

INTERNATIONAL COMMITTEE OF THE RED CROSS

**Conference
of Government Experts
on the Use of
Certain Conventional Weapons**

(Lucerne, 24.9—18.10.1974)

REPORT

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1975**

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I. INTRODUCTION

1. The Conference of Government Experts on Weapons that may Cause Unnecessary Suffering or have Indiscriminate Effects (hereinafter called the Conference), convened by the International Committee of the Red Cross (or ICRC) at the request of the XXIIInd International Conference of the Red Cross (Teheran, November 1973; resolution XIV), was held at Lucerne, Switzerland, from 24 September to 18 October 1974. Participants in the Conference included experts appointed by the governments of 49 States and by some national liberation movements, as well as representatives of the Secretary-General of the United Nations and of the Director-General of the World Health Organization. In addition, the Conference was attended by representatives of the National Red Cross, Red Crescent and Red Lion and Sun Societies, the Stockholm International Peace Research Institute (SIPRI), the International Federation of Former Prisoners of War, and the Special Non-Governmental Organisations Committee on Disarmament. A list of the participants is annexed to this report (Annex 1).

2. As the Diplomatic Conference on the Reaffirmation and Development of Humanitarian Law Applicable in Armed Conflicts had in its first session (Geneva, 20 February-29 March 1974) decided not to invite the Provisional Revolutionary Government of South Vietnam to take part in its work, and as the ICRC had subsequently found from the replies to a written enquiry among governments that a majority of those who expressed their opinion on the matter were against any change in the list of invitations to the present Conference, the ICRC, although itself in favour of the broadest possible participation, had decided not to amend Article 2 of the Rules of Procedure. The President pointed out that it was not for the Conference to challenge this decision.

3. In the first plenary session, a number of experts expressed regret at the decision taken by the ICRC. In their opinion, this was both ill-founded in law (as it was contrary to the Geneva Conventions, to which the Provisional Revolutionary Government was a party since the time of its accession) and irregular on account of the form which the consultation by the ICRC had taken. These experts pointed out that the decision was also contrary to the Paris Agreement and to the Final Act of the International Conference on Vietnam, and that the Provisional Revolutionary Government ought to have

been invited notwithstanding the contrary decision taken earlier by the Diplomatic Conference. Other experts, who made reference to Article 8 (3) of the Rules of Procedure (see hereafter, para. 5), considered that these remarks were political and out of order. They said that the Conference should not reopen an issue which the Diplomatic Conference and the enquiry made by the ICRC had already decided.

4. The ICRC had indicated at the preparatory stage of the Conference that its costs would probably amount to ca. 500,000 Swiss francs and that it counted on voluntary contributions on the part of governments to render the Conference possible. At the time of writing this report, a total amount of 428,548 Swiss francs had been contributed or pledged by 27 governments. A list of these governments and of the amounts they contributed is annexed to this report (Annex 3).

5. The procedure of the Conference was governed by Rules of Procedure drawn up by the ICRC and communicated to governments prior to the Conference. Some important aspects of the Rules of Procedure were the following: the meetings of the Conference would not be public (Rule 4); experts would speak in their personal capacity and without binding their governments (Rule 8, para. 1); the Conference would not adopt any resolution or recommendation nor would it vote (Rule 8, para. 2); the Conference would abstain from any discussion of a controversial or political nature (Rule 8, para. 3) (see Annex 2).

6. At the opening session, after having heard addresses by the President of the ICRC, Professor E. Martin, and the Presidents of the State of Lucerne and of the Community of Emmen, the Conference elected Dr. Jean S. Pictet, Vice-President of the ICRC, as its President. At a somewhat later stage, the Conference decided to elect eight Vice-Presidents, this in derogation of Rule 6 which provided for five, and with a view to ensuring representation of all geographic regions. The Vice-Presidents elected were the following: Messrs. D.M. Miller (Canada), A. El-Erian (Egypt), G. Fricaud-Chagnaud (France), R. Chaspuri (Indonesia), O. Hugler (German Democratic Republic), H. Blix (Sweden), J. Jacotte (Venezuela), K. Makelele (Zaire). Mr. Claude Pilloud acted as Secretary-General to the Conference.

7. The Conference subsequently appointed as principal rapporteur Dr. F. Kalshoven (Netherlands), who would be assisted in his task by Mr. H.-J. Rytz (Switzerland) and Dr. J.W. Ardagh (New Zealand) as co-rapporteurs for military and medical aspects respectively. The rapporteurs received in their work the assistance of Messrs. J.-L. Cayla, M. Veuthey and B. Zimmermann, legal experts of the ICRC.

8. The purpose of the Conference, as described in Rule 8 (3), was to study in depth, from the humanitarian standpoint, the question of the prohibition or limitation of the use of conventional weapons that may cause unnecessary suffering or have indiscriminate effects. To this end, the Conference had at its disposal the following documentation (Rule 3):

- (a) report prepared by an international group of experts, under the auspices of the ICRC, entitled "Weapons that may Cause Unnecessary Suffering or have Indiscriminate Effects" (ICRC, Geneva, 1973; hereinafter referred to as ICRC report);
- (b) reports of the Secretary-General of the United Nations on "Napalm and other incendiary weapons and all aspects of their possible use" (A/8803/Rev. 1, hereinafter referred to as UNSG report); and on replies received from Member States (A/9207);
- (c) survey prepared by the United Nations Secretariat of "Existing rules of international law concerning the prohibition or restriction of use of specific weapons" (A/9215, Vols. I and II);
- (d) report of the ad hoc Committee on Conventional Weapons of the Diplomatic Conference (CDDH/47/Rev.1) and summary records of the meetings of that Committee (CDDH/IV/SR.1-7);
- (e) working paper on conventional weapons submitted to the Diplomatic Conference by Egypt, Mexico, Norway, Sudan, Sweden, Switzerland and Yugoslavia (CDDH/DT/2).

The following documents were also available, although exclusively in an English version:

- (f) study of a Swedish governmental working group on "Conventional weapons, their deployment and effects from a humanitarian aspect" (Stockholm, 1973);
- (g) documents submitted by SIPRI: Interim report on "Napalm and incendiary weapons" (1972); proof edition of *Incendiary Weapons*, Chapter 3: "Thermal effects of incendiary weapons on the human body" (1974); "Working papers on international law and the prohibition of unnecessary injury" (1974), and a working paper on "Toxic effects of white phosphorus (WP) munitions" (1974).

9. While the above documentation was accepted as a starting-point and a good basis for discussion by a number of experts, many others stated reservations with regard to the adequacy or accuracy of the information provided in some of the documents, or the conclusions derived from these by their authors. In so far as these reservations took the form of detailed criticism of specific

documents, this is reflected in subsequent chapters of the present report. These experts added that the fact that they had not taken a position on other parts of the document in question should not be construed as an indication that they approved them.

10. It was generally felt that there was a need for additional information on the various aspects of use of weapons and their effects. To the extent that such information was provided in the course of the Conference, it is set out in some detail in subsequent chapters. Those statements, on the other hand, which amounted to a confirmation or an endorsement of earlier documents, are rendered in the report in a somewhat more summarized form. For this reason, it is necessary for a good understanding of the present report to read it in conjunction with those earlier documents, in particular the reports mentioned in para. 8 under (a)-(c):

11. The agenda of the Conference, as drawn up by the ICRC and welcomed by the ad hoc Committee of the Diplomatic Conference, included the following items:

- discussion and analysis of proposed legal criteria
- incendiary weapons
- small-calibre projectiles
- blast and fragmentation weapons
- delayed-action and treacherous weapons
- other categories and new weapons
- any other business
- discussion of report.

12. Still according to the agenda, the pattern for the discussion of each category of weapons would be as follows:

- brief description of the various weapons within the category;
- military value and effects of the various weapons including their functional interrelationship with other weapons and weapon systems; possible alternatives, effects of such alternatives;
- accuracy of the various weapons, danger of their affecting civilians and combatants alike;
- medical effects of the various weapons, including the degree of suffering or injury inflicted by them;
- assessment of the various weapons in the light of applicable criteria;
- technical, operational and legal practicability of prohibitions or restrictions of the use of the weapons, and the form any such prohibitions or restrictions might take.

13. The debate developed in conformity with the main lines of the agenda set out in para. 11 and the report is therefore divided into chapters under the same headings. In each category of weapons, however, a somewhat simpler form was applied than the subdivision indicated in para. 12, the discussion in the main being broken up into military, medical and legal aspects. For the purposes of the present report, a slightly more detailed subdivision was applied when opportune.

14. Throughout the Conference, the debate was held in plenary session. The establishment of working groups was at times considered, but no working group was in fact set up by the Conference. An informal working group examined the question of the definition and classification of incendiary weapons (see hereafter, Chapter III, para. 49, and Annex 5).

15. In the course of the proceedings, several papers providing detailed information of a military, technical or medical nature were read to the Conference. In view of their length, which rendered their inclusion in the body of the report impracticable, it was decided to add a list of these documents as an annex to the report.

II. LEGAL CRITERIA

16. The Conference started its work with a debate on legal criteria. The purpose of this debate was to clarify as far as possible the criteria, and this in the presence of the military and medical experts, who would thereby, so it was hoped, gain a better understanding of the factors determining the admissibility or non-admissibility of weapons falling within the scope of their expert knowledge. In this respect, some expert lawyers felt a need for legal parameters far more accurate than the criteria presently existing or being envisaged, so that their application to a given weapon could be performed almost as a mechanical task. Others, who were convinced that such precise parameters would be impossible to achieve, would be satisfied, more modestly, if the debate brought out at least some degree of clarification. Others, again, while accepting that such an attempt at clarification would serve a useful purpose, emphasized that there would always be room for an assessment of weapons and their effect regardless of pre-existing or pre-formulated legal criteria.

17. At the outset of the debate, a paper entitled "Legal criteria for the prohibition or restriction of use of categories of conventional weapons" by a British expert was distributed to the Conference. This paper, which was welcomed by many experts as an important contribution to the debate, received much support as well as criticism from various sides. Hereinafter, and although it did not constitute a document emanating from the British Government, it will be referred to as the British paper.

18. Essentially, the British paper discussed three criteria: unnecessary suffering (or superfluous injury), indiscriminateness, and treacherous (or perfidious) character. These were the criteria most extensively discussed in the debate as well, although some other criteria were also mentioned, such as ecological damage and the prohibition of the use of force.

19. The criterion of "unnecessary suffering" (or "superfluous injury") was recognized as an existing legal precept by most experts. A few experts hesitated, however, to accept the concept of "unnecessary" suffering as this implied that other suffering would be considered "necessary". In the view of these experts, all suffering caused by war was, in a sense, unnecessary. An expert, replying

to this remark, explained that the distinction between unnecessary and other suffering was not meant to condone the infliction of suffering of any kind, but merely was aimed at precluding certain forms or degrees of suffering in a situation (armed conflict) where the infliction of suffering could never be wholly avoided.

20. To clarify the standard of “unnecessary suffering”, experts examined the language by which it found expression in Article 23 (*e*) of the Hague Regulations respecting the Laws and Customs of War on Land, of 1899/1907. The official British translation of the authentic French text of 1907 reads as follows:

“In addition to the prohibitions provided by special Conventions, it is particularly forbidden ... to employ arms, projectiles or material calculated to cause unnecessary suffering”.

21. One question was how closely this translation corresponded to the French text, which refers to arms (etc.) “propres à causer des maux superflus”. While it was generally agreed that “maux superflus” should perhaps better be translated as “superfluous injury” and that “injury” was a more objective concept than “suffering”, several experts pointed out that the latter concept had come to be accepted in its own right, as distinct from that of “injury”. They thought it would be unthinkable for this Conference, by merely expressing its preference for another translation of the original French text, to remove the subjective element contained in the word “suffering” from the body of international law.

22. A similar difficulty was posed by the words “calculated to cause”. It was generally admitted that these contained an element of calculation or design, which might not be present in the French expression “propres à causer”. Several experts stated that, to the extent that the English text might be construed as more restrictive than the French, the latter should prevail. One expert did not want to see the element of calculation discarded from the text, because he felt that without it weapon designers might not always refrain from deliberately designing weapons that would cause unnecessary suffering.

23. The concept of “injury” or “suffering” evoked some further comment. It was generally considered that this comprised such factors as mortality rates, the painfulness or severeness of wounds, or the incidence of permanent damage or disfigurement. Some experts considered that not only bodily harm but also psychological damage should be taken into account. Another expert could not accept such a wide interpretation of the concept at issue, as all wartime wounds, no matter how slight, could entail severe psychological harm.

24. A question of particular importance was what injury should be considered as superfluous, what suffering as unnecessary. There was widespread agreement among the experts that this involved some sort of equation between, on the one hand, the degree of injury or suffering inflicted (the humanitarian aspect) and, on the other, the degree of necessity underlying the choice of a particular weapon (the military aspect). It was also widely agreed that the equation would often be a particularly difficult one, as neither side of the equation could easily be reduced to precise figures and as, moreover, the two sides were so different that they were hard to compare.

25. According to some experts, the element of military necessity consisted solely in the capacity of a weapon to put an enemy *hors de combat*, this in conformity with the preamble to the St. Petersburg Declaration of 1868, where it is stated that “the only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy” and that “for this purpose it is sufficient to disable the greatest possible number of men”. An expert, elaborating this idea, felt that the subjective element it contained could be reduced, e.g. by a formulation which would require that, if two or more weapons would be available which would offer equal capacity to overcome (rather than “disable”) an adversary, the weapon which could be expected to inflict the least injury ought to be employed. Other experts held, in contrast, that the element of military necessity in the choice of weapons included, besides their capacity to disable enemy combatants, such other requirements as the destruction or neutralization of enemy matériel, restriction of movement, interdiction of lines of communication, weakening of resources and, last but not least, enhancement of the security of friendly forces.

26. Even if the first interpretation of the concept of military necessity were accepted, this would leave open how much injury is required to disable an enemy soldier. According to some experts, it might be necessary, particularly at short range, to inflict a severe wound for this purpose, as a comparatively minor injury might enable him to continue fighting.

27. A remark made in this connection by some experts was that, whereas the ideal solution might perhaps be that the soldier be equipped with a range of weapons from which he could select the one that would, in the concrete situation, put his enemy out of action with the least possible injury, this solution was impracticable and that, hence, even much graver injury than the minimum strictly required in a given situation could not always be avoided.

28. In the British paper, the view was expressed that a weapon which in practice would be found inevitably to cause injury or suffering disproportionate to its military effectiveness could be held to contravene the existing

prohibition. Some experts supported the correctness of this view, while others questioned the correctness of the word "inevitably" in this statement; in their view, it was not a true statement of the law that only those weapons were forbidden which caused, without exception, disproportionate injury or suffering. The true test, according to these experts, was whether a given weapon would normally, or typically, entail such disproportionate effects. Other experts however considered that concepts like "normally" or "typically" were too vague a guide because what was the normal or typical use of a given weapon would vary from campaign to campaign and from one party to a conflict to another. The British paper did, moreover, also point out that even if a weapon was otherwise lawful, its use on certain occasions might be such as to contravene the basic general rule.

29. Indiscriminateness, although not clearly and unequivocally expressed in any international legal instrument in force, was generally accepted as a valid standard of the law of armed conflict. Opinions differed markedly, however, as far as the scope of this concept was concerned. According to some experts, it included not only the prohibition (recognized as valid by all experts) of indiscriminate attacks but also a prohibition of the use of "indiscriminate weapons". Other experts denied that the latter prohibition had already acquired the status of a rule of positive international law.

