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# **The Role of Systems Engineering in Combating Terrorism**

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Anti-Terrorism International WG**

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# Terror Attack

## Hijacked Jets Fly Into Trade Center, Pentagon



Two hijacked commercial jets slammed into the World Trade Center towers in New York City, and a third hijacked jet crashed into the Pentagon in Washington, D.C., on Sept. 11, 2001, in a coordinated terrorist attack that killed nearly 3,000 people.

The attacks, which were the deadliest in U.S. history, shocked the nation and the world. The hijackers, who were members of the Islamic extremist group al-Qaeda, claimed responsibility for the attacks.

The World Trade Center towers were destroyed by the impact of the hijacked planes and the resulting fires. The Pentagon was damaged by the impact of the hijacked plane, but it remained standing.

The attacks led to the U.S. invasion of Afghanistan in 2001 and the War on Terror.

**UPDATE**  
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### Timeline of Terror

8:46 a.m.	A hijacked Boeing 767 jet from United Flight 175 strikes the North Tower of the World Trade Center in New York City.
9:03 a.m.	A hijacked Boeing 767 jet from American Flight 11 strikes the South Tower of the World Trade Center in New York City.
9:37 a.m.	A hijacked Boeing 757 jet from American Flight 77 strikes the Pentagon in Washington, D.C.
9:58 a.m.	A hijacked Boeing 767 jet from United Flight 93 crashes into a field in Pennsylvania.
10:28 a.m.	The World Trade Center towers are destroyed by the impact of the hijacked planes and the resulting fires.
10:38 a.m.	The Pentagon is damaged by the impact of the hijacked plane, but it remains standing.
11:00 a.m.	The U.S. government declares a state of emergency.
11:30 a.m.	The U.S. military launches Operation Enduring Freedom in Afghanistan.
12:00 p.m.	The U.S. government declares a national day of mourning.

### A Day of Carnage and Chaos

The attacks on Sept. 11, 2001, were a day of carnage and chaos. The hijacked planes struck the World Trade Center towers and the Pentagon, killing nearly 3,000 people. The attacks shocked the nation and the world, and led to the U.S. invasion of Afghanistan and the War on Terror.







# ***The Role of SE in Combating Terrorism: Panel Thesis and Relationship to Systems Engineering***

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- q **Panel Thesis:** The multidisciplinary approach of systems engineering is useful in evaluating future terrorist threats, identifying existing system vulnerabilities, and reducing or eradicating international terrorism
  
- q **Definition and origins of Terrorism**
  - **Terrorism** is the systematic use of force and violence to create fear as a means of coercion.
  - It emerged as a concept in 1793-94 during the Reign of Terror in France
  - It has been used by dissident groups to violently intimidate a population or government into granting their demands.
  - The calculated murder of political personalities and military personnel to achieve political objectives has given way to the almost random killing of innocent people and civilian populations.

## ***Introduction to the Panelists***

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- q **William Mackey – Sr. Member Exec. Staff, CSC**  
**“The History of Terrorism and INCOSE’s Response to the Events of September 11”**
- q **Art Pyster – FAA Deputy CIO**  
**“The FAA Response to the Highjacking and Cyberterrorism Threats”**
- q **Steve Mayian – Attorney, Former Marine Pilot and Commercial Airline Captain**  
**“A Commercial Airline Pilot’s View of the Terrorist Threat”**
- q **Shabaz Raza – GIS Engineer for the State of Maryland,**  
**“A Practicing Muslim’s View of the Terrorist Threat”**

## ***Introduction to the Panelists (cont'd)***

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- q **Harry Crisp – Director of Naval Collaborative Engineering Environment, Dept. of the Navy  
“Military Roles in Response to the Terrorism Threat”**
- q **David Cropley – Professor, University of South Australia, Australia INCOSE Chapter  
“The International View of the World Response to the Terrorist Threat”**
- q **James Long – President, Vitech Corp.  
“Anti-Terrorism Simulations and Applications to Intelligence Analysis”**
- q **Patrick Sweeney – SE Initiatives TC Chair  
“ Systems Engineering Approaches to Anti-Terrorism”**

