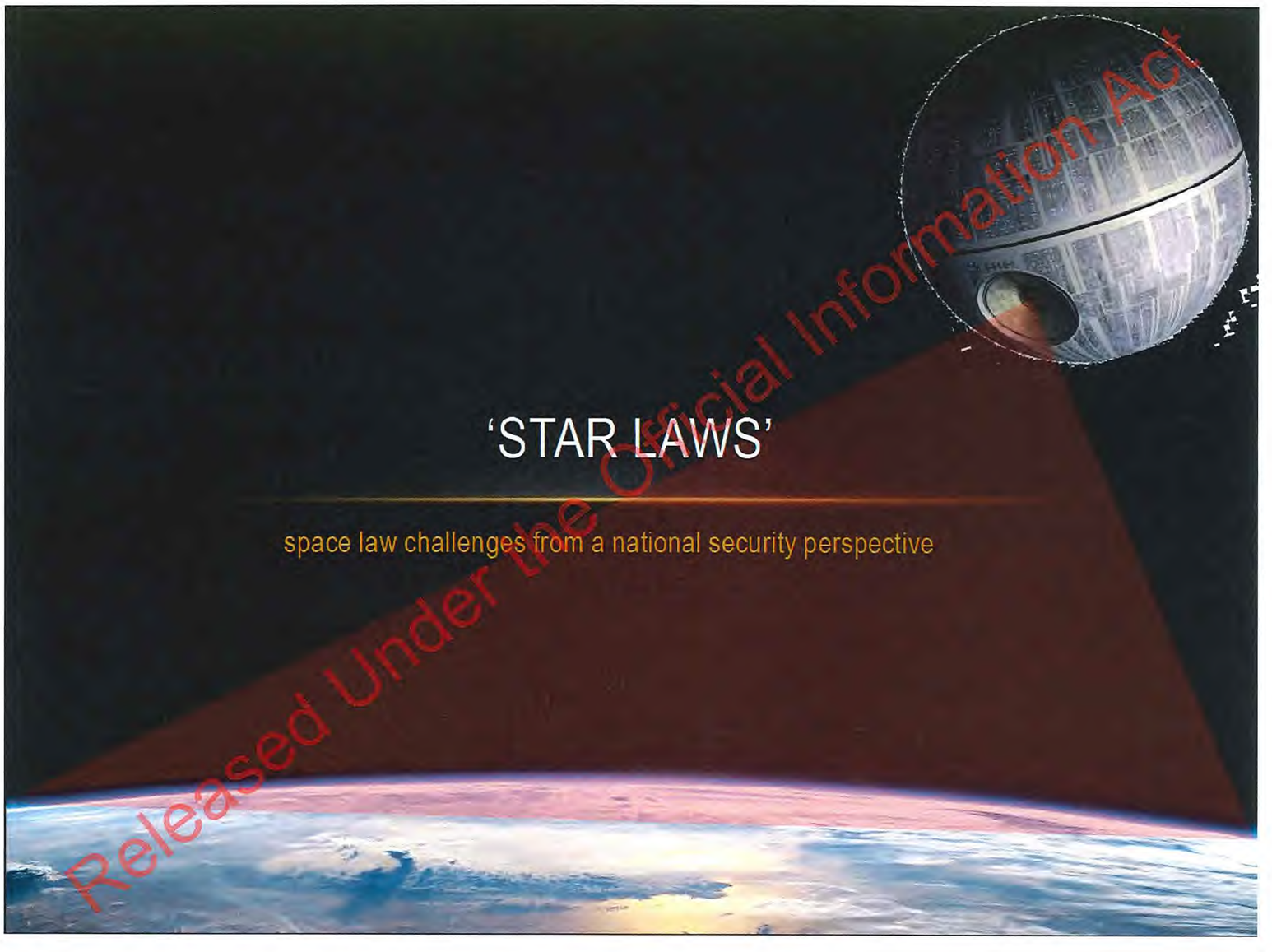
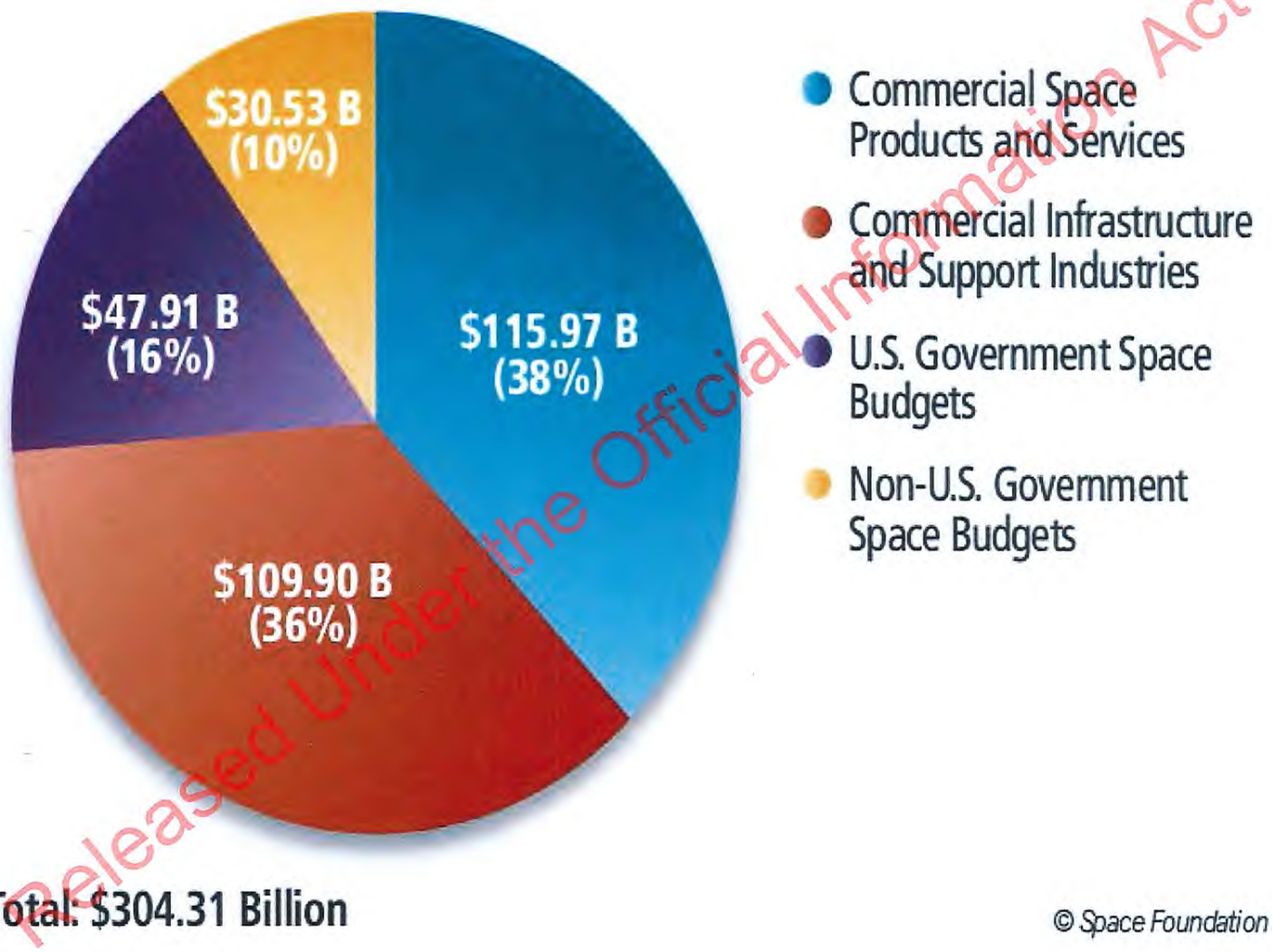


‘STAR LAWS’

space law challenges from a national security perspective



Total: $304.31 Billion

EARTH OBSERVATION

- Resources exploration
- Mapping

EARTH OBSERVATION

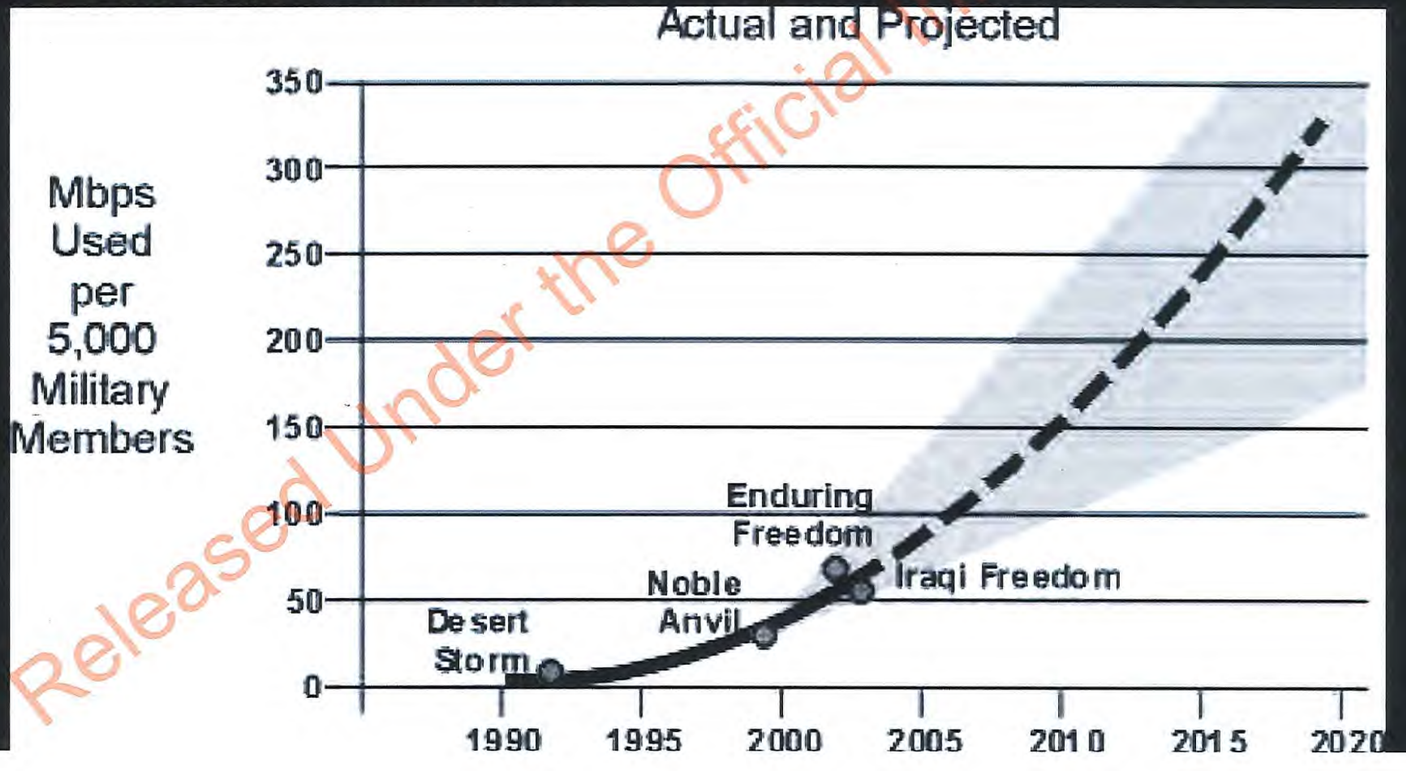
- Treaty verification
  - eg, *New Strategic Arms Reduction Treaty*
  - Non-interference with 'National Technical Means' – as a matter of law
  - Non-interference with missile-warning – as a matter of common-sense! (and ROE?)
- International criminal culpability – Sentinel Project

