

# *Air evacuation of patient with high infectious disease under biosafety containment*

CROCE ROSSA ITALIANA

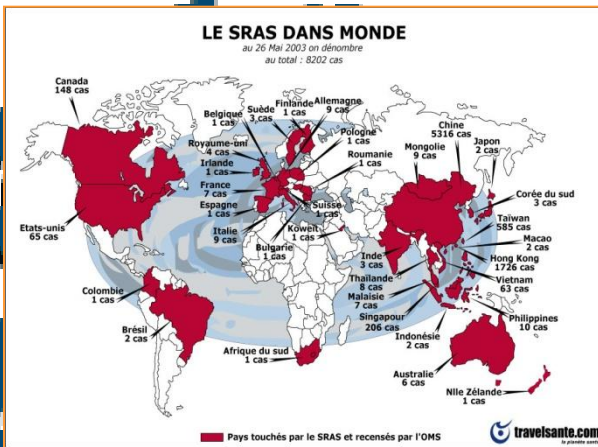


COMITATO PROVINCIALE DI ROMA



CORSO di FORMAZIONE "DISASTRI E CALAMITA NATURALI" 26 maggio 2011  
**Lt. Col Marco Lastilla** Italian Air Force - Medical Corps





**NEW FLU 2009**

**SARS 2003**

*Every year...  
 .. new infectious diseases*



**MARBURG 2005**





# Polio in Tajikistan, first importation since Europe certified polio-free

- **23 April 2010** -- Poliovirus type 1 has been detected in diagnostic samples from cases of Acute Flaccid Paralysis (AFP) from Tajikistan. This represents the first importation of poliovirus in the WHO European Region since it was certified polio-free in 2002.
- As of 21 April 2010, 120 cases of acute flaccid paralysis had been reported from Tajikistan. The majority of these have onset of paralysis within the past 2 weeks, prompting the Government to notify WHO of an outbreak. Ten of the children have died. The vast majority of the cases are children < five years of age. Preliminary data suggests >45% had four or more doses of oral polio vaccine.



- To date, poliovirus type 1 has been identified in the south-west of the country, in an area bordering four remaining polio-endemic countries: Uzbekistan, Tajikistan, Afghanistan and Pakistan. The first case of polio confirmed by virological testing in 2008, the last year for which complete data are available under the process. AFP surveillance indicators in Tajikistan reported 35 cases of acute flaccid paralysis, of which none were confirmed. Globally, more than 90,000 cases of acute flaccid paralysis were reported in 2009, 60% by wild poliovirus.

- WHO is communicating with countries in the Region about the outbreak. It is important that neighboring countries strengthen surveillance for cases of acute flaccid paralysis, in order to rapidly detect any new poliovirus importations and facilitate a rapid response. Countries should also enhance routine immunization coverage data to identify any sub-national gaps in population immunity, and carry out targeted immunization activities, thereby minimizing the consequences of any new virus introduction. Priority should be given to areas at high risk of importation and where OPV3/DPT3 coverage is <80%.
- WHO does not recommend the imposition of restrictions to the international movement of persons as a control measure at this time.

