UNCLASSIFIED

THE WHITE HOUSE
WASHINGTON

June 6, 1962

NATIONAL SECURITY ACTION MEMORANDUM NO. 160

TO: The Secretary of State
The Secretary of Defense
The Chairman, Atomic Energy Commission
The Director, Bureau of the Budget

SUBJECT: Permissive Links for Nuclear Weapons in NATO

1. After an examination of the problem of installing permissive links in nuclear weapons dispersed in NATO commands, I have decided we should now make the commitment to procure appropriate devices for all nuclear weapons, now dispersed and to be dispersed to NATO commands, for both non-U.S. and U.S. forces. (See attached memorandum to me from Dr. Wiesner dated May 29. This decision corresponds to Alternative 5 of that memorandum.)

2. This will require a supplementary appropriation for the Atomic Energy Commission budget. The Secretary of Defense, the Chairman, Atomic Energy Commission, and the Director, Bureau of the Budget will work out the details of the budget presentation.

3. At the earliest feasible time, the Secretary of Defense will submit for my approval a schedule for installation of these devices in NATO weapons. In making this schedule, the Secretary should consult with the Secretary of State on the political problems arising from the existence of weapons assigned to U.S. forces and weapons assigned to our Allies.

4. The Chairman, Atomic Energy Commission, in consultation with the Secretary of Defense, will carry out a research program on an urgent basis directed toward an examination of the feasibility and desirability of more advanced permissive link devices with a wider range of capabilities.

/s/ John F. Kennedy

UNCLASSIFIED

APPENDIX A

NSAM-160 and Wiesner Memorandum
Original Document Secret

MEMORANDUM FOR

THE PRESIDENT

At your request, I have reviewed, in consultation with the AEC and the DOD, the technical and cost aspects of equipping nuclear weapons dispersed overseas with permissive link hardware. The object of this review was to establish the program options that were technically available to implement such a program as rapidly as possible, and to determine the amount of supplemental funds that would have to be requested in the AEC FY '63 Budget to accomplish these options.

A decision on this problem involves the following basic policy issues which, while not technical in themselves, are affected by the availability of equipment and the program timing and cost:

(1) Should a permissive link be incorporated at this time in all dispersed nuclear weapons or just in those critical weapon systems with quick reaction, high yield and long range (e.g., Jupiter missiles and quick reaction aircraft)?

(2) Should a permissive link be incorporated at this time in all weapons dispersed to NATO (U.S. as well as non-U.S.) or just to non-U.S. weapons?

(3) Should a permissive link be incorporated at this time in weapons committed to NATO but based in the U.K. as well as weapons based on the European Continent?

These policy issues raised the more basic question as to what objective one is attempting to accomplish by incorporating a permissive link. A permissive link can attempt to meet any of the following objectives, each of which imposes increasingly difficult technical problems:

purpose of this review, I have not attempted to meet a specific objective but rather have analyzed the operational value of the best available equipment and attempted to determine how rapidly it could be incorporated in dispersed nuclear weapons.

While the permissive link equipment presently recommended by the AEC leaves something to be desired and can clearly be much improved with time, I believe that this equipment can be used as the basis for a crash program since development quality hardware exists and initial production and installation could begin in the immediate future.

Specifically the AEC recommends that, if a permissive link program is undertaken on a crash basis, bombs for aircraft and warheads for longer range missiles be equipped with an electro-mechanical lock which would have to receive a prearm numerical code in order to make the weapon operable. In the case of certain bombs which cannot be easily retrofitted with this equipment, as an interim measure pending the development of improved compatible permissive link hardware, mechanical combination locks would be installed to cover a socket into which an arming plug must be inserted. In the case of those bombs as well as short range missiles, such as Honest John and Mike Hercules, and the 8-inch shell, the arming plugs would be stored in self-destruct safes. The proposed program does not include specific hardware for the Davy Crockett missile which presents a particularly difficult problem because of its small size and possible forward deployment.

The numbers which would operate both the electro-mechanical and the combination lock could be held at any echelon or command. If circumstances required, the combination could be held by the U.S. custodial officer himself. This procedure could therefore give the weapons the same state of readiness that they now possess.

In evaluating the utility of this equipment, it must be recognized that it is simply intended to buy time. A specialist with proper equipment might be able to crack the electro-mechanical lock in a few hours time. If he were able to circumvent the self-destruct feature of a safe, a skilled locksmith could open a combination lock relatively quickly. In any event, it would also be possible for skilled technicians familiar with weapons to make these weapons operate in a period of from several hours to weeks, depending on the extent of thier knowledge, by opening the weapons and bypassing the electric circuits. Despite the limitations of this equipment, I believe it would give further (and probably decisive) protection against individual psychotics and would certainly cover unauthorized use by military forces holding the weapons during periods of high tension or military combat. While it would not assure that the weapons could not be used if they were forceably seized by an organized group or a foreign power with technically capable individuals, it would provide in the case of the more important weapon systems equipped with electro-mechanical lock a period of time, varying from hours to days, in which decisions could be made as to what our proper response to the seizure should be. The question of the legal and political requirements of control were beyond the scope of my review.

