CENTER FOR SCIENCE AND TECHNOLOGY INTELLIGENCE
NATIONAL DEFENSE INTELLIGENCE COLLEGE

GLOBAL CONTEXT FUTURE FOCUSED-INTELLIGENCE FOR OUR NATION'S SECURITY

S&T Intelligence in a Globalized World

Anticipating Innovation

September 8, 2008

"What one man can invent, another can discover"

Sherlock Holmes in "The Adventure of the Dancing Men"

National Intelligence Priorities Framework

- The NIPF is the DNI's guidance to the IC on the National Intelligence Priorities approved by the President.
  - Continuous process to establish focus
- ***"Emerging and Disruptive Technologies"***
  - New or disruptive technologies and capabilities:
    - Counter U.S. technological superiority
    - Significantly affect U.S. military, economic, critical infrastructure, or national security interests.

Technology Surprise

Emerging Technology

Sustaining

Can Be Anticipated

Can be beneficial or harmful to US interests

Disruptive Technology

Transforming

Can Be Anticipated

Can be beneficial or harmful to US interests

Technology Surprise

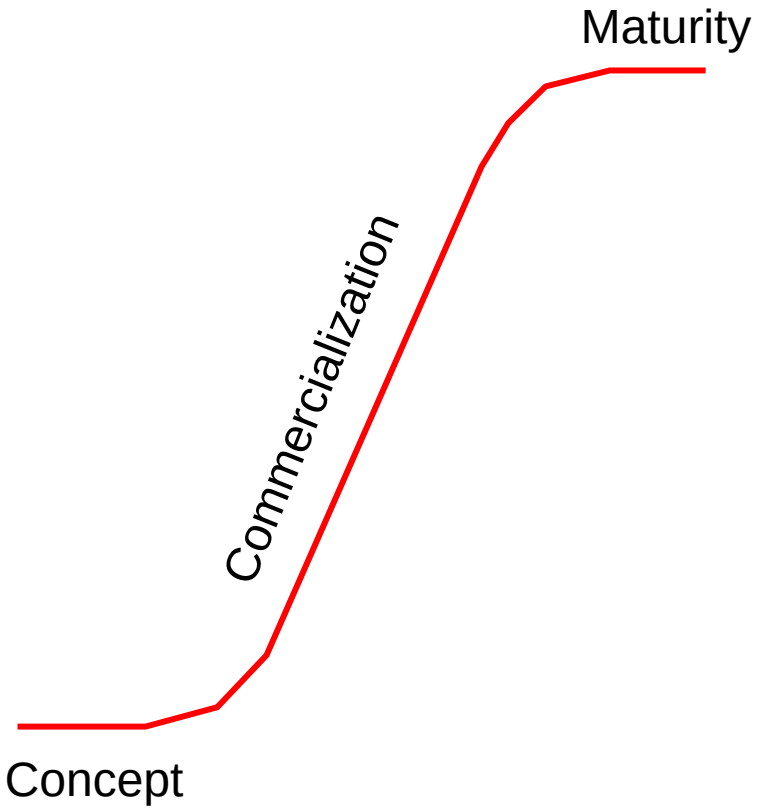
Can Be Either Disruptive or Emerging

Is Not Warned or Anticipated

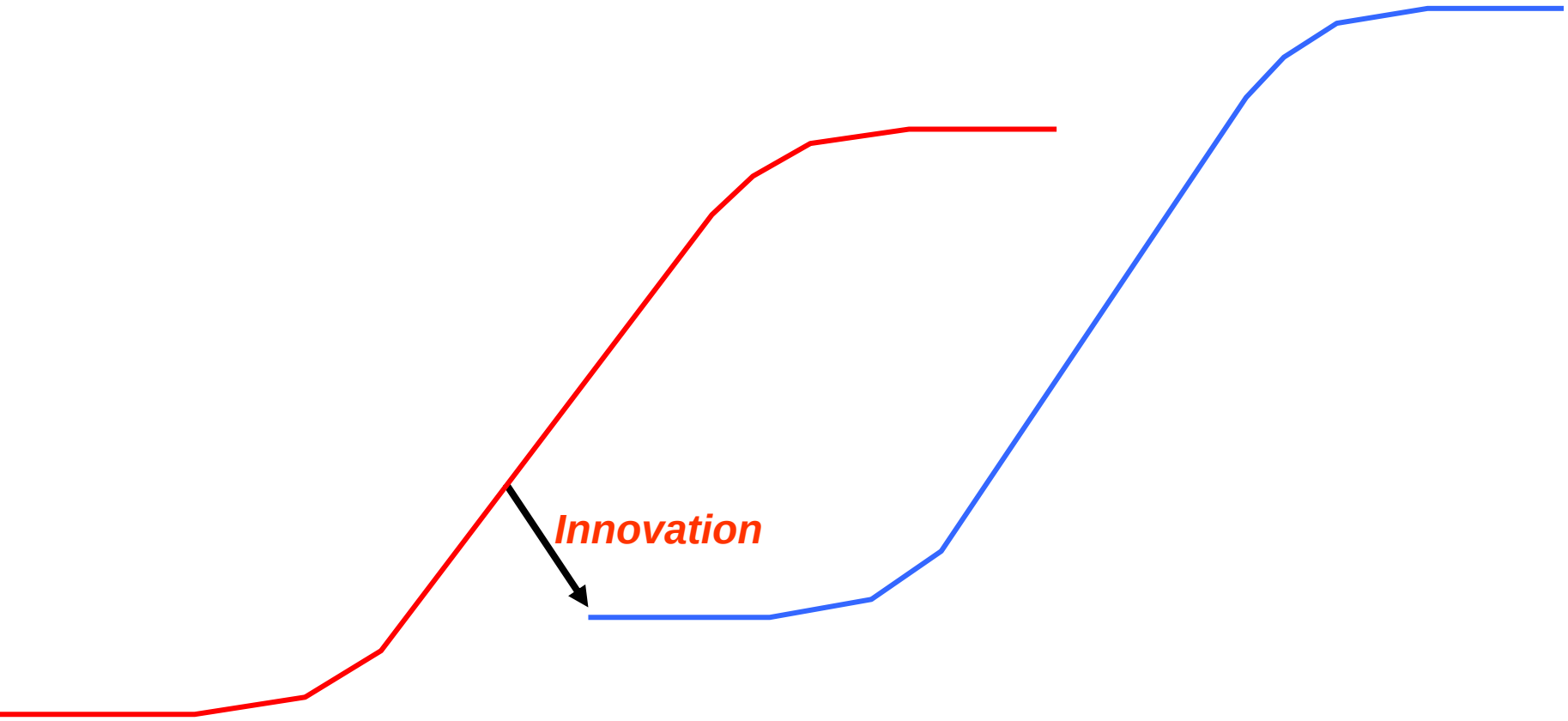
Creates Vulnerability

Technology Diffusion

- Technology Maturity Curve
  - Initial discovery
    - Development
  - Commercialization
    - Modification and significant improvements
  - Technology Maturity
    - Incremental improvements



Innovation; Creation of a New "S" Curve



Technology Surprise # 1: WWII RADAR

- The significance of Radar in WWII cannot be overstated
  - "The bomb may have ended the war, but radar won the war."

- German, Japanese, Dutch, Italian, French and US radar research all pre-dates 1935
  - Britain recognized the usefulness of the system for aircraft ***detection***