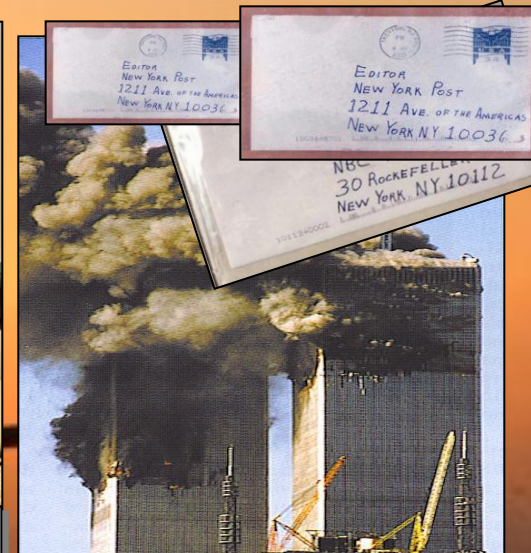
A volte ritornano



*Air travels to exotic and isolated areas for tourism or business are popular*



*Armed Forces are deployed across the world*



*Bioterrorism*



**Exposure to possible risk of contracting a Highly Infectious Disease**





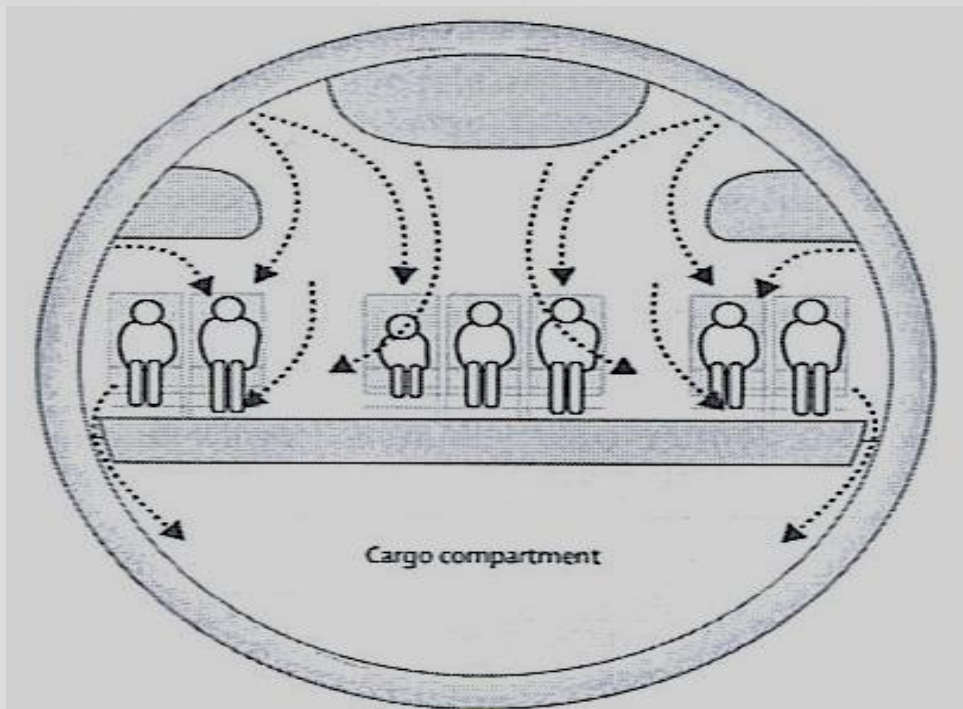
GAO Novembre 2009



## Transmission of infectious diseases during commercial air travel

Alexandra Mangili, Mark A Gendreau

Because of the increasing ease and affordability of air travel and mobility of people, airborne, food-borne, vector-borne, and zoonotic infectious diseases transmitted during commercial air travel are an important public health issue. Heightened fear of bioterrorism agents has caused health officials to re-examine the potential of these agents to be spread by air travel. The severe acute respiratory syndrome outbreak of 2002 showed how air travel can have an important role in the rapid spread of newly emerging infections and could potentially even start pandemics. In addition to the flight crew, public health officials and health care professionals have an important role in the management of infectious diseases transmitted on airlines and should be familiar with guidelines provided by local and international authorities.



	Number of reports	Comments
<b>Airborne/fomites</b>		
TB <sup>25,26,29-41</sup>	2	Positive TB skin test only. No active TB.
SARS <sup>17,46-48</sup>	4	No cases since WHO guidelines.
Common cold <sup>49</sup>	0	Difficult to investigate.
Influenza <sup>25,27,33</sup>	2	None since ventilation regulations.
Meningococcal disease <sup>50</sup>	0	21 reports of ill passengers, no secondary cases
Measles <sup>52,62</sup>	3	Imported cases and international adoptions
<b>Food-borne</b>		
Salmonellosis <sup>43,44</sup>	15	No recent outbreaks
Staphylococcus food poisoning <sup>45,46</sup>	8	No recent outbreaks
Shigellosis <sup>49</sup>	3	No recent outbreaks
Cholera <sup>43,47,48</sup>	3	During cholera epidemic
Viral enteritis <sup>49</sup>	1	Common on other types of transport
<b>Vector-borne</b>		
Malaria <sup>45,76</sup>	7	Probably underestimated
Dengue <sup>77</sup>	1	Likely to be airport, not aircraft, transmission
Yellow fever	0	No outbreaks since disinsection of aircraft
<b>Bioterrorism agents</b>		
Smallpox <sup>5,26,77</sup>	1	Before eradication

Table: Reported infections transmitted on commercial airlines





# DECISION MAKING

## GENERAL RULE:

Do not fly during a communicable phase of illness

Treat in place

Low risk of transmission  
No facilities available  
Window of non-communicability

