




***Deployments and Operations  
Working Group***

- 
- **Our Customers**
  - **Our Products**
    - **Periodic Reports**
    - **Monthly Reports**
    - **Special Projects**
    - **Safety Handbook**
    - **Special Reports**
    - **Predator Mishap Trends**
  - **Sharing the Data**
  - **Questions**

- 
- **NIPR**
    - MRAP Mishap Trend Analysis
    - OEF Tactical Vehicle Rollover Trend Analysis
  - **SIPR**
    - OEF Aircraft Lasing Incident Trend Analysis
    - CENTCOM Mishap and Other Deployed Locations Report

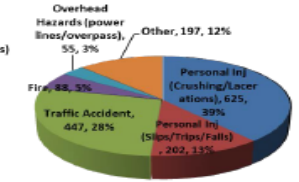
# MRAP Mishap Trends - Periodic Report

- Provides real time trend tracking for all MRAP mishaps
- Issued monthly, timely, 16 slides
- Over 250 personnel on distribution
- Distribution email includes data set, slide deck, master Safety Messages tracking, and other safety material
- Take-away: The efforts have kept us ahead of the MRAP mishap "bow wave" and provided basis for DOTMLPF improvements.

UNCLASS

## MRAP Mishap Distribution from 1 Nov 07 – 31 May 14

- 2572 recorded mishap events from multiple sources\*
- 958 events (37%) involve some type of rollover/tip-over
  - 509 - Fall initiated: occurred due to uneven terrain or ground surface collapse
  - 215 - Maneuver initiated: swerving maneuver on flat ground or terrain
  - 43 - Impact initiated: hitting object caused rollover
  - 191 - Unknown
- **Twenty one** rollover events have resulted in **32 US fatalities**; 14 drowning, 18 blunt force trauma to crewmembers, the most recent occurred 25 Apr 2012. To date there have been **916** reported rollover injuries.
- Fifty eight others, (2 US citizens and 56 other nationalities), have received fatal injuries from 42 MRAP mishap events
- Five other events resulted in **5 US fatalities**; 1 gunner hit by an overpass and 2 crewmember pinned between two vehicles and 2 crushed under
- 1614 Other events (63%) include:
  - Personal Inj (Crushing/Lacerations) 55, 3%
  - Personal Inj (Slips/Trips/Falls) 447, 28%
  - Traffic Accident 447, 28%
  - Fire 48, 3%
  - Overhead Hazards (power lines/overpass) 197, 12%
  - Other 197, 12%

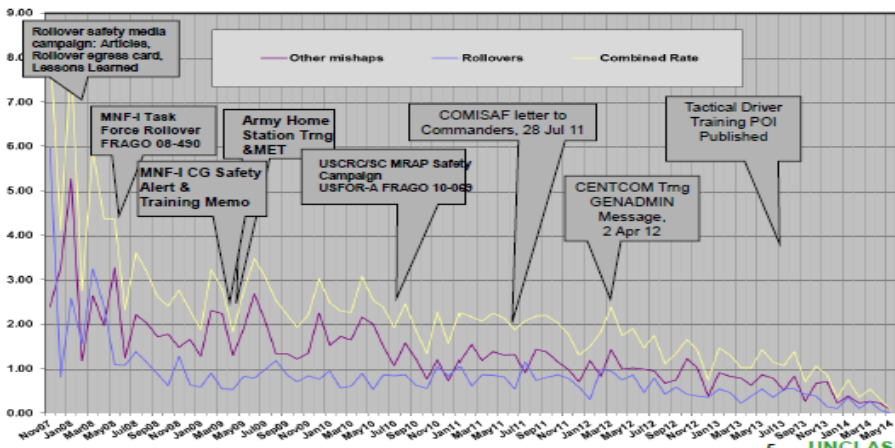


\* CENTCOM SIGACTS, Unit Safety Gram/Red-Hash, Safety Centers. Data includes CONUS, OIF/OND and OEF.