30. Both these latter and some other experts felt that such a prohibition of the use of indiscriminate weapons would be exceptionally hard to apply. Except for the case of a weapon intentionally designed to follow a random course and at the end of its trajectory hit whatever object happened to be there, all conventional weapons could be used in circumstances where the risk of hitting civilians was virtually non-existent. Conversely, all weapons could be used without discrimination. According to these experts, the method of use of a weapon, rather than its properties, would in general be the decisive element in determining whether the requirement of discrimination had been violated. Another expert gave, as examples of weapons which are inherently indiscriminate, gas and bacteria.

31. In the British paper, the latter view was given a formulation in the statement that clarification of the concept of "indiscriminate weapons" could take the form of a generic prohibition on the use of any weapon which cannot be accurately directed against military targets, that such a prohibition should not be extended to other weapons merely on the ground that they might have been used indiscriminately in the past and that the remedy must be to attempt to formulate a sensible restriction on such a method of use. This statement was more restrictive than the position taken in the report on the work of

experts regarding “Weapons that may Cause Unnecessary Suffering or have Indiscriminate Effects” (supra, para. 8 (a) of Chapter I), where both the weapons indiscriminate by their very nature and those whose normal or typical use would be one which had indiscriminate effects were brought under the scope of the prohibition (Report, paras. 27, 244). Some experts were inclined to favour the position taken in the latter report. Other experts, taking a middle position, thought that those weapons ought to be regarded as indiscriminate which, having regard to their effects in time or space, cannot be employed with sufficient or with predictable accuracy against the chosen target. Yet another expert, however, warned against a reliance on accuracy in this context, as accuracy was a relative concept in all cases and could never provide a clear guideline.

32. A somewhat different approach was taken by an expert who considered that, starting from the distinction he made between point weapons and area weapons, the question ought to be examined whether the latter are necessarily indiscriminate.

33. Some experts advocated that the criterion of treacherousness be given a separate place among the legal criteria governing the admissibility of specific weapons. These experts would then have a preference for the term “perfidy”, a concept now being developed in the context of the Draft Additional Protocols to the Geneva Conventions of 1949, rather than maintain the old term “treacherousness” contained in Article 23 (b) of the Hague Regulations of 1899/1907.

34. Several experts, in contrast, felt that the concept of treacherousness or perfidy did not deserve such a separate place. In their view, the perfidious nature of the use of a given weapon in certain specific conditions would rather constitute an element in the determination whether the weapon caused unnecessary suffering or was used without discrimination.

35. In the quest for further criteria governing the use of weapons, reference was repeatedly made to the Martens clause contained in the preamble to the Hague Convention respecting the Laws and Customs of War on Land, of 1899/1907, according to which “the inhabitants and the belligerents remain under the protection and the governance of the principles of the law of nations, derived from the usages established among civilized peoples, from the laws of humanity, and from the dictates of the public conscience”. The reliance placed on this clause assumed two forms; in the eyes of some experts, what one had to look for was principles of international law derived, e.g., from public conscience; others were inclined to regard the public conscience as a standard by itself.

36. For the former group of experts, it would be necessary to show that the influence of public opinion had resulted in a new principle being incorporated into the body of international law. For the latter group, a strong demand on the part of the public conscience would be sufficient to formulate a new rule.

37. Criteria mentioned in this respect by some experts included the prohibition against doing irreparable damage to the environment (the criterion of ecological damage) and the abhorrence evidently provoked by the use of certain weapons, such as napalm and other incendiary weapons. The latter criterion of the abhorrent nature of certain weapons was also related by some experts to the "laws of humanity" mentioned in the Martens clause.

38. Other experts felt that the public conscience did not constitute a legal criterion by which the admissibility of the use of specific weapons could be measured. In the view of these experts, while public opinion should never be disregarded and could in fact represent a strong driving force, it constituted a political rather than a legal factor, which governments should take into account in examining and assessing the various questions involved in the deployment and use of modern conventional weapons.

39. An expert thought that the entire question of legal criteria should be tackled from a completely different angle, taking into account the present state of international law and international relations. Present-day international law included such basic principles as the non-use of force and equal security for States. In his view, the prohibition of the use of force, enshrined in the Charter of the United Nations and reaffirmed in many treaties to which his government was a party (and to whose conclusion it had often taken the initiative), implied a prohibition against the use of any and all weapons of war, the only exception to this rule being the case when a people would exercise its right of self-defence. This being so, he felt that disarmament was the primordial goal which governments should strive to achieve. In this context of disarmament, it would be necessary to consider all weapons together, both nuclear and other weapons of mass destruction and so-called conventional weapons, all of which were capable of producing terrible suffering. Admittedly, governments could, in the course of disarmament negotiations conducted in the proper forum (such as the Conference of the Committee on Disarmament, or the proposed World Disarmament Conference), conclude agreements proscribing the use of specific weapons. He emphasized, however, that such agreements, to be effective, ought to be general. His views were supported by some other experts.

40. Another expert expressed his profound scepticism at any efforts to place a ban on the use of specific weapons. According to this expert, it was not

the force of legal instruments but the fear of retaliation which kept States from using certain weapons. In a situation where this fear did not exist and where a belligerent party expected to secure a military advantage by the use of a prohibited weapon, this belligerent might well decide simply to set the prohibition aside. This expert felt, therefore, that agreements restricting the use of specific weapons or defining the targets against which they could be used would be incomplete and, indeed, of no avail, if they did not at the same time proscribe the production, stockpiling, etc., of those weapons.

41. Yet another expert expressed the view that the prime task of humanitarian law lay in protecting man against the aggressive war machine. To this end, the use of this aggressive war machine should be condemned as a war crime. In this context, a set of complete and detailed regulations prohibiting criminal means and methods of combat ought to be brought about. Inadequate and dangerous concepts such as "superfluous injury" and "unnecessary suffering", as well as "proportionality" and "military necessity", ought to be discarded. These considerations had led this expert's government to propose a number of amendments to the Draft Additional Protocols envisaging a better protection of the civilian population and of man in general, and prohibiting such methods as genocide, biocide and ecocide.

42. In view of the great diversity of opinion on applicable legal criteria which had emerged from the debate, the suggestion was made that the Conference set up a working group of legal experts which could then, after a thorough examination of all the questions involved, present the Conference with a set of suitably defined criteria for the assessment of specific conventional weapons. The general feeling was, however, that this would be premature; criteria would have to emerge, or find clarification, as much as the result of discussions on military and medical aspects of the use of specific weapons as of the work of legal experts.

III. INCENDIARY WEAPONS

III.1 Definition and classification

43. Experts agreed that the types of weapon that could be considered to fall within the general designation "incendiary weapons" were many and varied. Wide variations existed as regards size (and hence scale of effect), composition of the incendiary agent used, means of delivery to the target, nature and intensity of the incendiary effect and manner of use. In that some of the weapons and usages appeared more germane to the Conference than others, several experts attached great importance to questions of definition and classification.

44. As regards definition, although there appeared to be broad agreement on what was or was not an incendiary weapon, no attempt was made at the stage of the debate in plenary session to reach general agreement on any one particular formulation. In the course of the discussions the following received attention:

- (a) An incendiary weapon is one which depends for its damage effect on the action of an incendiary agent, this being a substance which damages its target primarily through the action of flame and/or heat derived from self-supporting and/or self-propagating exothermic reaction.
- (b) Napalm and other incendiary weapons are designed to inflict damage on an enemy, his possessions or his environment primarily through the action of heat and flame.
- (c) Any device or artefact which contains liquid, solid or colloidal substances capable of producing fire in combustible materials with which they come into contact and of causing burns and suffocation in man.

45. As regards classification, several experts expressed concern lest, in the absence of clear lines of demarcation, the facts about one class of incendiary weapon might wrongly be applied to another class, with the result that the Conference arrived at unwarranted conclusions. Moreover some experts felt that, because in their view it would be unrealistic to expect States to accept limitations on all classes of incendiary weapons, it would be advisable to develop a classification which would facilitate an ordering of priorities. A number of

suggestions were put forward for possible ways of classifying incendiary weapons. Generally speaking, they can be classified according to the type of munition, the method of use, or the type of agent.

46. Regarding method of use, several experts recommended a distinction between antipersonnel and antimatériel incendiary weapons, the former being of more obvious humanitarian concern than the latter. The following definitions were put forward by one expert and strongly supported by other experts:

antipersonnel incendiaries: those primarily designed or used in such a way as to cause burn injury to persons;

antimatériel incendiaries: those primarily designed or used in such a way as to damage matériel targets through the action of flame and/or heat;

weapons with secondary or incidental incendiary effects: those designed and used in such a way that the bringing of fire to bear on the target is demonstrably not the primary purpose of the weapon.

It was generally appreciated that certain types of incendiary weapon could be used against either category of target, and, in the opinion of some experts, this would make it difficult to formulate the distinction in a practical manner. For other experts, this went to show that the Conference could most usefully concentrate on the antipersonnel use of the weapons in question.

47. Wider agreement was reached among experts on the necessity for distinguishing weapons that are primarily designed to have an incendiary effect from those in which the incendiary effect is not the primary one. It was generally considered that the Conference should concern itself only with the former category.

48. The class of weapon excluded from consideration comprises those pyrotechnic or pyrophoric munitions which, although capable of burning people or objects, are not primarily designed for that purpose. Examples include tracer ammunition, signal flares, illuminants and smoke munitions. As far as smoke munitions were concerned, however, some experts expressed reservations about the propriety of excluding white phosphorus (WP) munitions, having regard, first, to the numerous instances of their use for incendiary purposes both against matériel and against people, and, secondly, to the characteristics of WP burn injuries. However, no particular instances of the use of this type of WP munitions against personnel were cited. It was, moreover, stated on the other hand that, although WP munitions could be used for different purposes, the design was normally optimized for smoke rather than

incendiary or antipersonnel effects; this would become evident upon close examination of the munition.

49. In view of the great importance attached by several experts to the questions of definition and classification, an informal working group continued to discuss these questions after the debate in plenary on incendiary weapons had been adjourned. This group finally reached consensus on the following definition of incendiary weapons:

For the purposes of this Conference, an incendiary munition has been considered to be any munition which is primarily designed to set fire to objects or to cause burn injury to persons through the action of flame and/or heat produced by a chemical reaction of a substance delivered on the target.

The working group also recognized the existence of some categories of munition which may have secondary or incidental incendiary effects but which do not fall within the definition stated above. Examples given were illuminants, tracers, smoke, signalling systems and fuel-air explosives.

50. One group of munitions caused some concern to the working group. Many of the experts taking part in the working group suggested a statement to the effect that the group recognized the existence of incendiary munitions such as certain armour-piercing and anti-aircraft projectiles that combine their incendiary effect with other destructive effects which assist in achieving the purposes of the munition. An expert, however, suggested that the word "incendiary" in front of "munition" be deleted, on the ground that the expression "incendiary munitions" would *a priori* constitute these types of munition as incendiaries even if the incendiary effect is very limited and highly secondary.

51. The informal working group submitted a report on the results it had reached to the plenary Conference (see Annex 5). In commenting on the report, several experts commended the group for its painstaking efforts to arrive at agreed solutions. As for the definition submitted by the working group, while several experts considered it to be an adequate one and while no views to the contrary were presented, no attempt was made to reach general agreement in the Conference. Regarding the difference of opinion on certain armour-piercing and anti-aircraft munitions mentioned in the previous paragraph, a number of experts stated that they considered the munitions in question to be incendiary weapons. Furthermore, an expert stated that according to the definition recommended by the working group, munitions with a limited, secondary incendiary effect will not fall within the definition in any case.

52. With regard to the technical characteristics of the incendiary weapons that are discussed in this report, several experts expressed satisfaction with the descriptions of agents and weapons given in Chapter I of the UNSG report. Reference should therefore be made to that document, or to the précis given in the ICRC report, for details. A number of experts drew attention in particular to the distinction made between “intensive-type” and “scatter-type” incendiary agents. The former, which comprise metallic (e.g. magnesium or zirconium) and pyrotechnic (e.g. thermate) incendiary agents, are designed for use against matériel of low combustibility. The scatter-type agents, which comprise various oil-based (napalm) and pyrophoric [e.g. thickened triethylaluminium (TEA)] compositions, are designed for use against readily-combustible matériel or against people.

III.2 The use of incendiary weapons

53. Concerning methods of use of incendiary weapons, many experts noted that incendiary weapons were suited to several types of warfare. Distinctions were made between their use in regular battlefield operations, their use in guerilla combat situations, and their use against the strategic rear. In all cases their utility was considered to depend in part upon their destructive effects and in part upon their psychological impact on the enemy. The paragraphs which follow in this section summarize the statements of experts on the military aspects of incendiary warfare insofar as these relate to methods of using incendiary weapons rather than to the properties of the weapons *per se*. This distinction is not a clear-cut one, however.

54. Experts speaking of the military applications of incendiary weapons dwelt extensively on their utility in battlefield operations. Some experts noted that guerilla warfare was often characterized by military action against enemy personnel in close proximity to non-combatants, while other experts observed that guerillas might often be forced to resort to the use of fire as a weapon. One example was in making use of Molotov cocktails and similar easily manufactured munitions.

55. In considering questions of discriminateness, several experts discussed the relationship between the area-effectiveness of the weapons, their capacity for initiating spreading fires, and the criteria for selecting one type of weapon rather than another for use in a given operation. Thus it was stated by some experts that certain types of incendiary weapon have been considered militarily useful partly because they are area weapons and, as such, can find applications against area targets in several types of warfare. Other experts stated that the area covered by individual incendiary munitions was generally less than some

high-explosive and fragmentation weapons. These experts stated that fire-bombs were used in close air support because of their limited, well-defined area of effectiveness. Some experts emphasized the particular utility of incendiary weapons against military matériel targets such as parked aircraft, vehicle concentrations, headquarters complexes, fuel and store dumps, etc.

56. In this regard, some experts considered it important to distinguish primary area effects from the alleged attendant risk of the spreading of fire out of the target area. In their view, it was hardly likely that armies would make use of a weapon in such a way that there would be a risk of friendly personnel becoming engulfed in the secondary fire. In consequence, they suggested that incendiary weapons likely to cause spreading fires would not be used in close engagements. Other experts, as noted in para. 58 below, questioned the degree to which the users of incendiary weapons, of any type, could control the secondary spread of fire. Furthermore, it was stated that there were many types of operation in which the increased area-effectiveness resulting from secondary spread, far from being considered a military liability, might be considered an asset. Examples cited included the use of mass-fire to destroy forest cover in guerilla warfare; the employment of air-delivered incendiaries as a terror weapon in remote areas; the large indiscriminate fire-raids launched against cities during the strategic bombing operations of World War II, and certain bombing operations of the Korean war.

57. It was stated by some experts that large-scale incendiary attacks on urban or rural areas were no longer considered important in military doctrine. It was also pointed out that the capacity for mounting and conducting fire-raid attacks on cities, such as those of World War II, was today at the disposal of only a very few States, if any at all. In the opinion of these experts, therefore, large incendiary area attacks were a thing of the past. This was not to say, as other experts pointed out, that the use of incendiary weapons had become obsolete for the attack of specific targets located within urban areas: under conditions of modern warfare, the strategic rear may stretch back into the heartland of countries.

58. With regard to the likelihood of secondary fires being initiated by incendiary weapons, it was generally agreed that, apart from climatic conditions, the important determinant was combustibility of the target area. There were differences of opinion, however, on the necessary degree of combustibility. Some experts considered that incendiary weapons had a high capacity for initiating spreading fires even in materials or vegetation of rather low combustibility, and even if the weapons were not used specifically for that purpose. Other experts stated that, within a particular climatic region, there was no greater risk of fire spreading from incendiary weapons than there was from, for

example, high-explosive weapons (although in both cases the risk might sometimes be serious). In the particular case of air-delivered napalm in battlefield operations, one expert stated that, while there had undoubtedly been cases in which napalm fires had spread, there had been no evidence presented that fire-spread is a major risk in practice. Another expert from an industrialized country with extensive treed areas deemed the firespread capabilities to be exaggerated, and offered to discuss basic forest fire-fighting techniques with any interested experts.