SATELLITE COMMUNICATIONS

- Television (DTH and otherwise)
- Radio
- Remote telephone services
- Maritime communications
- Internet access
- MILSATCOM

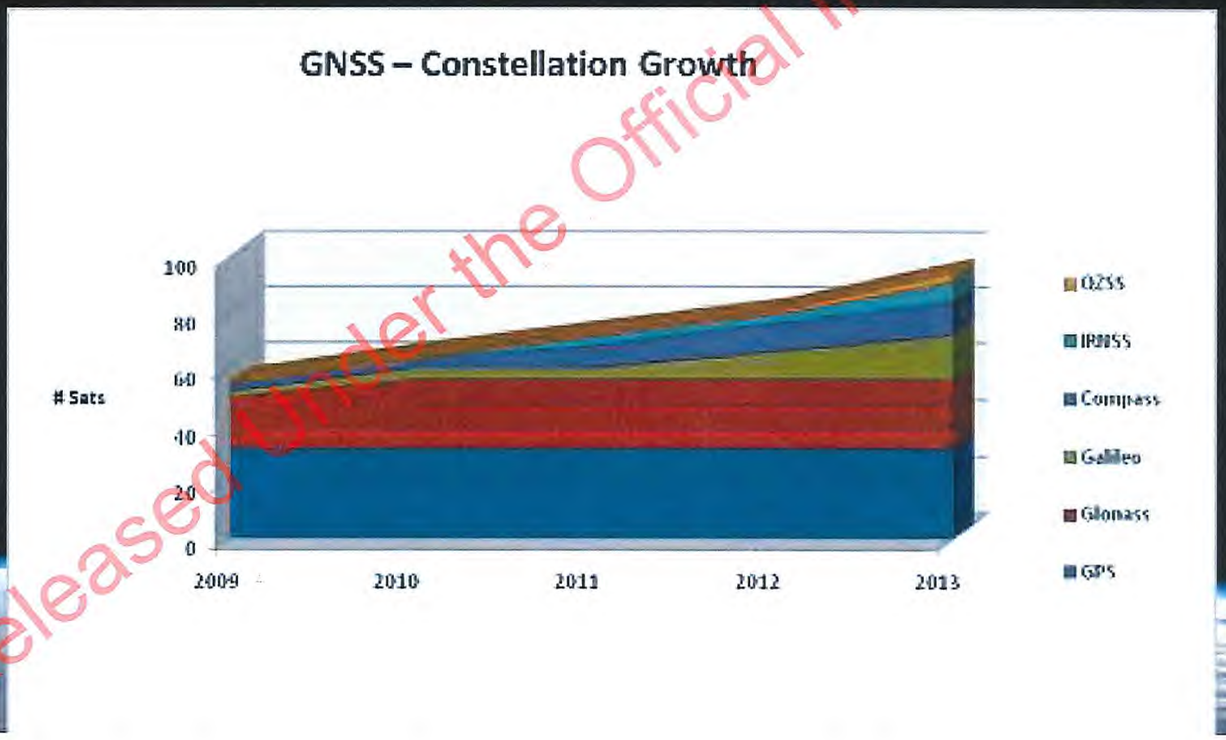
SATCOM

- Tactical to strategic communications
- Remotely piloted vehicles (RPVs)



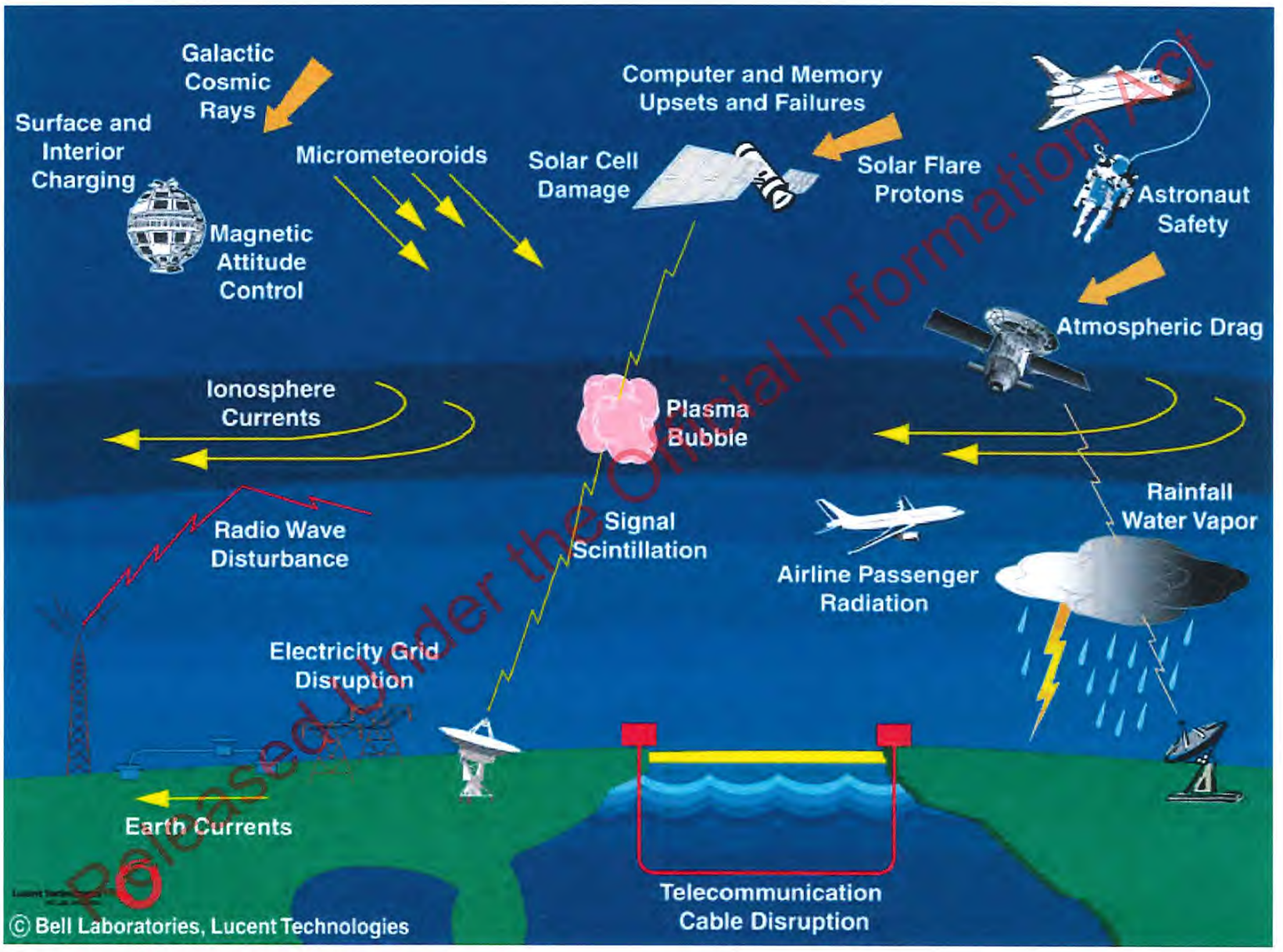
GLOBAL NAVIGATION SATELLITE SYSTEMS

- GPS guidance
- Data communications



A DAY WITHOUT SPACE

- Satellite television?
- Mobile phones?
- Commercial shipping (insurance)?
- Banking?
- Stock markets?
- Meteorology?
- Internet?
- Power grid?
- Goods logistics?
- Military communications networks?
- Remotely piloted vehicles?
- Missile warning?
- ISR?
- Naval navigation?
- Military aviation navigation?
- GPS-guided munitions?


Galactic Cosmic Rays
Surface and Interior Charging
Micrometeoroids
Computer and Memory Upsets and Failures
Solar Cell Damage
Solar Flare Protons
Astronaut Safety
Magnetic Attitude Control
Atmospheric Drag
Ionosphere Currents
Plasma Bubble
Radio Wave Disturbance
Signal Scintillation
Airline Passenger Radiation
Rainfall Water Vapor
Electricity Grid Disruption
Earth Currents
Telecommunication Cable Disruption
© Bell Laboratories, Lucent Technologies
Released Under the Official Information Act

SPACE CONTROL

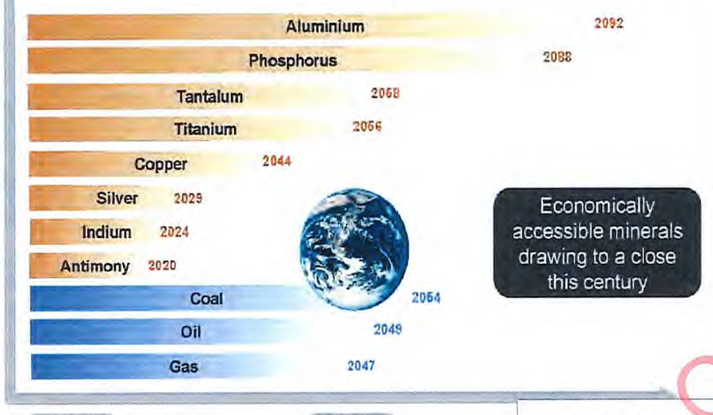
- Defensive Space Control
  - Space weather
  - Inadvertent threats
  - Intentional threats
  - Hardening and self-protective measures
- Offensive Space Control / Threats
  - Ground
  - Link
  - Space (ASATs & DEWs)
  - EMP

INCREASING MILITARISATION AND POSSIBLE WEAPONISATION – WHY?