Dedicated flights

- unknown disease without the identification of the pathogen;
- suspected of biological attack;
- VHF

movement of large numbers of  
BW casualties is NOT for AE

Aeromedical Isolation Team



# DEDICATED FLIGHT

Evacuation of close contact, high risk contact,  
low risk suspect case

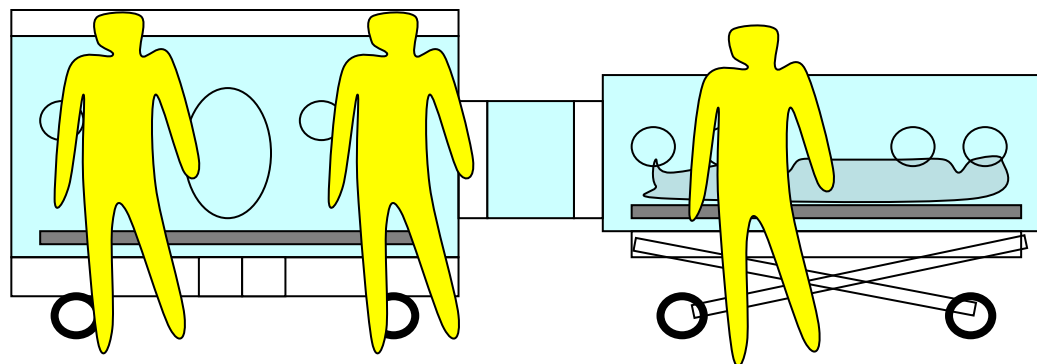
- Flight with aeromedical crew
- PPE
- Patient in isolated area of the aircraft with bathroom
- Patient with mask
- Disinfection and decontamination procedures of the aircraft



# The Aeromedical Isolation Team



A rapid response team who can deploy to any area of the world to transport and provide medical care with isolators to a limited number of patients exposed to, or infected with, highly infectious, potentially lethal pathogens.





## Air Evacuation under High-Level Biosafety Containment: The Aeromedical Isolation Team<sup>1</sup>

**George W. Christopher and Edward M. Eitzen, Jr.**

**U.S. Army Medical Research Institute of Infectious Diseases,  
Fort Detrick, Maryland, USA**

Military contingency operations in tropical environments and potential use of biological weapons by adversaries may place troops at risk for potentially lethal contagious infections (e.g., viral hemorrhagic fevers, plague, and zoonotic poxvirus infections). Diagnosis and treatment of such infections would be expedited by evacuating a limited number of patients to a facility with containment laboratories. To safely evacuate such patients by military aircraft and minimize the risk for transmission to air crews, caregivers, and civilians, the U.S. Army Medical Research Institute of Infectious Diseases maintains an aeromedical isolation team. This rapid response team, which has worldwide airlift capability designed to evacuate and manage patients under high-level containment, also offers a portable containment laboratory, limited environmental decontamination, and specialized consultative expertise.

# European concepts for the domestic transport of highly infectious patients

S. Schilling 1 , P. Follin 2 , B. Jarhall 3 , A. Tegnell 4 , M. Lastilla 5 , B. Bannister 6 , F. Maria Fusco 7 , R. Biselli 5 , H.-R. Brodt 1 and V. Puro 7 1) Department of Infectious Diseases, University Hospital Frankfurt, Frankfurt am Main, Germany, 2) Department of Communicable Disease Prevention and Control, Västra Götaland, 3) Department of Infectious Diseases, University Hospital Linköping, Linköping and 4) Department of Communicable Disease Prevention and Control, Swedish National Board of Health and Welfare, Stockholm, Sweden , 5) Italian Air Force, Health Service, Rome, Italy , 6) Department of Infectious Diseases, Royal Free Hospital, London, UK and 7) National Institute for Infectious Diseases 'L. Spallanzani', Rome, Italy

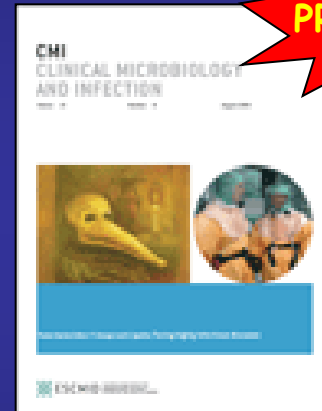
*Highly infectious diseases involve clinical syndromes ranging from single to multiorgan infections and pose a constant threat to the public. In the absence of a definite treatment for most causative agents, patients benefit from maximum supportive care as clinical conditions may deteriorate in the short term.....*

