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6 JAN 1977

[redacted] - UNCLASSIFIED UPON REMOVAL OF ENCLOSURE

MEMORANDUM FOR THE ASSISTANT SECRETARY OF THE NAVY (RESEARCH & DEVELOPMENT)

Subj: Review of Legality of the TOMAHAWK Cruise Missile (U)

Ref: (a) SECNAVINST 5711.8 of 14 Jan 1976, Subj: Review of Legality of Weapons under International Law
(b) ASN (R&D) ltr ser. S634258 of 23 Dec 1976

Encl: (1) Subject review

1. (U) Reference (a) requires the Judge Advocate General to conduct a review of weapons acquired or procured under the responsibility of the Department of the Navy to ensure that the intended use of the weapon is consistent with applicable international law. Pursuant to the information provided by reference (b), such a review has been completed in the case of the TOMAHAWK Cruise Missile. The weapon as currently configured is consistent with the obligations of the United States under applicable international law. A memorandum concerning the legality of the weapon and discussing certain legal principles which must be considered in its employment is forwarded as enclosure (1).

WILLIAM O. MILLER
Rear Admiral, JAGC, U.S. Navy
Judge Advocate General

Copy to:
OP-098
OP-02
OP-03
CHNAVMAT (less encl)
ASN (I&L) (less encl)

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5 January 1977

Classified by ASN (R&D)

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ENCLOSURE (1)

Review of the Legality of the TOMAHAWK Cruise Missile (U)

I. (U) Introduction

The TOMAHAWK Cruise Missile, currently under advanced development, is designed as a long range cruise missile configured either as a nuclear armed land attack missile or a conventionally armed anti-ship missile, capable of launch from submarine, surface or aircraft platforms.

II. [redacted] Requirement for the Weapon. (U)

A. (SRD) Land Attack Missile. (U)

The possibility of Soviet aggression poses a significant threat to vital U.S. interests overseas. Faced with numerically superior opponents, especially in Europe, U.S. forward deployed forces are responsible for deterrence of Soviet aggression. Should our strategy for deterrence fail and hostilities occur, the U.S. should have the capability to apply weapons appropriate to the provocation and reduce the potential for further escalation. U.S. forward deployed conventional and Theater Nuclear Forces (TNFs) provide the National Command Authority (NCA) with the capability to direct military actions aimed toward conflict termination at the lowest level of intensity without resorting to use of strategic nuclear weapons.

[redacted] Theater Nuclear Forces play a key role in deterring Soviet aggression by enhancing the warfighting ability of deployed U.S. forces and providing continuity of force capabilities over a wide range of warfare operations. Should the employment of Theater Nuclear Forces be directed by the NCA, the weapon applied should be highly accurate and capable of penetrating severe defenses to insure the highest confidence in target destruction. Weapon yields must be sufficient to destroy the target while minimizing collateral damage. Cruise missiles designed with these characteristics and deployed as regional defense weapons (i.e. Theater Nuclear Forces) would provide the NCA with the capability to conduct limited nuclear war within clearly defined boundaries, minimizing the risk of further escalation, while retaining the integrity of our strategic nuclear deterrent.

[redacted] Since cruise missiles can be launched from a wide variety of platforms, these weapon systems would increase significantly the total capability of Theater Nuclear Forces (TNF). Sea-based cruise missiles would reduce dependence on land-based nuclear weapons stored overseas. Deployment on

[redacted]

[redacted]

sea-based platforms also avoids the security threats posed to land-based TNF from terrorists in peacetime and direct attacks during hostilities.

[redacted] - Current Navy power projection capabilities to support land operations reside principally in a limited number of U.S. aircraft carriers. The addition of other sea-based power projection forces armed with land-attack cruise missiles would increase the number of offensive platforms manyfold. Equally important, submarine launched TOMAHAWK missiles will permit deployment of additional naval power projection forces capable of operating independently of the carrier task force as initial engagement forces in high threat areas and as power projection forces in areas not routinely patrolled by carrier task forces.

[redacted] - The versatility and flexibility derived from its penetrability, high accuracy [redacted] make TOMAHAWK an ideal candidate for employment in non-SIOP limited nuclear options. Enemy defensive forces would be faced with a new, low altitude threat requiring significant expenditure of resources to counter it effectively. TOMAHAWK's high accuracy will provide high confidence in achieving target destruction. [redacted] Additionally, the capability to perform ad hoc targeting functions would significantly improve the utility, flexibility and responsiveness of deployed naval forces supporting U.S. theater nuclear policy.