2 UNCLASS

UNCLASS

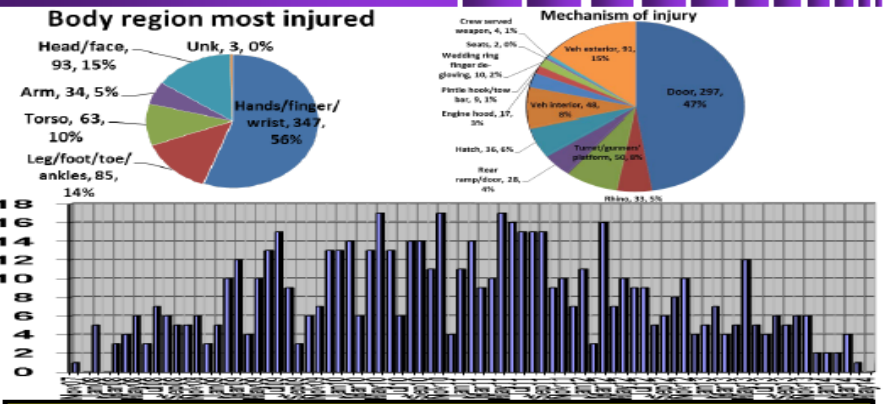
## MRAP Mishap Rates per 1,000 Fielded Vehicles 1 Nov 07 – 31 May 14



5 UNCLASS

UNCLASS

## MRAP Personal Injury\* Analysis – (known factors 625)



Four US Mil fatalities from being crushed between or under vehicles  
 \*Fractures, lacerations, crushing, blunt trauma, etc. Excludes personal injury from falls. Numbers include only the most serious injury for the individual.

10 UNCLASS

# USFOR-A Tactical Vehicle Rollovers - Monthly Report

- Provides trend tracking USFOR-A (Afghanistan) tactical vehicle rollovers, all Services, all tactical vehicles
- Timely, 12 slides
- Incidents, fatalities, injuries with and by vehicle type, and date timeline
- Take-away: OEF rollovers decreasing

UNCLASS

## Tactical Vehicle Rollover Trends from 1 Jan 09 – 30 Apr 14

- 885 recorded rollover events from **multiple sources\***
- **Type of rollovers**
  - 434 - Fall initiated: occurred due to ground surface collapse or fall from higher elevation to lower elevation
  - 177 - Maneuver initiated: swerving maneuver on flat ground or terrain
  - 26 - Impact Initiated: hitting object/or vehicle caused rollover
  - 248 - Unknown
- **25** rollover fatalities (US Mil only) and **712** rollover injuries
- MRAPs rollover are the most prevalent (n=694, 78%)

Type	Stryker	MRAP	HMMWV	ASV	LVS	PLS-M1074	M2	Tank	7 Ton	TIT Truck	LMTV	MTVR	Fueler/HEMT	Other
Fall	3	373 (15)	1	1	4	3			1	3	3 (1)	12	2	28
Maneuver	2 (1)	125 (1)	3 (2)	1	2	8			1	2	1	6	2	24 (3)
Impact	1	17	1 (1)						1		1			5
Unknown	4	179	4	1	1	4			1	1	3	2	6	42 (1)

(xx) indicates fatalities

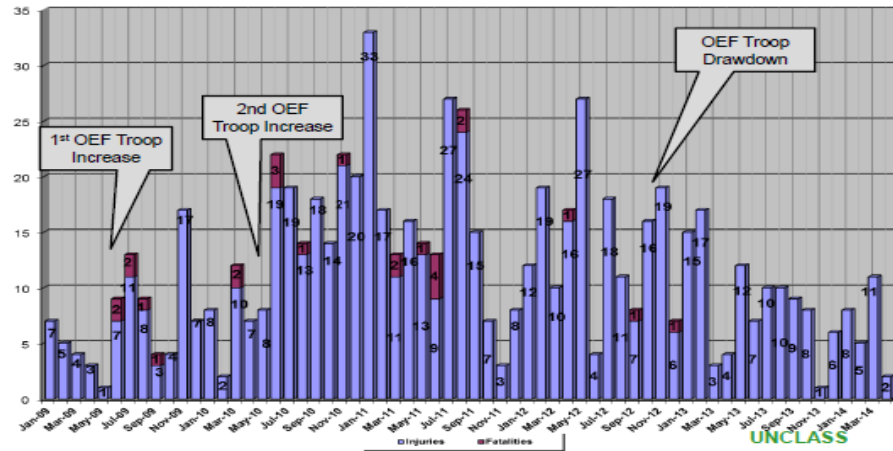
\* CENTCOM SIGACTS, Unit Safety Gram/Red-Hash, Safety Centers

