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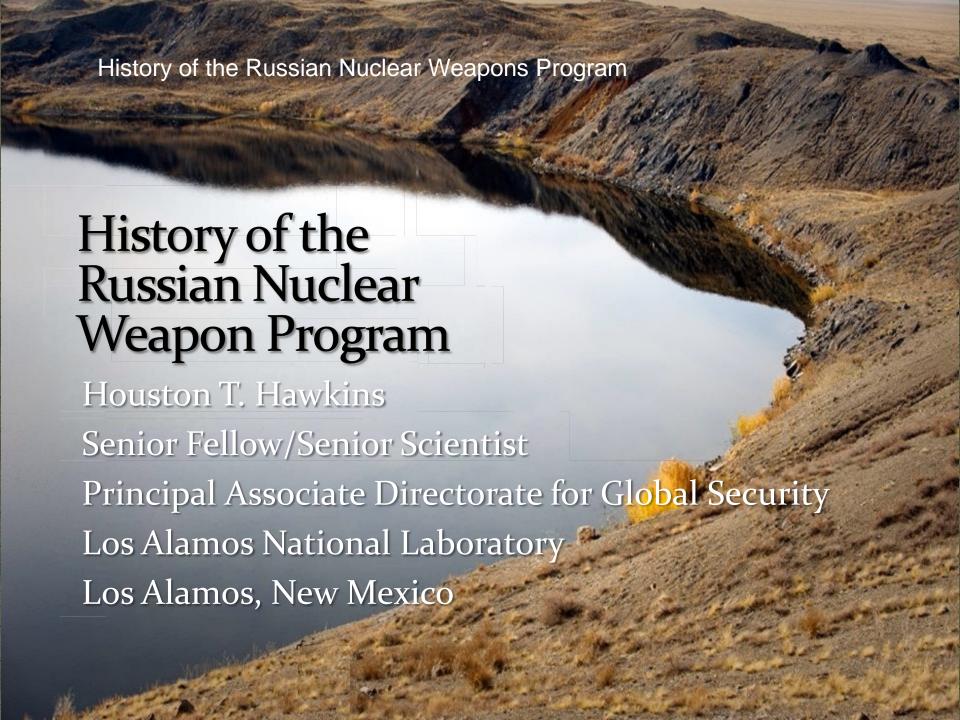
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Potsdam Conference was held at Potsdam, Occupied Germany. The Trinity test occurred on July 16, 1945 or the day before the conference began. Passed notes that "the baby was born," Truman and Churchill knew of the successful test. When informed by Truman, Stalin seemed unimpressed. Soviet espionage that had penetrated the joint US/UK atomic weapons program had already informed him.

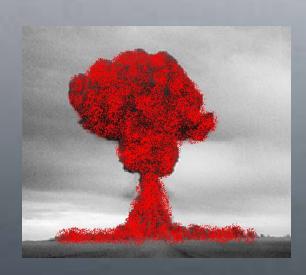




Potsdam Conference, July17- August 2, 1945

История русской ядерной программы

THE SOVIET PATH FORWARD VIA ESPIONAGE

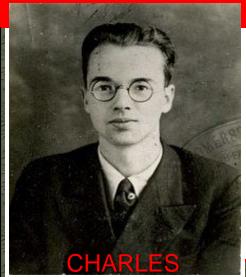


USSR'S ATOMIC SPIES "TRACK FOUR"

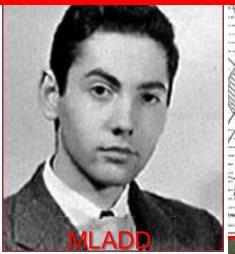
"ENORMOZ" (Russians term for the Manhattan Project)

(Background documents, declassified and used in Federal trial of Rosenbergs)











Klaus Fuchs

Theodore Hall

David Greenglass



Harry Gold



Saville Sax



Ethel & Julius Rosenberg

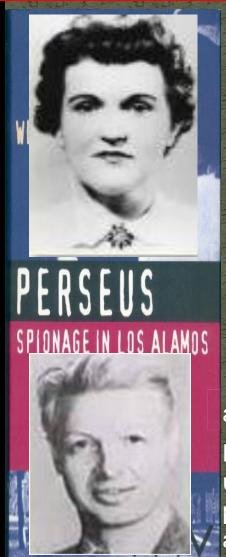


Владимир Барковски USSR Consulate, NYC

Персей Perseus

- a. Joined the Manhattan Project in 1942
- b. Physicist passed information to the Cohens
- c. Associated with the Spanish Civil War
- d. Still alive and in the USA as of October 1992

















Morris and Lona Cohen, handlers of Perseus, fled to the UK under the names Helen and Peter Kroger. After their arrest and prosecution in the UK, they were exchanged for Gerald Brooke and flown to Russia where they were welcomed as heroes.



George Koval Code Name "Delmar"







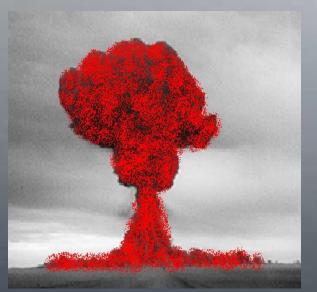
George Koval died in Moscow on 31 January 2006. His role was never officially recognized until 2 November 2007, when the Kremlin announced his posthumous decoration with the highest state honor, "Hero of Russia." Cited among his major contributions to the Soviet atomic project was the design of the "neutron fuse" for the first Soviet atomic device, which was tested on August 23, 1949. Koval was cited for "his courage and heroism while carrying out special missions and was the only Soviet intelligence officer to infiltrate the Manhattan Project's secret plants."



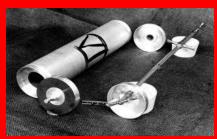
История русской ядерной программы



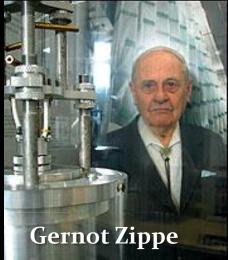
EARLY DEVELOPMENTAL PATH DOWN TO JOE-1







Contributions of Third Reich Knowledge and Materials

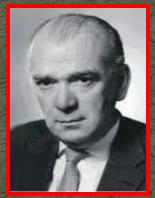






For the Soviet nuclear weapons program, the most significant contribution from the defeated Third Reich was the location and seizure of 300 tons of uranium, 100 tons from the heavily bombed Auergesellshaft plant in Oranienburg and 100 tons from a leather tanning factory in Neustadt am Glewe. This material was used to fuel Reactor "A" located in the Urals that provided plutonium for JOE-1. In addition, German scientists such as Nicholaus Riehl and Gernot Zippe provided the Russians with information on uranium metallurgy and enrichment. Likewise, captured German rocket technicians and rockets (such as the Wasser Fall) helped "jump start" the Russian IRBM and ICBM programs.