The question has been raised whether the installation of this development quality hardware on a crash basis might reduce the reliability of the nuclear weapons. However, in view of the simple nature of this equipment and the method of installation, I believe that it is now generally agreed that it would not reduce the inherent reliability of the weapons. The weapons would, of course, not be operable if the combination number were not received from a higher headquarters. This is a communication and management problem, which can be very simple or a very complex, depending on the level of command at which the combination number is held and the degree of control maintained through coding procedures or the use of different combination numbers for different weapons. In its simplest form, it should be possible to handle this procedure wherever a "go code" can be transmitted which is presently a requirement if any control is to exist. In any event, I wish to emphasize that, if circumstances demand, a decision can be made to release the combination number to the U.S. custodian with the field unit and thereby revert to the state of readiness and control that exists today.

At my request, the AEC has estimated the cost and time for completion of the following five alternative programs, which I believe represent the full range of possible application of the permissive link on a crash basis to nuclear weapons dispersed to the European Theater:

The estimated completion date, total cost, and FY '63 for each of these programs is as follows:

Alternative	Estimated Date Completed Installation	Total Cost ($ Millions)	FY '63 Cost ($ Millions)
I	June 1963	3.2	3.2
II	Oct. 1963	11.3	10.6
III	Dec. 1963	13.6	11.7
IV	Mar. 1964	18.6	13.8
V	Aug. 1964	26.9	14.0

A supplemental to the AEC FY '63 Budget would call for obligation of the total cost of the program but expenditure of only the FY '63 cost of the program.

On the basis of this review, I have concluded that it is technically possible to equip on a crash basis all nuclear-weapons dispersed to the European Theater with reasonably effective permissive link equipment at relatively small cost. Therefore, the decision as to the extent to which permissive link equipment should in fact be incorporated in dispersed weapons can be made solely in terms of broad policy considerations as to the desired objective.

Whatever decision is made on the crash program to install permissive link equipment on dispersed nuclear weapons equipment, I would recommend that a vigorous program be undertaken to develop an improved electronic lock which would be incorporated directly in the electronic package associated with all future weapons so that the option of a permissive link would always exist. This program should also include work to develop improved devices to retrofit the bombs and medium range missiles which were equipped with combination locks only as an interim measure in the above crash program. I would also recommend that there be an agressive research program to develop more advanced concepts of the permissive link including mechanics to assure the self-destruction of a weapon if efforts were made to by-pass the permissive link. It is my understanding that the AEC has funds available to cover the R&D necessary for these advanced programs.

Jerome B. Wiesner

Intentionally Left Blank

APPENDIX B

General Characteristics for PAL Devices
Original Document Secret

Item I

GENERAL CHARACTERISTICS FOR PREMISSIVE DEVICES
FOR USE WITH NUCLEAR WEAPONS (U)

General Characteristics
Approved by the OSD:
13 September 1962

1. Purpose. These General Characteristics define an arming control device for use with designated nuclear weapons which is intended to provide some additional physical means for preventing unauthorized use of nuclear weapons.

2. General Characteristics. The device shall conform to the general characteristics and provide the capabilities listed below:

a. The device shall be capable of repeated enabling, disenabling, and recoding. Further, the device shall be capable of being maintained in either the enabled or disenabled mode.

b. When the device is enabled, a positive indication of enabled condition shall be provided. It is highly desirable that this indication provide no usable information to an unauthorized operator.

c. The time required for authorized enabling of the device shall not add to the weapon system reaction time under any readiness condition. Capability for inflight operation of this device is required for certain aircraft applications.

DOE
b(3)

e. The device and associated equipment shall be designed so that inspection or disassembly of the weapon will not disclose the combination or code.

f. The combination or code shall be transmitable by all standard communications means, and shall be capable of being changed rapidly and accurately by persons having the appropriate equipment and the old combination or code.

g. The device shall be so located and shall function in such a manner that it will permit performance of the required weapon maintenance, retrofit, and test operation throughout the stockpile-to-target sequence, without enabling the device.

h. The device and associated equipment shall be of such quality as not to decrease significantly the weapon reliability.

i. The device and its associated equipment shall be designed so as to permit installation and use of the device in bombs or warheads without degrading weapon safety.

j. The device installed in the weapon itself should not degrade the delivery capability or alter the ballistics of the weapon system.

k. Meters, dials, and switches on device components which are used in the open without blackout protection shall be illuminated in such a manner that blackout will not be violated.

l. The device and its related equipment shall withstand, without functional impairment or reduction of operational reliability, the environmental criteria specified in the applicable stockpile-to-target sequence of authorized weapon applications and in assoicated environmental specifications.

Item 2

GENERAL CHARACTERISTICS FOR
PERMISSIVE ACTION LINK SYSTEMS USED WITH NUCLEAR WEAPONS (U)
(Attachment to DDR&F Letter to Chun, AEC, Same Subject, 27 October 1969)
(Original Document Secret)

1. Purpose. To provide general characteristics for permissive action link systems incorporated in weapon systems to prevent unauthorized nuclear detonation. This document is not intended to in any way inhibit development of improvements beyond the characteristics set forth.

