# Toward a Comprehensive Approach to Counter the IED

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To counter the explosive threat we offer the following approach:
Control explosive precursors

- Use administrative tracking from “cradle to grave” for the purposes of detecting and preventing their diversion;
- Denature the precursors to chemically prevent their use in formulating explosives while not negating their original purpose in commerce;
- Find a suitable substitute for explosive precursors;

Development of detection protocols and technologies for the specific threats and for specific venues;

Evaluate the chock points in the transportation node; concentrate initial blast mitigation efforts there.

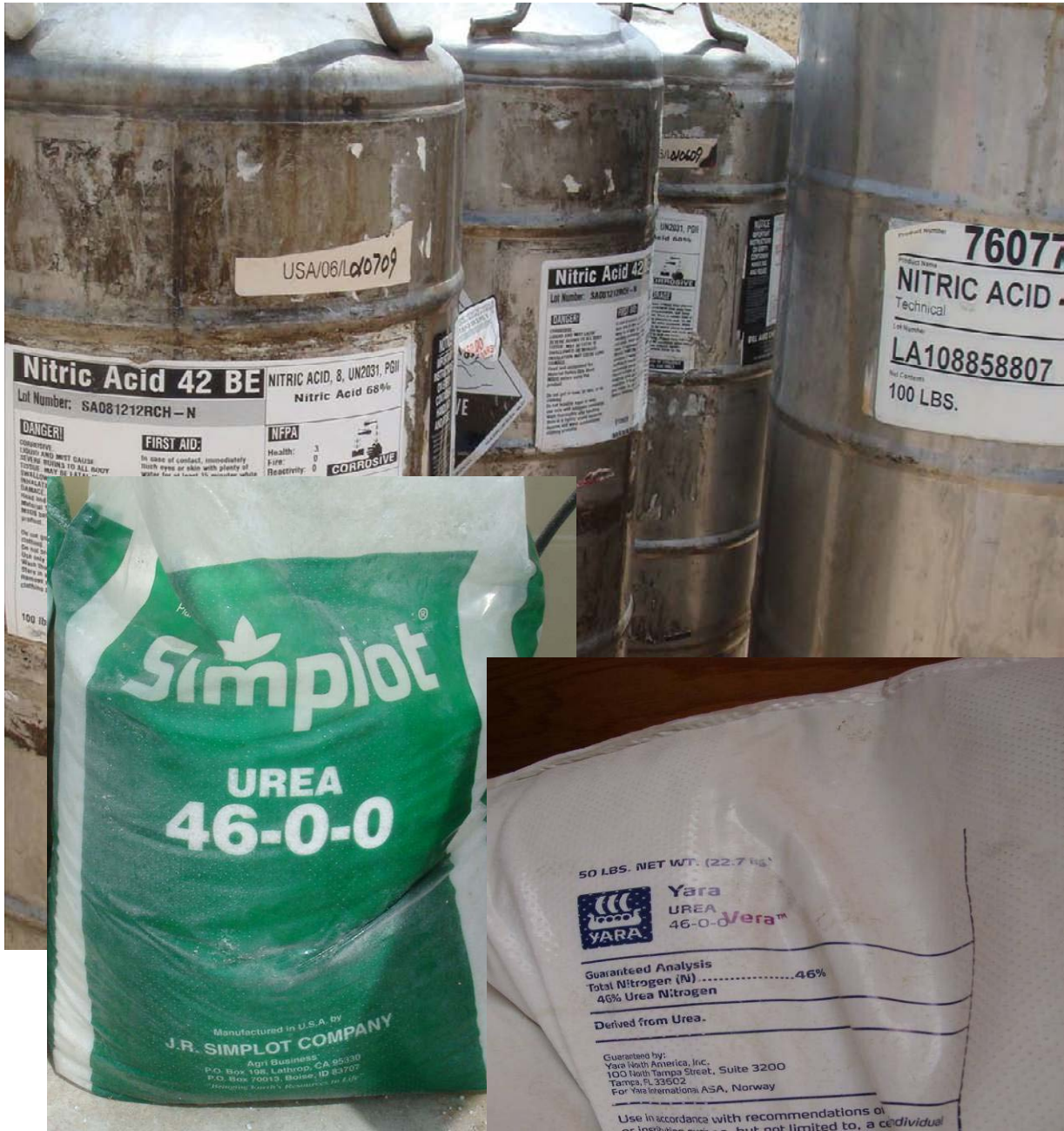
Evaluate the entire transport system with consideration of resilience; setup alternate transport routes ahead of time, not just for passengers but for cargo, as well.