UNCLASS

2

UNCLASS

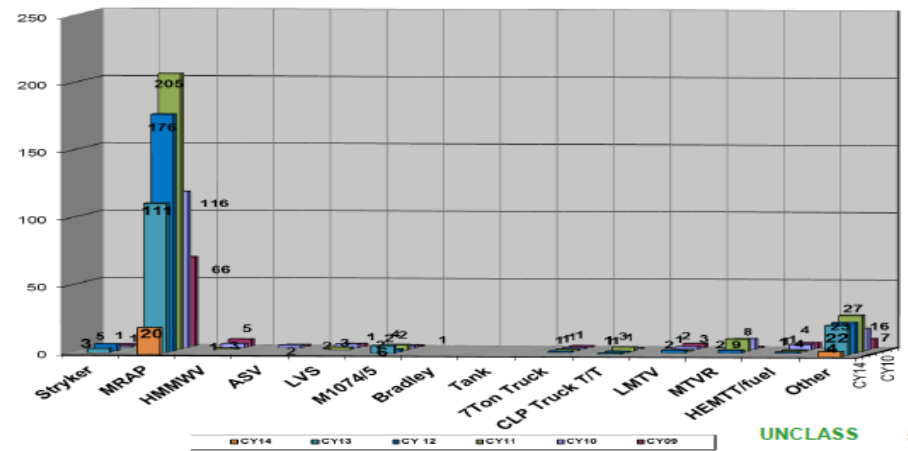
## USFOR-A Rollover Casualties 1 Jan 09 – 30 Apr 14




7

UNCLASS

## USFOR-A Rollovers by Vehicle Type 1 Jan 09 – 30 Apr 14



5

- 
- **FOB/Base Camp Safety Handbook**
  - **Lighter-than-Air (Aerostat/PGSS/PTDS)**
  - **Mishap Trend Analysis**
  - **Stryker Mishaps**
  - **Predator (MQ-1) Mishap Trend Analysis**
  - **Turret Gunner Injury Analysis**
  - **Effects of Heat Stress an Ground Mishaps**

# *FOB/Base Camp Safety Handbook and Briefing*

- Provides Safety Handbook and Class for FOB Mayors and Mayors cells
- Data Source: Existing COCOM, DOD, ACE, Service, policies, resources and documents
- Customers: FOB Mayors and Mayors Cells
- Helps fill an information/knowledge gap
- Addresses FOB safety infrastructure standards and design, safety councils, roles and responsibilities, inspections, RAC codes, Fire and Emergency Response

## **Forward Operating Base (FOB) and Base Camp Safety;**

**Resources for FOB/Base Camp Mayors,  
Mayors Cells, and Safety Officers**



24 Pages

Forward Operating Base/Base Camp  
Safety Handbook



Safety Handbook

Version 1.1  
5 Apr 2014

POC for this Handbook: [alfred.lucio.sob@gmail.com](mailto:alfred.lucio.sob@gmail.com)

# Lighter than Air (LTA) Platform Mishaps - Special Report

- Review Lighter than Air mishap trends
- Data Source: CENTCOM SIGACTS, DSES
- Timely , 12 slides
- Customers: AOR Safety Pros, CENTCOM, J-39 ROD
- ~ \$218.3M in losses, FY05 thru 10 Jun 14
- Take-away: Increase in future fielding of LTAs will need mitigation measures to prevent future losses

UNCLASS/FOUO

## Purpose

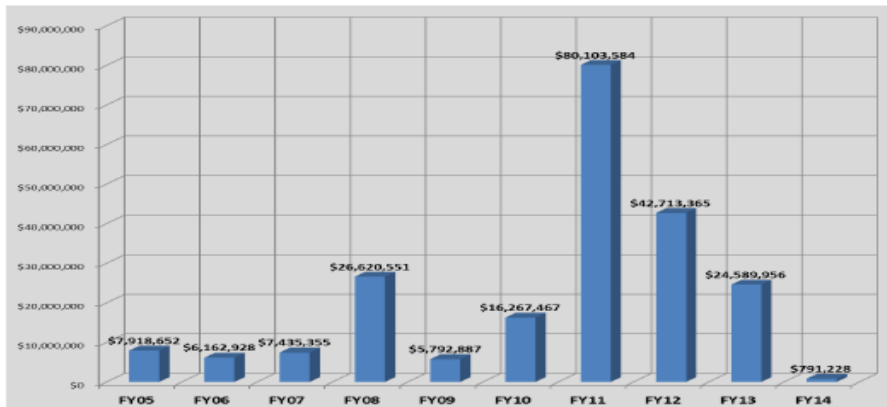
- Identify and summarize “lighter-than-air” (LTA) platform (i.e. PTDS, PGSS, JLENS, RAID, Aerostat, ALTUS) mishaps to review potential opportunities to reduce DOD LTA mishaps and enhance LTA readiness
- Data Source: Defense Force Risk Reduction Enterprise System, CENTCOM SIGACTS, and Service Safety Center Safety Reports; 5 Apr 2005 thru 10 Jun 2014



