




Aviation, Space, and Environmental Medicine

The Official Journal of the Aerospace Medical Association

March 2011 • Volume 82, Issue 3 • ISSN 0095-6562









Annual Meeting Program and Abstract Issue

[442] COMMERCIAL SUBORBITAL SPACEFLIGHT: A NEW CHALLENGE FOR THE CONSULTING FLIGHT SURGEON

G. KLUGE, C. STERN AND M.W. TRAMMER
Aeromedical Center, German Aerospace Center, Institut of Aerospace Medicine, Köln, Germany

INTRODUCTION: Commercial suborbital and orbital human spaceflight has huge perspectives in the next decades. Passengers of these flights need to be medically selected, checked and prepared for their flight. As most commercial spaceflight participants in the next decade might be participants of suborbital flights. This rapidly growing mass market is a challenge to define selection and training methods that allow a rapid decision as to whether a possible participant is fit to fly. Participants are going to have only a short and intensive preparation time for the flight. The broad medical situation of requesting passengers becomes a rising challenge for the consulting flight surgeon. The save and comfortable flight for the passengers and the risk reduction for the medical induced critical incidence and the prevention of the final flight abortion seems to be the main goal for the future of commercial spaceflight

Learning Objectives:

1 Selection and training methods that allow a rapid decision as to whether a passenger is fit to take part in suborbital spaceflight

[443] AIR QUALITY IN AIRCRAFTS: IS OZONE STILL A RELEVANT PROBLEM ON MEDIUM AND SHORT HAUL FLIGHTS?

J.F. HEDTMANN, T. SYE AND C. FELTEN
Directorate for Occupational Safety and Health, BG Transport and Traffic, Hamburg, Germany

INTRODUCTION: The formation of ozone in the atmosphere in the presence of ultraviolet light from < 240 nm wavelength in regions mainly above the tropopause is well known. Affected heights are between 20.000 ft and 100.000 ft. Relevant ozone concentrations in aircraft are expected at flight levels near the tropopause or above regardless of the season both in spring and winter mostly on northern flight routes. The current international limit value recommendations for ozone on workplaces are 0.1 ppm. On flight levels higher than the tropopause ozone concentrations more than 0.1 ppm are very likely. On flight levels below the tropopause ozone concentration > 0.1 ppm cannot be completely excluded, probably due to ozone bubbles in the atmosphere. These values were confirmed by measurements of the BG-Verkehr (Germanys social accident insurance body for transport and traffic industry) in 2009 and 2010 during flights in aircraft of member companies. The field studies were carried out on medium haul flights within Europe in the cockpit and the galley of aircraft (total more then 150 single readings). Examined aircraft types were Boing 737 and Canadair CRJ 900. Possible solutions to avoid or to reduce ozone exposure of aircraft staff such as the installation of effective ozone converters or the selection of lower flight levels as well as organizational measures are in discussion.

Learning Objectives:

1 The audience will learn that ozone is still a relevant occupational problem for aircraft staff on medium and short haul flights.
2 The ozone levels in aircraft cockpit and cabin have been measured and will be presented.
3 Consequences must be drawn out of the ozone level-measurements.

[444] SMOKE AND FUMES IN COCKPIT AND CABIN - IS TCP A RISK FOR FLYING PERSONNEL?

C. FELTEN, U. METZDORF AND J. HEDTMANN
Occupational Health and Industrial Hygiene, Berufsgenossenschaft für Transport und Verkehrswirtschaft, Hamburg, Germany

INTRODUCTION: Since the early fifties cockpit crews and cabin staff reported sporadically oil smell incidents. Diverse health issues were chronicled. In fact components of oils could enter into cabin or cockpit accidentally. This difficulty is not an isolated theme, because there are some more possible harmful influences like chronodisruption, low humidity, changed pressure conditions, ozone or manifold other smells. A reason for concern is that pilots reported feelings of inca-pacity after oil smell-incidents. For aircraft turbines special synthetic oils are used, based on fatty acid esters and with phosphoric acid esters as additives - e.g. tricresylphosphates (TCP). If turbine oil reaches the bleed air system pyrolysis is imaginable. The spectrum of oil and pyrolysis components is immense. In such situations usually a measurement project is planned to identify critical components and their concentrations in the air. Valid methods for sampling, analytics and biomonitoring have been developed recently. But it is almost impos-sible to perform a comprehensive measurement campaign for TCP concentrations in work-place air, because the occurrence of oil smell incidents cannot be predicted. Simulation processes are being searched and/or suitable biomonitoring shortly after a fume incident has to be carried out. The research results of exposure parameters like duration, frequency, probable concentration and marginal skin contacts give reasons for a low risk. Based on the information currently available TCP are not the cause for hazard effects. Knowledge about the mode of action of TCP shows low consensus with the reported symptoms of flying per-sonnel. Nevertheless all possible TCP-related reasons for the occurrence of incapacity have to be cleared urgently.