III.3 The military characteristics of incendiary weapons

59. The paragraphs which follow in this section summarize the statements of experts on the military aspects of incendiary warfare insofar as they relate to the properties of the weapons *per se*, rather than to the manner in which the weapons are used. It has proved necessary, however, to introduce some consideration of use in order to provide a background, in particular the types of target against which the weapons are, according to experts, commonly used. The different weapons are described according to a classification based on delivery means; several experts made recommendations with regard to the structure of such a classification.

Air weapons

60. One expert noted that it was the practice in his country to classify air-delivered incendiary munitions, of the type considered in the present report, either as "incendiary bombs" or as "firebombs". He explained that the former are designed for use as antimatériel weapons, containing intensive-type incendiary agent. Firebombs contain scatter-type agent, generally napalm, and have been extensively used in recent conflicts both as antimatériel weapons and as antipersonnel weapons.

61. Incendiary bombs, so defined, depend for their effectiveness on their ability to initiate secondary fires. As several experts noted, they are used to penetrate to the interior of structures and then, by creating intense point sources of heat, to ignite the contents. Massive-bomb and clustered-bomblet forms have been developed, although as regards present-day production reference was made only to a cluster weapon using bomblets containing zirconium as the incendiary agent. It was noted that these weapons are constructed to provide predictable ballistics so that they can be aimed from high altitudes, and that they are adaptable to advances in guidance accuracy and stand-off capability, e.g. with laser and electro-optical systems.

62. Incendiary bombs and clusters of the type just described are intended for use against combustible targets in the strategic rear, the examples cited by experts including troop installations, fortifications, factories, assembly plants and storage areas. The cluster incendiary munition mentioned in para. 61 is intended primarily for use against fuel storage depots or vehicles containing fuels. It was noted that these targets were also vulnerable to high-explosive and fragmentation bombs; these weapons accordingly provide alternatives to incendiary bombs. Opposing views were, however, expressed on the degree to which such weapons were in fact satisfactory substitutes. Some experts mentioned the use of incendiary bombs against targets dispersed over a vast area.

63. Firebombs, as several experts explained, are usually large thin-walled containers, resembling external fuel tanks, filled with napalm. White phosphorus is commonly used to ignite the agent. Firebombs are delivered from low altitudes by ground-support aircraft, either against certain specific targets or against relatively small area targets which are readily combustible or which can be damaged by intense heat. The examples cited included exposed personnel, field fortifications, parked aircraft, motor transport vehicles, ammunition or supply depots in the open, stationary armoured vehicles or "unbuttoned" tanks, unhardened radar and communication facilities, wooden construction matériel, and warehouses of combustible construction. Firebombs, some experts stated, could like incendiary bombs be used against targets dispersed over a vast area. These experts stressed that firebombs had also been used against civilian houses and dwellings.

64. Against most of these targets, it was noted by several experts that high-explosive, fragmentation and cluster munitions were generally more effective than firebombs. Strafing with aircraft cannon, the dropping of retarded general-purpose bombs or cluster bombs were seen as an alternative to napalm in many circumstances because of their accuracy and effectiveness. In particular, recent experience had shown that firebombs were not the weapons of choice for the destruction of tanks, artillery pieces or rocket launchers. Some experts did, however, express dissenting views on the foregoing. Figures were cited for the effectiveness of one type of firebomb. Against personnel in the open, trucks, parked aircraft and radar sites, the probability of destroying the target was less than 10%. Against primitive buildings, the probability rose to 15%. Only against area barracks was the probability thought to approach 100%. It was noted that, because firebombs have to be delivered from low altitudes, well into the effective range of all levels of enemy anti-aircraft defence, this serves to inhibit their use against well-defended targets.

65. Figures were also cited for the area of effectiveness of firebombs, and the accuracy with which they can be delivered. A typical 100-gallon design scatters

napalm over an elliptical area of about one-quarter of a hectare; damage to personnel and matériel outside this area was said to be slight. The delivery accuracy was said to be much the same as with high-explosive or fragmentation bombs, and rather better than artillery figures cited for typical accuracy included a DEP (deflection error probable) of 10-20 metres and a REP (range error probable) of 30-60 metres.

66. In the opinion of several experts, the distinctive operational characteristic of the firebomb is the combination of accuracy and an area-effectiveness which is limited to a sharply defined and predictable area. High-explosive and fragmentation weapons differ in that they have a more diffuse area of effectiveness. Therefore, in those combat situations that require the use of area weapons in close proximity to friendly personnel, firebombs are, in the opinion of these experts, the weapons of choice. However, no quantitative data were presented on fragmentation or high-explosive weapons which could be substituted for firebombs.

67. It was thus in close air support operations that experts believed napalm firebombs to have their greatest value. Some experts believed that this was an indispensable role for napalm. The usefulness of firebombs in other types of operation, notably in forward air support operations against armour deployed in a "zone of preparation", was also noted, although few experts asserted indispensability. Within the context of close air support, examples were cited of the particular types of target against which napalm had proved effective. The majority of these were matériel targets. With regard to personnel targets, many experts expressed doubt about those passages in the UNSG report which suggested that napalm was an "all-or-nothing" weapon, likely to cause high mortality among casualties; this is discussed further in para. 95 below. Indeed, far from being a devastating antipersonnel weapon, information put forward by experts suggested in the eyes of some others that the napalm firebomb, when compared with other weapons, was relatively ineffective as an antipersonnel weapon in terms of inflicting physical damage; its psychological effect was unchallenged. The most significant data in this connection are set out in para. 96 below: they seem to indicate that, even for combat units receiving a direct hit from firebombs, the proportion of men *immediately* incapacitated is likely to be small. It was pointed out that this finding has an obvious relevance for operations in which opposing ground forces are in close proximity to one another. Moreover, as several experts remarked, the antipersonnel effectiveness of napalm is greatly dependent upon the training, experience and equipment of the personnel against which it is used. Some other experts pointed out, however, that civilians in the vicinity of the target could not be protected by these counter-measures. They said that the effects on personnel were generally much worse on civilians than on soldiers.

Ground weapons

68. Experts noted that a variety of incendiary projectiles were available for ground forces. They included grenades and small rockets for use by the individual infantryman, mortar ammunition and artillery projectiles. Other types of ground incendiary weapons included flamethrowers and emplaced devices such as landmines and flame fougasses.

69. Experts referred to three different types of flamethrower: portable, mechanized and emplaced. Emplaced flamethrowers, and such things as flame fougasses and incendiary landmines, find their principal application in perimeter defence, both of fixed and of temporary positions. One expert noted that alternatives to employment of portable flame weapons intended for close support of ground troops included small arms, demolitions, grenades and anti-tank weapons which were immediately available to the infantryman. This expert stated that close ground support could be provided by artillery and air-delivered munitions, but that this created a safety problem for friendly ground forces when engaged in combat.

70. Portable and mechanized flamethrowers were seen to have several applications of which the two most important were the attack on pillboxes, and other such strongpoints, and the burning away of vegetation from positions suspected of concealing enemy units. With regard to the attack of strong-points, experts noted such shortcomings as limited range, limited duration of fire, vulnerability to enemy fire, and the need for frequent resupply. Some experts suggested that high-explosive munitions, particularly ones using shaped charges, might serve as effective substitutes. Other experts agreed with this insofar as there was a direct line-of-sight to the target, in which case guided weapons might be used. Other experts, again, noted that in certain armies portable flamethrowers (and, later perhaps, mechanized ones as well) were giving way to other flame weapons, notably small rockets dispensing thickened TEA upon impact.

71. Foremost among the projectiles remaining for consideration are infantry grenades and mortar bombs containing intensive-type incendiary agents. Several experts spoke of the military value of these weapons, particularly during patrols and sentry duties at night. In the latter case, the appreciable area of antipersonnel effectiveness of the grenades (a radius of 10 metres was cited), coupled with their illuminating capacity, was often important, the same holding true for WP grenades as well. In the former case, the grenades (or, for longer ranges, mortar bombs) were said to provide a valuable means of destroying caches of enemy matériel encountered on patrol. Other uses noted for these devices included the destruction of equipment or documents that were to be abandoned during withdrawals. While explosive or fragmentation weapons

could no doubt be used for these different purposes, the general view was that they lacked the convenience of incendiary munitions.

72. A further type of incendiary projectile was referred to by one expert, who stated that it had been used in a recent conflict. This was a 420 mm unguided rocket having a payload of crude oil. No information was presented about its utility or effectiveness.

73. Reference was made by one expert to land mines of the jumping type containing white phosphorus. Other experts expressed their ignorance of such a munition and sought further information. Some experts maintained that if the munitions did indeed exist, they represented an instance of a WP munition designed primarily for antipersonnel incendiary effect.

Flame field expedient weapons

74. Experts noted that on numerous occasions combat units had been able to improvise effective flame weapons. This had occurred during battlefield operations, as when flame fougasses, air-droppable flame canisters, etc., were made up of gasoline thickened in the field with napalm soap.

75. Flame expedients have also found frequent application in the hands of insurgent, partisan and other such combat units. In some cases the expedients have constituted the only effective weapon available, and in this connection several experts noted the so-called "Molotov cocktails". Although these particular weapons are relatively ineffective in destroying tanks of modern design, they are capable of setting fire to older designs of tank; and experts also remarked that all types of tank can be effectively blinded by the flames from such expedients.

III.4 Substitutes for incendiary weapons

76. Noted in the preceding section are a number of observations made by experts concerning possible substitutes for particular incendiary weapons. In considering such substitutions, several experts drew attention to certain wider factors, and to the possible dangers of overlooking them. Thus, a number of experts were of the opinion that, although particular targets might be as vulnerable to certain explosive or fragmentation weapons as they were to incendiary weapons, this was not necessarily an adequate basis for advocating substitution or accepting humanitarian constraints: it was also necessary to take operational considerations into account and the likely humanitarian arguments against using alternative weapons which might cause greater casualties. The effectiveness of a particular incendiary weapon *per se* could be a misleading factor.

77. Adopting a broad perspective on this matter, one expert interpreted the evolution of military doctrine over the years as a process of maintaining balance between changing levels of fire-power and capacity for manoeuvre. In his view, limitations imposed on available firepower, whether incendiary or any other, might upset this balance, resulting in a degradation of freedom of battlefield manoeuvre and movement, which in turn could necessitate compensating increases in the battlefield firing of weapons. The net result could well be an increase in the number of casualties on both sides, and among the civilians between the two sides.

78. As a particular example of this general proposition, another expert noted that incendiary weapons were rarely used in isolation from other types of weapon, and that if incendiary fire support was precluded, not only might a larger weight of firepower have to be directed against the enemy, but also, in the process, friendly forces might become more exposed to enemy firepower (or even to their own firepower). Several illustrations of this were given. Thus, one expert drew attention to the fact that napalm was often used to immobilize tanks as a prelude to their destruction by anti-armour weapons; if the tank were not so immobilized, its eventual destruction could prove considerably more costly in terms of human lives. He also reminded the Conference that the primary duty of governments and commanders in the field was to conserve the lives of their own troops engaged in battle. In this connection, he recalled that casualties up to one million had been sustained by the attacking sides during specific battles on the stalemated western front during World War I. These, he felt, were weighty humanitarian arguments to be taken into account.

79. In a similar vein, another expert noted that if incendiary area weapons were no longer available to field commanders, the use of other types of area weapon might become necessary, perhaps even tactical nuclear weapons.

80. A number of experts held the opinion that weapons which had outlived their usefulness would automatically disappear from arsenals: the military were not accustomed to maintaining useless or superfluous items of equipment. It followed, in their view, that arsenals contained only weapons for which a definite military necessity was perceived. Likewise, only those weapons were retained for which adequate substitutes did not already exist in the arsenals.

81. In considering whether newly developed weapons might in the future be acquired as substitutes for existing incendiary weapons, experts noted the importance of cost-effectiveness considerations. Some countries could afford more expensive weapons than others, and for them it was conceivable that cost-effectiveness calculations might favour new fragmentation weapons, say, over

napalm firebombs. Indeed, in the view of some experts, this was quite a likely possibility in the case of the rich industrialized countries: the extra expense of the weapons, if accompanied by an increased effectiveness, might well appear warranted by the rising costs of weapon-delivery systems, particularly aircraft.

82. For the poorer countries, however, the potential substitutes for incendiary weapons might never come within economic reach. This was the view of several experts, who pointed out that the comparative cheapness and ready availability of some incendiary materials made certain incendiary weapons, particularly napalm ones, accessible to almost all countries of the world. If the poorer countries were prevented from acquiring them, they might, in the opinion of several experts, be denied an important implement of self-defence, particularly with regard to easily manufactured weapons such as the Molotov cocktail. However, other experts noted that, while certain sophisticated incendiary weapons might indeed be widely accessible, the same was not true of the systems needed to deliver them. Moreover, it was argued that the interests of the smaller countries might be better served by international constraints on armaments, for these could contribute a more valuable element to their overall security. Some experts from developing countries did not accept the argument which seeks to link all possibilities for restricting or prohibiting the use of incendiary weapons to the need to replace these by other weapons. In this context, they did not share the preoccupations of some experts from rich countries regarding the high cost of substitute weapons.

III.5 Medical effects of incendiary weapons

83. Chapter III of the UNSG report, which describes the effects of incendiary weapons on the human body and on populations, was generally considered to provide a useful basis for further discussion. Some experts accepted it without reservation; others expressed strong doubts about certain passages in it. Among these passages were para. 104 (b) and 114, dealing with mortality rates among napalm victims (see para. 95 below); para. 116, dealing with the related question of shock in napalm burns (see para. 92 below), and para. 123, dealing with the toxic effects of phosphorus (see para. 99 below). Other criticisms concerned points of medical detail. Thus, one expert considered that para. 140 overstated the quantitative medical requirements for treating wartime burn injuries. He also took exception to the statement in para. 136 that skin grafting ought to be extended over a prolonged period so as not to overtax the strength of the patient; in his opinion it was essential to get skin cover as soon as possible.

General features of burn injury

84. All experts agreed that the effect of a burn wound depended on the extent, depth and site of the burn, and on the quality and accessibility of medical facilities.

85. All experts agreed that a burn wound could, like other wounds, be very painful, and that, generally speaking, severe burn wounds were probably the most painful type of wound and frequently remained so for long periods of time. There was general agreement that they may require long-term treatment and rehabilitation; that a high grade of medical care is required for adequate treatment; and that they may result in permanent disability, including physical, functional, cosmetic, social and psychological disability.

86. Burn injuries may involve systemic effects; most experts agreed that these were due to such factors as fluid and electrolyte imbalance, infection, blood loss and so forth, and that the systemic effects were similar for all burns of a similar degree and extent, however caused. One expert considered that there was no evidence which supported conclusively the involvement of a "burn toxin", as is implied in para. 120 of the UNSG report.

87. All experts agreed that in special circumstances burn victims could display respiratory burns. Some experts considered that in recent conflicts they had perhaps not been so common as during the Second World War. One expert stated that the so-called toxic effects of respiratory burns were not due to toxicity but were the same effects as resulted from any interference with gaseous interchange at the alveolar or air-sac level. All experts agreed that smoke was a respiratory irritant.

88. Experts agreed that the mortality rate among burn victims varied greatly depending on the extent and degree of the burn, the age and physical condition, the quality of medical treatment, and the rapidity with which medical treatment commenced.

