

44.348: ADVANCED SEMINAR ON WEAPONS OF MASS DESTRUCTION AND TERRORISM



Week 1: Introduction

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INTRODUCTIONS



- Who are you, and why are you here?
- Course Syllabus Review
 - Reading Assignments
 - Writing Assignments
 - Quizzes & Exams

POINT OF DEPARTURE



- What are 3 things you really want to know about WMD by the end of this course?

DEFINING WMD



Weapons that have a relatively large-scale impact on people, property, and/or infrastructure.

WMD are defined in US law (18 USC §2332a) as:

- (A) any destructive device as defined in section 921 of this title (i.e. explosive device);
- (B) any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals, or their precursors;
- (C) any weapon involving a biological agent, toxin, or vector (as those terms are defined in section 178 of this title)
- (D) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

CBRN weapons: chemical, biological, radiological, nuclear

1) CHEMICAL WEAPONS



Chemical Weapons use the toxic properties of chemical substances to cause physical or psychological harm to an enemy

Many different kinds, including:

- **Choking and blood agents** (like chlorine, phosgene, fentanyl gas) cause respiratory damage and asphyxiation
- **Blistering agents** (like mustard gas and lewisite) cause painful burns requiring immediate medical attention
- **Nerve gases** degrade the functioning of the nervous system, causing a loss of muscle control, respiratory failure, and eventually death

Can be delivered through bombs, rockets, artillery shells, spray tanks, and missile warheads

2) BIOLOGICAL WEAPONS



Biological weapons intentionally disseminate agents of infectious diseases to harm or kill others.

Key considerations include infectivity, virulence, toxicity, pathogenicity, the incubation period, transmissibility, lethality and stability.

- * Bacteria (like Anthrax, Brucellosis, Tularemia, Plague)
- * Viruses (Smallpox, Marburg, Yellow Fever)
- * Rickettsia (Typhus fever, Spotted fever)
- * Fungi (the molds that cause stem rust of wheat and rye)
- * Toxins (like Ricin, Botulinum and Saxitoxin) *aka "midspectrum"*
- * Infectious Pathogens:
 - Emerging threats; SARS, Avian Influenza
 - 'Old' threats: TB, HIV, Malaria

- Relatively cost-effective weapons
- Considered by many to be the most insidious type of weapons

3) RADIOLOGICAL WEAPONS



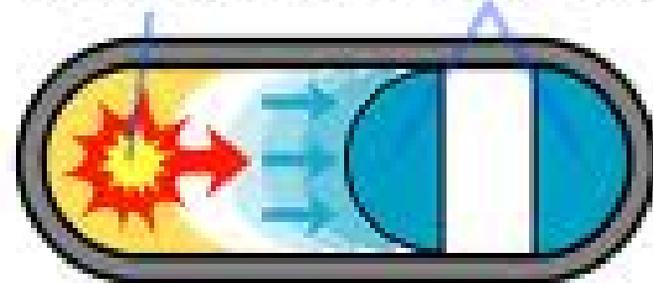
- A radiation emission device (RED) or a radiological dispersion device (RDD) – also known as a “dirty bomb” – is a bomb to cause panic and mass disruption; areas with severe radioactive contamination would be uninhabitable for many years.
- Built using radioactive material (such as cesium 137, cobalt 60, strontium 90, plutonium oxide and uranium oxide), which is dispersed by the detonation of conventional explosives.
- Myriad sources of radioactive material could be used for this purpose, like medical/educational facilities, atomic waste storage reservations, commercial sites, etc.
 - Many lack strong security, especially medical facilities, educational institutions
 - Can also acquire radioactive materials via mail order or Internet