# Approaches for Precursor Control

Solid oxidizers, which may or may not require fuel--ammonium nitrate, chlorates;

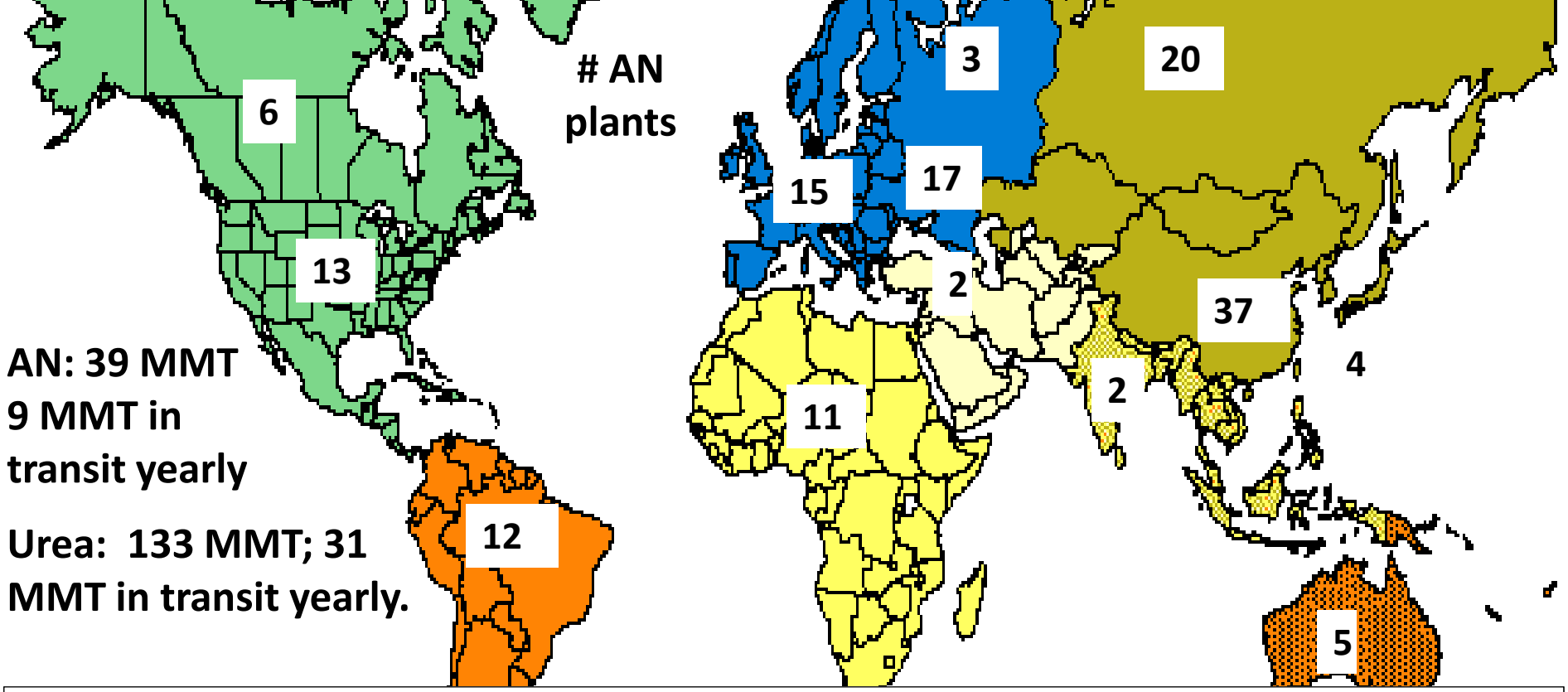
Liquid oxidizers, which may or may not require chemical synthesis--nitric acid, hydrogen peroxide;