Former Third Reich Scientists Who Assisted in the Russian Nuclear Weapons Program



Nicholas Riehl



Karl Zimmer



Robert Doepel



Manfred von Ardenne



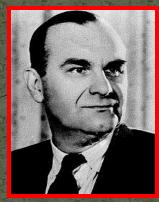
Peter Thiessen



Max Volmer



Gernot Zippe

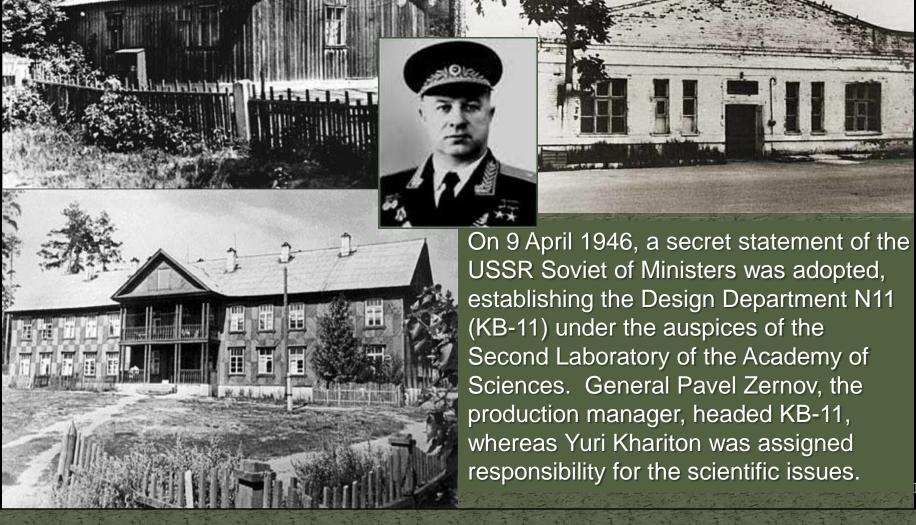


Heinz Barwich



Gustav Hertz

Design Department N11 aka Arzamas 16





Arzamas-16 Apamac-16

AKA Sarov or VNIIEF





The pressure to test with a 100% chance of success......

PACCEKREVEHO

GODAFARIOU GRIPATIIO

Benda THIRE, Ha" (High Explative).

а толи мустие вобе геда вандается произведстве первого варыва атадия бамай.

Зенствукция бемен. Античным велествем втей бемей надлегоя эле 94 бел применения урана-235. В пентре варк из ядутения весем 5 ики праци пемедается так наз. инициатер — беридкеве-пелениявый истечные адмей-частиц. Плутений екружется 30 фунтами тысе-вашея , нетерий вихлется темпером. Нее эте немещестся в соепечку из аппикния тем ней 11 см. Ита апримименая соепечки, в свен ечередь, виружется ил виримунтете велества "пенталит" или "сомперсос, "(пе другим данным "Семрежий» В) о телярней степки 46 см. Мериус бемем, в метерий пемещестся эте ВВ, имеет внутренний диаметр 140 см. Общий вес бем виличая ненталит, корпус и проч — внесе 3 теми. Схидается, чте сита взрана бемем будет разна сиде взрана 5.00

тени ТИТ «(Кеспирконт педелного действия - 5-6%). Кедичестве «(155) равне 75.10²⁴.

Запасы антивнеге материала.

- а) Уран-235. На апредъ с/г быле добыте 25 инпограмы Уран-235.
 Его добыча в настепясе время составляет 7,5 иг. в месяц.
- б) Плутений (элемент 94). В пагере-2 имеется 6,5 иг. жаутения Пелучение его налажено, илам дебычи перевыпелияется.
 - Table-annell yezeshee nansanne ypana (commencial acadism del

Ориентировочне варыв ежидается 10 имяя с/г.

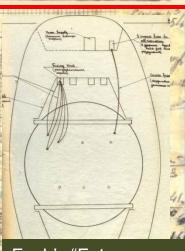
Примичания: Сировии составления:











Fuch's "Fat Man" Diagram



KURCHATOV CITY

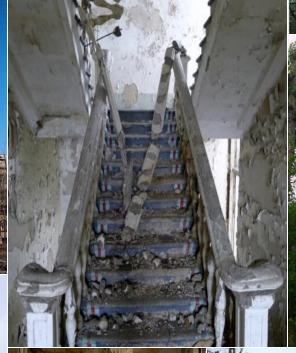




From 1949 to 1993, at least 456 nuclear weapon tests were conducted in a remote part of eastern Kazakhstan, in the province of Semipalatinsk. Kurchatov City was the entry point for the three major test areas --- (1) Experimental Field where the first Russian test (Joe-1) occurred, (2) Balapan where atmospheric tests occurred, and (3) Degelen Mountain where underground tests were carried out. Locals called "Kurchatov City" "Haw Город" or "Our Town."

Kurchatov City (2013)













Lavrenty Pavlovich Beria



Beria was appointed the administrative leader of the Soviet nuclear weapon program. *Kurchatov remained in charge of the scientific* research. Shortly after the atomic bombings of Japan in 1945, Stalin issued an ultimatum to Beria ordering the "bomb" to be built and tested within five years. NKVD Special Department "S" was established by Beria to organize intelligence documents gathered about the U.S. bomb and to accelerate the research efforts. The bomb was ready for testing within four years. The Russian scientists would have preferred testing their own design but opted for a copy of the US Trinity device because Beria had informed them that they would be executed if the test failed.



