413-430.

Smith, P.J., Spencer, A., Evans, M., Andre, A. and Krozel, J. (2009). Human factors issues in the design of superdense operations airspace. Proceedings of the 2009 Annual Meeting of the Human Factors and Ergonomics Society, San Antonio.

Smith, P.J., Bower, J. and Spencer, A. (2009). Asynchronous communication of Army operations orders. In P. McDermott and L. Allender (eds.), *Advanced Decision Architectures for the Warfighter*. Aberdeen MD: Army Research Laboratory, 413- 430.

Billings, C., Smith, P.J. and Spencer, A. (2008). Safety event reporting systems: Problem detection in distributed systems. In C. Nemeth (ed.), *Improving Healthcare Team Communication*. Hampshire, England: Ashgate, 65-78.

Smith, P. J., Spencer, A.L. and Billings, C. (2007). Strategies for designing distributed systems: Case studies in the design of an air traffic management system. *Cognition, Technology and Work*, 39-49.

Smith, P.J., Bennett, K. and Stone, B. (2006). Representation aiding to support performance on problem solving tasks. In Williges, R. (ed.), *Reviews of Human Factors and Ergonomics, Volume 2*. Santa Monica CA: Human Factors and Ergonomics Society.

Smith, P.J., Stone, R.B. and Spencer, A. (2006). Design as a prediction task: Applying cognitive psychology to system development. In W. Marras and W. Karwowski (eds.), *Handbook of Industrial Ergonomics*, 2nd Edition. New York: Marcel Dekker, Inc., 24-1 – 24-18.

Smith, P.J., Klopfenstein, M. Jezerinac, J. and Spencer, A. (2005). Distributed work in the National Airspace System: Providing feedback loops using the Post-Operations Evaluation Tool (POET). B. Kirwan, M. Rodgers and D. Schaefer (eds.), *Human Factors Impacts in Air Traffic Management*. Hampshire England: Ashgate.

Spencer, A., Smith, P.J. and Billings, C. (2005). Airport resource management and decision aids for airlines. *Proceedings of the 2005 International Symposium on Aviation Psychology*, Oklahoma City.

Smith, P.J., Beatty, R., Spencer, A. and Billings, C. (2003). Dealing with the challenges of distributed planning in a stochastic environment: Coordinated contingency planning. *Proceedings of the 2003 Annual Conference on Digital Avionics Systems*, Chicago, IL.

Smith, P. J., Billings, C. and Spencer, A. (2001). *Airline Operations Control Perspectives on the Design of Tools and Procedures for the Future Aviation System*. Institute for Ergonomics Technical Report #2001-17. Ohio State University, Columbus OH.

Smith, P.J., McCoy, E. and Orasanu, J. (2001). Distributed cooperative problem-solving in the air traffic management system. In G. Klein and E. Salas (eds.), *Naturalistic Decision Making*. Mahwah, NJ: Erlbaum, 369-384.

Smith, P. J., Obradovich, J. Heintz, Guerlain, S., Rudmann, S., Strohm, P., Smith, J.W., Svirbely, J., and Sachs, L. (1998). Successful use of an expert system to teach diagnostic reasoning for antibody identification. *Proceedings of the Fourth International Conference on Intelligent Tutoring Systems*. San Antonio, Texas, August 16-19, 354-363.

Guerlain, S., Smith, P. J., Obradovich, J. H., Rudmann, S., Strohm, P. Smith, J. W., Svirbely, J., and Sachs, L. (1999). Interactive critiquing as a form of decision support: An empirical evaluation. *Human Factors*, 41, 72-89.

Denning, R. and Smith, P.J. (1998). A case study in the development of an interactive learning environment to teach problem-solving skills. *Journal of Interactive Learning Research*, 9, 3-36.

Smith, P.J., McCoy, E. and Layton, C. (1997). Brittleness in the design of cooperative problem-solving systems: The effects on user performance. *IEEE Transactions on Systems, Man and Cybernetics*, 27, 360-371.

Denning, R. and Smith, P. J. (1997). Cooperative learning and technology. *Journal of Computers in Mathematics and Science Teaching*, 16, 177-200.

Smith, P. J., McCoy, E., Orasanu, J., Billings, C., Denning, R., Rodvold, M., Gee, T., and Van Horn, A. (1997). Control by permission: A case study of cooperative problem-solving in the interactions of airline dispatchers and ATCSCC. *Air Traffic Control Quarterly*, 4, 229-247.

Guerlain, S., Smith, P.J., Obradovich, J., Rudmann, S., Smith, J.W. and Svirbely, J. (1996). Dealing with brittleness in the design of expert systems for immunohematology. *Immunohematology*, 12(5), 101-107.