UNCLASS/FOUO

UNCLASS/FOUO

## LTA Class A-D Mishaps Losses FY05 thru 10 Jun 14 - \$218.3M



CAVEAT: Cost does not include 81 events (FY05 thru 10 Jun 14) that have no \$ estimate records. These events were found in SIGACTS, but no damage cost is available.

UNCLASS/FOUO

UNCLASS/FOUO

## Observations

- Lighter-than-air (LTA) mishaps are one of the costliest of the ground mishaps (\$218.3M in losses from FY05 thru 10 Jun 14)
- Fielding new equipment to units without fully developed training programs, tactics/techniques/procedures, standard operating procedures, and policy/manuals has been a contributing factor in mishaps
- Operations during extreme winds result in most of the losses
- With increased fielding of LTA platforms, the losses will continue, unless there mishap mitigation intervention steps are implemented

UNCLASS/FOUO

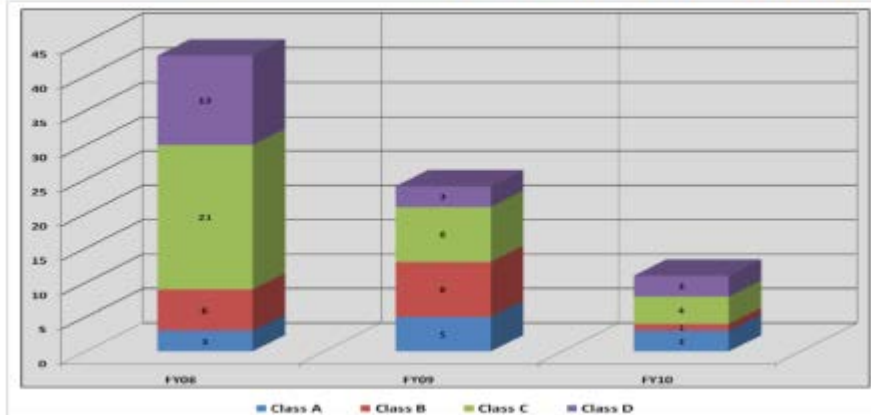


# Stryker Mishaps FY08 – FY10 – Special Report

- Provides information on Stryker mishap trends
- 13 Slides
- Injury and fatalities, Classes of mishaps, Categories: rollover, traffic, fire, personal injuries, etc and associated injuries and fatalities
- Produced based on demand
- Take-away: Mishaps similar to MRAP

UNCLASS

Stryker Mishaps by Class A-D



\* Data Source: USACRC/SC RMIS as of 27 Dec 10. Not all mishaps for FY10 may have been submitted.

4 UNCLASS

UNCLASS

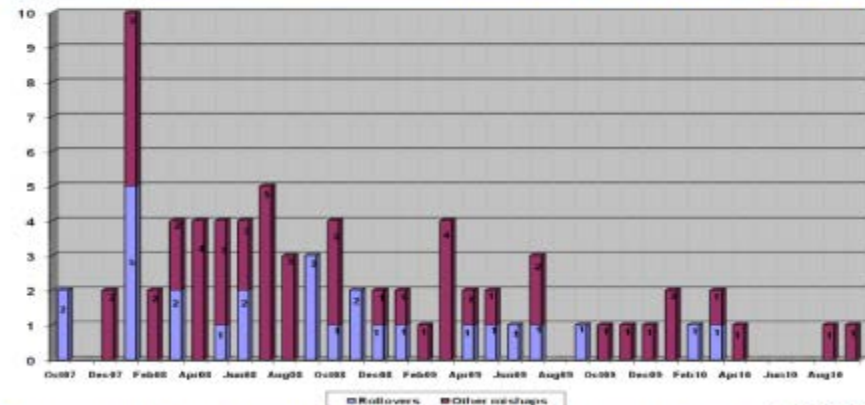
Stryker Rollover Analysis - Known Causes (23)

