

UNCLASSIFIED

~~TOP SECRET~~

B-79366

JSTPS REPORT # 3-61

STAFF STUDY

DAMAGE CRITERIA

3 June 1961

UNCLASSIFIED

Delete classified markings from this copy  
only. This COPY, as redacted, was  
released as part of HQ USSTRATCOM FOIA  
Case # 95-14.

~~DOWNGRADED AT 12 YEAR  
INTERVALS; NOT AUTOMATICALLY  
DECLASSIFIED. DOD DIR 5200.10~~

Prepared by

NSTL Division

JSTPS

UNCLASSIFIED

Copy 10

~~TOP SECRET~~

UNCLASSIFIED

B-79366

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
STATEMENT OF THE PROBLEM	1
FACTS BEARING ON THE PROBLEM	1
ASSUMPTIONS	2
CONCLUSIONS	2
RECOMMENDATIONS	3
ANNEX A, DETAILED DISCUSSION	4
APPENDIX 1, ALTERNATE PROPOSAL	15
APPENDIX 2, ALTERNATE PROPOSAL	19
SPECIAL REFERENCES	22

UNCLASSIFIED

B-79366

DISTRIBUTION

CINCREPS	2 ea (10)
JCSLG	1
JCS	2
SIOP Division	1
NSTL Division	6
DDSTP	1
Secretariat	1

UNCLASSIFIED

UNCLASSIFIED

~~TOP SECRET~~

B-79366

DAMAGE CRITERIA

THE PROBLEM

1. Determine the damage criteria which should be employed in developing STOP-63.

FACTS BEARING ON THE PROBLEM

2. Assurance of weapon arrival at the Bomb Release Line (BRL)\* and damage criteria are closely related.

- [
4. The statement of criteria should specify minimum probabilities and levels of damage considered acceptable.
  5. The primary sources of target vulnerability data for specific installations are: (a) the Target Data Inventory (TDI), produced by the Air Force Intelligence Center (AFIC); (b) AFM 200-8 produced by AFIC and (c) the draft of the Joint Atomic Weapons Planning Manual (JAWPM) produced by the Defense Atomic Support Agency (DASA).
- ] Ex 1

7. The study shall reflect consideration for cumulative effects of adjacent detonations.

- [
9. For purposes of this study, damage criteria are treated entirely separate from delivery assurance, and have no bearing on the manner of expressing either assurance or damage expectancy.
- ] Ex 1

\* BRL is the point, approaching the target, at which the warhead is released from the carrier to continue on its own power to the detonation point. Dud and enemy attrition factors after BRL are included in the delivery probability values.

UNCLASSIFIED

UNCLASSIFIED

~~SECRET~~

B-79366

ASSUMPTIONS

10. The desired assurance of arrival of weapon(s) may vary with the size of force, but the probability and level of damage will not change.

} Ex 1

DISCUSSION

12. For Discussion, see Annex A.

CONCLUSIONS

13. If assurance criteria and damage criteria are stated separately, as assumed for the purpose of this study, the damage criteria as developed is the best approach to expression of criteria for various types of targets.

} Ex 1

}  
}

Ex 1

Ex 1

}  
}

Ex 1

UNCLASSIFIED

~~SECRET~~

UNCLASSIFIED)

~~TOP SECRET~~

B-79366

RECOMMENDATIONS

7

EXI

19. If the method of criteria expression recommended by the NSTL in the staff study on assurance is adopted, it is recommended that the levels of damage proposed in this study be adopted in the expectancy criteria statement. It is further recommended that the specified probability values proposed in this study be used in the development of appropriate expectancy criteria.

UNCLASSIFIED

UNCLASSIFIED

~~TOP SECRET~~

B-79366

ANNEX A

DISCUSSION ON

DAMAGE CRITERIA

1. Vulnerability Numbers and Associated Data. The TDI, JAWPM and AFM 200-8 list Vulnerability Numbers (VNs) for specific installations which describe the predicted level of damage. The VNs are identified with appropriate "T" and "K" factors. The T-factor identifies the target as either primarily responsive to peak overpressure (P) or to dynamic pressure (Q). The K-factor denotes the increased effectiveness realized from the longer positive blast phase of the higher yield weapons, particularly in the megaton range. The first or "assigned" VN relates to severe damage. [ - ]

2. Probability of Damage.

a. Probability of Damage (Pd) is defined as the probability of achieving a specified level of damage to a point target or of achieving an expected fractional coverage of an area target with the specified level of damage.