4) NUCLEAR WEAPONS

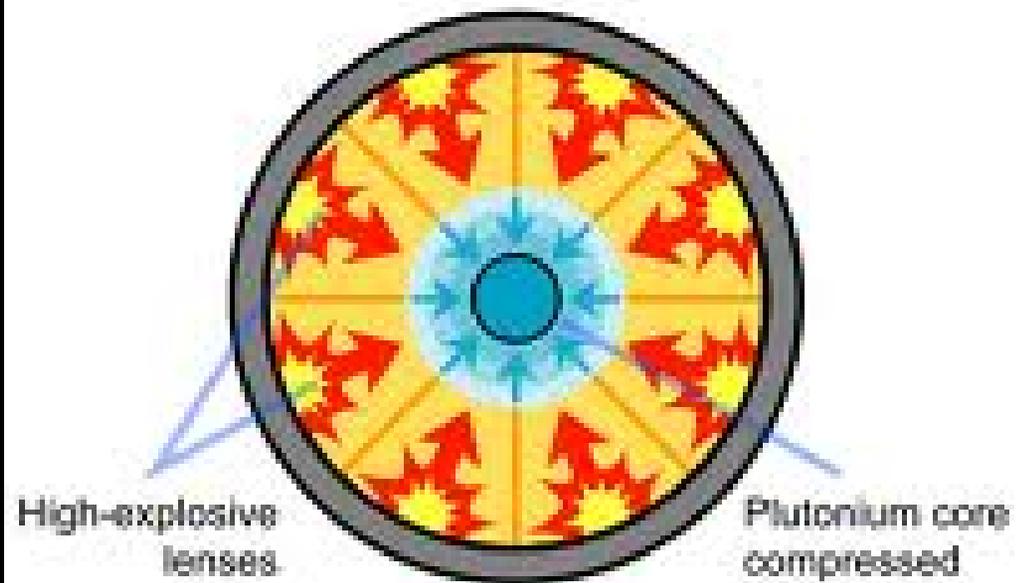


- Unique in their explosive energy, derived from **nuclear fission**: splitting the nucleus of an atom, usually of highly enriched uranium or plutonium, into two or more parts by bombarding it with neutrons, and causing a chain reaction
- Destructive power up to 50 megatons
 - 1,000 tons of TNT = 1 kiloton
 - WWII nukes = 15-22 kilotons
 - 1,000 kilotons = 1 megaton
- 2 types: Gun-type and Implosion

Conventional chemical explosive Sub-critical pieces of uranium-235 combined



Gun-type assembly method



Implosion assembly method

THE HISTORY



- First major use in modern warfare (April 22, 1915); during World War I, the German army released chlorine gas in an attack against the French in Ypres, Belgium
- About 124,000 tons of chemical weapons were used by all sides during World War I, inflicting over a million casualties (90,000 fatalities).
- WWII examples of WMD include:
 - Italy used mustard gas against Ethiopians
 - Japan used intestinal typhoid bacteria to poison a Soviet water supply
 - Japan used air cargo drops of rice and wheat mixed with plague-carrying fleas over China and Manchuria

THE CHANGING ENVIRONMENT



During the Cold War

- Bipolar international system
- Monopoly of WMD by strong, powerful states
- International treaties signed to curb WMD proliferation
- Stringent security surrounding atomic material in US/USSR, mostly due to concerns about spying, espionage

The Post-Cold War threat environment has changed

- Nuclear proliferation in South Asia, N. Korea, Middle East
- The Non-Proliferation Regime's crisis of legitimacy
- Fears of CBRN proliferation after Soviet collapse
- Major advances in biotechnology

TERRORISTS AND WMD



“Dozens of identified domestic and international terrorists and terrorist groups have expressed their intent to obtain and use WMD.”

- Denis Blair, Director of National Intelligence, 2010

“There is a high likelihood of some type of WMD terrorist attack by the year 2013.”

- Commission on the Prevention of WMD Proliferation and Terrorism, 2008

THE HISTORY



History of use by non-state actors includes:

- 1984, The Dalles, Oregon: Rajneeshes poison locals with salmonella
- June 1990, Sri Lanka: Liberation Tigers of Tamil Eelam (LTTE) used chlorine gas in its assault on a Sri Lankan Armed Forces camp at East Kiran
- Japan, 1994-1995: Aum Shinrikyo uses Sarin gas in Matsumoto and Tokyo
- U.S., October 2001: anthrax attacks through U.S. mail
- Russia, 1995: Chechen rebels planted a dirty bomb in Moscow's Ismailovsky Park

EMERGING THREAT INDICATORS

- June 2003, a Jemiaah Islamiah weapons storage facility in Malaysia is found to contain various kinds of chemicals
- April 1985, a compound of the Sword, the Covenant and the Arm of the Lord is found to have a 55-gallon barrel of cyanide
- January 2003, an apartment in north London is found to have raw ingredients for making cyanide and ricin, as well as instruction manuals
- January 2004, seven pounds of cyanide salt are found during a raid on a Baghdad house reportedly connected with al Qaeda
- November 2004, a “chemical laboratory” is discovered in Fallujah containing potassium cyanide, hydrochloric acid, and sulfuric acid

THE CHANGING ENVIRONMENT



Contemporary threat vectors include:

- The transfer, theft and detonation of an intact nuclear weapon (INW) by a terrorist group like al Qaida
- WMD designs, instruction manuals available online
- The theft or purchase of fissile material (by states or terrorists) to fabricate and detonate a crude nuke – an improvised nuclear device (IND)