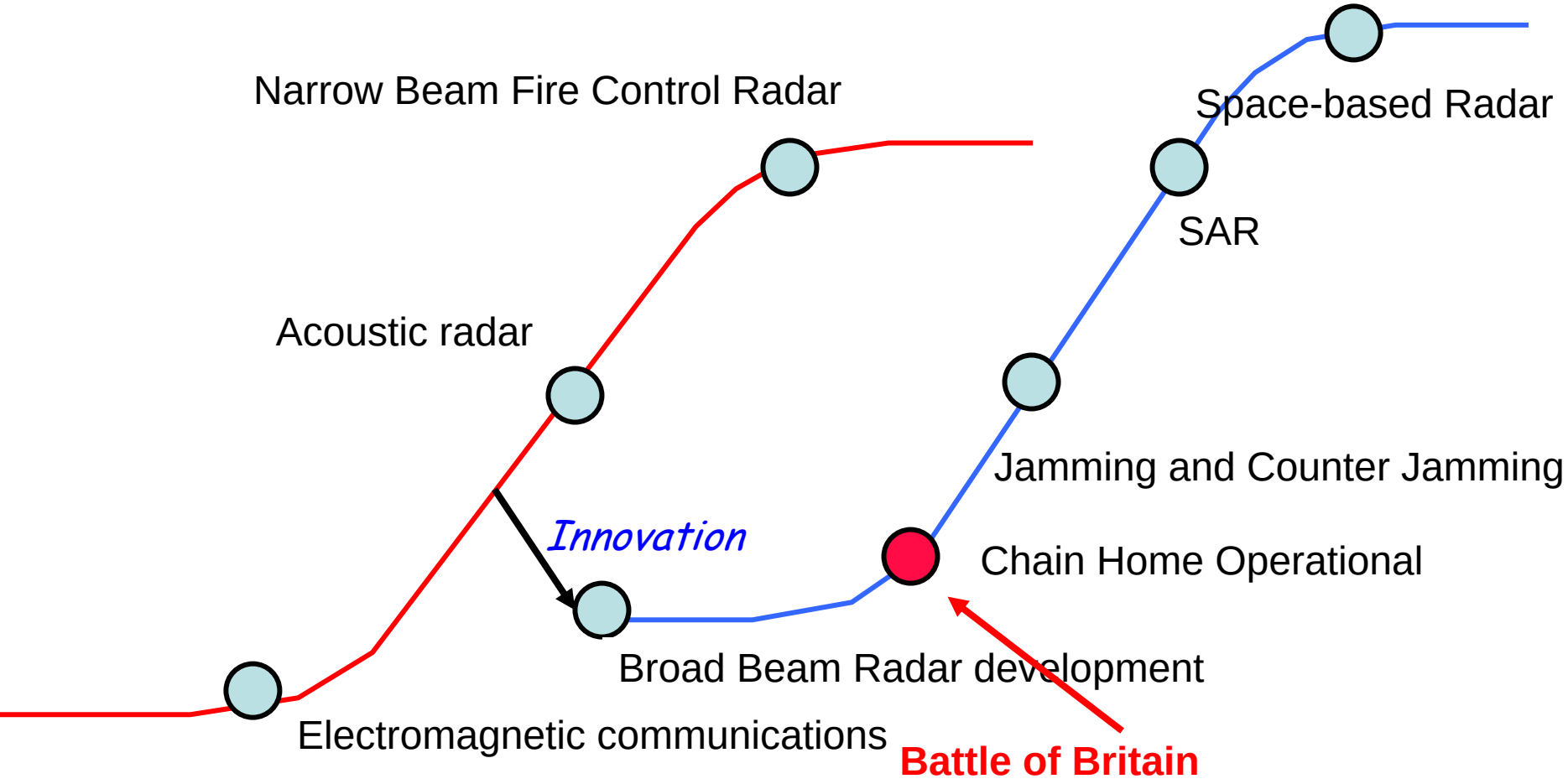
Innovation

- The British system was fairly primitive (50hz);
  - To be battle-ready it was rushed into production
  - It was believed that "third-best" would do if "second-best" would not be available in time and "best" never available at all.

- German MASINT:
  - Detected a massive and persistent noise in the 50-cycle wavelength that interfered with their radio-listening equipment
  - Knowing that the British power grid operated at 50 htz, the Germans assumed the interference was lousy British cable joints and loose connections.

- So Germany went to war unaware of British radar defences.

Radar


Narrow Beam Fire Control Radar
Space-based Radar
SAR
Acoustic radar
Jamming and Counter Jamming
Innovation
Chain Home Operational
Broad Beam Radar development
Electromagnetic communications
Battle of Britain

Why was Germany Surprised?

- ***Failure based on mirror imaging***
  - Misunderstanding the application
  - Incomplete information about differing implementations
  - Attributing measurement to error.

Technology Surprise #2: Sputnik

"On Sputnik Night, as it came to be known, the United States seemed to have only two types of people: those looking up, scanning the sky and those looking down for places to hide."