B. [redacted] Anti-Ship Missile. (U)

The Soviet Navy has developed a significant capability to conduct surface-to-surface attacks with cruise missiles that outrange guns, the primary surface-to-surface weapon on most U.S. Navy ships. Additionally, the Soviets have deployed two helicopter carriers (MOSKVA class) and the VSTOL carrier KIEV which have the potential to use their aircraft in long-range anti-ship attacks. Soviet designed anti-ship missiles have proliferated to sixteen countries in the form of missile-equipped fast patrol boats. With the exception of the 60 mile range HARPOON Cruise Missile planned for employment in 1977, the U.S. Navy's current

[redacted]

[redacted]

capability to attack surface ships at ranges greater than about 20 miles is concentrated in its attack aircraft deployed on aircraft carriers. In considering a major war with the Soviet Union, this U.S. force posture is undesirable for two reasons. First, the carriers may be urgently needed for missions other than opposing Soviet surface forces; and second, the carriers are likely to be the focus of Soviet attacks at the beginning of hostilities. These considerations indicate that the U.S. needs to deploy long range cruise missiles in order to strengthen and diversify its ability to attack Soviet ships at longer ranges. In comparison with HARPOON, the anti-ship TOMAHAWK deployed on nuclear attack submarines (SSN 594, SSN 637 and SSN 688 classes) and certain surface combatants (CGN-36, CGN-35, CG-26, CGN-25, CGN-38, CG-9, DD-963 and CSGN classes) will provide the Navy with an anti-ship missile having a longer range, improved survivability and greater lethality against Soviet surface combatants. The increased capabilities afforded by TOMAHAWK will provide an increased operating flexibility for U.S. Naval Forces. Given an estimated target location, TOMAHAWK could use part of its range capability for search, target acquisition and discrimination having once reached the expected target location.

III. [redacted] Land Attack Missile. (U)

A. (SRD) Characteristics. (U)

1. (S) Operational Performance Objectives. (U)

a.	Maximum range	1300 NM to 2000 NM
b.	Cruise Altitude (smooth terrain)	Down to 150 ft
c.	Terminal accuracy (CEP)	[redacted]
d.	Mission success rate	[redacted]
e.	Maximum Standoff from coast	800 NM

[redacted]

[redacted]

f. Cruise speed — 0.7 Mach

g. Launch depth — [redacted]

2. (C) Technical. (U)

a. Propulsion	Turbofan sustainer engine
b. Booster	Solid rocket
c. Launch weight	3300 lbs
d. Length	246 inches
e. Diameter	21 inches
f. Guidance system	Inertial reference aided by a radar altimeter and Terrain Contour Matching System (TERCOM)

3. [redacted] Warhead (W80). (U) 1/

a. Weight — [redacted]

b. Yield — [redacted]

1/ The W80 warhead is in Phase 3 Engineering Development by the Energy Research and Development Administration (ERDA), and is planned to be a common warhead for TOMAHAWK, the U.S. Air Force Air Launched Cruise Missile (ALCM) and the USAF Short Range Attack Missile (SRAM).

B. (C) Flight Performance. (U)

1. (C) Typical Trajectory. (U)

After surface or submerged launch the solid rocket thrust vector control booster ignites and burns for about 13 seconds and climbs at a controlled angle. A pitchover maneuver and engine start occur after the booster separates and the missile flies to a predetermined cruise altitude. The missile is then inertially guided to a pre-selected landfall from which position the

[redacted]

[redacted]

TERCOM system provides a series of navigation updates from check point to check point on a designated course to the target. Between check points the missile flies inertially. TOMAHAWK can be programmed to change course, speed and altitude to obtain greater range performance and penetrativity and is capable of a maximum cruise altitude of 40,000 feet. Just prior to arrival at the target, the missile climbs (or descends) to the optimum burst height (as determined by target type and hardness). The rocket booster, after ejection, will not impact on land for any reasonably anticipated launch point.

Under normal stockpile to target sequence environments, warhead detonation is met only when the summation of all pre-planned mission related events has been verified to have occurred in proper sequence over a specified time interval, and the Arming and Firing Circuits have been activated. The only probable way for a warhead detonation signal to be commanded by the missile guidance computer is for the missile to be at the intended target at the intended time with the missile computer functioning as intended. Nuclear safety is provided in the Arming and Firing Circuits through computer control of [redacted] All of the Arming Relays must be closed and latched before the warhead detonation signal can be issued. Thus, multiple series redundancy is employed to achieve nuclear safety. The Arming and Firing Circuits are designed such that inadvertent malfunction of any single component will not result in the arming or firing of the warhead.

During the entire flight, a complex test program is continually being run in the guidance computer concurrently with mission flight functions to self-test the computer. The computer verifies the occurrence of seven out of nine TERCOM fixes over terminal arming maps before closing the last warhead Arming Relay. The probability of the missile being at an unintended position after the TERCOM arming position fix is less than 1 in 10^9. In flight probability of success of missile guidance computer hardware is 0.989 (excluding effects of any enemy action).