SHIPMENT OF JOE-1 DEVICE TO SEMIPALATINSK BY RAIL

August 1949





JOE 1 Test



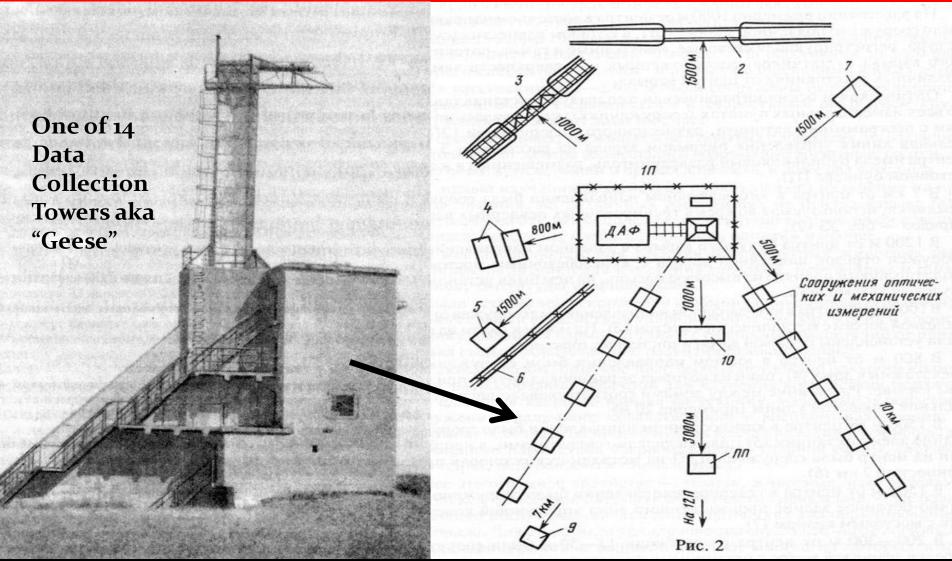






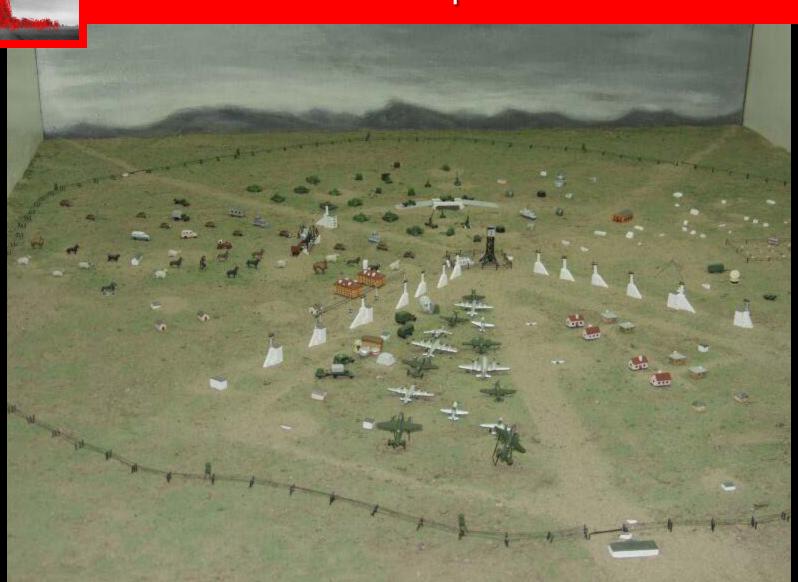


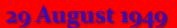
JOE 1 Experimental Layout PLan



JOE-1 Test Layout Model

Effects seem more important than the device

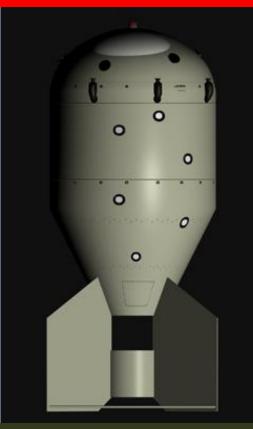






JOE-1* First Lightning







РДС-1 (RDS-1 or Reaktivnyi Dvigatel Stalina) was a copy of the Trinity (Fat Man) device and demonstrated that Russia could manufacture and test nuclear weapons. As promised, executioners in black leather were in the bunker at the time of the test. The letter is from Beria and the scientists thanking Stalin for his leadership in the success. In the blue note at the top left, Stalin responded, "Where is Nicholas Riehl's signature?

JOE-1 Control & Observation Bunker





JOE-1 Crater







President Truman Announces Russian Test









Of interest -- one day before President Truman's announcement of the 1 September 1949 test-- an intelligence estimate produced by the CIA's Office of Research and Estimates (ORE) assessed that mid-1953 would be "the most probable date for a Soviet nuclear test." This assessment paper was coming off the presses when filter papers loaded with radiological debris from JOE-1 were being taken off AFLOAT-1 aircraft.

THE DETECTION OF JOE 1

Doyle L. Northrup Donald H. Rock ¹

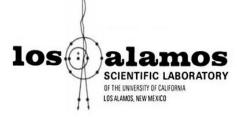
Alert 112 began just like many of the previous 111 sounded in the Long Range Detection System. A field unit reported on 3 September 1949 that a filter paper exposed for three hours at 18,000 feet on a weather plane flying from Japan to Alaska showed a radioactivity of 85 counts per minute, 35 counts over the recently halved official threshold of significance. But this time the slight indication was to trigger a massive reaction.

Before it was over, the Air Weather Service had mounted 92 special air sampling flights from Guam to the North Pole and from Japan to the British Isles. As the radioactive cloud moved east, British authorities were alerted and the RAF flew missions from Gibraltar to 70°N latitude. Other samples were taken by fixed air sampling stations in the Far East and North America and by Navy rainwater stations in North America.

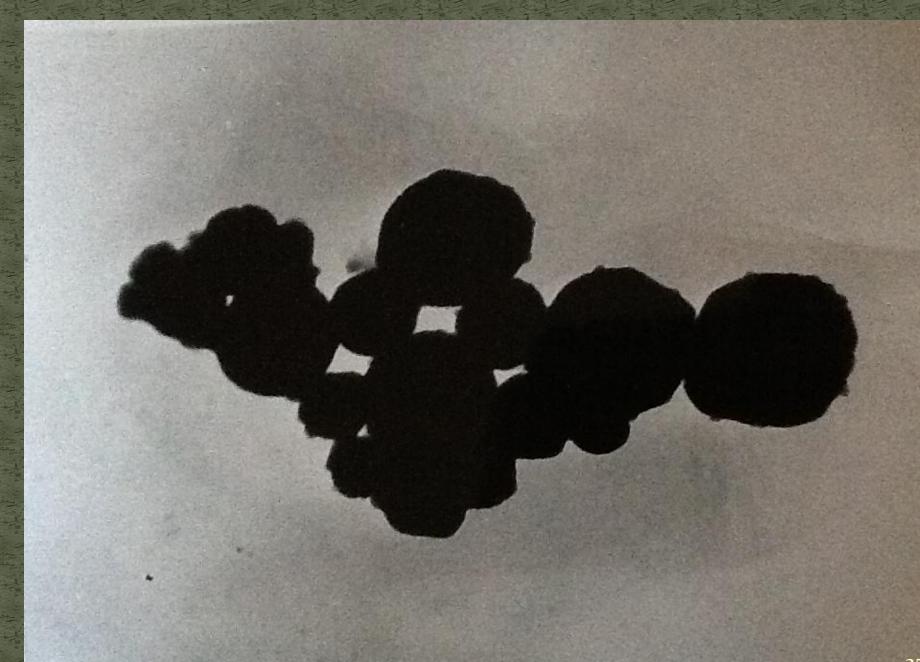
Analyses of the air filter samples by Air Force's contractor Tracerlab and the Los Alamos Scientific Laboratory provided unambiguous evidence that the Soviets had succeeded in detonating a plutonium bomb. The rainwater samples, analyzed by the Naval Research Laboratory, the Los Alamos lab, and the University of California Radiation Laboratory, later told more about the nature and timing of the shot. The U.S. conclusion was independently confirmed by the British sampling and radiochemical analysis.