The Space Race Begins

- July 1955, the White House announced an International scientific program:
  - IGY encompassed eleven Earth sciences:
    - aurora and airglow,
    - cosmic rays, geomagnetism,
    - gravity, ionospheric physics,
    - longitude and latitude determinations (precision mapping),
    - meteorology, oceanography, seismology and solar activity.
  - Plans to launch Earth-orbiting satellites

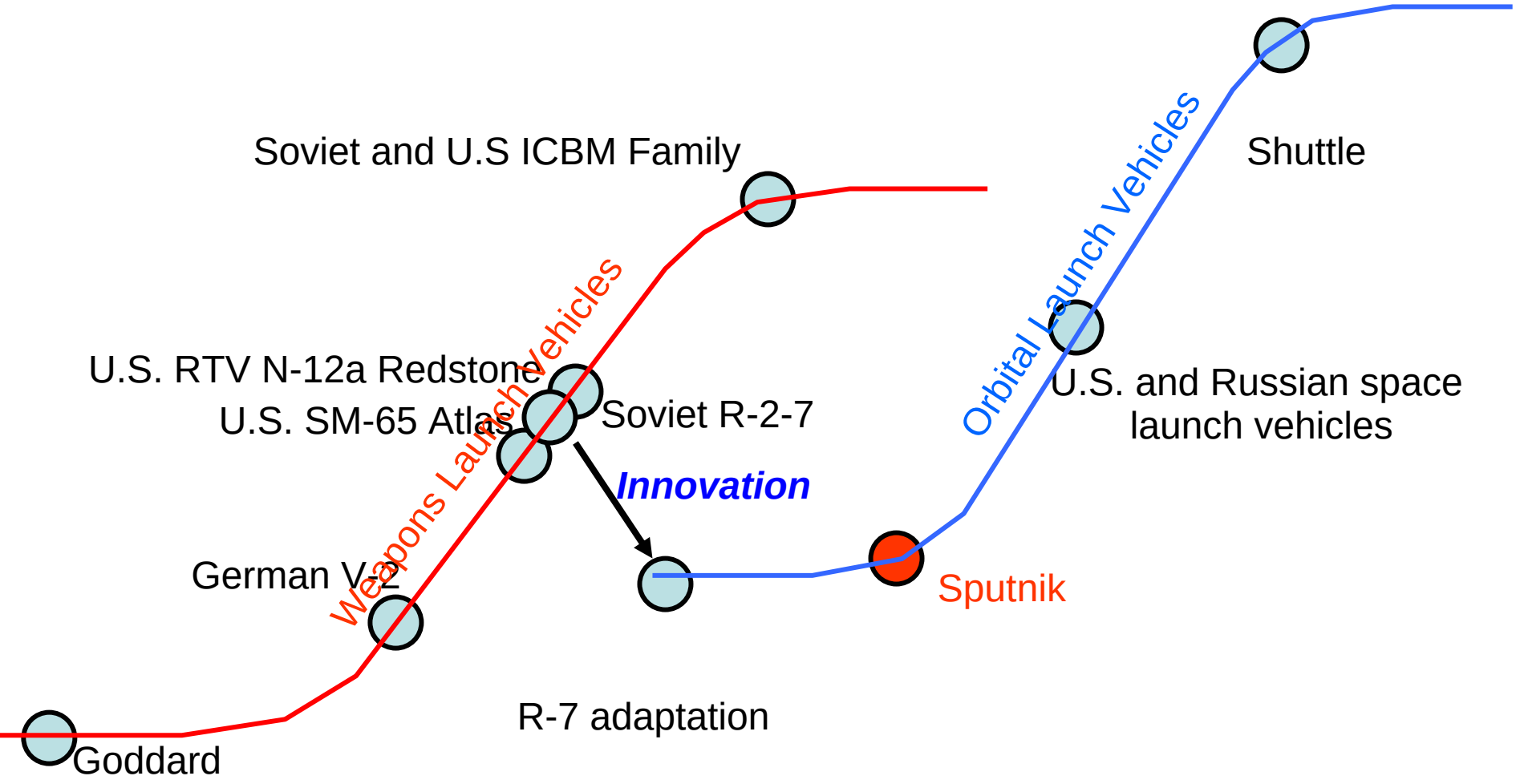
Soviet Program

- Soviets announced launch plans for Soviet Revolution anniversary 1957;
  - “Object D”
    - Weighing over a ton
    - Program replete with delays and design problems
    - Clearly not ready for anniversary
- At last minute developed a substitute orbiter
  - It was called PS-1, for *"Prosteishiy Sputnik;"* Simplest Satellite.
    - Launch vehicle designed for weapons delivery, not space orbit
    - Built in less than three months with primitive instruments on board

