The history of breakthroughs in ABM technology—testing and development

1958

Secretary of Defense Neil McElroy gives U.S. Army responsibility for development of antiballistic-missile systems and charters the new Defense Advanced Research Projects Agency (DARPA), with responsibility for research and development for antiballistic-missile systems.

DARPA launches Project Defender for development of a space-based ABM system to intercept ballistic missiles in their boost phase. Interceptors studied during the four year program include: lasers (invented in 1960), particle beams, and kinetic energy kill with high velocity pellets.

Soviet scientists discover "x-ray effect"—that x-rays from an H-bomb blast can disable ICBM warheads.

1960

Thedore Maiman of Hughes Aircraft Co. builds first laser.

April: U-2 photographs reveal ABM test system at Sary Shagan in Soviet central Asia.

1962

Soviet government publishes Marshal V.D. Sokolovskii's *Military Strategy,* which states:

> In our country the problem of eliminating rockets in flight has been successfully solved by Soviet science and technology. Thus the task of warding off strikes of enemy missiles has become quite possible. . . .
>
> Possibilities are being studied for the use, against rockets, of a stream of high-speed neutrons as small detonators for the nuclear charge of the rocket, and the use of electromagnetic energy to destroy the rocket charge in the descent phase of the trajectory or to deflect it from its target. Various radiation, anti-gravity, and anti-matter systems, plasma (ball lightning), etc., are also being studied as a means of destroying rockets. Special attention is devoted to lasers ("death rays"); it is considered that in the future, any missile and satellite can be destroyed with powerful lasers.

This second paragraph is dropped from the 1968 and subsequent editions of Sokolovskii's text.

U.S. Army Nike-Zeus program makes multiple successful intercepts of ICBM warheads in 1962 and 1963.

1963

Soviets begin to deploy nationwide "Tallinn" air defense system, based on anti-missile-missile ABM system tested at Sary Shagan.

1964

Soviets deploy ABM system around Moscow with interceptor missile, given DoD code-name "Galosh."

1968

Soviet scientist V.L. Tal'roze builds first pure hydrogen-fluoride chemical laser with a significantly greater efficiency than in the existing U.S. hydrogen-uranium-fluoride laser.

Soviets test first anti-satellite weapon in space.

1970

Soviet scientists B.I. Stepanov, E.V. Ivakin and A.S. Rubanov discover how to correct distorted laser beams via optical phase conjugation using "four wave mixing."

1971

Soviet physicist V.G. Dudnikov and his team at the Nuclear Physics Institute in Novosibirsk invent a source for intense negative ions. This and subsequent research, reported the Rand Corporation in 1982, allows the Soviets to produce high-intensity, high-brightness, low-emittance negative ion beams for inertial confinement fusion and possibly exoatmospheric beam-weapon applications.

May: Rand Corporation reports on Soviet designs for an x-ray laser to be pumped by an electron beam.

Soviet ASAT system is declared operational.

Soviet Lebedev Institute reports first-ever generation of a 300 Gigawatt-power pulse from a high-energy laser.

1972

A laser pointing and tracking system developed in U.S. Air Force Project Eighth Card controls a laser beam sufficiently to burn a dime-sized hole through a target waved at the tip of a pole at one kilometer.

An Air Force system composed of a high-energy gas dynamic

laser and an on-gimbal telescope shoots down a drone aircraft at Kirtland AF Base in New Mexico.

1973

Rand Corporation report reviews Soviet work on application of electron beams to production of x-rays, notably the work of A. A. Rukhadze showing 1) that the deceleration of fast electrons results in conversion of 1 percent of their energy to x-rays; and 2) the possibility of producing x-ray lasers by exposing various gas media to high-current electron beams.

Academician Y. P. Velikhov publishes a design for pulsed energy production from a magnetohydrodynamic generator powered by thermonuclear explosives detonated in spherical chambers. There is evidence that such a device was built at the Soviet weapons testing facility at Semipalatinsk to power beam-weapon devices there.

1975

L. Wood and G. Chapline publish article on x-ray lasing in *Physics Today*. At Lawrence Livermore Lab, Wood begins campaign to develop nuclear-pumped x-ray laser.

1976

A high-energy electric laser mounted on the U.S. Army Mobile Test Unit destroys drone aircraft at the Redstone Arsenal in Alabama.

1977

P. Allison at Los Alamos National Lab constructs a negative ion source based on Dudnikov's 1971 work. The U.S. Army funds the program, known as "Sipapu," to develop the source for a neutral particle-beam accelerator weapon for a space-based ABM system.

1978

U.S. Army announces that with sufficient funding, the Sipapu neutral beam system would be ready for launching as an anti-satellite weapon between 1981 and 1983. The additional funding never comes.

U.S. Navy Sealite program successfully destroys TOW antitank missile with a chemical laser.

