HSI TF and ad hoc working group: Back and neck pain, vibration, and impact from military systems

USAARL Overview

John Crowley MD MPH
Science Program Director

31 Jan 12
Medical Research and Materiel Command
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama

**Historical Successes**

- ISO Jolt Standard
- Cockpit Air Bags
- Crash Helmet Standards
- Night Vision Goggles
- Communication Ear Plugs
- Crash Neck Injury
- Operational Stimulants for Aircrew
- Crash Survival
- Aircrew Heat Stress
Jolt ISO Standard Summary

- A new biomedically-based method was developed for HHA of repeated shocks
- An International Standard (ISO 2631-5) was proposed and adopted in unusually fast time
- Both parts of the ISO 2631 and the HHA method have been implemented in a user-friendly software program used by CHPPM and supported by USAARL
Develop effective medical countermeasures against combat and operational stressors to maximize Warrior health, performance and fitness.

**USAARL’s Key Focus Areas Under MOM**

INJURY
Injury Prevention and Reduction

THREATS
Blast Overpressure
Blunt Head and Body Trauma
Traumatic Brain Injury
Acoustic Trauma
Face, Eye and Spinal Cord Injury
Return to Duty for Wounded Soldiers

PSYCH
Psychological Health and Resilience

THREATS
Concussion (mTBI)
Return To Duty Standards for Wounded Soldiers

PHYSIO
Physiological Health

THREATS

ENVIRO
Environmental Health and Protection

THREATS

Soldier
Neck Pain in U.S. Army Female Aviators

John Crowley
Joanna Greig
US Army Aeromedical Research Lab

Vivienne Lee
QinetiQ Ltd, UK
Conclusions

• 40% of US Army female aircrew (respondents) report in-flight neck pain.

• Neck pain during and after flight is associated with use of NVG’s

• Neck pain during flight is associated with total hours of NVG use

• Neck pain during flight is associated with hours of NVG use per night
# Acute and Chronic Neck Injury Exercise Countermeasures Workshop

Friday, May 14, 2010  
Sheraton Phoenix Downtown Hotel

## Agenda at a Glance

<table>
<thead>
<tr>
<th>Time</th>
<th>Item</th>
<th>Speaker</th>
<th>Organization</th>
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<tbody>
<tr>
<td>0800-0810</td>
<td>Welcome, administrative announcements</td>
<td>John Crowley MD MPH</td>
<td>US Army Aeromedical Research Laboratory</td>
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<td>Barry Shender PhD</td>
<td>US Naval Air Systems Command/TP-7 Chair</td>
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<td>Overview</td>
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<tr>
<td>0810-0840</td>
<td>Neck Pain, Injury, and Disease in Aviation</td>
<td>James Persoon MD MPH</td>
<td>US Army Aeromedical Research Laboratory</td>
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<td>LTC MC</td>
<td>US Army Aeromedical Activity</td>
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<td>0840-0900</td>
<td>Current Treatment of CSD in Aircrew</td>
<td>Shean Phelps MD MPH</td>
<td>US Army Aeromedical Research Laboratory</td>
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<td>0900-0920</td>
<td>C-Spine Injury Modeling</td>
<td>Barry Shender PhD</td>
<td>US Naval Air Systems Command</td>
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<td>Break 09:30-09:40</td>
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<td>0940-1000</td>
<td>Exercise as Injury Prevention</td>
<td>Ed Zamorski PhD</td>
<td>US Army Research Institute of Environmental Medicine</td>
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<td>1000-1020</td>
<td>Muscle Training and Injury Studies</td>
<td>John Koo</td>
<td>Harvard University</td>
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<td>1020-1040</td>
<td>Manipulation Therapy Studies</td>
<td>Jason Eggers DC</td>
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<td>1040-1100</td>
<td>Massage Therapy Studies</td>
<td>Jo Sefton PhD</td>
<td>Auburn University</td>
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<td>Research Presentations</td>
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<td>1100-1130</td>
<td>C-Spine Assessment in Military Helicopter Crew</td>
<td>Marike Van den Dool PhD</td>
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<td>1130-1200</td>
<td>Neck Exercise Training in Canadian Forces Helicopter Crew</td>
<td>Patrick Neary PhD</td>
<td>Regina University, Canada</td>
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<td>Lunch 12:00-1:30</td>
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<td>1300-1340</td>
<td>Neck Problems in Swedish Air Force Helicopter Pilots</td>
<td>Bjorn Ang PhD</td>
<td>Karolinska ...</td>
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<td>1340-1400</td>
<td>High Performance Fixed-Wing Neck Injury Countermeasures</td>
<td>Greg HAMMOND</td>
<td>Royal Australian Air Force, Australia, Royal Air Force, UK</td>
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Mitigation of acute and chronic neck pain in military aircrew