2. General.

[redacted] DOE b(3)

b. The system shall provide for two modes, enable (unlock) and disenable (lock), of the warhead by insertion of one 4-digit decimal code.

[redacted] DOE b(3)

d. The system shall not significantly degrade weapon reliability, nor shall it degrade safety, or delivery capability. The time required for enabling (unlocking) of the device shall not unduly add to the weapon system reaction time under any readiness condition.

3. System Operation.

a. The control equipment must provide visual indications of the satus of the system. As a minimum, the equipment must indicate when (a) the number of unsuccessful enabling (unlocking) attempts is zero, (b) the number of unsuccessful enabling (unlocking) attempts is greater than zero but less than that required for lockout, and (c) the device is locked out.

b. The system shall be capable of recoding, enabling (unlocking) or disenabling (locking) at any point in the STS:

(1) in the case of aircraft weapon systems, up to the time of taxi and/or aircraft launch; and enabling (unlocking) or disenabling (locking) after aircraft launch.

(2) in the case of projectiles, at any time up to the time of loading into the weapon breech.

(3) in the case of missile systems, up to the time of final; prefire operations.

c. The code shall be capable of being changed rapidly and accurately by persons using the appropriate equipment. Changing of the code will be dependent upon possession of the old (existing) code.

d. At anytime prior to permanent lockout the feature which counts the number of incorrect tries shall reset to zero whenever the proper code is inserted.

e. The system shall be capable of a code check operation which will allow verification of the ser code without changing the mode of the device.

4. System Compatibility and Reliability.

a. The system shall be compatible with the weapon operational concepts to include the readiness requirements stated in the STS.

b. The system will be compatible with normal logistical movement in either selected mode.

c. The system shall be electrically compatible with other weapons system circuitry. In the case of aircraft systems it will be compatible with circuitry during all phases of circuit operation, both ground and air.

d. The design of control equipment shall preclude permanent disenabling (locking) if a permissive action link operation is interrupted by power failure.

e. The system shall incorporate a means of determining electrically, by a T-304 or similar service continuity test equipment, whether the permissive action link device is in the enabled (unlocked) condition.

5. Inspection & Maintenance.

a. The system shall be designed so that inspection or disassembly of any component external to the warhead will not disclose the codes.

b. The permissive action link shall be so located and the system shall function in such a manner that it will permit perormance of the required warhead maintenance, retrofit (including internal and external components exclusive of the permissive action link system), and test operations throughout the STS without changing the mode of the device.

c. The system shall be capable of having maintenance performed on it in either the enabled (unlocked) or disenabled (locked) mode.

d. The operational storage life of that portion of the system installed in the warhead shall be no less than that of other warhead components.

6. Control Equipment.

a. Control equipment with the exception of decoders installed in aircraft shall be designed to permit disenabling (locking) and enabling (unlocking) using the "two-man" concept, and recoding using the "two-team" concept.

b. Control equipment shall provide a positive indication of the mode of the permissive action link device. This indication should provide no information regarding the set code.

c. Decoders shall be capable of enabling (unlocking), disenabling (locking), and code checking.

d. Recoders shall be capable of recoding and code checking the system without enabling (unlocking) the device.

e. Design alternatives which combine decoders and recoders are acceptable.

7. Environmental Considerations.

a. Meters, dials, and switches on componenets which are used in the open without blackout protection shall be illuminated in such a manner that blackout will not be violated.

b. The system and its related equipment shall withstand, without functional impairment or reduction of operational reliability, the evironmental criteria specified in the applicable stockpile-to-target sequence of authorized weapon applications and in associated environmental specifications.

Item 3

GENERAL CHARACTERISTICS FOR
PERMISSIVE ACTION LINK SYSTEMS USED WITH NUCLEAR WEAPONS (U)
(Attachment to DDR&E Letter to Chmn, AEC, same subject, 31 Dec 1970.)
(Original Document Secret)

1. Purpose. To provide general characteristics for permissive action links incorporated in weapon systems to prevent an unauthorized nuclear detonation. This document is not intended to inhibit in any way development of improvements beyond the characteristics set forth.

2. General.

[redacted] DoE b(3)

b. The system shall provide for two modes, unlock and lock of the warhead by insertion of one 6-digit decimal code.

[redacted] DoE b(3)

d. The system shall not significantly degrade weapon reliability, nor shall it degrade safety, or delivery capability. The time required for unlocking the device shall not unduly add to the weapon system reaction time under any readiness condition.

3. System Operation.

a. The control equipment must provide visual indications of the status of the system. As a minimum, the equipment must indicate when (a) the number of unsuccessful unlocking attempts is zero, (b) the number of unsuccessful unlocking attempts is greater than zero but less than that required for lockout, and (c) the device is locked out.

b. The system shall be capable of recoding, unlocking or locking at any point in the STS:

(1) in the case of aircraft weapon systems, up to the time of taxi and/or aircraft launch; and enabling (unlocking) or disenabling (locking) after aircraft launch.

