Improving Nuclear Stability through Shared Missile-launch Surveillance: Introduction

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MIT's Program on Science, Technology and Society

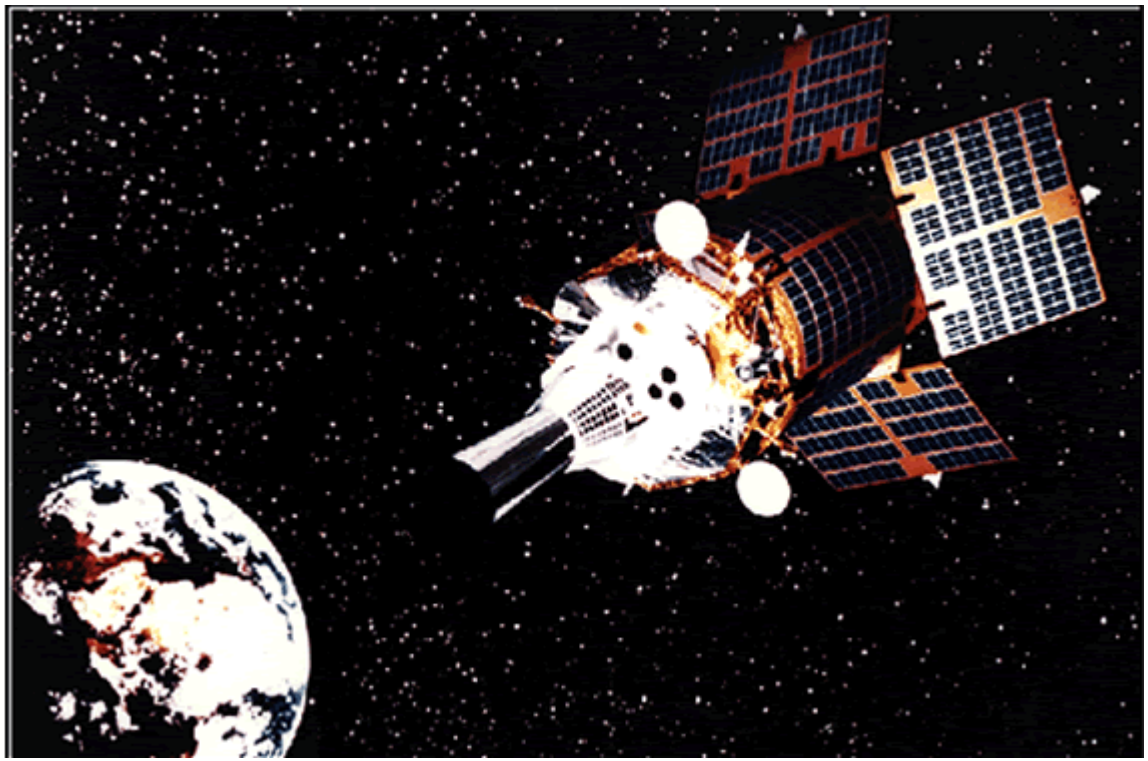
1. U.S. Nuclear Accidents and One-Point-Safety of Nuclear Weapons
2. Nuclear Accidents and the Failure of Deterrence
3. Shared Missile Launch Surveillance from Space

Shortly before 9am, on November 9, 1979, NORAD's computer screens showed a massive nuclear attack on the US…

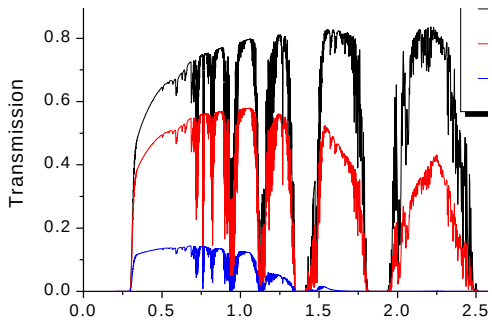
US nuclear forces were put on heightened alert…

and a National Threat Assessment Conference at the Pentagon's National Military Command Center was convened…

Fortunately, the National Threat Assessment Conference was able to review the raw data from the Defense Support Program satellites…



These satellites can see the hot plume from outer space…



No Launches were detected! The alert was canceled and the US nuclear forces stood down.