- Resources
- Congestion
- Competition for frequency and orbital slots
- Broader destabilising factors
- Increasingly contested

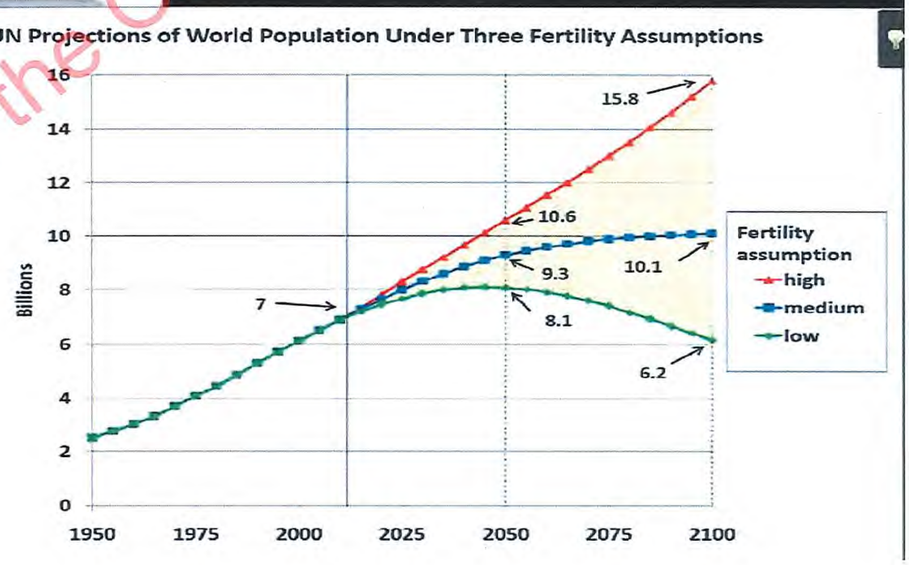
Resources

US Geological Survey, Achort Resources, World Bureau of Metal Statistics, International Copper Study Group, Mrmormetals.com, Cordell et al (2009), Smil (2000), Silver Institute, BP Statistical Review of World Energy 2010



Economically accessible minerals drawing to a close this century

© SEC March 2013



THE SPACE ECONOMY: A MODERN DAY GOLD RUSH

Asteroid Mining Will Create A Trillion-Dollar Industry

As our **population grows** we need to find a **sustainable supply of natural resources** to fuel exploration in space and prosperity on Earth.

PLATINUM-RICH ASTEROID

Could contain more Platinum Group Metals than **what's been mined on Earth in all of history**

NEAR-INFINITE SUPPLY OF PRECIOUS RESOURCES

USES OF PLATINUM GROUP METALS ON EARTH

REDUCE COST OF ELECTRONICS

ELECTRIFY TRANSPORTATION

DRIVE INNOVATION, AND CREATE A GREENER EARTH

MORE ASTEROIDS DISCOVERED NEAR EARTH EVERYDAY

1,500	EASIER TO REACH THAN MOON
8,800	DISCOVERED TO DATE
1000+	NEARLY 1K+ FOUND EVERY YEAR

WATER-RICH ASTEROID

One water-rich asteroid could produce **enough fuel for every rocket launched in history.**

ONE SINGLE 500M platinum-rich asteroid

At current market prices, one ounce of platinum is valued over $1,000

Worth $2.9 Trillion

174 times more than the yearly world output of platinum

More than the known world-reserves of PGMs

USES OF WATER IN SPACE

ROCKET **FUEL**

BREATHABLE **AIR**

DRINKABLE **WATER**

ONE SINGLE 500M water-rich asteroid

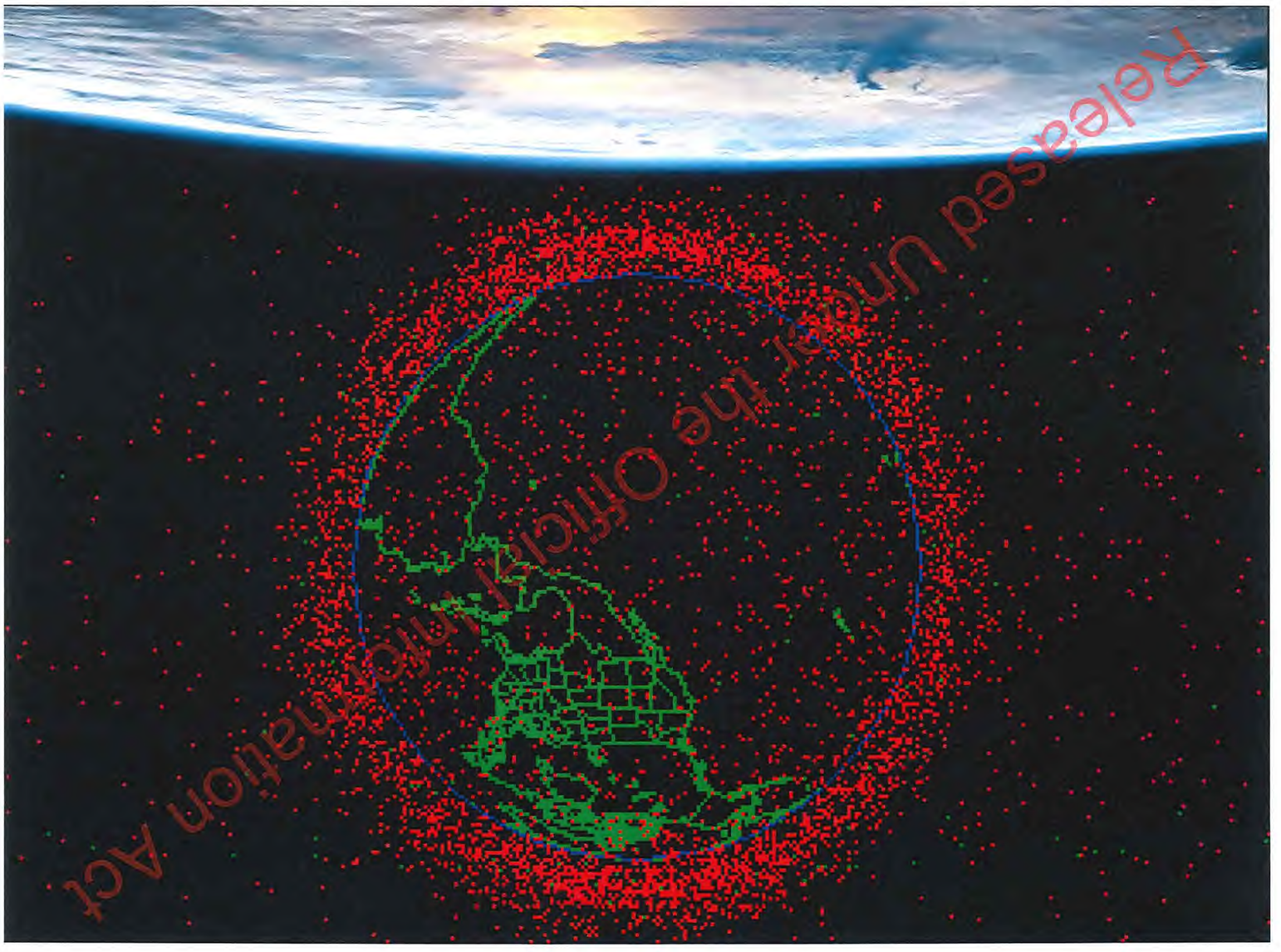
$5 trillion

Would produce over $5 trillion worth of water for use in space.

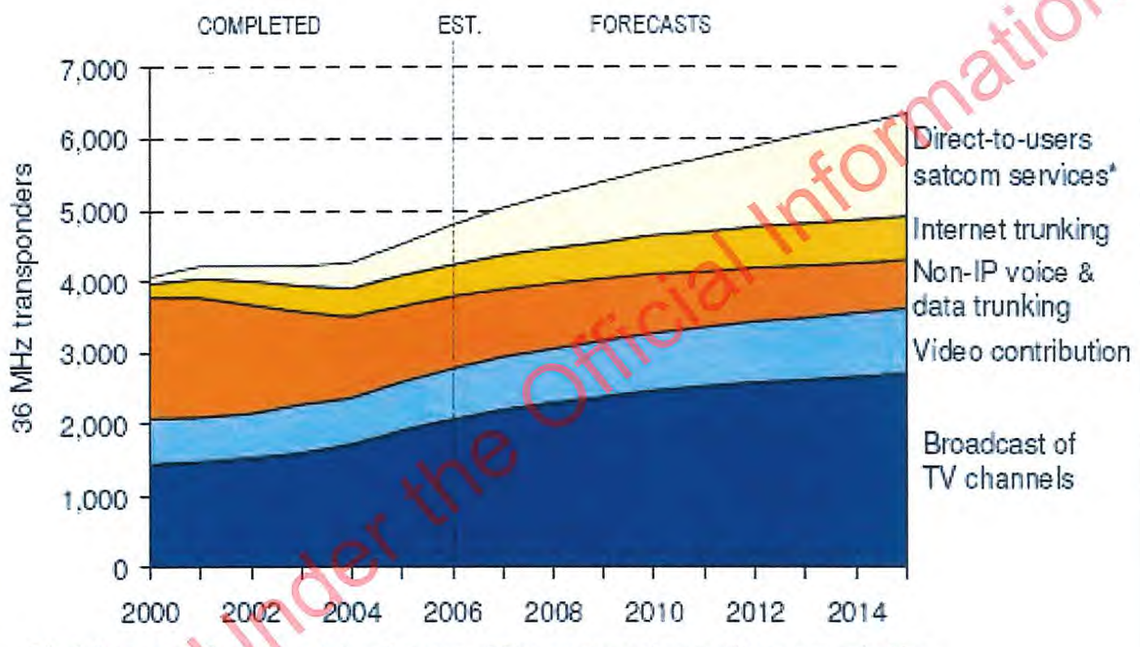
It currently costs $10,000 to send a liter of water from Earth to Deep Space

Asteroid mining will open a trillion-dollar industry and provide a **near-infinite supply** of Platinum Group Metals and water to **support our growth** both on this planet and off.

PLANETARY RESOURCES



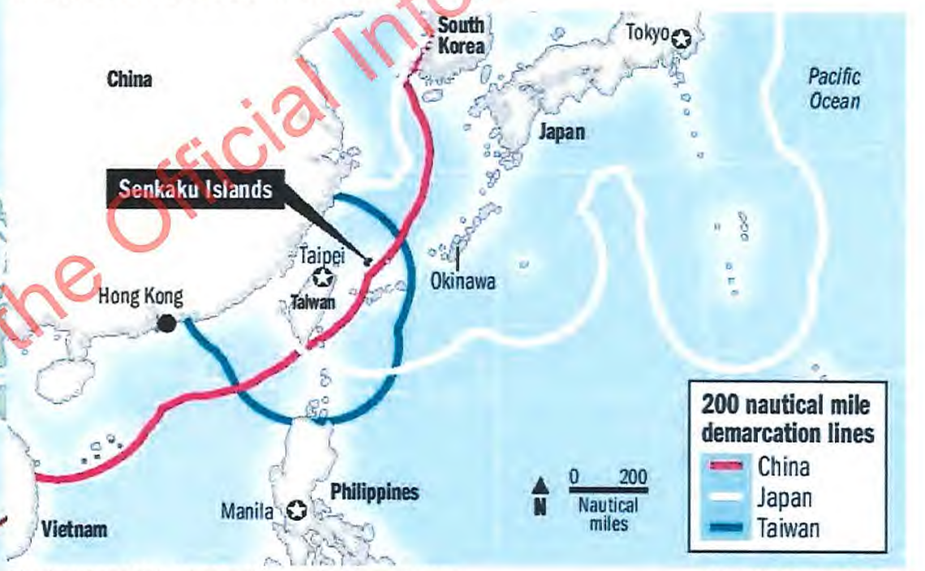
Forecasts of Transponder Demand by Application



* Includes corporate networks, Internet access, civilian government and military communications

TENSIONS RISE WITH FIERY RHETORIC

A recent declaration by a Chinese official that the Senkakus were a "core interest" ratcheted up fears in a region where China has increased patrols, Japan has said it would use force to protect its territory and the US said it would stand with Tokyo.

