

# ***Pacific Air Forces***

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*Integrity - Service - Excellence*

## **Epidemiological Analysis of Air Medical Evacuations Conducted by the U.S. Air Force (USAF) in Antarctica 2011-2016**



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# Overview

- **Background**
- **Antarctic Environment**
- **Operation DEEP FREEZE (ODF)**
- **Study Design**
- **Sample Cases**
- **Data**
- **Conclusion**



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# Antarctic Environment

## ■ Coldest Place On Earth

- Lowest temperature ever recorded
- Vostok Station, -89.2 C



## ■ Driest Place On Earth

- 2" of water equivalent per year – less than the Sahara
- Unlike other deserts, moisture does not evaporate

## ■ Windiest Place on Earth

- 320 km/hr
- French Dumont d'Urville base in July, 1972



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# Antarctic Environment

- Huge mountainous land mass (Highest continent on Earth)
- Visibility
  - Classifications vary by station
  - McMurdo: Category 3 – Category 1
- Flight Operations
- Runways



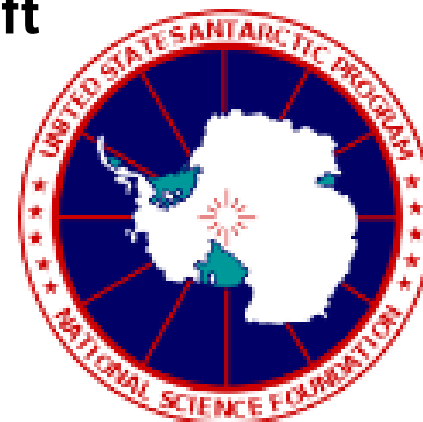
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# ODF Mission Background

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- Operation DEEP FREEZE is a US Department of Defense (DOD) activity in support of the National Science Foundation (NSF)
  
- Military Services provide operational & logistical support
  - Coordinate strategic inter/intra-theater airlift
  - LC-130 field support airlift
  - CASEVAC support
  - Sealift; seaport access
  - Bulk fuel supply





# USAF Airlift Platforms





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# The Research

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Epidemiological Analysis of  
*Air Medical Evacuations*  
Conducted by the USAF in  
Antarctica 2011-2016

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# What is “Patient Movement?”

- **CASEVAC (CASualty EVACuation)** is a term used by all US military services (USA, USN, USMC USAF & USCG) refers to the unregulated movement of casualties aboard ships, vehicles, or aircraft
- **MEDEVAC (MEDical EVACuation)** – Traditionally refers to US military services’ unregulated patient movement using predesignated tactical or logistic aircraft (both fixed wing and rotary), boats, ships, and other vehicles temporarily equipped and staffed with medical attendants for en-route care.
- **AE (Aeromedical Evacuations)** refers to USAF fixed-wing movement of regulated patients using USAF or Civilian Air Ambulance (CAA) contracted airframes with AE aircrew trained explicitly for this mission





# CONTINUOUS EN ROUTE CARE: THE NEW STRATEGY

Times In Red: Old Strategy  
Times In Blue: New Strategy

GOAL: Maintain Equal or Greater Level of Care Across The Entire Spectrum Of The Transport Mission



TC CET

Intratheater EVAC  
1-24 Hours (7 days)

Intertheater EVAC  
24-72 Hours (15 days)

Level of Care

CASEVAC/MEDEVAC  
1 Hour (24Hrs)