Later it was determined that someone had placed a training tape—featuring all the signs of a realistic massive attack—in the computer just before shift change.

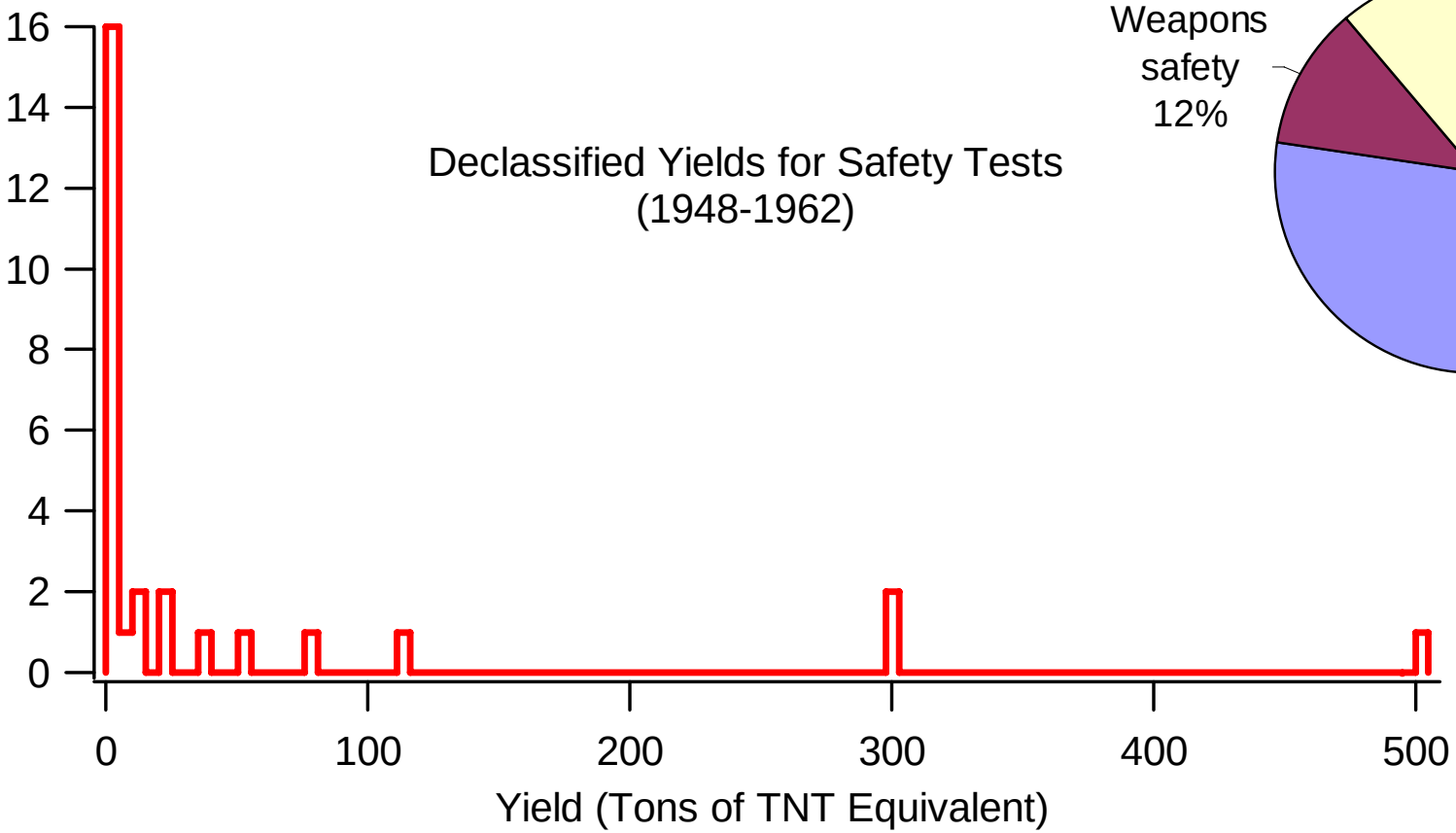
The Problem: Accidental nuclear detonations.