*Despite the development of consensus curricula for the clinical management of highly infectious patients, medical transport still lacks a common European approach. This paper describes, as examples, three current European concepts for the domestic relocation of highly infectious patients by ground vehicles and aircraft with respect to national legislation and geography.*

**Abstract**

**ABSTRACT**

**PRESENT**



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and Infection**

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Journal Compilation 2009  
European Society of Clinical  
Microbiology and Infectious  
Diseases



# *The Flight Environment: major and minor stressors of flight*

- **Major**
  - **Hypoxya**
  - **Barometric pressure changes**
    - (expansion of trapped gas, decompression and sickness)
- **Minor**
  - **Dryness**
  - **Noise**
  - **Vibrations and turbulence**
  - **Temperature changes**
  - **Fatigue of flight**



# WHAT IS AN AIR TRANSIT ISOLATOR ?

An Air Transit Isolator (ATI) is a self-contained isolation facility designed to transport safely a patient during air evacuation, protecting healthcare personnel, air crew and the aircraft from exposure to the infectious agents

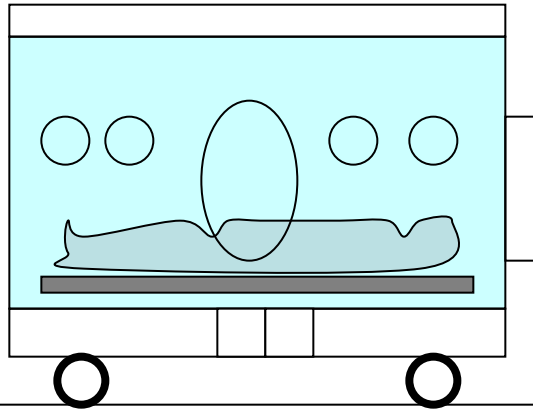




# ATI/STI systems

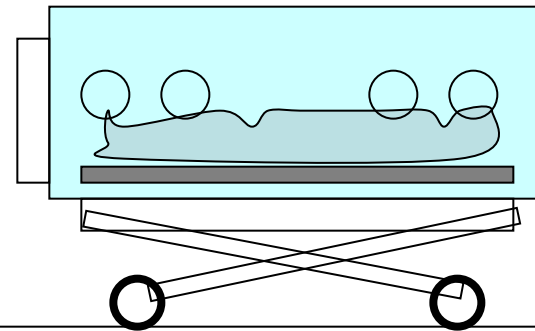
- Transport isolators have been designed specifically to provide a microbiologically secure environment for a patient requiring transportation