Considering the distances involved, Oppenheimer had believed it highly unlikely that debris from a Soviet nuclear test could be detected.



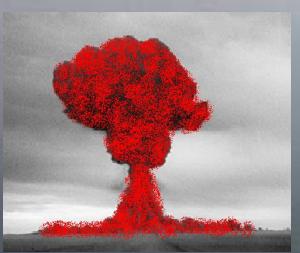






ИсториЯ русской ядерной программы

NUCLEAR
WEAPONTESTING
AFTER JOE-1







Semipalatinsk Nuclear Test Site







Degelen Gora Nuclear Test Site





Novaya Zemlya Nuclear Test Site













Novaya Zemlya Nuclear Test Site Support Base





Novaya Zemlya Nuclear Test Site





Novaya Zemlya Nuclear Test Site (cont'd)





Joe-2 Uranium Implosion, Tritium Boosted

24 September 195:

- It is likely that the Joe-2 design was provided to the Chinese. From 1958 until 1959, Arzamas-16 weaponeers led by Colonel E. A. Negin, N. G. Maslov and V. Gavrilov were assigned to China and provided the Chinese with extensive information on 1950-vintage fission weapons. Qian Sanqiang was the primary interface.
- After Klaus Fuchs was released from prison on 23 Jun 1959 and moved to East Germany, he met with Qian and authenticated the design information Russia had given to China.



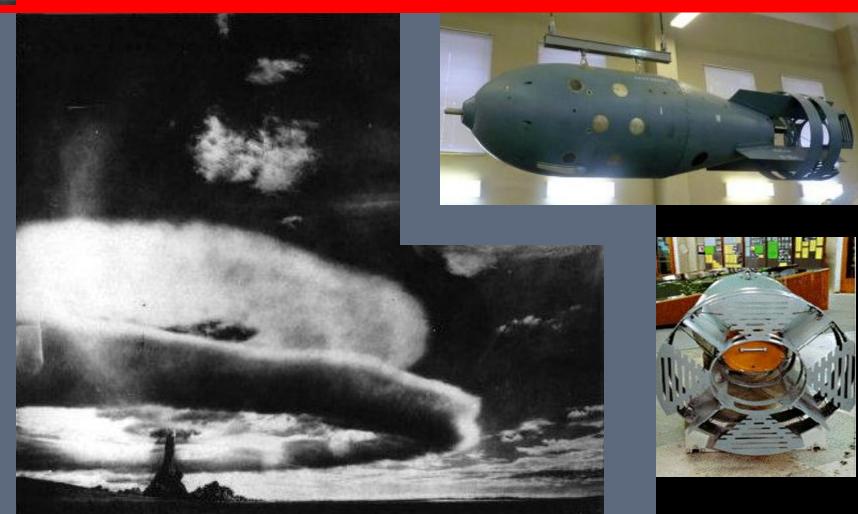
CHIC 1: 16 OCT/64, 20 KT, TOWER, FISSION DEVICE IMPLOSION OF U-235 CORE, BUT WITHOUT TRITIUM BOOST



JOE-3 First Soviet Airdropped Test

41.2 KT

18 October 1951





JOE-4 "Layer Cake"

12 August 1953

400 KT





*RDS-6c employed a design called the Слойка, a type of layer cake.



JOE-5 РДС-4

The RDS-4 (JOE-5) design would also be introduced into the Russian arsenal as the warhead for the R-5M medium-range ballistic missile

23 August 1953



RDS-4 (JOE-5) was a fission device using plutonium in a "levitated" core design. The test was an air drop on August 23, 1953, yielding 28 KT.



JOE-8 TOTSKOYE RANGE, ORENBERG

PIC-6 Exercise "Snezhok" (Snowball)

14 September 1953

First Soviet nuclear explosion in a military training exercise involved ~45,000 troops. Totskoye Range, the location for Snezhok was chosen because its topography was similarity to West Germany. Regrettably for the Russians, wind carried the airdropped device and its detonation debris toward the participants. Thousands of Russian soldiers were contaminated.