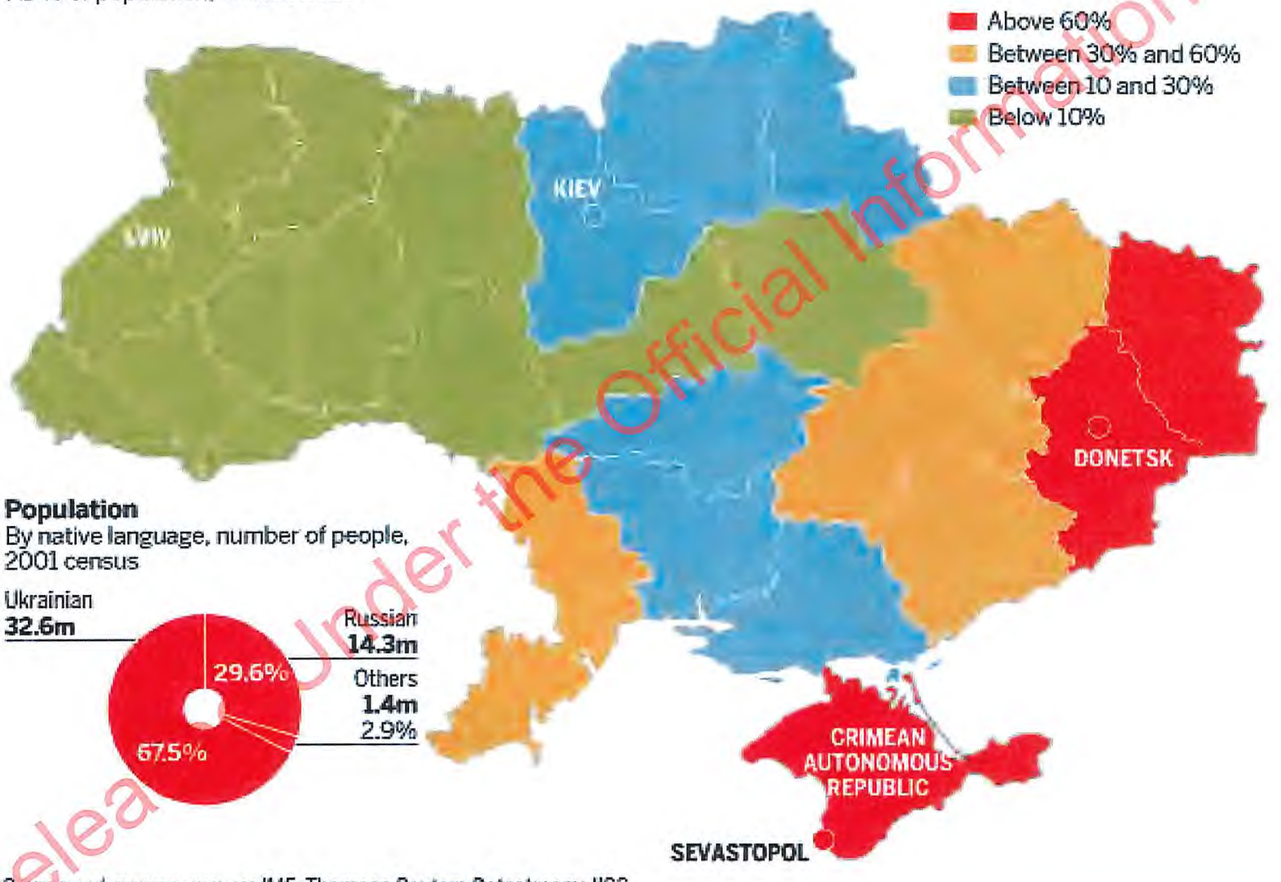


SOURCE: NATURAL EARTH MAPPING DATA, MILITARY TIMES RESEARCH

JOHN BRETSCHNEIDER/STAFF

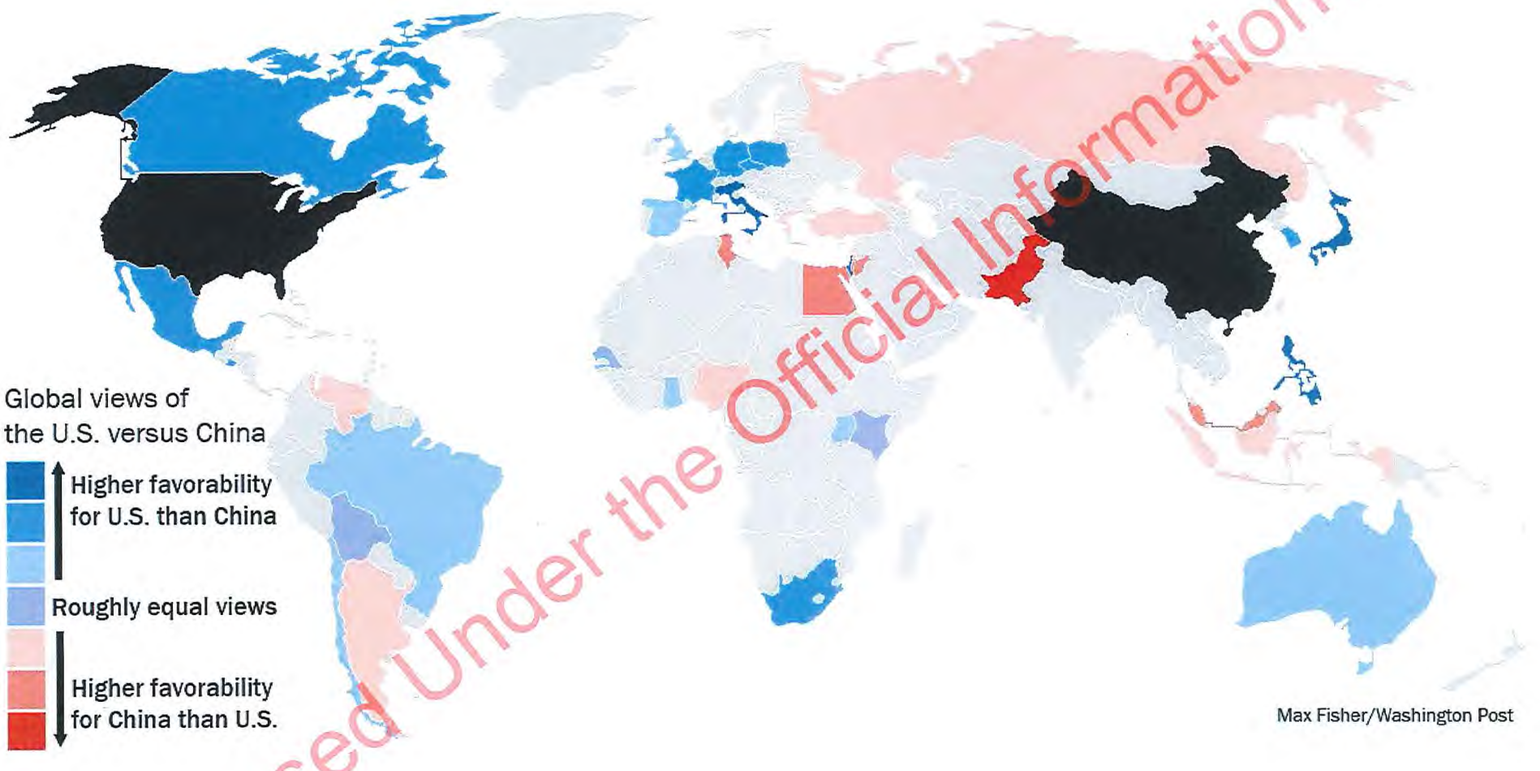
Ukraine: Russian native speakers

As % of population, census 2001



Population
By native language, number of people, 2001 census

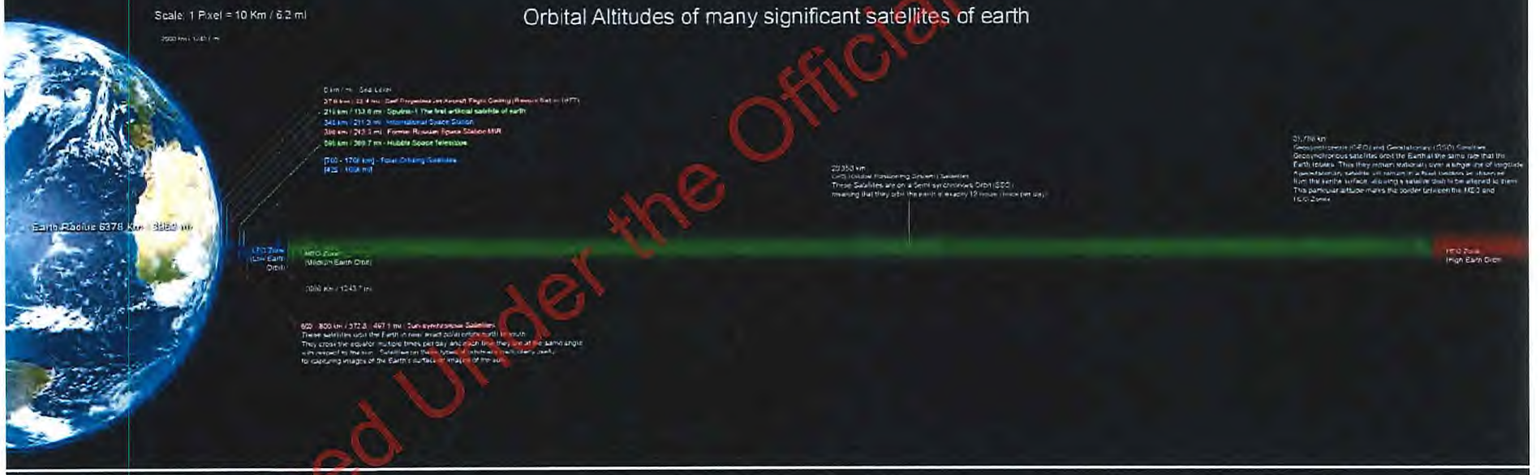
Sources: ukrcensus.gov.ua; IMF; Thomson Reuters Datastream; IISS

