

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Engineering

Nadine B. Sarter, associate professor of industrial and operations engineering, with tenure, Department of Industrial and Operations Engineering, College of Engineering, is recommended for promotion to professor of industrial and operations engineering, with tenure, Department of Industrial and Operations Engineering, College of Engineering.

Academic Degrees:

Ph.D. 1994 Ohio State University, Industrial and Systems Engineering  
M.S. 1983 University of Hamburg, Applied & Experimental Psychology  
B.S. 1981 University of Hamburg Psychology

Professional Record:

2004-present Associate Professor, Industrial and Operations Engineering and Center for Ergonomics  
2002-2004 Associate Professor, Industrial and Systems Engineering (Joint Appointment:  
Psychology), Ohio State University  
1999-2002 Assistant Professor, Industrial and Systems Engineering (Joint Appointment:  
Psychology), Ohio State University  
1996-1999 Assistant Professor, Institute of Aviation - Aviation Research Lab; Department of  
Mechanical and Industrial Engineering; Department of Psychology; Beckman Institute  
for Advanced Science and Technology, University of Illinois at Urbana-Champaign

Summary of Evaluation:

Teaching: Professor Sarter has developed and taught three new courses in the area of cognitive ergonomics and system safety, two at the senior undergraduate level (434-Human Error and Complex System Failures and 491-Multimodal Displays: Conceptual Basis and Design) and one at the graduate level (536-Cognitive Ergonomics). She has significantly increased the department's footprint in the area of cognitive ergonomics. Her Q1 and Q2 scores range from 4.11-4.85 and 4.56-4.96, respectively. Professor Sarter has developed a new teaching tool called "concept mapping" to help students place different concepts covered in class in context. In her career, Professor Sarter has graduated six Ph.D. students, two at Ohio State, one at the University of Illinois, and three at the University of Michigan. One of her recent UM students has accepted a position at Texas A&M, a leading industrial engineering department. She has also supervised six M.S. student theses at her previous institutions.

Research: Professor Sarter's research is in the general area of cognitive ergonomics with a particular focus on human-machine automation systems and related errors, and multi-modal displays. Her work is characterized by an integrated approach of analyzing accidents and incidents in the real world and using simulation studies of pilot-automation interactions. Her work has grounded the concepts of "mode error" and "mode confusion" in solid empirical findings. In the field of multi-modal displays, including tactile displays, she integrates psychological theories with controlled lab experiments. This work has direct applications in aviation (where she has won many awards) and in health care. Roughly half of Professor Sarter's publications have been in *Human Factors*, the leading journal in her field. Some of her other publications have been in more specialized aviation-related journals as well as book chapters. Eight of her publications have been cited over 100 times according to Google Scholar, and her H-index on Google Scholar is 20. Two of her early papers have been cited over 300 times.

Her research has been exceptionally well-funded. During her career, she has been the PI or co-PI on nearly \$7M of research projects, mostly funded by the aviation industry, the FAA or NASA. She also received an NSF CAREER Award. This level of funding, mostly from industry, is a testament to the importance of her work in industry and practice. She has won several best-paper awards including the Jerome H. Ely Human Factors Article Award for the best paper published in the journal *Human Factors* in 2008.

Service: Professor Sarter serves as an associate editor of *Human Factors*; *IEEE Transactions on Systems, Man and Cybernetics*; and the *IEEE Transactions on Intelligent Transportation Systems*; all top journals in her fields. She also serves on the editorial boards of five other journals. Clearly, her expertise is valued in the editorial world. She has also served on numerous National Research Council committees, as well as on industry and professional society committees. Within the university, Professor Sarter chairs the department's Safety Committee and serves on the Graduate Admissions and Financial Aid and Graduate Program Committees in the department. She is a member of the Department Committee (2010-11) and served on the IOE Internal Review Committee in 2010. She is a founding member of two ADVANCE STEP committees and served on the College's Diversity and Outreach Council for three years. She is frequently called upon to mentor female students in the department. She is clearly dedicated to diversity within the department, college and university.