Learning Objectives:

1 The audience will learn to assess the health hazards to the flying personnel due to Tricresyphospates (TCP) in cabin air during by smoke incidents

[445] CASE REPORT: INFLAMMATORY BOWEL DISEASE AND FIT FOR FLYING?

M.W. TRAMMER
Aeromedical Center, Institute of Aerospace Medicine, German Aerospace Center, Köln, Germany

INTRODUCTION: A medical history or clinical diagnosis of inflammatory bowel disease (IBD), according to European Regulations for Flight Crew Licensing (JAR FCL), results in an unfit assessment for professional and private pilots. A 47-year-old professional pilot (ATP) reports during his yearly renewal examination in our Aeromedical Center (AMC), that some months ago he had been diagnosed with colitis ulcerosa. Therefore the issuance of his Medical Certificate has to be refused. This case report describes the course of disease and the ongoing review procedure according to European (German) standards. The necessary limitations for the pilot's recertification are defined and put forward for discussion. In addition a short overview of expected interferences between IBD (pathologic changes / complications / treatment's side effects) and environmental stress during flight duties is given.

Learning Objectives:

1 Interferences between IBD and environmental stress during flight duties

[446] CHALLENGES OF THE MOUNTAIN WAVE PROJECT AT TIBETAN PLATEAU AND THE HIMALAYAS

R. HEISE[1], K. OHLMANN[1], A. GENS[2] AND C. LEDDERHOS[2]
[1]*Mountain Wave Project Team, Berlin, Germany;* [2]*German Air Force Institute for Aviation Medicine, Fuerstenfeldbruck, Germany*

INTRODUCTION: After two expeditions to the Andes, the MWP Team is now in the planning process of a research mission to the Tibetan Plateau and the Himalayas pursuing a multidisciplinary approach, in which phenomena of physics of the atmosphere and human performance and limitations shall be studied. As the Tibetan Plateau is the only region on Earth where the Planetary Boundary Layer often directly borders the Tropopause, one can expect the exchange processes between the Earth's surface and the stratosphere to be much

more direct and intense than anywhere else on Earth. The Himalayan mountains` range reaches into the high-wind levels (often even into the jet-stream niveau) and thus, their effect on regional and even global flow patterns is much more dramatic. To our best knowledge, there have never been high-resolution aircraft-based scientific measurements of atmospheric parameters carried out over the Tibetan Plateau or the high mountains surrounding it. **METHODS:** Therefore, there are a multitude of scientific questions that would greatly benefit, if even a limited set of such measurements could be made. The objective of the study includes high-resolution aircraft-based (Stemme S10VT) scientific measurements of atmospheric parameters (3-dimensional wind vector, turbulence parameters, turbulent fluxes of sensible and latent heat (evaporation) and CO_2, ozone, vertical momentum transfer and the diurnal anabatic flow in the complex terrain) as well as measurement of vertical profiles of all parameters. Moreover, concomitant aspects of human performance and limitations under these uniquely extreme environmental conditions (high altitude, low temperature, turbulences) are to be investigated in the intended study. For that purpose, the portable psychophysiological multisensor monitoring system (Health-Lab System) and an early warning oxygen deficiency sensor will be used. The study will be performed in cooperation with the Institute of Tibetan Plateau Research of the Chinese Academy of Sciences.

Learning Objectives:

1 Physics of Atmosphere
2 psychophysiological strain assessment
3 non-invasive psychophysiological monitoring wi the HEALTHLAI System