(2) in the case of projectiles, at any time up to the time of loading into the weapon breech.

(3) in the case of missile systems, up to the time of final prefire operations.

c. The code shall be capable of being changed rapidly and accurately by persons using the appropriate equipment. Changing of the code will be dependent upon possession of the old (existing) code.

d. At anytime prior to permanent lockout the feature which counts the number of incorrect tries shall reset to zero whenever the proper code is inserted.

e. The system shall be capable of a code check operation which will allow verification of the set code without changing the mode of the device.

4. System Compatibility and Reliability.

a. The system shall be compatible with the weapon operational concepts to include the readiness requirements stated in the STS.

b. The system will be compatible with normal logistical movement in either selected mode.

c. The system shall be electrically compatible with other weapons system circuitry. In the case of aircraft systems it will be compatible with aircraft circuitry during all phases of circuit operation, both ground and air.

d. The design of control equipment shall preclude permanent locking if a permissive action link operation is interrupted by power failure.

e. The system shall incorporate a means of determining electrically, by a T-304 or similar service continuity test equipment, whether the permissive action link device in the unlocked condition.

5. Inspection & Maintenance.

a. The system shall be designed so that inspection or disassembly of any component external to the warhead will not disclose the codes.

b. The permissive action link shall be so located and the system shall function in such a manner that it will permit performance of the required warhead maintenance, retrofit (including internal and external components exclusive of the permissive action link system), and test operations throughout the STS without changing the mode of the device.

c. The system shall be capable of having maintenance performed on it in either the unlocked or locked mode.

d. The operational storage life of that portion of the system installed in the warhead shall be no less than that of other warhead components.

6. Control Equipment.

a. Control equipment with the exception of decoders installed in aircraft shall be designed to permit disenabling (locking) and enabling (unlocking) using the "two-man" concept, and recoding using the "two-team" concept.

b. Control equipment shall provide a positive indication of the mode of the permissive action link device. This indication should provide no information regarding the set code.

c. Decoders shall be capable of unlocking, locking, and code checking.

d. Recoders shall be capable of recoding and code checking the system without unlocking the device.

e. Design alternatives which combine decoders and recoders are acceptable.

7. Environmental Considerations.

a. Meters, dials, and switches on componenets which are used in the open without blackout protection, shall be illuminated in such a manner that blackout will not be violated.

b. The system and its related equipment shall withstand, without functional impairment or reduction of operational reliability, the evironmental criteria specified in the applicable stockpile-to-target sequence of authorized weapon applications and in associated environmental specifications.

Item 4

GENERAL CHARACTERISTICS FOR
PERMISSIVE ACTION LINK SYSTEMS USED WITH NUCLEAR WEAPONS
(Attachment to DDR&F Letter to Chun, AEC, Same Subject, 26 July 1972)
(Original Document Secret)

1. Purpose To provide general characteristics for AEC-produced electromechanical/electronic permissive action link (PAL) systems used with nuclear weapons to prevent an unauthorized nuclear detonation. This document is not intended to inhibit in any way development of improvements beyond the characteristics set forth.

2. Nomemclature

[redacted]

DOE b(3)

3. Definitions

Permissive Action Link (PAL) – A family of devices and subsystems designed to reduce the possibility of obtaining a nuclear detonation from a nuclear warhead without the use (insertion) of a controlled numerical code, thus reducing the probability of an unauthorized nuclear detonation.

Passive Protection – Precludes operation of weapon arming circuits.

Active Protection – Senses attempts to gain unauthorized access to weapon arming circuits, with option to respond by initiating weapon disablement.

Mode – Refers to the protected condition (LOCK) or the unprotected condition (UNLOCK) of the PAL.

State – Refers to the condition of the active protection feature (OFF/TEST/ON).

Unlock Code – A preset code used to unlock the PAL.

Off Code – A preset code used to change state of OFF.

Code Check – Confirms stored code(s) in PAL without affecting weapon PAL mode.

Recode – Allows changing of stored code(s) in PAL.

Code Inhibit – Precludes a second unlock of a PAL with a given code until recode.

Limited-Try – Counts consecutive incorrect code trials and resets to zero on a correct code trial.

Temporary NO-GO – Precludes additional code trial operations without special field equipment after a number of incorrect code trials.

Permanent NO-GO – Precludes additional code trial operations with field equipment after additional incorrect code trials.

4. General Characteristics

A. Category A and Category B [redacted]

DOE b(3)

2. These systems shall provide for two modes, UNLOCK and LOCK of the PAL by insertion of one 4-digit decimal code.

B. Category B'

DOE
b(3)

3. The system shall provide for two modes, UNLOCK and LOCK of the PAL by the insertion of one 4-digit decimal code.

C. Category C – The characteristics stated above (Category B') apply with the following modifications:

1. The system shall provide for two modes, UNLOCK and LOCK of the PAL by insertion of one 6-digit decimal code.

D. Category D

DOE
b(3)

DOE
b(3)

5. System Operation

A. All Categories

1. The system shall not significantly degrade weapon reliability, safety, or delivery capability. The time required for unlocking the device shall not unduly add to the weapon system reaction time under any readiness condition.