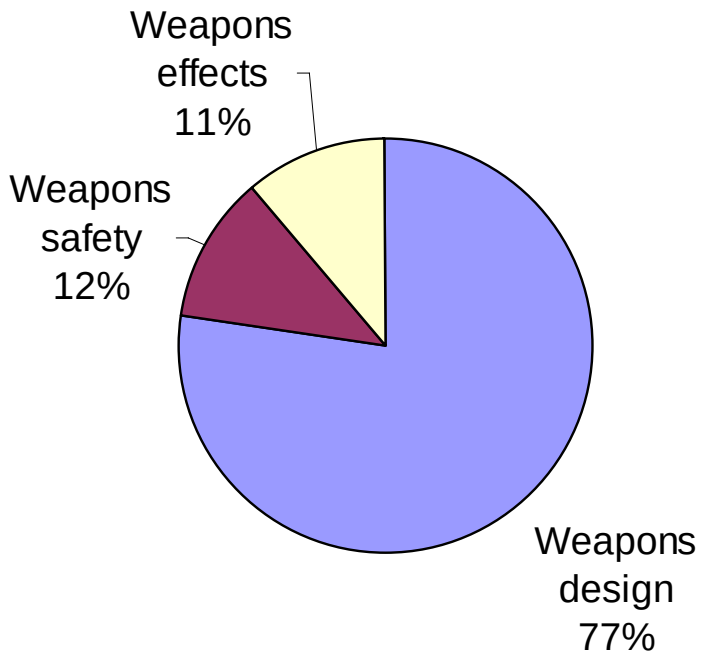
June 7, 1960, a on-alert BOMARC nuclear-tipped air defense missile burned, **melting the plutonium pit in the warhead.**

January 16, 1961, A US fighter on quick reaction alert was accidentally burned while loaded with a nuclear weapon. **The Genie (1.7 Kt) nuclear warhead was scorched and blistered**.

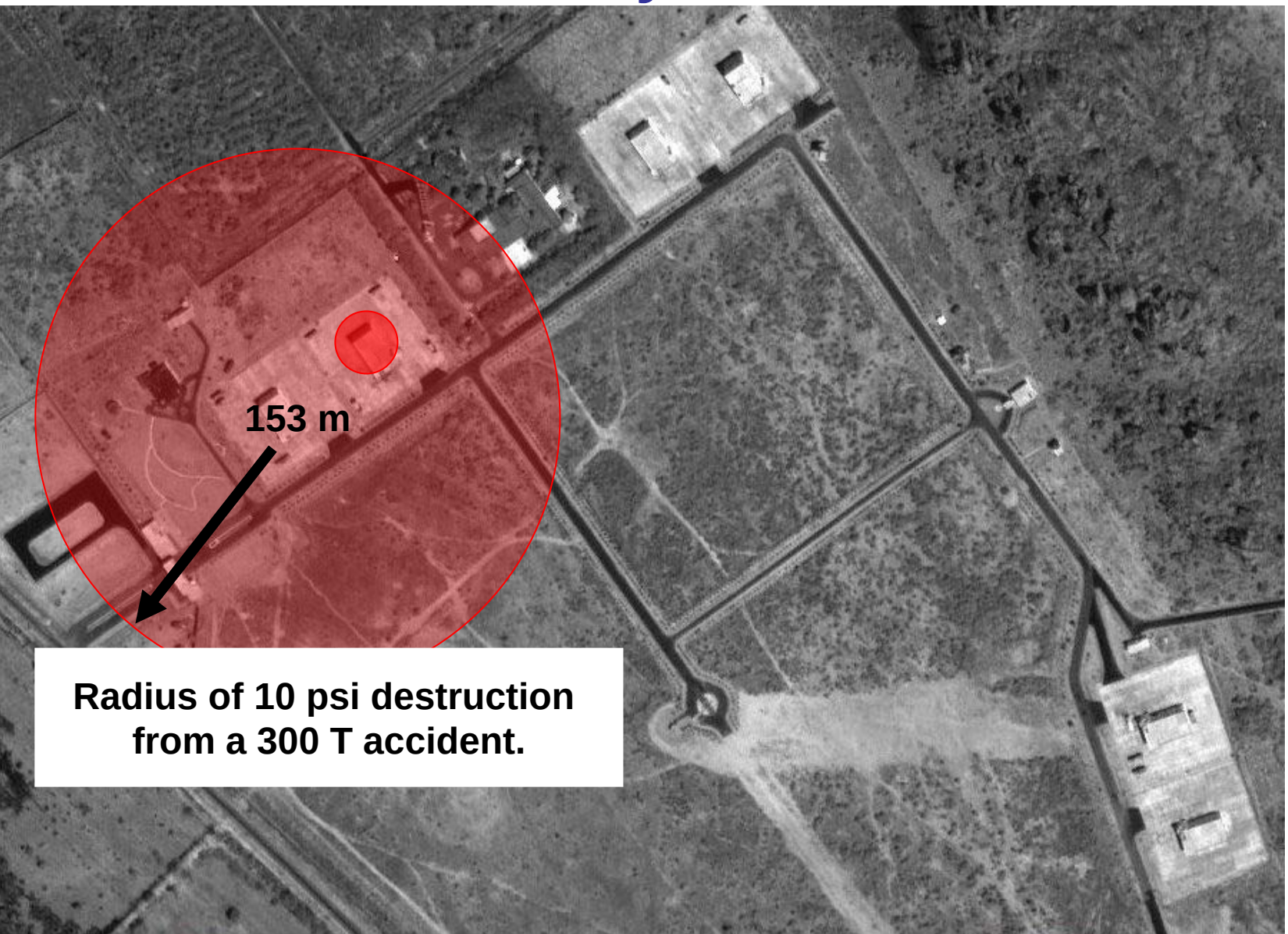
And many, many more!

