



Aircrew Flight Equipment Technology

Technology provides an immediate solution giving pilots a new edge in fighting against deadlier and more sophisticated air defense systems.

Presented By:

Mark Harvie, Pilot, Engineer
President
Omni Medical Systems, Inc.

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USAF, NAVAIR
NASA Orion Space Suit



“RED Storm Rising”

“Pilots facing deadlier air defenses”

LANGLEY AIR FORCE BASE, Va. — “The Air Force is facing more sophisticated and lethal air defense systems all over the world”.

Chief of Staff Gen. Mark Welsh



If action is not taken, our pilots and aircraft will continue to be vulnerable as a result of their loss of Situational Awareness during bladder relief.



It's Life, it's Medical, get over it

Maybe if we don't talk about it it will go away

- Bladder Relief is at best an **Awkward, and Difficult** subject to discuss with Pilots and especially Military Command. This has resulted in a culture that has **long tolerated** the practice of Tactical Dehydration by pilots.
- Military Service leadership, including those directly responsible for flight safety, know about the **widespread practice of tactical dehydration**. Flight Surgeons, Aircrew Physiologists and Safety Officers acknowledge it as a perennial problem.

*Dr. Nicholas Davenport, CAPT USN, Command Flight Surgeon,
Navy Safety Center, Aeromedical Division Code 14,*



Performance and Safety

In-Flight Bladder relief - the Weak Link

- Unbuckling from Harness
- Tactical Dehydration results in Pilot Performance issues
- Current Solutions – result in Loss of SA



“A chain is only as strong as its weakest link”





Class- A Mishaps

The Blue Threat—Our Deadliest Enemy

“We continue to take ourselves out with **deadly precision**, through errors, lapses and **poor decisions**. The Class-A mishaps are the result of our actions against ourselves.”

by RADM George Mayer

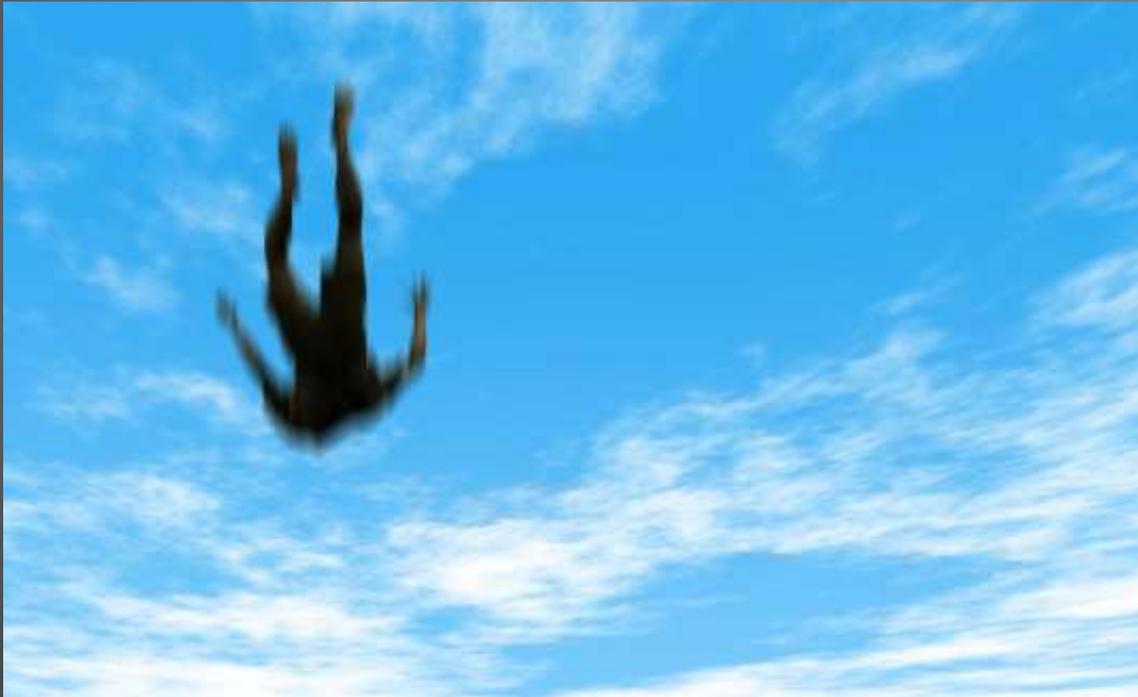
The Naval Air Warfare Center Aircraft Division Report No. NAWCADPAX—96-268-TM “SITUATIONAL AWARENESS GUIDELINES” xi 6.3.4 states: **Flight Gear** should be compatible with personal activities such as drinking water and **relief methods**. If these activities require crewmember attention, **some type of automation should be in place** to take over key aircraft functions.