POI: TCCC,  
SABC, CLS

Lvl-I/BAS:  
ATLS/ACLS

Lvl-II/Forward  
Surgical Teams:  
Damage Control  
Surgery/Resuscitation

Lvl-III/CSH,  
EMEDS, EMF:  
Theater  
Hospitals

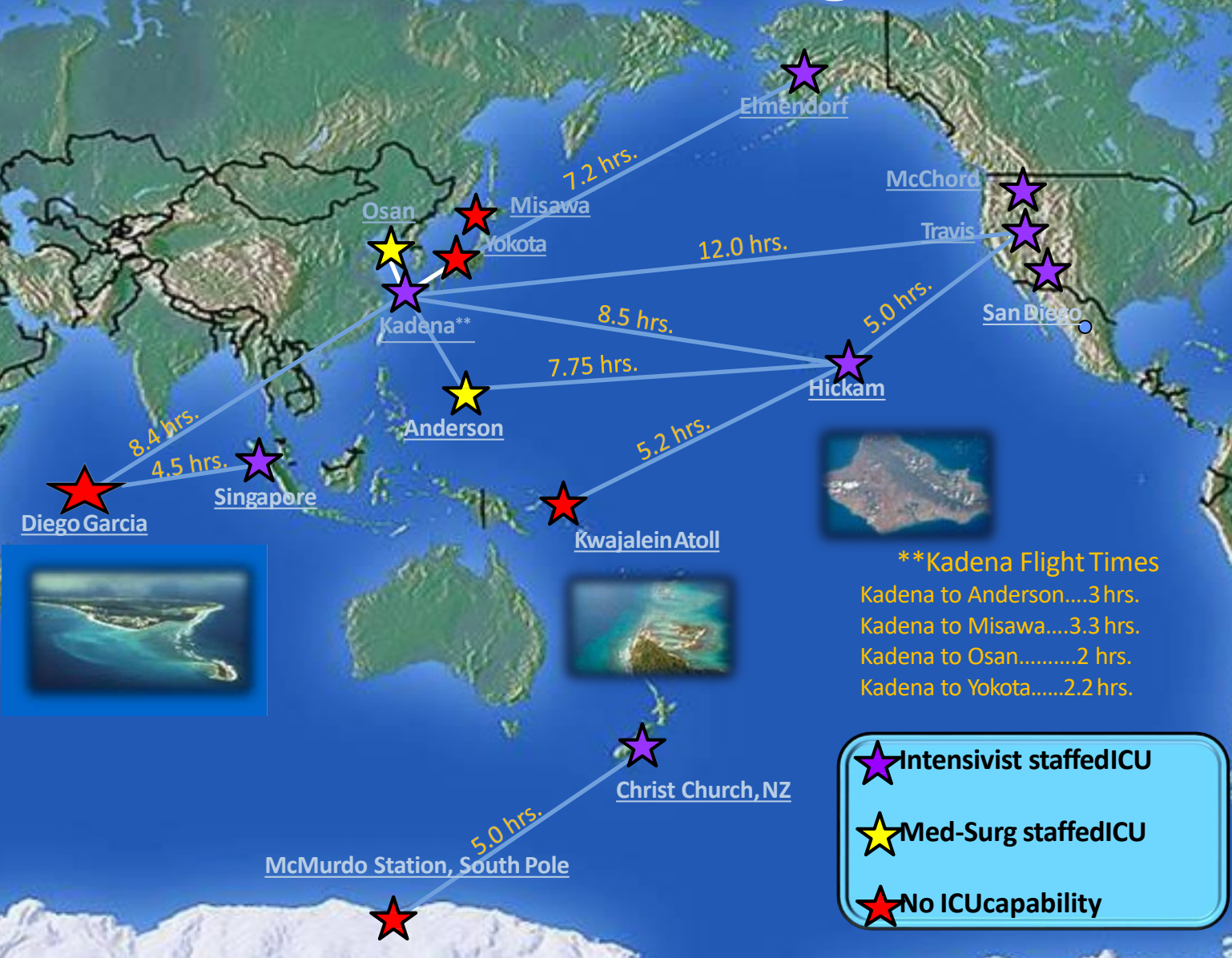
Lvl-IV:  
Definitive  
Care, Rehab

Continuous Increase in Level of Care Provided