## *In Memoriam*

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- Ω **To the 3,018 victims lost in the airplanes, the World Trade Center and the Pentagon on September 11, 2001, including**
  - 2,794 in the World Trade Center attacks**
  - Including 494 killed or missing victims of 91 different nations**
    - Britain had 67 lost**
  - Including 343 heroic firefighters and 72 heroic policemen**
  - 184 killed or missing at the Pentagon**
  - 40 killed on the Pennsylvania airplane crash**

## *Issues Posed to the Panelists*

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- q **From your viewpoint, what could have been done to avoid the events of September 11?**
- q **What needs to be done to existing systems to mitigate similar terrorist threats?**
- q **How can Systems Engineering be useful in preventing future terrorist events?**

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***“The History of Terrorism and INCOSE’s Response  
to the Events of September 11”***

**Dr. William F. Mackey  
Computer Sciences Corp. and  
University of Maryland University College**

**INCOSE Technical Board Chair  
Anti-Terrorism International Working Group  
Chair**

# ***Major World Terrorism Incidents Since 1970***

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- 1972 – Munich, Germany Olympic Massacre
- 1988 – Lockerbie, Scotland
- 1988 – Pan Am Flight 103
- 1995 – Tokyo, Japan Sarin Attack
- 1996 – Khobar Towers
- 2001 – World Trade Center Attack
- 2002 – Bali, Indonesia
- 2003 – Riyadh, Saudi Arabia
- Over 360 major incidents worldwide since 1967**

# **Major Terrorism Attacks on the United States Since 1985**

<b>Date</b>	<b>Attack</b>	<b>Killed</b>	<b>Injured</b>
Aug. 7, '88	US Embassy Bombings	252	5,000+
Feb. 27, '93	WT Center Bombing	6	1,000+
Apr. 19, '95	Oklahoma City Bombing	168	300+
July 27, '96	Atlanta Olympic Park	1	0
Jan. 16, '97	Atlanta Abortion Clinic	0	0
Oct. 12, '00	USS Cole Bombing	17	39
Sep. 11, '01	WTC Aircraft Attacks	2,794	6,000+
Sep. 11, '01	Pentagon and Penna. Aircraft Attacks	224	100+
Oct. 2-24, '02	Washington area sniper	10	3

# ***Who Are the Terrorists Responsible?***

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- Q There is no international terrorism without the support of sovereign states (Terrorist States)**
  - Iran**
  - Iraq**
  - Syria**
  - Taliban Afghanistan**
  - Palestinian Authority**
  - Sudan**
  
- Q Terrorist states and terror organizations form a Terror Network whose constituent parts support one another operationally as well as politically**
  - Over 43 major terrorist organizations worldwide, examples include:**
  - Hamas (Islamic Resistance Movement)**
  - Palestine Liberation Front (PLF)**
  - Al-jihad (Egyptian Islamic Jihad)**
  - Al-Qaida (Usama Bin-Laden led)**
  - Japanese Red Army (JRA)**

# ***What is Their Motive?***

***(Excerpts from the Fighting Terrorism by Benjamin Netanyahu)***

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- q **Militant Islamists resent the West for pushing back the march of Islam into the heart of Europe during the Crusades many centuries ago**
- q **More recently, the supposedly inferior West penetrated the Islamic realms in North Africa, the Middle East, and the Persian Gulf**
- q **They hate the establishment of Israel in 1948, because it is an island of Western democratic values in a Moslem-Arab sea of despotism**
- q **Bin Laden accuses America of continuing aggression against the Arabian peninsula by “plundering its riches, dictating to its rulers, and humiliating its people”**
- q **Ultimate Goal: Destroy America and win eternity**

# ***What Must Be Done to Defeat Them?***

***(Recommendations from the Fighting Terrorism by Benjamin Netanyahu)***

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- 1. Impose sanctions on suppliers of nuclear technology to terrorist states**
- 2. Impose diplomatic, economic, and military sanctions on the terrorist states themselves**
- 3. Neutralize terrorist enclaves**
- 4. Freeze financial assets in the West of terrorist regimes and organizations**
- 5. Share intelligence**
- 6. Actively pursue terrorists**
- 7. Do not release jailed terrorists**
- 8. Train special forces to fight terrorism**

# ***What Must Be Done to Defeat Them? (cont'd)***

***(Recommendations from the Fighting Terrorism by Benjamin Netanyahu)***

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## **9. Educate the public**