2. (C) Guidance. (U)

The Terrain Contour Matching System (TERCOM) updates the inertial navigator along the flight path over land. Updates are based on the correlation of stored map data with the elevation profile of the terrain being

[redacted]

overflown [redacted] measured by a radar altimeter. Terminal accuracy is dependent on distance from the last update point (accuracy decreases with increasing distance). The terminal accuracy [redacted] has been achieved during Advanced Development flight tests. Variation in CEP as a function of distance from the last TERCOM fix point does not deteriorate excessively for use [redacted] against soft military target at distances up to 100 NM from the last TERCOM update.

C. [redacted] Weapon Effects. (U)

1. [redacted] Structures and Installations. (U)

Structures and installations are categorized as soft, including soft military targets and industrial type facilities; and hard such as hardened command and control center, underground fuel/ammunition storage facilities and hardened missile silos. The weapon effects on these two general types of targets are quite different and will be treated separately. (C)

a. [redacted] Soft Targets. (U)

Potential soft to medium targets include airfields, supply depots, command and control centers, surface-to-air missile sites including radar antennas, missile launchers, electronic equipment in either vans or semi-protected emplacements, missile storage/maintenance areas, troop concentrations and unhardened industrial areas; ground radar facilities, early warning and Air Traffic Control radars. As an example of the effect of the TOMAHAWK W80 warhead with [redacted] a soft military target, the damage expectancy against a Surface-to-Air (SAM) installation in the open is presented. The TOMAHAWK warhead will result in the launcher being overturned and the missile(s) being destroyed at about 5 psi peak overpressure. The optimum height of burst of the warhead of this type target is such that little or no debris from the ground is drawn into the fireball, resulting in negligible radioactive fallout. In this example there would be only light damage to residential wood frame structures over one mile from the detonation.

b. [redacted] Hard Targets (U)

The TOMAHAWK missile with a [redacted] delivered against a reinforced concrete igloo for ammunition storage will result in collapse of the igloo with moderate to severe damage to the contents. The low altitude burst would result in significant radioactive fallout. Against a massive arch masonry bridge, the W80 [redacted]

[redacted]

the [redacted] option will achieve a 50% probability of severe cracking and rupture at the crown of the arch. The optimum height of burst would be such that debris from the ground would be sucked into the fireball resulting in significant post-detonation radioactive fallout.

2. [redacted] Personnel. (U)

Collateral fatalities/injuries associated with a nuclear warhead attack against military or industrial targets will result.

a. [redacted] Specific Effects. (U)

(1) [redacted] Thermal. (U)

The TOMAHAWK W80 warhead with a [redacted] will cause 2nd degree burns, under good visibility conditions, on exposed personnel at distances up to [redacted] from ground zero of the burst (airburst). Similarly the [redacted] yield warhead in an airburst will result in 2nd degree burns at distances up to [redacted] Second degree burns over 25 percent of the body result in a 50 percent probability of death. For near-ground bursts, burns are heavily dependent on shielding by structures and natural terrain barriers.

(2). [redacted] Initial Nuclear Radiation. (U)

The W80 warhead [redacted] yield airbursts will result in 100 percent fatalities out to a range of about 4000 feet to exposed personnel with decreasing percentages of death out to a range of about 5000 feet. A [redacted] airburst will result in 100 percent fatalities to exposed personnel out to a range of about 4900 feet with decreasing percentages of deaths out to about 6500 feet.

(3) [redacted] Peak Overpressure. (U)

The peak overpressures required to cause damage to wheeled vehicles such as heavy trucks will also have a 50 percent probability of incapacitating injuries to personnel (rupture of internal organs).

(4) (U) Secondary Blast Effects. (U)

These effects include body transition and impact, structural impact and bodily injury from flying debris. In buildings, 5 psi overpressures will result in

[redacted]

[redacted]

50 percent probability of incapacitating injuries. In streets, 3 psi overpressures will result in 50 percent probability of incapacitating injuries.

b. [redacted] Combined effects. (U)

Injuries in heavily populated areas are generally dominated by secondary blast effects resulting from peak overpressures as low as 3 to 5 psi. The optimum height of burst for a W80 warhead [redacted] and targeted at an exposed Surface-to-Air missile site is about 1300 feet. At that height of burst, about 4 psi peak overpressure will result at about 1100 feet from ground zero. For a populated area inside a circle of 1100 feet radius about the same site, the [redacted] detonation will result in about 65 percent fatalities plus an additional 20 percent incapacitating casualties for personnel within frame wood buildings, wall bearing buildings, adobe buildings or forests.

c. (U) Fallout Radiation.

Since the optimum height of burst for soft military targets is well above the minimum altitude defined for an air burst weapon, contamination from fallout is not significant. For hard targets, [redacted] low altitude or ground bursts will result in significant radioactive fallout. However, many hard military targets are located away from heavily populated urban areas.