2. The design shall preclude permanent locking if a PAL operation in interrupted by power failure.

B. Category A

1. The control equipment must provide visual indications of the mode of the system.

2. The system shall be capable of recoding, unlocking or locking at any point in the STS up to the time of final prefire operations.

3. The system shall be capable of being recoded rapidly and accurately by persons using the appropriate equipment. Recoding will be dependent upon possession of the old (existing) code.

C. Category B

1. The control equipment must provide visual indications of the mode of the system.

2. The system shall be capable of recoding, code checking, unlocking, or locking at any point in the STS up to the time of aircraft taxi and/or launch; and unlocking or locking after aircraft launch.

3. The system shall be capable of being recoded rapidly and accurately by persons using the appropriate equipment. Recoding will be dependent upon possession of the old (existing) code.

D. Category B' and C

1. The control equipment must provide visual indications of the mode of the system. The control equipment must also indicate when (a) the number of unsuccessful code trial attempts is zero, (b) the number of unsuccessful code trial attempts is greater than zero but less than that required for NO-GO, and (c) the device is NO-GO.

2. The system shall be capable of recoding, code checking, unlocking or locking at any point in the STS.

a. In the case of aircraft weapon systems, up to the time of taxi and/or aircraft launch; and unlocking or locking after aircraft launch.

b. In the case of missile systems, up to the time of final pre-fire operations.

3. At any time prior to permanent NO-GO the feature which counts the number of incorrect tries shall reset to zero whenever the correct code is inserted.

4. The system shall be capable of being recoded rapidly and accurately by persons using the appropriate equipment.

E. Category D

The characteristics stated for Category B' and C above apply with the following addition:

1. The system shall contain a Master Recode feature to allow recoding of all six stored codes using any one of the old not inhibited (existing) codes.

2. At any time prior to permanent NO-GO, the feature which counts the number of incorrect tries shall reset to zero whenever a correct, not inhibited code is inserted.

F. Category E and F

The characteristics stated for Category D shall apply with the following additions:

[redacted]

DOE
b(3)

6. System Compatibility

A. Category A

1. The system shall be compatible with the weapon operational concepts to include the readiness requirements stated in the STS.

2. The system shall be compatible with normal logistical movement in either selected mode.

3. The system shall be electrically compatible with other weapon system circuitry.

B. Category B, B', C, D, E, and F

1. The system shall be compatible with the weapon operational concepts to include the readiness requirements stated in the STS.

2. The system shall be compatible with normal logistical movement in any selected mode.

3. The system shall be electrically compatible with other weapon system circuitry. In the case of aircraft systems, it will be compatible with aircraft circuitry during all phases of aircraft operation, both ground and air.

4. The system shall incorporate a means of determining electrically, by a T-304 or similar service continuity test equipment, whether the PAL is in the unlocked mode.

7. Control Equipment

A. Category A

1. Control equipment shall be designed to permit locking and unlocking using the "two-man" concept, and recoding using the "two-team" concept.

2. Control equipment shall provide a positive indication of the mode of the permissive action link. This indication should provide no information regarding the set code.

3. Decoders shall be capable of unlocking and locking.

B. Category B, B', and C

1. Control equipment shall be designed to permit locking and unlocking using the "two-man" concept, and recoding using the "two-team" concept.

2. Control equipment shall provide a positive indication of the mode of the PAL. This indication should provide no information regarding the set code.

3. Recoders shall be capable of recoding and code checking the system without unlocking the device.

4. Decoders shall be capable of unlocking, locking, and code checking.

5. Aircraft decoders shall be capable of unlocking.

6. Decoders installed in aircraft shall be designed for single man operation.

C. Category D, E, and F

1. The system shall be electrically compatible with other weapon system circuitry. In the case of aircraft systems, it will be compatible with aircraft circuitry during all phases of aircraft operation, both ground and air.

2. The system shall incorporate a means of determining electrically, by a T-304 or similar service continuity test equipment, whether the PAL is in the unlocked condition.

3. Recoders shall be capable of recoding and code checking the system without unlocking the PAL.

4. Decoders shall be capable of unlocking and locking.

5. Aircraft decoders shall be capable of unlocking and locking

6. Decoders installed in aircraft shall be designed for single man operation.

7. Recoders shall be capable of recoding all six unlock codes and the off code using any one of the old not inhibited stored unlock codes, or recoding any one new code using one of the old not inhibited stored codes.

8. Recoders shall be capable of code checking all seven stored codes in one operation or code checking any one of the stored codes.

9. Air Force recoders shall also be capable of recoding and code checking Category B and B' systems.

10. Army recoders shall also be capable of recoding and code checking Category C PAL systems.

11. Air Force aircraft decoders shall also be capable of unlocking Category B and B' systems.

12. Air Force ground decoders shall also be capable of unlocking, locking, and code checking Category B and B' systems.

13. Army decoders shall also be capable of unlocking, locking, and code checking Category C PAL systems.

8. Inspection and Maintenance

A. All Categories

1. The system shall be designed so that inspection or disassembly of any component external to the warhead will not disclose the codes.