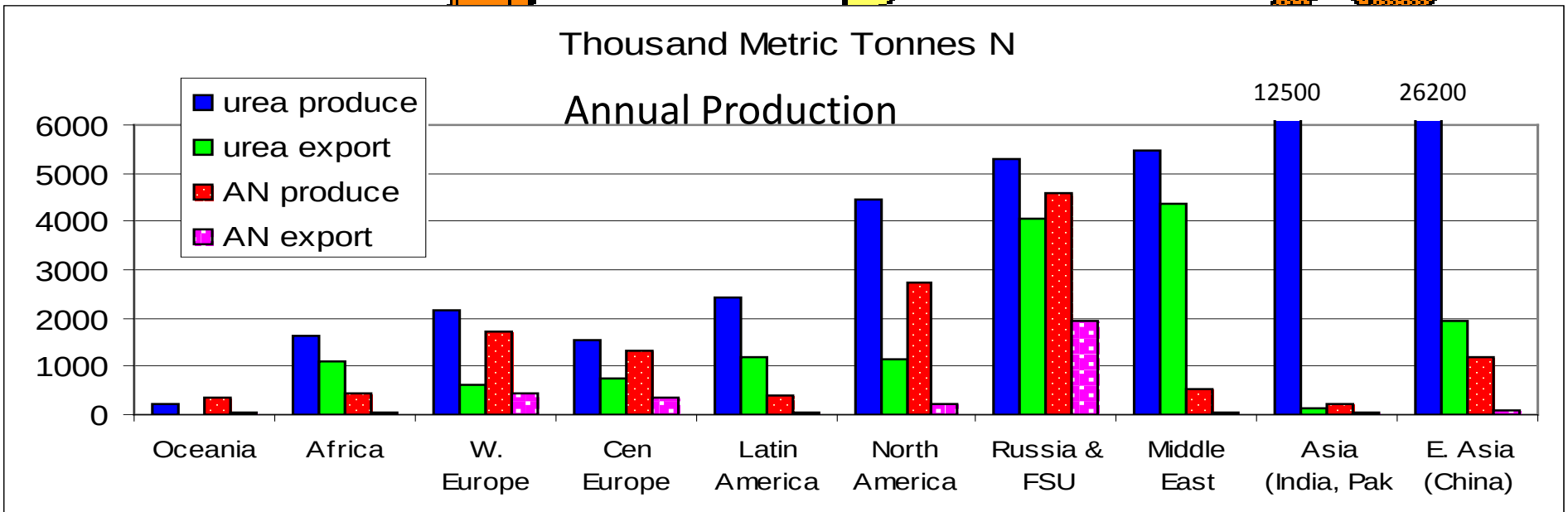
Special organics used in synthesis--urea (the only one likely to be used in large-scale), hexamine, acetone, glycerin, ethylene glycol, erythritol