For air transportation and in-flight care



**ATI: Aircraft Transit Isolator**

For transportation by ambulance or other means



**STI: Stretcher Transit Isolator**



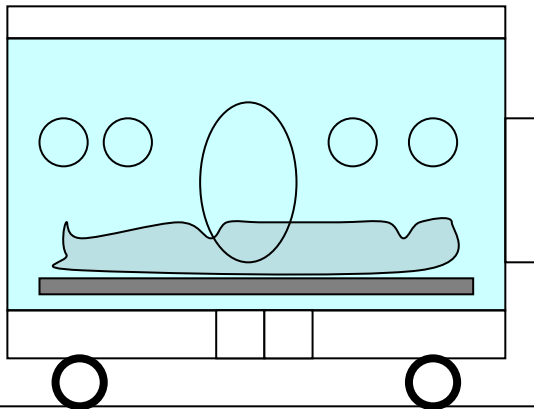
# Isolation Principles

4. Personal Protection Equipment

3. HEPA (High Efficiency Particulate Air) filters

2. Negative pressure

1. PVC envelope



**Multi-layer protection**



# ATI: Nursing facilities

Two sleeves for intravenous drip bags

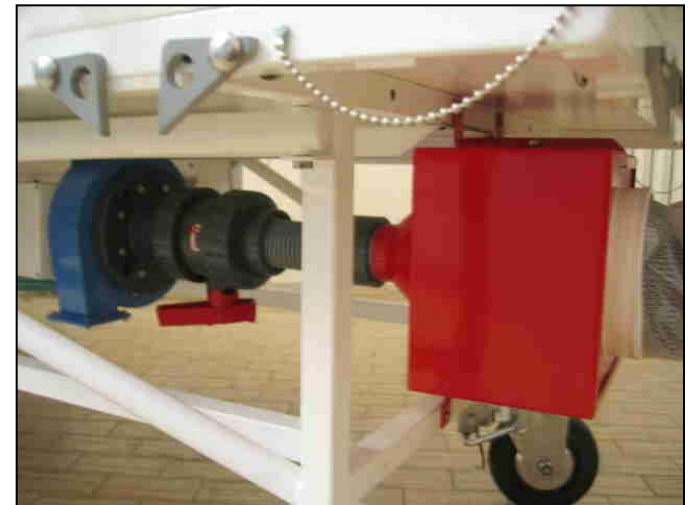
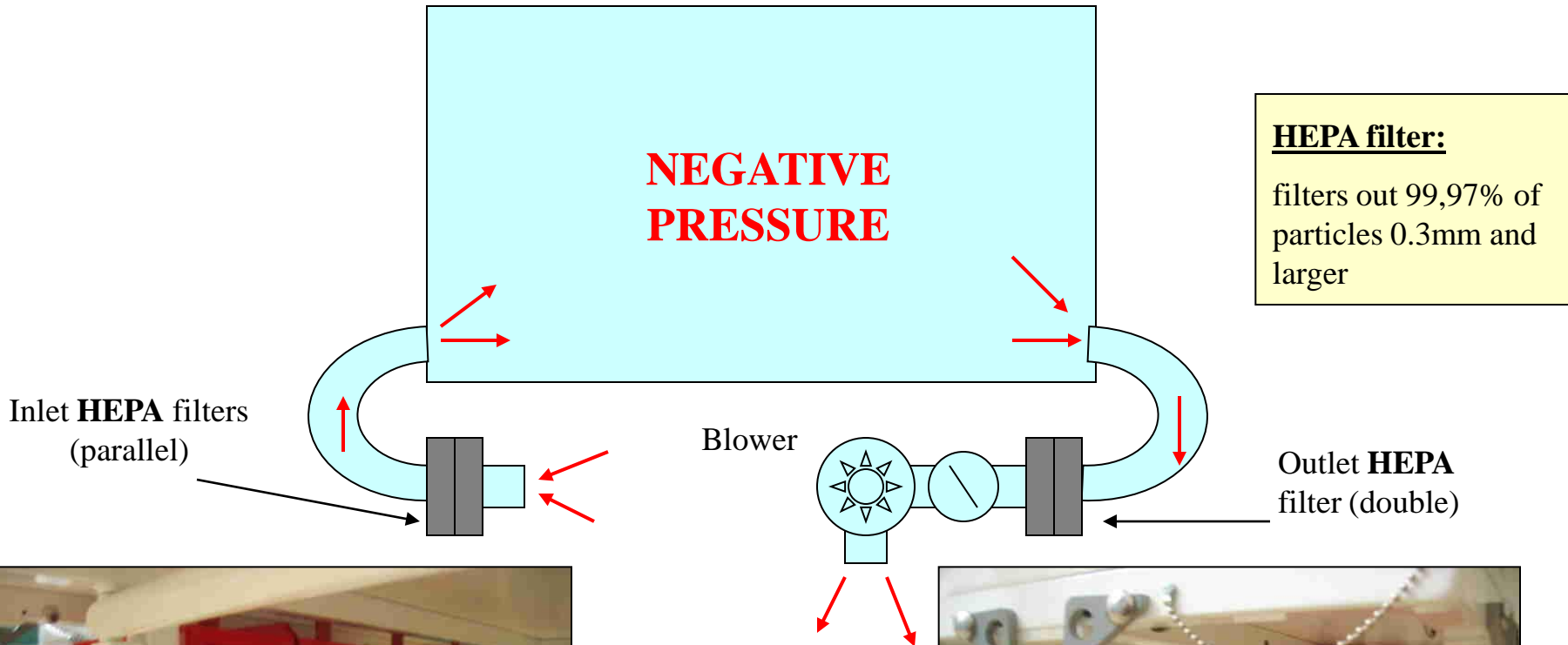
Four pairs of gloved sleeves



Two half suits for use if the freedom of movement within the sleeves is insufficient



# ATI - Air Supply Unit



# ATI - Electrical Supply System

Control panel beneath  
the isolator baseboard

## DOUBLE SYSTEM

- **Four 12 volt BATTERIES**  
with operating time of 6 hours each (24 hours independent time)
- **Compatible electrical connections with C130J for emergency**





# • PPE: Different Biosafety Levels

**1.** Gown, facial mask, goggles, gloves

**2.** Suit (tyvek), full face mask with filters, gloves

**3.** Full body suit (tychem C) with positive pressure, gloves



# Flight Certification

- *Rapid decompression Test*
- *Vibration Test*
- *Electromagnetic Test*
- *Environmental Test*