Innovation

- Sputnik was far from being part of a well-planned strategy to demonstrate communist superiority over the West.
  - A spur-of-the-moment gamble driven by the frustrations of a scientist;
    - whose team scrounged a rocket,
    - slapped together a satellite, and
    - persuaded Khrushchev to override an existing program.

Sputnik; Technology Surprise!



So, How Were We Surprised?

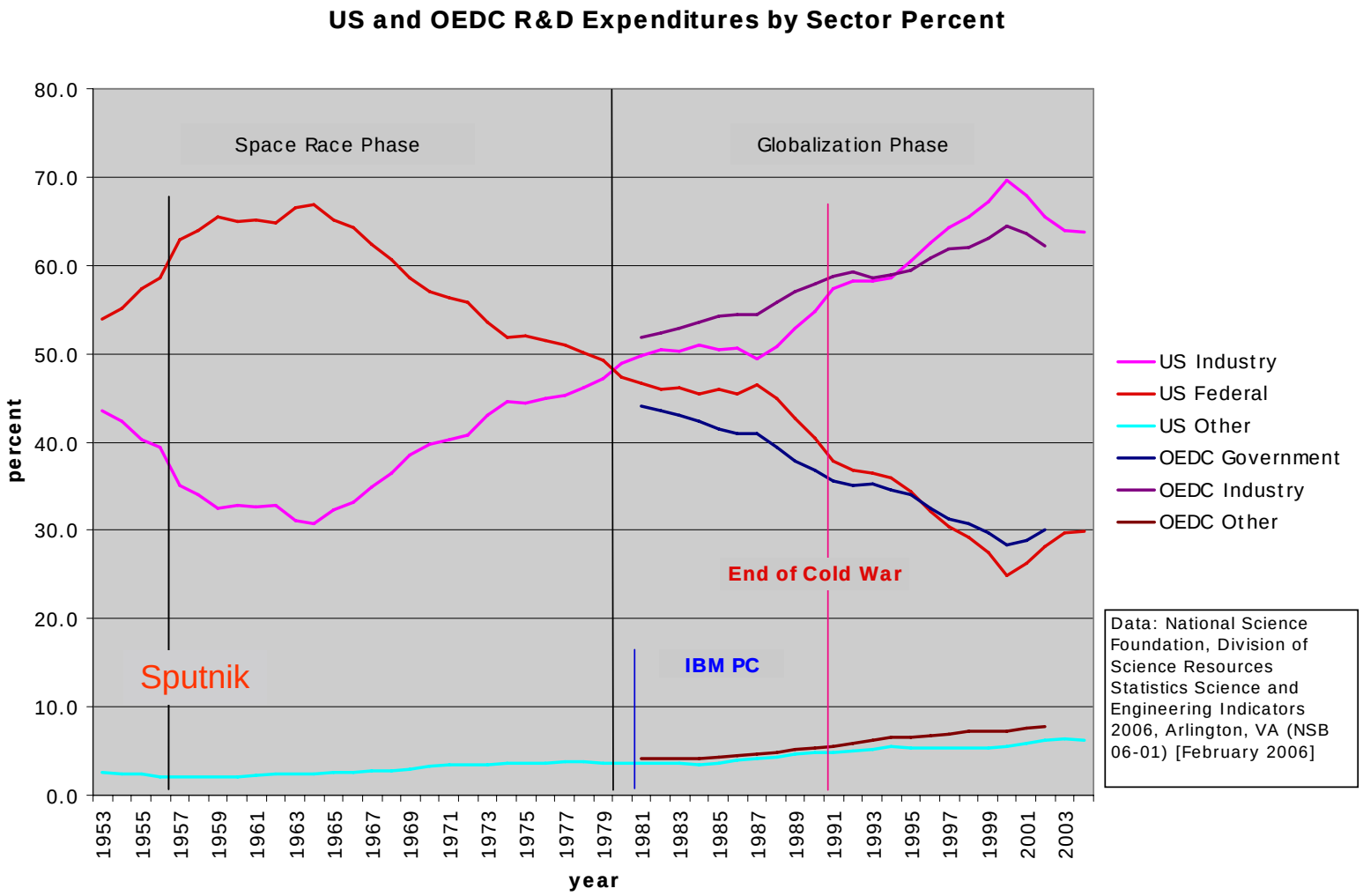
- ***Failure of hubris***
  - Not believing adversarial technology is equivalent to one's own.
- ***Failure to recognize adversarial intent***
  - Not recognizing adversarial commitment to success.