89. All experts agreed that it was very difficult to quantify pain and suffering in any wound, and especially so in burn wounds where suffering may continue for months or even years. All agreed that there were subjective, objective and psychological elements in the assessment of pain. One expert believed that, in general, burn victims were likely to experience more pain than the victims of mechanical injuries, primarily because the latter could be closed more quickly. Moreover, burn wounds were, in the opinion of several experts, considerably more difficult to treat, generally speaking, than bullet or fragment wounds. Many experts also stressed that, if a victim with a large burn injury survived, it usually meant that repeated surgical and other medical interventions would

be needed for a very long time, and that the social readjustment of burn victims was often very difficult. The sometimes prolonged interval between injury and death in the mortally burnt victim was taken up by several experts, who pointed out that, after a mortal injury from causes other than burn, death often followed without long delay, whereas a victim with a large burn might live for a longer period of time before death occurred. One expert was of the opinion that, in severe cases, burn victims might rather die than continue suffering.

Burn injuries from incendiary weapons

90. Several experts believed there was no fundamental medical difference between burns resulting from commonly used incendiary weapons and those resulting from other thermal injury. Both categories were considered equally grave. However, some experts were of the opinion that both napalm and WP burns were generally more severe and deeper, and hence more painful, with a greater risk of mortality and permanent disability, than would be expected of wounds resulting from any other burn injury.

91. With regard to napalm injuries, a number of experts claimed that the adhesive quality of napalm tended to increase both the extent and the degree of burn. Some experts, however, stated that there had been no evidence presented to support this assertion.

92. Most experts agreed that no conclusive evidence was yet available to support what was suggested in para. 116 of the UNSG report, namely that napalm burns inherently caused greater shock than burns of a similar degree due to other causes. It was generally agreed that a burn of any extent or depth caused some degree of shock which varied with the degree and extent of the burn, the rapidity and quality of the treatment, and the age and physical health of the victim. One expert expressed his strong dissent.

93. With regard to possible asphyxiation and carbon-monoxide poisoning in napalm victims, it was considered by one expert that napalm in fact was a chemical weapon. All experts agreed that these effects could occur particularly whenever burning took place in a confined space, no matter what incendiary agent or other cause was responsible. A few experts insisted, however, that this was more likely with napalm because its combustion consumed a large amount of oxygen, because it always produced carbon monoxide and other products of incomplete combustion, and because of its higher burning temperature. This was challenged by one expert who stated that no clinical evidence of such effects had been presented to the Conference.

94. Several experts stressed the need not merely for qualitative data about the medical effects of napalm and other incendiaries, but also for quantitative

data: only if these were forthcoming would it be possible to reach adequate conclusions about degrees of suffering and injury. Several other experts recalled that there was already an extensive body of information derived from clinical experience with conventional burn injuries, and they noted that the medical experts were in agreement that incendiary-weapon burns were hardly likely to be less severe than conventional burns. Other experts, again, raised the question of whether it would ever be possible to accumulate useful statistical data on incendiary-weapon burns, having regard to the enormous pressure under which medical personnel, the people most competent to collect the data, commonly operated under combat conditions.

95. With regard to the overall casualty and mortality rates likely to be inflicted by napalm, strong exception was taken by several experts to para. 114 of the UNSG report. These experts considered that the conclusions reached in the paragraph were unsupported by the available data. Concerning the published statement by Professor Dudley quoted in the paragraph (to the effect that his experience in South Vietnam had led him to believe that napalm was an "all-or-nothing" weapon), one expert reported that Professor Dudley had revealed to him that the statement had been based only on very slight evidence. With regard to the other authority cited in para. 114, several experts regretted that it was an unpublished communication and was therefore not available for evaluation. (The Conference was, however, informed by one expert that the observations which were the subject of the communication had since been published in the German medical literature.) Several of the medical experts had served with aid teams in one particular war theatre in which, according to one expert, somewhere in the range of 100,000 to 400,000 tons of napalm had been employed; yet none of those experts had ever observed a napalm casualty among the civilian patients treated.

96. In refutation of para. 114 of the UNSG report, one expert summarized the findings of a hitherto unpublished study of accidents with napalm firebombs. Five such accidents had been studied, all of them involving firebombs dropped inadvertently on friendly combat units in the field. Two of the accidents involved sizeable groups, while the others affected no more than a few individuals. A total of 53 personnel were affected. Only four of them died. Out of the 45 burned in the two major incidents, only five men received greater than 10% third-degree burns, even though they were right in the fireball. Of the 45 men, 44 had still been capable of performing their required military duties until evacuated. These findings refuted the argument, in the view of the expert relating them, that napalm was an all-or-nothing weapon.

97. One expert recalled the fact, noted above, that the medical experts were agreed that the mortality rate among burn victims was dependent upon the

quality of medical treatment and the rapidity with which it was given; and he noted that medical facilities may vary greatly according to combat circumstances. In view of this he suggested that the foregoing accident data were not necessarily incompatible with the mortality-rate conclusions reached in the UNSG report: the accident victims were said to have been evacuated within 10-20 minutes, and subsequently given all possible medical support of the most modern kind. This expert recalled that studies other than the one mentioned in the preceding paragraph reported an immediate battlefield fatality rate of up to 35 per cent and a mortality rate of about 22 per cent in hospital.

98. With regard to WP, most experts were agreed that burns due to this agent were not basically different from burns due to other causes. All were agreed, however, that WP could continue burning on or in the tissue and could, for that reason, if left without treatment for any time, cause deep burns. These burns would, however, according to a few experts, usually be small and scattered. One expert claimed that the majority of the so-called phosphorus burns were in fact due to clothing ignited by the agent, and that they were, therefore, largely indistinguishable from other burns.

99. All experts recognized that phosphorus was a protoplasmic poison, and that if absorption of phosphorus occurred it could result in toxic effects on the heart, liver, kidneys and blood-forming tissues. It was generally agreed that the importance of the toxic component of WP injury was still an open question requiring further study. One expert stated that such effects, if they occurred at all, would occur only if a particularly heavy dose had been received which persisted in the body for a prolonged period, and that they would be minimal if debridement of the wound were performed early.

III.6 Evaluation

100. Experts taking part in the debate on this item of the agenda repeatedly pointed to the conflicting nature of the information supplied in the course of the debate on military and medical aspects of the use of incendiary weapons, which they thought was in some respects directly contradictory to the information provided in the earlier UNSG and ICRC reports. As one group of experts evidently, or in some cases expressly, relied on the earlier evidence and on those statements made at the present Conference which tended to corroborate this, while another group of experts was inclined to place more reliance on the contradictory evidence presented at the Conference, this state of affairs could only result in a sharp difference of opinion over the assessment of incendiary weapons in the light of applicable legal criteria. This difference of opinion came to light with respect to each of the major questions at issue, viz., the questions of unnecessary suffering and of indiscriminateness, as well as

in the views expressed by experts regarding the question of prohibition of the weapons under discussion.

101. A number of experts answered in the affirmative the question of whether incendiary weapons caused unnecessary suffering. They based their opinion, in the first place, on such factors as the nature of the wounds inflicted, the degree of pain which victims of war burns had to suffer, and the difficulty and prolonged duration of medical treatment. In all these respects, they were convinced that the suffering due to severe burns caused by incendiary weapons was considerably worse than that resulting from other war wounds. While these considerations seemed to suffice for some of these experts, others added that, in their view, the military value of incendiary weapons was at best strictly limited in most cases and that, even apart from this, incendiary weapons could be substituted by other weapons with equal or greater efficacy. For this group of experts, therefore, the humanitarian element outweighed by far the element of military necessity.

102. A number of other experts considered that the thesis had not been proven that incendiary weapons inevitably, or even on the average, caused graver suffering than other weapons. While admitting that, generally speaking, severe burn wounds were probably the worst possible type of wound, these experts were not convinced that the use of incendiary weapons resulted in all cases in an exceptionally high incidence of casualties, let alone of gravely wounded; on the contrary, they thought that in certain situations these figures might even be significantly lower than those resulting from the use of other weapons. In the view of these experts, the substitution of incendiary weapons by such other weapons, even if militarily feasible, might well result in an increased number of casualties and of severely injured in particular. Some of these experts pointed moreover to the fact that burns occur in war as a result of many causes other than the employment of incendiary weapons alone; consequently, a prohibition on the use of these weapons might effectuate no more than a slight reduction in the incidence of war burns. According to this group of experts, the military value of incendiary weapons was far from negligible in many instances, and weapons of this category were indeed highly effective or even indispensable in certain situations, particularly against military matériel targets. These experts concluded that there was insufficient evidence to conclude that incendiary weapons caused unnecessary suffering.

103. A similar split of opinion became apparent where the question of indiscriminateness was concerned. According to a number of experts, incendiary weapons are unquestionably indiscriminate in that they exert their primary effect over a certain area, while moreover the secondary effect they often have and which is due to the self-propagating character of fire is beyond the control

of the user of the weapons. Several of these experts cited the large-scale use of incendiary weapons against cities in the course of the Second World War as an example of the indiscriminate use to which incendiary weapons had been put in the past. Some experts pointed, moreover, to the more recent example of guerilla warfare, where counter-guerilla operations involving widespread use of incendiary weapons had often resulted in large numbers of casualties being caused among the civilian population. Thus, also in these cases (which one expert referred to as asymmetric conflict situations) the weapons under consideration were held by these experts to have demonstrated their indiscriminate effects.

104. Other experts, on the contrary, while conceding that incendiary weapons, like most other weapons, could be used without discrimination, denied that they were indiscriminate in all cases, or by their nature. In the view of these experts, modern incendiary weapons are as accurate as other weapons and are, indeed, at times even more discriminate than other weapons that might be used in their stead; their primary effect can be confined to a strictly limited area, and the spread of the fire, as with many alternative weapons, depends upon the nature of the target. To refer to the air-raids of the Second World War was really to refer to an obsolete method of warfare, which had little or no bearing on present-day battlefield uses of incendiary weapons. In more recent armed conflicts, while incendiary weapons might at times have been used indiscriminately, in other instances they had proved their capacity for discriminate use.

105. The latter experts took exception, moreover, to the tendency to deal with incendiary weapons as a class. In their view, questions of unnecessary suffering or indiscriminateness could not be treated in relation to the category of incendiary weapons as a whole, but only in relation to specific incendiary weapons used in specific situations. In this respect, these experts thought that in particular the battlefield use of present-day incendiary weapons generally speaking remained entirely within the bounds set by international law. At the other extreme of the line, they felt there could be little doubt that the massive use of incendiary weapons against civilian population centres was either already in contravention of existing international law, or should be banned one way or another (see hereafter, para. 112). In general, they felt that attention could more usefully be focussed on the antipersonnel employment of those weapons than on their antimatériel role.

106. No suggestion was made during this debate that incendiary weapons ought to be regarded as treacherous or perfidious weapons.

107. Some experts referred to the possible poisonous or asphyxiating effects of certain incendiary weapons as an additional ground for their abolition.

108. For many experts, the public conscience played an important role in the debate on incendiary weapons. In the eyes of some, public opinion concerning the use of incendiary weapons provided yet another argument for the illegality of the use of those weapons; reference was sometimes made, in this connection, to the Martens clause (see above, Chapter II, para. 35). Other experts, who were not convinced that the use of incendiary weapons was unlawful in all circumstances and who could not accept the public conscience as an independent source of international law, were prepared to admit that existing public opinion with respect to incendiary weapons provided a strong political factor for governments to take into account in determining their future policy with respect to this category of weapons. One expert, who endorsed the view that governments may need to look for a guide in public opinion, cautioned that one ought to be sure about its real nature: public opinion might disapprove of napalm, while for example approving the use of incendiary devices by partisans for destroying oil tanks; this aspect of the question, he felt, needed and deserved further consideration.

109. Drawing their conclusions from the entire debate on military, medical and legal aspects of the use of incendiary weapons, a number of experts stated as their considered opinion that the use of these weapons ought to be categorically prohibited. This prohibition, they thought, should be without exception. One of these experts, while admitting that there might exist certain incendiary weapons that could be used with discrimination, nevertheless felt that the injuries caused by incendiary weapons were always apt to cause much suffering. He felt, therefore, that only through a categorical ban on incendiary weapons could such injuries be expected to be effectively prevented; a partial ban would always leave room for interpretation, and new types of incendiary weapons might be designed which, although not falling under the terms of the prohibition, might produce precisely the effects the prohibition was aimed to prevent. These experts made reference to the working paper CDDH/DT/2, submitted to the Diplomatic Conference by Egypt, Mexico, Norway, Sudan, Sweden, Switzerland and Yugoslavia, in which a draft rule for the prohibition of incendiary weapons was proposed. This proposal, it was pointed out by one expert, left room for the tactical use of incendiary weapons in that high-explosive/incendiary and armour-piercing/incendiary munitions were uniquely excepted from the general prohibition. Another expert of this group, on the other hand, made a point of stating expressly that the prohibition should include the latter types of incendiary munitions as well.

110. Experts of this group considered the prohibition they envisaged not only necessary but also practicable. In their opinion, substitutes for incendiary weapons were available or could be developed, and the ban would do

no one harm (and would, indeed, be for the benefit of all) as it would apply equally to all belligerent parties.

111. Some of these experts felt that, if others were not ready at this stage to contemplate such a comprehensive prohibition, they ought at the very least to advance suggestions which would be in line with the view they apparently held that the use of incendiary weapons against civilian population centres was an obsolete method of warfare. One of these experts, considering that attacks on military objectives situated within such centres would probably continue to occur, drew attention to the risk that incendiary weapons, when used in such attacks, could lead to fires spreading over a wide area outside the target. This, he felt, went to reinforce his argument that the use of incendiary weapons should be prohibited, in these situations as in all others.

112. A number of other experts, equally drawing their conclusions from the entire preceding debate, could not subscribe to the above conclusions. They were of the opinion that indiscriminate attacks against civilian population centres should be formally proscribed; the Diplomatic Conference was already considering this issue. The question whether it would be preferable to supplement such a general rule with a specific prohibition on the use of incendiary weapons against such targets, was answered affirmatively by some of these experts, while others preferred to leave it open for the moment. One expert took care to point out that the prohibition against indiscriminate attacks on civilian population centres did not preclude attacks on military objectives within such centres; in this respect, he pointed to the responsibility of the authorities of a country, who should ensure that no vital military objectives were found amidst the civilian population.

113. Experts of the latter group considered that there was no place for a comprehensive prohibition against the use of incendiary weapons. Weapons of this category had been used in the past as well as in the most recent armed conflicts, and it was not to be expected that belligerents would give up the use of incendiary weapons altogether. Such use was neither inherently indiscriminate nor would it necessarily entail unnecessary suffering.

114. A matter for consideration might in the opinion of experts of this group be whether specific types of incendiary weapons deserved to be banned. In this connection, the attempts at classification of incendiary weapons were considered as a useful step; further study along those lines, some of them felt, might show more agreement than was readily apparent. Examination of antipersonnel weapons was considered by some experts to be the more useful focus of such further studies.

115. Experts of both groups emphasized that international agreement would be indispensable to bring about effective prohibitions or limitations on the use of incendiary weapons. Some experts expressed the view that agreement might perhaps be brought about on a regional basis. As for wider agreement, some experts considered that this could only be achieved in the context of disarmament negotiations.

116. One expert, reiterating the views he had already expressed in the debate on legal criteria (see Chapter II, para. 39), thought that the entire question of legal criteria should be tackled from a completely different angle, taking into account the present state of international law and international relations. Present-day international law included such basic principles as the non-use of force and equal security of States. In his view, the prohibition on the use of force, enshrined in the Charter of the United Nations and reaffirmed in many treaties to which his government was a party (and to whose conclusion it had often taken the initiative), implied a prohibition against the use of any and all weapons of war, the only exception to this rule being the case when a people would exercise its right of self-defence. This being so, he felt that disarmament was the primordial goal which governments should strive to achieve. In this context of disarmament, it would be necessary to consider all weapons together, both nuclear and other weapons of mass destruction and so-called conventional weapons, all of which were capable of producing terrible suffering. Admittedly, governments could, in the course of disarmament negotiations conducted in the proper forum (such as the Conference of the Committee on Disarmament or the projected World Disarmament Conference), conclude agreements proscribing the use of specific weapons. He emphasized, however, that such agreements, to be effective, ought to be general. Some other experts supported his views.