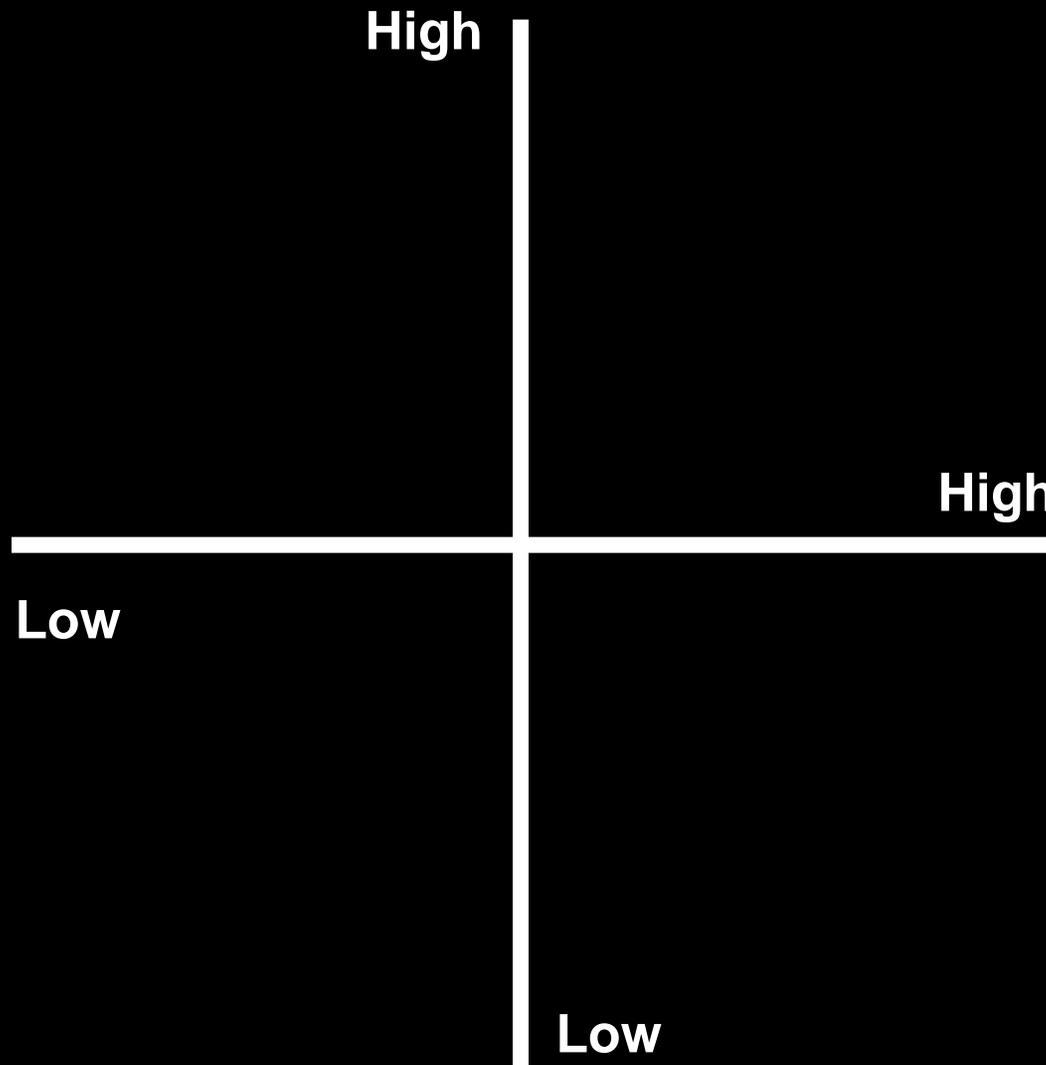
“Pre-positioned WMD”

- Nuclear power plants
- Chemical storage facilities
- Bio-technology labs
- Dams, water protection infrastructure (e.g., Katrina)
- Urban transportation of toxic chemicals