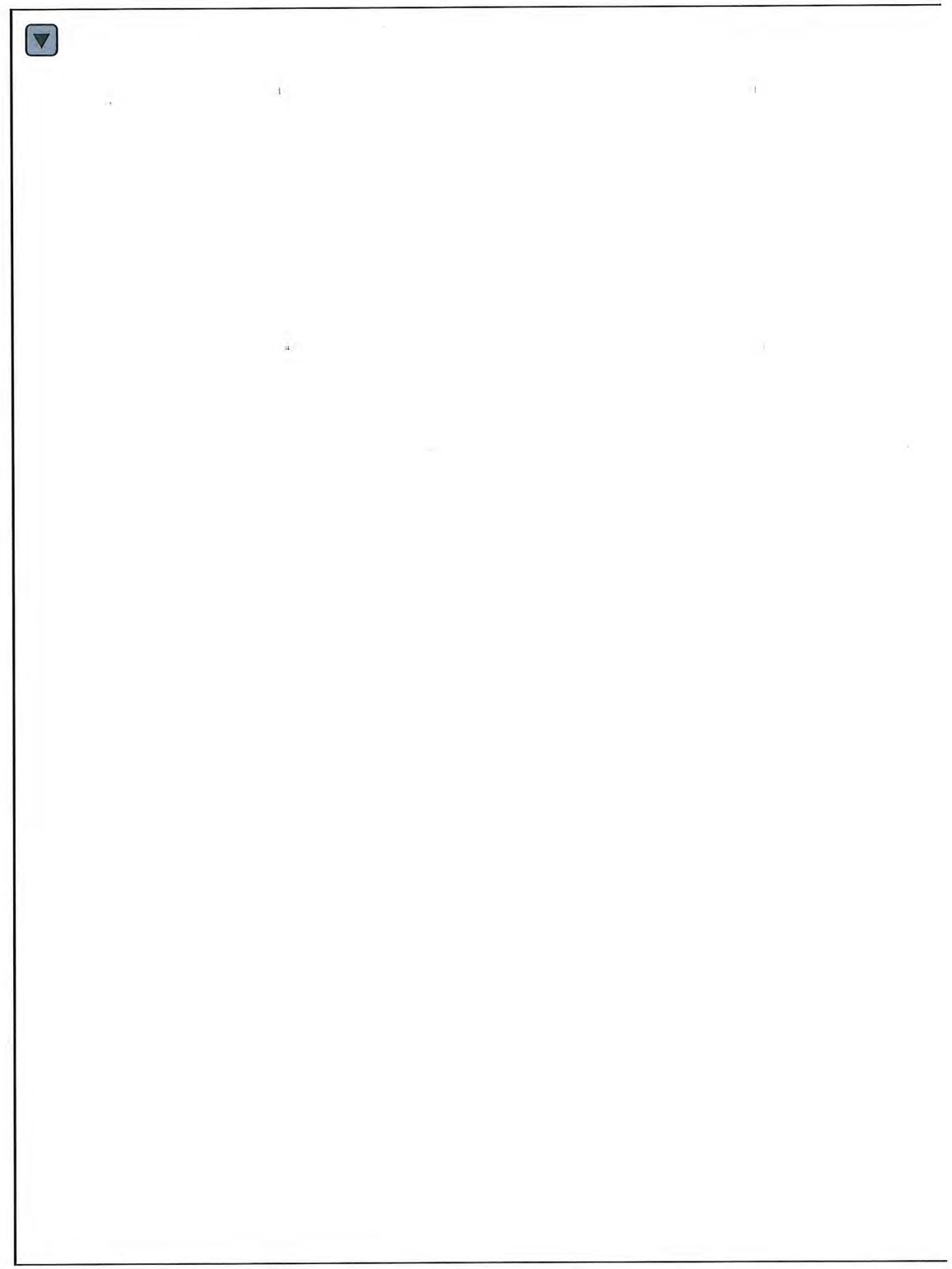


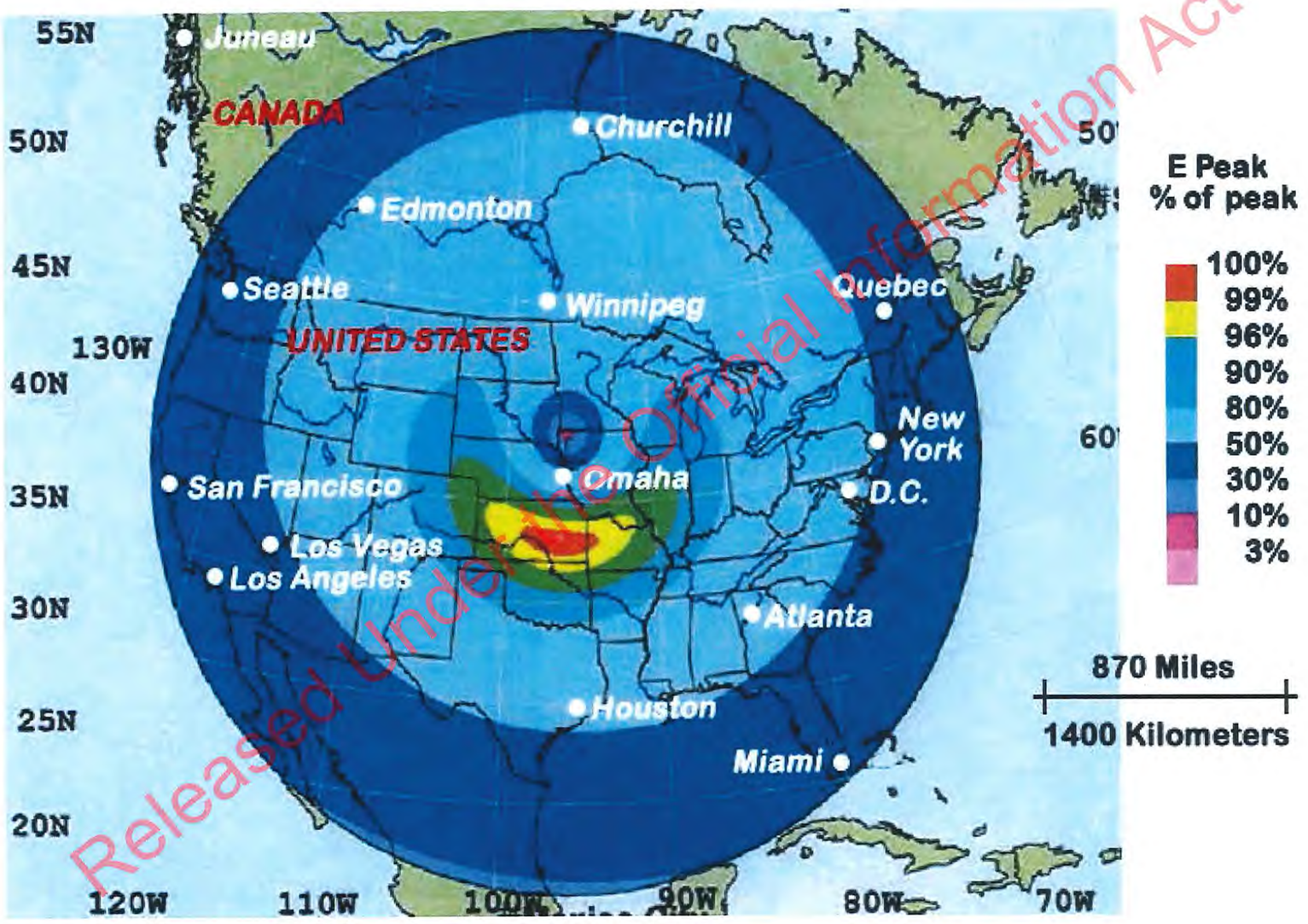
INCREASING MILITARISATION AND POSSIBLE WEAPONISATION – HOW?

- Increasingly contested
- Weapons from space
- Weapons through space
- Weapons to space
- Weapons in space