ADMINISTRATIVE CONTROLS

| NRC<br>1996-98 | Canada<br>Aug-06 | Australia<br>Nov-06 | Singapore<br>Dec-06 | European Union<br>Mar 07 | United States<br>Apr-07; 6-08; 3-09 |
|---|---|---|---|---|---|
| **nitric acid** | >68% > 3.5 kg | NA | | > 65% | > 68%, 2000 lb |
| **$NH_4NO_3$** | AN, ≥28%N | SSAN >45%, ≥3kg | ≥28%N, soln ≥60%AN | > 27%N (>77%AN) | ≥ 23%N, 2000 lb |
| **$KNO_3$** | > 25kg | X | >5wt% | pure | 400 lb |
| **$NaNO_3$** | > 25kg | X | >5wt% | | 400 lb |
| **$Ca(NO_3)_2$** | | | | | |
| **$KClO_3$** | > 1kg | X | X | pure | 400 lb |
| **$NaClO_3$** | > 1kg | X | X | pure | 400 lb |
| **$H_2O_2$** | >30%, >1L | X | >20wt% | > 10% | >35%, 400 lb |
| **$KClO_4$** | > 10kg | X | X | pure | 400 lb |
| **$NaClO_4$** | | X | X | | |
| **$NH_4ClO_4$** | | X | X | | 400 lb |
| **urea** | | | | | 2000 |
| **nitromethane** | > 1L | X | | pure | 400 lb |
| **sulfuric acid** | | X | | >10% | oleum, 10,000 lb |
| **HCl** | | | | > 10% | >37%, 15,000 lb |
| **acetone** | | | | pure | |
| **hexamine** | | | | >90% | |
| **citric acid** | | | | pure | |
| **dinitrotoluene** | | | $Ba(NO_3)_2$ | | RDX, HMX 400 lb |
| **$Ca(OCl)_2$** | | | GN | | HNS, Dingu 400lb |
| **nitrobenzene** | | | $C(NO_2)_4$ | | |
| **$KMnO_4$** | | | K or Na $NO_2$ >5% | | |


# AN plants
6
13
12
3
20
15
17
2
37
4
2
11
5
AN: 39 MMT
9 MMT in transit yearly
Urea: 133 MMT; 31 MMT in transit yearly.


Thousand Metric Tonnes N
Annual Production
urea produce
urea export
AN produce
AN export
6000
5000
4000
3000
2000
1000
0
12500
26200
Oceania
Africa
W. Europe
Cen Europe
Latin America
North America
Russia & FSU
Middle East
Asia (India, Pak
E. Asia (China)

# Denaturing Explosive Precursors **Hydrogen Peroxide**

James Smith; Jimmie Oxley; Joe Brady University of Rhode Island

$H_2O_2$ >70% concentration can be explosive. Depending on choice of fuel, explosives can be camouflaged as common, innocuous liquids or pastes.

Any concentration of $H_2O_2$ can be used to synthesize TATP or HMTD—an easy route to primary explosives. But terrorists/criminals recommend concentration by boiling off water.

Our approach: additive to HP which results in decomposition rather than concentration.

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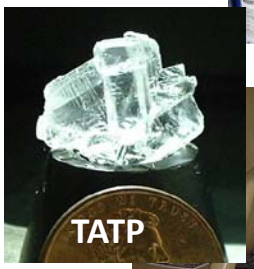

