Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

Title: Effects of Nuclear Weapons

Chairperson: Mr **Piyush Ghasiya**, Research Associate, CAPS

Speaker: Wg Cdr **Rohit Kaura**, Research Fellow, CAPS

Discussant: Ms **Hina Pandey**, Associate Fellow, CAPS

Rapporteur: Ms **Swati Sinha**, Research Associate, CAPS

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Highlights of the Fellows' Seminar held on September 1, 2017 are as follows:

- On July 16, 1945 the world came to the cusp of a momentous change with the detonation of the Trinity, mankind's first nuclear explosion in New Mexico. Less than a month later with the dropping of the bomb on Hiroshima on August 06, 1945 the change became prominently clear.
- Although there are fewer nuclear weapons today as compared to the Cold War, the number of countries possessing them has increased. As a result, involvement of more actors poses a greater potential for mishap or misunderstanding, and greater risk that a weapon could be detonated, either intentionally or accidentally.
- The detonation of a nuclear weapon would have serious immediate and long-term consequences for people, society and the environment. While the full extent of these consequences depends on several factors, including the size, number, height and location of the explosion(s), it is possible to make some general predictions on the basis of past experience and accumulated knowledge.

- It is legitimate for anyone living on this planet to question the consequences of a nuclear explosion on human beings, societies and the environment. A basic understanding of the potential hazards one may encounter in the event of a nuclear detonation and protective measures required to minimise the exposure of these hazards is therefore necessary.

- Different types of hazards result from a nuclear explosion. These include the effects from the flash, thermal and blast waves, initial nuclear radiation, and the long-term hazard from radioactive fallout.

- A nuclear weapon is an explosive device that derives its destructive force from the nuclear reactions, either fission or a combination of fission and fusion (thermonuclear weapon).

- There are biological effects of thermal radiation:

    - The flash in nuclear explosion is so intense that it causes "flash blindness "and skin burns injuries.
    - When flash blind, people are unable to see what is going on around them or what they are doing. A 6-kiloton blast could cause flash blindness a Km away on a clear day, or 30 km away at night. Many people in Hiroshima and Nagasaki were blinded for several minutes. Some cases of flash blindness lasted up to three hours. A night time blast probably would have caused more severe blinding effects due to the degree of pupil enlargement and focusing actions of the eye.
    - Thermal radiation causes burns through absorption of the energy by the skin, and is known as flash burns or by ignition of clothing because of fires started by the thermal radiation, known as flame burns. Such thermal injuries may occur even at distances where blast and initial nuclear radiation effects are minimal. Indirect flame burns can easily outnumber all other types of injury
    - A 10-kiloton blast causes first degree burns 3 km away on a clear day. First degree burns are equivalent to a bad sunburn. The same blast can cause second degree burns 2.5 km away and third degree burns about 1.6 km away. Third degree burns destroy skin tissue and will cause serious shock and death without specialized medical care.

- Other effects of thermal expansion are: shock expansion, blast and shock effects, radiation, radiation fallout, global fallout.

- The resultant shock wave from a nuclear explosion can destroy buildings and other structures for kms around. An overpressure of as little as 2 to 3 psi could blow people out and cause serious injuries.

- Radiation release is an event exclusive to nuclear explosions. A nuclear burst results in four types of ionizing radiation: alpha, beta, gamma and neutron.

- Radiation effects are considerably more complex and varied. People close to ground zero may receive lethal doses of radiation, however, only a relatively small proportion of deaths and injuries result from initial radiation. Nonetheless, radiation can neither be seen nor felt, but it can produce harmful effects.

- Strontium-89, strontium-90 and iodine-131, all of which are formed in considerable quantities because of fission, are known to be biologically hazardous when deposited in humans and animals. These potentially hazardous fission products may be taken into the body by either inhalation or ingestion, and tend to collect in certain parts of the body such as the bone or thyroid, where their damage is done over an extended period leading to higher incidence of leukaemia, bone and thyroid cancer.

- Among the long term and global environmental impacts due to nuclear war, is included the possibility of a 'nuclear winter'. On a larger scale, it is threatening to agriculture and hence food supplies across the world.

- Other effects include major damage to the ozone layer – which protects humans and ecosystems from damaging ultra-violet rays from the sun and the long-lived effects of radioactivity.

- Nuclear weapons' use will affect military as well as civilians, aggressors and innocents similarly, killing individuals alive now and generations not born yet. There is no panacea for protection from nuclear attack.

- In a major attack upon any country, millions of people would be killed. There appears to be no practical program that would avoid large-scale loss of life. But an effective program of civil defense could save the lives of millions who would not otherwise survive. Fallout shelters and related preparations, for example, could greatly reduce the number of casualties.