Problem
• Neck pain is a common complaint that can affect mission performance ranging from an incapacitating event to low level distraction

Purpose
• Evaluate a neck exercise program and manual manipulation therapy (MMT) as tools for the prevention of acute and chronic neck pain

Plan
• Recruit 80 subjects at Fort Rucker and Patuxent River
• Randomize into 4 groups (exercise, MMT, exercise and MMT, control) and follow their symptoms for 1 year.

Product/Payoff
• A tool for prevention of neck pain in aircrew

Progress
• Recruitment problems; scope extended and new push to recruit in Feb 2012
• Report completion est. 4Q/FY14

Schedule & Funding

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<tr>
<th>MILESTONES</th>
<th>FY11</th>
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<td>Protocol Development</td>
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Mitigation of acute and chronic neck pain in military aircrew

- USN/USAARL collaboration
- Examines long term effectiveness of a graded core exercise program and/or manual manipulation therapy for prevention of neck pain and management of chronic neck pain. Based on original study by Dr Bjorn Ang.
- Approaching 1 year out of 3. Experiencing difficulties with recruitment.
Aircrew Health Cohort Study of Apache Mk1 Pilots

Problem
• The Apache was newly introduced to the UK in 2000-2001
• Little was known about long term health effects of monocular helmet mounted displays

Purpose
• Analyze data collected from British Army pilots over a 10 year period
• Compare visual, neck and back symptoms of Apache aircrew with non-Apache aircrew

Plan
• Collate data then analyze questionnaires and examinations for statistical differences

Product/Payoff
• Increased knowledge of risks to Apache aviators

Progress
• Database created, initial descriptive statistics and entry level statistics complete. Longitudinal analysis ongoing.
• Report completion est. 4Q/FY12

Schedule & Funding

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Total Funding = $
Aircrew Health Cohort Study of Apache Mk1 Pilots

• Study predominantly aimed at visual effects of IHADSS however questionnaire included neck and back symptoms.
• Currently analyzing data however small numbers of Apache aircrew and high dropout rate reduce likelihood of significance in data.
Anthropometry neck and back pain study

Problem
- Anthropometry recommendations are often ignored when selecting aircrew
- Neck and back pain are common disabling or incapacitating conditions among aircrew

Purpose
- Determine whether there is evidence that extreme anthropometric measurements are a risk factor for neck and back pain among aircrew

Plan
- Measure and survey aircrew volunteers (front and rear, all airframes) based at Fort Rucker

Product/Payoff
- Model for measurements that best predict neck or back pain in aircrew

Progress
- Data collected from 88 aircrew (3 female)
- Data analysis in progress
- Report completion est.4Q/FY12

Schedule & Funding

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Total Funding = $1.25M
Anthropometry neck and back pain study

• Study to evaluate anthropometric measures as risk factors for neck and back pain
• Data collected from 88 aircrew (front and rear), currently being analyzed.
**WIAMan Program**  
**FY11-17**

**Purpose:**
Conduct cadaveric research to establish a scientific and statistical basis for evaluating SKELETAL injuries to occupants during Under Body Blast events.

Develop an improved blast test manikin that incorporates the medical research which provides an increased capability to measure and predict skeletal occupant injury during Under Body Blast events.

**Results:**
- A medically validated set of skeletal injury criteria for occupant injury during blast events
- Human response curves that inform the concurrent design and Biofidelity of the blast test manikin
- Improved prototype blast test manikin that incorporates the medical research which provides an increased capability to measure and predict occupant injury during Under Body Blast events

**Payoff:**
- Improved ability to accurately measure the occupant injury from accelerative loads during Under Body Blast Testing by using medically validated accelerative loading methodologies and metrics
- Increased knowledge of soldier survivability in Under Body Blast Testing
- Potential for enhanced vehicle design and soldier survivability

**Schedule & Funding**

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FY17 funds to be obtained through a coordinated 14 POM request
POINT of CONTACT

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DSN 558-6917
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