According to *Air Safety Certification* the isolator must undergo stringent safety testing in extreme conditions

**Air Transit Isolator (ATI)**  
**Hercules C130-J**



Located at Pratica di Mare Air Force Base

Founded in 2005

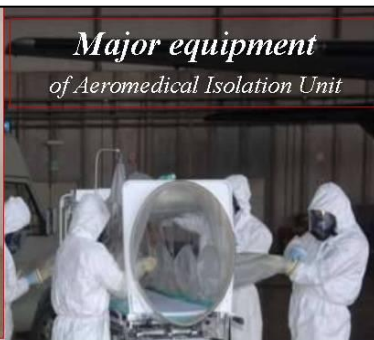


AIT

**Two teams, each comprised of:**

- 1 Team leader, (Flight surgeon, Medical Corps)
- 2 Physicians (Medical Corps)  
(2 specialist: 1 in infectious diseases and 1 in anesthesia)
- 6 Health care specialists (Nurse Corps)  
+ 1 Laboratory Technician (Mission dependent)





### Major equipment

of Aeromedical Isolation Unit

#### Trolley equipped for the service and care of the patient one aboard

- Cardiac and respiratory monitoring system;
- Portable O<sup>2</sup> support;
- Defibrillator with monitor;
- Infusion Pumps; Suction apparatus;
- Paramedic drugs/supplies



### Portable decontamination system

- Curtain of decontamination for the insulators;
- 2 showers of decontamination for the staff;
- Material and liquids recovery contaminated containers



### Major equipment

of Aeromedical Isolation Unit



- **PPE** Various levels of "biosafety" according to the risk level



### Major equipment

of Aeromedical Isolation Unit





# *Aeromedical Isolation Unit*

*...training...training...training...training...*

Every 15 days the team trains in Pratica di Mare

- *Patient placed in cell*
- *Management of the patient on the stretcher both on the ground in flight*
- *Decontamination*





**Spallanzani Hospital Team and Air Force Team working together**



**High Containment Ambulance  
of Spallanzani Team**





*Every year 3 unit components attend  
a three-week course at USAMRIID  
at Fort Detrick*



**2004**



**2005**

**2006**



**WELCOME TO  
FORT DETRICK**



**Unità di Isolamento Aeromedico, ITALIA – Aeromedical Isolation Team, USA**  
*Joint Training*  
*Pratica di Mare 20 Settembre 2006*