Ejection Seat

Piddle Packs (and/or Travel Johns) are **UNSAFE**

Ejection while using a Piddle Pack : **100% Fatal**



Requires Pilot to Unbuckle from Harness and Unzip, and use both hands



Class- A Mishaps

Unanticipated Extended ground ops –Tactical Dehydration

<http://nation.time.com/2012/08/24/death-in-11-seconds-when-headlights-become-stars/>

“You can fly the nation’s hottest warplanes flawlessly for 1,462.6 hours. **But modern warfare is unforgiving.** So in your final 11 seconds of flight, and life – when night and dust storms blind you, turn headlights into stars, and a radio tower that looks upside down is really right-side up – **you can make a deadly mistake.**”

By [Mark Thompson](#)



Situational Awareness

Piddle Packs (and/or Travel Johns) are **UNSAFE**

Exposed and Distracted using the **Piddle Pack**: **Loss of SA**
Requires Pilot to Unbuckle, Unzip and use both hands.

Imagine a Pilot:

- Unstrapped from Harness
- Unzipped Ensemble
- Exposed Anatomy
- Hands holding
 1. Anatomy
 2. Piddle Pack



Average 10 Minutes to use – Not Buckled Distracted to Urinate



Situational Awareness

I have 1784 hours and I can “HOLD IT”

Urinary Retention *reduces attention span & ability to make decisions*
to the same degree as **alcohol intoxication**
or **24** hours of **sleep deprivation**

“Although we were provided with little ‘piddle-packs’, I personally held it for 7 hours... as I had planned, [and] I prepared by remaining dehydrated. [...] Upon arrival [...] I could barely salute the welcoming Air Force Colonel.”

John R. Chesire CDR USNR

Dehydration adversely affects G-Lock, SA and SD, which have been identified as a **major cause** of military Class A mishaps even during short flights of 60 to 90 minutes, **costing great loss of life and aircraft.**



Fire Safety

Requirement: Aircrew Flight Equipment non-Flammable

Exposed using the Piddle Pack:

Pilot is Unzipped, Expose Anatomy and use both hands.

Piddle Pack and Travel John fail Safe-to-Fly Flame Test

- burst into flames, even while in use
- drips molten burning plastic
- does not self extinguish
- produces toxic PVC fumes.

**Third Degree
Burned Anatomy
or Death**





Hydration and G-Tolerance

BY ORDER OF THE SECRETARY OF THE AIR FORCE

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

PAMPHLET 11-419 17 OCTOBER 2014 Operations G AWARENESS FOR AIRCREW

3.5.2. High-G flight requires a physiological system that is operating as close to 100-percent as possible. **Proper sleep, nutrition & hydration** must be emphasized. There will be days when the right answer is to not fly or fly a less demanding sortie. Practice good nutrition and good sleep discipline. Fly nourished and rested to the maximum extent possible. **Don't fly when ill, fatigued, dehydrated**, or while on medications. Regular exercise, good nutrition, and regular sleep allow aircrew to fly at peak condition (peak G capacity).

3.5.3. **Proper hydration is critical for normal G-tolerance.** Don't wait until a feeling of thirst. **Proper hydration starts days, not minutes,** before step. Plan to bring **sufficient water** to the aircraft to meet the demands of **unanticipated extended ground ops or high heat conditions**



USAF, USN and DOA studies

“Effects of Dehydration on Cognitive Function of Pilots”

If you feel **thirsty** (2%), it's already *too late*.