IV. 2. [redacted] Anti-Ship Missile. (U)

A. [redacted] Characteristics. (U)

1. [redacted] Operational Performance Objectives. (U)

a. Maximum aerodynamic range:	650 NM
b. Maximum operational range:	300 NM
c. Cruise altitude:	50 feet
d. Cruise speed:	0.7 Mach
e. Launch depth:	[redacted]
f. Probability of hit (destroyer size target):	[redacted]

[redacted]

2. (U) [redacted] Technical. (U)

a. Propulsion:	Turbofan sustainer engine
b. Booster:	Solid rocket
c. Launch weight:	3300 lbs
d. Length:	246 inches
e. Diameter:	21 inches
f. Guidance system:	Midcourse guidance unit (AUTOPILOT), radar seeker and radar altimeter

3. (U) [redacted] Warhead (MOdified MK 40 Mod 1 BULLPUP Warhead).* (U)

a. Weight (total):	969 lbs
b. High explosive (HE) weight:	371 lbs
c. HE TNT equivalence:	406 lbs
d. Projectile:	588 lb forged steel case
e. H.E. components	284 lbs of H6 (RDX/TNT/Aluminimum/Wax) and 87 lbs of PICRATOL

*The MK 40 Mod 1 Warhead is classified as a penetrating type warhead.

B. (C) Flight Performance. (U)

1 (U) [redacted] Typical Trajectory. (U)

Prior to launch, the missile fire control system initializesthe missile computer and aligns the attitude reference system. For long range targets it is necessary to inject data that define a trajectory to

[redacted]

[redacted]

follow when searching for the target. After launch, the missile's booster and thrust vector control system propel it to an altitude of about 1200 feet. Booster burnout initiates the sequence of booster jettison, wing deployment and cruise engine start. After turning to the pre-determined initial flight course, TOMAHAWK adopts a low cruise altitude, using a radar altimeter for control. When beginning search for the target, the missile will climb to an altitude of about 400 feet in order to extend the horizon of its active radar seeker. The radar will search 45 degrees to each side and 0.2 to 24 miles ahead of the missile. When necessary, the missile will fly a search pattern to cover any target area of uncertainty. After radar searches, the missile will return to cruise altitude to reduce its detectability. In acquiring the target, TOMAHAWK goes through certain maneuvers and then begins terminal homing. In an electronic jamming environment the radar seeker, which has desirable countermeasures features, permits homing on the jammer. Passive Identification and Detection Equipment will assist the missile in homing on targets radiating a designated fire control radar. The warhead detonates on target impact.

e. (U) [redacted] Guidance. (U)

The guidance system consists primarily of modified HARPOON missile equipment. Major components are the radar seeker, midcourse guidance unit and radar altimeter. The active radar seeker is a horizontally polarized, frequency agile Ku-band unit incorporating a number of significant ECCM features, including jammer detection and decoy recognition; home on jam; and rapid reacquisition features. For extended range targets (over 100 miles), the missile can be programmed to make multiple passes at the target. The midcourse guidance unit consists of two functional elements -- an attitude reference assembly (rate gyros and accelerometers) and a digital computer/autopilot.

f. [redacted]eapon Effects

1. Fragmentation. On detonation the MK 40 BULLPUP Warhead produces approximately [redacted] with weights between 1 1/4 grams and 186 grams. Fragment velocity over the first 40 feet of flight range from [redacted] to [redacted]

[redacted]

[redacted]

V. [redacted] Employment of the Land Attack Missile. (U)

A. General. (U)

TOMAHAWK nuclear armed land attack missiles are planned for deployment on U.S. Navy General Purpose Force platforms (nuclear attack submarines and surface combatants) under operational control of the Theater Commander and in support of operational plans for theater nuclear operations developed by the Theater Commander and approved by. Targets would be assigned to TOMAHAWK at the direction of the National Command Authority (NCA), or delegated to the Theater Commander as the situation dictates for execution of Limited Nuclear Options and/or Regional Nuclear Options. The specific decision to launch the TOMAHAWK land attack missile against a target is retained by the NCA. Current planning for TOMAHAWK does not contemplate its commitment to SIOP, although ad hoc targets may be assigned by the Joint Strategic Target Planning Staff of the Joint Chiefs of Staff. It is contemplated that TOMAHAWK will be utilized in Theater Nuclear Operations or in Limited or Regional Nuclear Options in pursuit of the following objectives.

B. [redacted] National Strategic Objectives. (U)

1. (U) The principal objective is deterrence of nuclear and conventional attacks or attempts at coercion under a threat of nuclear and conventional attacks against the United States, its allies and any nation whose security is vital to United States interests.