## **10. Revise legislation to enable greater surveillance and action against organizations inciting violence, subject to periodic renewal**

**Such legislative revision might include:**

- **Outlaw fund-raising and channeling of funds to terrorist groups**
- **Permit investigation of groups preaching terror and planning the violent overthrow of the government**
- **Loosen warrant requirements in terrorist cases**
- **Restrict ownership of weapons**
- **Tighten immigration laws**
- **Require periodic legislative review to safeguard civil liberties**

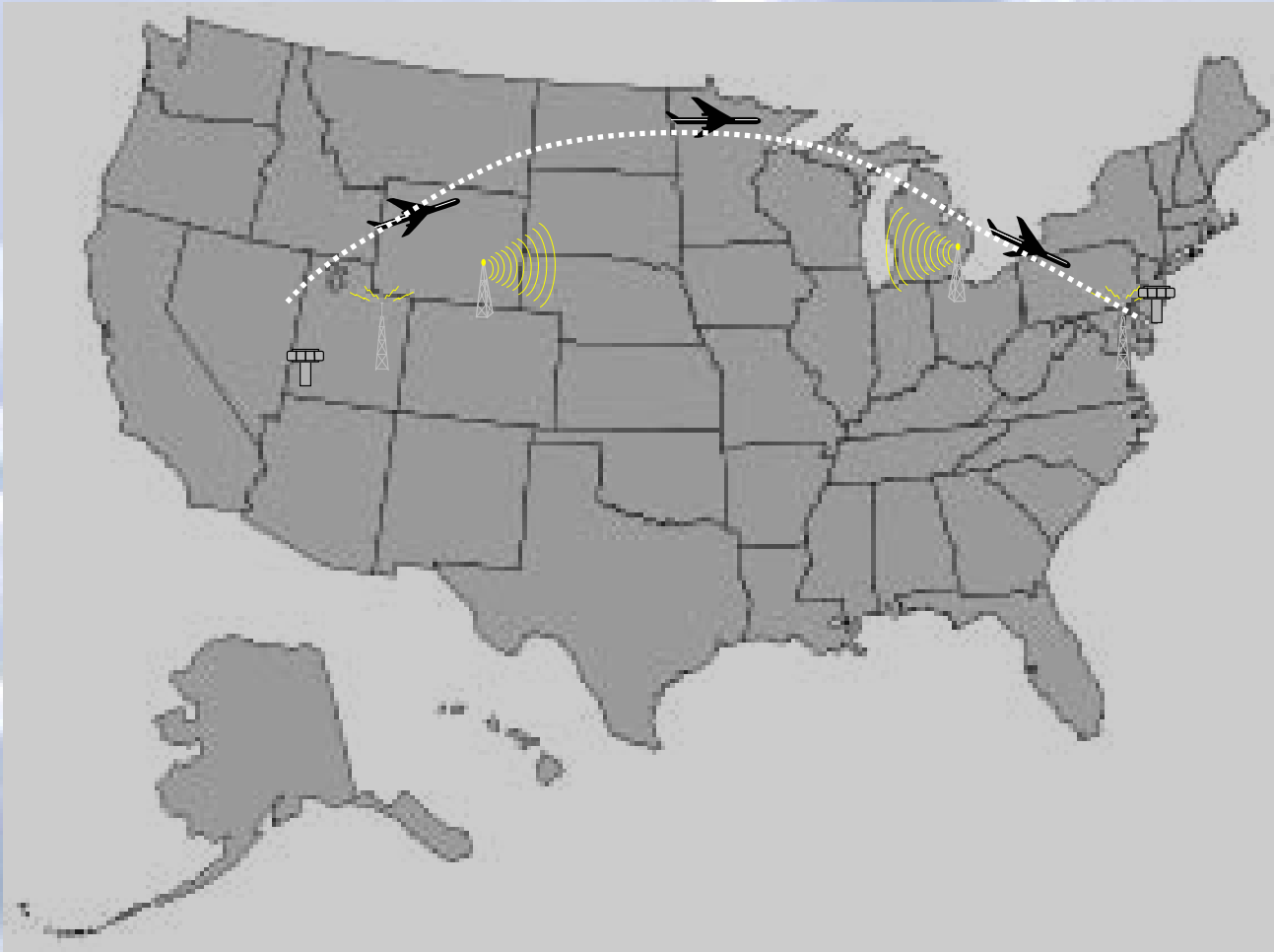
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***The FAA Response to the Hijacking and  
Cyberterrorism Threats***