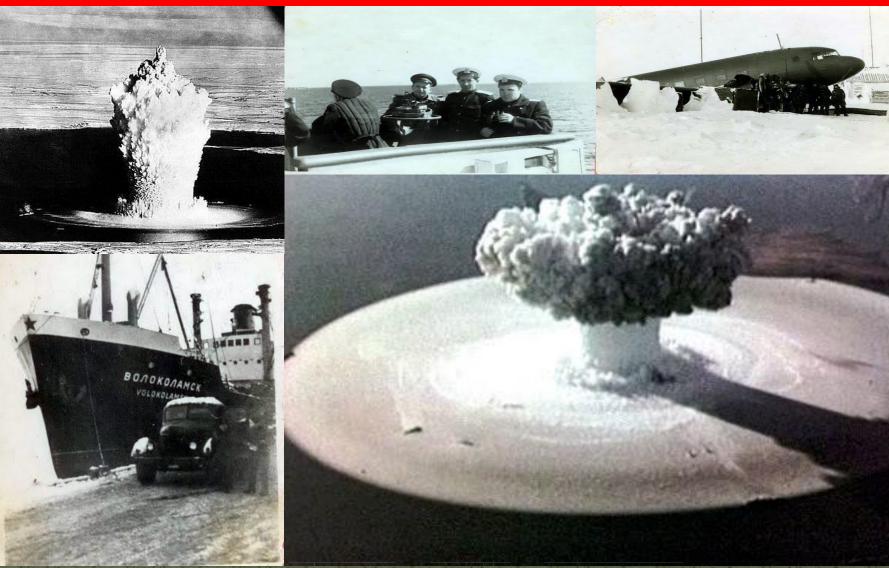




JOE-17 First successful NZ test

Guba Chernaya, Novaya Zemlya

21 September 1955



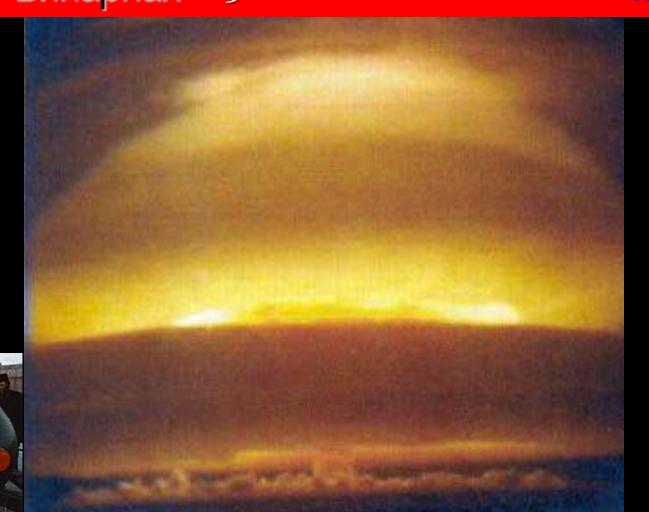
The first test of the РДС-9 design on 19/10/1954 was a fissile.



JOE-19 STAGED THERMONUCLEAR DEVICE **РДС-37** Бинарная 3.0 МТ >1.6 МТ 22 November 1955









JOE-111 Tsar Bomb Ан-602 Царь-бомба

~50 MT

30 October 1961





Chagan PNE "Atomic Lake"

Чаган МЯВ

"Industrial Nuclear Explosion" 140 KT - 15 January 1965

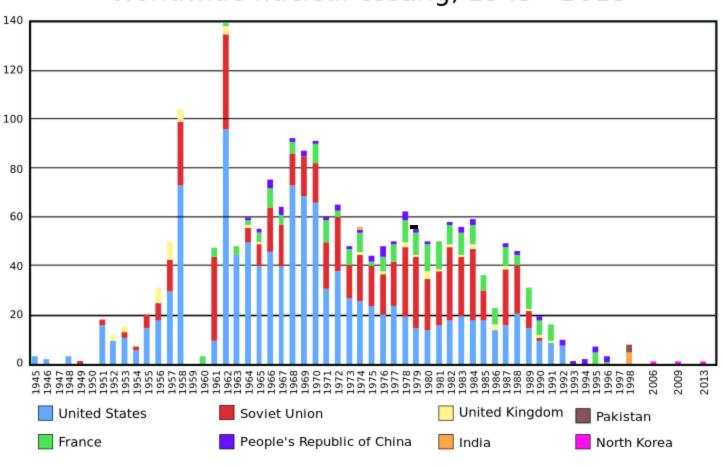






Aggregate Declared and Detected Tests 1945-2013

Worldwide nuclear testing, 1945 - 2013





Russian Nuclear Weapon Complex





Russian Nuclear Weapon Complex

Sarov, Arzamas-16, Sarova, Avangard Nuclear Weapon Physics/Design, Nuclear Weapon Assembly/Disassembly

Snezhinsk, Chelyabinsk-70, Kasli Nuclear Weapon Physics/Design

Ozersk, Mayak, Chelyabinsk-65 (40) Plutonium Production, Tritium Production, Weapon Component Fabrication

Zelenogorsk, Krasnoyarsk-26, Dodonovo Plutonium Production

Tomsk-7, Seversk Plutonium Production, Uranium Enrichment

Zelenogorsk, Krasnoyarsk-45, Uranium Enrichment

Angarsk, Uranium Enrichment

Novoural'sk, Sverdlovsk-44 Uranium Enrichment

Zarechny, Penza-19 Nuclear Weapon Assembly/Disassembly

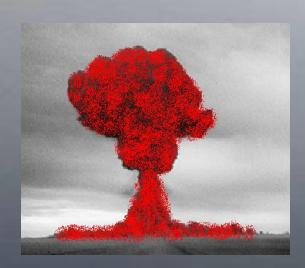
Lesnoy, Sverdlovsk-45, Nuclear Weapon Assembly/Disassembly, Weapon Component Fabrication

Tryokhgorny, Zlatoust-36 Nuclear Weapon Assembly/Disassembly

Novaya Zemlya Nuclear Test Site (former Semipalatinsk, Degelen Gora)



RESEARCH AND DEVELOPMENT INSTITUTES







Sarov ARZAMAS-16 VNIIEF



ALL-RUSSIAN RESEARCH INSTITUTE OF EXPERIMENTAL PHYSICS



- Founded 1946 at Sarov (Arzamas-16)
- Stewardship of the Russian nuclear stockpile and improved efficiency, safety and reliability of nuclear warheads
- Development of combined computer simulation methods for various physics phenomena using advanced high-performance computing systems
- Advanced design methods for complex engineering systems
- Hydrodynamics of transients, detonation physics and technology;
- Nuclear physics and radiation physics
- Development and operation of research reactors for the purposes of science
- Development and operation of technologies for control and accountability of nuclear materials
- Science and technology support of the international arms limitation and nuclear nonproliferation treaties