UNCLASSIFIED

EX1

EX1

'UNCLASSIFIED'

~~TOP SECRET~~

B-79366

Ex 1

b. The probability of damage specified in the criteria should be independent of specific weapon types. The probability value assigned must relate the importance of achieving the level of damage in the criteria to the objectives being accomplished by attacking the target. To achieve the criteria may require only one weapon at BRL or it may require several, depending upon the factors of the problem. For example, Weapon A, if it arrives, has a 56% probability of achieving the specified damage level and Weapon B has a 46% probability. Obviously, neither will achieve the desired level of damage. However, if combined, the probability of achieving the required level of damage is 76%. Therefore, the damage criteria statement is independent of specific weapon types. It may require only one weapon at BRL or it may require several, depending upon the target, CEP and yield. It denotes the desired probability of damage to the objective installations at BRL. Any related statement of assurance of arrival must include the words, "the necessary weapons to achieve the specified damage levels."

3. Levels or Degrees of Damage.

a. Nuclear structural blast damage varies from complete destruction near the burst point to minor damage at greater distances. The effect of nuclear blast on a particular type of installation or target, therefore, varies from absolute to extreme uncertainty dependent upon distances from the burst point. Thus, the following definitions are recommended:

Ex 1

UNCLASSIFIED

UNCLASSIFIED

~~TOP SECRET~~

B-79366

b. The following definitions of structural damage have been established by DASA (TM 23-200), and are in general use by the DOD at the present time:

(1) "Severe Damage: At least that degree of structural damage which precludes further use of a structure for the purpose for which it is intended without essentially complete reconstruction. Requires extensive effort before usable for any purpose."

(2) "Moderate Damage: At least that degree of structural damage to principal load carrying members (trusses, columns, beams, and load-bearing walls) that precludes effective use of a structure for the purpose for which it is intended until major repairs are made."

Ex 1

Ex 1

e. A factor that should be considered when predicting probable damage levels is fire damage. Fire damage results from thermal radiation and secondary causes from the blast effects. Detailed discussions on thermal effects and secondary fires will follow. (Refer paras. 7 and 8, respectively)

Ex 1

UNCLASSIFIED

~~TOP SECRET~~

UNCLASSIFIED

~~TOP SECRET~~ → B-79366

ex1

5. Target Types. Appropriate criteria should be stated for the various target types considered for development of the SIOP. The criteria should be expressed so that all comparable target types are combined into compatible groups.

6. Missile Targeting Criteria.

a. The desired damage criteria for each type of target will vary according to its vulnerability, function and importance. The criteria should not be designed to accommodate any particular weapons system. |

ex1

UNCLASSIFIED

~~TOP SECRET~~

UNCLASSIFIED

~~TOP SECRET~~

B-79366

UNCLASSIFIED

~~TOP SECRET~~

UNCLASSIFIED

~~TOP SECRET~~

B-79366

7. Thermal Effects. Thermal energy produced by a nuclear explosion constitutes approximately a third of the total energy released and may produce significant burning, melting or warping damage to installations and target elements exposed to the radiation. [

↑

Ex.