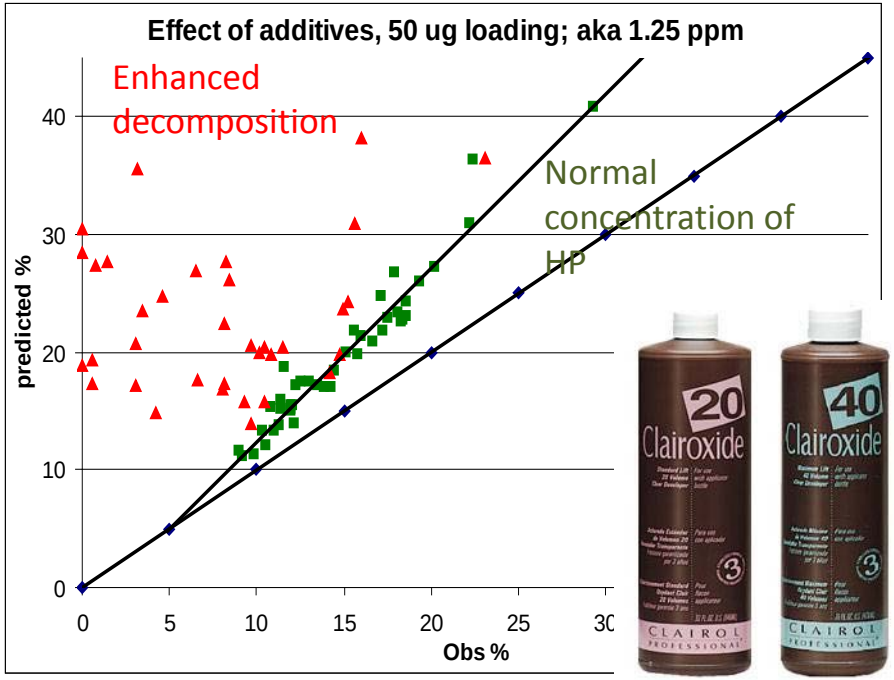

*lacing Explosive Precursors*

**1996--16 companies in 22 plants made solid AN.Capacity~7 Mst/yr**

**2006--7 companies,11 plants; 2 HD AN. Annual capacity 8.6 M st—3.5 Mst solid, 5 Mst liquor**

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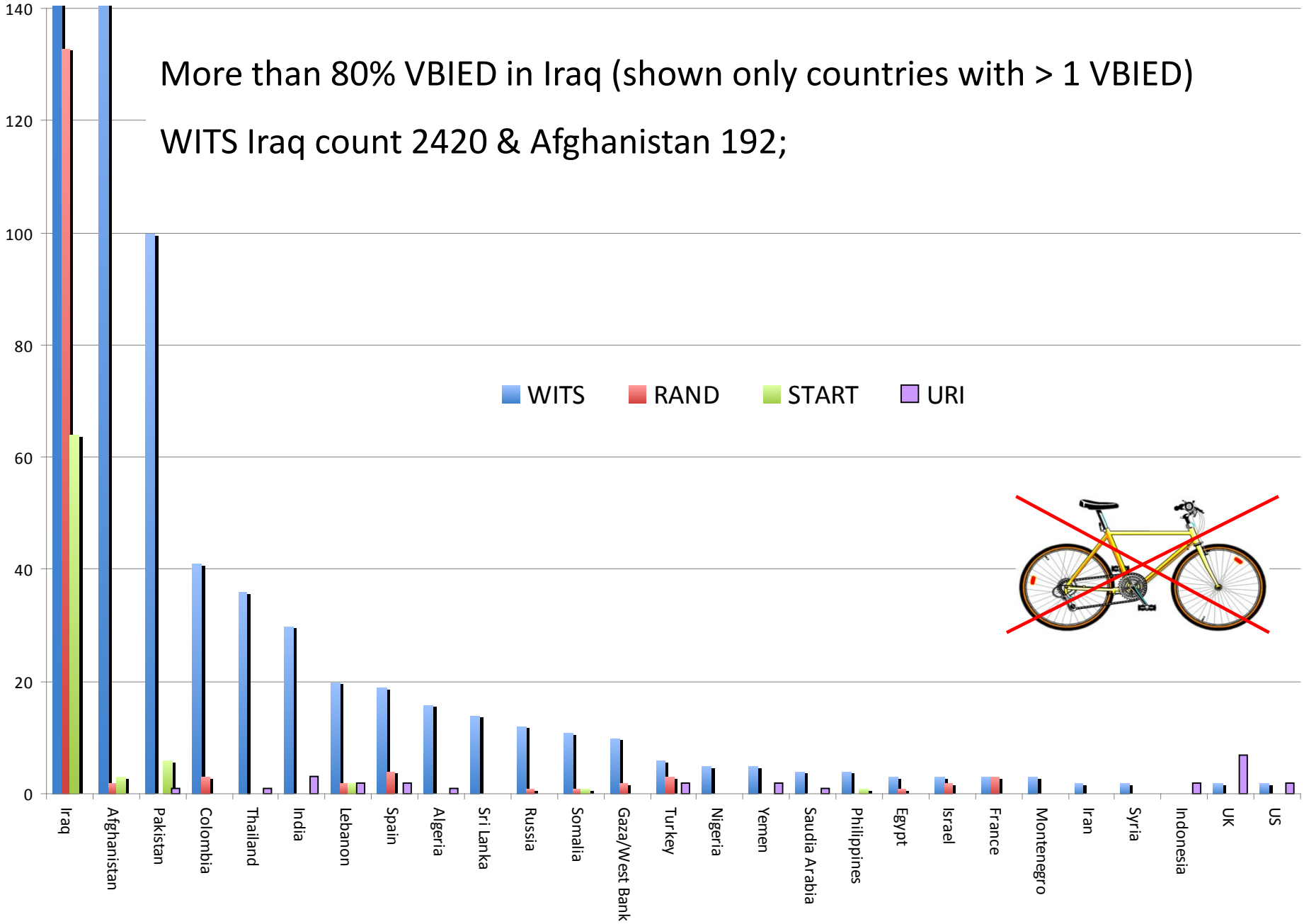
More than 80% VBIED in Iraq (shown only countries with > 1 VBIED)

