Thomas Schnell, Ph.D.

Captain Jim "MAX" Gross Chair in Engineering

3131 Seamans Center
University of Iowa
Iowa City, Iowa 52242

thomas-schnell@uiowa.edu
319 631 4445
https://hfdata.opl.uiowa.edu/opl/
https://www.youtube.com/user/ResearchAtOPL

EDUCATION

Institution	Dates Attended	Major	Degree	Date Awarded
Ohio University	6/94 – 6/98	IE	Ph.D.	6/98
Ohio University	8/92 – 6/94	IE	M.S.	6/94
Univ. of Applied Sciences Bern, Switzerland	8/87 – 4/92	EE	B.S. Dipl.	4/92

ACADEMIC POSITIONS HELD

University	Position	Dates	Main Courses Taught
USAF Test Pilot School	Human Systems Lecturer	2019-Present	Human Systems Integration
University of Iowa	Captain Jim "MAX" Gross Chair in Engineering	07/18-Present	
Center for Computer Aided Design	Associate Director	09/18- Present	
Center for Computer Aided Design	Director of Program Development	10/06- 2018	
The University of Iowa	Professor, IE, EE, Neurology	05/16-present	see below
The University of Iowa	Associate Professor	4/04 – 05/16	Ergonomics, Senior Design Projects, Unmanned Aircraft Systems, Airborne Design of Experiments, Human Factors in Aviation
The University of Iowa	Assistant Professor	8/98 - 4/04	Ergonomics, Senior Design Projects, Airborne Design of Experiments, Human Factors in Aviation
Ohio University	Research Engineer	2/94 - 1/99	Human Factors
Ohio University	Research Assoc.	8/92 - 2/94	Human Factors Asst.
Univ. of Applied Sciences Bern, Switzerland	Lecturer	12/97 - 12/97 12/96 - 12/96	Human Factors Human Factors

INDUSTRIAL POSITIONS HELD

Company	Position	Dates
Rockwell Collins	Consultant	6/01 - present
APP Informatik AG	Software Engineer	1/90 - 8/92
Ascom Bern	Software Engineer	6/88 - 1/90
Ascom Bern	Electronics Designer	4/87 - 6/88
Ascom Bern	Electronics Apprentice	4/83 - 4/87

SCIENTIFIC AND PROFESSIONAL SOCIETIES

1. Iowa representative of the Aerospace States Association (ASA) under the Lt. Governor, 2017-Present
2. Member of the Vertical Lift Consortium (VLC), 2017-Present
3. Member of the American Helicopter Society International, 2017 - Present
4. Member of Tailhook Association (Carrier Navy) by Invitation from Tailhook Board of Directors, 2014 - present
5. Member SAE G-10, Synthetic Vision, 2005 - 2010
6. Member of the Institute for Industrial Engineers (IIE), 2008 - present
7. Member of the Experimental Aircraft Association, 1997 - Present
8. Member of the North American Trainer Association, 2011 - Present
9. Member of the Optical Society of America (OSA), 2005 - 2011
10. Member of American Institute of Aeronautics and Astronautics (AIAA), 2002 - 2011
11. Member of the Aerospace Medical Association (ASMA), 2005 - 2009
12. Chairman of the Roadsign Technical Committee (TC 4-38) of the International Committee on Illumination (CIE) Division 4, Lighting and Signaling for Transport, 1999 - 2005
13. Member of the International Committee on Illumination (CIE) Division 1, Vision and Color 1998 - 2005
14. Member of the International Committee on Illumination (CIE) Division 4 Lighting and Signaling for Transport, 1998 - 2005
15. Member of the Transportation Research Board Simulation and Measurement Committee A3B06, 1997 - 2005
16. Member of the Transportation Research Board Simulation and Measurement Committee A3B06, 1997 - 2005
17. Member of the Human Factors and Ergonomics Society, 1992 - present
18. Member of Iowa Traffic Control and Safety Association, 2000 - 2005

PROFESSIONAL CERTIFICATIONS

DoD Secret Clearance with Crypto and Comsec

US commercial pilot license 2725889, single and multi-engine land, rotorcraft-helicopter, instrument airplane, instrument helicopter, glider, CE-500, AV-L29, AV-L-39, DH-115, DH-112, HQ-90B (Unmanned Aircraft)
US flight instructor license 2725889CFII, single engine land, rotorcraft helicopter, instrument airplane, instrument helicopter
FAST Formation accreditation, Wingman, North American Trainer Association #3288
Remote Pilot License 3941135

Total Flight Time manned aircraft 6,300 hrs, multi-engine 663 hrs, turboprop 370 hrs, turbojet 1036 hrs (mostly L-29), turbine helicopter 1338 hrs, MIL MI-2 418 hrs, piston helicopter 114 hrs, 2,700 hrs fixed wing unmanned aircraft, 220 hrs rotorcraft unmanned aircraft.

This registration and significant piloting experience is critical for me to perform my work in aeronautical engineering, airborne human factors testing, and test piloting of avionics payloads.

HONORS, PRIZES, AWARDS

2018 Recognition of Outstanding and Dedicated Support of NASA Technologies for Airplane State Awareness (TASA) research Effort, George Finelli, Director Aeronautics Research Directorate, NASA Langley

2018 Captain Jim "Max" Gross Chair in Engineering, endowed chair

2017 Best Paper of Training Subcommittee, Jaclyn Hoke, Christopher Reuter, Thomas Romeas, Maxime Montariol, Thomas Schnell, Jocelyn Faubert, "Perceptual-Cognitive & Physiological Assessment of Training Effectiveness", In Proceedings of the Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC), Orlando, December 2017

2017 IEEE Digital Avionics Systems Conference (DASC), September 20, 2017, St. Petersburg, Schnell T., Reuter C., Cover M., "Visual Dominance in Pilots During Recovery from Upset", award for Best Paper of Session and separate award for Best Paper of Track

2017 Faculty Excellence Award for Research, University of Iowa, College of Engineering

2015 Letter of Appreciation from USAF Test and Training Director Michele A. Hefers, for test pilot duties including payload mount engineering, test card development, safety of flight analysis, and flying 150 high dynamics test maneuvers on Eglin AFB test range as part of Common Range Integrated Instrumentation System (CRIIS), September, 2015

2015 1-135th Attack Reconnaissance Battalion, Certificate of Appreciation for outstanding support to the 1-135th for resolving Apache Aircraft on Ground (AOG) situation which allowed the 1-135th to accomplish its mission and preserve government resources

2015 College of Engineering Award for Excellence in Teaching and Dedication to Student Learning

2013 Iowa Space Grant Research Recognition Award for Outstanding Contribution in the field of Aerospace Research

2013 Northrop Grumman Industrial Associates Award for UAS in National Airspace, $5,000, Northrop Grumman, Bethpage, NY

2013 Rockwell Collins Supplier of the Year Award, Advanced Technology for Live Virtual Constructive training technology which connects ground-based simulators with airborne jets in distributed training exercises to increase the fidelity of pilot training at a dramatically reduced cost.

2012 Northrop Grumman Industrial Associates Award for UAS in National Airspace, $5,000, Northrop Grumman, Bethpage, NY

2011 Northrop Grumman Industrial Associates Award for UAS Interface Research Concept, $5,000, Northrop Grumman, Bethpage, NY

2011 Rockwell Collins LVC Demonstration Award of $2,779 for showcasing LVC Close Air Support Technology at the Waterloo Iowa Air Show

2011 Rockwell Collins LVC Demonstration Award of $2,645 for showcasing LVC Close Air Support Technology at the Quad Cities Air Show (QCAS)

2010 Rockwell Collins I/TSEC 2010 Team Award for first known netcentric training of a certified Joint Terminal Attack Controller (JTAC) for credit using a distributed Live Asset flown by the Operator Performance Laboratory (OPL).

2010 Northrop Grumman Industrial Associates Award for Live Virtual Constructive (LVC) Concept, $5,000, Northrop Grumman, Bethpage, NY

2009 Best Paper of Human Dimension Track, Modsim World 2009 Conference, October 14-16, 2009, Virginia Beach, Guangfang Zhang, Roger Xu, Wei Wang, Jiang Li, Schnell Tom, Keller Mike, Individualized Cognitive Modeling for Closed-Loop Task Mitigation, *In Proceedings of Modsim World 2009 Conference*, October 14-16, 2009, Virginia Beach

2009 Northrop Grumman Industrial Associates Award for Advanced Flight Controls and Displays for Lunar Landing and Operation, $20,000, Northrop Grumman, Bethpage, NY

2009 CCAD Research Award

2007 Best Poster Award, Cornwall R., Schnell, T., Schmorrow, D., Cohn J. (2007), "Using Advanced Neurocognitive Techniques to Ensure Warfighter Resilience: Tactical Aircraft Simulator - Cognitive Cockpit–Research test-bed", Poster Presented at the 113th Annual Meeting of AMSUS, November 11-16, 2007, Salt Lake City, Utah

2007 Best Topic Paper, Augmented Cognition International (ACI) Conference, "Application of the Cognitive Avionics Tool Set (CATS) in Airborne Operator State Classification," 2007

2007 Inventor of the Year Award, Iowa Technology Association

2006 Best Topic Paper, Augmented Cognition International (ACI) Conference, "Toward the "Cognitive Cockpit": Flight Test Platforms and Methods for Monitoring Pilot Mental State"

2003 NASA Turning Goals Into Reality (TGIR) Award for Research on Terrain Portrayal for Head-Down Displays in Simulation and Flight Test, NASA Langley Research Center

2002 Best paper of session and of Track, Authors: Sohel Merchant , Yongjin Kwon, Tom Schnell, Tim Etherington, Tom Vogl, "Evaluation Of Synthetic Vision Information System (SVIS) Displays Based On Pilot Performance", In Proceedings of the 20th Digital Avionics Systems Conference, October 14-18, Daytona Beach, 2001

2001 Old Gold Summer Fellowship, University of Iowa, Iowa City, IA

1999 3M Traffic Control Materials Division, Faculty Award

1999 Old Gold Summer Fellowship, University of Iowa, Iowa City, IA

1992 Ascom Prize, Award for the highest GPA and the best of class on 1992 in the Department of Electrical Engineering of the Institute of Technology, Bern, Switzerland, 1992

PATENTS

9,648,313, Aviation display system and method Patent, May 9, 2017, An aviation display system includes an input source configured to provide a left eye input channel including a first band and an input source configured to provide a right eye input channel having a

second band different from the first band. A processor is coupled with the input sources and with a non-transitory processor readable medium storing processor executable code, which causes the processor to receive data indicative of the left eye and right eye input channels from the input sources and to generate a left eye output channel and a right eye output channel. A display is configured to receive the left and right eye output channels from the processor and to provide an image indicative of the left eye output channel to a left eye of a user, and an image indicative of the right eye output channel to a right eye of the user.

#9058749, Embedded simulator method and related system, June 16, 2015, A system and method is disclosed for correlation of received objects offering a valid presentation to an operator. The method correlates actual objects and simulated objects to offer a valuable training presentation environment to an operator. The method may receive a plurality of data streams including sensed data, simulated sensed data, and truth data to correlate among the plurality of data to determine if the data corresponds to a common object. Each of these data streams may be received from an off-board source via datalink or generated by an onboard simulation data source. The system correlates data received from an onboard source with data received from an off-board source to present the best available training scenario to the operator.

#20080262664, Synthetic vision system and methods, October 23, 2008, The present invention is directed to a system and methods, embodiments of which provide increased situation awareness information in an improved Synthetic Vision System (SVS). According to the present invention, a Primary Flight Display (PFD), a top-down view Multi-Function Display (MFD), and side-view Vertical Profile Display (VPD) are presented on one user interface with an input device, such as a transparent touch screen for quick and easy data entry. The present invention also provides color shading, such as red, to communicate areas where the aircraft may be in conflict with terrain or obstacles at a point in time in the future.