117. Other experts rejected the suggestion that the disarmament forum was the proper one to negotiate an effective agreement on the prohibition or limitation of use of incendiary weapons, while yet other experts were of an open mind as to the most suitable forum.

SMALL-CALIBRE PROJECTILES

IV.1 Definition and scope

118. Ammunition for a wide variety of individual and crew-served weapons came within the scope of the agenda item on small-calibre projectiles (SCPs). While recognizing this, experts focussed their attention primarily on rifle ammunition. "Small-calibre projectiles" were understood to be those having a substantially smaller calibre than the 7.62 mm rounds which had been in common use since the turn of the century. Experts noted that SCPs were currently being developed in several countries for military rifles, sub-machine guns, light and medium machine guns, fixed vehicle guns and aircraft cannon. Of those which had been deployed, much attention was given to one particular 5.56 mm round and to the automatic rifle with which it had been widely used. Reference was made to development work on 4.6 mm and 4.32 mm ammunition.

119. In seeking to explain the humanitarian concern engendered by SCPs in particular, experts expressed the opinion, disputed by other experts, that the introduction of this ammunition had increased the incidence of very grave bullet wounds, especially at short range. It was therefore necessary, in their view, to undertake a searching appraisal before these and even smaller projectiles became accepted as a normal feature of modern warfare. Other experts doubted whether SCPs in fact represented any significant novelty in small-arms ammunition; and, as noted in para. 127, they observed that people had been expressing dismay about reductions in bullet size at frequent intervals since the nineteenth century.

120. Experts frequently used the expression "high-velocity projectiles" synonymously with "small-calibre projectiles". It was, however, noted by one expert that to many military people "high-velocity" already had a well defined meaning when applied to projectiles. In this parlance, hand-guns and sub-machine guns are said to use low-velocity ammunition, their projectiles commonly having a muzzle velocity of around 400 m s⁻¹; in contrast, rifles and machine-gun bullets, which usually have about twice this muzzle velocity, are referred to as high-velocity ammunition.

IV.2 Military requirements for SCPs

121. In the discussion on the reasons for current military interest in SCPs, experts noted a variety of different factors. Foremost among them was the need to balance the firepower available from the individual infantryman against changing battlefield conditions, such as the need for increased personnel mobility and dispersion. This required, in particular, a lighter weight rifle, lighter ammunition (which would also serve to ease logistic and resupply problems), and an automatic fire capability. It was stated by some experts that operational analyses drawing from combat experience during and since World War II had shown that the majority of small-arms engagements occurred at a range of less than 400-500 metres. It was generally agreed that these considerations favoured a move into small-calibre projectiles.

122. A number of experts identified certain disadvantages of SCPs, but, from a strictly military point of view, these were not generally considered to be of major importance. They included such factors as insufficient range to supply supporting fire, the greater ease with which SCPs can be deflected from their trajectories by vegetation; the smaller payload available for tracer materials; the somewhat greater protection that can be provided against them; and the possibility of wastage through an inherent tendency towards over-consumption of ammunition when operating in the automatic fire mode. On the last of these, it was noted by one expert that compensation, if it was indeed necessary, would be a simple matter of training, fire-control and discipline.

123. Several experts discounted the suggestion that small-calibre weapons represented an unnecessary increase in wounding power. One expert observed that modern combat conditions no longer necessitated any such increase, having regard to the wounding capacity already at the command of the designers of infantry weapons. The primary task, in his view, was to provide for other operational requirements, such as those noted in para. 121. Another expert stated that the first task of the designer was to establish the optimized bullet-characteristics striking-velocity to achieve the minimum guaranteed incapacitation at the required maximum range; he could then go on to build the weapon. Any overstatement of requirement or over-incapacitation would lead to an unnecessarily heavy and unwieldy weapon. It was, however, generally agreed that at ranges below the maximum for which the weapon was designed, or against unprotected targets, there would inevitably be some over-incapacitation; this would be true of all military rifles.

124. With regard to the problem of maintaining effectiveness while satisfying new operational requirements, experts identified two parameters of major importance: hit probability and incapacitation probability. It was the com-

bination of these, that is to say the hit-incapacitation probability, which determined the military worth of a new design, a point which one expert illustrated in detail with reference to the recently introduced 5.56 mm rifle. Experts noted that a small-calibre projectile, because of its higher velocity over its effective range, would travel along a flatter trajectory than a heavier one, and would have a shorter flight time. This would mean an increase in hit probability, although accuracy over longer ranges would decline rapidly with distance. On automatic fire, another significant contribution to hit probability would be the diminished recoil momentum resulting from the smaller weight of the projectile. One expert noted that a high hit probability was especially conducive to discriminate use of the weapon; and in this connection it was also noted that the space envelope within which incapacitation could occur would be smaller with SCPs than with larger-calibre ones.

125. With regard to incapacitation probability, it was accepted by some experts as self-evident that an SCP would need to be fired at a higher velocity than a larger-calibre one in order to put a man out of action at the maximum required range. Several experts addressed themselves to the question of whether, and in what manner, a boundary might be defined beyond which necessary incapacitation became superfluous wounding. Reference was made to the incapacitation criteria based on the kinetic energy carried by the bullet which had been current in various countries at one time or another. These ranged from 40 joules up to 240 joules, a divergence which indicated clearly, in the view of several experts, the failings of such a criterion. While there was no dispute that kinetic energy was important, it was generally considered that a kinetic energy criterion would be inadequate unless qualified by bullet-shape, bullet-path, and other such considerations. In support of this, one expert cited the anti-riot "rubber" bullet which, although clearly not lethal, had kinetic energy sufficient to defeat body armour by the criteria cited in the ICRC report. Moreover, one expert noted that time-to-incapacitation could be as important as degree of incapacitation, particularly in close combat. Despite the importance to weapon designers of being able to quantify incapacitation probabilities, it was stated by several experts that, although experimentation and combat data collection had been continuing for a very long time, it was still not possible to formulate a reliable predictive relationship between the physical parameters of a projectile and the degree of incapacitation which it would cause: the human body was too heterogeneous to allow this.

IV.3 Wound ballistics and medical considerations

126. In the discussion of the medical aspects of SCPs, experts ranged over the whole area of wound ballistics. The following paragraphs summarize the

discussion in relation to the question of whether SCPs can or cannot be said to represent a significant increase in wounding capacity.

127. Historical evidence was cited by a number of experts that showed, in their opinion, how common it had been for newly introduced rifle ammunition to be criticized on the grounds of causing far more injury than its predecessor, and how in fact, on closer examination, those claims had proved untenable. In particular, comparisons were made by some experts between the various nineteenth century writings on the so-called explosive effect of existing rifle bullets and present-day concern about SCP wounds. Thus one expert who had made a detailed study of the contemporary literature on the subject stated that the types of bullet in common use up to the mid-nineteenth century, and the short ranges at which they were generally used, could easily give rise to very serious wounds, sometimes resembling those of explosive bullets. Because those wounds were often at least as terrible as those caused by the smaller-calibre rifle bullets introduced subsequently, it was not possible, in his opinion, to discern a discontinuity in effect.

128. In the opinion of a number of experts, high-velocity bullets were likely to cause more destruction of human tissue than low-velocity bullets. Some experts considered that a high-velocity wound would usually, though not always, be worse than a low-velocity wound. But there was no agreement among experts on the extent to which a simple velocity criterion could be used to differentiate wound severities.

129. Chapter III of the ICRC report was strongly criticized by many experts for suggesting that, at impact velocities of around 800 m s, there was a discontinuity or jump in the relationship between bullet velocity and bullet wounding capacity. Although some of these experts acknowledged that there was a correlation between impact velocity and seriousness of wound, it was considered that several other variables, some of which could well have a greater significance than bullet velocity, ought to have been taken more closely into account. In their view it was incorrect to suggest that an impact velocity above 800 m s would invariably give rise to a more severe wound than a lower velocity impact. Several instances were cited where this was demonstrably not the case. A number of other experts noted that powerful weapons could cause slight injuries, and less powerful weapons grave injuries, depending upon where the body was struck and from what range; it was wrong, in their view, to draw general conclusions from such anecdotal comparisons.

130. A number of experts stated that, in addition to projectile velocity, such other physical parameters as angle of yaw, angle of incidence, projectile

geometry and projectile spin-rate were also likely to have a significant influence on wound severity. Their relative importance was discussed primarily in terms of their contribution to those phenomena which, in the ICRC report, were held to be responsible for the characteristic features of high-velocity wounds. Apart from penetration, there were three such phenomena: projectile tumbling, projectile break-up, and cavitation.¹ There was also discussion of the process of energy deposit, which, in the ICRC report, was considered primarily as an integration of the other phenomena.

131. In commenting on the three wounding phenomena and their determining parameters, experts drew upon four distinct categories of experience: theoretical studies, primarily computer-modelling of projectile-tissue systems; experimental studies of the behaviour of projectiles fired into blocks of gelatin, a tissue-simulant material; experimental studies with animals; and the observation and treatment of gunshot casualties. As was generally acknowledged by experts, each of these four sources of evidence has its own characteristic merits and limitations; they are therefore discussed separately and in turn.

Evidence from computer modelling

132. One expert presented the results of detailed calculations made with the aid of a computer model of the behaviour of small-calibre, spin-stabilized projectiles penetrating a dense medium, acknowledging that, as with any such model calculations, numerous simplifications had to be made in both the mathematical and the physical parameters. The modelled projectiles included current 7.62 mm rounds as well as a variety of general-issue, developmental and hypothetical SCPs. The computations showed that projectiles have varying propensities to tumble, and that yaw-angle on impact is a determining factor. This expert also observed that, in view, among other things, of their lesser longitudinal moment of inertia, SCPs were likely to yaw more in their trajectory than were larger-calibre ones; and that because this would mean more rapid tumbling after impact, more severe wounds could be expected. However, other experts criticized the model as being an oversimplification of reality. Thus, one expert stated that each projectile had its own peculiar yaw cycle and that to compare the effects of various projectiles at equal ranges and yaws was in his opinion unrealistic. The opinion was also advanced that if the model had taken into account the influence of cavitation, the apparent differences in tumbling propensity might not have been so marked.

132a. One expert provided a theoretical equation used to predict projectile yaw, including tumbling, as a function of penetration depth in gelatin. He stated that the predictions made with this equation correlated well with actual

test data; the test data which he cited in this connection are noted in para. 135. The equation contained no parameter describing projectile velocity, indicating, in his view, that projectile velocity was not a principal factor in determining projectile tumbling.

133. Another expert alluded briefly to work done in his country on the modelling of complex penetration-mechanics phenomena, in particular the modelling of cavitation effects in a homogeneous medium. He stated that there was good correlation between the results from this model and observations made during gelatin-block experiments. This theoretical work had shown that the maximum temporary cavity created along the path of the projectile increased with increasing impact velocity. However, he also observed that there was no discontinuity in the region of 800 m/s, and that even low-velocity projectiles did, through cavitation, produce effects that extended beyond the path of the projectile.

Evidence from gelatin-block experiments

134. Several experts presented selected findings from gelatin-block experiments. One expert (who remarked that security considerations precluded a fuller display of data) stated that high-velocity SCPs did in general produce a greater effect than 7.62 mm rounds, but only at very short ranges. Another expert reported that SCPs tended to deposit a higher proportion of their kinetic energy than did larger-calibre ones, except in experiments where the gelatin-block was covered by a thin steel plate in order to simulate actual battle conditions where some degree of protection may exist. In this instance, the heavier round deposited the greater proportion of energy in the gelatin-block.

135. Another expert compared the tumbling effects of different projectiles. He presented data to show that tumbling could begin earlier with a particular low-velocity bullet than it did with a particular higher-velocity one. These data also showed that the same projectile can begin to tumble sooner at lower rather than higher velocities under certain circumstances.

136. One expert described the results of experiments performed using standard 7.62 mm and 5.56 mm military rounds and 7.62 mm dum-dum projectiles. These experiments covered all practical combat ranges with equal overall results. An integration of results over the full combat range for each type of projectile showed lesser effects from 5.56 mm rounds than from 7.62 mm rounds. The effects of the dum-dum bullet were from 3 to 20 times larger than those of the ordinary military bullets, all fired under equal conditions at various ranges.

Evidence from experiments on anaesthetized animals

137. One expert presented data from experiments with different bullets fired into pigs and sheep. His conclusion was that even under a wide variety of circumstances it could not be demonstrated that SCPs tended to cause more severe wounds than older types of projectile.

138. Another expert reported in great detail on experiments with bullets fired into pigs. In contrast to the findings of the previous expert, these experiments seemed to indicate that high-velocity and low-velocity effects could be distinguished by inspection of the wound. In limbs, muscle destruction from high-velocity projectiles appeared greater, and in the abdomen there was likely to be more rupture of organs lying beyond the path of the projectile. In the view of another expert, however, the findings presented did not support this claim.

139. The expert who described the experiments in para. 138 also performed and described experiments in which steel spheres were shot into dogs. These experiments provoked divergent comments from experts. Experimentation of this type provided a means, it was explained, of dissociating tumbling effects from other wounding phenomena. Impact velocities of 500 m s and 1,000 m s were used in order to study, in particular, systemic physiological changes and cavitation effects. With regard to the first of these, it was observed that the high-velocity spheres produced an immediate local haemodynamic reaction with increased blood flow and a lowered peripheral resistance to blood flow; a myocardial depressive reaction was noted even though there was very little loss of blood from the wound. Moreover, in an experiment in which blood from a shot dog was immediately transfused into a control dog, severe changes of regional blood flow were observed in the latter, but only when the former had been shot with a 1,000 m s sphere, not with a 500 m s sphere. Suggestions were advanced by experts in explanation of these phenomena, but it was generally agreed that the findings justified further experimentation. In the opinion of some experts, the possibility that a unique high-velocity effect was involved, perhaps related to transonic flow phenomena such as might be expected for spheres in the region of 800 m s, could certainly not be ruled out. Experts noted that with actual projectiles, rather than spheres, transonic flow phenomena might occur at impact velocities as low as 600 m s.

Evidence from gunshot casualties

140. Several experts expressed the opinion that, from their clinical experience of war wounds, surgeons were not able to distinguish between the severity of the wounds caused by any of the military rifles in current use, both of modern and of pre-World War II design; and they were not able, from the appearance of the wound, to ascertain which rifle caused it. A dissenting view was expressed by

one expert who noted that, on the basis of observations published in the medical literature, some military surgeons did appear to be capable of distinguishing between the wounds caused by different rifles.

141. It was generally agreed that surgeons can usually distinguish between wounds caused by rifles and wounds caused by low-velocity weapons such as pistols, carbines or sub-machine guns. The latter are generally much less severe.

142. One expert expressed the opinion, disputed by others, that the wounds caused by high-velocity SCPs were characteristically harder to treat, and carried a higher mortality risk. Another expert, supporting this view, drew attention to the greater cavitation effects of high-velocity projectiles; in his opinion it was this phenomenon, involving more necrotic tissue, internal damage and a greater risk of infection, which increased the treatment difficulties.

143. With regard to projectile break-up, one expert presented medical data obtained from a combat theatre regarding wounds from particular 7.62 mm and 5.56 mm rifle bullets. At short ranges, the bullets examined tended to break up in human tissue. It was found that with one particular type of 7.62 mm round, projectile break-up in the wound occurred 50 per cent of the time at ranges of up to 200 metres, which corresponded, for that projectile, to an impact velocity in the region of 500-600 m s.