- Impact initiated – 1
  - Other vehicle – 1
- Maneuver initiated – 8
  - Transitioning surface (hard/soft) – 1
  - Making a turn (flat surface) – 1
  - Avoiding road objects/potholes – 2
  - Avoiding other vehicles – 1
  - Overcorrection – 1
  - Towing – 1
  - Up an embankment – 1
- Fall initiated - 17
  - Road/Ground/Bridge Collapsed or gave way – (subset total 5)
    - By Canal/Embankment/Ditch – 1
    - Culvert – 1
    - Bridge – 3
  - Fall due to uneven terrain – (subset total 12)
    - Canal/Embankment/Ditch – 7
    - Canal/Embankment/Ditch during a maneuver/turn – 3
    - Terrain incline/decline – 1
    - Vehicle upload on flatbed – 1

UNCLASS

UNCLASS

Stryker All Mishaps, 1 Oct 07 – 30 Sep 10



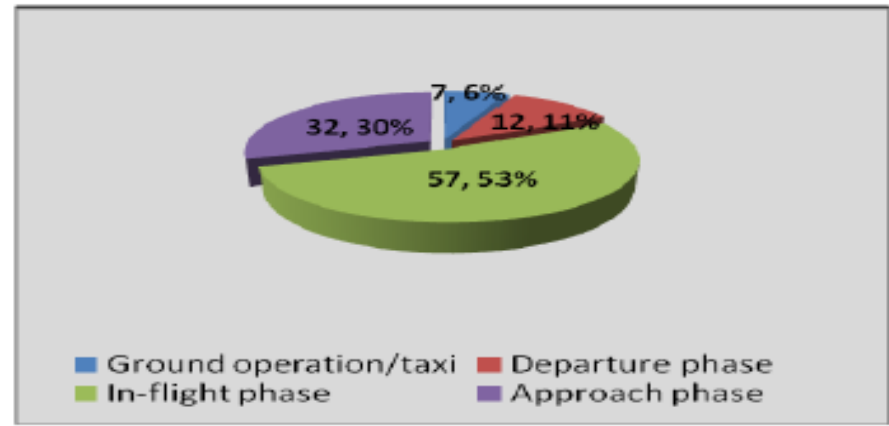
\* Data Source: USACRC/SC RMIS as of 27 Dec 10. Not all mishaps for FY10 may have been submitted.

6 UNCLASS

# Predator Mishap Trends

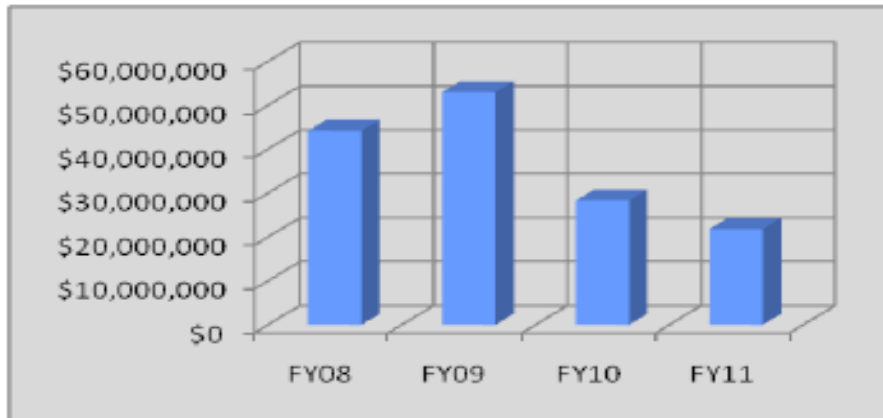
- Provides mishap data and trends for UAV/RPA community
- Identifies system failures and phase of flight when mishap occurs
- Provides awareness of cost data on losses

UNCLASS/FOUO DRAFT  
*Predator Class A-C Mishaps, by Phase of Operation FY08 thru 31 Jul 11*