SERVICE TO THE DEPARTMENT

2018-Present	Chair Department Consulting Group (DCG) for Matters of Tenure and Promotion of Faculty
2018 – Present	Member of Business Developer search, Center for Computer Aided Design
2018 - Present	Member of Graduate Committee
2014 - 2015	Member of Graduate Committee
2014 - 2015	Member of the IE Lecturer Position Search Committee
2010 - 2012	Member Undergraduate Committee
2010 - 2012	Member Graduate Committee
2006 - 2010	Chair Graduate Committee
2009	Member of MIE human factors faculty search committee
2009	Member of ECE faculty search committee.
2009	Member of Department DEO review committee
2004 - present	Member of the Appropriate Faculty Group (AFG, now DCG)
2002 - 2003	Member MIE Design Committee
2001 - 2002	Member of Undergraduate Committee
2000 - 2001	IE faculty responsible for activities related to ABET 2000 Participate in ABET workshop, preparation of Program Objectives and Outcomes documents, Class Outcome Worksheet (COW) coordination, webmaster for IE ABET web page
1998 - 2000	Secretary, faculty meeting, Industrial Engineering Prepare meeting minutes

SERVICE TO THE COLLEGE

2018 – Present	Member of Strategic Planning Committee, College of Engineering
2018 – Present	Member of Communications Director Search, College of Engineering
2011 - 2012	Member, EPS-1 Committee
2004 - 2006	Member of the undergraduate Curriculum Committee
2000 - 2001	IE faculty responsible for activities related to ABET (see same point at Department level, participation in ABET Anonymous meetings
2000 - 2001	CCAD Strategic Planning Committee, preparation of strategic plan, mission statement

SERVICE TO THE UNIVERSITY

2017	Chair, Decanal Review Committee for Dean Scranton, College of Engineering
2017	Hosted AFROTC Detachment 255 for Aviation Day at OPL, March 4, 2017
2005 - present	University of Iowa Foundation Charitable Giving, various funds including Engineering Excellence Fund and Iowa Impact Fund, Total gift to date valued $21,780.68
2015 - present	Advisor to VPR and General Counsel on Unmanned Aircraft Systems
2012 - 2013	Member of the Conflict of Interest in Research Committee
2010 - 2014	IRB Advisory Group, College of Engineering Representative
2008 - 2010	University of Iowa Faculty Senate
2006 - 2007	Host to FIRST Robotics Competition Team
2007 - present	Host to UVSI Aerial Robotics Competition
2002 - 2003	Proposal review committee member for Iowa Research Experience for

	Undergraduates (IREU) program
1999 - 2001	Alternate member of the Institutional Review Board (IRB-02XM), UI

LOCAL, NATIONAL, AND INTERNATIONAL SERVICE

2017	Laboratory visit of Senator Joni Ernst, Tour of OPL, August, 2017
2015	Legislators in the Lab, Vice President of Research sponsored tour of the OPL for State of Iowa Legislators, Nov 12, 2015
2015	Engineering Staff Advisory Council, OPL Open House Visit and Demonstration at the Iowa City Municipal Airport, October 20, 2015
2015	Mechanical and Industrial Engineering Advisory Board, OPL Open House Visit and Demonstration at the Iowa City Municipal Airport, October 9, 2015
2015	Iowa City Area Development Group (ICAD), Annual Meeting and Open House Event at the Iowa City Municipal Airport, Exhibited OPL Simulation and Flight Test Capabilities, September 17, 2015
2015	Rockwell Collins Executive Leadership Forum, Presented UAS and Helicopter to Rockwell Collins Leadership team at RCI Flight Operations, September 3, 2015
2004- present	Old Capitol Service to Mankind (SERTOMA) Annual Pancake Breakfast Fly-In and Fund Raiser, OPL Open House, aircraft exhibits and demonstrations
2015	Old Capital Valley Cub Scouts at the Johnson County Fairgrounds, presentation of aviation research at OPL to Boy Scot camp attendees
2014	UI Foundation, We Are Phil Fundraising Committee
2014	Reviewed one papers for the Journal of Applied Ergonomics, one paper for the Journal of Aerospace Medicine and Human Performance
2013	Reviewed two papers for Journal of Applied Ergonomics
2013	Invited to serve as test pilot to NASA TASAR concept Flight Test on Marinvent Piaggio Avanti Test Platform, Hampton, Virginia
2012	Provided arm's length review of faculty up for promotion from Assistant to Associate Professor, Department of Industrial and Systems Engineering, Mississippi State University
2012	National Academies of Sciences, Briefing by invitation to the Committee on Assessing Foreign Technology Development in Human Performance Modification
2009	Northrop Grumman Tech Demos, El Segundo, CA, demonstrate Synthetic Vision for the purpose of landing on the moon, June, 2009.
2009	Iowa Alumni Association, Presentation of the Operator Performance Lab (OPL) flight test capabilities, June, 2009
2008	Iowa Academy of Science, "About Brains and Planes", Presentation at the 120th Annual Meeting, April 12, 2008, Kirkwood Community College, Cedar Rapids
2007	The University of Iowa Alumni Association (UIAA), "Synthetic Vision: Aiding Aviation" at OPL Flight Ops, 1801 South Riverside Drive, May 24.
2006	The University of Iowa Alumni Association (UIAA), "Synthetic Vision: Aiding Aviation" at the John Deere Pavilion, 1400 River Drive Moline, Ill., March 23

2005	Invited Presentation, "The Spatial Orientation Enhancement System (SOES): In-Flight results", Invited Presentation at the 43rd Space and Flight Equipment (SAFE) Conference, October 25 – 26, Salt Lake City, UT
2004	Invited Presentation at the NASA LaRC Synthetic Vision Symposium, Hampton, Virginia, April
2004	Office of the Vice President for Research Colloquium, Aviation Human Factors Research at the University of Iowa: A New Research Focus Taking Off, Organized and held Colloquium at the OPL Facility at the Iowa City Airport, October
2004	Student Activities Chair for the 23rd Digital Avionics Systems Conference, October 24-28, Salt Lake City, Reviewed a total of 43 papers for Best Student Paper Award
2003	FHWA Roadway Visibility Roundtable Meeting to discuss and plan the FHWA Research Topics for the next five years. Invited were the 35 leading transportation visibility researchers in the US from government, academia, and industry.
2003	Reviewer for the Paul Jainski Award that will be awarded during the 2003 Progress in Automotive Lighting Conference (PAL) in Darmstadt, September, 2003, for the best dissertation in Lighting Technology for 2003 PHD Candidates
2002	Situation Awareness Displays, Session Chair, 20th Digital Aviation Systems Conference (DASC), 21st Digital Avionics Systems Conference, Air Traffic Management for Commercial and Military Systems, Hyatt Regency, Irvine, California, 27-31 October 2002
2002	Chairman of the 16th Biennial Symposium on Visibility and Simulation, June 2-4, Iowa City, Iowa, 2002
2002	Chairman of Workshop W8 on Visibility Modeling, 35th Annual Human Factors in Transportation held during the 81sth Annual Meeting of the Transportation Research Board, January 12-17, 2002, Washington, DC
2001	Session Chair, 20th Digital Avionics System Conference (DASC), Daytona Beach, October 14-18, 2001
2001	Co-organizer of the Civil Air Patrol Annual Flight Clinic, September 22, 2001, Seamans Center, The University of Iowa, Iowa City, Iowa
2000	Program Co-Chair, 15th Biennial Symposium on Visibility, Transportation Research Board, May 15-16, Washington, DC, 2000 Organized and chaired Workshop on Eye Movements, Human Factors Workshop, Transportation Research Board Annual Meeting, Washington, DC, 2000
2000	Co-chairman, Transportation Research Board Visibility Committee A3A04 Visibility Symposium, May, 2000
1999	Transportation Research Board, Human Factors Workshop, Chaired Workshop on Driver Eye Movements
1999 - 2005	Chairman of TC4-38 Road Sign Committee, International Illumination Commission
1997 - present	Paper reviewer, Transportation Research Board Simulation and Measurement Committee A3B06
2001 - present	Captain in the Civil Air Patrol (CAP), USAF Auxiliary, mission pilot, standardization and evaluation pilot, Cedar Rapids Senior Squadron Aerospace Education Officer 2001-2008

SERVICE TO STUDENT ORGANIZATIONS

- USAF ROTC Det 255, Cadet Involvement at OPL for Airwarfare Training Technology Indoctrination
- FIRST Robotics Competition Team, 2007 - 2008
- Iowa Space Grant Consortium, OPL Raccoonworks student organization, 2005 - 2013
- Collaboration with USAF ROTC. About 10 AFROTC cadets are involved in my aviation research laboratory, assisting in setting up an F-15 Flight Simulation Device.
- Academic Advisor to University of Iowa Chapter of the Society of American Military Engineers (SAME)

TEACHING

Semester	Course Number	Course Title	Sem. Hours	Number of Students	Remarks
Fall 18	IE:6450	Aviation Human Factors	3	6	
Spring 18	IE:4600	IE Design Project	4	51	
Fall 17	IE:6480	Unmanned Acft Sys	3	8	
Spring 17	IE:4600	IE Design Project	4	28	
Fall 16	IE:6450	Human Factors in Aviation	3	6 UI, 13 ISU	ISU AERE 471X
Spring 16	IE:4600	IE Design Project	4	25	
Fall 15	IE:6480	Unmanned Acft Sys	3	12	New course
Spring 15	IE:3450	Ergonomics	3	46	Peer reviewed
Spring 15	IE:4600	IE Design Project	4	32	Peer reviewed
Spring 14	56:147	Ergonomics	3	54	
Spring 14	56:160	Operational Systems	4	37	
Spring 13	56:147	Ergonomics	3	54	
Spring 13	56:160	Operational Systems	4	40	
Fall 12	56:245	Aviation Human Factors	3	8	
Spring 12	56:147	Ergonomics	3	39	
Spring 12	56:160	Operational Systems	4	30	
Fall 11	56:244	Airborne DOE	3	8	
Spring 11	56:245	Aviation Human Factors	3	2	
Spring 11	56:147	Ergonomics	3	45	
Spring 11	56:160	Operational Systems	4	18	
Fall 10	56:245	Aviation Human Factors	3	17	Peer reviewed
Fall 10	56:191	Graduate Seminar	1	29	
Fall 10	56:161	Enhanced Design Experien	3	1	
Spring 10	56:147	Ergonomics	3	28	
Spring 10	56:160	Operational Systems	4	16	
Fall 09	56:091	Professional Seminar	1	45	
Fall 09	56:161	Enhanced Design Experien	3	1	
Spring 09	56:091	Professional Seminar	1	26	
Spring 09	56:147	Ergonomics	3	41	Peer reviewed

Spring 09	56:160	Operational Systems	4	13	
Fall 08	56:091	Professional Seminar	1	31	
Fall 08	56:245	Aviation Human Factors	3	8	
Spring 08	56:147	Ergonomics	3	21	
Spring 08	56:160	Operational Systems	4	14	
Fall 07	56:244	Airborne DOE	3	8	
Spring 07	56:147	Ergonomics	3	21	
Spring 07	56:160	Operational Systems	4	26	
Fall 06	56:245	Aviation Human Factors	3	13	
Spring 06	56:147	Ergonomics	3	31	
Spring 06	56:160	Operational Systems	4	21	
Fall 05	56:295	Aviation Human Factors	3	9	
Spring 05	56:147	Ergonomics	3	24	
Spring 05	56:160	Operational Systems	4	29	
Spring 04	56:147	Ergonomics	3	32	
Spring 04	56:160	Operational Systems	4	42	
Fall 03	56:244	Human Factors in Transp	3	9	
Spring 03	56:147	Ergonomics	3	60	Peer reviewed
Spring 03	56:160	Operational Systems	4	50	
Fall 02	56:245	Assessing Human Visual P	3	12	
Fall 02	56:191	Graduate Seminar	0	25	
Spring 02	56:147	Human Factors II	3	60	
Spring 02	56:160	Operational Systems	4	30	
Fall 01	56:240	Human Performance	3	12	
Spring 01	56:147	Human Factors II	3	35	Peer reviewed
Spring 01	56:162	Quality Control	3	25	Peer reviewed
Fall 00	56:244	Human Factors in Transp	3	10	Peer reviewed
Spring 00	56:147	Human Factors II	3	30	
Spring 00	56:162	Quality Control	3	34	
Fall 99	56:240	Human Performance	3	8	
Spring 99	56:140	Ergonomic Design	3	26	Peer reviewed
Fall 98	56:163	Quality Engineering I	3	12	

DOCTORAL STUDENT SUPERVISION

Sem	Student	Date	Topic	Award	Permanent Position	Remarks
FA00	Fuat Aktan	08/03	Glare of HID Headlamps		3M	completed
SP11	Scott Openshaw	04/11	Physiological Measures		HON	completed
SU14	Kyle Ellis	07/14	Eye Tracking Workload		NASA	completed
SP15	Michael Yocius	11/14	Light Field Imaging		LMCO	completed
FA17	Jaclyn A. Hoke	12/17	Image processing		RCI	completed
FA18	Matthew Cover	08/18	Integrated Alerting		OPL	completed