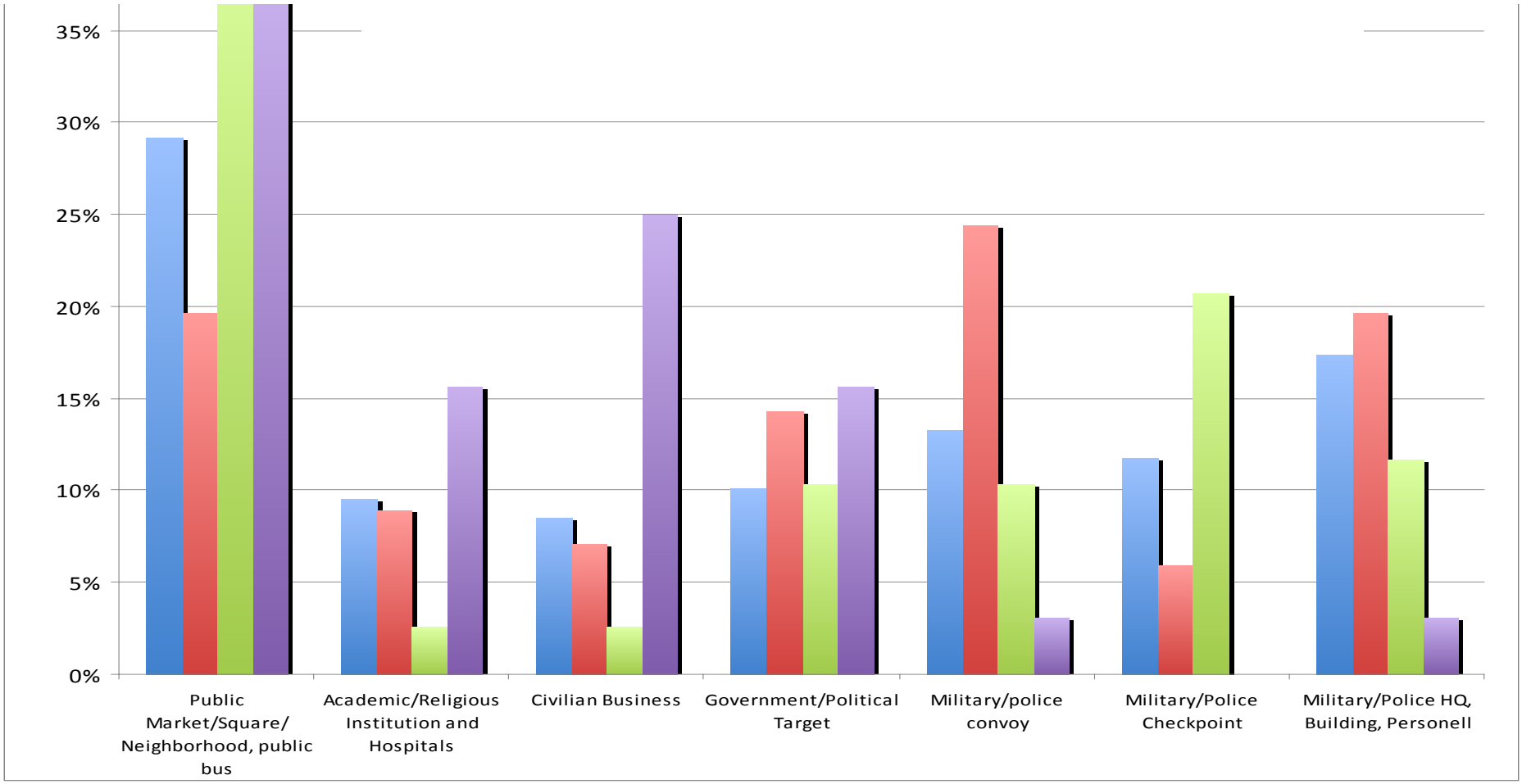
WITS Iraq count 2420 & Afghanistan 192;