•Data Source: CENTCOM SIGACTS, Defense Safety Enterprise System, and Service Safety Center UNCLASS/FOUO

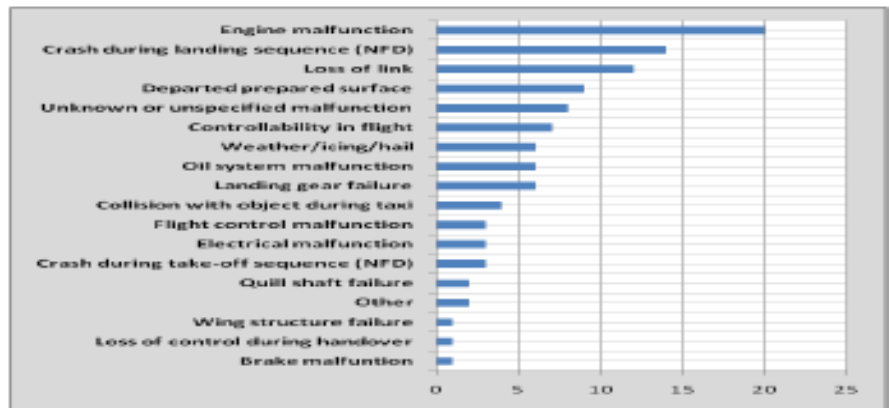
UNCLASS/FOUO  
*Predator Class A-C Mishaps Losses FY08 thru 31 Jul 11 - \$147M*



CAVEAT: Cost does not include 24 events where the damage cost is unavailable at the time of this report  
 Data Source: Defense Safety Enterprise System and Service Safety Centers

UNCLASS/FOUO

UNCLASS/FOUO  
*Predator Class A-C Types of Mishaps FY08 thru 31 Jul 11*



•NFD=No further details

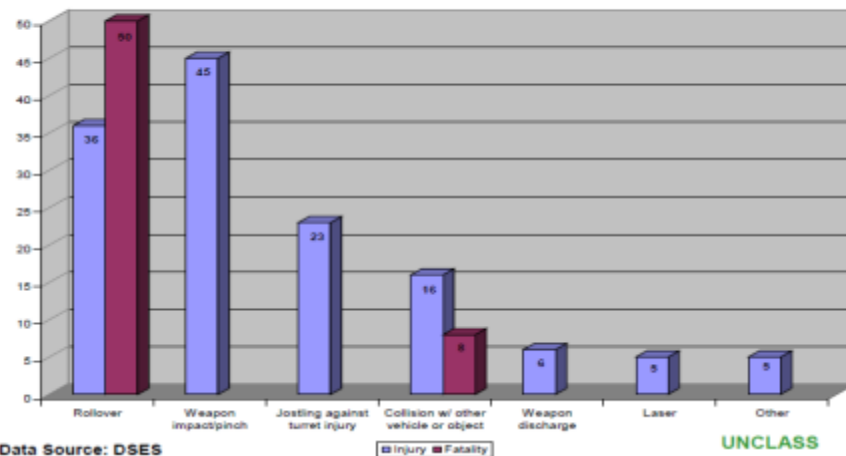
•Data Source: CENTCOM SIGACTS, Defense Safety Enterprise System, and Service Safety Center UNCLASS/FOUO

# Turret Gunner Injury Analysis – Special Project

- Provided analysis on turret gunner injuries
- Data makes a case for need for maxillo-facial shields and motorized gunner’s harness retractors for tactical vehicle turret gunners
- Take-away: Turret gunners are the most vulnerable to both hostile and non-hostile injuries

UNCLASS

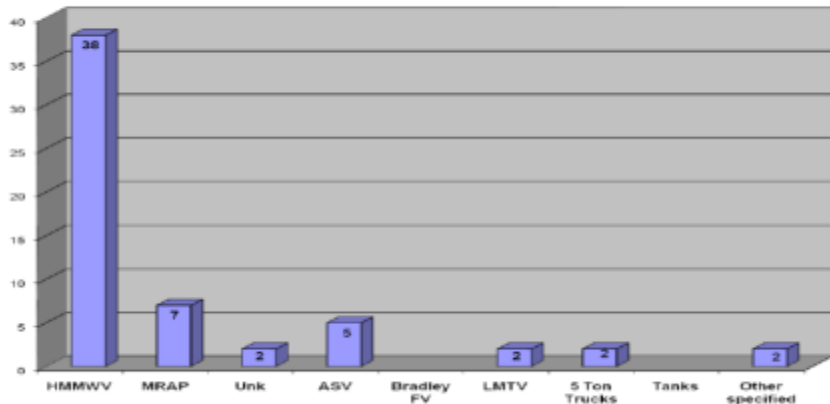
DoD Gunner Injuries, 22 Feb 01 – 15 Mar 10



