

later stages of development, before they have reached final design and long before they are produced and operationally deployed. For example, the ABM Treaty includes a statement that an ABM system based on physical principles other than those being employed in 1972 should be subject to discussion regarding specific limitations. In most cases such an innovation would require extensive testing before deployment could be considered.

Recent arms control agreements have included undertakings not to interfere with NTM, including a commitment to refrain from encrypting telemetry at test ranges. START provides for exchange of telemetry tapes, together with information useful for interpretation of the signals, and sets limits to the practice of returning data to earth in capsules, rather than by telemetry. It seems probable that further cooperation may be offered by invitations for observers to attend tests of various conventional weapons and of space launches. Precedents have been set by arrangements among the USA, Russia, and the UK for visitors to monitor nuclear tests, and to inspect ballistic missile reentry vehicles to determine the number of warheads. This latter activity will become more important with the "downloading" of multiple warheads, as encouraged by START and subsequent unilateral proposals. Such examples of transparency stand in sharp contrast to the former obsessive secrecy surrounding the technical characteristics of strategic missiles.

The systems whose tests reveal the most to monitoring by NTM are those such as space vehicles and long-range missiles which will follow a long trajectory at high altitude, some of it possibly in outer space or international airspace. Verification of an agreement not to put certain types of equipment into orbit, or to launch it for weapon tests, might demand inspection on the launch site. The testing of weapons such as short-range missiles and guns would be much more difficult to verify without the presence of inspectors at the test range.

Another aspect of verification which can involve testing arises when a treaty agrees to limitations on testing. The ABM Treaty allows testing of fixed ground-based ABM systems composed of interceptor missiles, launchers, and radars, but forbids testing of space-based ABM systems or testing "in an ABM mode" of systems originally designed for anti-aircraft or antisatellite defence. If research and development is pursued into the design of a system intended for defence against tactical ballistic missiles, satellites, or aircraft, then live testing would be required, and difficulties could arise in verifying that its capabilities fall short of defence against strategic ballistic missiles. A fundamental difficulty lies with the definition of the categories "strategic" and "tactical" ballistic missiles.

It can be seen that testing of weapons can be both a valuable means of verification and also a subject for verification. Except for cooperative situations in which inspectors are permitted to visit test ranges or observe tests, the information will have to be gathered by NTM of a sophistication possessed by very few nations.

Personnel Limitations

Limitations on military personnel were discussed throughout the long and unsuccessful MBFR negotiations, but satisfactory arrangements for verification could not be agreed. The CFE Treaty — sometimes called CFE 1 — was signed* in November 1990, providing for reductions in several types of equipment (Treaty Limited Equipment or TLE), and includes provisions for intrusive verification. However, it left the vexed topics of aerial inspection and personnel limitations to be negotiated in follow-on CFE discussions, pending which the parties undertook not to increase the total peacetime authorized personnel strength of their armed forces. (In fact they made substantial unilateral reductions). A concluding act (often called CFE 1A) on personnel strength was signed in July 1992,

* The signatories were all 16 NATO nations (including the unified Federal Republic of Germany), the U.S.S.R. and the other states of the Warsaw Pact.