DOE
b(3)

B. Category E

1. The system shall be capable of extended storage in the environments specified in the weapon STS in any functional state for a period of eight years.

9. Environmental Considerations

A. All Categories

1. Meters, dials, and switches on components which are used in the open without blackout protection shall be illuminated in such a manner that blackout will not be violated.

2. The system and its related equipment shall withstand, without functional impairment or reduction of operational reliability, the environmental criteria specified in the applicable stockpile-to-target sequence of authorized weapon applications and in associated environmental specifications.

Item 5

GENERAL CHARACTERISTICS FOR
PERMISSIVE ACTION LINK SYSTEMS USED WITH NUCLEAR WEAPONS
(Attachment to Director, DMA Letter, Same Subject, 18 April 1980)

1. (U) INTRODUCTION. These general characteristics describe permissive action link (PAL) systems used with nuclear weapons to prevent unauthorized nuclear detonations. Early PAL categories currently in stockpile weapons, but no longer being acquired, are not addressed in these characteristics. This document is not intended to inhibit in any way research and development of improvements beyond the characteristics set forth. These general characteristics will be maintained as a continuously current document and therefore will require amending, at appropriate future dates, to reflect changes of employment policy or improvements in PAL technology.

2. (U) DEFINITIONS.

(U) Permissive Action Link (PAL) – A family of devices and subsystems designed to reduce the possibility of obtaining a nuclear detonation from a nuclear warhead without the use (insertion) of a controlled numerical code.

(U) Passive Protection – Precludes normal operation of weapon arming and/or firing circuits.

(U) Active Protection – Senses attempts to gain unauthorized access to critical weapon components, and responds by initiating weapon disablement.

(U) Mode – Refers to the protected condition (LOCK) or the unprotected condition (UNLOCK) of the PAL.

(U) State – Refers to the condition of the active protection feature (OFF/TEST/ON).

(U) Unlock Code – A preset code used to unlock the PAL.

(U) Off Code – A preset code used to change state to OFF.

(U) Code Check – Confirms stored code(s) in PAL without affecting weapon PAL mode or state.

(U) Recode – Procedure for changing stored code(s) in PAL.

(U) Code Inhibit – Precludes use of a given code, for any PAL operation other than code check, once that code has been used (lock or unlock).

(U) Limited Try – Counts consecutive incorrect code trials, resets to zero on a correct code trial, and is capable of invoking temporary or permanent NO-GO options.

(U) Temporary NO-GO – Precludes PAL operations without special field equipment after a given number of incorrect code trials.

(U) Permanent NO-GO – Precludes PAL operations.

3. (U) GENERAL PAL CHARACTERISTICS

A. (U) Category D.

DOE
b(3)

(U) 2. This system shall have two modes, UNLOCK and LOCK of the PAL. PAL UNLOCK or LOCK shall occur upon insertion of any one of multiple preset unlock codes.

(U) 3. The system shall contain a "Code Inhibit" feature to allow a subset of the preset unlock codes to be inhibited. Once a code is inhibited, access for recoding that code and removing the inhibit may only occur using a different preset unlock code which itself has not been inhibited.

(U) 4. The system shall contain a "limited-try" feature to deter successful unlocking by trial and error.

B. (U) Category E and F. The characteristics stated in Category D apply with the following modifications.

DOE
b(3)

DOE
b(3)

C. (U) All Categories

(U) 1. The system shall be compatible with the weapon operational concepts to include the readiness requirements stated in the STS.

(U) 2. The system shall be compatible with normal logistical movement in any selected mode.

(U) 3. The system shall not significantly degrade weapon reliability, safety or delivery capability. The time required for unlocking the device shall not unduly add to the weapon system reaction time under any readiness condition.

(U) 4. The system shall be capable of being recoded, code checked, unlocked or locked at any point in the STS up to:

a. (U) In the case of missile systems, up to the time of final pre-fire operations.

b. (U) In the case of aircraft weapon systems, up to the time of taxi and/or aircraft launch, with unlocking or locking after aircraft launch. However, recode is not required after weapon loading on aircraft.

(U) 5. The system shall contain a Master Recode feature to allow recoding of all stored codes using any one of the old codes which has not been inhibited.

(U) 6. The system shall be capable of being recoded rapidly and accurately by persons using the appropriate equipment.

4. (U) CONTROL EQUIPMENT

A. (U) All Categories

(U) 1. The system shall be electrically and mechanically compatible with the weapon system. In the case of aircraft systems, any equipment installed in the aircraft or associated with the weapon will be compatible with aircraft circuitry during all phases of aircraft operation, both ground and air.

(U) 2. The system shall incorporate a means of determining electrically, by service continuity test equipment, whether the PAL is in the unlocked condition.

