A SUMMARY OF RESEARCH PROJECTS AND EXPERIMENTS AT THE NASTAR CENTER 2009 – 2013

There are currently **six (6)** ongoing research projects at the NASTAR center. **Eleven (11)** projects have been completed and published since 2009. **One (1)** additional protocol has been proposed and designed.

ONGOING RESEARCH PROJECTS

1. The Effect of Hyper Gravity on Manual Control Tasking Ability
2. Training effects on anxiety, arousal, and performance in simulated sub-orbital spaceflight
3. Optical Brain Monitoring using Functional Near Infrared (fNIR) Spectroscopy to Measure Cognitive Workload While Under G.
4. Integrated Vibration and Acceleration Testing to Reduce Payload Mass, Cost and Mission Risk
5. Quantification of Coriolis Cross-Coupling Intensity during Centrifugation and Sustained-G Flight Training
6. Tolerance of Centrifuge-Induced G-Force by Disease State

COMPLETED RESEARCH PROJECTS

1. Adaptation to Coriolis Inducing Head Movements in a Sustained-G Flight Simulator
2. Human Orientation Perception during Vehicle Roll Tilt in Hyper-Gravity
3. Perception Modeling for Aircraft Accident Investigation
4. GL4000 Sustained-G Flight Simulator Pilot Assessment and Motion Fidelity Analysis
5. GL4000 Sustained-G Flight Simulator Upset Prevention and Recovery Training Investigation
6. Effectiveness of Sustained-G Simulation in Loss of Control and Upset Recovery Training
7. Centrifuge Evaluation of Chemical Biological Aircrew Respirator (CBAR)
8. Evaluation of commercial space pressure suit as an approach to enhance safety and health of commercial spaceflight travelers
9. Integrated Vibration and Acceleration Testing for Space Payloads
10. Moisture Cream Study
11. An experiment to evaluate transfer of upset recovery training conducted using two different flight simulation devices

PROPOSED PROJECTS & PROJECT AWAITING FUNDING

1. Pilot Reactions to Unusual Aircraft Attitudes: A Physiological, Bio-Chemical and Psychology Assessment.

ONGOING RESEARCH PROJECTS (6)

1. THE EFFECT OF HYPER GRAVITY ON MANUAL CONTROL TASKING ABILITY

Summary
This experiment will be the first to study the effect of the G-Excess illusion on a subject's ability to manually control and stabilize a vehicle's tilt angle. While perceptions are interesting from theoretical perspective, the true concern is that illusory perceptions will impact piloting performance resulting in accidents. This experiment will study the impact on pilot manual control in a controlled task across a range of angular roll tilt frequencies. Pilots will be tasked with keeping the ATFS-400 gondola upright (in reference to the net gravitational vector) in response to a pseudorandom roll disturbance at varying G levels.

Objectives
- To study the effect of the G-excess illusion on the manual stabilization of a rate-controlled vehicle
- To provide data to support the development of future countermeasures to the G-excess illusion, including displays, training, and different vehicle designs, which can be tested in a controlled laboratory setting
- To adapt the ATFS-400 for manual stability and control testing for future sub-orbital pilot testing and more general academic research

Customer/Partner
Massachusetts Institute of Technology partnered with ETC

Status
IRB Review. Centrifuge runs will start in January 2013.

Future Publications
Annals New York Academy of Sciences
Journal of Vestibular Research
Aviation Space and Environmental Medicine

2. TRAINING EFFECTS ON ANXIETY, AROUSAL, AND PERFORMANCE IN SIMULATED SUB-ORBITAL SPACEFLIGHT

Summary
Thus far, space travel has been limited to a small group of highly screened and selected test-test pilot astronauts. Soon, commercial space vehicles will provide public access to space for the first time in history. Although exciting, this poses a serious concern due to the limited knowledge on how the medically variant, general human population will subsist in space. This study will examine the effect of full versus minimal/no training on subject performance, anxiety and arousal during simulated sub-orbital spaceflight in the ATFS-400 man rated centrifuge. A battery of physiological and psychology assessment tests and data will be recorded and compared.