WEAPONS FROM SPACE





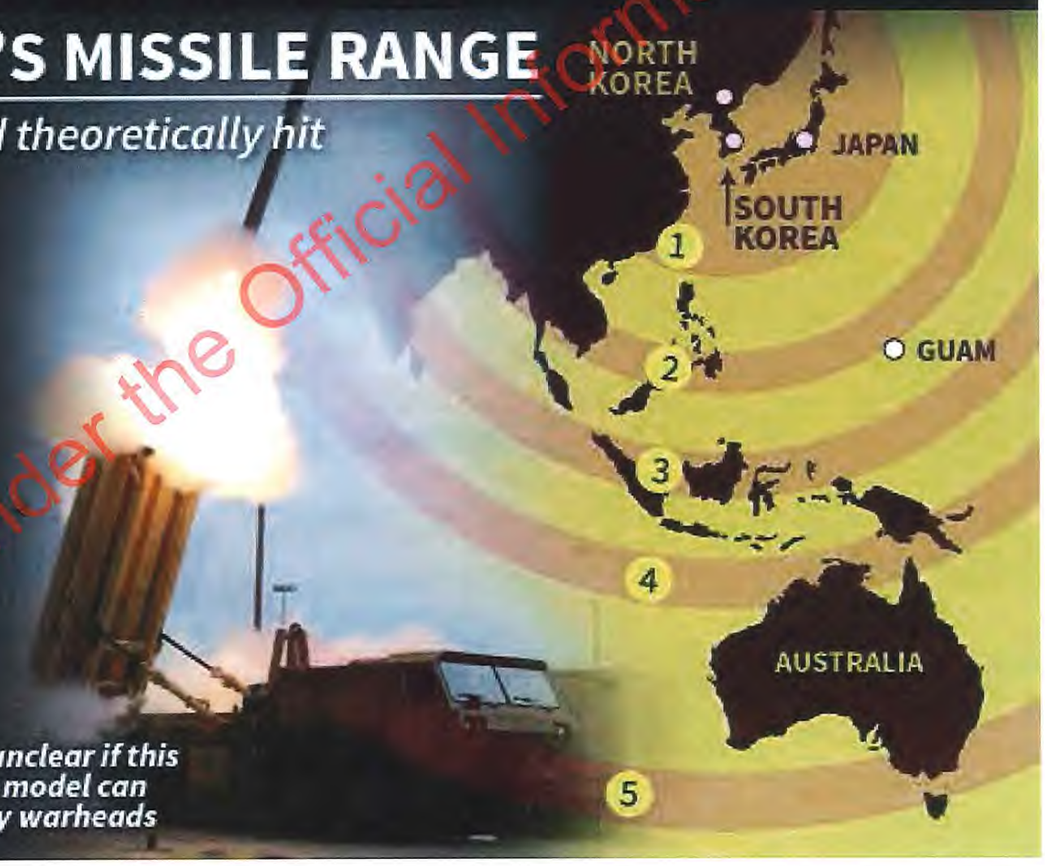


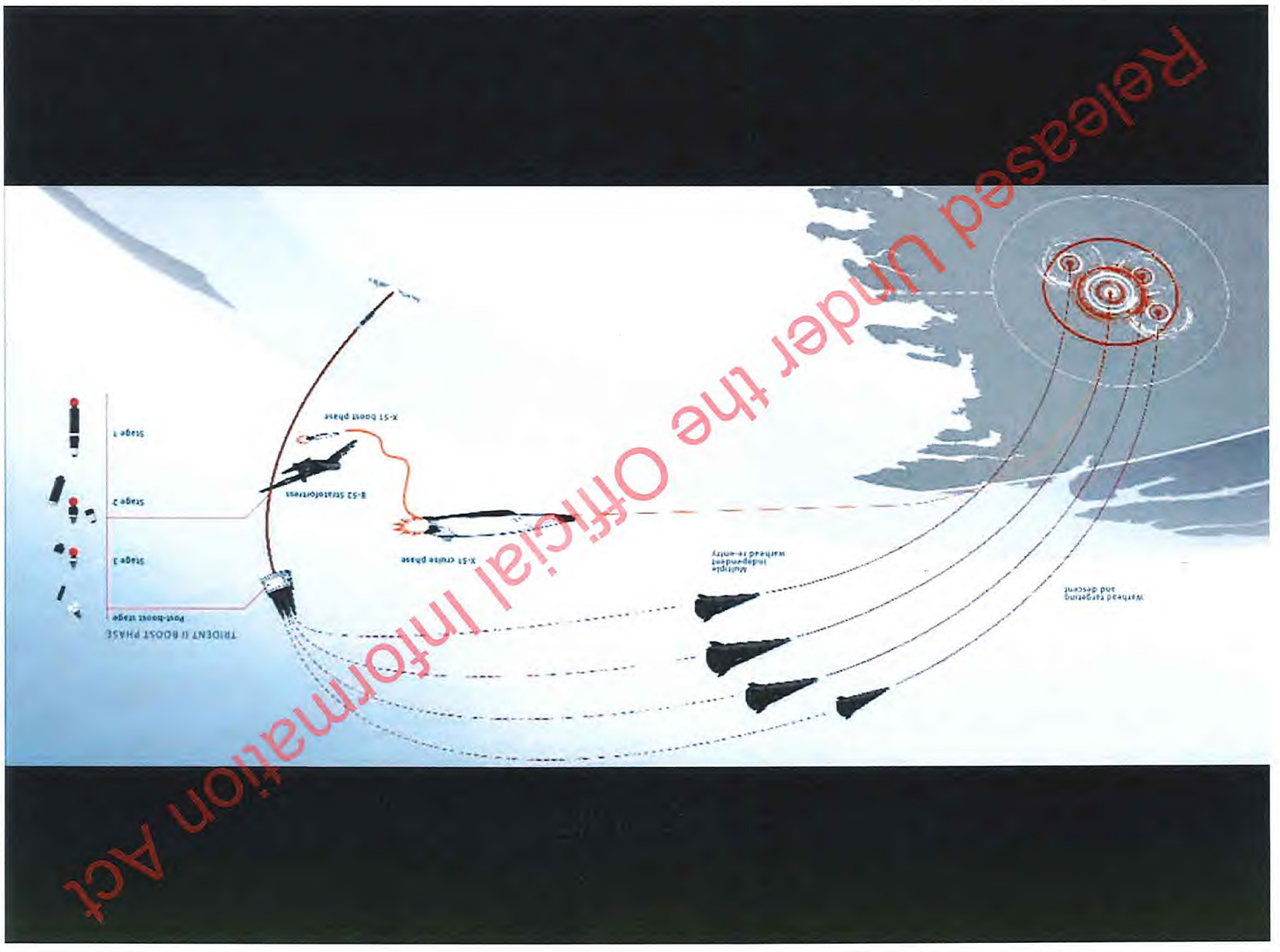
WEAPONS THROUGH SPACE

NORTH KOREA'S MISSILE RANGE

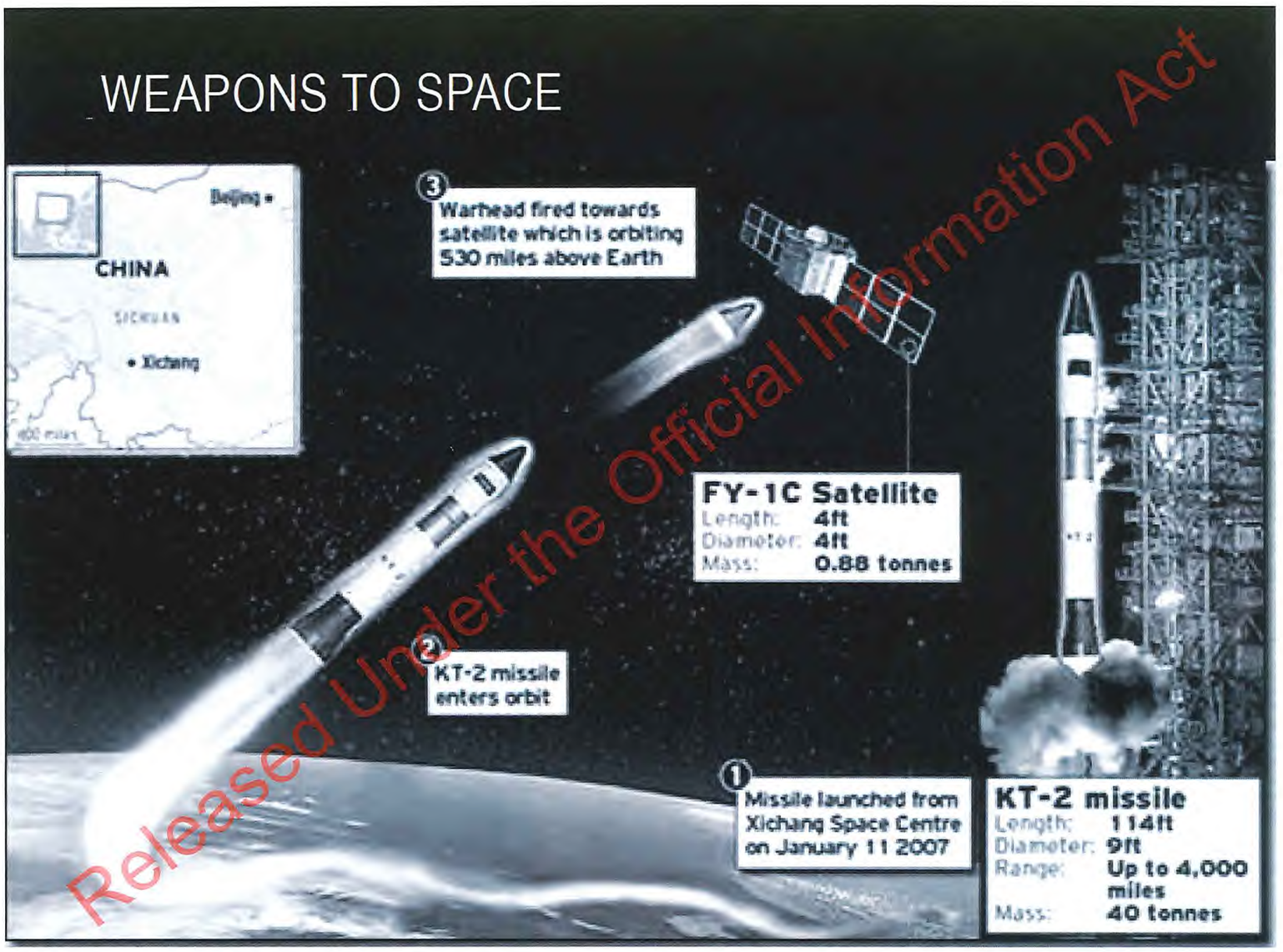
Where the rockets could theoretically hit

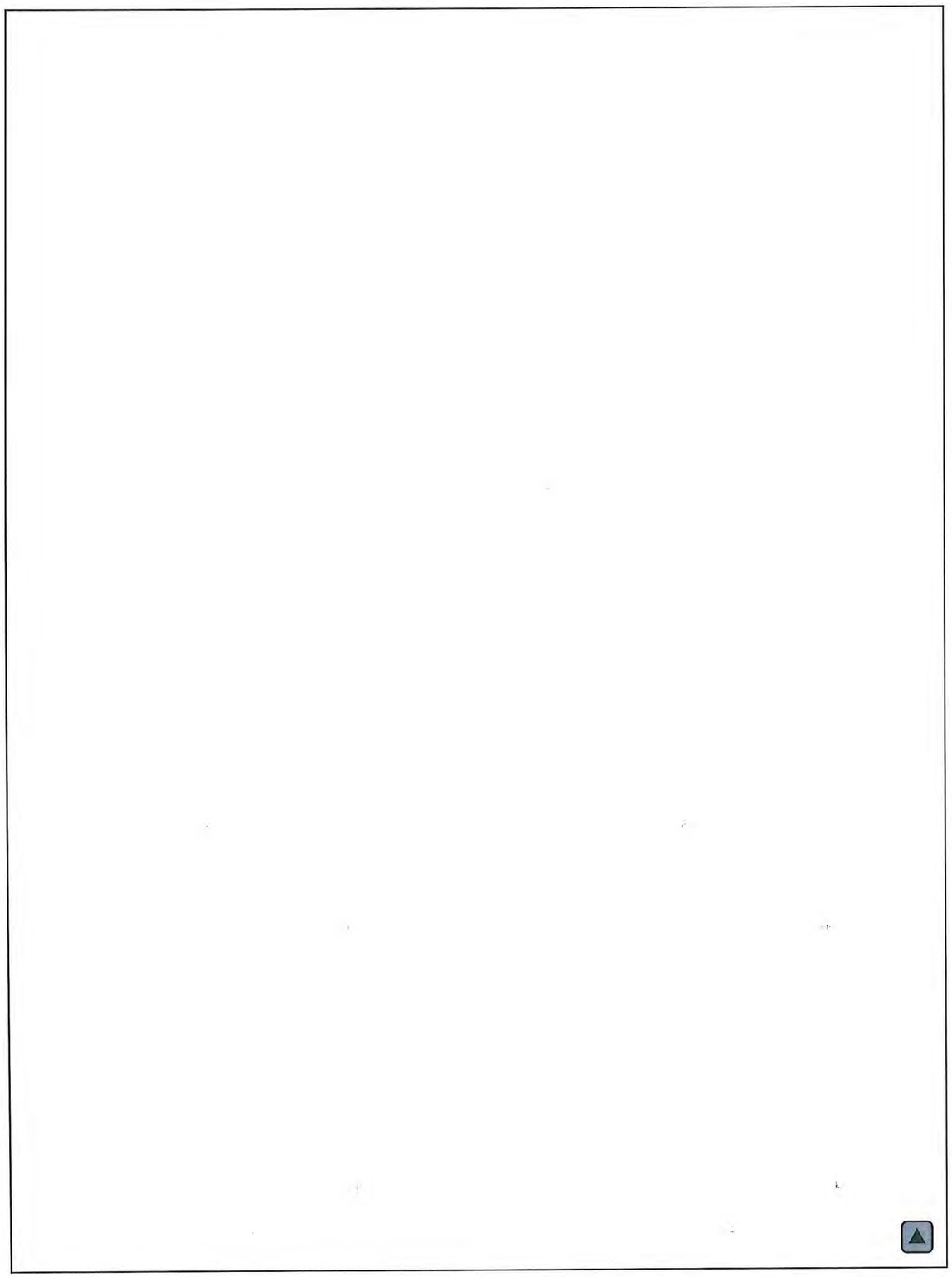
1. Nodong model **1,000km**
2. Taepodong-1 model **2,200km**
3. Musudan model **4,000km**
4. Taepodong-2 model **6,000km**
5. 5 Unha-3 model **10,000km** } ***It's unclear if this new model can carry warheads***

