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unauthorized use. Detailed threat definition is essential to the performance characterization of PAL systems.

(U) Overall system characterization identifies all elements of the protective system and develops the functional relationships between them. The interaction among system elements can then be analyzed to determine performance standards for each element. These standards, in turn, can be compared to the actual performance characteristics in order to evaluate the performance both of system elements and the protective system as a whole.

(U) System characterization and threat definition are not independent. In many cases, the elements of the overall system depend on the identity and objectives of the threat. For example, measures taken to protect against unauthorized detonation by an insider would include the personnel reliability program and the two-man rule. Neither of these measures provides protection against detonation following a host nation takeover. PAL however, could play a part against either threat.

(U) A clear statement of the purpose of PAL in terms of defining the threat(s) against which it is intended to provide protection, and the role of PAL in terms of characterizing the overall protective system(s), is needed to evaluate objectively the performance of the existing PAL system and the utility of new technology.

### 3.2 Deployment of Early-Technology PAL (U)

(U) Today's PAL system includes a variety of PAL devices, including mechanical locks, CAT A and B PAL, the MCCA, the APS, and soon the MCCSS for GLCM. These devices reflect the results of a 20-year engineering development effort. Based on the capabilities of the devices, it is useful to divide them into two groups which we call, for convenience, Old PAL and Modern PAL.

(U) Weapons equipped with Modern PAL devices feature a code-controlled, warhead-enable feature provided by an MCCA or an MCCSS. These weapons may, in addition, be equipped with an APS. Modern PAL, developed since the early- to mid-1970s, is characterized by:

- limited try capability
- multiple code capability
- unlock combination population  $> 10^6$
- code inhibit

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(U) The requirements for PAL, stated at the Executive, JCS, and theater CINC levels, are thus apparently satisfied by existing PAL systems. However, as with any system, there are areas for possible improvement. In the remainder of this section, some of these areas are identified.

### 3.1 Definition of PAL Goals and Purpose (U)

(U) While today's PAL systems seem to satisfy the stated requirements, the role of the PAL system in accomplishing the national policy objectives that drive the requirements for PAL and the extent to which the PAL system fulfills that role are not clear. This is because the statements of policy have not been related to the operational function of PAL. The stated function of PAL is to delay unauthorized detonation once unauthorized access to a weapon has been gained. Two representative statements of PAL system objectives are:<sup>21</sup>

- "to prevent unauthorized nuclear detonations"
- "to reduce the possibility of obtaining a nuclear detonation from a nuclear warhead without the use of a controlled numerical code"

(U) Strictly speaking, PAL, as a device for delaying unauthorized actions, cannot by itself achieve either of these goals, but it can make a contribution. Two issues are important to an understanding and evaluation of the role PAL plays in deterring and preventing unauthorized nuclear detonations: threat definition and the characterization of the larger system of which PAL is a part.

(U) Threat definition involves complete specification of the threat against which protection is desired. Elements of the threat include the identity, objectives, and capabilities of the potential adversary. Threat definition is important because the amount of delay afforded by a PAL device depends on the capabilities of the adversary and on other aspects of the threat scenario, such as the number of weapons subject to

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