Objectives
- Compare anxiety and arousal for trained and untrained sub-orbital space flight passengers
- Quantify physiological changes and challenges for the general population of potential sub-orbital space flight participants
- Determine effectiveness of ground based space flight training

Customer/Partner
ETC Internal Research and St. Peter's University

Status
Experimental design and IRB preparation. Centrifuge runs and subject recruitment will begin in 2013.

Future Publications
Aviation Space and Environmental Medicine

3. OPTICAL BRAIN MONITORING USING FUNCTIONAL NEAR INFRARED (FNIR) SPECTROSCOPY TO MEASURE COGNITIVE WORKLOAD WHILE UNDER G.

Summary
An accurate measure of mental workload in human operators is a critical element of monitoring and adaptive aiding systems that are designed to improve the efficiency and safety of human–machine systems during critical tasks. Functional near infrared (fNIR) spectroscopy is a field-deployable non-invasive optical brain monitoring technology that provides a measure of cerebral hemodynamics within the prefrontal cortex in response to sensory, motor, or cognitive activation. This study seeks to determine the efficacy of using fNIR spectroscopy to measure cognitive workload while under G by testing a group of naive subjects at several standardized mental workload, memory and cognition tasks at various G levels in the ATFS-400.

Objectives
To determine differences in cognitive performance and mental workload at various G levels
To validate the fNIR optical brain monitoring system under G loading
To develop protocols and metrics for future testing of aviators during UPRT, SD and Tactical flight training at NASTAR
To develop potential cognitive screening mechanisms for pilot selection

Customer/Partner
Drexel University Cognitive Neuro-engineering and Quantitative Experimental Research (CONQUER) program partnered with ETC

Status
Under review by the NASTAR Institutional Review Board.

Future Publications
NeuroImage
Journal of Biomedical Optics

4. INTEGRATED VIBRATION AND ACCELERATION TESTING TO REDUCE PAYLOAD MASS, COST AND MISSION RISK

Summary
It was demonstrated, through both simulation and test, that exposing a spacecraft to simultaneous acceleration and vibration loads can cause nonlinear structural responses, including shifts in natural frequencies, changes in mode shapes, and changes in the components that are excited. However, current space launch qualification standards call for a series of discrete tests that apply individual load components separately. Therefore, combined environments testing is the only known method of evaluating the otherwise "hidden risks" of nonlinear structural responses.

Phase 1 developed and demonstrated the capability to deliver simultaneous acceleration and vibration loads to space launch hardware utilizing a state-of-the-art centrifuge. The second objective was to understand the significance of any effects identified. A 1U CubeSat (the Drexel University DragonSat-1) was selected as the Device under Test (DUT).

The Phase 2 proposal will extend the Phase 1 modeling efforts to actual acceleration testing in the ATFS-400.

Objectives
Test two fixtures for combined environment testing in the ATFS-400. One test fixture was designed for vibration loads aligned with the acceleration vector. The second fixture delivered vibration loads in a transverse direction.
Compare results with modeling and simulation effort completed in Phase 1

Customer/Partner
American Aerospace Advisors, Inc. & Drexel University

Status
In the process of developing SBIR Phase 2 Proposal (January 2013)

Future Publications
SBIR Report
Aviation Space and Environmental Medicine

5. QUANTIFICATION OF CORIOLIS CROSS-COUPLING INTENSITY DURING CENTRIFUGATION AND SUSTAINED-G FLIGHT TRAINING

Summary
Technological advances have allowed centrifuges to become more than physiological testing and training devices; sustained-G fully interactive flight simulation is now possible. However, cross-coupled stimulation of the semicircular canals, due to head or gondola motion during centrifugation, can cause tumbling sensations that are potentially distracting, nauseogenic, and unpleasant. As new efforts are underway to mitigate or eliminate these motion artifacts, reliable, quantitative tools for measuring tumbling intensity are necessary.