Surgical Capabilities Pushed Forward



# Theater MTFs and Flight Times



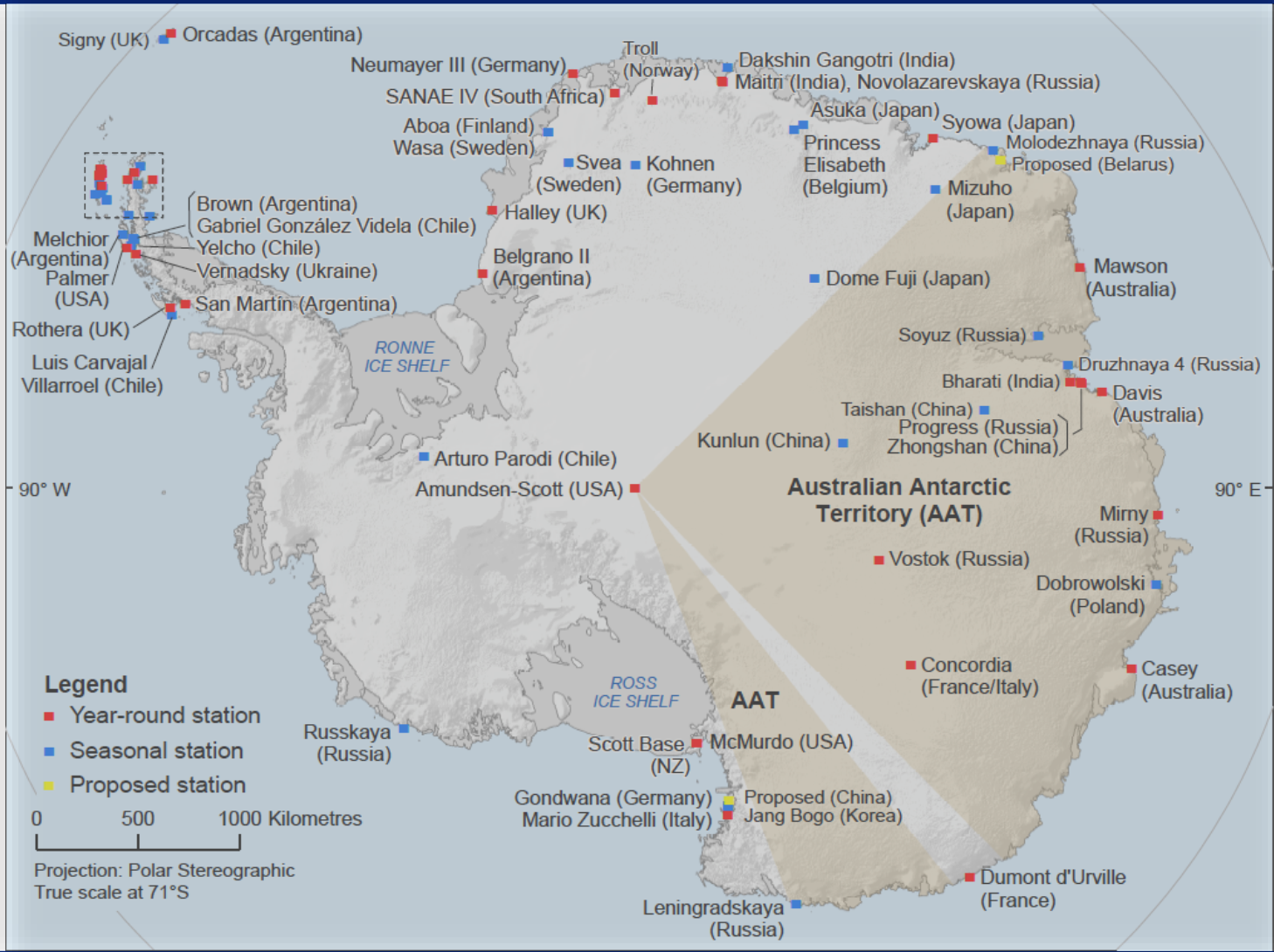
**\*\*Kadena Flight Times**  
 Kadena to Anderson....3 hrs.  
 Kadena to Misawa.....3.3 hrs.  
 Kadena to Osan.....2 hrs.  
 Kadena to Yokota.....2.2 hrs.