UNCLASS 37

UNCLASS

DoD Gunner Fatalities, by Vehicle, 22 Feb 01 – 15 Mar 10



Note: MRAP program began fielding Nov 07, HMMWV fielded for entire period

Data Source: DSES

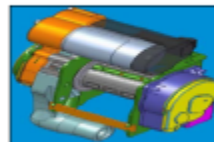
UNCLASS 36

UNCLASS

## Gunner Injuries

• Recommendations:

- All gunners in turrets wear gunners restraint harnesses system, be trained in proper usage, and leader enforcement
- PMs pursue research in automatic or motorized gunner harness retraction device to preclude gunner from partial ejection
- PMs pursue research in providing padding for critical areas in the turret that may cause blunt force injuries to the torso
- Gunners should wear a maxillofacial shield (MFS) when practical, especially when operating in rough terrain



Motorized Retractor



MFS – provides protection from IED blast and blunt force trauma.

UNCLASS 39

# Turret Gunner Ricochet Trend- Special Report

- Reviewed turret gunner ricochet incidents to develop TTP
- Data Source: CENTCOM SIGACTS, DSES
- Customers: AOR Safety Pros, Leaders
- Developed Lessons Learned
- Incorporated into CALL MRAP Handbook 11-11, January 2011
- Take-away: Successful mitigation thru awareness and doctrine addition

18 Jul 10, OIF. Turret gunner was at the test fire pit and after firing his M240B, from the M1151, test fired his M4 without the barrel completely being clear of the turret. The round ricocheted off the turret, entering the vehicle striking the gunner's left arm and right leg. 855 MP Co.

5 Jun 10, OIF. Turret gunner was at the test fire pit and test fired his M4 without the barrel completely being clear of the turret. The round ricocheted off the turret, entering the vehicle striking the gunner's right leg and the drivers right leg. A Co, 1-30 IN.



19 Jun 09, OIF. While conducting RKG-3 training, SM shot with his M4, the inside of his MRAP turret causing the third round to hit the gunners shield and ricochet inside the turret. SM sustained minor wounds to his left leg. 3-82 FA.

31 May 09, OIF. SM was wounded in the forearm by a round from his own M4 carbine when it discharged against the turret shield of the MRAP. SM was traveling thru the ECP when he grabbed his M4 and the truck hit a bump and the weapon discharged inside the turret. 1-8 CAV.

25 May 09: Soldier was in a test-fire pit, shooting an M249 5.56mm light machine gun (Squad Automatic Weapon) from the turret of a vehicle, without having mounted the weapon in the vehicle. (The weapon reportedly was not authorized for firing from that location.) During the firing, movement of the weapon caused it to no longer clear the vehicle turret. Two of the fired rounds struck the turret, causing one of the rounds to ricochet. The ricochet struck the soldier in the thigh. Soldier was hospitalized for one day, with an additional four lost duty days.

## Turret Gunner Ricochet Hazard (OND/OEF)

- **Observation.** Gunners using their individual weapon (usually an M4 carbine) while in the Objective Gunner Protection Kit (OGPK) have shot and hit elements of the OGPK causing ricochets that have severely wounded themselves and other crew members inside the vehicle.
- **Discussion.** A phenomenon called "parallax off-set" can allow a gunner to see a target, while the weapon muzzle may still not be clear of the intended target line. Firing from within the OGPK can result in bullets being fired into the inside armor and ballistic shield causing bullets to ricochet about the turret and into the crew compartment.
- **Lesson learned.** Having a clear line of sight on the target does not ensure the bullet travel path from the barrel is clear.
 