“Technology Surprise”

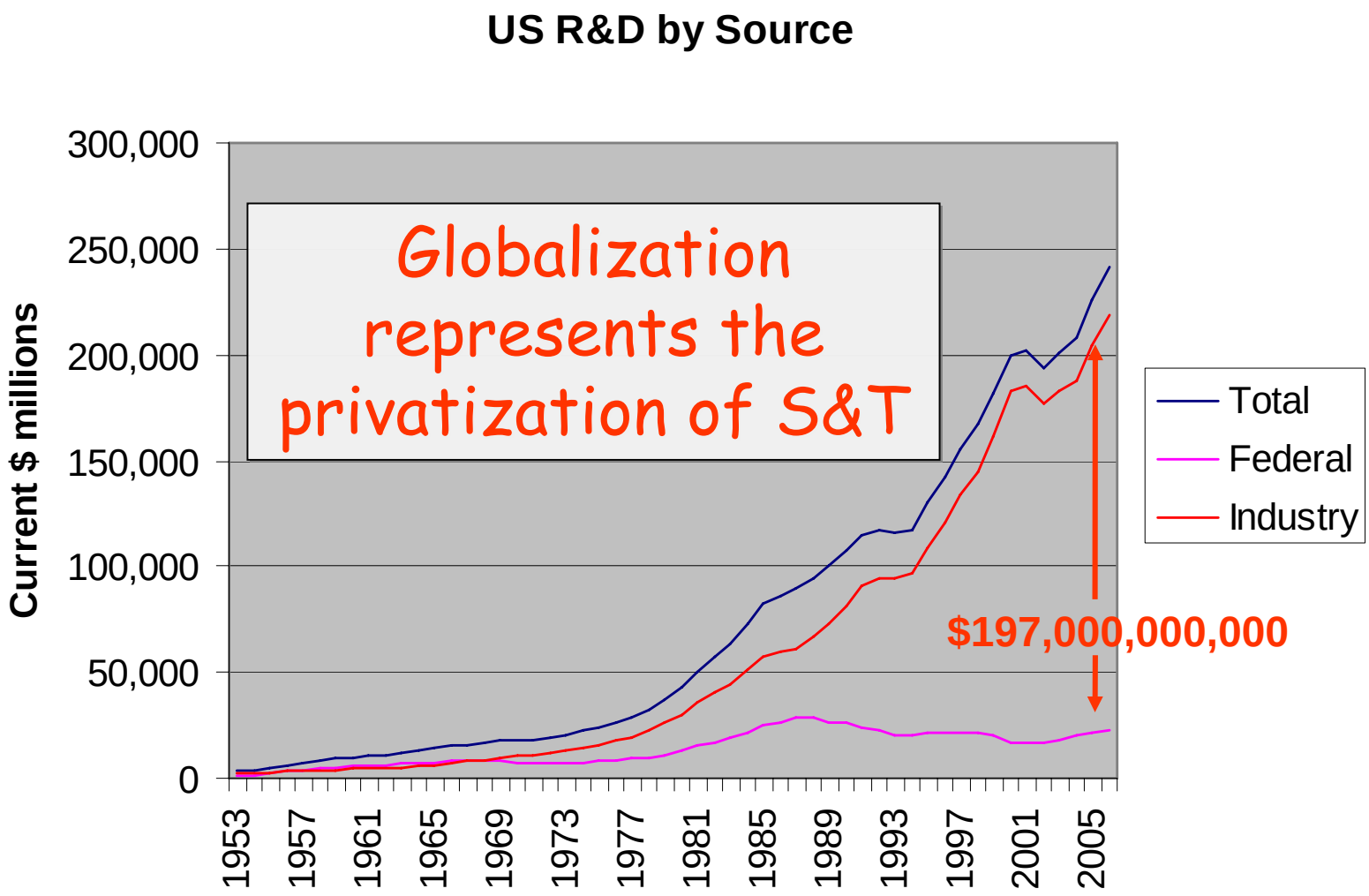
- It’s not technology that surprises the IC,
  - It’s the innovative implementation and timing
- Warning requires identifying the event likelihood and timing
  - Recognizing adversarial innovation