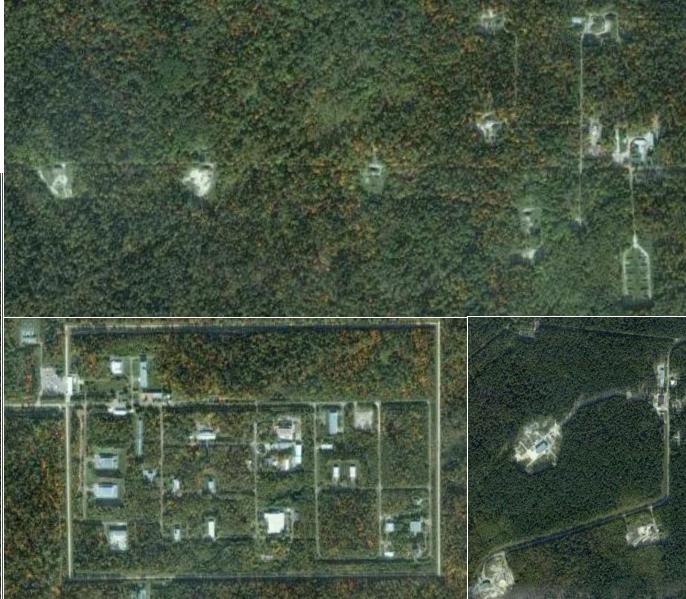








Facilities Arzamas-16 / 2012





Rocket Sled Facility Arzamas-16 / 2012





Arzamas-16 Museum





Arzamas-16 Museum





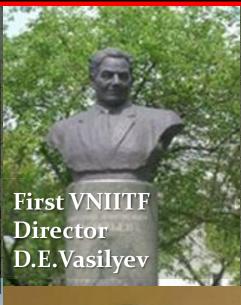
CHELYABINSK-70 VNIITF



ALL-RUSSIAN SCIENTIFIC RESEARCH INSTITUTE OF TECHNICAL PHYSICS









- Founded 1955 at Snezhinsk
- Stewardship of the Russian nuclear stockpile and improved efficiency, safety and reliability of nuclear warheads
- Properties of substances in a wide range of pressures and temperatures
- Kinetics of explosives
- Thermonuclear reactions
- Plasma physics
- Turbulent mixing
- Gas dynamics
- Inertial thermonuclear fusion
- Physics of the interaction of laser radiation with matter
- Astrophysics
- Computational mathematical modeling.



Kasli (Касли) CHELYABINSK-70 VNIITF





ALL-RUSSIAN SCIENTIFIC RESEARCH INSTITUTE OF TECHNICAL PHYSICS





KASLI ---VNIIETF







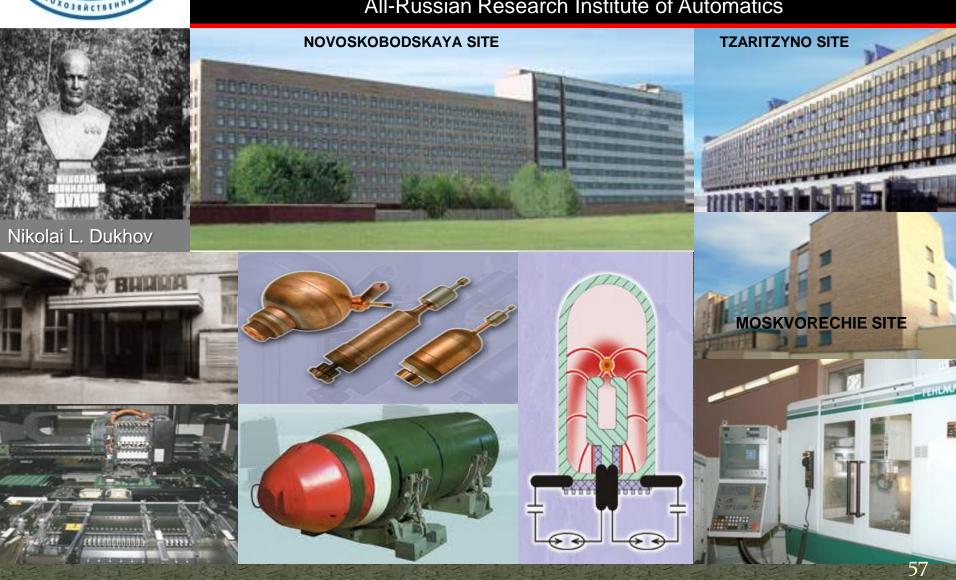




Nikolai L Dukhov Institute of Automatics VNIIA



All-Russian Research Institute of Automatics

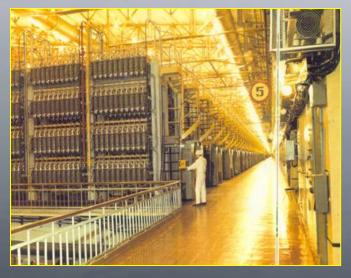




История русской ядерной программы

FISSILE MATERIAL PRODUCTION FACILITIES







Mayak Plutonium Recovery & Conversion Facility





Zheleznogorsk Plutonium Production KRASNOYARSK-26

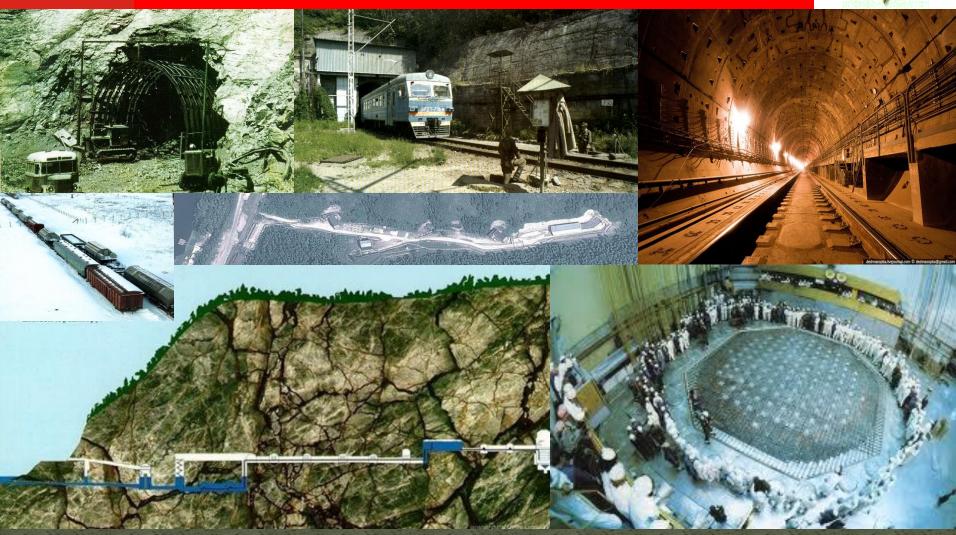






Zheleznogorsk Plutonium Production KRASNOYARSK-26 "DODONOVA"







Seversk Plutonium Production Tomsk-7















Angarsk Electrolysis Chemical Complex (Uranium Enrichment)