-  Intensivist staffed ICU
-  Med-Surg staffed ICU
-  No ICU capability



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# Antarctica Research Stations



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# Unique Medical Issues

- Remote and Harsh Environment
- Cold injuries, accidents, infections
- Psychiatric issues
- Definitive care is 3,822km away (~ Bangkok to Pyongyang)
  - C-17: 5 flight hours
  - LC-130: 8 flight hours



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# Unique Medical Issues

- Circadian Rhythm Disruption
- Lack of specialists
- Vaccinations
- Diverse population



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# Medical Resources

## ■ Contract civilians:

- Clinic Director
- Flight Nurse
- Clinic Manager RN
- Mid-level provider
- Pharmacy Technician

## ■ USAF personnel:

- Flight Surgeon
- Flight Nurse
- Aeromedical Evacuation Technician

## Flight Surgeon's Office



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# Medical Resources

## ■ Hospital Facility

- ER (2 beds)
- Inpatient (6 beds)
- Dental Room
- Lab (basic)
- Radiology (x-ray, U/S)



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# Patient Transport (LC-130)



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# Patient Movement Items (PMI)



**Zoll MD**



**Ventilator**



**Suctioning**



**Infusion Pump**



**H-Tanks**



**Glide Scope**

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# Humanitarian Assistance 2010

- Davis Station (Australia)
- 31 year-old male
- Quad driven off a cliff
- Pelvis & both ankles broken
- Weather: 2-week delay
- Joint Medical Attendant Transport Team (JMATT) to Tasmania
- Good clinical outcome



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# Critical Care Air Transport Team (CCATT) rescue 2011

- Polar winter evacuation from McMurdo Station (USA)
- Ruptured appendix, subsequent mesenteric abscess
- <72 hours from call to transport
- C-17 landed on ice runway using Night Vision Goggles (NVGs)
- C-17 flew total of 4600 miles (7403 kilometers) to make the save (radius of Earth = 3,959 miles)

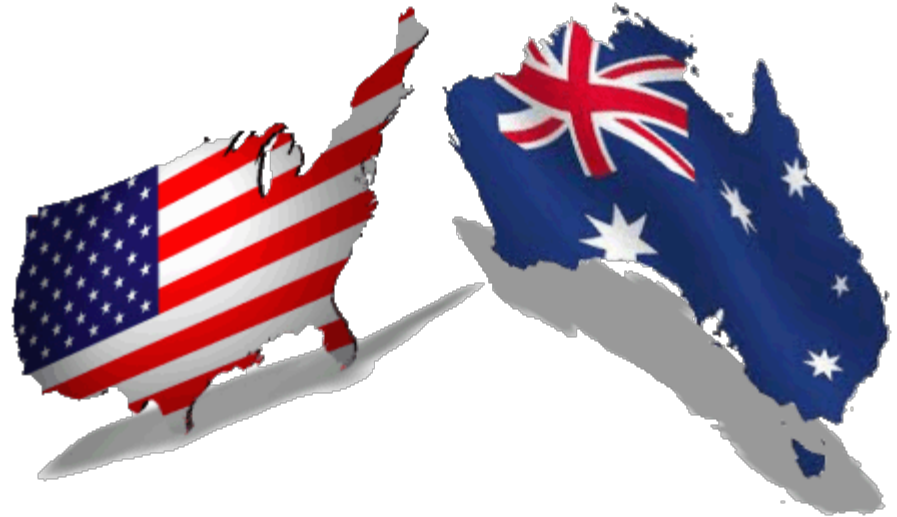


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# Partner/Civilian Rescue 2012

- MCM patient ruptures appendix week prior to WINFLY
- NSF contracted Civilian air ambulance (Australia)
- Australian Antarctic Division (AAD) Med Team
- Flown to CHC with good clinical outcome







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# Humanitarian Assistance / Disaster Response 2012

- **Jung Woo 2**
- **Burning Korean fishing vessel**
- **3 fatalities / 7 burn victims**
- **Transferred from ship to ice, then to MCM via helicopter**
- **After treatment at MCM, flown to Christchurch via LC-130**



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# Intrinsic Assets 2013

- Cargo offload operations late season
- US Navy personnel, struck in face by cargo hook
- +LOC, lacerations, facial/neck swelling
- Intubated and transported to CHC by FS and FN
- CT scans/x-rays negative
- After surgery in CHC, extubated and did well



