July 1, 1955

Report by the Commission on the Review of the Scientific Principles of Atomic Compression and the Data on the Experimental Device RDS-37

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Summary:

A report on the design of the RDS-37 nuclear device and the implications of radiation implosion induced nuclear fusion on weapons design.

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A commission composed of I.E Tamma (chairman), M.V Keldysh, M.A Leontovich, A.D Sakharov, V.L Ginsburg, Ia.B Zel'dovich, and I.M Khalatnikov, was introduced for the first time at the KB-11 to the theoretical and experimental works done on the [RDS]-3c7 device.

The commission heard reports by comrades Sakharov, Zel'dovich, [unclear], Shumaev, Romanov, Babaev, Rabinovich, Gendal'man, Kozlov, Aleksandrov, Feoderitov, Stziborskov, Zamiatin, Ledenev, and [unclear], and discussed in detail the problems associated with different components of the [RDS] 37 device.

The commission likewise familiarized itself with the reports of theoretical sectors no. 1 and no. 2, the scientific reasoning behind the radiation implosion method, the calculation methods used, and the results of calculations relating to the RDS-37 device.

The commission confirms that the utilization of radiation implosion opens up completely new possibilities in the realm of nuclear weapons. It allows for a symmetrical compression of the device to an extent that, in relevant dimensions, cannot be achieved with standard explosives. It can be assumed that the use of radiation implosion will allow us to devise a rational design of a super-device and will also radically lower the cost of devices with lower yield.

As known, in systems that, within the dimensions of the RDS-6s use standard explosives for nuclear fission, achieving 100% efficiency with relation to uranium-235 is impossible.

In such systems, the role of the thermonuclear reaction is limited only to the limited increase of the effects that we normally see in the fission of heavy particles.

The use of radiation implosion opens the possibility of the use of a thermonuclear reaction as a primary source for energy release. Thus, within the dimensions of the RDS-6s we can expect to get approximately 2 megatons with an efficiency of up to 300% with relation to the quantity of [fissile material] put into the system.

It can be expected that for other dimensions (weight 15 tons) it will become possible to build a system that will yield a release energy of 10-15 million tons at the expense of (…) kg of [fissile material] and of (…) kg of "Lithium-6 Deuteride."

In principle, it is also possible to create radiation implosion within the dimensions of the RDS-4 with a yield of about 0.5 megatons.

In a system using radiation implosion, almost all of the energy release can be attributed to thermonuclear reactions in the cheapest light 6LiD device and the fission of natural uranium resulting from these reactions.

On the basis of the mentioned reports, it is possible to conclude that about half of all energy is released directly from thermonuclear reactions while the other half is released from the fission by fast neutrons of uranium-238 atoms.

It is worth noting that thanks to the latter circumstance, the quantity of radioactive products in systems using radiation implosion will be significant.

The actions of systems with radiation implosion can be broken up to following essential stages -

(…)

The commission states the following about the state of the work on the calculations on the steps listed -

(…)

Conclusions:

The commission notes that great efforts have been made at the KB-11 and at the Department of Applied Materials in studying the new scientific principles that underline the design of hydrogen bombs using radiation compression.

These studies show that a hydrogen bomb with a large capacity can be constructed

within the dimensional constraints while using significantly less fissile material, as compared to such inefficiencies in our current devices.

The commission believes that the next important step in the development of hydrogen weapons is the testing of the proposed KB-11 experimental device at polygon number 2.

The experiments that were conducted support the notion that the conducting of the test in 1955 is indeed warranted.

The commission recommends that a number of provisions will be clarified by additional calculations and tests, to be upwardly modified.

The head of the Commission: Tamm I.E

Members of the Commission: Ginsburg V.L

Zel'dovich' Ia. B.

Keldysh, M.V

Leontovich M.A

Sakharov A.D

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