MASTER OF SCIENCE STUDENT SUPERVISION

Sem	Student	Date	Topic	Permanent Position	Remarks
FA 98	Fuat Aktan	12/00	Development of Nighttime Visibility Model for UV Pavem. Markings	OPL	degree completed
FA 99	Jeff Mohror	12/00	Evaluation of Traffic Flow Analysis Tools	NADS	degree completed
FA 99	Phil Ohme	03/01	Enhancing Visibility For Older Drivers	Consultant	degree completed
SU 00	Sohel-Merchant	08/01	Pilot Performance	FORD	degree completed
FA 01	James Hogsett	ND	Pavement Marking	FORD	incomplete
SP 00	Tuhin Diptiman	04/02	Fun in Driving	FORD	degree completed
FA 01	Jason Schenk	11/02	Stochastic Discrete Event Simulation In the ER	OSU	degree completed
SP 05	Mike Keller	03/07	Spatial Orientation	OPL	degree completed
FA 03	Jason Wenger	07/07	Synthetic Vision System	RCI	degree completed EE
SP 06	Lora Yekhshatyan	03/08	Left Turn Lane Design		degree completed
FA 08	Jaclyn Hoke	04/09	Optical Helmet Tracking	RCI	degree completed EE
SP 07	Gregory Neiswander	04/10	Helicopter Brownout	NASA	degree completed
SP 05	Nick Lorch	04/11	Live Virtual Constr.	OPL	EE
FA 07	Kyle Ellis	07/09	Eye Tracking Metrics	NASA	degree completed
FA 08	Artistee Harris	07/09	Eye Tracking Model	UI Grad	degree completed EE
SP 10	Michael Yocius	04/11	Image Analysis	OPL	EE
FA 10	Ahmed Diken	03/11	Pilot Fatigue	OPL	
SP08	Nicole Becklinger	4/10	Wide Area Surveillance	OPL	degree completed
SP11	Ahmed Diken	4/11	Analysis of different pha. of a commercial flight	UNK	IE
SP12	Shawn Parker	4/12	Impl. of a deep learning	11 Wireless	EE
SP18	Christopher Reichlen	5/18	Spatial D in 5th Gen Fight	USAF	AFIT-USAF

MEMBERSHIP ON DOCTORAL COMMITTEES

Sem	Student	Date	Topic		Permanent Pos.
SU 00	Tim Brown	07/00	Modeling Driver Performance	NADS	
SU 00	JongJin Kwon	07/00	Robust Control of Surface Roughness	WKU	Asst. Prof.
SP 99	Al Hallene	12/99	Develop. Of Logistic Regression for K-12 Education		
SU 00	Jingzhou Yang	07/00	Swept Volumes		Diss.Proposal defense
SU 01	Wen-Chieh	07/01	Product Chain		
SP03	Yuan Gan	07/03	Clustering Algorithms	N/D	
SP09	Shan Bao	08/09	Eye Tracking Workload	TBD	
SP10	Rose Danek	07/10	Incidental Learning	NIU	Psych Student

SP11	Joseph Engler	04/11	Chaotic Attractors	RCI
SP15	Moh Batineh	05/15	Artif. Neural Network	
SP17	Howard Chen	04/17	Inertial Measurement	
FA18	Hamed Salehi	12/18	Mental Models of Hazards	TBD

POST DOCTORAL ASSOCIATES SUPERVISION

Sem	Name	Project Description	Present Position
FA01	Yongjin Kwon	Synthetic Vision for Acft.	Western KY University
SP02	Katherine Lemos	Synthetic Vision for Acft.	NASA Langley Research Center
SP03	Richard L. Newman	Synthetic Vision for Acft.	FAA, Seattle
FA03	Pieter Poolman	Physiological Measures	UIHC
FA11	Joseph Engler	Chaotic Attractors	Rockwell Collins

SEMINARS AND SHORT COURSES

Date	Location	Host Organization	Title/Description
12/96	Bern, Switzerland	Univ. of Applied Sciences	Human Factors Engineering
12/97	Bern, Switzerland	Univ. of Applied Sciences	Human Factors Engineering
4/99	Athens, Ohio	Ohio University	Visibility Modeling, Concepts, Capabilities, and Limitations
4/99	Iowa City, Iowa	IE Seminar	Predicting Driver Visibility
5/99	Bern Switzerland	Univ. of Applied Sciences by Invitation	Ergonomics of Garden Hand Tools
7/99	St. Paul, MN	3M Company, Invitation	British Standards Institute Sign Luminance Requirements
8/99	Lansing, MI	Michigan DOT	Efficient Material Tracking Techniques

Note: The above workshop was also given to the Mississippi DOT, Ohio DOT, Wisconsin DOT, Minnesota DOT, and the Iowa DOT

9/99	Iowa City, Iowa	ME Seminar	Pavement Marking Visibility
10/99	Vermillion, SD	University of SD, Invited	Human Visual Performance
10/99	1000 Oaks, CA	Rockwell Science Center by Invitation	Alternate Control Techniques
01/00	Washington, DC	Transp. Res. Board by Invitation	Chaired Eye Movement Workshop
02/00	Iowa City	CEE Seminar lecture	Eye Movement Research
08/00	Zurich, Switzerland	Swiss Fed. Inst. of Tech.	Human Factors at UI, by invitation
09/00	Iowa City	IE Seminar lecture	Visual Performance
03/01	Des Moines	IA Governor Safety Off.	Pavement Markings
05/01	Iowa City	BME Graduate Sem.	Synthetic Vision
9/01	Iowa City	Civil Air Patrol	Synthetic Vision

10/01	Ames	Inst. Of Traff. Engr.	Pavement Markings
02/02	Iowa City	OPL, Flight Laboratory	Aviation Human Factors Tour of facility given to35 Lone Tree, Iowa, 6A and 6B students
3/02	Iowa City	CE Graduate Seminar	Synthetic Vision Systems
10/02	Iowa City	Biomedical Grad. Seminar	Human Factors 101
Fall02	Iowa City	Operator Performance Lab	Bi-Weekly course on Private Pilot Ground School, 10 weeks
01/03	Los Angeles	Aerospace Lighting Institute Synthetic Vision Research	Aerospace Lighting Institute (ALI), by invitation
07/03	Oshkosh	Experimental Aircraft Association	Synthetic and Enhanced Vision Research
07/04	Oshkosh	Experimental Aircraft Association	Pilot Requirements
07/05	Oshkosh	Experimental Aircraft Association	Synthetic Flight Bag
03/06	Moline	Iowa Alumni Association	Synthetic Vision
05/07	Iowa City	Iowa Alumni Association	Flight Testing
09/07	Iowa City	Operator Performance Lab	Open House
12/07	Orlando, Florida	I/ITSEC 2007	Cognitive Avionics
04/08	Cedar Rapids	Kirkwood Community Coll.	Brains and Planes
04/08	Peoria, IL	Peoria Airshow	OPL Flight Research
06/08	Davenport, Iowa	Quad Cities Airshow	OPL Exhibit
10/08	St. Paul, MN	Digital Avionics Systems Conference	Cognitive Performance Measurement
12/08	Orlando, Florida	I/ITSEC 2008	Cognitive Monitoring
04/09	Iowa City, Iowa	University Foundation	Aviation Research
06/09	Davenport	Quad Cities Airshow	OPL Flight Research
06/09	Peoria, IL	Peoria Airshow	OPL Flight Research
06/09	El Segundo, CA	Northrop Tech Demo	Airborne Brain Research
6/09	Iowa City, Iowa	Iowa Alumni Association	Airborne Brain Research
08/10	Peoria, IL	Peoria Airshow	OPL Flight Research Exhib.
12/10	Orlando, FL	I/ITSEC 2010	Live Virtual Constructive Exhib.
07/13	Cedar Rapids, IA	Hawkeye Downs	Exhibit MI-2 to Public
07/13	Oshkosh, WI	Experimental Aircraft Assn.	Warbirds in Review, MI2
07/14	Oshkosh, WI	Experimental Aircraft Assn.	Warbirds in Review, MI2
04/15	Washington, DC	American Academy of Neur	Crew Resource Management
02/16	Cedar Rapids	Engineers Week Keynote	Flight Test at OPL
02/16	Peosta, IA	STEM, NICC	Flight Research at OPL
07/17	Dubuque, Iowa	Dubuque Air Show	Research and Study at UI
07/17	Oshkosh, WI	EAA Warbirds Airshow	MIL-MI2 helicopter demo
08/17	Ames, IA	Spaceflight Workshop	Flight Testing at OPL
01/18	Santa Monica, CA	RAND Corporation	LVC Airwarfare Training

ADVISOR TO STUDENT GROUPS

Sem	Group	Description
AY 04	Society of American Mil. Engr	Military Engineering Society
AY 05	Society of American Mil. Engr	Military Engineering Society
AY 06	AIAA	Aerospace
AY08	IIE Faculty Advisor	Iowa Student Chapter
AY09	IIE Faculty Advisor	Iowa Student Chapter

TEACHING AWARDS AND NOMINATIONS

Date	Title	Grantor	Selection Process
2015	Excellence in Teaching	Industrial Engineering	Students nominate

FUNDED AND UNFUNDED COURSE, CURRICULUM, SOFTWARE, AND LABORATORY DEVELOPMENT

1. University of Iowa Internal Funding Initiative (IFI), Core Facilities/Shared Equipment for Research Grant, "Unmanned Aircraft System (UAS) for Diverse University Payloads, $70,000, The proposed equipment request is designed to address sUAS regulatory concerns by organizing the operation of the sUAS under the OPL flight test infrastructure, May, 2015.
2. Participated in development of proposal for Occupational Safety & Health Training Grant, US Department of Health & Human Services, Centers for Disease Control & Prevention, 12.5% Co-PI, with Cook, T., Wilder D, Lee J: Ergonomics Program portion of center. $190,678: Award # 27050 06 (External Grant), July, 2001
3. Developed graduate course "Assessing and Modeling Human Visual Performance", 56:245, Fall 2002
4. Operator Performance Laboratory (OPL) and USAF ROTC Collaboration in flight research laboratory, 2001-present
5. Courses newly prepared by Tom Schnell: 56:163 Quality Engineering, 56:140 Ergonomic Design (now 56:147 Human Factors II), 56:240 Human Performance in Engr. Sys, 56:162 Quality Control, 56:244 Human Factors in Transp.
6. Prepared proposal for Undergraduate Equipment for Laboratory Exercises in Visual Performance, 56:147 Human Factors II, September, 2000
7. Application for and participation in 1999 nTitle workshop to improve teaching effectiveness and to more efficiently use electronic teaching aids, 1999
8. Preparation of a proposal seeking UI internal funding for the development of an Artificial Intelligence computer program for the diagnosis and treatment of Hepatitis C for instructional purposes in the College of Medicine, July, 2000
9. Co-developed the proposal for the new human factors curriculum in Industrial Engineering, co-developers are Geb Thomas and John Lee, new Human Factors curriculum now in effect, January, 1999.
10. Co-preparation of an equipment and software proposal for expansion of the Human Factors Teaching Laboratory in the Department of Industrial Engineering. Co-authors are Geb Thomas and John Lee. Proposal submitted to the DEO, January, 1999.
11. Co-preparation of an laboratory space proposal for expansion of the Human Factors Teaching Laboratory in the Department of Industrial Engineering. Meeting with Dean Jacob Odgaard to discuss space availability, Co-authors are Geb Thomas and John Lee, 1999.

12. NTitle 99 participation and application of learned subject matter for preparation of present classes. All classes taught by Dr. Schnell are now based on new technology and the worldwide web.

RESEARCH ACCOMPLISHMENTS AND SCHOLARLY PRODUCTIVITY

During my tenure at the University of Iowa, I have:

- Generated $ 23,230,274 in external research funding as 100% PI
- Published 40 peer reviewed journal papers.
- Published and presented 102 conference papers at technical and scientific conferences with proceedings.
- Produced 30 technical reports as primary deliverable to large projects.
- Presented 19 posters or presentations at conferences for which no proceeding materials were published.
- Published two chapters in refereed book volumes.
- Established a world renowned flight test laboratory that employs six full-time researchers, four graduate students, four undergraduate students and seven part time employees, and that includes eleven instrumented aircraft (six manned five unmanned).
- Designed and developed six flight simulators for use in my lab.
- Designed and developed the flight operations process necessary to operate the aircraft in my lab, including risk management, pilot training, aircraft maintenance, and legal compliance.
- Designed and developed eleven instrumented flight test aircraft testbeds including:
    - Six instrumented manned aircraft (2 x L-29, 2x MI2, 1x A36, 1x C172). These represent a worldwide unique capability in a faculty lead flight test lab and enable sustainable future research in the area of manned aircraft systems.
    - Five instrumented unmanned aircraft testbeds (3 x TBM-3M 65lbs, 1 x Vapor 55, 1 x HQ-90) which enable present and future research in unmanned aircraft systems.
- Produced 28 live flight demonstrations to large audiences involving a total of around 106 aircraft sorties. These productions are similar in effort to a highly rehearsed, scripted, choreographed, stage theater production involving multiple actors and distributed technologies. The purpose of the productions range from demonstrating deliverables of a project to stakeholder communities to student recruitment and promotion of the University of Iowa. I also have participated in flight activities for NATO on US and foreign owned military aircraft as part of my research.
- Developed a Synthetic Vision System (SVS) aircraft cockpit instrument suite which has been commercialized under the Dynon SkyView brand and is now flying in thousands of aircraft cockpits. The value of SVS is that it is proven to save lives by preventing controlled flight into terrain (CFIT).
- Designed and developed a human workload model called CATS (Cognitive Assessment Tool Set) which measures the mental workload of a person in real-time. This model has been used in numerous simulator and flight test projects inside and outside of my lab and it enables adaptive training systems capabilities which modulate training difficulty to match the trainee skill levels.
- Generated upwards of 39 appearances in print, online, and TV media at the local, national, and international level. Some of these productions involved time-consuming recording of footage in the OPL. Additionally, some of this coverage demonstrates the quality of the output created in my lab and represents unmistakable evidence that I am a nationally and internationally recognized scholar in my field.
- Collected unique data sets as test pilot with the aircraft testbeds that support the worldwide scientific and relevant user community with information that cannot be obtained in ground based testbeds:

- Unmanned Aircraft Lidar test, Beyond Visual Line of Sight (BVLOS), Rockwell Collins and Ameren, 2018
- Unmanned Aircraft SCISR (US Marines) datalink test, HQ-90B, 2018
- Unmanned Aircraft datalink test, Beyond Visual Line of Sight (BVLOS), NASA TCL3 UTM Test, Camp Grafton, ND, 2018
- Rotorcraft whiteout datasets for Lidar and EO/IE sensors in moderate to very heavy whiteout conditions
- Unmanned Aircraft datalink test, Beyond Visual Line of Sight (BVLOS), Rockwell Collins and Ameren, 2017
- Rotorcraft flight into degraded visual environments (DVE) with Helmet Mounted Display (HMD), test pilot and principal investigator, flights in instrumented helicopter in the brownout Landing Zone (LZ) of the Yuma Proving Ground (YPG). Operated one of two helicopters that participated in NATO Flight Trials. Additionally, flew Swiss Air Force EC-635 helicopter as Evaluation Pilot (EP) in European NATO DVE-M campaign, February, 2017.
- Spatial disorientation in tactical attack scenarios and pilot performance during recovery from unusual attitudes: This data, which has been collected by me, has been used for the design of Synthetic Vision Systems for cockpit instrumentation, design of symbology of helmet mounted displays such as the F-35 helmet, and for the certification of future commercial transport aircraft displays. User groups include the National Aeronautics and Space Administration (NASA), USAF 711th Human Performance Wing, and the Commercial Aviation Safety Team (CAST).
- Time Space Position Information (TSPI) and Data Link performance: Engineered structural aircraft mounts to carry the test payloads and tested the payloads under high g-force maneuvering in carefully scripted flight profiles. This data was collected by me in our fighter jet platforms for the Joint Strike Fighter Rapid Prototype Initiative (JSF-RPI) and the design and certification of military range instrumentation systems such as the Common Range Integrated Instrumentation System (CRIIS). I received a letter of appreciation from the USAF Test and Training Director for my engineering and test piloting activities in this large DoD project.
- GPS Embedded Module (GEM) performance in GPS denied environments: This dataset was collected by me on OPL's fighter jet trainer at the White Sands Missile Range (WSMR) during GPS jamming and spoofing (at night) using two payload instruments from the government to compare legacy and future capability of navigating in GPS denied airspace.
- Live Virtual Constructive (LVC) fighter pilot interaction with simulated threat entities: Collaborated with industry to pioneer an avionics solution that can generate blue (friendly) and red (enemy) interactions which are generated by ground based simulations on the airborne cockpit instruments and studied how fighter pilots interact with real and simulated fighter entities. Some of these sorties generated significant TV and other media coverage and spanned netcentric airwarfare operations with coalition partners around the globe.
- Airborne data link performance: I performed over nine years of data link testing on OPL's manned and unmanned testbeds to assess performance aspects such as range, reliability, throughput, and security of data links. In several projects, OPL's test data was used to assess technical readiness or the need to enhance datalink systems for deployment on Unmanned Aircraft or on command and control assets that were flown in Iraq and Afghanistan. User groups included DARPA, US Army, USAF, and NASA. In several cases, the tests were a matter of national priority to expedite selected datalink technology for use in theater.
- Certification of avionics for military and air transport applications: Test flew and collected data for performance of TACtical Air Navigation receivers, GPS receivers, and Inertial

Measurement Units for fixed wing and rotorcraft applications toward certification of use. The user community was industry which procured the tests to demonstrate effectiveness of the systems and compliance with federal requirements.

- Aerial imaging and surveillance: Engineered gimbaled and Nadir sensor solutions and flew them for various surveillance applications such as precision agriculture, river hydraulics management, energy waste surveys, and wide-area persistent surveillance.

- Designed and developed a Target Visibility Prediction (TarVIP) model that can be used to quantify how far traffic signs and pavement markings are visible at night under automobile and fixed roadway lighting conditions. TarVIP is available for download and is used by users in several countries for assessment of minimum requirements for road markings, signing, and automobile headlights. TarVIP and its analyses have been used by the US Federal Highway Administration (FHWA) in the establishment of roadway marking and signing minimum requirements.

ACTIVE RESEARCH AREAS

Human performance in Live Virtual Constructive (LVC) and Synthetic Training Environment (STE) systems, physiological based workload measurement, manned-unmanned teaming, pilot spatial orientation, Electro-optic and Synthetic Vision Systems, human performance in flight testing, avionics flight testing, flight simulation, vision at low light levels, and pilot safety.

BRIEF DESCRIPTION OF THE LABORATORY

The Operator Performance Lab (OPL) is a simulation and flight testing organization that has developed an infrastructure aimed at providing low-cost distributed flight simulation and flight test services. The development of the necessary infrastructures was informed by experiences made in over 12 years of distributed simulation flight test involvement ranging from large-scale flight test deployments to small-scale flight tests of no more than one hour duration. In the OPL, there are six flight simulators and eleven FAA registered flight test aircraft, including two L-29 fighter jet trainers, one Beechcraft A-36 Bonanza, one Cessna 172N, two twin-turbine MIL MI-2 helicopters, three TBM-3M Unmanned fixed wing gasoline powered aircraft (62 lbs.), one unmanned Vapor 55 electrically powered helicopter (55 lbs.), and one Latitude HQ-90 (90 lbs).

OPL has an extensive airborne telemetry infrastructure consisting of a range instrumentation station with datalink antennas as well as a Model 997 HMMWV that serves as a command and control vehicle that can be deployed at test ranges. This infrastructure is being used for manned and unmanned aircraft testing. OPL has UAS Certificates of Authorization across roughly 8,000 acres in Iowa. The OPL at the University of Iowa conducts flight test research in operational relevant environments. OPL has around 21 members including graduate and undergraduate students, full time research engineers, emeritus faculty, research pilots, and crew chief. The OPL is situated in an 8500 square-foot vehicle integration hangar, a 2200 square-foot electronics laboratory and software development laboratory space, and a 4500 square-foot maintenance hangar. OPL is a self-contained full-service flight simulation and flight test research organization complete with the necessary organizational and procedural processes to maintain and modify research simulators and airframes for use in OPL's human-in-the-loop tests. Flight test operations are governed by the flight operations manual, which has been approved at the leadership levels of the University of Iowa, State of Iowa.

100% PRINCIPAL INVESTIGATOR ON CONTRACTS AND/OR GRANTS (TOTAL $23,230,274)
CO-INVESTIGATOR ON CONTRACTS AND/OR GRANTS (NOT LISTED IN TABLE BELOW TOTAL $324,155.82)

Title	*Sponsor Name*	*Prime Sponsor*	*Start Date*	*End Date*	*Increment Cost [$]*	*Total Cost [$]*
Project SLAAM OPL	Rockwell Collins, Inc.		12/1/2018	11/30/2019		
HQ-90 Data Collection and Demo	Rockwell Collins, Inc.		11/15/2018	1/30/2019		
Integration and Flight Testing of the TCTS II Airborne Systems (AS) and Internal Mount (IM)	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy	11/7/2018	8/31/2020		
GOII PNT Solution	Rockwell Collins, Inc.		11/1/2018			
2018 UAS Monitoring Electric Transmission Line Construction	Rockwell Collins, Inc.	Black & Veatch Corporation	10/29/2018	11/30/2018		
Phase IIB. UAS Monitoring Electric Transmission Line Construction, Mission Execution	Rockwell Collins, Inc.	Black & Veatch Engineers	10/25/2018	12/1/2018		
Phase IIB. UAS Monitoring Electric Transmission Line Construction, Mission Prep	Rockwell Collins, Inc.	Black & Veatch Engineers	10/25/2018	12/1/2018		
NEWT Pod Installation and Test Flight	Rockwell Collins, Inc.		10/1/2018	12/31/2018		
PROJECT HAVE VADER	Lockheed Martin, Inc.		10/1/2018	12/31/2018		
Phase IIB. UAS Monitoring Electric Transmission Line Construction, Mission Execution	Rockwell Collins, Inc.	Black & Veatch Engineers	10/1/2018	9/30/2019		
RCI Training Effectiveness Study FY19, Adaptive Learning Assessment	Rockwell Collins, Inc.		10/1/2018	10/18/2019		
Assessment of the effects of emergent helicopter transport on stroke in a rodent model	US Department of Health & Human Services, National Institutes of Health		9/1/2018	8/31/2019		
Engineering Evaluation of Pilot State Assessment for Aerial Refueling Certification, in support of Human Interface Research and Technology (HIRT) Contract HIRT Task Order 07 C-17	Ball Aerospace and Technologies Corporation	US Department of Defense, Air Force	8/16/2018	12/31/2018		
Engineering Evaluation of Pilot State	Ball Aerospace and	US Department of	8/16/2018	12/31/2018		

Assessment for Aerial Refueling Certification, in support of Human Interface Research and Technology (HIRT) Contract HIRT Task Order 07 C-17	Technologies Corporation	Defense, Air Force		
Non-Cooperative RADAR Demonstration	Rockwell Collins, Inc.		7/26/2018	9/20/2018
Eye Tracking Integration in Tactical Aircraft HMD	Lockheed Martin Corporation		7/23/2018	11/23/2018
Planning, Preparation and Execution for Flight Test Experimentation and Analysis, in support of Human Interface Research and Technology (HIRT)	Ball Aerospace and Technologies Corporation	US Department of Defense, Air Force	7/1/2018	9/30/2018
UNI Hyperspectral Airborne Data Collection	University of Northern Iowa		5/29/2018	7/31/2018
Non-Cooperative RADAR Demonstration	Rockwell Collins, Inc.		5/3/2018	9/30/2018
Testing of an Airborne Perception Module	Xwing, Inc.		4/26/2018	6/30/2018
Vision Systems Human Factors Research	US Department of Transportation, Federal Aviation Administration		4/6/2018	4/5/2019
NEWT Pod Installation and Test Flight	Rockwell Collins, Inc.		3/27/2018	9/15/2018
NASA Unmanned Traffic Management (UTM) Technology Capability Level 3 (TCL3)	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	3/1/2018	4/30/2018
Non-Cooperative RADAR Demonstration	Rockwell Collins, Inc.		2/12/2018	9/30/2018
Integration of Lidar on Vapor 55, Local GCS Infrastructure Build-Up and Test Flight	Rockwell Collins, Inc.		1/29/2018	8/31/2018
Establish Latitude HQ-90 Initial Operational Capability for UAS Flight Test	Rockwell Collins, Inc.		12/18/2017	7/31/2018
Effects of Helmet Mounted Display Format and Spatial Audio Cueing on Pilot Performance and Spatial Disorientation Prevention, in support of Human Interface Research and Technology (HIRT)	Ball Aerospace and Technologies Corporation	US National Aeronautics & Space Administration	12/12/2017	8/13/2019
Effects of Helmet Mounted Display Format and Spatial Audio Cueing on Pilot Performance and Spatial Disorientation Prevention, in support of Human Interface Research and Technology (HIRT)	Ball Aerospace and Technologies Corporation	US National Aeronautics & Space Administration	12/12/2017	8/13/2019

Effects of Helmet Mounted Display Format and Spatial Audio Cueing on Pilot Performance and Spatial Disorientation Prevention, in support of Human Interface Research and Technology (HIRT)	Ball Aerospace and Technologies Corporation	US National Aeronautics & Space Administration	12/12/2017	8/13/2019
Installation of Autopilot in OPL L-29 #48 & #73	Rockwell Collins, Inc.		11/30/2017	2/15/2018
Integration and Preparation for UAS Monitoring Electric Transmission Line Construction	Rockwell Collins, Inc.	Black & Veatch Corporation	11/22/2017	12/31/2017
I/ITSEC 2017- LVC Demos and Operation Blended Warrior	Rockwell Collins, Inc.		11/6/2017	11/30/2017
Classification of Workload using physiological-based Analysis of an ECG Signal	Lockheed Martin Corporation		10/27/2017	12/15/2017
RCI Training Effectiveness Study, Phase II - Adaptive Learning Module	Rockwell Collins, Inc.		10/13/2017	9/20/2018
RCI Training Effectiveness Study, Phase II	Rockwell Collins, Inc.		10/13/2017	5/8/2018
Technologies for Indicating System Status and Dependencies During Complex Non-Normal Situations	US National Aeronautics & Space Administration		10/1/2017	9/30/2018
Technologies for Indicating System Status and Dependencies During Complex Non-Normal Situations	US National Aeronautics & Space Administration		10/1/2017	
Assessment of the effects of emergent helicopter transport on stroke in a rodent model	US Department of Health & Human Services, National Institutes of Health		9/29/2017	8/31/2018
A Smart Service System for UAS Traffic Management in Low-Altitude Airspace	Iowa State University	US National Science Foundation	8/16/2017	8/15/2018
Instrumentation, Measurement, and Data Analysis of Positional Information on Kinze Planters	Kinze Manufacturing, Inc.		6/19/2017	11/10/2017
Integration and Preparation for UAS Monitoring Electric Transmission Line Construction	Rockwell Collins, Inc.	Black & Veatch Corporation	5/16/2017	7/31/2017
Advanced Technology Center UAS Projects	Rockwell Collins, Inc.		5/2/2017	9/30/2017