Novoural'sk Uranium Enrichment





Zelenogorsk Uranium Enrichment KRASNOYARSK-45





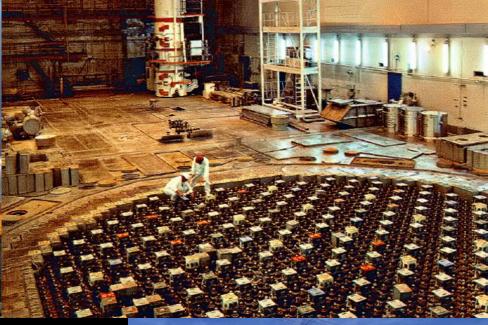
Seversk Siberian Chemical Combine TOMSK-7 URANIUM ENRICHMENT





Ancilliary Tritium Production from RBMKs





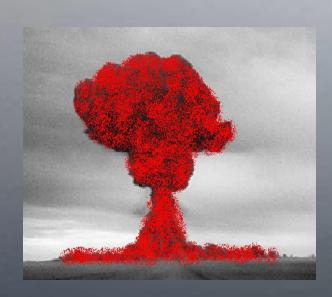


"High Power Channel-type Reactors"





WEAPON PARTS PRODUCTION FACILITIES







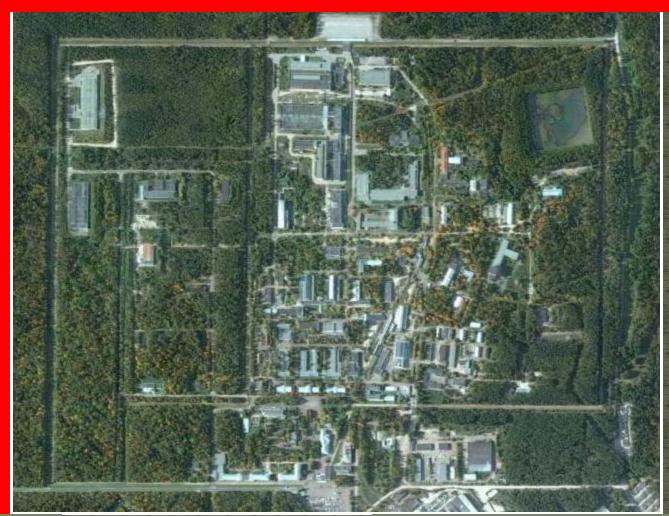
Mayak Pit Facility SECTION OF CHELYABINSK







Arzamas
Avangard
Warhead
Assembly/
Disassembly
Facility







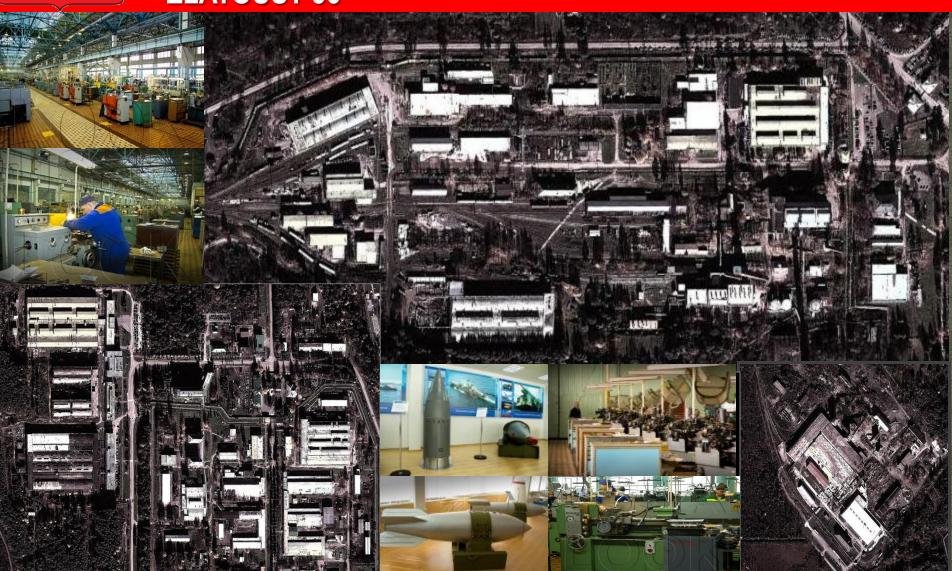


Kasli (Касли) Area 9 CHELYABINSK-70 VNIITF





Trekhgorny Weapon Parts/Assembly zlatoust-36





Lesnoy Weapon Parts/Assembly SVERDLOVSK-45 Лесной











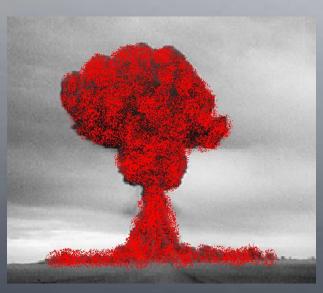
Zarechny Weapon Parts/Assembly (PENZA-19)







RUSSIAN NUCLEAR WEAPONS





















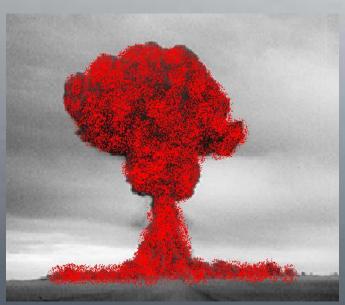








NUCLEAR WEAPON DELIVERY SYSTEMS









Russian Strategic Bombers









The Wasser Fall Legacy



The Wasser Fall was designed as an anti-aircraft weapon and was used several times to destroy Allied bombers amassed in formations. With the fall of the Third Reich, Wasser Fall missiles, parts, production equipment, and the technicians who operated the German production line were relocated to the Soviet Union.