Recent and Significant Publications:

- Sarter, N. and Woods, D.D. (1995). How in the World Did We Ever Get Into That Mode?: Mode Error and Awareness in Supervisory Control. *Human Factors*, 37(1), 5-19.
- Sarter, N. and Woods, D.D. (1997). Teamplay with A Powerful and Independent Agent: A Corpus of Operational Experiences and Automation Surprises on the Airbus A-320. *Human Factors*, 39(4), 553-569.
- Sklar, A.E. and Sarter, N. (1999). Good Vibrations: The Use of Tactile Feedback In Support of Mode Awareness on Advanced Technology Aircraft. *Human Factors*, 41(4), 543-552.
- Sarter, N. and Schroeder, B. (2002). Supporting Decision-Making and Action Selection Under Time Pressure and Uncertainty: The Case of Inflight Icing. *Human Factors*, 43(4), 573-583.
- Sarter, N. (2006). Multimodal Information Presentation: Design Guidance and Research Challenges. *International Journal of Industrial Ergonomics*, 36(5), 439-445.

External Reviewers:

Reviewer A: "Put in the most simple and direct terms, I see this case as a 'slam dunk.' ... Dr. Sarter has consistently chosen important but tractable research issues to which she has made important theoretical but also practical contributions. ... Here again Dr. Sarter's work is groundbreaking and outstanding."

Reviewer B: "...the problems she has selected to study and solve are central to our discipline: designing interfaces to reduce the likelihood of mode confusion and mode error (a failure of a system operator to understand the state of the system being controlled), and the design of multi-modal interfaces (the use of combinations of sensory modalities, such as vision, audition, and haptics) to enhance an operator's situation awareness. ... she exudes a very high level of enthusiasm that tends to inspire others, especially students. Anyone witnessing one of Nadine's presentations cannot come away without a clear appreciation that she both loves her work and is highly dedicated to it."

Reviewer C: "She is clearly one of the most accomplished and influential members of the human factors community. ... Her papers on mode awareness and automation surprises have provided fundamental insights into the challenges that people have in responding to automation."

Reviewer D: “Dr. Sarter is one of the leaders of the cognitive approach to human factors. Her work on mode confusion was seminal in understanding this phenomenon. Her distinction (in work with David Woods) between errors of commission and errors of omission provided an important conceptual tool to understand pilot errors.”

Reviewer E: “...she is considered one of the top international authorities in multimodal attentional processing...”

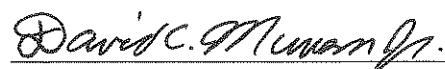
Reviewer F: “She is, quite simply, one of the leading scholars in the world in the field of cognitive engineering. ... This work significantly influenced my own research on humans and automation and has since spawned numerous other fruitful avenues of research on this topic. ... Again, my own work has been significantly influenced by these studies.”

Reviewer G: “Dr. Sarter is clearly one of our leading scholars. ... She is the complete package of scholar, mentor, colleague – I would love to have her here at [my institution].”

Reviewer H: “She is also well known for key experimental work on multi-sensory modal displays and multi-modal control inputs in machine operation in general (not necessarily in aviation). The number of best paper awards she and her graduate student have produced is truly impressive.”

Reviewer I: “By all measures she is at the top of her field. ... Her research is not just of the highest scientific quality, she also does work that has direct impact on safety.”

Summary of Recommendation: Professor Sarter is a leading scholar in the field of cognitive ergonomics and system safety, a dedicated teacher and mentor to her students, and a devoted colleague willing to serve the profession and her university. Her exceptionally strong record in all dimensions clearly qualifies her for promotion to the rank of Professor. It is with the unanimous support of the College of Engineering Executive Committee that I recommend Nadine B. Sarter for promotion to professor of industrial and operations engineering, with tenure, Department of Industrial and Operations Engineering, College of Engineering.



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David C. Munson, Jr.  
Robert J. Vlasic Dean of Engineering  
College of Engineering  
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