FY17				
RCI BDSV LVC Demo	Rockwell Collins, Inc.		3/20/2017	4/30/2017
Flexible Integrated Intelligent Network (FIIN) for Prognostics Health Management (PHM) Systems	Global Strategic Solutions, LLC	US Department of Defense, Army	3/2/2017	7/31/2017
Night Vision Camera and HMD Flight Test in Rotorcraft	BAE Systems		2/1/2017	12/31/2017
Night Vision Camera and HMD Flight Test in Rotorcraft	BAE Systems		2/1/2017	12/31/2017
Single Pilot Understand through Distributed Simulation (SPUDS)	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	12/1/2016	5/15/2017
Training Effectiveness Study, OPL Alliance	Rockwell Collins, Inc.		11/30/2016	9/30/2017
USAF Test Pilot School Capstone Project Support	Classic Solutions Company, Inc.	US Department of Defense, Air Force	10/12/2016	10/11/2017
Technologies for Indicating System Status and Dependencies During Complex Non-Normal Situations	US National Aeronautics & Space Administration		10/1/2016	11/23/2018
Technologies for Indicating System Status and Dependencies During Complex Non-Normal Situations	US National Aeronautics & Space Administration	US National Aeronautics & Space Administration	10/1/2016	9/30/2017
Physiological Based Adaptive Training	US Department of Defense, Army Research Laboratory		9/30/2016	11/8/2018
Physiological Based Adaptive Training	US Department of Defense, Army Research Laboratory		9/30/2016	9/29/2018
Physiological Based Adaptive Training	US Department of Defense, Army Research Laboratory		9/30/2016	9/29/2017
Advanced Technology Center Projects FY16 - Task Ferox Redundancy and Autoland	Rockwell Collins, Inc.	US Department of Defense	7/21/2016	11/18/2016
iOS Framework and Application Development for Electronic Kneeboard	Global Strategic Solutions, LLC	US Department of Defense, Department of the Navy, Office of Naval Research	7/20/2016	12/13/2016
Analyses to Support the Safety and Training Effectiveness of Live-Virtual-	Rockwell Collins, Inc.	US Department of Defense, Department of	7/14/2016	6/30/2017

Constructive (LVC) Training Exercises FY15 Option Year		the Navy, Office of Naval Research		
LVC Wireless Network Evaluation	Massachusetts Institute of Technology	US Department of Defense, Air Force	7/1/2016	12/31/2016
FY16 Live Flight LVC Demo	Rockwell Collins, Inc.		5/26/2016	9/30/2016
Methods for Actionable Measures of Absolute Cognitive Workload	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	5/11/2016	6/19/2017
Ferox #2 UAV Configuration and Autopilot Tuning	Rockwell Collins, Inc.		4/26/2016	7/1/2016
Degraded Visual Environmenta/Brown-out Rotorcraft Research	Airbus Defence and Space		4/25/2016	12/1/2016
Degraded Visual Environmenta/Brown-out Rotorcraft Research	Airbus Defence and Space		4/25/2016	12/1/2016
UAS Monitoring Electric Transmission Line Construction	Rockwell Collins, Inc.	Black & Veatch Corporation	4/1/2016	7/31/2017
RKO Coalescence Demo, LVC	Rockwell Collins, Inc.		3/21/2016	3/31/2016
RADM Conn Fallon LVC Demo	Rockwell Collins, Inc.		1/11/2016	2/12/2016
RCI Sinapore Air Force LVC Demo	Rockwell Collins, Inc.		12/15/2015	12/30/2015
Advanced Technology Center Projects FY16	Rockwell Collins, Inc.	US Department of Defense	11/24/2015	8/31/2016
Helmet Video	Rockwell Collins, Inc.		9/3/2015	9/18/2015
Farm Nutrients Precision Agricultural Research Thrust through Remote Sensing	Farm Nutrients		8/24/2015	11/30/2015
OPL Deployment to Eglin AFB for CRIIS Testing	Rockwell Collins, Inc.	US Department of Defense	8/3/2015	12/30/2015
Rockwell Collins Lockheed Martin LVC Demo	Rockwell Collins, Inc.		6/26/2015	6/30/2015
CANSEC RealFires Demo	Rockwell Collins, Inc.		5/24/2015	5/31/2015
Spatial Disorientation Threat Characterization for F-5 Representative Helmet-Mounted Display Use in the Flight Environment	Wyle Aerospace Group	US Department of Defense, Air Force	5/20/2015	5/31/2017
Live Virtual Constructive (LVC) Enabled Training Pod	Rockwell Collins, Inc.		4/1/2015	9/30/2015
LMCO Aircrew Labor In-Cockpit	Lockheed Martin, Inc.	US Department of	3/2/2015	11/30/2015

Automation System (ALIAS)		Defense		
LMCO Aircrew Labor In-Cockpit Automation System (ALIAS)	Lockheed Martin, Inc.	US Department of Defense	3/2/2015	11/30/2015
Advanced Technology Center Projects FY15	Rockwell Collins, Inc.	US Department of Defense	2/24/2015	9/30/2015
Sterling LVC Demo	Rockwell Collins, Inc.		1/27/2015	1/29/2015
Modified TRA-4114 Weather Radar Flight Testing on MI-2 Helicopter	Rockwell Collins, Inc.		1/1/2015	7/31/2015
SOCOM RealFires Demo	Rockwell Collins, Inc.	US Department of Defense, Special Operations Command	12/17/2014	12/19/2014
TSPI Flight Test Event !-	Rockwell Collins, Inc.	US Department of Defense	11/7/2014	12/30/2014
Modified TRA-4114 Weather Radar Flight Testing on MI-2 Helicopter	Rockwell Collins, Inc.		10/14/2014	12/31/2014
Single Pilot Understand through Distributed Simulation (SPUDS)	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	10/1/2014	9/30/2016
Planning Funds for Live-Virtual-Constructive (LVC) Training Exercises FY15	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy, Office of Naval Research	10/1/2014	9/30/2016
Planning Funds for Live-Virtual-Constructive (LVC) Training Exercises FY15	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy, Office of Naval Research	10/1/2014	9/27/2015
Flight Deck Visual and Auditory Display Counter-Measures to Spatial Disorientation and Loss of Energy State Awareness	US National Aeronautics & Space Administration		10/1/2014	11/30/2016
Single Pilot Understand through Distributed Simulation (SPUDS)	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	10/1/2014	9/30/2015
Analyses to Support the Safety and Training Effectiveness of Live-Virtual-Constructive (LVC) Training Exercises FY15	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy, Office of Naval Research	10/1/2014	9/30/2015
MI-2 Head Tracking Integration	Rockwell Collins, Inc.		9/12/2014	9/27/2014
UAS in NAS: OPL Alliance FY14	Rockwell Collins, Inc.		9/12/2014	9/27/2014

A Performance-based Flight Deck Information Management System for Improved Hazard Awareness and Source Data Integrity	Ohio University	US National Aeronautics & Space Administration	9/1/2014	4/30/2016
Live Virtual Constructive (LVC) Enabled Training Pod	Rockwell Collins, Inc.		8/11/2014	9/27/2014
Magic Carpet II	Aptima, Inc.	US Department of Defense, Department of the Navy	8/1/2014	11/30/2014
CRIIS T-MAC Flight	Rockwell Collins, Inc.		7/24/2014	11/28/2014
CRIIS T-MAC Flight	Rockwell Collins, Inc.	US Department of Defense	7/24/2014	11/30/2014
Fairchild Controls LIDAR Connectivity and Testing on MI-2	Fairchild Controls Corporation		7/1/2014	6/30/2015
Support for NASA CNPC Flights	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	6/19/2014	7/31/2014
Binocular Helmet Display for Live Virtuall Constructive (LVC) Research	US Department of Defense, Department of the Navy, Office of Naval Research		6/13/2014	8/31/2015
RTA Weather Radar Flight Testing	Rockwell Collins, Inc.		6/9/2014	9/30/2014
Obstacle Course for LIDAR SVS	Rockwell Collins, Inc.		3/19/2014	10/3/2014
Cassidian LIDAR Connected to CAAS/SVS	Rockwell Collins, Inc.		3/19/2014	9/27/2014
Virtual Inter Professional Education and Research (VIPER)	Rockwell Collins, Inc.		2/17/2014	9/30/2014
UAS in NAS: OPL Alliance FY14	Rockwell Collins, Inc.		12/19/2013	9/27/2014
SBIR: A12-087 (Army), Sensitive and Diagnostic Mental Workload Classifier	Advanced Brain Monitoring, Inc.	US Department of Defense	12/12/2013	10/31/2015
L-29 GPS Denied Night Flights	Rockwell Collins, Inc.		11/21/2013	12/30/2013
UK Open House JTAC Demonstration	Rockwell Collins, Inc.		10/29/2013	12/1/2013
Safety of Flight Requirements of Integrated LVC Symbology	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy	10/21/2013	9/30/2016
Flight Deck Visual and Auditory Display Counter-Measures to Spatial Disorientation and Loss of Energy State Awareness	US National Aeronautics & Space Administration		10/1/2013	9/30/2014

STTR: Tailoring Training for Disparately Skilled Participants in Large-Scale Training Exercises (SKATE) expansion: Phase II, Option I	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy, Office of Naval Research	9/29/2013	8/22/2014
CATS in HUMAN Lab under AF Contract FA8650-11-C-626	Aptima, Inc.	US Department of Defense, Air Force	9/20/2013	12/1/2014
C-Band Ground Plane Antenna Flights	Rockwell Collins, Inc.		9/1/2013	9/27/2013
UAE AWC JTAC Demonstration	Rockwell Collins, Inc.		9/1/2013	9/27/2013
Air Data and Heading Reference System (ADAHRS) Technical Standard Order (TSO) Flight Test for Civil Airworthiness Certification	Rockwell Collins, Inc.		8/8/2013	6/2/2014
MAGIC CARPET Workshop	Aptima, Inc.	US Department of Defense	7/30/2013	1/24/2014
Northrop Grumman 2013 Support for Industrial Affiliates Program	Northrop Grumman Corporation		7/1/2013	6/30/2014
UAS in NAS: OPL Alliance	Rockwell Collins, Inc.		7/1/2013	9/27/2013
PREDICT	Aptima, Inc.	US Department of Defense, Department of the Navy, Office of Naval Research	6/1/2013	12/21/2013
TACAN Integration and Testing Support: A-6 Flight Demonstration 201	Rockwell Collins, Inc.		4/26/2013	9/30/2013
DOD SBIR 12.2 Phase I Topic A12-087: Sensitive & Diagnostic Mental Workload Classifier	Intelligent Automation, Inc.	US Department of Defense	4/12/2013	5/15/2013
JSF RPI L-29 and Boanza Flights 201	Rockwell Collins, Inc.		4/11/2013	7/31/2014
ROTORCRAFT ONBOARD SENSOR EVALUATION (ROSE)	US Department of Defense		2/1/2013	1/31/2014
Upgrade of L-29 from Blue Mountain EFIS to Dynon Skyview EFIS	Warbirds East, Inc.		1/5/2013	4/1/2013
Legibility of Prismatic and Non-prismatic License Plates	3M Company		12/1/2012	8/31/2013
CRIIS Time, Space Position Information (TSPI) Integration and Testing Support: L29 Flight Demonstration	Rockwell Collins, Inc.		10/31/2012	5/31/2013

USAF LVC Demo: OPL Alliance	Rockwell Collins, Inc.		10/1/2012	9/27/2013
I/ITSEC LVC Demo: OPL Alliance	Rockwell Collins, Inc.		10/1/2012	12/7/2012
Safety of Flight Requirements of Integrated LVC Symbology for the ONR Live, Virtual and Constructive (LVC) Training Fidelity BAA 11-005 dated March 11, 2011	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy	10/1/2012	9/30/2013
Flight Deck Visual and Auditory Display Counter-Measures to Spatial Disorientation and Loss of Energy State Awareness	US National Aeronautics & Space Administration		10/1/2012	9/30/2013
A Performance-based Flight Deck Information Management System for Improved Hazard Awareness and Source Data Integrity	Ohio University	US National Aeronautics & Space Administration	9/1/2012	8/31/2014
A Performance-Based Flight Deck Information Management System for Improved Hazard Awareness and Source Data Integrity	Ohio University	US National Aeronautics & Space Administration	9/1/2012	8/31/2013
LTE Flight Test on Bonanza	Rockwell Collins, Inc.		8/28/2012	9/28/2012
AI2-SKATE - UAS Control Station	Advanced Infoneering, Inc.	Rockwell Collins, Inc.	8/21/2012	9/30/2012
DDW Data Collection Flight on Fixed Wing Aircraft	Rockwell Collins, Inc.		8/8/2012	11/12/2012
Tactical Aircraft Online Service (TAOS) Demonstration to SOFIC May 21-23 (7th TAOS Demo)	Rockwell Collins, Inc.		8/6/2012	8/8/2012
CRIIS Time, Space Position Information (TSPI) Integration and Testing Support: Air-Air Video	Rockwell Collins, Inc.		7/27/2012	5/31/2013
SKATE - UAS Control Station	Rockwell Collins, Inc.		7/19/2012	9/30/2012
Northrop Grumman 2012 Support for Industrial Affiliates Program	Northrop Grumman Corporation		7/1/2012	6/30/2013
NASA SBIR A1.08 Phase I: Non-Intrusive Hazardous Pilot Cognitive State Assessment via Semi-Supervised Deep Learning: CSA Deep	Intelligent Automation, Inc.	US National Aeronautics & Space Administration	5/15/2012	8/10/2012
Synthetic Vision Avionics Backbone	Rockwell Collins, Inc.	US Department of	5/14/2012	3/15/2013