Historically, tumbling intensity has been measured via non-compensatory vestibular-ocular reflex (VOR) response (i.e. eye movement data from infrared or electrode recordings) or with a subjective intensity rating scale verbalized by the subject. Both methods are inadequate for quantitative research and development purposes. VOR data has been shown to differ from perceived response for many common perceptual paradigms, including Coriolis tumbling, and subjective intensity scales are difficult to aggregate across subject populations. New efforts have been focused on quantitative and comparable methods for measuring tumbling.

Objectives
Design and implement 2 devices for CCC quantification
Design an experiment to match results with traditional methods (i.e. rating scales and eye movement data)
Compare results with perception model simulations

Customer/Partner
Internal Research

Status
Experimental design and hardware development started in January 2013

Future Publications
American Institute of Aeronautics and Astronautics (AIAA)

6. TOLERANCE OF CENTRIFUGE-INDUCED G-FORCE BY DISEASE STATE

Summary
The coming of the commercial age of spaceflight portends a paradigm shift concerning the medical qualifications of future space "tourists." The majority of the medical knowledge of the human body in microgravity is based upon studies of remarkably healthy individuals well-trained for such an environment. However, unlike career astronauts, prospective commercial space passengers will self-select based upon financial means, which is often inversely related to youth and physical fitness. With very little data regarding the effects of spaceflight on individuals with known diseases, the development of medical standards and screening of commercial passengers is currently an area of much discussion and debate. UTMB has received funding from the FAA under the Center of Excellence for Commercial Space Transportation grant to investigate this area. The concern is whether spaceflight, an already hazardous endeavor, would be a greater hazard for the less healthy individual. It remains difficult to predict how particular disease processes will respond to the hyper-gravity environment during launch and landing of space craft, and exactly what these hazards may entail. In this study we will train and test individuals with known disease processes in the NASTAR Center centrifuge in Southampton, PA. Various G-profile runs will be used in order to determine the subjects' overall stamina for exposure to acceleration forces that might be experienced in a suborbital commercial spaceflight.

Objectives
We aim to screen individuals known to have each of the following: (1) controlled hypertension (2) controlled diabetes (3) well controlled cardiovascular disease or disease history such as coronary artery disease, (4) respiratory compromise from chronic obstructive pulmonary disease or asthma, and (5) history of neck or spine injury or disease. We will further screen individuals with no known history of these diseases to act as a control group.
We will compare each of the study groups to a similarly-sized group of individuals undergoing the same acceleration exposures without any known disease processes.
This understanding will provide the foundation on which medical screening criteria can be developed that may be applicable to commercial spaceflight participants.

Customer/Partner
UTMB Health, FAA Center of Excellence for Commercial Space Transportation

Status
IRB Review January 2013. Experiment to start Q1 CY2013.

Future Publications
American Institute of Aeronautics and Astronautics (AIAA)
Aviation Space and Environmental Medicine

COMPLETED RESEARCH PROJECTS (11)

1. ADAPTATION TO CORIOLIS INDUCING HEAD MOVEMENTS IN A SUSTAINED-G FLIGHT SIMULATOR

Summary
Experienced pilots made 14 predetermined head movements in a sustained G flight simulator (at 3 Gz+) on five consecutive days and 17 days after training. Symptoms were measured after each head turn using a subjective 0-10 motion sickness (MS) scale. The Simulator Sickness Questionnaire (SSQ) was also administered before and after each daily training session. RESULTS: After five daily training sessions normalized mean MS scores were 58% lower than on day one. Mean total, nausea, and disorientation SSQ scores were 55%, 52%, and 78% lower, respectively. During retesting 17 days after training, nearly all scores indicated 90-100% retention of training benefits. DISCUSSION: The reduction of unpleasant effects associated with sustained-G flight simulation using an adaptation training protocol may enhance the effectiveness of simulation. Practical use of sustained-G simulators is also likely to be interspersed with other types of ground and in-flight training. Hence, it would be undesirable and unpleasant for trainees to lose adaptation benefits after a short gap in centrifuge use. However, current results suggest that training gaps in excess of two weeks may be permissible with almost no loss of adaptation training benefits.