(U) 3. The control equipment must indicate when (a) the number of unsuccessful trial attempts is zero; (b) the number unsuccessful code trial attempts is greater than zero but less than that required for NO-GO; and (c) the device is NO-GO.

(U) 4. Control equipment shall be provided that will:

a. (U) Allow recoding and code checking without unlocking the PAL.

b. (U) Allow recoding any one or all unlock and off codes using one not inhibited stored code.

c. (U) Allow code checking all stored codes in one operation or code checking any one of the stored codes.

d. (U) Allow unlocking and locking the PAL.

e. (U) Allow PAL unlocking and locking operations in an aircraft to be performed by a single individual.

(U) 5. New control equipment shall minimize potential TEMPEST, tampering, and bugging vulnerabilities. DoE b(3)

5. (U) INSPECTION AND MAINTENANCE

A. (U) All Categories

(U) 1. The system shall be designed so that inspection or disassembly of any component external to the warhead will not disclose the codes.

(U) 2. The PAL system shall function in such a manner that with the active protection OFF, warhead maintenance and test operations can be performed without changing the mode of the passive protection.

6. (U) ENVIRONMENTAL CONSIDERATIONS

A. (U) All Categories

(U) 1. The system and its related equipment shall withstand, without functional impairment or reduction of operational reliability, the environmental criteria specified in the applicable weapon stockpile-to-target sequence.

(U) 2. Meters, dials, and switches on components which are used in the open without blackout protection shall be illuminated in such a manner that blackout will not be violated.

APPENDIX C

Letter from J. P. Wade, Jr., to D. C. Sewell

DEPARTMENT OF DEFENSE
MILITARY LIAISON COMMITTEE
TO THE
DEPARTMENT OF ENERGY
WASHINGTON, D.C. 20301

April 18, 1980

Honorable Duane C. Sewell
Assistant Secretary for
Defense Programs
Department of Energy
Washington, D.C. 20585

Dear Mr. Sewell:

(U) Over the past several months a great deal of concern and discussion has surfaced involving the policy for non-violent disablement and what role it should play in nuclear weapon security matters. Specific controversy has centered on questions of: which weapons should have a disable capability?; what level of sophistication should be credited to the threat?; and how long should disablement render the weapon useless against this threat? Department of Defense guidance to the Department of Energy in this area has been presented in systems Military Characteristics and POG meetings, as well as in the Nuclear Weapon Development Guidance. Unfortunately, in many cases it has been less than specific or subject to interpretation in application.

(U) I would like to clarify the existing situation and toward that goal, two transmittals are enclosed. The first is a DoD statement of policy addressing the goals and current assessment needs associated with nuclear weapon disablement systems. The second is a revision of the July 1972 "General Characteristics for Permissive Action Link Systems Used with Nuclear Weapons."

DOE
b(3)

(U) The paper "General Characteristics for Permissive Action Link Systems Used with Nuclear Weapons" should be viewed as the basic DoD definitions for PAL systems in acquisition of weapon systems incorporating DoE produced PALs. This paper, that supersedes the original 1972 document and amendments, will be forwarded to DNA for handling in a manner similar to weapon military characteristics, that is DNA will be responsible for publication and maintenance of an up-to-date file including amendments that may occur in the future. Consistent with our intention to work toward standardization of PAL devices and associated control equipment, only three PAL systems, Category D, E, and F are addressed in this update of the paper. Earlier PAL devices continue to remain in the stockpile: however, their acquisition cycle has been completed and therefore they have not been included in this update of the characteristics document.

Sincerely,

/s/ James P. Wade, Jr.
Chairman

Attachments
a/s (SFRD)

Nuclear Weapon Non-Violent Disablement Systems

DOE
b(3)

APPENDIX D

DoD Directive S-5200.16
September 22, 1970

(Original Document Secret)

Deputy Secretary of Defense

APPENDIX E

JCS Pub 13, Volume II
(Excerpt From Chapter 7)

Report and Evaluation of Possible Compromises (U)

Intentionally Left Blank

APPENDIX F

Excerpt From Amendment 3 to the Military Characteristics for a Nuclear Warhead for the 155 mm Howitzer Projectile (Approved by the MLC 27 April, 1971)

3. Control Devices

3.1 Security Container System (SCS)

An SCS, compatible with projectile and warhead designs, will be used with the M517 on an optional basis. The SCS will be developed under a program separate from the XM517 development program. The SCS shall be designed and function as specified in the SCS Characteristics attached as an Appendix.[2]

3.2. Permissive Action Link (PAL)

The PAL shall conform to the general characteristics outlined in the letter from the Director of Defense Research and Engineering to the Chairman of the Atomic Energy Commission, "General Characteristics for Permissive Action Link Systems Used with Nuclear Weapons," dated 31 December 1970.

3.2.1. The PAL control equipment shall also operate and be capable of recoding the SCS six-digit, limited-try coded switch.

3.2.2. It is desired that the control equipment be compatible with Category B, six-digit single code PAL devices.

3.2.3. The system shall provide for two modes, unlock and lock for the warhead by insertion of one six-digit decimal code. Unlock shall occur upon the insertion of any one correct code of six preset unlock codes. These unlock codes may be preset so that each is unique, or so that redundancies occur among them.