The US has experienced a number of failures of one-point safety designs



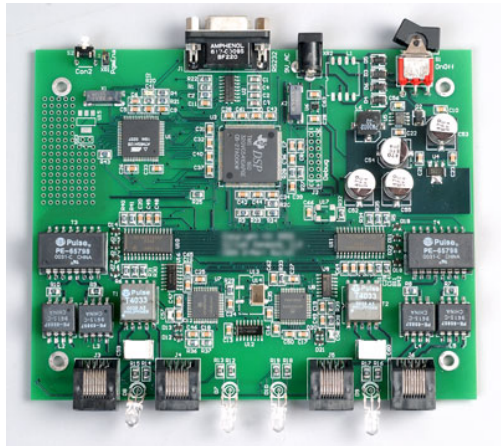


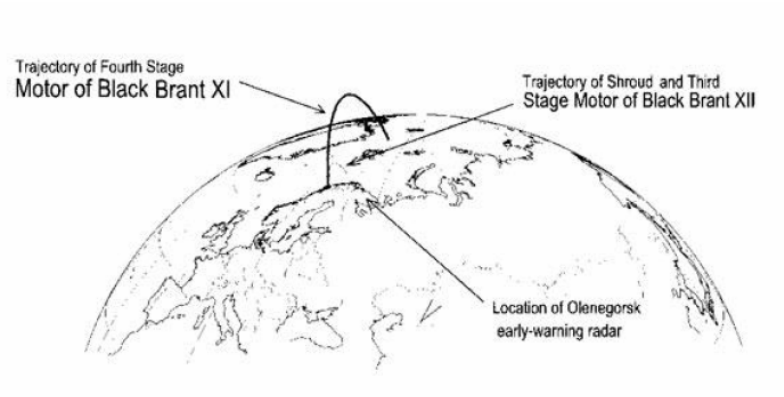
Probable Prithvi TEL Garages, outside Hyderabad, India



Two other incidents caused nuclear alerts that were prevented from escalating to nuclear wars by examining the information from space-based missile launch surveillance:

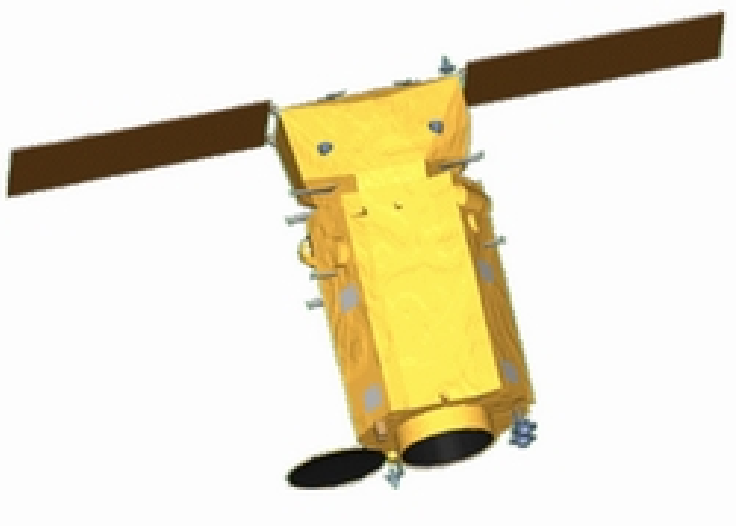
3 June 1980; a short circuit at NORAD caused the computers to show varying numbers of missile launches to be displayed. Again, DSP showed there had been no launches.

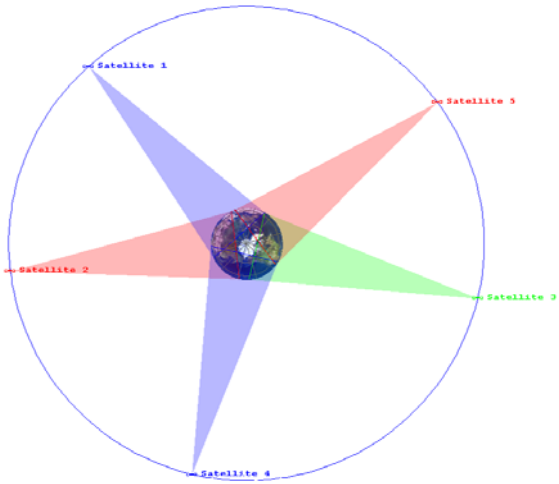


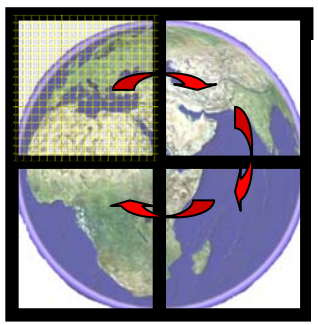


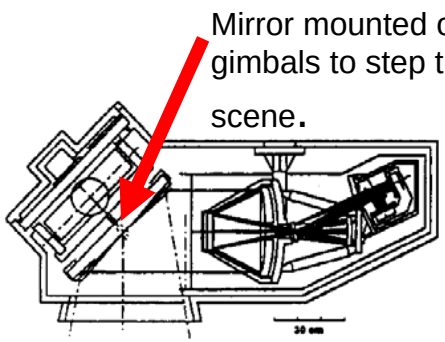
25 January 1995; a sounding rocket launched from Norway triggered a Russian nuclear alert. This time a Russian early-warning satellite reassured President Yeltsin that it wasn't part of a nuclear attack.

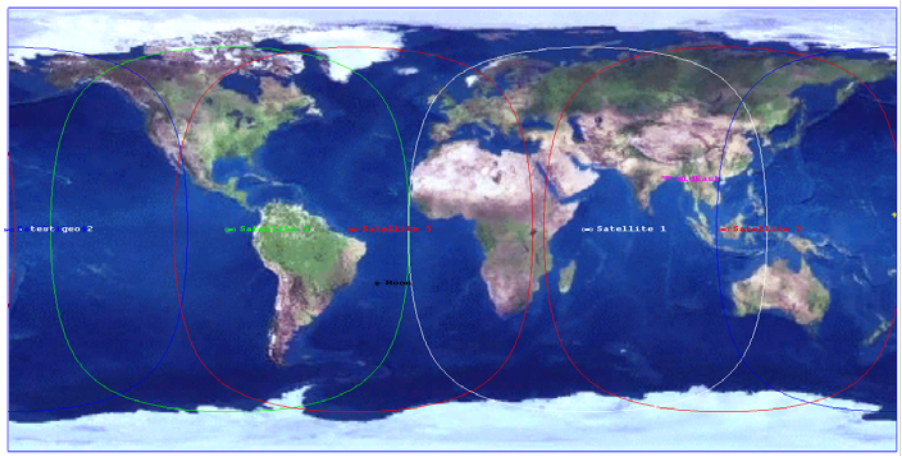
A globally shared, five satellite constellation capable of observing missile launches from geostationary orbit.