Objectives
- To determine if adaptation to repeated coriolis-inducing head movements in the sustained-G training environment is possible
- To determine the rate, degree and retention of possible adaptation
- To quantify the intensity of head movements at all angles within the cockpit for future software improvements (i.e. at 3Gz pitching head movements become very benign, therefore making it beneficial to present enemy targets in this plane of head-neck motion in order to significantly reduce motion artifacts)

Customer/Partner
St. Peter's College partnered with ETC

Status
Complete (February – April 2011). Final manuscript passed peer review December 2012. To be published in ASEM February 2013.

Publications
Aviation Space and Environmental Medicine (*Currently Pending Peer Review)*

Conferences Presented At
American Institute of Aeronautics and Astronautics (AIAA) GNC Conference
8th Symposium on the Role of the Vestibular Organs in Space Exploration
59th International Congress of Aviation and Space Medicine
2012 Aerospace Medical Association Annual Meeting – Atlanta, GA

2. HUMAN ORIENTATION PERCEPTION DURING VEHICLE ROLL TILT IN HYPER-GRAVITY

Summary
This experiment will study human perception of vehicle roll tilt in different gravitational environments. In the primary experiment, subjects will be placed in the cab of a long-arm centrifuge (AFTS-400), spun up to the desired gravitational level (1, 1.5. or 2 Earth G's aligned with the longitudinal or Z-axis), and then be passively rolled in the dark to a series of angles at different rates. Subjects will continuously report their perception of the roll angle using a somatosensory indicator which they will attempt to keep aligned with the direction of gravity. It is hypothesized that gravitational level, roll angle, and roll rate will effect subjects' perceptions of orientation.

Objectives
- To study the steady-state and transient dynamics of perception of the G-excess illusion during cab rotation in roll
- To improve G-Excess spatial disorientation training at the NASTAR center

Customer/Partner
Massachusetts Institute of Technology partnered with ETC

Status
Complete (Winter 2012). To be presented and published in 2013.

Future Publications
Journal of Vestibular Research
Aviation Space and Environmental Medicine

Conferences Presented At
NASA NSBRI Investigators Workshop (February 2012).

3. PERCEPTION MODELING FOR AIRCRAFT ACCIDENT INVESTIGATION

Summary
The goal of this effort is to develop a mathematical model of human spatial orientation perception and to determine, based on prior modeling efforts and experimental research, the general utility of the model in predicting spatial disorientation events and analyzing aircraft mishaps and accident scenarios.

Objectives

- Build, program and test past vestibular modeling efforts (i.e. Merfeld 1993, Zupan 2002, Vingerhoets 2007, Haselvanter 2001 etc.)
- Compare and validate each model's response to common experimental vestibular stimuli (i.e. Forward linear acceleration, constant velocity yaw rotation, off vertical axis rotation, post-rotational tilt, fixed and variable radius centrifugation etc.)
- Develop a GUI based analysis tool that unifies the input/output stream of the abovementioned perception models and allows simultaneous simulation and comparison between models

Customer/Partner
USARMY Air force Research Laboratory

Status
Final Report complete (August 2012) and under review by USARMY Aeromedical Research Laboratory

Future Publications
Technical Report to the USARMY Air force Research Laboratory
American Institute of Aeronautics and Astronautics (AIAA)

4. GL4000 SUSTAINED-G FLIGHT SIMULATOR PILOT ASSESSMENT AND MOTION FIDELITY ANALYSIS

Summary
The goal of this study is to acquire expert opinions on the capabilities of the GYROLAB GL-4000 Continuous G Device (CGD) utilizing the NASA GTM aeromodel for Upset Prevention and Recovery Training (UPRT). Twenty air transport pilots were invited to the NASTAR Center to fly the GL-4000 and were asked to give Cooper Harper ratings for various maneuvers and complete a questionnaire about their experience. The answers to these questionnaires will be used for device improvements and a possible statistical analysis depending on the outcome of the data.