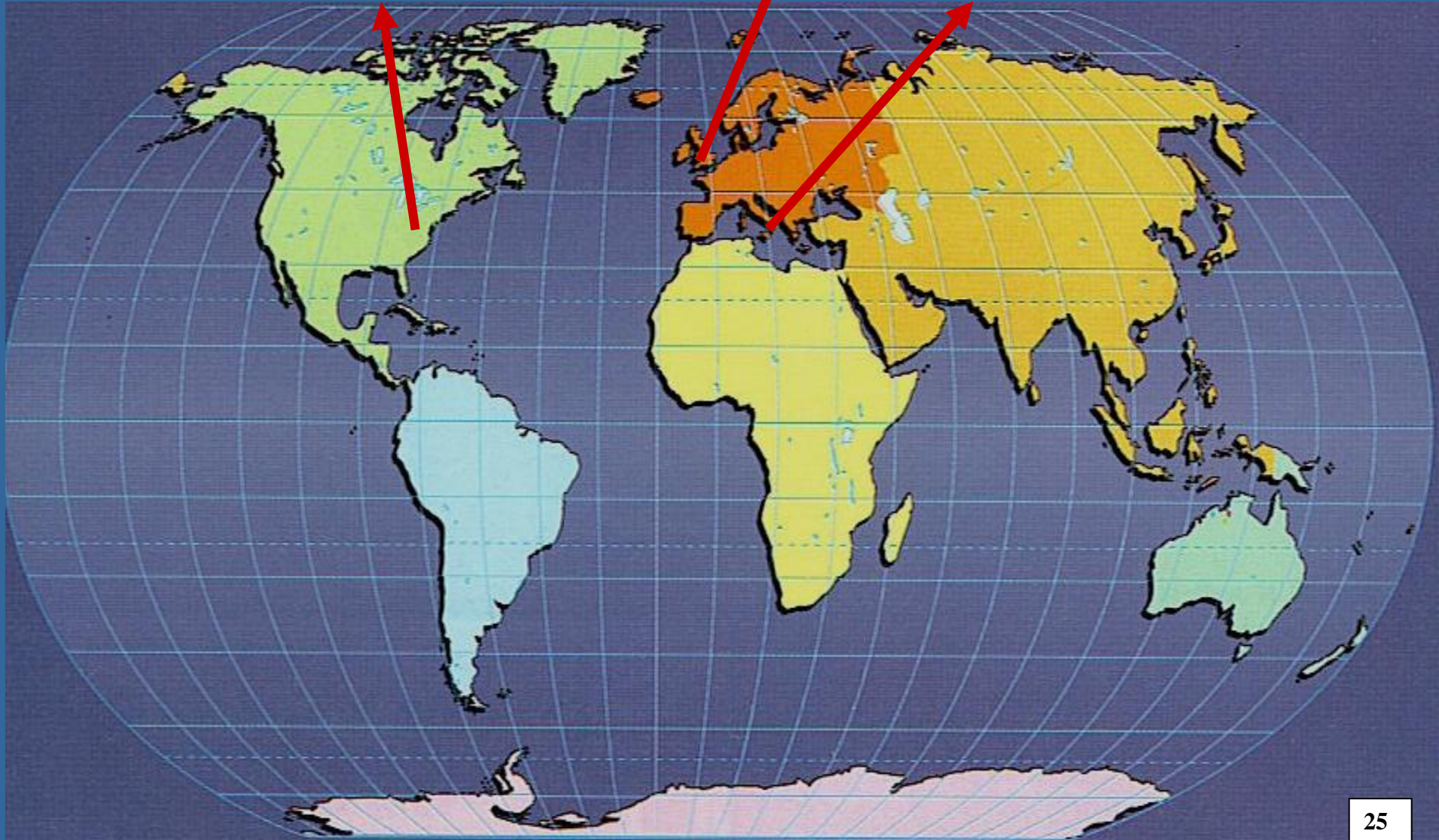


# Teams of Aeromedical Isolation Unit in the world

US

UK

ITALIA





## *"Case Reports"*

January 2006: patient with MDR TB - from Alghero (Sardinia) to Milan;

May 2007: patient with suspected Congo-Crimea hemorrhagic fever (after returning from Nepal) - from Turin to Rome;

July 2007: patient with MDR TB - from Alghero (Sardinia) to Bergamo

October 2009: patient with suspected hemorrhagic fever (after returning from Senegal) - from Turin to Rome;



## *Aeromedical Isolation Unit Deployments*

First operating mission: January 24th, 2006





Milano

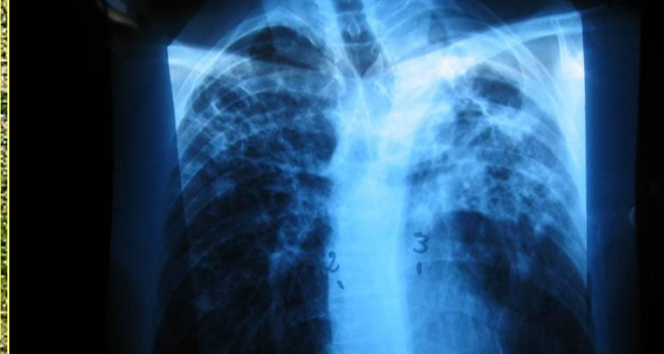
Alghero

Pratica di Mare

January 24<sup>th</sup> 2006



Lung Tuberculosis MDR



Chest X-Ray after first cycle of chemotherapy

January 2006: patient with MDR TB - from Alghero (Sardinia) to Milan;





May 2007: patient with suspected Congo-Crimea hemorrhagic fever (after returning from Nepal) - from Turin to Rome;

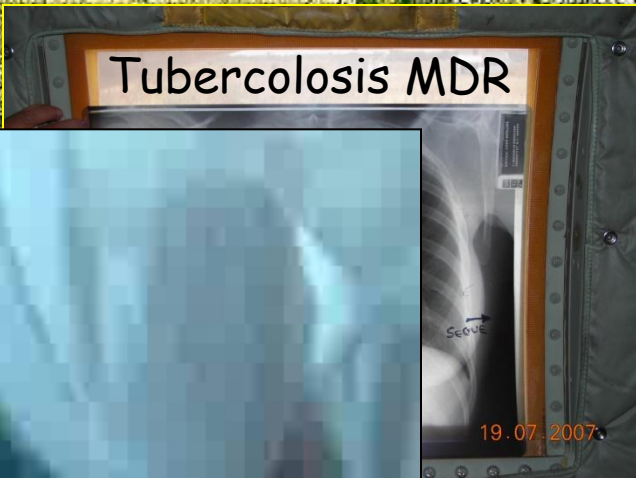




## *Aeromedical Isolation Unit* Deployments

2





**July 2007:** patient with MDR TB - from Alghero (Sardinia) to Bergamo.



Torino



Spallanzani Hospital

Pratica di  
Mare



10<sup>th</sup> October 2009

4

October 2009: patient with suspected hemorrhagic fever (after returning from Senegal) - from Turin to Rome;