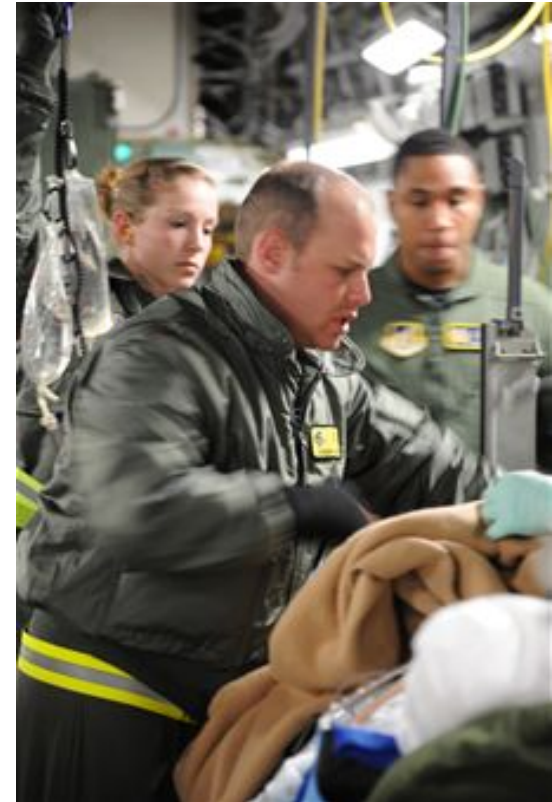
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# CCATT Rescue 2013

- **Polar winter evacuation (MCM, USA)**
- **Suspected Acute Myocardial Infarction**
- **C-17 onto ice runway using NVGs**
- **Quick turn around ... took only 35 minute ground time to load patient!**



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# Humanitarian Assistance / Disaster Response 2014

- Korean Antarctic Program requested assistance
- Research station opened for 2013-14 season
- Helicopter transporting passengers crashed into research vessel
- 4 passengers severely wounded
- 1 passenger intubated, all 4 transported to CHC
- FS, Civilian FN and AET attended patients en-route



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# Humanitarian Assistance 2015

- Italian Antarctic Program requested assistance
- Accidental tire explosion, poly-trauma (+ LOC, burns, multiple fractures including the orbit)
- Arrived at Willy Airfield via Twin Otter, trans-loaded to a diverted LC-130 after stabilization in a converted vehicle maintenance hut.
- Accompanied by USAF FN and Italian Anesthesiologist
- Arrived in CHC < 10 hours (from POI)
- Good clinical outcome



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# Partner / Civilian Rescue 2016

- **South Pole, winter rescue**
- **2 sick contractors needed hospitalization**
- **2 Twin Otters flew in from Canada, arrived at South Pole with a wind chill of -113 degrees Fahrenheit.**
- **Airlifted to Punta Arenas, Chile**
- **Good clinical outcome**



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# Humanitarian Assistance 2016

- South Pole transfer
- Former astronaut suffered illness due to high altitude at the South Pole (> 10,000 feet elevation)
- Airlifted from South Pole via LC-130 to MCM for “stabilization”
- Airlifted from MCM to CHC for definitive care accompanied by MCM physician via LC-130
- Good clinical outcome



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# Humanitarian Assistance 2017

- **Elderly Dutch tourist**
- **Suspected Stroke**
- **Airlifted from cruise ship via helicopter to MCM for “stabilization”**
- **Airlifted from MCM to CHC via C-17 with civilian FN, AF AE technician**
- **Recovered well**



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# DATA



- 5 SEASONS
- 89 patients evacuated total

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## TOP 3 Diagnosis:

1. Musculoskeletal Trauma (n=26, 29%)
2. GI requiring general surgery (m=19, 21%)
3. Acute cardiopulmonary disorder (=15, 17%)