A MODEL FOR ANALYSIS



Intentions

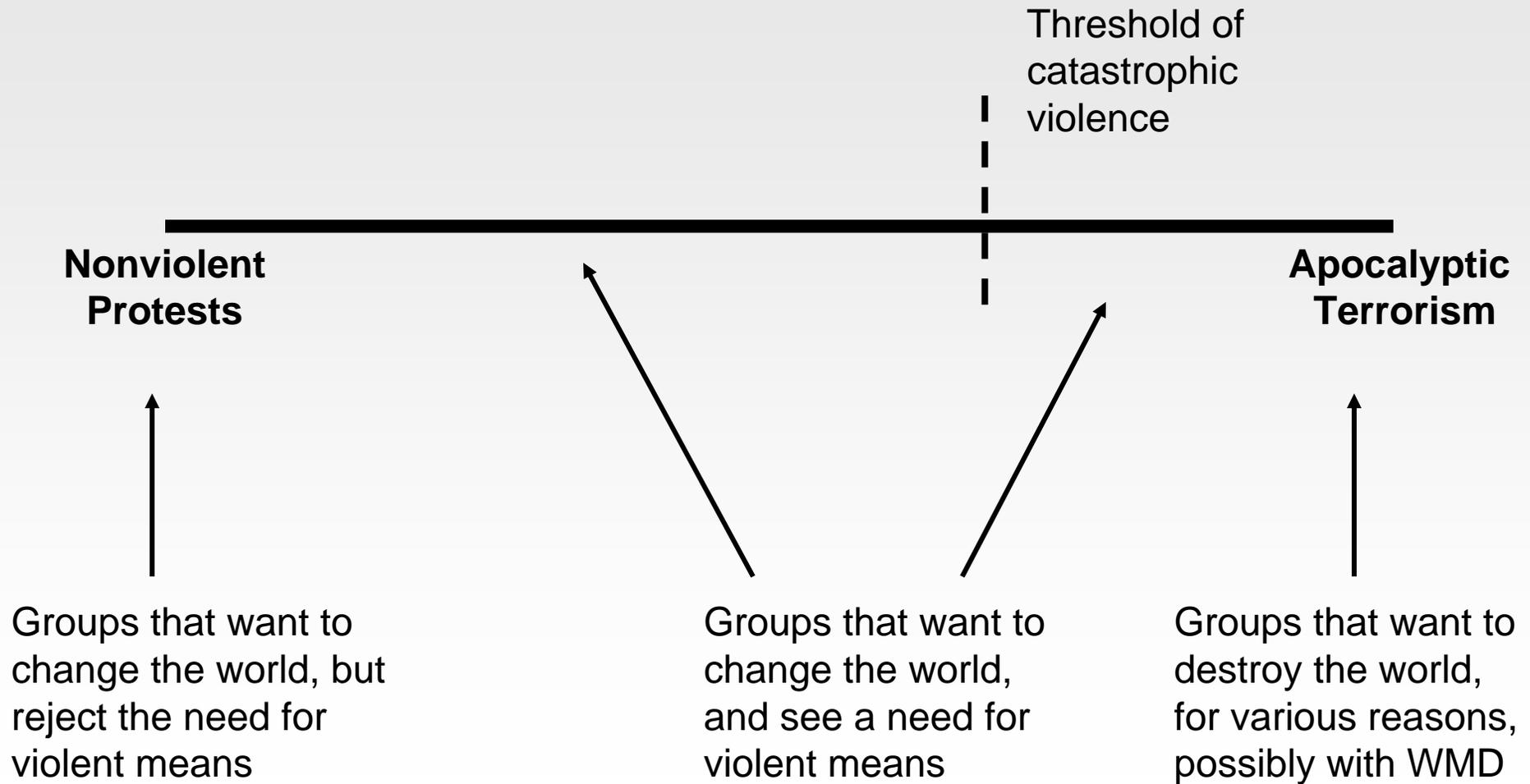


Capabilities & Opportunities

MOTIVATIONS



A Spectrum of Ideologies



Where do we place al Qaida on this spectrum?

WEAPON EFFECTS



Different interests according to weapon type

- Biological and chemical weapons can be deployed silently. Effects produced by chemical and biological weapons are usually delayed and spread over time.
- Radiological weapons involve both explosion and long-term effects
- Nuclear weapons are unique in their explosive energy (derived from fission) which can cause catastrophic damage and long-term radiation
- Terrorists prefer spectacular, massive impact, instant worldwide publicity, shock & awe effect
- Thus, nuclear or radiological may be more likely, but are more significantly more difficult

SUMMARY



- Proliferation of WMD (or CBRN weapons) is among the world's most daunting security challenges
- U.S. and International community struggling to contain the spreading availability of WMD
 - No IAEA-like watchdog for chemical or biological weapons
- Multiple countries are seeking to expand their WMD capabilities
- Scientific expertise and dual-use technological equipment become more readily available through globalization
- New technologies make some weapons easier, cheaper to make; possible implications for terrorists or other violent non-state actors to acquire and use them

FINAL THOUGHTS



- The threat is real, but within narrow parameters
- **Most important dimensions for terrorists:**
 - Motivations
 - Materials availability
 - Knowledge
 - Opportunities
 - Weapons attributes