		Defense, Defense Advanced Research Projects Agency		
TACAN Integration and Testing Support: A-36 Flight Demonstration 2012	Rockwell Collins, Inc.		5/9/2012	9/15/2012
TASAR Implementation and Pilot Assessments	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	4/30/2012	3/27/2015
TASAR Implementation and Pilot Assessments	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	4/30/2012	11/11/2014
TASAR Implementation and Pilot Assessments	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	4/30/2012	12/22/2014
Traffic Aware Strategic Aircrew Requests (TASAR) Analysis and Development	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	4/30/2012	3/30/2014
Traffic Aware Strategic Aircrew Requests (TASAR) Analysis and Development	Rockwell Collins, Inc.	US National Aeronautics & Space Administration	4/30/2012	3/30/2013
Safety of Flight Requirements of Integrated LVC Symbology for the ONR Live, Virtual and Constructive (LVC) Training Fidelity BAA 11-005 dated March 11, 2011	Rockwell Collins, Inc.	US Department of Defense, Department of the Navy	4/2/2012	9/30/2012
Knowledge Optimized Displays of Information in Human Computer Interaction (ORCID II), Phase II	Aptima, Inc.	US Department of Defense, Department of the Navy	3/28/2012	4/15/2014
Human-In-The-Loop Simulator (HITLSim); University of Iowa OPL Alliance	Rockwell Collins, Inc.		3/14/2012	7/1/2012
Tactical Aircraft Online Service (TAOS) at I/ITSEC	Rockwell Collins, Inc.		3/2/2012	3/31/2012
SensorPac Flight test on MI-2 Helicopter	Rockwell Collins, Inc.		2/29/2012	3/9/2012
Time, Space Position Information (TSPI) Integration and Testing Support: L-29 Flight Demonstration; Increment 4	Rockwell Collins, Inc.		2/27/2012	4/6/2012
Live, Virtual and Constructive (LVC) training	Aptima, Inc.	US Department of Defense, Department of the Navy, Office of Naval Research	2/9/2012	4/30/2015
Live, Virtual and Constructive (LVC) training	Aptima, Inc.		2/9/2012	4/30/2015
Live, Virtual and Constructive (LVC) training	Aptima, Inc.	US Department of Defense	2/9/2012	4/30/2015

Live, Virtual and Constructive (LVC) Training Fidelity: Technical Area 2: Optimal Fidelity Synthetic Environments	Aptima, Inc.	US Department of Defense, Department of the Navy	2/9/2012	4/30/2015
Crewstation Dynamic Training and Performance Enhancement & Cognitive/Neuroergonomical Human Machine interface (HMI) Design; HMMWV Integration	Raytheon Company	US Department of Defense, Army	12/2/2011	11/30/2012
Embedded Live Virtual Constructive (LVC) Training; OPL Alliance	Rockwell Collins, Inc.		11/2/2011	9/15/2012
Northrop Grumman 2011 Support for Industrial Affiliates Program	Northrop Grumman Corporation		10/11/2011	6/30/2012
QNT C-Band with Dynamic Spectrum Allocation (DSA)	Rockwell Collins, Inc.		9/23/2011	6/30/2012
Geolocation of Mesh Network Radio Nodes: Range Test of QNT C-Band Radio, Increment 6	Rockwell Collins, Inc.		9/23/2011	9/30/2011
UAV Integration	Rockwell Collins, Inc.		9/16/2011	9/23/2011
ONR STTR N11A-T001: Automated Human and System Performance Assessment in Operational Environments (AHSPA)	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	8/15/2011	3/15/2012
Workload Classification Algorithm Development and Validation for Human Factors Test Vehicle for DIAM	DENSO International America, Inc.		5/12/2011	3/31/2012
Geolocation of Mesh Network Radio Nodes: Range Test of QNT C-Band Radio	Rockwell Collins, Inc.		3/28/2011	9/15/2011
Geolocation of Mesh Network Radio Nodes: Range Test of QNT C-Band Radio, Increment 6	Rockwell Collins, Inc.		3/28/2011	9/15/2011
Range Test of QNT C-Band Radio	Rockwell Collins, Inc.		3/28/2011	9/15/2011
Design, Development, Verification, and Validation of an Integrated Alerting and Notification Function for an Intelligent Integrated Flight Deck	Ohio University	US National Aeronautics & Space Administration	12/21/2010	1/31/2012
Time, Space Position Information (TSPI) Integration and Testing Support: L-29 Flight Demonstration	Rockwell Collins, Inc.		12/14/2010	1/31/2011

Touch Screen Flight Displays	Rockwell Collins, Inc.		12/6/2010	3/31/2011
System for Workload Evaluation of Distributed Teams (SWEDT) Phase I	Aptima, Inc.	US Department of Defense, Army	12/1/2010	6/15/2011
Live Virtual Constructive (LVC) Infrastructure and Applications; OPL Alliance	Rockwell Collins, Inc.		11/8/2010	9/15/2011
Joint Strike Fighter (JSF) Rapid Prototyping Initiative (RPI) Dual Electronics Pod Fabrication, Integration, and Flight Test on L-29 #48	Rockwell Collins, Inc.		10/28/2010	3/31/2011
Enhancing Warfighter Situation Awareness Through Trojan Swarm TTNT Phase 3 Terminal at Yuma Proving Ground	Rockwell Collins, Inc.	US Department of Defense	9/23/2010	11/26/2010
Airborne Simulation Architecture Experimentation Support; Increment 2, QNT Data Link Test Support	Rockwell Collins, Inc.		9/21/2010	10/20/2010
Tailoring Training for Disparately Skilled Participants in Large-Scale Training Exercises (SKATE);Phase II	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	9/1/2010	7/1/2012
Development and Testing of a Human Factors Test Vehicle for DIAM	DENSO International America, Inc.		7/13/2010	3/31/2011
Eye Tracking Metrics for Workload Estimation in Flight Deck Operations	US National Aeronautics & Space Administration		7/1/2010	6/30/2011
Advanced Flight Control Interfaces and Displays for Aerospace Vehicle Operations	Northrop Grumman Corporation		5/24/2010	12/31/2010
Cognitive Modeling for Closed-Loop Task Mitigation, NASA SBIR A1.05 Phase II Subcontract	Intelligent Automation, Inc.	US National Aeronautics & Space Administration	5/20/2010	3/11/2012
Iowa Space Grant Consortium Training Grant	University of Northern Iowa	US National Aeronautics & Space Administration	5/17/2010	4/30/2011
Integrated Virtual Environments: New FY 2010 Scope	Rockwell Collins, Inc.		4/12/2010	9/30/2010
Enhancing Aircrew Situation Awareness Through Trojan Swarm 3G UMTS Cellular System	Rockwell Collins, Inc.	US Department of Defense, Army	3/29/2010	3/28/2011
Increment 3 for Common Range Integrated Instrumentation System (CRIIS) Time,	Rockwell Collins, Inc.		3/1/2010	2/28/2011

Space Position Information (TSPI) Integration and Testing Support: L-29 Flight Demonstration				
WAPS Airborne Package; Increment 4, Software Support	Rockwell Collins, Inc.		3/1/2010	2/28/2011
Common Range Integrated Instrumentation System (CRIIS) Time, Space Position Information (TSPI) Integration and Testing Support: L-29 Flight Demonstration	Rockwell Collins, Inc.		3/1/2010	2/28/2011
Non-Motion Simulator	Rockwell Collins, Inc.		12/17/2009	3/24/2010
Integrated Virtual Environments (IVE); OPL Alliance	Rockwell Collins, Inc.		12/17/2009	9/30/2010
Physiological-based Performance Assessment and Review System (PARS); Phase III IDIQ Delivery Order 001 Subcontract	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	11/12/2009	10/11/2010
Ground Proximity and Reactive Windshear Alerting Proof of Concept	Rockwell Collins, Inc.		11/10/2009	9/1/2010
Knowledge Optimized Displays of Information in Human Computer Interaction (ORCID II), Phase II	Aptima, Inc.	US Department of Defense, Department of the Navy	11/9/2009	2/28/2012
Knowledge Optimized Displays of Information in Human Computer Interaction (ORCID II), Phase II	Aptima, Inc.	US Department of Defense, Department of the Navy	11/9/2009	2/28/2012
Operator State Sensor Investigations and Operator State Classification and Feedback Algorithms	US National Aeronautics & Space Administration		11/1/2009	10/31/2011
Operator State Sensor Investigations and Operator State Classification and Feedback Algorithms	US National Aeronautics & Space Administration		11/1/2009	9/30/2012
Tailoring Training for Disparately Skilled Participants in Large Scale Training Exercises (SKATE)	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	10/26/2009	7/31/2010
STTR N08-T005 Intuitive Navigation System for Effective Collision-avoidance Tactics - INSECT Phase 1 Option	Aptima, Inc.	US Department of Defense, Department of the Navy	10/15/2009	4/14/2011

STTR N08-T005 Phase II for Intuitive Navigation System for Effective Collision-Avoidance Tactics - INSECT	Aptima, Inc.	US Department of Defense, Department of the Navy	10/15/2009	4/14/2011
Crewstation Dynamic Training and Performance Enhancement & Cognitive/Neuroergonomical Human Machine Interface (HMI) Design	Raytheon Company	US Department of Defense, Army	10/14/2009	12/31/2011
Advanced Flight Controls and Displays for Lunar Landing and Operation	Northrop Grumman Corporation		9/1/2009	3/31/2010
Real-Time Driver Workload and Stress Assessment Using Physiological Measurements	DENSO International America, Inc.		7/10/2009	3/31/2011
Eye Tracking Metrics for Workload Estimation in Flight Deck Operations	US National Aeronautics & Space Administration		7/1/2009	6/30/2010
Additional L-29 Flight Hours for (QTEA) Tool under Phase II STTR N07-T028	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	6/1/2009	3/16/2011
Reduced Oxygen Breathing Device Performance Assessment and Review System (ROBD-PARS): Phase II Enhancement	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	6/1/2009	11/16/2010
Physiological-Based Tools for Virtual Environment Fidelity Design Guidance, STTR Phase II	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	6/1/2009	3/16/2011
Driver Performance, Eye Movements and Fixations	Science Applications International Corporation	US Department of Transportation, Federal Highway Administration	4/20/2009	3/31/2010
Driver Performance, Eye Movements and Fixations	Science Applications International Corporation	US Department of Transportation, Federal Highway Administration	4/20/2009	3/31/2010
STTR N08-T004 Knowledge Optimized Displays of Information in Human Computer Interaction (ORCID-HCI)	Aptima, Inc.	US Department of Defense, Department of the Navy	4/12/2009	10/31/2009
STTR N08-T005 Intuitive Navigation System for Effective Collision-avoidance Tactics - INSECT Phase 1 Option	Aptima, Inc.	US Department of Defense, Department of the Navy	4/9/2009	7/20/2009
WAPS Airborne Package; Increment 3;	Rockwell Collins, Inc.		1/22/2009	9/1/2009