Objectives
- To improve GL-4000 fidelity by assessing device characteristics and automated upset recovery profiles
- To develop a simulator Cooper-Harper type rating system for quantitative simulator fidelity analysis
- To determine physiological and motion sickness symptom development of GL4000 pilots in order to develop appropriate training protocols

Customer/Partner
ETC Internal Research

Status
Complete (Sumer 2011). Final report was presented at AIAA Modeling and Simulation Conference Summer 2012.

Publications
American Institute of Aeronautics and Astronautics (AIAA)

5. GL4000 SUSTAINED-G FLIGHT SIMULATOR UPSET PREVENTION AND RECOVERY TRAINING INVESTIGATION

Summary
This study seeks to determine the effectiveness of simulator based UPRT using sustained-G and non-motion based flight simulation platforms. Twenty (20) Air Transport Pilot's (ATPs) were trained at the NASTAR Center in Southampton PA for UPRT in the GYROLAB-4000 (GL4K) Sustained-G Flight Simulator. Ten pilots trained using the GL4K's full motion and sustained-G capabilities while the remaining pilots operated the GL4K as a traditional fixed-based flight simulator with all motion disabled. Both groups received identical classroom training. Pilots were evaluated before and after training on their proficiency to recover from a series of randomly presented preprogrammed upset scenarios. Pilot's additionally provided feedback indicating their personal self-assessment of UPRT skill level, comfort, and overall ability before and after training. For the motion group, physiological and motion sickness symptoms were evaluated using the Simulator Sickness Questionnaire to determine potential training limitations associated with sustained-G training.

Objectives
- Compare pilot's proficiency in ability to recover from upset recovery scenarios following motion and non-motion flight simulator based UPRT.
- Develop metrics to grade UPRT recovery ability
- Optimize training methods for sustained-G based UPRT

Customer/Partner
ETC Internal Research

Status
Complete (Sumer 2011). Final report was presented at AIAA Modeling and Simulation Conference Summer 2012.

Future Publications
American Institute of Aeronautics and Astronautics (AIAA)

6. EFFECTIVENESS OF SUSTAINED-G SIMULATION IN LOSS OF CONTROL AND UPRT

Summary
This study is part of a larger body of research aimed at understanding man-machine interaction in aviation, and its influence on aviation safety. In part one of this study a group of pilots experienced flight upset profiles in the GYROLAB GL-2000 centrifuge-based simulator and evaluated the simulator to determine if sustained motion simulation is of sufficient fidelity to improve pilot-reaction to unplanned, simulated, aircraft upsets. In part two of this study pilots were monitored with a variety of physiological sensors to determine if there are identifiable psychological and physiological responses that occur in pilots when their exposure to an unplanned upset results in a mishap.

Objectives
- To observe trends between the success of recovery attempts and the physiological and psychological response of the pilots
- To validate the GYROLAB GL-2000, as a research and training tool for replication of pilot-in-the-loop control system performance and aircraft response in upset and off-nominal flight conditions
- To identify trends in the physiological and psychological responses of pilots recovering from upset conditions in large transport aircraft

Customer/Partner
NASA (Grant NNL06AA21G)

Status
Complete (2009)

Publications
Final report complete and available online
http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20110008036_2011007963.pdf

7. CENTRIFUGE EVALUATION OF CHEMICAL BIOLOGICAL AIRCREW RESPIRATOR (CBAR)

Summary
The U.S. Navy is developing a new Chemical-Biological Aircrew Respirator (CBAR) to replace the legacy system. Prior to flight testing, the system was evaluated at ETC by subjecting human volunteers to acceleration stress to determine if the CBAR, along with a standard US military breathing regulator, provides sufficient air to perform anti-G straining maneuvers during high Gz conditions.