Targets: ~38% of incidents were suicide vehicle that “crashed” into target or detonated when driven near target; but most were vehicles left parked near target. Note often decoy tactics.

Favorite targets: police stations, military/police convoys, checkpoints, bus stations & stops, “churches”, schools, haunt of political figures.

Unusual targets: 5 car dealerships, movie theater, Sri Lankan professional cricket team and VBIED’s crashed into 3 prisons & 4 ice cream shops.



# Large Terrorist Bombings

| Year | Date | City | Country | Perpetrator | Suicide (y/n) | Weapon | amount | Hurt | Dead | where |
|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | 10/23/87 | Beirut Marine & Frenc | Lebanon | Hezbollah | y | 2 truck bombs | 12Klb TNT e | 75 | 299 | suicide VBIED |
| 1983 | 4/18/87 | US embassy | Lebanon | Hezbollah | y | AN | | 120 | 63 | US embassy |
| 1988 | 12/21/88 | Lockerbie | Scotland | Abdelbaset Ali Mohme | n | Semtex RDX/PETN | | | 269 | Pan Am 103, |
| 1992 | 4/10/92 | London | UK | IRA | n | AN icing sugar | 1000's lb | | 3 | St Mary's Axe |
| 1993 | 3/13/93 | Bombay | India | Dawood Ibrahim | n | RDX, C4 imitation | | ~1200 | 317 | Stock exchange & hotels (scooter) |
| 1993 | 4/24/93 | London | UK | IRA | n | AN/icing sugar | 3000 lb | 40 | 1 | Bishops Gate |
| 1993 | 2/26/93 | New York City | US | Ramzi Yousef | n | urea nitrate | 1500 lb | ~1000 | 6 | World Trade Center, NY |
| 1995 | 4/19/95 | Oklahoma City | US | Timothy McVeigh | n | AN/NM & ANFO | 5000lb | 680 | 168 | Oklahoma City Federal building |
| 1996 | 6/25/96 | Khobar | Saudi Arabia | Hezbollah | n | C4 | 15,000 lb | 372 | 19 | Khobar Towers Housing Complex |
| 1996 | 2/18/96 | London | UK | IRA | n | AN/icing sugar | 3000 lb | 39 | 2 | Canary Wharf |
| 1996 | 6/15/96 | Manchester | UK | IRA | n | AN/icing sugar | 1000's lb | ~200 | 0 | commercial center |
| 1998 | 8/7/98 | Nairobi | Kenya | E.I. Jihad | y | TNT & AlNO3 & Al powd | 2000 lb | 4000 | 212 | U.S. embassy |
| 1998 | 8/7/98 | Dar es Salaam | Tanzania | E.I. Jihad | y | TNT & O2 tanks & AN | 2000 lb | 85 | 11 | U.S. embassy |
| 2000 | 10/12/00 | Port of Aden | Yemen | bin Laden | y | TNT & RDX | 1000 lb | 39 | 17 | U.S.S. Cole |
| 2002 | 10/12/02 | Bali | Indonesia | Jemaah Islamiyah | y | chlorate | 1000 kg | 209 | 202 | 3 bombs Bali nightclub |
| 2002 | 10/6/02 | Gulf of Aden | Yemen | al-Qaeda | y | TNT | | 12 | 1 | Limburg oil tanker |
| 2003 | 8/5//03 | Jakarta | Indonesia | Jemaah Islamiyah | y | chlorate | | 150 | 12 | Marriott Hotel, Jakarta |
| 2003 | 11/15/03 | Istanbul | Turkey | al-Qaeda | y | 2 bombs ANFO | | 300 | 27 | trucks drove into synagogues |
| 2003 | 11/20/03 | Istanbul | Turkey | al-Qaeda | y | 2 bombs ANFO | | 400 | 30 | HSBC Bank & British Consulate truck bombs |
| 2004 | 3/11/04 | Madrid | Spain | al-Qaeda | n | gelignite in 4 locations | | 1800 | 191 | Madrid subway, 10 suicide backpack bombs |
| 2005 | 2/18/05 | Sungai Kolok | Thailand | | n | AN mixed with RDX | | 40 | 6 | truck parked by hotel where prime minister was |
| 2005 | 7/7/05 | London | UK | 4 men (suicide) | y | Peroxide based | | 700 | 52 | subway trains |
| 2005 | 7/21/05 | London | UK | 5 men | n | Peroxide | | 0 | 0 | subway trains |
| 2006 | 7/11/06 | Mumbai | India | Lashkar-e-Toiba | n | 7 bombs, ANFO& RDX | | 625 | 190 | India railroad |
| 2006 | 12/31/06 | Madrid | Spain | ETA | n | AN mixed with RDX | 400 lb | 26 | 2 | airport parking garage |
| 2007 | 12/12/07 | Algiers | Algeria | alQaeda | y | nitroglycerin | | ? | 76 | near supreme cout & UN buildings |
| 2007 | 9/5/07 | Medebach | Germany | 3 men | n | hydrogen peroxide | 700 kg | 0 | 0 | stored HP and detonators for car bombs |
| 2007 | 2/19/07 | Panipat | India | Hindu Nationalists | n | KClO3 + S | | 50 | 68 | passenger train from Delhi to Pakistan |
| 2008 | 9/21/08 | Islamabad | Pakastan | | y | RDX mixed with TNT | 600 kg | 266 | 53 | Marriott Hotel -- explosive in dump truck |
| 2008 | 9/18/08 | | Yemen | Islamic Jihad | y | | | | 16 | US embassy gates |