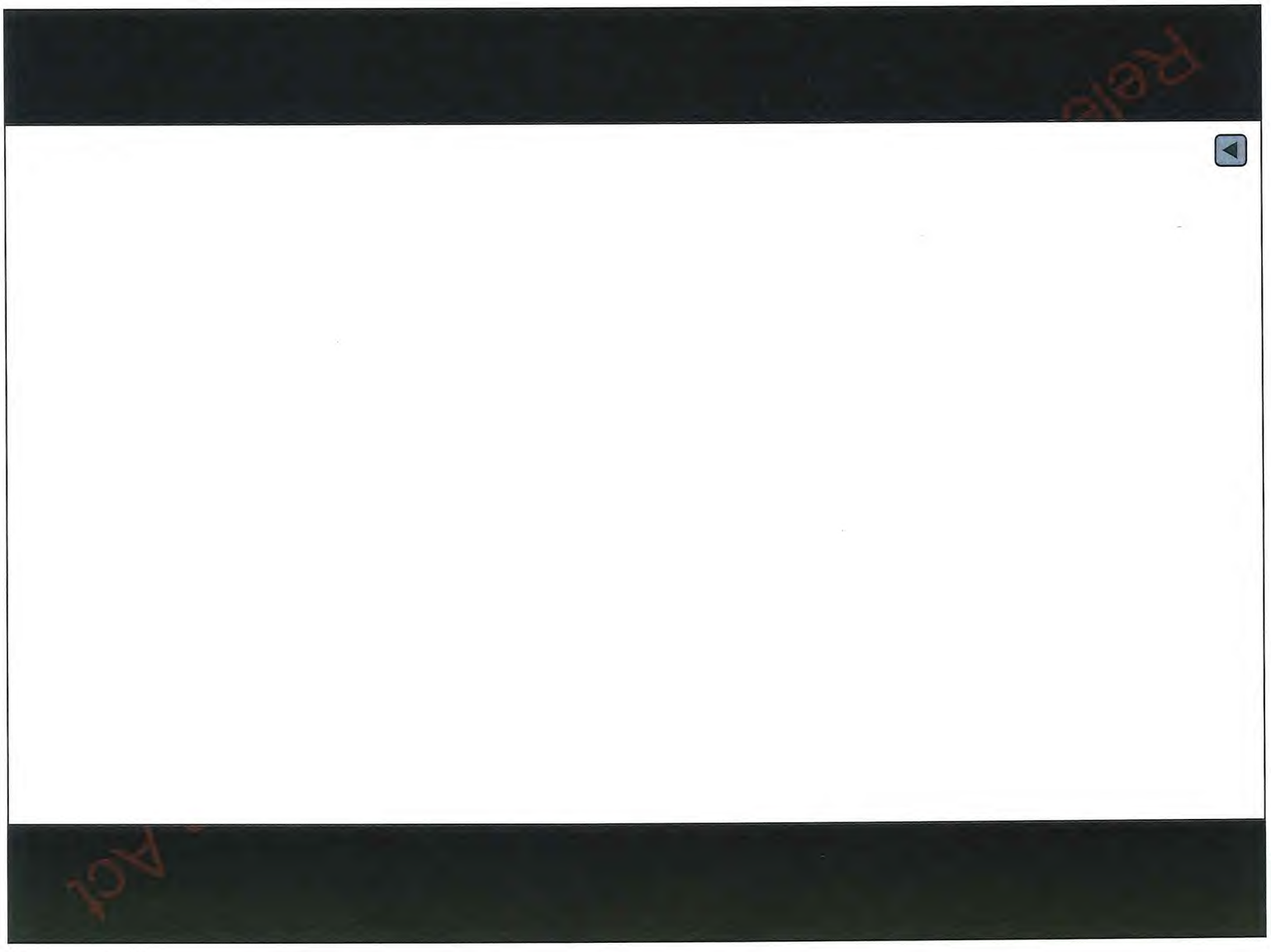


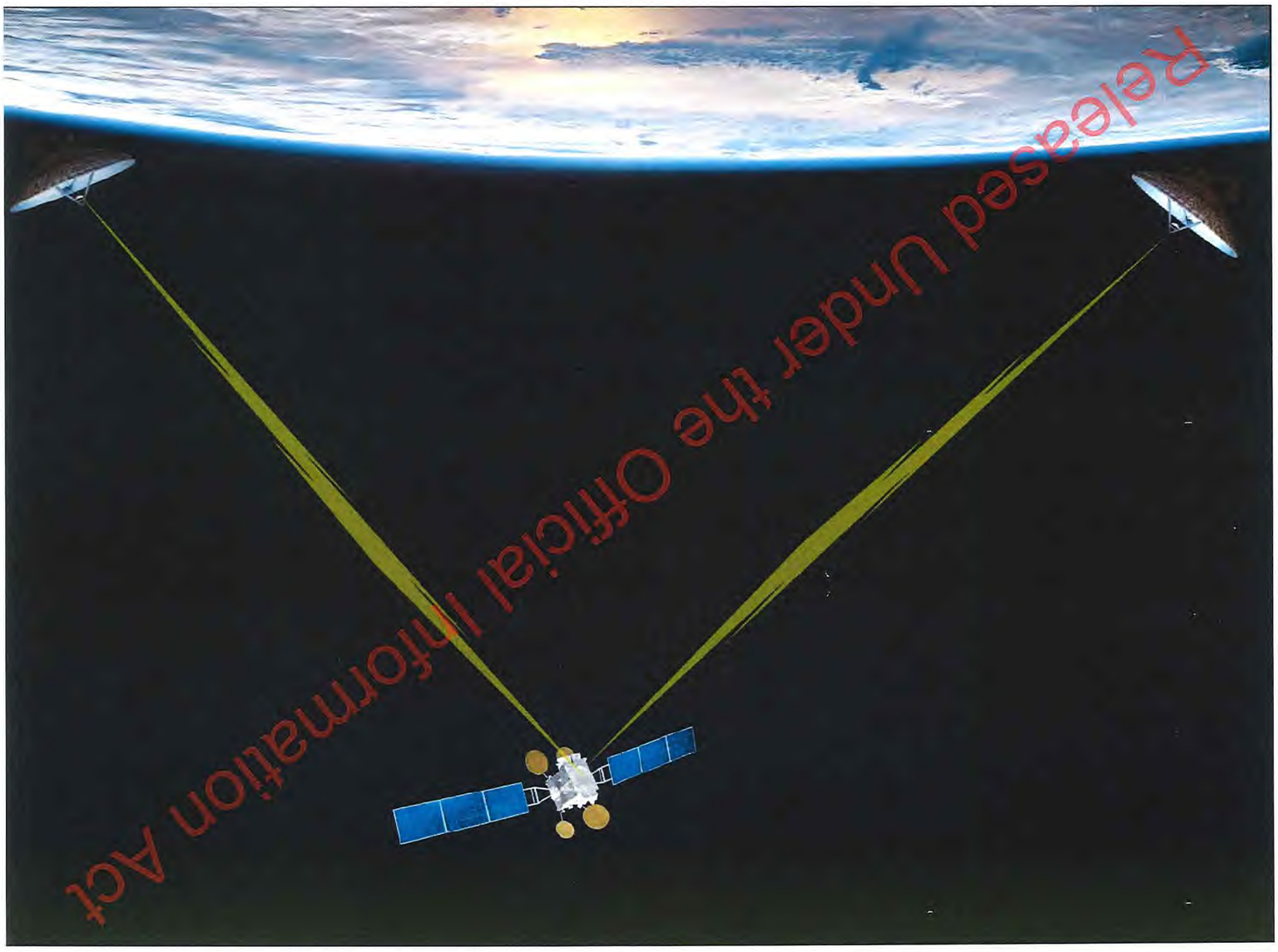


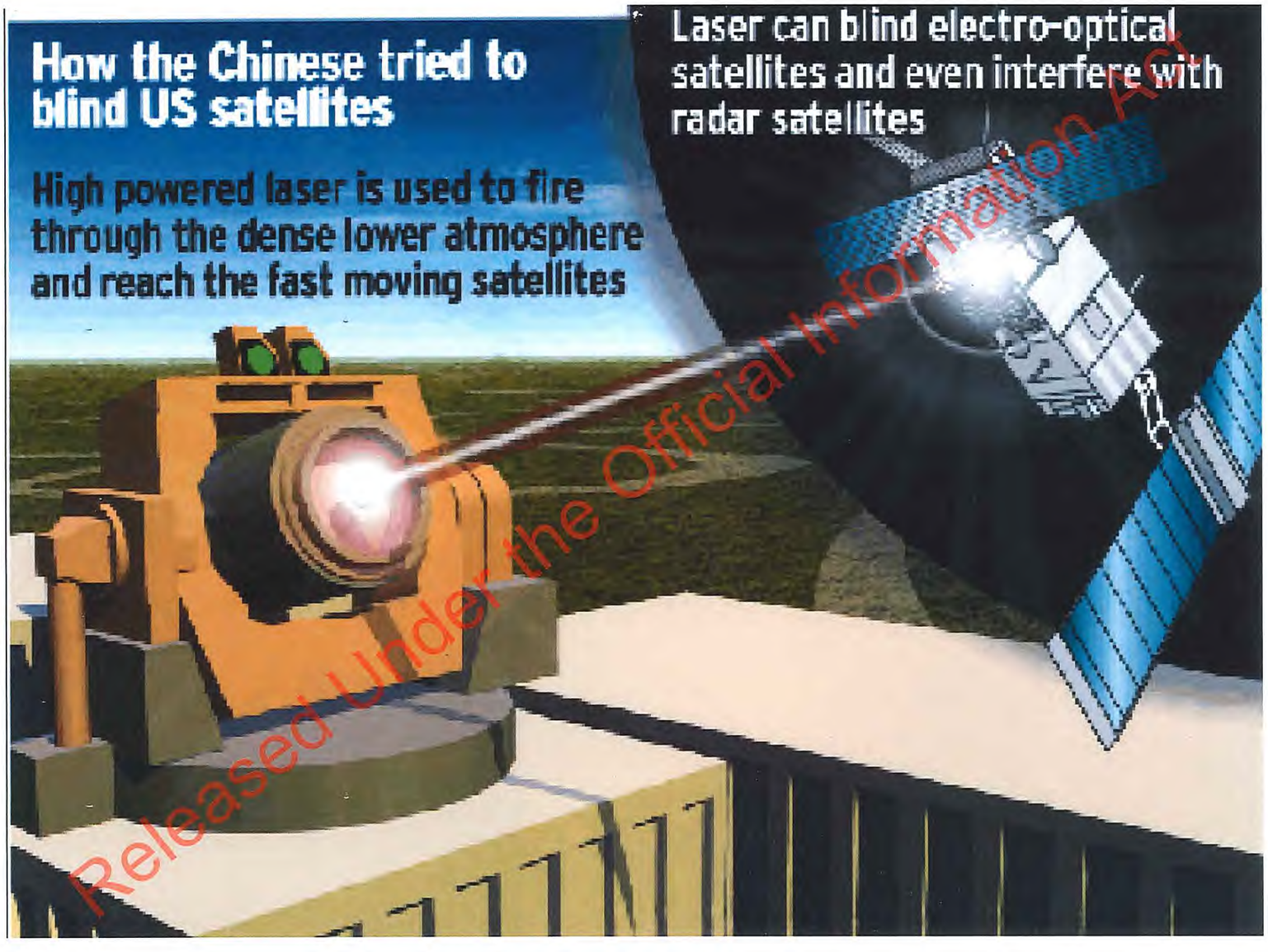
WEAPONS TO SPACE








Released Under the Official Information Act



WEAPONS IN SPACE

SOME NATIONAL SECURITY CHALLENGES

- Weaponisation of outer space
- Dual-use capabilities
  - Transparency
- Lack of clarity about 'Responsible Use of Outer Space'
- 'Escalation control' and spectrum from peace to conflict

PEACE

ARMED CONFLICT

ACTIONS	REACTIONS
Unfriendly, but not unlawful	Diplomacy (démarche) Retorsion International legal tribunals
Internationally wrongful act: • Breach of treaty obligation (eg, OST) • Breach of customary international law • Interference with sovereign rights • …	Protective measures
	Countermeasures
Threat or use of force (UN Charter Art 2(4))	Distress Necessity
Aggression?	Crime of aggression
Threat of (Anticipated) 'Armed Attack'	National (and collective) self-defence (CIL/UN)
Actual 'Armed attack (UN Charter Art 51)	UN Security Council resolution

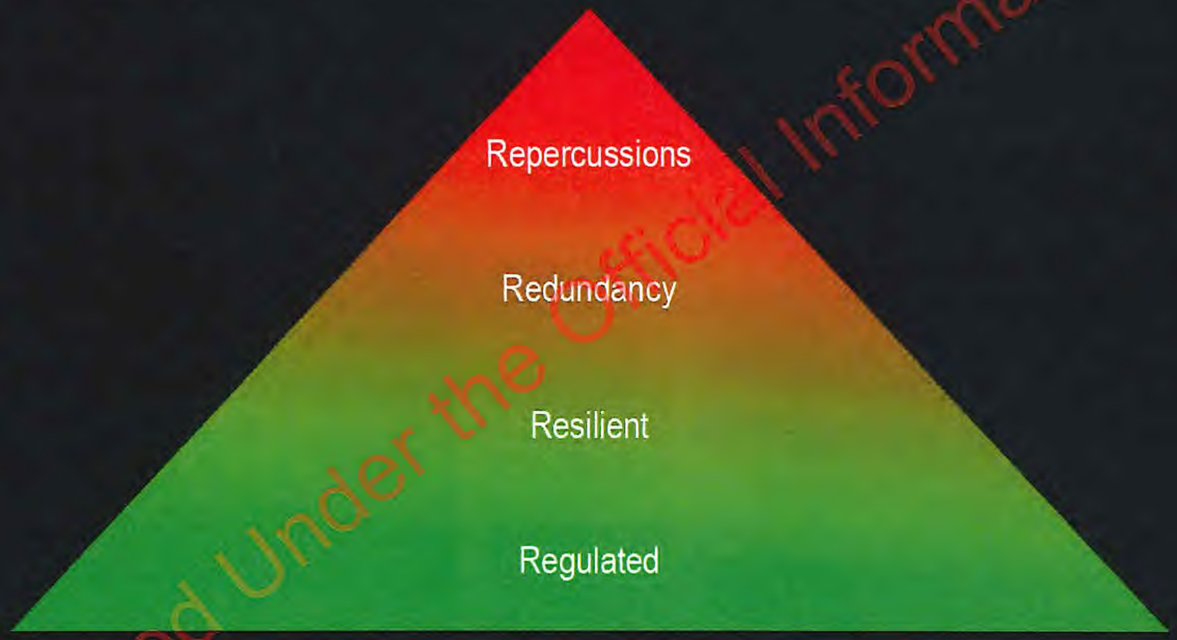
SPACE AND THE LAW OF WAR: *in bello*

- Military necessity
  - Space environment as a target: space debris as an area denial weapon, EMP
  - 'Envoys of mankind' as targets
  - Neutralisation vs destruction
- Distinction
  - Complex status of space objects: multi-national, dual-use
  - Perfidy, eg mobile satellite servicing
  - Marking
  - Registration and orbital parameters