Ten (10) volunteers were exposed to a series of acceleration profiles in the ETC centrifuge while wearing the legacy respirator and CBAR on separate days. Mask performance, physiologic and subjective responses were recorded for comparisons.

Objectives
- To compare the performance characteristics of a new Chemical-Biological Aircrew Respirator to the legacy system during a series of high-G centrifuge acceleration profiles
- To determine if the new CBAR system provides sufficient air to perform anti-G straining maneuvers during high Gz conditions

Customer/Partner
US NAVY (PMA-202 Aircrew Systems)

Status
Complete (July – October 2011)

Future Publications
Final Report delivered to US NAVY

8. EVALUATION OF COMMERCIAL SPACE PRESSURE SUIT AS AN APPROACH TO ENHANCE SAFETY AND HEALTH OF COMMERCIAL SPACEFLIGHT TRAVELERS

Summary
The purpose of this study is to evaluate the use of a new generation life support space suit as means to optimize human safety, protection, and performance during upcoming commercial space flights. As limited to no publically available data exists on commercial human spaceflight, this study is the first of its kind to understand the impact of a pressure suit during commercial suborbital flights.

Two subjects will evaluate a Contingency Hypobaric Astronaut Protective Suit (CHAPS) under G during a series of centrifuge runs at the National AeroSpace Training and Research(NASTAR) Center. Use of the Phoenix Centrifuge at NASTAR Center will permit realistic evaluation due to the replication of acceleration forces and physiologic conditions encountered upon humans during launch and reentry phases of suborbital space flight.

Objectives
- To elicit detailed feedback to enhance spacecraft seat and life support equipment designs
- To aid in the development of protocols associated with future suborbital research
- To integrate feedback into space training programs to provide space travelers with the best, most realistic training available that focuses on optimizing their health, safety and enjoyment in overall space flight experience

Customer/Partner
Drs. S. Alan Stern and Dan Durda of Southwest Research Institute (SwRI) in Boulder, CO and The David Clark Company, Incorporated (DCCI)

Status
Complete (January 2012)

Publications
Research summary available online
www.nastarcenter.com/nastar-center-supports-commercial-space-pressure-suit-evaluation-in-centrifuge

9. INTEGRATED VIBRATION AND ACCELERATION TESTING FOR SPACE PAYLOADS

Summary
The goal of the research is to develop the capability to provide integrated acceleration, vibration, and shock testing using a state-of-the-art centrifuge (Phoenix Centrifuge) at the NASTAR Center, in order to subject payloads to the synergistic effects of combined environments. By providing more realistic load profiles, combined environment testing has the potential to significantly reduce payload mass, test costs, and mission risk.

This contract is a follow on from a proof of concept demonstration performed in 2008 by NASTAR Center and AAAI. This contract expands on the original design and plans to employ a larger (electro-magnetic) shaker, a CubeSat-class satellite, increased instrumentation (~10 accelerometers), and features a series of combined environments testing with multi-axis loads, as well as strong modeling and simulation elements.

Objectives
- To develop the capability to provide integrated acceleration, vibration, and shock testing in the ATFS-400
- To obtain a Phase 2 Small Business Technology Transfer award

Customer/Partner
American Aerospace Advisors, Inc (AAAI) and Drexel University. NASA Kennedy Space Center is the sponsor of the STTR.