**Dr. Art Pyster – FAA  
Deputy Chief Information Officer**

# *The FAA's Job*

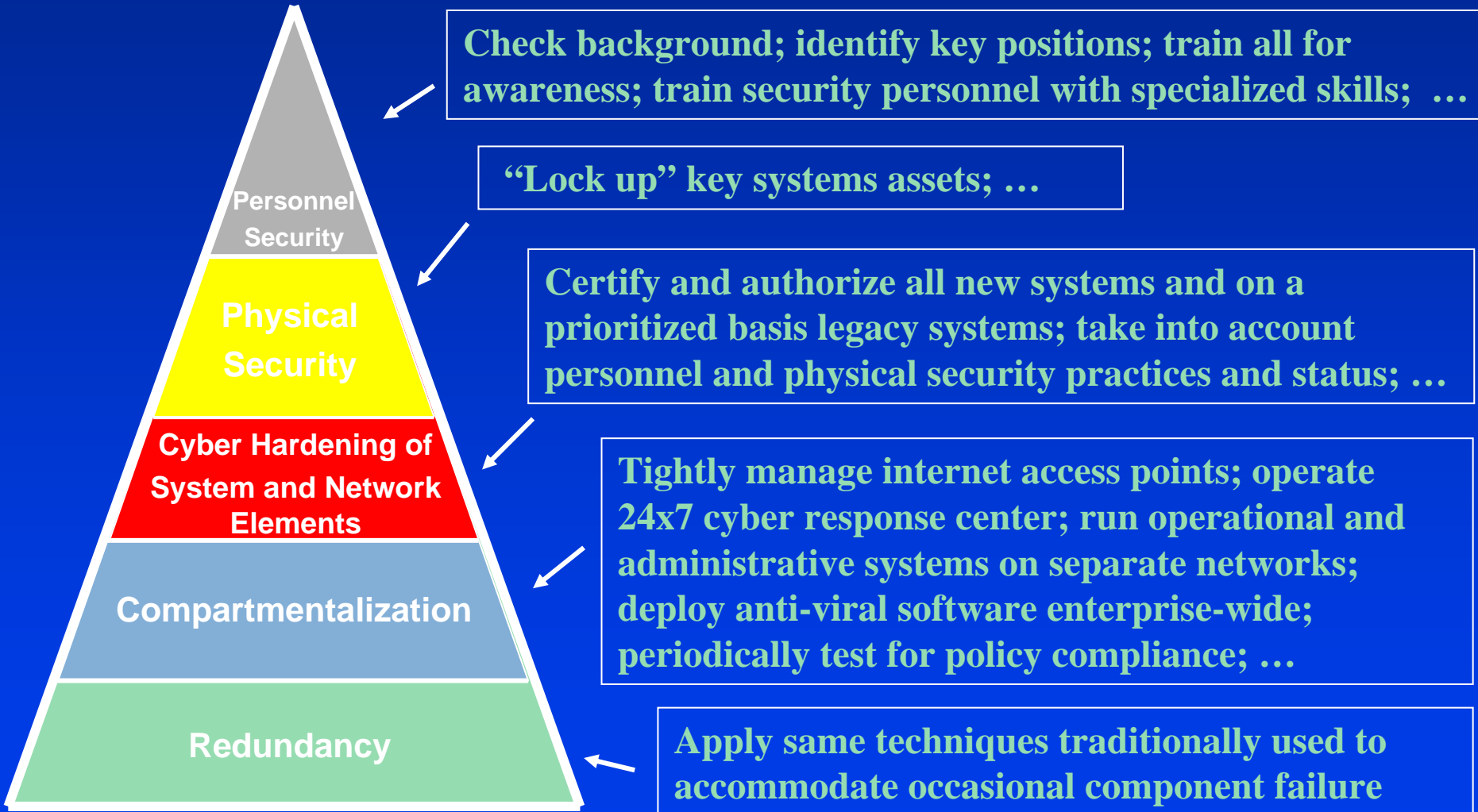
Each day, manage 30,000 commercial flights to safely move 2,000,000 passengers



- ~ 500 FAA Managed Air Traffic Control Towers
- ~ 180 Terminal Radar Control Centers
- 20 Enroute Centers
- ~ 60 Flight Service Stations
- ~ 40,000 Radars, NAVAIDs, Radios, etc.