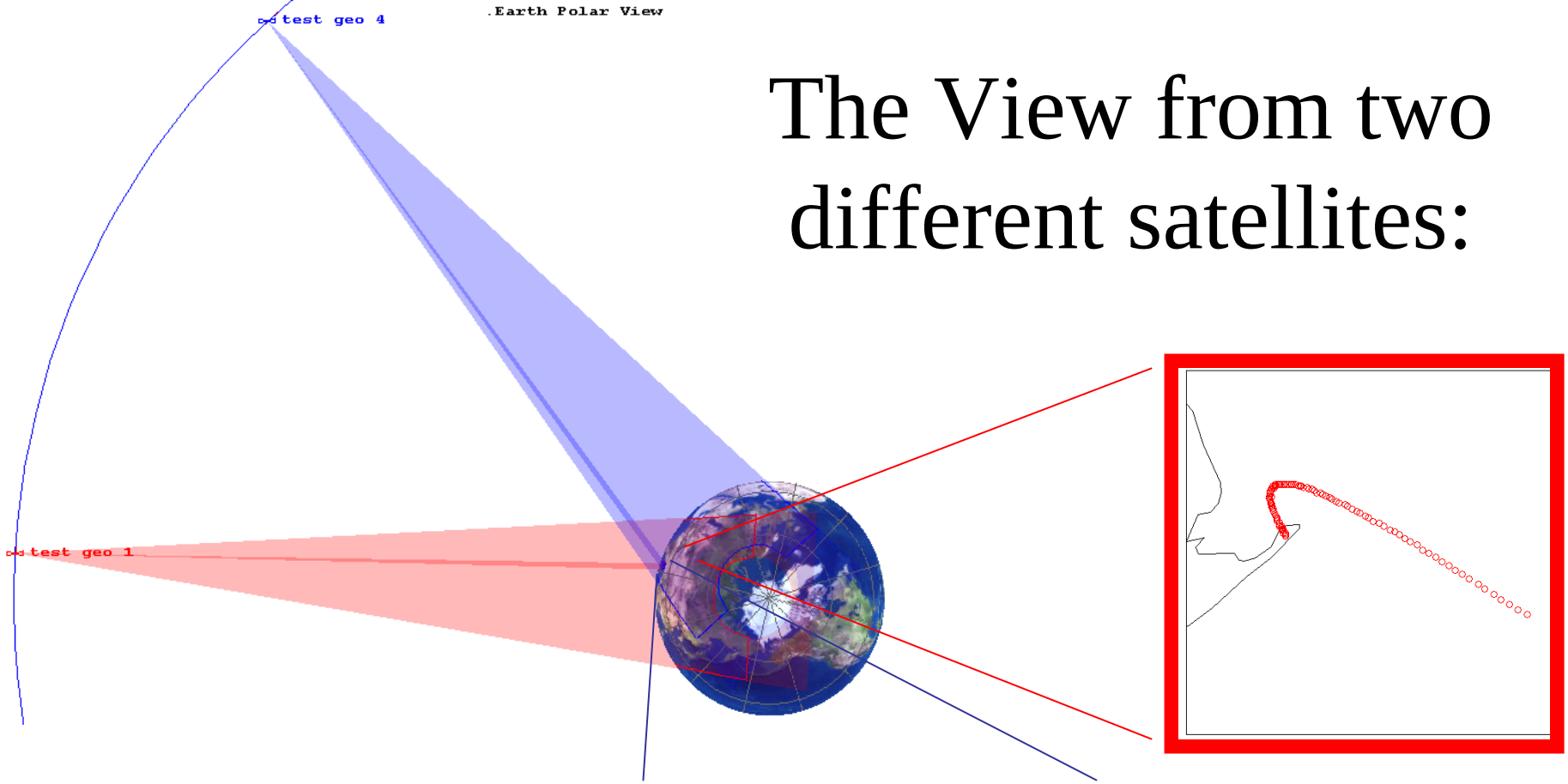


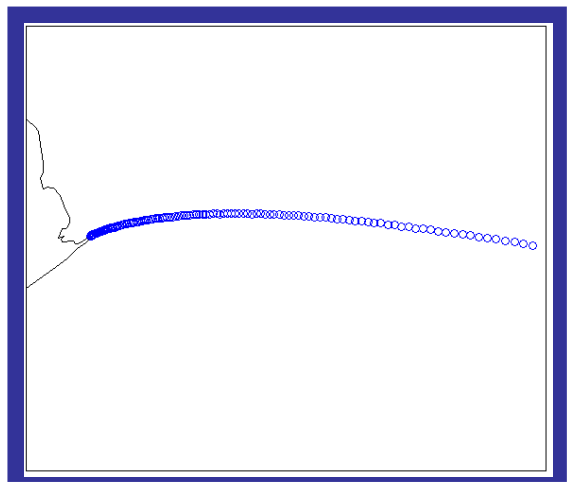






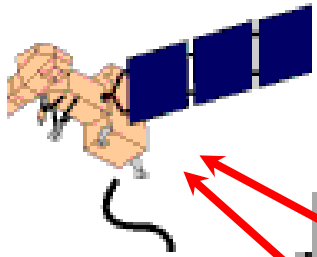
The View from two different satellites:





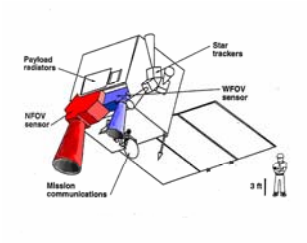
Two satellites can look at the same track to stereographically determine the altitude of the missile. But it is possible for a single satellite to determine the missile's altitude if it is below 30 km.