144. It was generally agreed that the data which had become available since the ICRC report was written, including the data presented by experts to the Conference, indicated that the ICRC report overstated the significance of velocity as a determinant of wound severity. Even so, there appeared to be general agreement that velocity *per se* was by no means a negligible factor. A number of experts expressed the opinion that, insofar as high-velocity effects can be characterized, the characteristic feature is primarily that of cavitation, including perhaps transonic flow phenomena; but the extent to which this is a guide to wound severity depends on the relative degrees to which the phenomena of cavitation, projectile tumbling and projectile break-up contribute to the overall trauma.

145. There was general agreement, noted above, that much more study was needed, particularly in the search for common ground between experimental and clinical data. Several experts noted that laboratory findings in animal or simulant experiments may bear very little relationship to what in fact happens in so complex and unreplicable a system as the human body; conversely, other experts noted that the anecdotal character of clinical observations precluded all but the simplest forms of statistical generalization. One expert suggested expanding the gelatin-block experiments to provide a better approximation of

the human body by appropriate variations in density such as the inclusion of bone simulators, perhaps made of plastic. Several experts suggested that it would be desirable not only to continue work on wound ballistics, but also to do it on a cooperative basis, involving experts from different countries.

IV.4 Evaluation

146. There was general agreement among the experts who took part in the debate on legal aspects that the concept of unnecessary suffering (superfluous injury) was the only one relevant to the assessment of small-calibre high-velocity projectiles. These bullets, they said, are neither inherently nor typically indiscriminate; indeed, one expert felt the evidence showed that they were definitely more discriminate because they were both more accurate than other types of rifle ammunition and quickly lost their lethality beyond their effective range, in contrast with the slower but heavier 7.62 mm bullet which remained lethal for much longer ranges. None of the experts mentioned the criterion of treacherousness or perfidy in this context, and neither was there any reference to public opinion as a separate factor to be taken into account here.

147. Experts hesitated greatly where the question of unnecessary suffering was concerned, and very few ventured to give their views in the form of firm conclusions. This hesitation was due to the nature of the evidence presented in the course of the debate on military and medical aspects, and to the lack of agreement among military and medical experts which had transpired from that debate. Indeed, much of the evidence appeared to be openly contradictory to information supplied in earlier publications and, in particular, in the ICRC report. One expert expressed regret at this trend in the evidence presented to the Conference; he would have preferred to see more attempts at constructive analysis. Another expert felt, on the contrary, that the debate had been highly instructive in that much new information had been presented and that a historical review had indicated that bullets had caused horrible wounds ever since the introduction of the modern rifle. Yet another expert suggested as a possible explanation of the above state of affairs (but one which he himself was not prepared to accept) that certain experts had been biased by the strong conviction of their governments that the modern type of small-calibre rifle was so militarily valuable that its prohibition ought to be prevented at all costs.

148. The high military value of these rifles was recognized in all quarters. One expert referred to their unique military utility. Be this as it may, some experts recalled that the military utility of those weapons, no matter how great, should be weighed against the suffering they caused.

149. For one expert, the debate had not changed any of his main conclusions, which had already found expression in the working paper CDDH/DT/2 submitted at the Diplomatic Conference by Egypt, Mexico, Norway, Sudan, Sweden, Switzerland and Yugoslavia. In that document a draft rule had been submitted for examination, to the effect that projectiles of small-calibre weapons must not be so designed or have such velocity that they would be apt to deform or tumble on or following entry into the human body or to create shock-waves damaging tissue outside their trajectories or to produce secondary projectiles.

150. This expert conceded that this language needed to be reconsidered in the light of the evidence now at hand. However, he emphasized that the main thrust of the proposal was to ban those modern small-calibre bullets that caused unnecessary suffering, and he estimated that at common fighting distances the bullets in question caused far graver injury than did most other current rifle bullets. He felt, therefore, that the modern small-calibre high-velocity bullets ought to be banned on the same rationale as that underlying the ban on dum-dum bullets, viz., to avoid extreme injuries not needed to put a man *hors de combat*. He warned that the progressive introduction of the modern type of small-calibre rifle with its higher injuring capacity would result in more suffering all around the world.

151. Other experts estimated that there was insufficient evidence to warrant the conclusion that modern small-calibre projectiles caused unnecessary suffering. In their view, the evidence demonstrated merely that wounds caused by modern small-calibre projectiles, or by what had been termed high-velocity projectiles, might or might not be more severe than the wounds caused by larger-calibre or lower-velocity projectiles. They noted that it appeared impossible to associate the so-called "high-velocity" wound effects with a specific projectile velocity, or, indeed, only with the velocity parameter. Other parameters, such as bullet design, might appear more important, but technical experts disagreed on this point as well as on others. On these grounds, they were of the opinion that the formulation of a rule of restriction or prohibition on the weapons at issue did not appear warranted; nor, they felt, would such a rule be practicable without previous agreement on relevant parameters. One expert commented that, in his opinion, the adoption of a rule as proposed in the working paper CDDH/DT/2 would lead to the prohibition of every military rifle in use today.

152. One of these experts did not accept that modern small-calibre bullets could be likened to the light explosive or the dum-dum bullet prohibited in 1868 at St. Petersburg and in 1899 at The Hague, respectively. Those participating in those conferences had been concerned with bullets inflicting wounds qualitatively different from those inflicted by normal bullets then in use, and

inevitably different. They had not concerned themselves with the normal bullets, although they were well aware of the history of severe rifle wounds since the middle of the 19th century.

153. Another expert, speaking in the same vein, doubted that a finding that small-calibre high-velocity projectiles tumble more often than do other bullets and thereby produce a more severe wound, would be sufficient to condemn the projectiles in question. It might be that the tumbling effect was indeed necessary to the end the soldier sought to achieve, that is, to incapacitate the adversary to such a degree that his combat activities would be immediately discontinued. If that were so, the tumbling effect could not be considered to cause unnecessary suffering.

154. All experts taking part in the debate readily agreed that further study and research were required to arrive at more definite conclusions. Several experts emphasized that to this end, besides efforts on the national level, international co-operation and an international exchange of views and information would be particularly important.

V. BLAST AND FRAGMENTATION WEAPONS

V.1 Definition and classification

155. No attempt was made to define the categories of weapon discussed in this Chapter. Indeed, it was noted that blast and fragmentation effects were to a varying degree inherent in all explosive devices. Weapons mentioned by experts ranged from general purpose bombs, rocket and missile warheads and mortar and artillery shells to such more recent developments as clusterbombs with different types of payload and fuel-air explosives.

156. As for classification, experts realized that there is no clear separation between blast weapons and fragmentation weapons. Most weapons discussed here have both blast and fragmentation effects, some weapons acting mainly through blast and others mainly through fragmentation. The purest example of a blast weapon is the fuel-air explosive, while the multiple-fléchette projectile comes the nearest to being a pure fragmentation weapon.

157. One classification suggested by an expert was into antimatériel and anti-personnel weapons, according as the weapons were designed for the one or the other purpose, it being admitted that some of the weapons described here were designed to serve both purposes. Another expert cautioned that this distinction between antipersonnel and antimatériel weapons should be treated carefully, since many weapons and munitions were used against both, and matériel and personnel were often combined as weapon systems in the target area.

158. Some other experts, while not suggesting any classification themselves, urged that the weapons falling within the category of blast and fragmentation weapons should be treated individually and each examined and judged on its own merits, as otherwise the risk would exist that whole classes of weapon were condemned at a stroke on emotional rather than rational grounds.

V.2 The use and military characteristics of blast and fragmentation weapons

Fragmentation weapons

159. Most experts concentrated on fragmentation weapons, and much information was provided concerning the use of this type of weapon. Experts

discussed both the general utilization of fragmentation weapons and the use of recently developed controlled- or pre-fragmented and fléchette weapons of various types.

160. As for the general aspects of the use of fragmentation weapons, experts noted that a great many weapon systems, both older and modern, acted through fragmentation and that such weapons were used in the most diverse situations, whether in attack or in defence, as air weapons or ground weapons, and as long-range or short-range weapons.

161. An expert stated that the use of artillery and mortar fire in assault operations had the aim of inflicting a maximum of casualties and holding the enemy down while the attacking units were advancing. In this situation, a close connection between this fire and that from the attacking soldiers' individual weapons, from tank- or APC-mounted automatic guns and machine guns, and, as the case might be, from the weapons of aircraft providing close air support, would, according to this expert, be desirable. In this view he was supported by other experts.

162. In a defence situation, this expert explained that the defender tried to combat the attacking forces with all available means, such as artillery and mortar fire and, if available, attacks from the air, while at closer range this fire would be combined with the effect from the individual soldiers' weapons. Another expert, expounding on this theme, contended that the defender will always face a much larger quantity of matériel and personnel and that he therefore must have at his disposal weapons which permit to put large amounts of the attacker's forces out of action at an early stage of the attack, that is, under normal conditions, when there is still a great distance between the combatant forces. This, he felt, was to say that in these circumstances there is a military need to use weapons which cover a large area, in such a manner that there will be little chance for the attacking forces to go unscathed; in other words, this situation requires an even spread of a large number of fragments over a wide area.

163. Discussing the general military utility of fragmentation weapons, an expert noted that fragmentation occurs when explosive gases under extremely high pressure and temperature expand the weapon casing until it shatters, and that the size of the resulting fragments depends on the thickness of the casing, the casing material and design, the explosive, and the ratio of explosive charge weight to casing weight. In weapons whose fragment size is not pre-determined, such as general-purpose bombs and shells, the fragments vary widely in size and weight. In weapons where maximum fragmentation is the desired effect, casings are designed to produce a uniform fragment size.

164. Turning to artillery, this expert was of the opinion that this had the day-night, all-weather capability to deliver accurate, effective fire for general support of ground forces in addition to long-range interdiction and counter-battery fire. He doubted that artillery, which is employed against a variety of targets including both enemy matériel and personnel, can be outdone by any other weapon system in engaging targets on a cost-effectiveness basis. He conceded that other systems such as air-delivered ordnance can be of greater military value in certain situations; however, this could result in significantly increasing the cost associated with maintaining a given level of effectiveness.

165. Another expert stated that surface-to-surface artillery was generally carefully controlled and applied, and that the bulk of targets were engaged by observed fire (whether with the eye or with modern electronic means) where the effects could be assessed. Artillery, he said, could be concentrated on a small area or dispersed over a larger area as required. Then, although unobserved predicted targets could be engaged with artillery fire, he stated that it would rather be a task for the air force to deal with targets in depth. Turning to the effectiveness of artillery fire, this expert took issue with theoretical figures quoted in the ICRC report; these, he said, invariably reflected the optimum situation; many factors could, however, and would in practice, greatly reduce the effects. This led him to state that generally field artillery was not very effective in terms of producing casualties; he agreed with other experts that the most widely used role for artillery fire was neutralization, that is, keeping the enemies' heads down for a limited period; while very few casualties would be incurred by troops dug in, the effect on morale and the reduction in their will to fight might on the other hand be significant. In armoured warfare nowadays, he added, artillery was also used to damage vehicles to prevent them from taking part in the direct fire battle, but once again the purpose was not necessarily to kill the crews.

166. This expert stated that the tendency in artillery was to increase accuracy. Better fragmentation, he said, would not be used to increase the number of personnel casualties but to reduce the number of rounds needed to be fired, so that the logistic problem was eased.

167. Other conventional fragmentation weapons discussed by some experts included mortars and air-to-surface rockets. The latter weapons, one expert stated, were employed against a wide variety of both matériel and personnel targets, the most important being armed vehicles, artillery positions and infantry. Air-delivered rockets, he said, provided the attacker with high fire-power and a forward firing stand-off capability; as they were relatively inexpensive, they could be used at high rates; then they were less subject to the normal visual delivery errors than other unguided ordnance and provided an excellent weapon

at times when visibility was reduced. They could be launched at greater distances from the target than alternative weapons such as general purpose bombs and aircraft cannon and machine guns.

168. Regarding more recently developed types of fragmentation weapon, several experts explained the reasons which had led to this development. Already mentioned among the foregoing have been the need to get an even spread of a large number of fragments over a wide area (para. 162) and the desire to reduce the number of artillery rounds to be fired (para. 166). An expert noted that weapon concepts for controlled fragmentation devices and fléchettes were not new and did not represent radical departures in weapon designs. He stated that they stemmed from a normal evolutionary trend in weapon development in response to changing battlefield requirements and new technology. The increasing fire-power of infantry and the resulting greater dispersal of infantry formations required, as counter-measures, antipersonnel weapons with greater area coverage such as the cluster bomb units (CBUs). Another expert stated that even such so-called antipersonnel fragmentation weapons could, and were in fact, used against soft matériel targets such as electronic equipment, soft skin vehicles and aircraft parked in the open.

169. An expert gave a detailed description of the present trend, especially in the design of antipersonnel warheads, towards smaller and smaller fragments. It has been found, he said, that even a fragment weighing a fraction of a gram, and at a high velocity, may put a soldier out of action. As the same amount of casing material is divided into a far greater number of fragments, the hit probability is increased whereas the incapacitation probability of each fragment, as compared with older munition, is lower but still at a fairly high level. This expert stated that there was, however, a considerable risk, at shorter ranges, of hitting the same person with several fragments, resulting in multiple injuries.

170. Another expert, dealing with the same aspects of modern fragmentation weapon developments, criticized a passage in para. 124 of the ICRC report, where it is stated that if improved fragmentation characteristics "can be achieved with a munition, both its hit probability and its incapacitation or kill probability will be increased". He had conducted an evaluation of this statement, using the fragmentation data of three types of conventional and three types of improved fragmentation munition. The input of these data into a computerized simulation of a burst of each munition, with men standing in open terrain and uniformly distributed about the burst as the assumed targets, had led to results which, he said, substantiated the assertion that the use of improved munitions increased the expected number of hits on a target. It was also found that the average level of incapacitation caused by the conven-

tional munitions was significantly higher than that caused by the improved munitions. This led him to state that the modern munitions were considered an improvement over the conventional variety because they hit more targets but on the average caused a lower level of incapacitation.

171. This expert also criticized para. 128 of the ICRC report, where the wounds are discussed which are caused by the low-mass/high-velocity fragments produced by the improved munitions and where it is stated that “such fragments may have the severe and characteristic medical consequences” that were described in the chapter on high-velocity projectiles. In order to evaluate this statement, he had compared an average fragment produced by a conventional munition with an average fragment of an improved munition, with the aid of the model used to predict the maximum temporary cavity in gelatin. The results, he said, reinforced the conclusion that mass and velocity were both important in determining the cavitation effects of projectiles; further, it was clear that the wound caused by the significantly heavier but lower-velocity conventional fragment would cause much more extensive damage than the fragment from the improved munition.

171a. Another expert, equally referring to para. 128 of the ICRC report, stated that the initial velocities there ascribed to the fragments of modern fragmentation munitions (and said to be 1,000 to 2,000 m s) were not exclusive to those munitions and applied to fragmentation velocities in general. According to this expert, the initial fragmentation velocities of the weapon discussed in para. 126 of that report are lower than average, viz., approximately 1,100 m s, with hardly any velocities exceeding 1,200 m s.

172. Both this expert and other experts dealt extensively with certain types of cluster bomb. The expert just quoted, still discussing the ICRC report, criticized para. 126 where it is stated that a person standing 15 metres from the burst of one of the nearly 700 bomblets, each weighing about 0.5 kilograms, contained in one example of an extensively used fragmentation cluster bomb resembling a massive 350 kg bomb, will probably be hit by at least five fragments, each weighing about 0.5 gram. He said that his data indicated that the high fragment densities required to obtain this result are only produced by munitions much larger than bomblets, and that no single sub-munition is capable of producing so many fragments. Another expert joined in this criticism of para. 126 of the ICRC report. Other experts pointed to the probability that several bomblets would be scattered around; one person could then be hit by fragments from more than one bomblet.