[447] TRAINING IN THE FIELD OF AEROSPACE MEDICINE AT GERMAN UNIVERSITIES

V. HARSCH
Aerospace Medicine, MV Center for Occupational Health, Aviation and Travel Medicine, Neubrandenburg, Germany

INTRODUCTION: Aerospace Medicine is a specialty in Germany for decades. Postgraduate training is mainly performed at the German Air Force Institute for Aviation Medicine in Fuerstenfeld-bruck and at the German Academy for Aviation and Travel Medicine in Frankfurt. As well training of medical students, interested in the field of aerospace medicine, is offered at several medical schools. The article shows the present state of aerospace medical training and makes suggestions for further developments. **METHODS:** Oral history and library research are performed to present a timeline in aerospace medical training in Germany. In addition a questionaire was distributed to all aerospace medical specialists involved in acedemic aerospace medical training at German medical schools. **RESULTS:** Aerospace Medicine is a specialty in Germany since the 1920s. Specialists are mainly trained at the German Air Force Institute for Aviation Medicine in Fuerstenfeldbruck and at the German Academy for Aviation and Travel Medicine in Frankfurt. As well training of medical students, interested in the field of aerospace medicine, is offered at several Medical Schools. At the RWTH Aachen Professor Dr. Gerzer from DLR is heading the leading institution in medical student training. At several other medical schools aerospace medicine is tought by flight surgeons and specialists in aerospace mediicne as in Berlin, Braunschweig, Greifswald, Hannover, Mainz and Munich. The author is lecturing aerospace medicine, travel medicine and occupational health at the Ernst-Moritz-Arndt-University in Greifswald sindce 2006. The agenda of the training with its theoretical and practical parts is compared to other aerospace medical courses of different universities. **DISCUSSION:** Aerospace medical training is offered on an individual basis at several German universities. To promote the scientific education it would be in future advisable, to offer the aerospace medical training at all medical schools. In addition to support this mission the German Society of Aviation and Space Medicine DGLRM could coordinate the medical training in this particular field.

Learning Objectives:

1 The audience will learn about the development and present state of aeromedical training at German universities.

Wednesday, May 11 *2:00 PM*
Kahtnu (Kenai) 1

PANEL: FROM PROCESS TO PRODUCT: YOUR RISK PROCESS AT WORK

[448] FROM PROCESS TO PRODUCT: YOUR RISK PROCESS AT WORK

C.E. KUNDROT, J.A. FOGARTY, J.B. CHARLES, L. BUQUO, J.D. SIBONGA, J.T. JAMES, J.M. EDWARDS AND W.R. ANTON
Space Life Sciences & Human Research Program, NASA-JSC,

PANEL OVERVIEW: The Space Life Sciences Directorate (SLSD) and Human Research Program (HRP) at the NASA/Johnson Space Center work together to address and manage the human health and performance risks associated with human space flight. This includes all human system requirements before, during, and after space flight, providing for research, and managing the risk of adverse long-term health outcomes for the crew. We previously described the framework and processes developed for identifying and managing these human system risks. The focus of this panel is to demonstrate how the implementation of the framework and associated processes has provided guidance in the management and communication of human system risks. The risks of early onset osteoporosis, CO_2 exposure, and intracranial hypertension in particular have all benefitted from the processes developed for human system risk management. Moreover, we are continuing to develop capabilities, particularly in the area of information architecture, which will also be described. We are working to create a system whereby all risks and associated actions can be tracked and related to one another electronically. Such a system will enhance the management and communication capabilities for the human system risks, thereby increasing the benefit to researchers and flight surgeons. a. Intro - brief mention of framework b. Ms. Lynn Buquo - Information architecture & risk(requested) c. Dr. Jenn Fogarty - Intracranial hypertension d. Dr. Jean Sibonga - Bone risks - how the framework/tools were used to obtain solutions. (confirmed) i. RMAT drove the bone summit as well e. Dr. John James - CO_2

[449] HARNESSING THE RISK-RELATED DATA SUPPLY CHAIN: AN INFORMATION ARCHITECTURE APPROACH TO ENRICHING HUMAN SYSTEM RESEARCH AND OPERATIONS KNOWLEDGE

L. BUQUO AND K. JOHNSON-THROOP
Space Life Sciences Directorate, NASA-JSC, Houston, TX

INTRODUCTION: NASA's Human Research Program (HRP) and Space Life Sciences Directorate (SLSD), not unlike many NASA organizations today, struggle with the inherent inefficiencies caused by dependencies on heterogeneous data systems and silos of data and information spread across decentralized discipline domains. The capture of operational and research-based data/information (both in-flight and ground-based) in disparate IT systems impedes the extent to which that data/information can be efficiently and securely shared, analyzed, and enriched into knowledge that directly and rapidly supports HRP's research-focused human system risk mitigation efforts and SLSD's operationally oriented risk management efforts. As a result, an integrated effort is underway to more fully understand and document how specific sets of risk-related data/information are generated and used and in what IT systems that data/information currently resides. By mapping the risk-related data flow from raw data to useable information and knowledge (think of it as the data supply chain), HRP and SLSD are building an information architecture plan to leverage their existing, shared IT infrastructure. In addition, it is important to create a centralized structured tool to represent risks including attributes such as likelihood, consequence, contributing factors, and the evidence supporting the information in all these fields. Representing the risks in this way enables reasoning about the risks, e.g. revisiting a risk assessment when a mitigation strategy is unavailable,