UNCLASSIFIED

UNCLASSIFIED

~~TOP SECRET~~

B-79366

8. Mass Fires. The spread of fires in a built-up area such as an urban-industrial center, depends upon a number of extremely important and variable conditions. These are essentially as follows: (a) Weather, (b) Terrain, (c) Closeness and combustibility of buildings, (d) Adequacy and survivability of fire-fighting services, and (e) Available water supply. Fires may originate from secondary causes such as electrical short circuits, broken gas lines, upsetting of stoves, furnances and so on, which are a direct effect of the blast wave. At Hiroshima, for example, the total area severely damaged by fire was roughly four times as great as in Nagasaki. One of the primary reasons for this was that Hiroshima is relatively flat with a high building density, whereas Nagasaki was hilly with a less dense concentration of buildings near ground zero. From the evidence of charred wood found at both Hiroshima and Nagasaki, it is believed that there was no actual ignition of wood from thermal effects. The fires actually originated from secondary causes resulting from blast effects. Contributory factors to the destruction by fire at Hiroshima were (a) Fire-fighting forces were located close to ground zero, (b) Failure of the water supply, and (c) The ensuing "fire storm" at Hiroshima consisted of a wind which blew toward the flat, burning area of the city from all directions, reaching a maximum velocity of 30 to 40 mph about 2 to 3 hours after the explosion. At Nagasaki no fire storm occurred. In this connection, it should be noted that "fire storms" are not a special characteristic of nuclear explosions. They may or may not occur.

9. Nuclear Radiation Effects. Nuclear radiations, prompt and residual, can cause injury to exposed personnel or damage to radiation-sensitive equipment such as transistors and other electronic components. [

ex 1

UNCLASSIFIED

UNCLASSIFIED

~~CONFIDENTIAL~~

B-79366

Ex 1

Ex 1

11. Conditions Under Which War May Start. With regard to the conditions under which hostilities may start, it is not contemplated that the damage criteria will be affected. A target or installation, when attacked, has an established vulnerability that must be considered in order to meet the desired damage levels. The vulnerability of an installation does not change, it is constant. The degree of delivery assurance or, in fact, whether a target is attacked at all, could conceivably depend upon the way war starts, and size of force.

Ex 1

UNCLASSIFIED

CONTENTS OF 2 PAGES WITHHELD

UNCLASSIFIED

~~TOP SECRET~~

B-79366

Ex:

13. Alternate Proposals. Alternate damage criteria proposals by CINCLANT and CINCPAC Representatives are included as appendices 1 and 2, respectively.

UNCLASSIFIED

~~TOP SECRET~~

UNCLASSIFIED

~~TOP SECRET~~

B-79366

APPENDIX I

COMMENTS OF CINCLANT REPRESENTATIVE ON DAMAGE CRITERIA  
PROPOSAL

1. The referenced study in draft form was made available on 23 May 1961, and in final form on 3 June 1961, for the comment of the CINCLANT Representative. There are certain matters discussed in it which are considered to have been presented in a misleading or inaccurate manner and on which there should be amplification. In addition the recommended damage criteria is not concurred in. The purpose of this paper is to set forth the views of the CINCLANT Representative to the JSTPS on these matters and to recommend a different statement of damage criteria for use in future SIOP planning.

~~TOP SECRET~~

UNCLASSIFIED

CONTENTS OF 3 PAGES WITHHELD IN THEIR ENTIRETY

UNCLASSIFIED

~~TOP SECRET~~

B-79366

APPENDIX 2

COMMENTS BY CINCPAC REPRESENTATIVE ON DAMAGE CRITERIA  
PROPOSAL

1. The "participation" of the CINCPACREP in the preparation of the JSTPS Damage Criteria Study, dated 12 May 1961, has been limited to comments on the initial draft received on 23 May and the final draft received on 3 June.

Ex 1

19.

~~TOP SECRET~~

UNCLASSIFIED

CONTENTS OF 2 PAGES WITHHELD IN THEIR ENTIRETY

UNCLASSIFIED

~~TOP SECRET~~

B-79366

SPECIAL REFERENCES

1. SM-1310-60, Joint Strategic Capabilities Plan (JSCP-62)
2. TM 23-200, Capabilities of Atomic Weapons (U) Prepared by Armed Forces Special Weapons Project (AFSWP).
3. Target Data Inventory (TDI), Prepared by the Air Force Intelligence Center (AFIC)
4. Draft, Joint Atomic Weapons Planning Manual (U) (JAWPM), Prepared by the Defense Atomic Support Agency (DASA), in coordination with the Services at the direction of the Joint Chiefs of Staff.
5. AFM 200-8, Nuclear Weapons Employment Handbook (U), Prepared by the Physical Vulnerability Division, Air Force Intelligence Center (AFIC)

UNCLASSIFIED

~~TOP SECRET~~

CONTENTS OF  
2 PAGES WITHHELD IN THEIR ENTIRETY