What did Sputnik Really Cause?

Technology Globalization



Globalization of S&T
You can't put the toothpaste back in the tube…



Don't Simply Look Under the Streetlight

- It is clear that the focus of S&T intelligence has to be on more than the government sector.
  - Tracking only government S&T ignores most of the activity where innovation is sure to occur
- We need to understand the current globalized private sector S&T environment
  - Business and innovation models

Business Models

- Two older models of business – *maximizing value*:
  - The **international model** of the 19th century
    - Most operations were centered in a home country.
    - International activity was material flow:
      - Import of raw materials and export of finished goods.
  - The **multinational model** of the 20th century
    - A response to trade barriers after both World Wars.
    - Companies created small versions of themselves in each country

Globalization

- Globally Integrated Enterprise: *"Virtual Enterprise" "Agile Manufacturing" "Round-the-clock Design"*
  - *Maximize **both** production and value*
  - Companies create or access component processes as a worldwide integrated delivery system.

- Nation State borders no longer reflect the boundaries of corporate thinking or practice.
  - Culture of collaboration across the world in real time
    - Boeing's 787 "Dreamliner" as a first order example.

Is your car foreign or domestic???

- **Ford** has major component manufacturing or final assembly operations in:
  - Canada, Mexico, the United Kingdom, Germany, Turkey, Brazil, Argentina, Australia, the People's Republic of China, and several other countries, including South Africa, and a cooperative agreement with Russian automaker GAZ.
- Foreign-based companies like **Nissan**--along with **BMW**, and **Honda** are building vehicles in American factories, using American workers and American suppliers.
- In 2002, **Toyota** initiated the "Innovative International Multi-purpose vehicle" project (IMV) to optimize global manufacturing and supply systems.
  - Diesel engines made in Thailand
  - Gasoline engines in Indonesia
  - Manual transmissions in the Philippines and India.
  - Vehicle assembly, in Thailand, Indonesia, Argentina and South Africa.

So…

What do these business models have to do with Intelligence ?

New Course for S&T Intelligence

- Collection – new targets for S&TI
  - Target deck changes to private sector
  - Targets are not connected to objectives
  - Multinational collaborations
  - Integrators as well as service delivery providers
- Analysis – necessary new contexts for S&TI
  - Market and product analysis
  - Social analysis
  - Financial analysis