## FAA's 5 Layers of System Protection – Awareness and Execution





## Conclusion

- **Because of the size and complexity of the Air Traffic Control System, only a systems approach can provide adequate defense**
- **The fundamental strategy guiding cyber defense is:**
  - **Harden individual system and network elements**
  - **Isolate elements to avoid “viral” spread**
  - **Back up elements to avoid service disruption**
- **Our systems approach implements this strategy**

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***A Commercial Airline Pilot's View of the Terrorist  
Threat***

**Captain Stephen M. Mayian, Esq.  
Attorney at Law,  
Former Marine Pilot and  
Commercial Airline Captain (Ret.)**



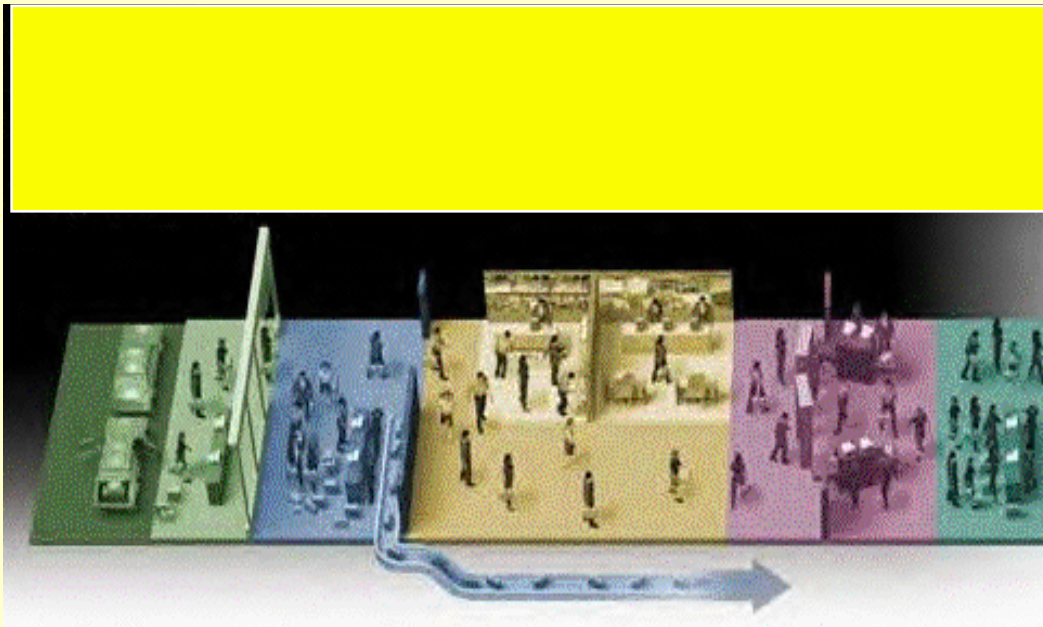


## AIRPORT PERSONNEL

- q POLICE
- q FIRE
- q PARAMEDICS
- q FBI
- q FAA
- q AIRPORT ADMIN
- q FACILITIES MAINT
- q CONTRACTORS
- q SUPPLIERS
- q VENDORS

## AIRCRAFT PERSONNEL

- q CREW
- q MAINTENANCE
- q FUELERS
- q BAGGAGE "SMASHERS"
- q GATE AGENTS
- q CABIN CLEANERS
- q FOOD CATERING
- q LAVATORY SERVICE
- q INS (INT'L)
- q CUSTOMS (INT'L)
- q PASSENGERS



# Conclusion

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- q Pursue a policy of “Defense in Depth”
- q Control the admission of aliens to the U.S. via an Entry-Exit System
- q Form the Department of Homeland Security with improved intelligence gathering capabilities
- q Provide pilots, as the last line of defense, with access to the means to apply deadly force
- q Universally upgrade airport security
- q **Summary: Several pilots and crew lost their lives along with the passengers on September 11. As the last line of defense, this pilot believes the system tradeoff favors a pilot crew capable of defending the safety of the passengers, crew and airplane.**