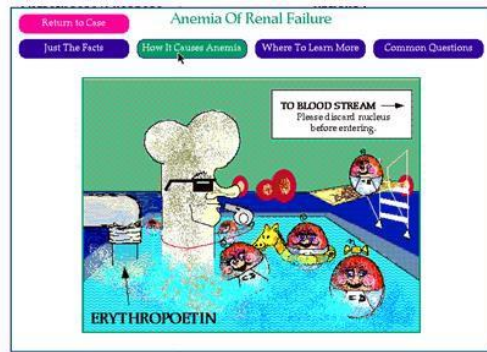
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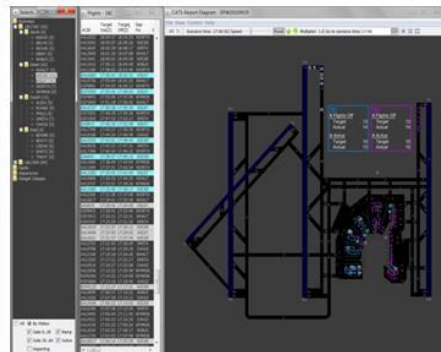
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Smith, P. J., Giffin, W., Rockwell, T, and Thomas, M. (1986). Modeling fault diagnosis as the activation and use of a frame system. *Human Factors*, 28(6), 703-716.

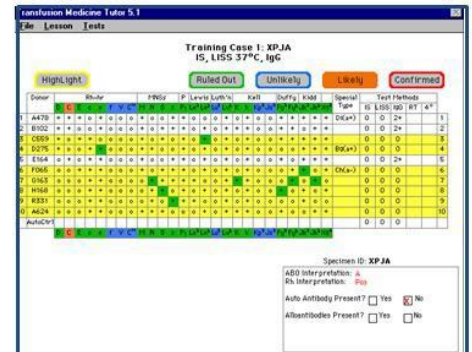
## Software Development



Biology Sleuth



Collaborative Airport Traffic System



Transfusion Medicine Tutor

**CATS** (Collaborative Airport Traffic System) – This is an airport simulation with a stochastic model of airport movement and departure times to study airport surface management strategies, including departure metering. It contains actual and forecast weather to study the collaborative performance of terminal airspace management by ARTCC and TRACON traffic managers (including MIT restrictions, fix closures and pre-departure reroutes) with ground controllers and a Departure Reservoir Coordinator.

**C-MRE** (Collaborative Multimedia Recording Environment) – A second generation extension of C-MRE used to study multimedia communication in military planning.

**CSLANT** (Collaborative SLide Annotation Tool) – A research prototype supporting asynchronous multimedia communication.

**DETUR** (Departure Evaluation Tool for Understanding Reroutes) – DETUR provides an analysis of all the route filings and amendments associated with given destinations for some departure airport and is being used to support the dynamic use of coded departure routes to deal with uncertainty about weather and traffic constraints. This is in beta testing by New York Center, Cleveland Center, Minneapolis Center, Delta, United, Continental and NetJets.

**ARMADA** (Airport Resource Management and Decision Aid) – This research prototype is a decision support tool to assist in expediting the movement of aircraft on the airport surface and on the integration of airport surface and airspace data in order to improve planning and tactical operations.

**AIDA** (Antibody IDentification Assistant) and **TMT** (Transfusion Medicine Tutor) – This pair of interactive critiquing systems is used to provide decision support in blood banks and to teach immunohematology. TMT is in use by over 100 teaching programs around the world.

**General Aviation Performance Feedback System** – This tool provides general aviation pilots and system analysts with detailed feedback on performance during general aviation flights.

**POET** (Post-Operations Evaluation Tool) – This is one of the major operational tools used by the airlines and FAA air traffic system to evaluate performance in the airspace system.

**RAT** (Reroute Advisory Tool) - This prototype supports the dissemination of information to NAS users and FAA facilities regarding air traffic advisories to deal with dynamic constraints in the airspace system. It has been used as the basis for developing an operational system by the FAA.

**GAIT** (Gait Analysis Instructional Tool) – This research prototype provides a multimedia environment for teaching diagnostic skills to orthopedic surgeons.

**The Biology Sleuth** – This prototype provides a problem-based learning environment for teaching problem solving skills to high school biology students.

**Flight Planning Testbed** – This prototype demonstrates the design of a graphical interface for flight planning by airline dispatchers, built upon a simulation of the performance of a Boeing 737 aircraft.

**EP-X** (Environmental Pollution eXpert) – This research prototype demonstrates the design and functioning of a knowledge-based system to support semantically-based search of the literature on environmental chemistry.