  - Incapable of distinction?: creation of space debris, EMP, EW, cyber warfare

SPACE AND THE LAW OF WAR: *in bello*

- Proportionality
  - Extent of effects: creation of space debris, EMP, EW, cyber warfare
  - 'Day without space' and potential disruption, especially loss of PNT and SATCOM
- Humanity
  - Satellites have no mothers
  - 'Astronauts' ejecting in distress
  - Extra-terrestrials?

ATTRIBUTES OF A PEACEFUL SPACE DOMAIN

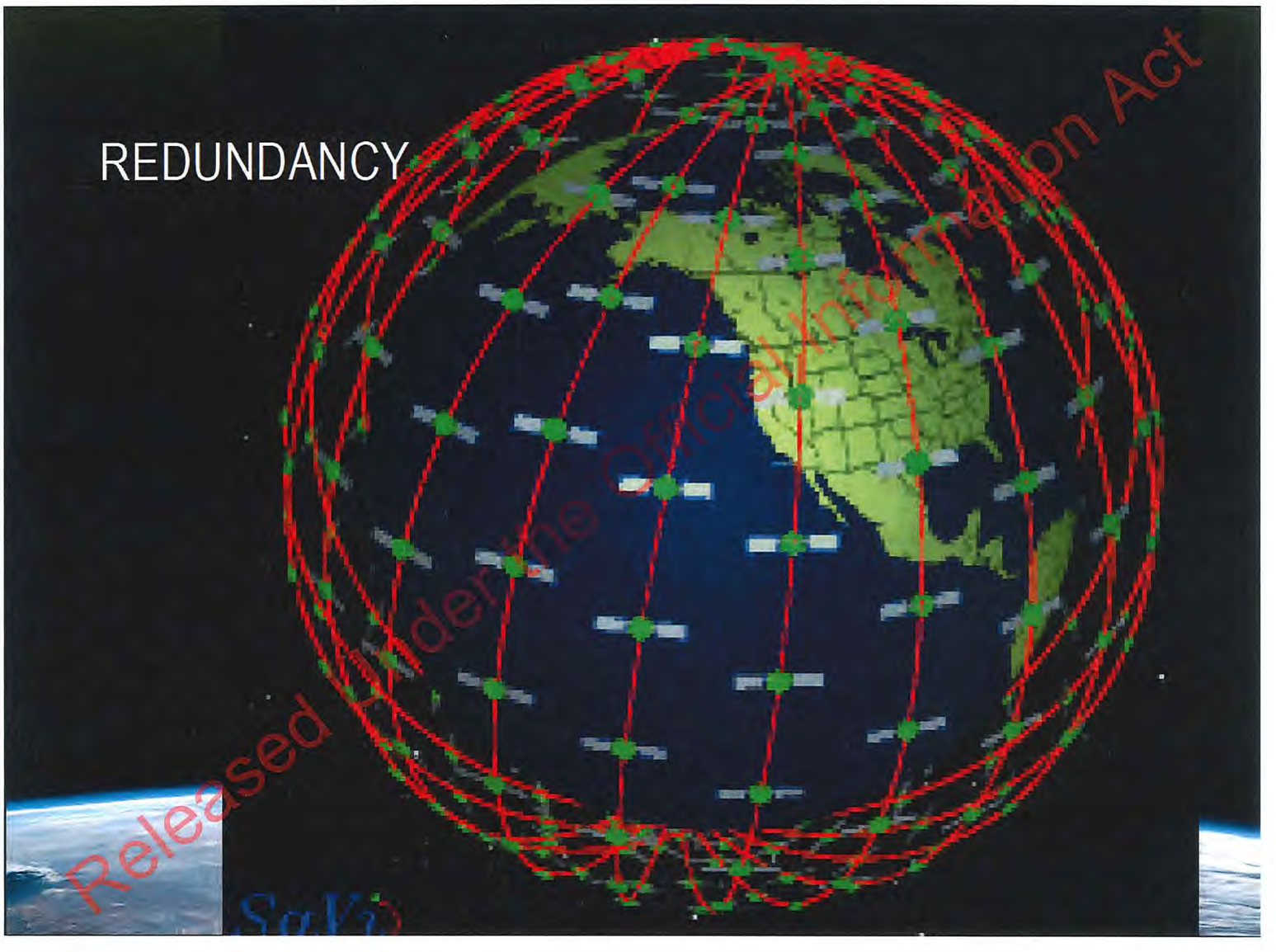


REGULATED

- Clarity
- Awareness
- Transparency
- Attribution

RESILIENT

- Protection
- Recoverability



REPERCUSSIONS

- Attribution
- Verifiability
- Normative framework
  - McGill Manual of International Law Applicable to Military uses of Outer Space
- Legitimacy
- Clarity
- Capability
- Effective
- Minimum recoil

DO WE NEED A 'LEVIATHAN' FOR SPACE?

NATURAL COSMIC HAZARDS AND PLANETARY DEFENCE

International Law Commission, Draft Articles of State Responsibility – Article 25:

1. Necessity may not be invoked by a State as a ground for precluding the wrongfulness of an act not in conformity with an international obligation of that State unless the act:

(**a**) is the only way for the State to safeguard an essential interest against a grave and imminent peril;

and

(**b**) does not seriously impair an essential interest of the State or States towards which the obligation exists, or of the international community as a whole.

QUESTIONS / COMMENTS