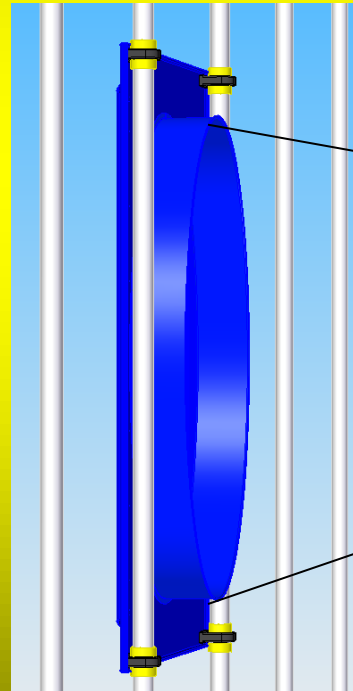
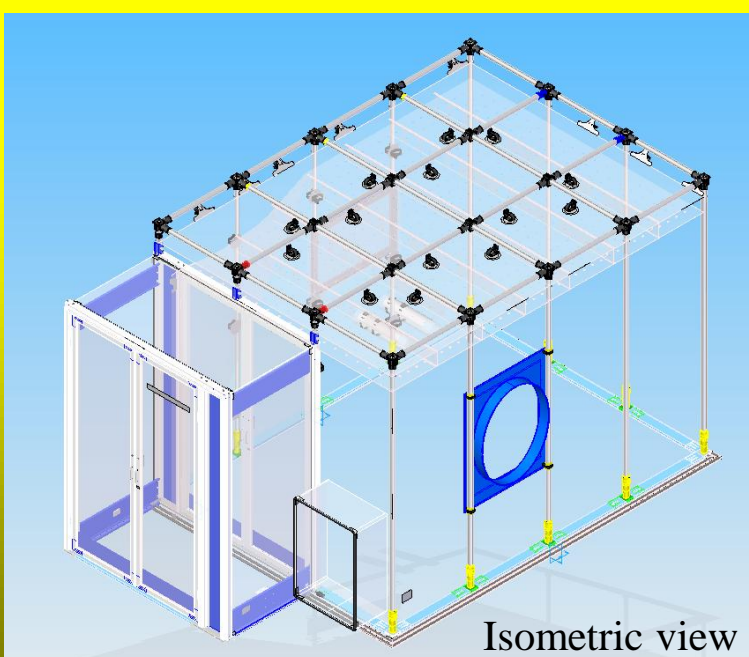


# in conclusion....

- Flying with an infectious patient means having the clearance of the countries we are flying over, because in case of emergency we could be forced to land; for this reason the flight must be carefully planned
- *The transfer could be long*.... How long is it possible, to manage the patient and the isolators in an acceptable way on the C130J aircraft? If the distance is very long, there may be an intermediate stop due to a technical or meteorological problem and so the aspects of distance and length of flight are crucial points.

*In light of this, we added to its equipment also a portable negative pressure room, called Isoark, able to allow us to manage the patient for a long period.*

## NEGATIVE PRESSURE ROOM (ISOARK )



FIELD ISOLATION

NEW CAPABILITIES 2008



*The IsoArk 36-2 Isolation System is an ideal solution to rapidly isolate patient or an item temporarily, which is thought to be contaminated by infectious particles or disease to an isolated area for safe treatment. This system provides maximum protection and operational safety for both contaminated patient or item and the operational team*



**NEXT FUTURE**

32 bis







- **Movement of highly infectious patients is *possible***

**BUT**

- Planning flight
- Limited resources in air
- Length of transfer

- **Maintaining well trained and equipped personnel to deal with such a situation is key factor.**  
Without a trained staff care would be inadequate.

**BE PREPARED**



**Thank you very much  
for your attention**

*For a human being there is nothing that can  
provoke as much terror as an unexpected event.  
This is exactly what occurs when unknown  
disease breaks out. **Edward Kass***