Each country would have direct access to the raw data



In a time of crisis, it will be the **LACK** of a missile launch that will be important!

Satellite Cost Estimates



(Assuming Russian launch services)

Unit satellite costs = $250 M

Launch service cost per satellite = $75 M

} **x5**

Development costs = $400 M

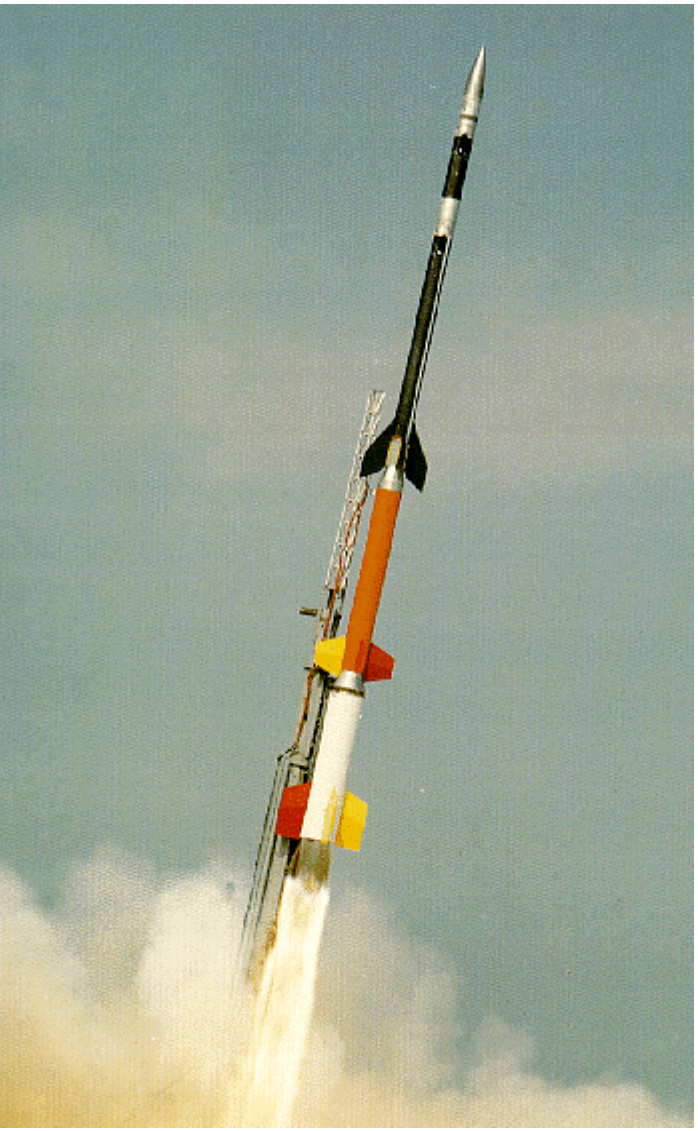
Total cost for system = $2,025 M

There are policy questions to be considered:

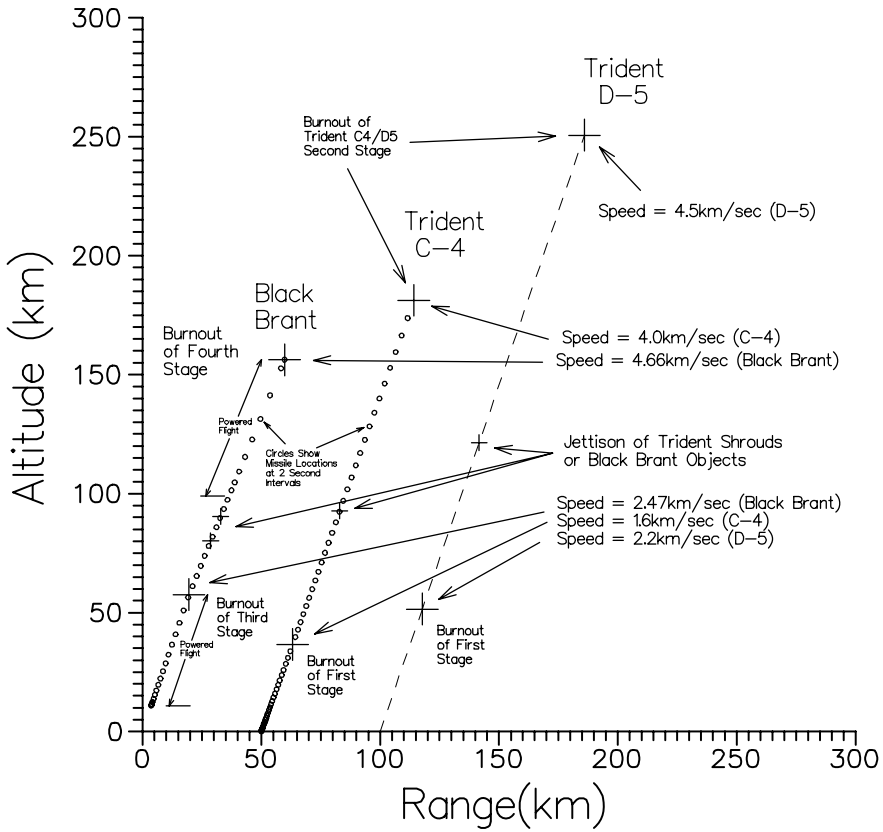
- Could the system be abused (by enabling a switch to launch on warning, for instance?) and could that be countered by adding a delay in data transmission?
- How can we make the data inherently authentic?
- Is the resulting increased transparency into missile proliferation desirable or not? (see the next session)

Questions/Comments?

A January 26, 1995 sounding rocket launch triggered an increased Russian alert level



Many of the Black Brant XII's characteristics appeared similar to a Trident's.



What Russia was afraid of:

Unfortunately, there are all too many other examples of accidents involving nuclear weapons!

27 July 1956—RAF Base Lakenheath. A B-47 practicing touch-and-go landings, slid off the runway and crashed into a nuclear weapons storage igloo spilling jet fuel from the bomber. Fire engulfed the storage igloo and the nuclear weapons inside.

31 January 1958—SAC Base Reflex, French Morocoo. A B-47 with one nuclear weapon in full strike mode, skidded off the end of the runway, rupturing its fuel tanks and spilling jet fuel over the weapon. The base was evacuated fearing a nuclear explosion.

11 March 1958—Florence, South Carolina. During a SAC exercise, a B-47 accidentally released a nuclear weapon over a sparsely populated area near Florence. The high explosive in the weapon exploded on impact but there was no nuclear detonation.

4 November 1958, Dyess AFB, Abilene, Texas—A B-47 caught fire on takeoff with one nuclear weapon onboard. The weapon's high explosive detonated (causing a crater 35 feet in diameter and six feet deep) but did not cause a nuclear explosion.

…and many, many more!