2. (U) If deterrence fails, the major objectives are to assure a position of power and influence on the part of the United States and to limit the scope of the conflict, its consequences and damage to the United States and its allies. This is to be accomplished through control of escalation:

a. by conducting selected military operations to protect vital United States interests and to foreclose enemy opportunities for further aggression.

b. by attempting to limit the level and scope of violence.

c. by holding some vital enemy targets hostage and threatening their subsequent

[redacted]

[redacted]

destruction in order to coerce the enemy into negotiating a war termination.

d. [redacted] If escalation cannot be controlled, the United States objective is to maximize the resultant political, economic and military power of the United States relative to the enemy in the postwar period in order to preclude enemy domination. This is to be accomplished by: (U)

(1) [redacted] Destruction of those enemy political, economic and military resources critical to the enemy's postwar power and influence and national and military recovery.

(2) [redacted] Limitation of damage to the United States and its allies through counterforce operations.

(3) [redacted] Maintenance of a strategic force in reserve for protection and coercion during and after the war.

C. [redacted] Theater Nuclear Forces. (U)

1. (U) Policy.

It is U.S. policy to maintain theater nuclear forces which complement and provide a continuum between conventional and strategic nuclear forces. Theater Nuclear Forces (TNFs) are intended to deter nuclear attacks, to deter conventional attacks in conjunction with conventional forces and, if necessary, to defend in the event of attack. TNF's are not a substitute for conventional forces. TNFs will be forwarded deployed in those areas where they enhance deterrence, protect against failure of conventional defenses, discourage proliferation, and can be provided reasonable security in both peace and war. Defense Guidance 10, [SecDef memo of 9 November 1976, hereinafter Defense Guidance]

2. [redacted] Employment in event of Conflict. (U)

TNFs will be considered for employment with conventional forces in the event of enemy first use of nuclear weapons or in the force of failure of the conventional defense. Authorization for the use of theater nuclear weapons will be maintained by the President as provided by law. Planning should recognize that release will be neither immediate nor automatic, and would be intended to achieve a significant improvement in the U.S. position given the likelihood of a Soviet response. Defense Guidance 16.

[redacted]

[redacted]

3. [redacted] Planning. (U)

TNFs should be structured to have the following characteristics; inter alia:

a. TNFs should provide the capability, with limited use and without excessive collateral damage, and in conjunction with conventional forces, to blunt a major enemy penetration, attack selected military, political and economic targets throughout the theater, and demonstrate to the enemy and his allies the risks inherent in continued aggression. Such limited employment should, however, provide such shock and decisiveness as to change dramatically the local situation, alter the assessment of enemy political leaders regarding quick victory and set the stage for negotiations in which the U.S. and its allies can expect to attain these basic objectives. Defense Guidance 22.

b. TNFs should provide military utility over a wide range of options including those which are limited in yield, number of weapons, collateral damage and geographic scope of employment (either basing or targets). Probable enemy response should be considered in every case. Defense Guidance 22.

D. [redacted] Pertinent Limitations on Employment. (U)

1. [redacted] General. (U)

Nuclear appendices of contingency plans for LNOs and RNOs are required to include the following considerations in discussion of the categories of weapon systems and target combinations to accomplish a given task or objective:

a. Minimum yield consistent with target characteristics and delivery accuracy.

b. minimum destruction/damage to noncombatants and facilities.

c. precautions to preclude the undesirable effects of initial nuclear radiation and

[redacted]

[redacted]

other effects in the context of reduced casualties to friendly forces.

d. the importance to the enemy of his command, control and communications.

e. the constraints imposed on force application.

f. the inclusion of nuclear alternatives which will provide the flexibility necessary for the NCA in making decisions for the employment of nuclear weapons. JSCP, Annex C at 10.

2. [redacted]Personnel and Residential Structures. (U)

Nuclear attack planning is not directed toward civilian population or residential structures per se, although substantial injury/damage to population and residential structures may result from targeting to accomplish the objectives in paragraph V.B. above. Additionally, plans for utilization of nuclear weapons are designed to minimize civilian casualties and civil destruction in friendly and neutral countries. Specifically, planning for LNOs and RNOs must provide for, inter alia, limitation of collateral damage to levels appropriate to objectives of the option, and minimizing damage to nonmilitary targets and friendly military forces [redacted] delivery vehicles with suitable accuracies and alternative targets to accomplish the objective.

3. [redacted]Urban areas. (U)

Attacks on certain targets, such as those which are in or collocated with major urban areas of 100,000 or more population may be prohibited or optionally withheld by a given plan for utilization of nuclear weapons. A target is defined to be collocated with a major urban area in terms of the level of damage to residential floor space which would result from attacking the target. Specifices planning guidance for LNOs and RNO's provides that every reasonable effort will be made to limit attacks in the vicinity of densely populated areas and avoid significant fallout. In any LNO or RNO the expected prompt and long term civilian fatalities should not exceed 10% of the population of centers with more than 25,000 and less than 50,000 people, or 5% of centers with 50,000 or more but less than 100,000 people. Damage to centers with 100,000 or more people should be avoided and expected civilian fatalities will not exceed

[redacted]

[redacted]

comparable figures. JSCP, Annex C, Appendix A at 27.