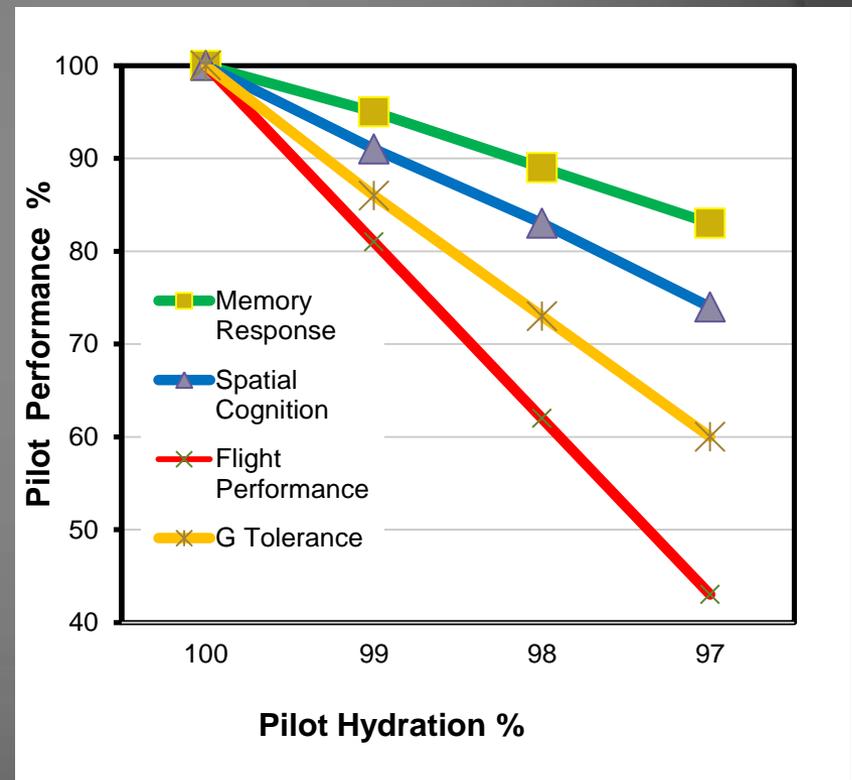
Reduced Abilities at 1-3 %

- 57% reduction in flight performance
- 40% reduction in G-Tolerance
- 26% reduction in Spatial Cognition
- 17% in short term Memory Response

Reduced Situational Awareness (SA)

Increases Spatial Disorientation(SD)

Increases Heat stress and Fatigue



Urinary Retention has same effect as **Intoxication** or **24 hrs Sleep Deprivation**



F-35 Tactical Dehydration

F-35 Pilot – Adjusting Exercises to Avoid High G-loads

The Norwegian F-35 Program Office within the Norwegian Ministry of Defence, has just published an [interesting article](#),

written by Major Morten “Dolby” Hanche,

“Dolby” has more than 2200 hours in the F-16, he is a U.S. Navy Test Pilot School graduate, and currently serves as an instructor and as the Assistant Weapons Officer with the 62nd Fighter Squadron at Luke Air Force Base in Arizona.

“Before the training begins, we always check whether we are “fit for fight”; will I be able to withstand the g-load today? «G-awareness exercise» implies two relatively tight turns, with gradually increasing g-load. My experience is that especially dehydration, but also lack of sleep affects g-tolerance negatively. If someone has a «bad g-day», we adjust the exercises accordingly and avoid high g-loads.”

AMXDmax In-flight Bladder Relief System

Hands Free Bladder Relief System - Mandatory

If action is not taken, our pilots and aircraft will continue to be vulnerable as a result of their loss of Situational Awareness during bladder relief.

Problem Overview

- Current systems for in-cockpit bladder relief (**Piddle Pack**) greatly impair the ability to fly the aircraft, are not **Ejection Seat or Fire Safe** and result in pilot Tactical Dehydration
- Aviators **sacrifice performance** by dehydrating prior to flight due to lack of effective means for bladder relief
- Not possible to use and maintain Immersion Suit of CBRN sealed protection.

Solution Key Points

- The **Air Force and Navy funded** the development of the Gen II AMXDmax to provide a **Hands Free and Safe solution**.
- USAF, USN and USMC **Safe to Fly** Approval certification (Feb 2014)
- Fully self contained system with optional Through Suit Connector (TSC) providing a Sealed solution for Immersion Suits and CBRN ensembles

“The Pilot pack should be replaced with the **AMXDmax Hands Free Bladder Relief System** and be made Mandatory Flight Equipment.”

Gen. Herbert J. "Hawk" Carlisle four-star commander USAF ACC

AMXDmax

Developed for the USAF

Maximizes Aircrew Performance and Safety

Non-invasive, fully automatic, hands free, In-Flight Bladder Relief



AMXDmax - Weight 4 oz.

Easily configured for use with all aircrew ensembles,

Through Suit Connector for hands free Immersion Suit and CBRN ensemble.

The Collection Bag can be located in any orientation

The Cup and Pad are discretely worn under flight gear.

The AMXDmax is approved Safe-To-Fly on all USAF and USN/USMC aircraft.

AMXDmax Immersion and CBRN Suits

Sealed, Hands Free Relief in Immersion and CBRN Suits

The AMXDmax with the TSC (Through Suit Connector)



Easy Quick Connect/
Disconnect

The TSC maintains suit seal

The Cup and Pad are discretely worn inside , connected inside ensemble

The AMXDmax Aircrew Flight Equipment

Sustainment supplies (Cup/Pad and Collection Bag)



AMXDmax

Developed for the USAF

TSC Suit Connector is AFE Shop Installable.



Five minute installation into any Flight, Immersion, CBRN suit and Cold Weather Gear.