173. An expert noted that the ICRC report in Chapter IV seemed to be inclined to treat cluster bombs as one entity, without differentiating between various

classes of cluster bombs designed for entirely different purposes. He thought that such differentiation was necessary. In order to clarify the position as he knew it, he gave a detailed description of the BL 755 cluster bomb. This bomb of about 250 kg is designed to replace high-explosive bombs on such targets as armoured and soft-skinned vehicles, parked aircraft, anti-aircraft batteries, radar installations, small ships and headquarters or maintenance areas. It dispenses a number of dual-purpose sub-munitions, distributing them evenly over an area of less than 1 hectare on the ground, an area necessary to take into account movement of the target and errors in delivery. He noted that a far higher degree of high-explosive must be delivered into the target area when using conventional bombs. He described the individual bomblets, which are dual-purpose in that they have a shaped charge for the defeat of armour and also produce fragments to attack soft-skinned vehicles and similar matériel targets as well as the personnel manning them. He emphasized that to realize the full potential of this weapon it is necessary visually to identify the target and to aim at it positively. He also pointed out that the fusing of the bomblets is such that detonation on impact is assured regardless of the angle at which the bomblet strikes the target or ground, and that the incidence of in-flight bomblet detonation is extremely small, so that the effects of the weapon are contained within the designated area and at the attack time.

174. Another expert, responding to earlier comments on the use of cluster bombs to suppress anti-aircraft fire, stated that the primary role of the munition in that case was to drive anti-aircraft personnel from their weapons, so that aircraft could attack important military targets with minimal losses. As it had been suggested that this might yet lead to heavy losses among civilians in cases where the anti-aircraft battery was situated in the vicinity of civilian dwellings, he said that even very light shelters would offer protection to any civilians near the target.

175. An expert provided particulars about a series of cluster bombs (which he would prefer to indicate as "bomblet dispensing systems with their associated sub-munitions"). He mentioned successively: the rearward-ejection multi-tube dispenser for attack and fighter aircraft; the rectangular-bay, downward-ejection dispensers for bombers and cargo aircraft, and, in between these two extremes, the free-fall or clamshell type dispenser which opens in the air, releasing the bomblets contained therein; of the latter type he described some examples.

176. Some experts described cluster bombs used in recent theatres of war. One weapon so described was a cluster bomb containing about 400-600 bomblets, each of which consisted of two halves containing pellets of less than 0.5 cm diameter. The effect of each bomblet was limited to 5-10 metres.

177. Fléchettes were described by one expert as small fin-stabilized arrows or darts. While one expert suggested that these could be launched singly or in clusters from small-calibre arms, another stated that according to his experience there was no practical method of firing one, two or three fléchettes accurately. It was agreed that fléchettes can constitute the payload in various types of bombs or shells. According to one expert, although there might exist fléchettes especially designed for use against matériel targets, the present types of fléchettes, usually weighing from 0.5 to 1.2 grammes, were not very efficient against matériel and were, in fact, primarily designed for an antipersonnel role. Fléchettes, he said, had very good ballistic properties, especially with regard to retardation; in order to exploit these properties, they should be launched with their trajectories almost parallel to the ground.

178. Discussing the military utility of fléchettes, the first quoted expert suggested that canisters containing fléchettes, or shrapnel, fired from guns may play an important role in close defence of artillery units, enabling these to continue to use their main armament for the task at hand. According to this expert, fléchette weapons are very efficient in this application, surpassing the effect of a conventional artillery round by up to ten to one. Another expert was not sure that they enjoyed such a large advantage. This expert submitted that if they did, defenders of artillery batteries could not afford to have them replaced by the far less effective fragmentation munitions. The first quoted expert mentioned that another area where fléchettes had turned out to be effective was in tank antipersonnel munitions and in the use of rockets with fléchette warheads launched from helicopters or fighter-bombers against enemy personnel.

179. Some experts described the use of fléchettes in recent theatres of war. One expert mentioned air-to-ground rockets of 2.5 inches, which contained about 3,000 fléchettes, and a 105 mm projectile containing four explosive charges to split open the casing and allowing a small powder charge to ensure the ejection of 6 containers each containing about 700 fléchettes.

Blast weapons

180. Under the heading of blast weapons, one expert gave a description of fuel-air explosives. The active agent of these weapons is a combustible and volatile liquid, such as ethylene oxide. This liquid is forcibly sprayed out into the air over the target area. After a certain delay the air-diluted cloud of liquid fuel becomes explosive and at this point a detonating device is triggered, causing the cloud to detonate and thereby causing a blast wave of 2.5-3 megapascals (MPa) covering a more or less wide area. This expert mentioned certain types of these weapons, some of them containing as much as 500 kg of fuel.

181. Fuel-air explosives, this expert stated, were primarily used in land warfare and had been employed for such purposes as the clearance of minefields and booby-traps, or against parked aircraft. Evidently, he said, the detonations may also affect personnel in the open; the blast wave will moreover be propagated into terrain shelters such as foxholes and field fortifications, thereby causing blast injuries to soldiers. Another expert contested this, stating that experiments had shown that foxholes in the terrain do provide shelter against blast waves. The first expert then referred to the special properties of fuel-air explosives, which increased the probability that high overpressures could enter foxholes.

V.3 Substitutes for blast and fragmentation weapons

182. One expert, expressing himself on the point of substitution of fragmentation weapons as a class, found it hard to see any possibility of replacing these weapons with any other kind of weapon. Other experts shared this general view. The expert first mentioned added that his delegation still thought that some fragmentation weapons should be prohibited, this in view of the great risk of indiscriminate effects.

183. One expert, referring to the possibility that weapons controlled or guided by advanced electronic systems would be used to replace other fragmentation weapons and in particular air-delivered cluster bombs, submitted that, although the use of these advanced weapon systems could in the end contribute greatly towards more humanitarianism in warfare, yet one had to be careful not to overestimate the capabilities of those weapon systems. They required, he said, the availability of highly sophisticated aircraft and the fulfilment of a number of other conditions; the greatest problem might perhaps be presented by the financial sacrifices that would have to be made to replace weapons such as the cluster bomb by advanced electronically controlled or guided weapons.

184. An expert considered that fléchettes might be replaced with ordinary fragmentation warheads.

185. The question of substitutes for fuel-air explosives was not discussed.

V.4 Medical effects of blast and fragmentation injuries

186. Paragraphs 141-149 of the ICRC report were regarded as a useful basis of discussion.

187. Although discussion, by many experts, on the effects of blast and fragmentation munitions was taken separately, several experts emphasized that the effects would very often occur simultaneously.

Blast effects

188. None of the experts disagreed with the statement that at an overpressure of 35 kilopascals, the rather painful, but harmless, rupture of an ear drum could occur, but with this exception, the body can resist much higher pressure, if the wave is short, up to about 250 kPa. One expert stated that a blast wave with 1 MPa overpressure and 10 milliseconds duration will cause about 99% mortality of unprotected persons exposed to it.

189. Several of the experts noted that the effect of the blast depended on amplitude, wavelength and density of the environment. One of the experts stressed that the same effect on water could be produced by one-tenth of the charge required to produce a similar effect in air.

190. One expert, citing experiments on dogs, said that with a 50 kg explosive charge, all the dogs within 5 metres died, displaying extensive pulmonary haemorrhage, damage to the myocardium and intestines.

191. The same expert said that in a water environment, the main effect is seen where air-filled cavities border heavy masses of tissue or blood, and quoted injuries to the lungs, stomach, duodenum and colon. He gave an example of 150 sailors who were exposed to a missile explosion in the sea in 1947; 42 of the 150 were injured, 27 had pulmonary injuries, 19 had ruptured ear drums and 6 had ruptures of the small intestine; 4 died.

192. One expert stated that it was not possible to generalize on the medical effects of blast which depended on many different factors, including the type of weapon and munition and the medium in which the explosion took place. He felt that each weapon should be discussed separately.

193. He also suggested that, as medical assessments could vary considerably, all experts who discussed the medical effects of blast should state whether their observations were based on experimental evidence, a study of the literature or field experience.

194. The same expert stated that, while experiments on large dogs might have some comparison with the results in man, he warned against accepting parallel effects when using small dogs.

195. None of the experts disagreed with statements from three experts that, although the effects varied, the general medical effects of blast included: pulmonary haemorrhage; rupture of alveole; rupture or damage to hollow air-filled viscera including stomach, duodenum, small intestine and colon; myocardial damage, and rupture of ear drum. The cerebral effects sometimes seen were probably due to air embolism and this latter was possibly the cause of immediate death sometimes seen in blast injuries.

Fragmentation effects

196. All experts agreed that wounds due to fragmentation were the commonest wounds.

197. Concerning wounds produced by different types of fragments from spontaneous fragmentation munitions, controlled fragmentation munitions and pre-fragmented munitions, there was considerable discussion and divergence of opinion.

198. All the experts who expressed an opinion agreed that each individual fragment wound would be considered as a projectile wound when discussing the medical effects and treatment. The point was made however that the medical effect varied, widely depending on shape, mass, velocity and quality of medical help available, the number and severity of wounds, and the organs and tissues involved.

Shape, mass and velocity

199. There was considerable discussion on this aspect of fragments and fragment wounds. One expert said that an irregular fragment would cause greater tissue damage than a spherical fragment. Even if the sphere tumbled it remained a sphere and would thus cause less tissue damage, even allowing for the fact that a smooth fragment retarded its velocity less and might have a greater impact velocity.

200. Another expert however maintained that this was only true at low velocity and that at higher velocities the wound size was greater with a spherical fragment. He quoted an experiment concerning the mortality rate in untreated goats following wounds in the thigh with both spherical and irregular fragments.

201. Two experts claimed that, even if spheres did cause less tissue damage, they were easily liable to tissue deflection and the path of the sphere might be capricious.

202. Regarding multiple wounds, one expert said that this type of injury from smaller fragments might increase the medical load but at the same time would probably be less severe and, hence, put less strain on medical capability.

203. One expert claimed that multiple wounds would tend to increase the number of operations requiring more than one surgical team, e.g. neurosurgical and abdominal, simultaneously. Another expert said that he had not found this to be so from his experience in a theatre of war.

204. One expert expressed the view that multiple wounds did not necessarily equate with more severe injury and that the distance from the explosion, the tissue

or organs wounded and size of fragments were all important. He suggested that multiple wounds led to more incapacitation rather than to more serious wounding.

205. One expert criticized Table IV.1, on page 47 of the ICRC report. This expert stated that the original table in the book from which it was taken, had included another part of the table on the left side, giving comparable figures for the Korean war. This part had been omitted in the table reproduced in the ICRC report. This expert cited, as an example, that the figure of 92% fatality for wounds of 5 abdominal organs in World War II had, in the original table, also shown a figure of 16.7% fatality in the Korean war for a similar number of abdominal organs wounded.

206. Several other experts criticized para. 146 of the ICRC report, where it is stated that in mortality rate, the predominant factor in multiple injuries is the number of organs affected, and that if more than five abdominal organs were injured the probability of death was 100%. These experts said there was no foundation of fact for this statement and that mortality rate depended on many factors including which particular organs were injured, the degree of damage and the quality of treatment available.

207. Several experts agreed with the statement in para. 148 of the ICRC report, that the degree of pain experienced is increased by multiple injuries. Several experts disagreed with this statement expressing the view that the amount of pain depended on many other factors including the degree of tissue damage and the type and sensitivity of tissue damaged.

208. Several experts maintained that multiple wounds from smaller fragments produced greater pain, incapacity and mortality, while several other experts maintained that multiple, smaller fragments, while increasing the likelihood of hits and therefore the likelihood of incapacitation, resulted in general in less severe wounds and less morbidity and mortality. None of the experts disagreed that it was a difficult problem to compute and depended on size, shape and velocity of fragments, the particular organs or tissue wounded and the type of medical facilities available.

Fléchettes

209. Most experts agreed that, from the point of view of medical effects, *fléchettes* could be regarded as producing wounds similar, in general, to other fragmentation wounds.

210. One expert stated that, contrary to some opinions, *fléchettes* could penetrate to the same depth and extent as fragments. Two experts stated that

fléchettes could deform in the tissues and could become bent or hooked. One expert stated that the fin-bearing part could break off in the tissues and act as a separate missile.

211. One expert expressed concern at the “bamboo flechettes” which could result from “home made” grenades and explosives which caused medical problems in their inability to be seen in X-ray pictures and their great tendency to produce infection.

211a. One expert said all flechettes tumbled in the tissue at some striking velocity. He said a general tumbling velocity figure could not be found since tumbling was a function of item physical characteristics. Due to their low drag, flechettes maintained flight stability for longer distances than other fragments. With regard to wounding capacity, he said, a study made in his country showed that, considering the whole body, the wounding capacity of flechettes where no tumbling occurred was significantly lower than that of fragments or flechettes at striking velocities which resulted in tumbling, and that, in cases where they did tumble, there was little difference.

General

211b. One expert stated that, in spite of relatively few casualties in a recent theatre of war, massive medical aid was utilized which pointed to the seriousness of the wounds suffered. Another expert pointed out that a large medical effort was required in all wars because of the high incidence of illness and prevention of illness as well as injury.

V.5 Evaluation

212. Some experts, summing up their assessment of blast and fragmentation weapons in the light of existing legal criteria, considered that at least certain types of those weapons were indiscriminate or caused unnecessary suffering and must, therefore, be prohibited. The working paper CDDH/DT/2 submitted to the Diplomatic Conference by Egypt, Mexico, Norway, Sudan, Sweden, Switzerland and Yugoslavia, singled out “cluster warheads with bomblets which act through the ejection of a great number of small calibre fragments or pellets”, and “weapons which act through the release of a number of projectiles in the form of flechettes, needles and similar”.

213. One of these experts explained that one might perhaps consider a rule which would establish a certain maximum permissible density for the fragments of the bomblets released by cluster bombs. But he did not see how one could prevent violation of such a rule. Therefore, he was in favour of an

interdiction of all cluster bombs as described in the working paper. He was aware that there were perhaps no substitutes for those weapons. Yet he demanded their prohibition as they could act indiscriminately and cause multiple injuries.

214. Another expert of the same group was of the opinion that substitutes were available for all the weapons mentioned in the working paper. Yet another of these experts pointed to the effect which attended the use of such weapons: an extremely high degree of suffering, long and difficult treatment, and a high mortality rate, all of which constituted unnecessary suffering. Indeed, according to this expert the use of the weapons under consideration was already prohibited by virtue of the Declaration of St. Petersburg, Article 23 (e) of the Hague Regulations on Land Warfare, and certain military regulations which prohibited the use of devices ejecting glass fragments; the fragmentation or fléchette weapons produced analogous results.

215. Some other experts, equally making up their minds as to the assessment of blast and fragmentation weapons in the light of existing legal criteria, were not convinced that these weapons, or the ones singled out in the working paper, caused unnecessary suffering or were indiscriminate. Indeed, they felt that even the newly developed weapons in this category did not cause more suffering, nor were more indiscriminate, than the weapons whose place they had taken or those that would eventually replace them. As for indiscriminateness, this would depend on the use to which the weapons were put rather than on their nature. As regards suffering, the evidence seemed to show that the degree of suffering inflicted by the modern cluster bombs or by fléchettes was often less than that resulting from the use of the predecessors of those weapons.

216. In the opinion of some experts, the data presented and information supplied showed that, if the modern fragmentation weapons were prohibited and conventional ones were used instead, the results might prove to be hardly an improvement from a humanitarian aspect, as a much higher proportion of severe and life-threatening wounds was likely to occur.