VI. [redacted] Employment of Anti-Ship Missile. (U)

A. (S) General. (U)

The TOMAHAWK anti-ship missile will be employed in surface combatants and nuclear attack submarines under the operational control of Fleet Commanders in Chief and as delegated to subordinate U.S. Naval Commanders. Potential adversary surface ship targets are as follows:

1. Major combatants
2. Major amphibious ships
3. Major logistics force ships
4. Lesser combatants with significant stand-off range capability.
5. Large merchant ships

B. (U) [redacted] Over-the Horizon Targeting. (U)

TOMAHAWK's extended range capability has resulted in the need to develop longer range targeting techniques and systems. Recognizing the requirement to develop an Over-the-Horizon (OTH) targeting capability for TOMAHAWK, as well as other current and future system, the Navy has several programs and systems either planned or under consideration to advance OTH. Existing shipboard sensors being considered for near term targeting are hull mounted sonar, towed array sonar, high frequency direction finding (HF-DF), ESM and radar.

1. (U) [redacted] The Over-the-Horizon/Detection, Classification and Targeting (OTH/DC&T) problem is receiving special Navy consideration since it encompasses aspects of weapon, sensor and launch platform configuration as well as associated Command, Control and Communications problems. High level coordination and direction of Navy OTH/DCT is being established both in OPNAV and NAVMAT.

2. (U) [redacted] One promising related project is OUTLAW SHARK, now undergoing concept demonstration. Project OUTLAW SHARK, which is associated with evaluation of the Interim Fleet Command Center/Interim Tactical Flag Command Center, is intended primarily to demonstrate the ability of a submarine to engage surface targets with TOMAHAWK at ranges out to 300 nautical miles using target definition information provided from external sources via satellite communications. The submarine contains data processing and display equipment to provide OTH target definition based on the received information.

[redacted]

[redacted]

E. (S) The Navy is developing an active radar satellite (CLIPPER BOW) to perform surface ocean surveillance in ocean areas of interest and to assist in targeting OTH weapons.

V. (U) Applicable International Law.

A. General.

The means of warfare which may lawfully be used by belligerents is not unlimited. Hague Convention No. IV Respecting the Laws and Customs of War on Land, Annexed Regulations, Article 22, October 18, 1907, 26 Stat. 2277, T.S. No. 539, 1 Bevans 631 [hereinafter cited as Hague Regulations]. It is generally considered that, unless expressly prohibited, the selection of a weapon and its use are permissible under international law. See e.g., Dept. of the Navy, NWIP 10-2, Law of Naval Warfare, Sec. 613 [hereinafter cited as NWIP 10-2]. The relevant principles embodied in such prohibitions are:

1. Unnecessary suffering.

Article 23(e) of the Hague Regulations prohibits the employment of "arms, projectiles, or material calculated to cause unnecessary suffering." A weapon and its use are lawful in this regard if the reasonably predictable nature and number of personnel casualties caused by the weapon are not disproportionate to the military necessity dictating its use under the circumstances, in consideration of the effectiveness of the weapon against the particular target and alternative weapons available for accomplishing the military objective. Dept. of the Air Force, AFP 110-31, International Law Relevant to the Conduct of Armed Conflict and Air Operations, Para. 6-3.b., at 6-2 [hereinafter cited as AFP 110-31], and sources cited therein.

2. Poison, poisoned weapons and poison gas.

Article 23(a) of the Hague Regulations forbids the use of "poison or poisoned weapons," and the first use of lethal gas is prohibited by the Geneva Protocol on the Prohibition on the Use in War of Asphyxiating, Poisonous, or Other Gases, and of Bacteriological Methods

[redacted]

[redacted]

of Warfare, June 17, 1925, T.I.A.S. No. 8061, 94 L.N.T.S. 65. Moreover the United States has renounced the first use in war of riot control agents and herbicides, except in certain limited circumstances. Exec. Order No. 11850, 3A C.F.R. 149 (1975).

3. Indiscriminate effects.

The St. Petersburg Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight, November 29/December 11, 1868, 1 Am. J. Int'l. L. Supp. 95 (1907), confirmed the customary rule against unnecessary suffering and also stated "That the only legitimate object which States should endeavor to accomplish during war is to weaken the military force of the enemy (emphasis supplied)." Indiscriminate weapons are those which cannot be accurately directed at military objectives or those the effects of the use of which are so uncontrollable as necessarily to cause disproportionate injury or damage to civilian persons of objects. AFP 110-31, supra, para. 6-3.c., at 6-3, and sources cited therein.