Technology Warning Process

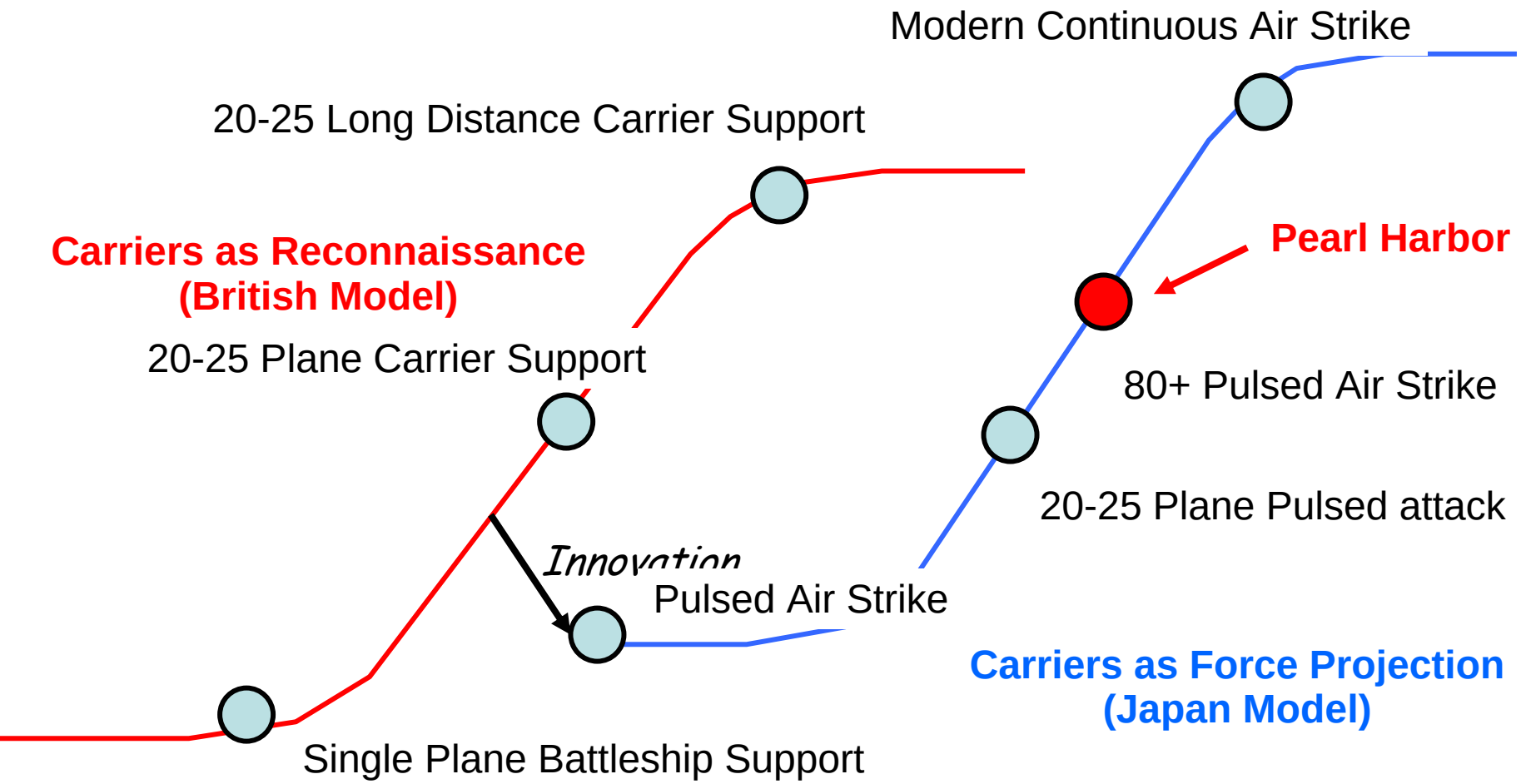
- **Assessment** - identification of technologies, who is developing them, what is the purpose and stage of development. ***Focus on private sector***
- **Estimation** – projection of a technological capability to pose a future threat without deployment by an adversary. ***Focus on Public/Private Interface***
  - Possible dual-use opportunities
  - Enhancement of capabilities against known US vulnerabilities
- **Warning —** adversary-specific identification of a threat technology: ***Focus on specific Threat Actor***
  - Evidence of ***who*** is interested in a technology and ***why***
  - Security, military, social, political and economic ***context*** of interested entities.
  - ***Time frame***

BACK UP SLIDES

Innovator's Dilemma

- A great idea does not mean commercial success:
  - Requires infrastructure and capital
    - Capture markets and customers
    - Respond to demand
    - Protect intellectual property and secrets
  - The list can go on at great length
    - Netscape (Mosaic)
    - Tucker Autos
    - Wang Computers

Yeah, but the big boys have trouble too…

- Entrenched Player's Dilemma
  - Resource dependence diverts assets away from developing the new technology or product.
    - In order to embrace new ideas, must abandon current activities.
  - Constrained by capital investments, customer demands, cash flow requirements.
    - A dilemma between continuing what works today and radically shifting to what will work tomorrow.

Battleship to Carrier