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# ***A Practicing Muslim's View of the Terrorist Threat***

**Shahbaz Raza  
Geographic Information Systems Engineer  
for the State of Maryland**

**Graduate Student, University of Maryland  
University College**

# Terrorism and Religion

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- q No society is free of violence of one type or another. The most vicious type is that which describes itself as **religious**.
- q The attack on 9/11 raised questions about **Islam** especially on Islam's view of terrorism:
  - q Who are these Terrorists and why do they call themselves Freedom Fighter/Martyrs?
  - q Is 'Jihad' really a 'Holy War' (declaration of religious war) against other religions?
  - q Are terrorists only **Muslims** or Muslims the only terrorists?
  - q Is terrorism really a *religious* issue or is it a *political* issue?

# “Muslims” – Who Are They?

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## g Five "pillars" of Islam.

1. **Testimony of faith** -- in the oneness of God and the prophethood of Muhammad.
2. **Daily prayer** -- Muslims are required to perform prayers five times a day at specified times and according to a particular ritual.
3. **Zakat** -- Muslims are obliged to give a portion from their income beyond their own needs to the poor.
4. **Fasting** -- During the month of Ramadan, the ninth month of their calendar, all Muslims are to fast from sunrise to sunset, taking neither food nor drink during that time.
5. **Pilgrimage** -- All Muslims who are physically and financially able to do so should make the pilgrimage to Mecca once during their lives, preferably during the six weeks following Ramadan.

g Another religious duty often mentioned along with the five pillars is that of **Jihad**. This term has the general meaning of struggling for moral perfection.

# *“Muslim Terrorists” - Who Are They?*

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- Over 1.2 billion people throughout the world are adherents of Islam.
- While Islam is often associated almost exclusively with the Middle East, Arabs comprise only about 15-18% of all Muslims.
- “Islamic Fundamentalist” is a term misused by media to refer to terrorists who happen to be Muslim.
- “Fundamentalist Islam” is simply the conservative wing of Islam (just as Fundamentalist Christianity is the conservative wing of Christianity).
- Studying the religious texts in their proper context is very important

# ***What Turns A Normal Human Being Into A Terrorist?***

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- q **Economic problems – basic human needs are not covered e.g food and shelter etc.**
- q **Desperation and feeling of hopelessness being unable to change their environment**
- q **Lack of education or no education among many religious educators**
- q **Only bad view of west is presented by the local media, religious educators and political leaders**
- q **Narrow interpretation and communication of religion by leaders**
- q **Politics - autocratic government e.g. no freedom of speech**
- q **Their mistaken view that they are the only who can lead to salvation and everybody else is wrong**

# ***What Could Be Done To Avoid Terrorism ?***

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- q **First of all it is important to understand the objectives behind the terrorism . There is a need to recognize that disciplined terrorists who execute well-planned acts of destruction are not deranged...they have OBJECTIVES.**
  
- q **Social Interactions (from local govt. To UN):**
  - q **Create social interaction between nations**
  - q **People-to-people exchanges and individual interactions between the people**
  
- q **Education policies**
  - q **Distinction between two Islamic schools of thoughts: one that justifies terrorism and other one that abhors it**
  - q **Train the religious trainers (“Mudrasahas” – religious schools)**
  - q **Portray the west in a more realistic and positive way to youth**
  
- q **Encourage responsible reporting in the mass media and accurate portrayal of religion in the movie industry**
  
- q **Keep International politics separate from religious issues**

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***“The International View of the World Response to  
the Terrorist Threat”***

**Dr. David Cropley**

**Professor, University of South Australia**

**Australia INCOSE Chapter  
INCOSE 2001 Technical Program Chair**

# *The International View of Terrorism*

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- q A soft systems approach to complex socio-technical problem solving may be the methodology that is required to address the most pressing socio-technical problem the world currently faces: **terrorism**
- q The international community has considerable experience with terrorism
- q Draw on the large body of prior knowledge as a first step in formulating a solution to this problem
- q Apply the essence of systems engineering, the solution of complex problems, in its broadest socio-technical sense, and demonstrate the power of systems engineering to define solutions that benefit mankind.