4. Attack on Civilian Populations and Urban Areas.

Attacks on civilians are prohibited by Article 3 (1) of the Geneva Convention Relative to the Protection of Civilian Persons in Time of War, August 12, 1949, 6 U.S.T. 3516, T.I.A.S. No. 3365, 75 U.N.T.S. 287: "Persons taking no active part in the hostilities...[shall not be subjected to]...violence to life and person...." Article 25 of the Hague Regulations provides, "The attack or bombardment, by whatever means, of towns, villages, dwellings, or buildings which are undefended is prohibited." The Hague Convention No. IX Concerning Bombardment by Naval Forces in Time of War, February 28, 1910, 36 Stat. 2351, T.S. No. 542, 1 Bevans 681, contains a similar provison in Article 1, and also provides:

> Article 2. Military works, military or naval establishments, depots of arms or war materiel, workshops or plants which could be utilized for the needs of the hostile fleet or army, and the ships of war in the harbour, are not, however, included in this prohibition. The commander of a naval force may destroy them with artillery, after a summons followed by a reasonable time of waiting, if all other means are impossible, and when the local authorities have not themselves destroyed them within the time fixed.
>
> He incurs no responsibility for any unavoidable

[redacted]

[redacted]

damage which may be caused by a bombardment under such circumstances.

If for military reasons immediate action is necessary, and no delay can be allowed the enemy, it is understood that the prohibition to bombard the undefended town holds good, as in the case given in paragraph 1, and that the commander shall take all due measures in order that the town may suffer as little harm as possible.

Article 5. In bombardments by naval forces all the necessary measures must be taken by the commander to spare as far as possible sacred edifices, buildings used for artistic, scientific, or charitable purposes, historic monuments, hospitals, and places where the sick or wounded are collected, on the understanding that they are not used at the same time for military purposes....

Article 6. If the military situation permits, the commander of the attacking naval force, ... before commencing the bombardment, must do his utmost to warn the authorities. See also NWIP 10-2, supra, sec. 621.

VI. [redacted] Consistency of Weapon and its Employment with International Law. (U)

A. [redacted] Land Attack Missile. (U)

1. [redacted] Unnecessary suffering. (U)

Some arguments assert the illegality of nuclear weapons by application of Article 23(e) of the Hague Regulations to the effects of the weapons: the use of these weapons results in horrible and lasting effects not experienced from other weapons, and their degree is such as to render death inevitable to its victims. M. Greenspan, The Modern Law of Land Warfare 371 (1959) [hereinafter cited as Greenspan]; J. Stone, Legal Controls of International Conflict 343 (1954). The rule to be applied "is not, however, the simple fact of destruction, nor even the amount thereof, that is relevant in the appraisal of such [weapons] it is rather the needlessness,

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the superfluity of harm, the gross imbalance between the military result and the incidental injury that is commonly regarded as decisive of illegitimacy." M. McDougal & F. Feliciano, Law and Minimum World Public Order 616 (1961). [hereafter cited as McDougal & Feliciano]. While application of this "rule of proportionality" does not compel the conclusion that the use of nuclear weapons, as a matter of law, causes unnecessary suffering, it does require that authorities give every consideration to minimizing the collateral effects of these weapons upon personnel. O'Brien, Legitimate Military Necessity in Nuclear War, 2 World Polity (1960) [hereinafter cited as O'Brien]. With specific reference to the TOMAHAWK missile, its warhead and its height of burst options over the target are designed and programmed to optimize its blast effects on structures. As a result, the thermal and radiation effects associated with the TOMAHAWK warhead detonation are significantly degraded in terms of the maximum number of personnel casualties which would otherwise result.

2. [redacted] Poison, poisoned weapons and poison gas. (U)

The missile warhead contains certain amounts of tritium gas, uranium and plutonium, all of which are radioactive and which also cause chemically deleterious physiological effects. Two considerations, however, support the conclusion that these effects are entirely secondary:

a. Fully 90%-95% of the combined effects upon personnel of the use of the weapon result from blast and heat caused by the explosion rather than from initial radiation. The effects of fallout radiation are minimized by its relatively rapid decay and by optimizing height of burst for maximum blast effects on the target.

b. All substances which are inherently chemically deleterious are so fundamentally altered by the nature of the fission process in the explosion as to drastically minimize if not completely dissipate their chemically deleterious effects after detonation. Further, as concerns the chemically deleterious effects of uranium and plutonium prior to detonation, such effects are not dissimilar from the heavy metal poisoning caused by lead, which itself is not prohibited by international law. For a discussion of the toxicity of depleted uranium, see Dept. of the Army, DAJA-IA 1976/19 of Apr. 19 1976, subject: Review of the XM774 for Legality under

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International Law: Finally, analogies to the specific prohibitions of poison, poison gas or bacteriological agents or other expressly prohibited weapons ignore the reality of current state practice and the generally accepted rule that, in order to be proscribed in international law, a weapon or its use must be the subject of an express prohibition. Mallison, The Laws of War and the Juridical Control of Weapons of Mass Destruction in General and Limited Wars, 36 Geo. Wash. L. Rev. 308, 331 (1967); McDougal & Feliciano, supra, at 77-8; O'Brien, supra, at 100 n. 83.