Software Support				
Cognitive Modeling for Closed-Loop Task Mitigation	Intelligent Automation, Inc.	US National Aeronautics & Space Administration	1/22/2009	7/22/2009
WAPS Airborne Package	Rockwell Collins, Inc.		1/22/2009	9/1/2009
Airborne Simulation Architecture Experimentation Support	Rockwell Collins, Inc.		1/8/2009	9/15/2009
Operator State Sensor Investigations and Operator State Classification and Feedback Algorithms	US National Aeronautics & Space Administration		11/1/2008	10/31/2009
Design, Development, Verification, and Validation of an Integrated Alerting and Notification Function for an Intelligent Integrated Flight Deck - Year 2, Increment 2	Ohio University	US National Aeronautics & Space Administration	8/29/2008	8/28/2011
Design, Development, Verification, and Validation of an Integrated Alerting and Notification Function for an Intelligent Integrated Flight Deck - Year 2	Ohio University	US National Aeronautics & Space Administration	8/29/2008	8/28/2010
Design, Development, Verification, and Validation of an Integrated Alerting and Notification Function for an Intelligent Integrated Flight Deck	Ohio University	US National Aeronautics & Space Administration	8/29/2008	12/31/2009
Design, Development, Verification, and Validation of an Integrated Alerting and Notification Function for an Intelligent Integrated Flight Deck - Year 3, Increment 2	Ohio University	US National Aeronautics & Space Administration	8/28/2008	1/31/2012
STTR N08-T004 Knowledge Optimized Displays of Information in Human Computer Interaction (ORCID-HCI)	Aptima, Inc.	US Department of Defense, Department of the Navy	7/9/2008	2/14/2009
STTR N08-T005 Intuitive Navigation System for Effective Collision-avoidance Tactics - INSECT	Aptima, Inc.	US Department of Defense, Department of the Navy	7/9/2008	1/14/2009
Distributed Mission Operations Capable L-29 Jet Aircraft	Rockwell Collins, Inc.		7/9/2008	12/31/2008
Synthetic Flight Bag (SFB) and Eye Tracking Research Support	Advanced Infoneering, Inc.		7/1/2008	12/31/2008

Advanced Physiological Measurement Techniques for Empirical Proof of Operator Performance Benefits	Northrop Grumman Corporation		6/26/2008	6/25/2009
Evaluation of Automatic Warning Modes for Night Vision Enhancement Systems	US Department of Transportation, National Highway Traffic Safety Administration		5/13/2008	12/31/2009
Real-Time Cogitive Monitoring and Performance Measurement in Flight Environments: Change to Purchase Order	Northrop Grumman Corporation		5/8/2008	12/31/2008
Real-Time Cognitive Monitoring and Performance Measurement in Flight Environments	Northrop Grumman Corporation		5/8/2008	10/31/2008
Operator Functional State Assessment and Dynamic Aiding Performance Tool (OFSADAPT)	Aptima, Inc.	US Department of Defense, Air Force	2/8/2008	11/7/2008
Synthetic Vision Systems Integration	Rockwell Collins, Inc.		1/19/2008	12/31/2008
Pilot Helmet Sensor Instrumentation	Rockwell Collins, Inc.		1/10/2008	12/31/2008
Operator State Sensor Investigations for Actual Airborne Applications	US National Aeronautics & Space Administration		1/1/2008	12/31/2008
Benefits of Luminance Above Threshold Levels	3M Company		11/15/2007	6/30/2009
Operator State Sensor Investigations and Operator State Classification and Feedback Algorithms	US National Aeronautics & Space Administration		11/1/2007	10/31/2008
Real-Time Driver Workload and Stress Assessment Using Physiological Measurements	Denso Corporation		10/1/2007	3/31/2009
Real-Time Driver Workload and Stress Assessment Using Physiological Measurements	Denso Corporation		10/1/2007	9/30/2008
Environment to Evaluate Candidate Operational Concepts for Alternative Terrain Awareness and Warning Systems; Incorporate GPS Approaches	Rockwell Collins, Inc.		8/14/2007	9/14/2007
Physiological-based Tools for Virtual	Advanced Infoneering,	US Department of	6/25/2007	3/31/2008

Environment Fidelity Design Guidance	Inc.	Defense, Department of the Navy		
Test Environment to Evaluate Candidate Operational Concepts for Alternative Terrain Awareness and Warning Systems	Rockwell Collins, Inc.		6/1/2007	8/17/2007
Physiological-Based Tools for Virtual Environment Fidelity Design Guidance, STTR Phase I Option	Advanced Infoneering, Inc.	US Department of Defense, Department of the Navy	5/24/2007	9/15/2008
Operator State Sensor Investigations and Operator State Classification and Feedback Algorithms	US National Aeronautics & Space Administration		11/1/2006	10/31/2007
Spatial Orientation Enhancement System (SOES): Contract Extension to Include CARP Flight Test and Software Library	Rockwell Collins, Inc.		9/1/2006	12/30/2006
Assessment of Glare Induced by HID and Tungsten Halogen Headlamps Final Report	Westat, Inc.	US Department of Transportation, National Highway Traffic Safety Administration	9/1/2006	9/30/2007
Rotorcraft University of Iowa Subcontract: CIB Data Reader	Rockwell Collins, Inc.		7/17/2006	7/16/2007
Research and Development of Synthetic Vision Displays for Low Level Helicopter Operations in Poor Visibility Environments: Task 1, Hover Display Study	US National Aeronautics & Space Administration		6/15/2006	2/14/2008
Modeling of Pilot Behavior Using a Controller-Based Approach	US National Aeronautics & Space Administration		4/12/2006	11/11/2007
Human Factors of Video and Data Displays: Effects of Latency on Flight Information Displays	Rockwell Collins, Inc.		3/1/2006	10/31/2006
Mile Marker and Ramp Designation Signing Study	University of Maryland	Maryland State Highway Administration	2/1/2006	6/30/2008
Rotorcraft University of Iowa Subcontract	Rockwell Collins, Inc.		1/23/2006	3/31/2006
Updates to Research Recommended Minimum Levels for Pavement Marking Retroreflectivity to Meet Driver Night Visibility Needs	University of Michigan Transportation Research Institute	US Department of Transportation, Federal Highway Administration	8/8/2005	6/30/2007
Spatial Orientation Enhancement System	Rockwell Collins, Inc.		6/15/2005	9/16/2005

(SOES): Rotorcraft				
Development of a Method to Incorporate Eye Tracking Technology in the CATERPILLAR Cab Audit Process	Caterpillar, Inc.		4/5/2005	12/31/2007
Provide CAAS Symbology Capability in FFD Lab (lab54) for Synthetic Vision Projects	Rockwell Collins, Inc.		3/30/2005	4/15/2005
Spatial Orientation Enhancement System (SOES): Contract Extension to Include CARP Flight Test and Software Library	Rockwell Collins, Inc.		1/1/2005	12/31/2006
Lexus LS430 Purchase in Support of Denso Corporation Driver Workload and Stress Assessment Using Physiological Measurements	Denso Corporation		12/6/2004	3/31/2007
Lexus LS430 Purchase in Support of Denso Corporation Driver Workload and Stress Assessment Using Physiological Measurements	Denso Corporation		12/6/2004	3/31/2006
Lexus LS430 Purchase in Support of Denso Corporation Driver Workload and Stress Assessment Using Physiological Measurements	Denso Corporation		12/6/2004	3/31/2006
Driver Workload and Stress Assessment using Physiological Measurements: Step 2 of 3	Denso Corporation		12/6/2004	9/30/2007
Driver Workload and Stress Assessment using Physiological Measurements: Step 1 of 3	Denso Corporation		12/6/2004	12/5/2005
Turn Lane Lengths for Various Speed Roads and Evaluation of Determining Criteria	Minnesota Department of Transportation		11/22/2004	6/30/2008
Turn Lane Lengths for Various Speed Roads and Evaluation of Determining Criteria	Minnesota Department of Transportation		11/22/2004	3/31/2007
Eye Tracking Analysis Toolset	Caterpillar, Inc.		9/27/2004	5/31/2005
Synthetic Vision for Rotorcraft: Symbologies for Forward Flight, Transition to Hover, and Hover	US National Aeronautics & Space Administration		9/15/2004	8/14/2005
Spatial Orientation Enhancement System (SOES)	Rockwell Collins, Inc.	US Department of Defense, Air Force	7/26/2004	12/31/2005

Advanced Media/Portable Media; Bi-Static GPS Measurements	US National Aeronautics & Space Administration		2/3/2004	2/2/2007
Advanced Media/Portable Media; Low Cost Synthetic Vision System	US National Aeronautics & Space Administration		2/3/2004	2/2/2006
Advanced Media/Portable Media; Low Cost Synthetic Vision System	US National Aeronautics & Space Administration		2/3/2004	5/31/2007
Determination of the State-of-the-Art in the Visibility of Extended Rectangular Targets Under Dark Conditions	Ecoglo Ltd.		1/5/2004	1/4/2005
Human Factors of Video and Data Displays, Development of a Study Plan	Rockwell Collins, Inc.		11/7/2003	3/26/2004
Aviation Weather Information Display Study (AWIDS)	ROCKWELL COLLINS, INC.	US NATIONAL AERONAUTICS & SPACE ADMINISTRATION	9/17/2003	3/15/2004
Laboratory Evaluation of a Flight Display Using Sensor Fusion	Rockwell Collins, Inc.	US Department of Defense, Air Force	9/12/2003	2/25/2005
Development of a Fixed Roadway Lighting Module for the Target Visibility Predictor (TarVIP) Computer Model	US Department of Transportation, Federal Highway Administration		9/4/2003	5/2/2005
Field Evaluation of the CTCLS Series Traffic Signal Load Switches, Work to Finish the Original Study	OHIO UNIVERSITY		4/1/2003	3/31/2004
NCHRP5-18 Color Effectiveness of Yellow Pavement Marking Materials	NATIONAL ACADEMY OF SCIENCES	US DEPARTMENT OF TRANSPORTATION	11/6/2002	6/30/2007
Performance Evaluation of Pavement Markings under Dry, Wet, and Rainy Conditions in the Field	3M COMPANY		9/30/2002	5/31/2003
Proposal for the Establishment of the Rockwell Collins Human Centered Research Institute at the University of Iowa	ROCKWELL COLLINS, INC.		9/27/2002	9/26/2003
Defining the Traffic Sign Luminance Needs of Nighttime Drivers for Achromatic and Chromatic Signs	3M COMPANY		7/1/2002	10/31/2003
Synthetic Vision Displays: Optimal Display Characteristics	US NATIONAL AERONAUTICS & SPACE ADMINISTRATION		6/1/2002	9/30/2003
Terrain Sampling Density and Texture	ROCKWELL COLLINS,		4/10/2002	12/20/2002

Requirements for Synthetic Vision Systems (SVS)	INC.			
Terrain Sampling Density and Texture Requirements of Synthetic Vision Systems (SVS)	IOWA STATE UNIVERSITY	US NATIONAL AERONAUTICS & SPACE ADMINISTRATION	2/1/2002	12/20/2002
How to More Safely Accommodate Pedestrians Through an Intersection with Free Flow Legs	MINNESOTA DEPARTMENT OF TRANSPORTATION		12/19/2001	6/30/2004
Human Machine Interfaces in Automotive Applications	HONDA RESEARCH & DEVELOPMENT AMERICAS, INC.		12/1/2001	7/31/2002
Headlight Glare Research	WESTAT, INC.	US DEPARTMENT OF TRANSPORTATION	10/1/2001	9/8/2003
Wet Weather Visibility of Pavement Markings	US Department of Transportation, Federal Highway Administration		6/1/2001	5/31/2002
Selection of Materials to Optimize Sign Performance	NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM	US DEPARTMENT OF TRANSPORTATION	5/2/2001	9/1/2006
Enhanced Nighttime Visibility	Virginia Polytechnic Institute and State University	US DEPARTMENT OF TRANSPORTATION	2/28/2001	6/30/2002
Fun and Stress in Driving	HONDA RESEARCH & DEVELOPMENT AMERICAS, INC.		1/22/2001	12/31/2001
Assessing Pilot Performance in Flightdecks Equipped with Synthetic Vision Information Systems	ROCKWELL COLLINS, INC.		11/22/2000	2/28/2001
Evaluation of Traffic Flow Analysis Tools Applied to Workzones Based on Flow Data Collected in the Field	OHIO DEPARTMENT OF TRANSPORTATION		7/1/2000	6/30/2001
Basic Human Factors in Aviation Research	ROCKWELL COLLINS, INC.		10/1/1999	9/30/2000
Effects of Diagrammatic Entrance Ramp Approach Signs on Driver Behavior	OHIO UNIVERSITY		6/1/1999	6/30/2000
Enhancing Pavement Marking Visibility for	IOWA DEPARTMENT OF	US DEPARTMENT OF	5/17/1999	4/30/2001

Older Drivers	TRANSPORTATION	TRANSPORTATION		
ENHANCING PAVEMENT MARKING VISIBILITY FOR OLDER DRIVERS	IOWA DEPARTMENT OF TRANSPORTATION	US DEPARTMENT OF TRANSPORTATION	5/17/1999	4/30/2001
Enhanced Nighttime Visibility	Virginia Polytechnic Institute and State University		4/1/1999	2/28/2001
HUMAN FACTORS AND DRIVER VISUAL PERFORMANCE	3M COMPANY		4/1/1999	3/31/2001
FACULTY RESEARCH AWARD	3M COMPANY		4/1/1999	3/31/2000
FIELD EVALUATION OF THE CTCLS SERIES TRAFFIC SIGNAL LOAD SWITCHES	OHIO UNIVERSITY		3/19/1999	3/18/2001

LOCAL, NATIONAL, AND INTERNATIONAL COVERAGE IN PRINT, ONLINE, AND TV MEDIA

1. Objective Performance Assessment, Features Cognitive Assessment Tool Set (CATS) and OPL Jet in recent project, https://www.youtube.com/watch?v=y_acJ9zd874
2. OPL's Jet Aircraft Featured in Aviation Classics, Issue 28, History on the Ubiquitous Dolphin L-29 Aircraft, https://hfdata.opl.uiowa.edu/docs/Delfin%20Story.pdf
3. Leadership Profile, Tom Mach Schnell, July/August Issue of Vertiflite, The Vertical Flight Technical Society, also featured on College of Engineering Website, https://www.engineering.uiowa.edu/news/operator-performance-lab-director-schnell-featured-vertiflite-magazine
4. January 11, 2017, John Croft, Aviation Week and Space Technology, Flying Airbus's Augmented Reality System In A Mil Mi2. Cover page January 16, 2017 digiprint.
5. Spring 2016, University of Iowa Foundation, Soaring to New Heights, The partnership between Rockwell Collins and the University of Iowa College of Engineering spans more than 40 years., https://www.youtube.com/watch?v=oul5le0cIBY#action=share
6. December, 2016, Interservice/Industry Training Simulation Education (I/ITSEC) Conference, Operation Blended Warrior (OBW), Flew Live Fighter Element, https://youtu.be/X4J8-tdgmM8
7. August 31, 2015, Benjamin Hill, Director, Video and Photo Communications, University of Iowa-Strategic Communication, Iowa Football Halftime Video featuring two shots of OPL, one featuring the L-29 on the ground and one featuring Tom Schnell flying in formation during a tactical demonstration, https://www.youtube.com/watch?v=kmOJ5QyP6zY
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RESEARCH HIGHLIGHTS

Since 1998, Dr. Schnell brought in $23,230,274 in direct Federal, State, and industry funding increments as 100% PI. Overall, Dr. Schnell has been assigned $324,155 as co-investigator with his collaborators in externally funded research. The Operator Performance Laboratory (OPL), which Dr.