Status
Complete (Fall 2012)

Future Publications
STTR Final Report

10. ESTEE LAUDER EXPERIMENT

Summary
The objective of this experiment is to measure the moisture loss that skin experiences under the conditions of a typical eight hour commercial airliner flight, and the efficacy of a new Estee Lauder product to reduce moisture loss. Twenty four (24) female subjects with dry skin will spend 8 hours in the NASTAR Altitude Chamber where the air pressure and humidity will simulate the conditions in a commercial airliner cabin. The pressure in the Altitude Chamber will equal the atmospheric pressure at 8,000 feet altitude, the maximum allowed cabin pressure altitude according to Federal Aviation Regulations. The Altitude Chamber will be maintained at 15-20% humidity, which is characteristic of most commercial airliner cabins.
The new moisturizing cream will be applied to one side of each subject's face prior to entering the chamber, and moisture readings will be taken using a non-intrusive probe. Subsequent skin moisture readings will be taken after 2, 4, 6 and 8 hours. The study will be performed over two days, with 12 subjects tested each day.

Objectives

- The objective of this experiment is to measure the moisture loss that skin experiences under the conditions typical of an eight hour commercial airliner flight and the efficacy of a new product to reduce moisture loss.

Customer/Partner
Estee Lauder Companies Inc.

Status
Complete (Summer 2012)

Future Publications
N/A

11. AN EXPERIMENT TO EVALUATE TRANSFER OF UPSET RECOVERY TRAINING CONDUCTED USING TWO DIFFERENT FLIGHT SIMULATION DEVICES

Summary
Air transport training programs provide simulator-based upset-recovery instruction for company pilots. However, no prior research demonstrates that such training transfers to an airplane in flight. This FAA-funded research experiment was designed to evaluate upset-recovery training transfer. Two groups of participants were given simulator-based training in upset-recovery, one in a high-end centrifuge-based device, the other using Microsoft Flight Simulator running on desktop computers. A third control group received no upset-recovery training at all. All three groups were then subjected to serious in-flight upsets in an aerobatic airplane. Pilots from both trained groups significantly outperformed control group pilots in upset-recovery maneuvering. However, performance differences between pilots from the two trained groups were less distinct. Moreover, pilot performance in both trained groups fell well short of the performance exhibited by pilots experienced in all attitude flight. Although we conducted flight testing in a general aviation airplane, our research has important implications for heavy aircraft upset-recovery trainers.

Objectives
- Compare pilot's proficiency in ability to recover from upset recovery scenarios following motion and non-motion flight simulator based UPRT
- Develop metrics to grade UPRT recovery ability
- Quantify transfer of desktop and simulator based UPRT to aircraft

Customer/Partner
Embry-Riddle Aeronautical University, FAA

Status
Complete (2009)

Publication
Final report for FAA available online
http://www.faa.gov/library/reports/medical/oamtechreports/2000s/media/200917.pdf

PROPOSED PROJECTS & PROJECT AWAITING FUNDING (1)

1. PILOT REACTIONS TO UNUSUAL AIRCRAFT ATTITUDES: A PHYSIOLOGICAL, BIO-CHEMICAL AND PSYCHOLOGY ASSESSMENT.

Summary
The goal of this project is to research the effects of anxiety in airline pilots who have never experienced extreme maneuvering in an aircraft. Specifically, we will analyze and compare the manifestation of anxiety and fear symptoms during upsets for two groups of pilot trainees; those that undergo NASTAR Non-Motion Upset Recovery Training and those that train in a full-fidelity sustained G flight simulator completing the NASTAR GL-2000 Full Motion Upset Recovery Training program. Physiological data, bio-chemical hormone levels (salivary cortisol levels), and subjective psychological questionnaires will be recorded and compared.

Objectives
- To determine if training in a realistic physiologically stressing simulated flight environment is superior to traditional classroom and non-motion based training at reducing anxiety, fear and startle during a real in-aircraft upset.
- This experiment will put the ETC slogan, “flight training without physiological stress is not flight training,” to the test. The resultant physiological, psychological and bio-chemical data will provide objective evidence to back or refute this claim as applied to UPRT.
- Additionally, this experiment will determine the effectiveness of sustained-G UPRT compared to traditional methods.

Customer/Partner
Embry-Riddle Aeronautical University partnered with ETC

Status
Postponed due to complications with ERAU IRB

Future Publications
Aviation Space and Environmental Medicine