3. (U) Indiscriminate effects.

The degree of accuracy achievable by the TOMAHAWK missile affords the United States greater flexibility in weapon employment and ability to minimize collateral damage and meets legal objections to ballistic missiles which are based upon analogy to such indiscriminate weapons as the German V-2 rockets. E. Castren, The Present Law of War and Neutrality 204 (1954). Greenspan, supra, at 79 n. 193. As discussed in VI.A.1. above, the employment guidance and design of the TOMAHAWK missile permit a considerable degree of control over the effects of the weapon. Such optimization of weapon employment parameters to enhance the achievement of military objectives significantly degrades the weapon's effects on collateral personnel injuries.

4. [redacted]Attack on Civilian Population and Urban Areas. (U)

The TOMAHAWK missile is neither designed for nor planned for employment against primarily civilian population or residential targets, although substantial damage to residential structures and population may result from targeting that meets the objectives in paragraph IV.A. above.

B. [redacted]Anti-Ship Missile (U)

1. (U) Unnecessary suffering.

Inasmuch as this weapon is primarily designed to deliver blast effects upon material targets which are legitimate military objectives, it meets with no legal obstacle based upon the principle of unnecessary suffering. As a matter of law, it is generally stated that large

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conventional explosive projectiles are not prohibited by the laws of war. E. Castren, The Present Law of War and Neutrality 189 (1954); J. Spaight, Air Power and War Rights 203 (1947); J. Stone, Legal Controls of International Conflict 551 (1954).

2. (U) Poison, poisoned weapons and poison gas.

The warhead is not designed to contain any substance which is prohibited by international law.

3. [redacted] Indiscriminate effects. (U)

A final determination concerning the capability of this missile and its employment to discriminate between ship targets which are valid military objectives and those which enjoy some protected status under international law must await further development of systems capable of furnishing adequate target information to the missile. With such a capability and the degree of accuracy presently achievable, the missile would not be prohibitied under international law. See E. Castren, The Present War of Law and Neutrality 204 (1954); Mallison, The Laws of War and the Juridical Control of Weapons of Mass Destruction in General and Limited Wars, 36 Geo. Wash. L. Rev. 308, 334 (1967); O'Connell, The Legality of Naval Cruise Missiles, 66 Am. J. Int'l. L. 785 (1972).

VII [redacted] Summary and Conclusion. (U)

A. [redacted] The Weapon. (U)

The land attack missile as currently planned is not inconsistent with the obligations of the United States under international law. Final determination of the legality of the anti-ship missile must await further technological advances in providing target information to the missile. Navy development of Project OUTLAW SHARK may solve this problem.

B. [redacted] Employment of the Weapon. (U)

It cannot, as a matter of law, be stated that the use of either version of the TOMAHAWK missile is prohibited. Concerning the anti-ship missile, Chapter 5 of NWIP 10-2 provides certain principles which must be considered in the selection of ship targets.

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Concerning the land attack missile, the nature of the weapon and its effects dictate that any decision for its employment must include the most scrupulous attention at the highest level to principles of international law relative to the selection and use of all weapons, conventional or nuclear, and that these principles be implemented in applicable plans for employment of this weapon: (U)

1. [redacted] In order to minimize suffering, the use of this weapon solely against personnel should be prohibited if suitable alternative anti-personnel weapons are available.

2. [redacted] The use of this weapon should be prohibited when its effects create risks of disproportionate injury/damage to unprotected civilian personnel or objects. The potential for risks of disproportionate injury/damage to civilian personnel or objects must be considered and precautions must be taken to minimize these risks if, in the absence of suitable alternative weapons, circumstances dictate the use of this weapon.

3. [redacted] It must be recognized that the employment limitations against nuclear attacks directed toward civilian population or residential structures, per se is perhaps the most singularly "absolute rule of law" governing the use of weapons. See Lauterpacht, "The Problem of the Revision of the Law of War, 29 Brit. Y. B. Int'l. L. 360 (1952).

C. [redacted] Reprisals. (U)

The land attack missile and the current guidance for its employment are designed to afford the National Command Authority with a maximum degree of flexibility in responding to situations of extreme national importance. No attempt has been made in this review to determine the the propriety of selection of individual targets, or all of the circumstances in which they might be struck by this weapon. It is recognized, however, that the flexibility afforded to the National Command Authority must include the doctrine of reprisal, which, depending on the circumstances, would permit certain otherwise prohibited actions in response to an act by the enemy which contravenes the laws of war.

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