SPECIFIED EXTERNAL DISTRIBUTION ONLY:

1-4A M-0701 US Department of Energy
Office of HDQS Services
Attn: Maj Gen W. W. Hoover, DODP22
J. Meinhardt, WPDP222
Col C. Steiner, WRD & TDP225
Col J. Weathers, SE & EA DP226
Library Branch, Room G-
Washington, DC 20545

5-6A M-0659 US Department of Energy
Albuquerque Operations Office
Attn: R. G. Romatowski, Manager AL
R. L. Hymer, WDP
PO Box 5400
Albuquerque, NM 87115

7-8A M-0737 Los Alamos National Laboratory
Mail Station 5000
Attn: J. C. Hopkins, F630
PO Box 1663
Los Alamos, NM 87545

9-11A M-0828 University of California
Lawrence Livermore National Laboratory
Attn: W. B. Shuler, L6
P. L. Chrzanowski, L9
P. Herman, L9
PO Box 808
Livermore, CA 94550

12-63A M-4772 Defense Communications Agency
Attn: Mr. Gentry J300
Washington, DC 20305

DUSDRE (C3I)
Attn: Dir, S&TNF C3
Washington, DC 20301

ATSD(AE) (2)
Attn: Dep Asst (Mil Appl) (Lt Col Saunders)
Washington, DC 20301

Director for Operations (J3), OJCS (3)
Attn: Strategic Operations Div (Col Brown)
Washington, DC 20301

Defense Nuclear Agency
Attn: OAOP (Col Linton)
Washington, DC 20305

Headquarters, Dept of Army
Attn: DAMO-NCS
Washington, DC 20310

SPECIFIED EXTERNAL DISTRIBUTION ONLY (cont):

Chief of Naval Operations
Attn: OP-653 (CDR Surles)
Washington, DC 20350

Headquarters, USAF
Attn: XOXFM
Washington, DC 20330

Headquarters, USMC
Attn: POG 31 (Maj Pryor)
Washington, DC 20380

Headquarters, USEUCOM (3)
Attn: J-3 (CCD)
APO New York 09128

CINCUSAREUR
Attn: AEAGC-NC-S
APO New York 09403

CINCUSNAVEUR
Attn: N353/N542
FPO New York 09510

CINCUSAFE
Attn: LGW
APO New York 09012

AEUSA-HS-P
Commander USA PAL Detachment
APO New York 09189

USCINCPAC (3)
Attn: J323/PAL Team
Box 13
Camp H. M. Smith, HI 96861

Commander
USA WESTCOM
Attn: APOP-NC
Fort Shafter, HI 96858

USCINCPACFLT
Attn: Code 626
Pearl Harbor, HI 96860

Headquarters, PACAF
Attn: LGWSN
Hickam AFB, HI 96853

CG, FMFPAC
Attn: G-3 (Lt Col Philip)
Camp H. M. Smith, HI 96818

[redacted]

SPECIFIED EXTERNAL DISTRIBUTION ONLY (cont):

Headquarters, EUSA
Attn: EACJ-POX-NS
APO San Francisco 96301

Defense Communications Agency (25)
Attn: Code J300
Washington, DC 20305

64A	M0800	M. A. Pound
65A	0010	A. Narath
		Attn: R. L. Hagengruber, 0300
		W. C. Hines, 0330
66A	0020	T. P. Cook
67A	1000	J. K. Galt
		Attn: R. G. Clem, 1600
		R. G. Clem (Actg), 1620
68A	1640	G. J. Simmons
		Attn: R. J. Thompson, 1641
69A	2000	E. D. Reed
		Attn: J. L. Wirth, 2300
		E. H. Barsis, 2330
		E. H. Barsis (Actg), 2331
		J. H. Stichman, 2335
70A	3180	R. B. Craner
71A	5000	O. E. Jones
		Attn: R. N. Brodie, 5100
		W. C. Myre, 5200
		L. D. Smith, 5300
72A	5100	J. C. Crawford
		Attn: C. C. Burks, 5110
		G. J. Hildebrandt, 5120
		K. D. Hardin, 5150
		W. R. Reynolds, 5160
73A	5130	J. C. Crawford, (Actg)
74-78A	5134	J. R. Caruthers
79A	7000	R. L. Peurifoy, Jr.
		Attn: J. M. Weisen, 7200
		W. L. Stevens, 7230
80A	7210	A. J. Clark, Jr.
81A	8000	R. S. Claassen
		Attn: L. Gutierrez, 8400
		J. Barham, 8460
		J. B. Woodard, 8465
82A	8100	D. M. Olson
		Attn: R. C. Wayne, 8110
		J. D. Gilson, 8130
		W. E. Alzheimer, 8150
		D. E. Gregson, 8160
83A	8220	R. L. Rinne
84-88A	3141	D. K. Brown (Actg)
89-91A	3151	W. L. Garner

Intentionally Left Blank