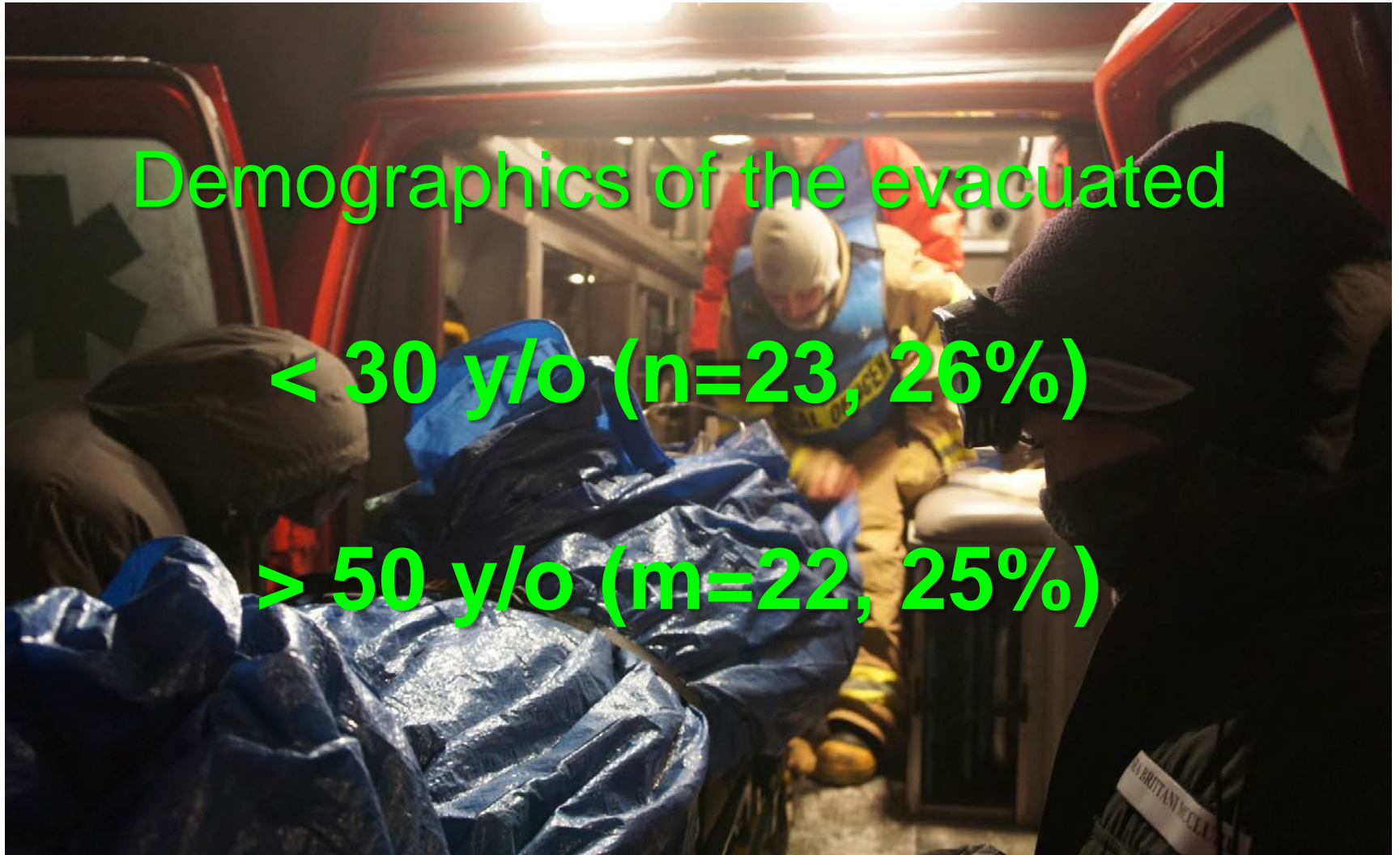


## Top Three Most Common Individual Diagnoses:

1. Fractures/Dislocations (n=15, 17%)

2. Acute Abdomen (n=14, 16%)

3. Suspected Acute Coronary Syndrome (n=11, 12%)



## Demographics of the evacuated

< 30 y/o (n=23, 26%)

> 50 y/o (m=22, 25%)





## Other statistics:

- 0% in-flight medical emergencies
- 100% of the patients reached Christchurch, New Zealand without en-route deterioration
- 12% of the patients required a physician on the transport team





# Conclusion

- **These initial epidemiological data (during peacetime missions – Operation DEEP FREEZE) captures different causes / diseases requiring patient movement compared to combat operations.**
- **More data will allow better preparation, anticipation and coordination of potential patient movements from austere locations in the future.**
- **There is a bimodal distribution of age group requiring patient movement. Top causes for evacuations also varied amongst different population and age groups.**
- **Health promotion programs and age appropriate medical screenings may help reduce preventable medical emergencies requiring patient movements**