15 HME, 14 military 10K 2300

TSWG Pocket Guide

Assuming use of vehicle is to facilitate a large charge.

| device | potential weight explosive | |
|---|---|---|
| | pounds | kg |
| pipe bomb | 5 | 2.3 |
| briefcase | 50 | 23 |
| compact sedan trunk | 500 | 227 |
| sedan | 1000 | 454 |
| passenger or cargo van | 4000 | 1814 |
| small moving van or delivery truck | 10000 | 4536 |
| moving van or tank truck | 30000 | 13608 |
| semi-trailer | 60000 | 27216 |

| | | | |
|---|---|---|---|
| AN | + | hydrocarbon | mix |
| chlorate | + | sugar/ROH | mix |
| Urea | + | $HNO_3$ | react |
| $H_2O_2$ | + | organic | mix |
| Nitromethane | + | sensitizer | mix |

# Safe Destruction of TATP

"ESCONDIDO, Calif. (AP) Authorities say the controlled burn of a home packed with explosives cost the San Diego County Sheriff's Department more than $541,000." Feb 2, 2011 CBS 8 (KFMB)

EOD in Escondido, CA Dec 9, 2010 HMTD, PETN, ETN

- Common method for disposal of TATP is "blow-in-place," but this isn't always feasible. **Goal:** Find a system to gently destroy TATP
- **Requirements:** Widely available, portable reagents which gently digest TATP in reasonable time-scale

Texas City, TX July 20, 2006 TATP/thermite

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