R-7 Engines

Evolution of Russian Missles to the R-7

R-7 (SS-6 Sapwood)

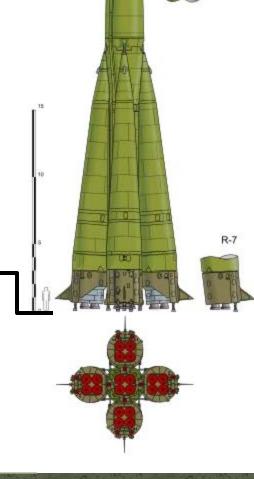


Plesetsk and one at

Baikonur (warhead

RDS - 46.5 MT)

R-7 Warhead









R-36M SS-18 SATAN

(8F675 Mod2) 20 MT warhead for R-36M2 / SS-18 Satan ICBM (single)

(8Fo21 2) 5 MT warheads for R-36MP / SS-18 Satan ICBM (3 MIRV warheads)

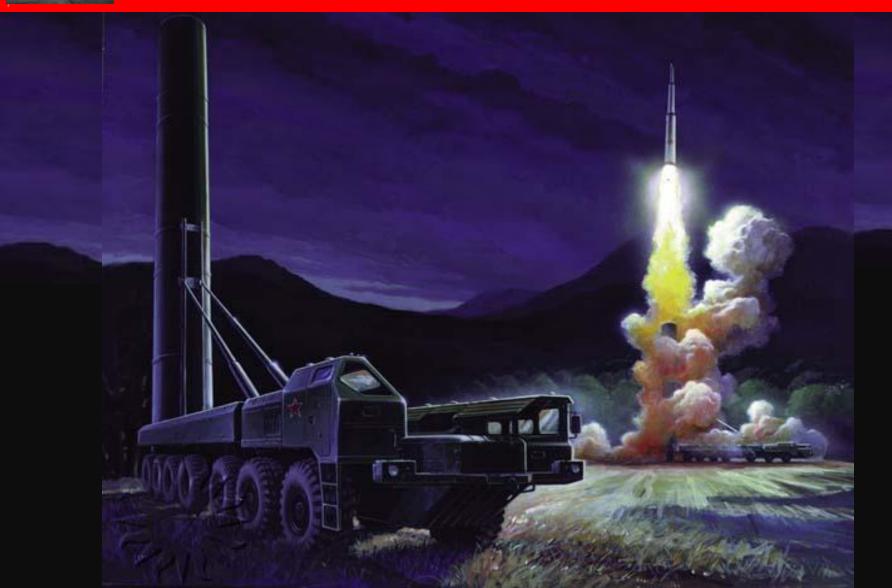
(R-36 MUTTh Mod 4) 550 KT warheads for R-36M2 / SS-18 Satan ICBM (10 MIRV warheads)

(R-36M2 Bоевода Mod 5) 10 MIRVed 750 KT warheads)

Russia is developing a new heavy ICBM



Road Mobile Topol Sickle Launch





RT-23 / SS-24 Scalpel ICBMs had 10 MIRV warheads with design yields of 550 KT. The system was extremely heavy, so heavy that it caused extensive rail damage when deployed. This problem likely was one reason the Russians agreed to retire the RT-23 under the SALT agreement.





Deputy Defense Minister Yury Borisov announced that the Moscow Institute of Thermal Technology (MITT) was developing a new, lighter weight rail-mobile ICBM system, permitted with the end of START. This upgrade eliminates the damage to railroads caused by the RT-23. According to public Russian statements, the nuclear warheads will be of a new design that will be significantly hardened to nuclear effects.



RS-24 Yars (NATO SS-29)



RS-24 Yars (NATO SS-29) is heavier than the Topal-M and can be deployed in both silo and road mobile. Yars could be capable of delivering 10 independently targetable RVs and entered service July 2010.



Moscow Institute of Thermal Technology



Road Mobile Topol-M (RS-12 M2) SS27 Sickle B



Per Russian Strategic
Missile Force Commander,
Lt. Gen. Sergei Karakayev,
Russia plans to replace its
single-warhead mobile RS12M2 Topol-M
intercontinental strategic
missile system with a new
Topol missile that can carry
up to four, independentlytargetted, nuclear warheads.



The New Roadmobile Version of the RS-24 Yars





Delta IV SSBN

139m long/12m beam







Delta IV SSBN (involved in Murmansk Fire, 29 Dec 2011)



Yekaterinburg Delta IV SSBN in 2011 Murmansk Fire



Project 941

Akula, SS-N-20 Missiles





R-27

SS-N-6



SS-N-8











R-29R SS-N-18

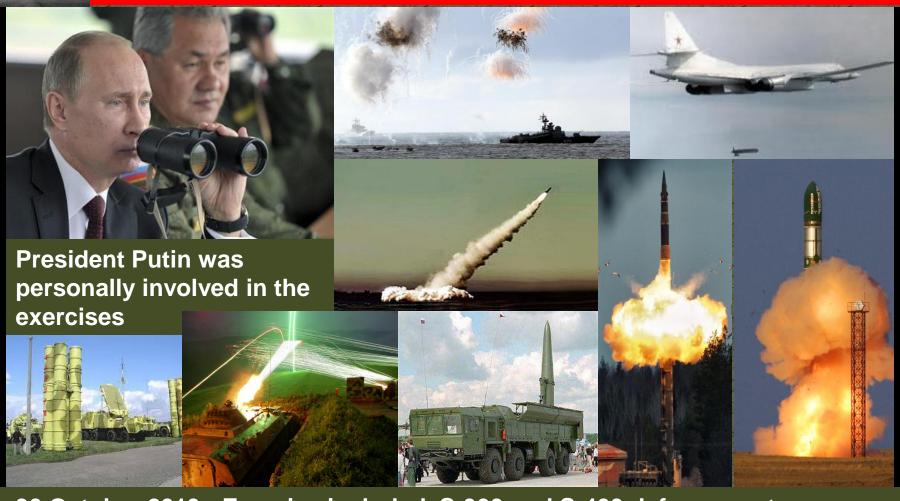
R-29RM SS-N-23

R-39 SS-N-20





2013 Major Russian Strategic Exercises



30 October 2013: Exercise included S-300 and S-400 defense systems; launches of 2 ICBMs (Topol and SS-18); 2 SLBMs; 4 SRBMs (Islander (1) and Tochka-U (3)); 6 TU-95M and 2 TU-160 flights to Venezuela.

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Reemergence of Confrontational Strategies





2008 Faker tracks resume to test and evaluated US defense posture and capabilities

2009 Russian nuclear submarine patrols off US coasts resume (Sierra-2)



TO CLOSE: RUSSIA VALUES ITS NUCLEAR WEAPON PROGRAM AND IS CONTINUING MAJOR NUCLEAR FORCE IMPROVEMENTS

- The Russian nuclear weapons complex has downsized while modernizing within a smaller and more efficient footprint.
- Emphasis is being placed on modernizing Russian nuclear warheads, missiles, and serial production capacities.
- Significant year-around experimentation with very large parks of instrumentation vans is constantly occurred at the Novaya Zemlya UGT Site.
- In late 2012, Russia ended the Nunn-Lugar program that had focused on safeguarding SNM and converting it to peaceful use.
- The majority of funds in the 'Russian' defense program up through 2015 will be spent on modernizing Russian strategic nuclear forces.*