Schnell established in 1999, presently funds six full-time researchers, four graduate students, four undergraduate students, two part-time crew chiefs/mechanics, four part-time pilots, one part-time air traffic controller, and one faculty member from the Department of Neurology. To date, Dr. Schnell wrote a total of around 283 proposals to various funding agencies, and research associated with the OPL resulted in a total of 41 journal articles, 101 conference proceeding articles, 30 technical reports, two book chapters, and 19 posters or presentations. The jet aircraft of the OPL were featured on the Cover of the December 3, 2012 Aviation Week & Space Technology with a detailed story on cutting edge Live Virtual Constructive (LVC) airwarfare training technology. The MI-2 helicopter was featured on the cover of January 16, 2017 Aviation Week & Space Technology digiprint issue.

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LIVE FLIGHT DEMONSTRATIONS

Live flight demonstrations are complex events that take a significant amount of preparation and planning, rehearsal, and concentration in the execution. The effort of producing a live flight demonstration is similar to that of executing a stage production involving multiple actors and synchronized technology with unknowns such as weather and mechanical malfunctions.

Year	*Demonstration Venue*	*# Sorties*	*# Aircraft*
2017	Operation Blended Warrior, Live aircraft (Blue Force), air-surface and Suppression of Enemy Air Defense (SEAD) engagements	3	1
2016	Operation Blended Warrior, Live aircraft aggressor, air-air engagements against virtual opponents	3	1
2015	Rockwell Collins Lockheed Martin LVC Demo	3	1
2015	CANSEC RealFires Demo	3	1
2015	Sterling LVC Demo	3	1
2015	Quad Cities Airshow, Close Air Support Demonstration	3	3
2015	Dubuque Airshow, MIL-MI2 Helicopter Demo	1	1
2015	EAA Warbirds in Review Airshow, MIL MI-2 Helicopter demo	1	1
2014	SOCOM RealFires Demo	3	1
2014	Support for NASA CNPC Flights	2	1
2014	Dubuque Airshow, MIL-MI2 Helicopter Demo	1	1
2014	Quad Cities Airshow, Close Air Support Demonstration	3	3
2013	UK Open House JTAC Demonstration	3	1
2013	UAE AWC JTAC Demonstration	3	1
2013	TACAN Integration and Testing Support: A-36 Flight Demonstration 2013	3	1
2012	TACAN Integration and Testing Support: A-36 Flight Demonstration 2013	3	1
2012	CRIIS Time, Space Position Information (TSPI) Integration and Testing Support: L29 Flight Demonstration	10	1
2012	USAF LVC Demo: OPL Alliance	10	2
2012	Tactical Aircraft Online Service (TAOS) Demonstration to SOFIC	3	1
2012	Interservice Industry Training Simulation Education Conference Flight Demonstration	9	2
2012	Quad Cities Airshow, Close Air Support Demonstration	3	2
2012	Waterloo Airshow, Close Air Support Demonstration	3	3
2012	Burlington Airshow, Close Air Support Demonstration	1	3
2011	Interservice Industry Training Simulation Education Conference Flight Demonstration	9	1
2011	Quad Cities Airshow, Close Air Support Demonstration	3	2
2011	Dubuque Airshow, Close Air Support Demo	1	2
2011	Rockford Airshow, Close Air Support Demonstration	3	2
2010	CRIIS Time, Space Position Information (TSPI) Integration and Testing Support: L29 Flight Demonstration	10	1

History of OPL Flight Ops

The OPL has been active at the Iowa City Airport for quite some time, about since 2002. We bought our first aircraft in 2004. This aircraft was used to develop a Synthetic Vision System (SVS) that has been commercialized by the Dynon company under the brand Skyview. When you walk around at the EAA Airventure in Oshkosh, you will see those displays in many aircraft and many vendor booths. This system has sold over 8,000 units and we believe that this accomplishment in itself is significant for aviation safety. In 2008, we bought our first L-29 and in 2010, we acquired our second L-29. In 2012, we bought our first MI-2 helicopter and we added a second MI-2 in 2017. We tend to use two of a kind aircraft so that we can leapfrog the avionics installations without disrupting current test programs. We received a donated Cessna 172 in 2016. In 2015, we acquired our first unmanned aircraft system (UAS), a Pulse Vapor 55 electric helicopter. This aircraft has performed in numerous record breaking long range flights beyond visual line of sight (BVLOS) along powerlines in Iowa and Illinois. Additional BVLOS work was performed at Camp Grafton (ND) as part of a NASA Unmanned Traffic Management (UTM) project to integrate UAS into the National Airspace (NAS). From 2015-2017, we also added three fixed wing UAS that were used in programs funded by Rockwell Collins and DARPA. Late in 2018, we acquired a Latitude HQ-90B UAS which is a fixed wing machine that has vertical takeoff and landing capabilities. This aircraft is being used in conjunction with entities such as FAA, NASA, and critical infrastructure operators to build out safe and effective ways to operate UAS in the NAS. In November, it flew a record 60 mile flight over a public energy utility (powerline) as part of a critical infrastructure inspection technology development program. While there is much research being done by universities using small drones, we are among a small number of entities performing significant work on integrating larger aircraft into NAS flight operations.

Many other leading edge projects were performed at our KIOW location. We were the pioneers of Live Virtual Constructive (LVC) training systems that the military is now formulating for training. We have been a recognized leader in LVC and have performed many tests since 2012. This month, we will perform a flight test that will bring several USAF general staff and other high ranking government officials to Iowa City. This level of interest by government stakeholders is a major catalyst to economic development in our area, especially in STEM disciplines.

A major component of an LVC system is the Navy TCTS-II, an avionics technology that enables test and training at ranges. This system is made by Collins Aerospace. Manufacturing of this system and its related product called the USAF Common Range Integrated Instrumentation System (CRIIS) provides hundreds of millions of dollars into Collins Aerospace and as such enables significant economic benefits for employees in our region. The significant part here is that OPL has performed all pre-production flight tests of that system on our aircraft from 2011 to 2017. As a necessary condition for the government to procure it, the CRIIS system had to first be certified by USAF. From 2015-2016, the government outfitted a single F-15 with specialized ground-truth equipment to determine if the CRIIS system was fit for production. Unfortunately, that F-15 was damaged before the certification flights could be performed. This brought the project to a halt. Someone in the test community remembered that our L-29 jets were fitted with the same test equipment as the specialized F-15. We were thus enlisted as a public entity to perform the final acceptance flights at the Eglin test range in 2016. For six weeks, we were the official testers of a major program of record with test points for score. The test was a full success and the CRIIS system was thus procured. In 2017, a second block of the system was purchased by USAF and Collins Aerospace was awarded the TCTS-II contract by the US Navy. We are now entering flight tests on TCTS-II similar to how we did it in CRIIS.

We are currently working with the FAA Tech Center (Atlantic City) on a two year project to enhance helicopter flight operations in degraded visual environments (DVE). This project is a technology

development flight test effort to create affordable sensors that can be carried by helicopters and displays that can be used by their pilots to safely fly in the DVE. This is significant because flight in the DVE continues claiming lives of Helicopter EMS (HEMS) crew and the patients they carry. We have been selected by the FAA for this effort because we have two research helicopters that are completely unmatched by any other testbed capability. Our MI-2 helicopters carry sensors and displays that we have used to land in landing zones (LZs) into full brownout at the Army Yuma Proving Ground (YPG). Unaided landing in brownout is very dangerous and continues as a leading cause of Class-A accidents in the US military. Our aircraft we flew at YPG has a see-through prototype display helmet which projects LZ symbology like a virtual helipad, even though the scene outside the windshield is nothing but a mess of swirling brown dust. The system is a bit like the Ironman helmet with augmented reality (AR) guidance symbology. We were selected by the US Army and Airbus for the YPG project due to our ability to integrate novel technology such as this display quickly and efficiently into a testbed for evaluation.

Since 2016, we have worked with the USAF 711th Human Performance Wing at Wright Patterson AFB in the testing of F-35 helmet symbology. Our L-29 is the only civilian aircraft in the world that has an actual F-35 helmet integrated. We used USAF Test Pilot School (TPS) students as subjects in evaluating a variety of off-boresight symbology sets that are designed to prevent loss of control due to pilot spatial disorientation. This work now continues by adding spatial audio cueing to give pilots a redundant auditory method for better situation awareness in dynamic maneuvering flight.

A recent flight test was performed for the NASA Langley Research Center (LaRC) to enhance the spatial orientation ability of airline pilots. Through our work, we received guidance from the Commercial Aviation Safety Team (CAST) to find ways to prevent loss of control accidents in flight (LOC-I) that are the result of a loss of spatial orientation. This work highlighted a pattern of stick-and-rudder skill atrophy due to reliance on highly automated flight decks. This is particularly concerning in pilots who are marginally skilled to start out with and who manage to mask that lack of skill with automation interventions. These accidents continue to happen as evidenced by the most recent Lion Air 610 crash where a flight crew fell prey to a faulty sensor and continued using automation until the aircraft and all aboard were lost. In our study, we tested low-time commercial co-pilots who fly for regional airlines. We evaluated their ability to recover from unusual attitudes using Synthetic Vision Systems (SVS) and their standard current-day avionics counterparts. These pilots were brought in to Iowa City from all around the country and we tested their reactions to upset conditions to provide NASA and CAST with design guidance for the next generation of avionics systems. The results of our study is now influencing design requirements for future avionics certification. We are very proud to have been involved in such an important body of work to make commercial aviation even safer. The fact that we were selected by NASA to perform this flight test is evidence that we are recognized by them as leaders in that field of research. To our knowledge, no other academic outfit is performing such advanced flight tests for NASA.

We are currently involved in a three-year study funded by Collins Aerospace to develop adaptive pilot training systems that quickly determine the strengths and weaknesses of trainees and which generate ad-hoc adaptive syllabi to enhance training in areas that the trainee is weak in and avoid overtraining in areas that they already master. To date, we have flown 50 flight hours and 30 subjects in an effort to isolate patterns that are found in highly skilled individuals and to apply those patterns as automated templates to teach lesser skilled or novice pilots more effectively. Adaptive training technology is critically needed to speed up and enhance pilot training to combat the looming pilot shortage. In this project, we are leveraging Augmented and Virtual Reality (AR/VR) to better train the pilots for flight in an aircraft. One part of the adaptation that we are looking for is that we expect pilots to not only perform their flight tasks correctly and quickly but we want them to be able to do that with small cognitive workload expenditures. Since 2004, the OPL has been developing a technology that can measure cognitive workload using physiological based signals,

specifically eye tracking and electrocardiogram (ECG). We perfected this technology, called the Cognitive Assessment Tool Set (CATS), such that it can be deployed on pilots in an airborne context. The real-time workload figure gets added to a machine learning algorithm that also assesses the quality of the airmanship. This algorithm then develops the treatment plan for the next training evolution and as such the system generates an automated way of personalized pilot training.

Since its inception, OPL has generated around $23 million in external research funding that has flowed into the University, and thus into our community. This funding stems from sponsors such as the FAA, US Army, USAF, Navy, Collins Aerospace, BAE, Ameren, 3M, to name a few. In all, we have completed 295 scientific projects and flown over 2,300 incident free flight test hours.