<p><b>Improper position:</b> Shows gunner with clear line of sight thru optics with bullet path set to ricochet against the turret shield.</p> 	<p><b>Proper position:</b> Shows muzzle clear of the turret shield and bracing against top of the turret shield allows for a steadier aim.</p> 
--	--
- **Recommendation.**
  - Individual weapons should be test fired from the dismounted position (on the ground) or by having another crew member test fire the weapon when gunner dismounting is not feasible.
  - Maintain muzzle awareness at all times.
  - When an individual weapon is fired from the turret, gunners should brace against the forward edge of the OGPK or as far forward as possible and support the rifle on the OGPK ensuring the barrel extends beyond the edge of the turret shield.
  - Ensure weapons are on safe at all times until ready to engage a target. *Unclassified*

## CALL MRAP Handbook 11-11, January 2011

### WARNING

Gunners using their individual weapon (usually an M4 carbine) while in the OGPK have hit elements of the OGPK, which caused ricochets that severely wounded them and other crewmembers inside the MRAP vehicle.

**KNOW WHERE YOUR MUZZLE IS POINTING WHEN USING YOUR INDIVIDUAL WEAPON INSIDE THE OGPK!**



# Effects of Heat Stress on Ground Mishaps – Special Report

- Reviewed the potential association of the effects of heat stress and dehydration on human performance and the potential increase in ground accidents
- Significant positive correlation exists that we have more accidents in CENTCOM during hot months due to heat degradation on human performance
- Take away: Effects of heat may be greater impact on mishaps the heat injuries themselves

UNCLASS/FOUO

## Mishap Incidence Jan 04 - Dec 08 Findings

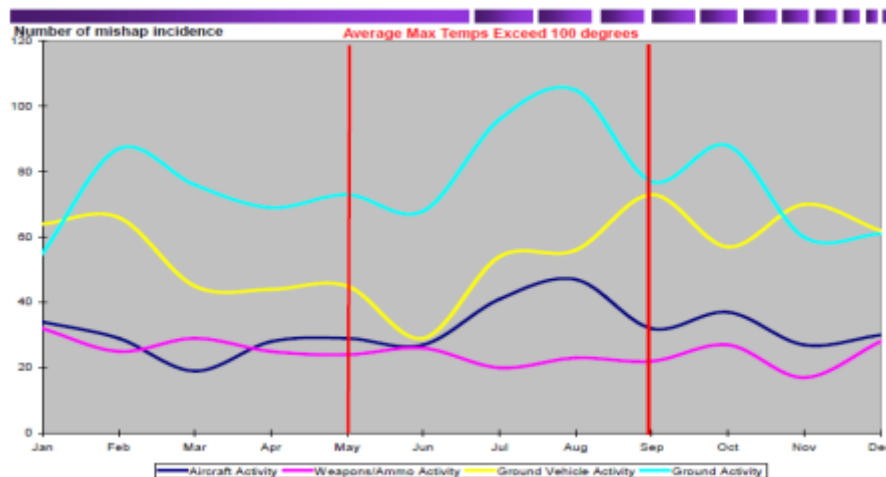
- The correlation coefficients showed that there was a positive and significant correlations between higher temperatures and mishap incidence for ground activity
- Pearson correlation

	Aviation Activity	Weapons/ Ammo Activity	Ground Vehicle Activity	Ground Activity
Correlation: Injury Type and Mean Maximum Daily Temperature	.488	-.448	-.394	.617
p-values	.108	.144	.205	.032*

Significant correlation =  $p < 0.05$

UNCLASS/FOUO

## Mishap Incidence Jan 04 - Dec 08 Grouped by Activity



UNCLASS/FOUO

UNCLASS/FOUO

## Conclusions and Recommendations

### Conclusion:

- There is a positive correlation between effects of heat stress with mishap incidence from “ground activities” in the CENTCOM theater using SIGACTS report data
- Initiatives to reduce heat stress and dehydration have the potential to reduce human error related mishaps

### Recommendations:

- The principle that heat stress/dehydration can lead to increases in mishaps should be added to DoD Heat Injury Prevention briefings and classes. Mishap outcomes are potentially a bigger risk than the heat injuries themselves.
- Studies needed to determine cumulative effects that degrade human performance; heat, dehydration, altitude and fatigue
- Assessment and application of cooling technologies may reduce mishaps
  - Microclimate cooling vests and cooling caps
  - Portable evaporating cooling fans
  - Mist cooling systems
  - Enhanced environmental control units for aircraft and vehicles
  - Forearm immersion in cooled water

UNCLASS/FOUO



# Questions