1980

Based on KH-11 reconnaissance satellite data, U.S. military intelligence detects a directed-energy weapon under construction since November 1979 at Sary Shagan. The device is powered by "magneto explosive generators," based on the work of A. I. Pavlovski. In 1982 the directed-energy device is identified as a pulse-powered iodine laser.

May 22: *New York Times* reports that the Soviets have developed a ground-based laser capable of "blinding" U.S. surveillance satellites.

December: First demonstration of nuclear-pumped x-ray laser at Yucca Flats, Nevada.

1981

Reagan administration reviews suspected Soviet violations of the ABM Treaty. These include:

1) Production of the mobile ABM-X-3 antiballistic-missile system with the Flat Twin tracking and Pawn Shop missile guidance radars. The system includes the SH-04 and SH-08 ABM interceptor missiles, which have replaced the Galosh missile around Moscow. This system is reportedly stored in warehouses across the Soviet Union for rapid deployment in a breakout of the ABM Treaty.

2) Deployment of three potential ABM "battle-management" phased array radars at Kiev, Pechora, and Komsomolsk.

1982

February: In the *Proceedings* of the U.S. Naval Institute, it is reported that there is "mounting evidence that at their test site at Saryshagan in Kazakhstan [the Soviets] repeatedly have destroyed ballistic missile reentry vehicles using what is thought to be a high-energy iodine-pulsed laser prototype weapon." The Soviets are also reported to have developed a land-based high-powered laser capable of destroying drone aircraft.

The Soviet Union deploys the SA-10 surface-to-air missile in a system to intercept cruise missiles and the SA-12 tactical ABM system to intercept the Pershing II missile. The SA-12 also has the capability to intercept submarine-launched ballistic missiles.

1983

Feb. 10: U.S. Defense Department declassifies existence of the program to develop the nuclear pumped x-ray laser.

May: Scientists at Hughes Research Labs announce that they have succeeded in propagating a coherent laser beam through atmospheric turbulence.

June: Los Alamos Scientific Lab successfully fires the 20 kilojoule Krypton-Fluoride laser, considered a leading contender for a ground-based laser.

June 20: A U.S. Air Force KH-9 reconnaissance satellite photographs a fourth ABM "battle management" radar at Abalakova. This radar violates not only the intent but also the letter of the ABM Treaty.

1984

May: U.S. Air Force announces its Airborne Laser Laboratory has demonstrated ability to target and track Sidewinder missiles travelling at 2,000 mph, in five consecutive tests, and releases film of the test series.

June 11: A U.S. Army interceptor missile successfully destroys an ICBM warhead in its mid-course trajectory via physical impact in the Homing Overlay Experiment.

The Kra Canal

and the

Industrialization of Thailand

A Conference Sponsored by

The Communications Ministry of Thailand
The Fusion Energy Foundation, U.S.A.
Executive Intelligence Review Limited Partnership, Bangkok

Oct. 31–Nov. 1, 1984

Dusit Thani Hotel Bangkok, Thailand

Wednesday, October 31

9:00 a.m. **Opening and Keynote Address**
His Excellency Minister Samak Sundaravej, Minister of Communications, Thailand

9:45 a.m. **The Economic Feasibility of the Kra Canal**
Panel Chairman:
Dr. Chitti Wacharasindhu
Deputy Permanent Secretary of the Communications Ministry of Thailand

Panelists:
Dr. Nimit Nontapunthawat
Vice-President, Chief Economist, and Manager, Economic and Marketing Research Center, Bangkok Bank
Sattaporn Tavitanun
Deputy Secretary General of the Board of Investments of the Office of Prime Minister
Dr. Uwe Henke v. Parpart
Director of Research, Fusion Energy Foundation

2:00 p.m. **Advanced Technologies for Canal Construction**
Dr. Milo Nordyke
Lawrence Livermore Laboratories, California
Harry Ekizian
T.A.M.S., New York
Pongpol Adireksarn
Member of Parliament, Thailand

Thursday, November 1

9:00 a.m. **High-Technology Industrial Development in the Canal Zone**
Dr. Svasti Srisukh
Former Secretary General of the Office of Atomic Energy for Peace, Thailand
Ramtanu Maitra
Editor, Fusion Asia
Douglas Headley
Engineering specialist, Pacific Engineers and Constructors, Taiwan

2:00 p.m. **International Policy—Regional Development and Cooperation**
Pakdee Tanapura
Fusion Energy Foundation, Thailand
Representatives from the nations of ASEAN
Pacifico Castro
Deputy Foreign Minister of the Philippines

Admission: $50.00

For More Information Call:
Fusion Energy Foundation, 304 W. 58th St., N.Y. N.Y. 10019, 212-247-8820

Fusion Asia, C-9 Nizamuddin East, New Delhi, 110013, India, 11-617-109

Executive Intelligence Review Limited Partnership, 421 Soi Siri Chunla Saweg, Silom Road, Bangkok 10500 Thailand, 2-235-4868