217. One of these experts was disappointed in that no precise answers had been found to the questions of military value of each type of weapon, the possibilities of substitution and their possible indiscriminateness.

218. One expert noted that the Conference seemed to be divided into two camps, with certain experts describing effects of weapons and proposing the prohibition or limitation of their use, while other experts contested those descriptions and even the utility thereof. At times he had had the impression that he was at an armaments conference rather than at a conference on humanitarian law.

VI. DELAYED-ACTION AND TREACHEROUS WEAPONS

VI.1 Definition and classification

219. With certain specific reservations noted below, Chapter V of the ICRC report was accepted by experts as a basis for discussion of the agenda item on delayed-action weapons and treacherous weapons. Several experts observed that the agenda item covered a highly diversified group of weapons, and that some degree of definition and classification was therefore advisable.

220. One expert, subsequently supported by others, spoke of the need to distinguish between the weapons *per se* and the uses to which they could be put. In order to illustrate this, he stated that, insofar as the weapons and devices under consideration had any feature in common, that feature was the element of surprise; yet the element of surprise was also something which many methods of using weapons were designed to exploit. Thus, in his opinion, there was no difference in principle between, for example, an unmarked mine, a booby-trap or an ambush.

221. Implicit, and in some cases explicit, in the interventions made by experts on this subject was the following classification. First, there was the general category of delayed-action weapons comprising a variety of time-fused devices, such as delayed-action bombs and target-activated devices, such as mines and booby-traps. Next there were those types of delayed-action weapon which, in use, are intentionally disguised or hidden; an emplaced mine, if it is left unmarked, would fall within this category. Finally there were those methods of using hidden or disguised weapons which were characterized by one expert as "perfidious", by which he stated that he meant the use of any weapon in such a way that it placed the intended victim under a moral, juridical or humanitarian obligation to act in such a way as to endanger his safety (see further hereafter, paras. 251 to 253). There was general agreement among experts, however, that a precise distinction between the second and third categories would not be easy to define, having regard to such devices as letter-bombs and exploding toys.

222. In addition to the foregoing sub-classification, based essentially on intent, experts also provided classifications based on design. This is reflected

in the summary of the discussion on military aspects contained in paras. 224 to 243, where time-fused weapons, naval mines, emplaced landmines, scatterable mines and booby-traps are treated separately.

223. On the subject of time-fused weapons in particular, and having regard to questions of discriminateness, one expert recommended a differentiation based on time-delay. In his opinion there would be advantages in the Conference concentrating only on those weapons having a time-delay longer than, say, a minute or so. But other experts perceived disadvantages in this, and noted that the military considerations which had led to the proposal of such a limit would, in some cases, be equally applicable to much longer time-delays.

VI.2 Military aspects

Time-fused weapons

224. Concerning time-fused weapons, experts addressed themselves only to delayed-action air-delivered weapons. It was explained that these might be either general-purpose bombs or small cluster-dropped bomblets fitted with fuses that could be set to detonate the munition after an interval of anything between seconds or days. One use for such weapons was said to be in low-altitude ground strikes where it was necessary to introduce a brief time-delay in order to ensure that the attacking aircraft did not suffer from the blast or fragmentation of its own weapons. Another use, for which one expert stated that there was an overriding operational need, was the neutralization of airfields; here a combination of impact-detonating, short- and long-delay weapons was needed in order to hamper and prolong such repair work as the filling-in of bomb craters on runways.

225. One expert was of the opinion that time-fused antipersonnel weapons were of particular value against the crews of anti-aircraft batteries. Since the aim here would be to suppress anti-aircraft fire during the period of an attack, a time-delay no longer than the duration of the attack would, in his opinion, suffice.

226. The same expert also stated that delayed-action bomblets could be used for interdiction or against unlocalized military targets, where, in certain combat circumstances, the military value might be high.

Naval mines

227. Experts did not address themselves in any great detail to naval mines. One expert explained that these mines might either be target-activated or ac-

tivated by remote control. Use of the latter type was restricted to coastal waters, being controlled from shore stations via underwater cable systems. Target-activated naval mines might either rest on, or be moored to, the sea bed; they might be activated either by direct contact with sea vessels (in the case of moored mines) or by some less direct influence.

228. The same expert went on to observe that international law stipulated that minefields at sea were not to be laid without public warning; and that moored mines coming adrift were to render themselves harmless automatically. With regard to the latter stipulation, he observed that corrosion after prolonged sea exposure often fouled de-activating mechanisms.

Emplaced landmines

229. It was widely agreed that the primary function of emplaced landmines, as well as scatterable landmines and booby-traps, was to counter enemy force mobility and to keep the enemy at tactical arm's length until such time as other weapon systems could be brought to bear on him. It was observed that landmines were primarily, though not exclusively, defensive weapons: they were used to channel enemy forces into defensible areas, to deny terrain which could not be covered by combat troops, to hinder enemy activities generally, and as close-in protective weapons for defending troops. There was also general agreement that landmines were unlikely to be used in isolation but rather as part of an integrated battlefield system comprising surveillance sensors, anti-tank weapons, artillery, tactical air power, and the individual soldier.

230. The opinion was expressed that fields of landmines were at present the most economical and effective artificial obstacle system that could be provided with conventional means; although men with weapons could restrict enemy movement without the need for special obstacle systems, available forces were often inadequate, thus making use of landmines a necessity. Several experts were of the opinion that the value of minefields as obstacles was directly related to the number and types of weapon systems covering them; if landmines were unsupported, they might be of little value, and it therefore followed, in the opinion of those experts, that minefields would be employed mainly in combat zones. Other experts stated that, while this might generally be so, it was not invariably the case, and that minefields could also have applications outside the area of battlefield operations.

231. Several experts observed that, because the use of minefields would normally form part of an integrated plan of action or operation, there would be a compelling need to record their location and extent most carefully. In order not to endanger friendly personnel, it would also, in most cases, be advisable

to mark the minefields, or even to fence them off; and one expert noted that, for minefields emplaced by the ground forces of his country, this was already the practice.

232. Experts stated that landmines might be designed either as antipersonnel weapons or specifically for use against vehicles, especially tanks. With regard to antipersonnel mines, one expert noted that there were two basic types in common use: blast mines and fragmentation mines. They could be detonated either through the direct pressure of a foot, or by means of sensors, such as trip-wires, arranged so that several enemy personnel within the immediate area of the mine could be affected simultaneously. It was stated that, in the case of fragmentation antipersonnel mines, the concentration of fragments discharged over any particular area would be considerably less than that resulting from normal artillery fire. The primary value of antipersonnel landmines was, in the opinion of several experts, to prevent the rapid clearing of anti-vehicle minefields; in this role they served to reduce the degree of surveillance and firepower necessary to defend the minefield.

233. It was suggested by one expert that, since it was known that about 30 grams of high explosive were sufficient to put a man out of action by damaging his feet and legs, there was no need for blast type antipersonnel mines to contain a larger quantity of explosive. Disputing the value of this suggestion, another expert stated that it was necessary to qualify the implied incapacitation criterion by reference to situational conditions.

Scatterable mines

234. Experts stated that scatterable mines, which are a comparatively recent development, serve much the same functions as emplaced mines, but with the additional utility that follows from the rapidity with which they can be deployed. It was stated that scatterable mines could be delivered both by tube and rocket artillery and, more commonly, by aircraft. The view was expressed that, perhaps to a greater extent than with emplaced mines, scatterable mines can be used offensively by providing flank security for advancing forces or by securing newly-gained positions against counter-attack.

235. Experts also noted that whereas ground emplacement of mines permitted some control over the forward movement of the enemy, techniques of scatter-mining allowed lateral and rearward control as well. Moreover, the rapidity with which scatter-minefields can be laid permits areas to be left mine-free, and therefore available for friendly manoeuvre, until the last moment.

236. It was stated that both antipersonnel and anti-vehicle scatterable mines were available. The antipersonnel type, it was explained, were frequently very

small, sometimes consisting of no more than a few grams of explosive contained in a sachet, and dispersible by the thousand over a wide area. Other types of scatterable antipersonnel mine were stated to be larger, sometimes capable of sending out a cobweb of trip-wires, and acting through fragmentation rather than blast. In the opinion of one expert, scatterable antipersonnel mines would be of particular value in harassing enemy activities in areas far to the rear, in locations which the user had no intention of occupying.

237. It was noted that scatterable anti-vehicle mines, like those of the emplaced type, were commonly designed to detonate only under the influence of more pressure than can be exerted by a man's foot or by other action not released by a single soldier.

238. It was generally agreed that the tactical use of scatterable mines had a greater propensity for endangering friendly troops and non-combatants than the use of emplaced mines. It was also agreed, however, that for the selfsame reason it would normally be in the interests of the user to maintain particularly tight control over mine scattering, as by careful recording and registration of minefields. Although experts stated that it would generally be less feasible to mark scatter-minefields than ground-emplaced ones, they noted that compensating security was available, and commonly used, through the incorporation in scatter-mines of self-destruct mechanisms that functioned after a pre-set time interval. This was stated to be mandatory for the scatterable mines currently in issue to, and under development for, the armed services of at least one country. One expert made the suggestion that markers such as flags or pyrotechnic flares, possibly designed according to an internationally agreed specification, might be incorporated in scatter-minefields in order to indicate their general location. Measures such as this, and the use of self-destruct mechanisms, would counter the potential for indiscriminate employment of scatterable mines to which a number of experts had drawn attention.

239. There was much discussion of the precision with which scatterable mines could be delivered. The general point was made by one expert that there were very high costs associated with the laying of scatter-minefields, and that scatterable mines would therefore be employed only if there was a substantial probability of imminent enemy contact with them. In his view, this itself demanded high precision, quite apart from considerations of discriminateness. He went on to state that scatter-minefields could be laid by artillery or by aircraft to within an accuracy of 100 metres. Other experts doubted whether this was a figure of general validity: much would depend, in their view, on the availability of sophisticated navigational and weapon-guidance systems, on user competence, on terrain, and on the prevailing conditions of combat and weather. One expert mentioned the possibility

to disperse simple scatter-type mines over large areas to deny the enemy access to those areas and to disturb and harass e.g. logistic supply lines. Such use, he felt, could easily become indiscriminate.

240. There was also much discussion, again with regard mainly to questions of discriminateness, of the efficiency of the self-destruct mechanisms that are built into scatterable mines. Criticism was directed towards the ICRC report where it stated, in para. 165, that those mechanisms were frequently unreliable. Experts reiterated the view recorded in para. 238 that efficient self-destruct mechanisms were militarily a necessity in order not to compromise friendly battlefield mobility. One expert stated that a reliability of better than 99.9% was available.

Booby-traps

241. Experts stated that booby-traps could serve the function of impeding enemy mobility just as minefields could. Indeed, as a number of experts observed, the difference between an unmarked mine and a booby-trap was largely a semantic one. Booby-traps were commonly used as nuisance and delay devices to hamper enemy minefield-breaching operations, as a means of alerting friendly troops to the presence of hostile soldiers, and to delay the enemy by posing a threat to his survival. In the opinion of a number of experts, the use of booby-traps for some of those purposes was militarily essential.

242. One point of difference between booby-traps and emplaced mines in their normal application is that the former are, by definition, unmarked and disguised. Several experts noted that booby-traps could display innumerable variations both in the method of disguise and in wounding action. The latter might depend on explosives; or it might be non-explosive, as in the cases noted by experts of concealed pits, contaminated spikes or falling weights. With regard to disguise, reference was made, not only to conventional methods of concealment, but also to the packaging of explosives to resemble innocuous or even attractive objects, such as children's toys or sweetmeats. One expert observed that booby-traps could be set up even with scarce military resources.

243. In discussing questions of discriminateness, experts observed that the problem of confining the effects of booby-traps to enemy combatants was a temporal rather than a spatial, one; with scatter-sown minefields both problems arose. A number of experts spoke of a need for careful destruction, self-destruction or programmed neutralization of any booby-traps placed to delay passage of enemy troops in built-up areas. One expert stated that such programmed destruction/neutralization should be effected immediately following the maxi-

imum delay-period which the retreating friendly forces had decided to impose on the advancing enemy forces.

VI.3 Medical considerations

244. All experts who spoke on the subject agreed that, because explosive mines and booby-traps produced their effects by blast and/or fragmentation, the wounds which they caused did not, broadly speaking, differ greatly from those caused by the blast and fragmentation weapons described in Chapter V. There was general concurrence with the description of the medical aspects of delayed-action weapons given in the ICRC report (paras. 175-178).

245. With regard to para. 175 of the ICRC report, where it is stated that in conventional warfare casualties from mines and booby-traps have normally been quite low in proportion to casualties from other weapons, a number of experts stated that the same was not true of guerilla warfare, where mine and booby-trap casualties were often considerably higher. One expert stated that, while working in a medical facility treating only civilian patients in a recent theatre of war that was characterized by guerilla operations, nearly 20 per cent of his patients, several of whom were children, had been injured by mines and booby-traps, both explosive and non-explosive.

246. Concerning non-explosive booby-traps, one expert said that, as there were many different types of such weapons, they could cause a variety of injuries in different parts of the body, including puncture wounds from sharp objects which might, at times, be coated with toxic or infective material.

VI.4 Evaluation

247. Two criteria entered into the discussion on assessment of delayed-action and treacherous weapons, viz., the concept of indiscrimination and that of perfidy. The discussion turned moreover around the question of whether one would pursue the prohibition of weapons as such or, rather, the prohibition or limitation of certain types of use of such weapons. Attention focussed on two categories of weapon: mines and booby-traps.

248. As for indiscrimination, while some experts felt that mines and booby-traps, or booby-traps alone, were indiscriminate by their very nature, other experts contested this. Where mines were concerned, several experts noted the possibilities for marking mine deposits and for the application of reliable self-destruct devices. It was suggested by some experts that those possibilities could and should be turned into mandatory rules. One expert suggested that

maps indicating the location of mines ought to be handed to the civilian authorities at the close of hostilities.

249. For the rest, these experts were of the opinion that mines, as other weapons, could be used with or without discrimination. If the precautions mentioned in the previous paragraph were observed, there would be no risk of the mines hitting civilians indiscriminately. One expert pointed out that civilians in close proximity to military objectives would always run a certain risk. The questions of utilization of weapons, these experts remarked, were on the agenda of the Diplomatic Conference where prohibition of indiscriminate attacks upon the civilian population, as well as the rule of proportionality, were under consideration.

250. Like mines, booby-traps could in the eyes of some of these experts also be used with discrimination, and it was therefore not right to regard them as inherently indiscriminate. A booby-trap, one expert remarked, was really a method of using a weapon rather than a weapon *per se*.

251. Regarding perfidy, one expert put forward a proposal for the definition of a perfidiously used weapon, mentioned already in para. 221 and reading as follows:

The use of any weapon in such a way that it places the intended victim under a moral, juridical or humanitarian obligation to act in such a way as to endanger his safety, is perfidious.

252. Commenting on this proposed text, an expert welcomed the reference to moral and humanitarian obligations as possible additional elements in the search for adequate legal criteria. Another expert felt, however, that moral and humanitarian obligations lacked the necessary precision upon which to base the definition of perfidious use. Until specific rules of international law, perhaps based upon such considerations, were incorporated into international law, references to such vague and variable concepts were not appropriate in a legal definition. This expert stated that to be perfidious an act had to involve a breach of an international confidence or right, and gave as an example the booby-trapping of a dead soldier. Other experts supported that view.

253. An expert thought that the language of the proposal, to be understood by all, ought to be made simpler. Another expert, too, felt that the language proposed would give rise to all kinds of interpretation problems.

254. Regarding possible prohibitions, some experts expressed as their considered opinion that at least certain types of antipersonnel mines, as well as booby-traps, ought to be banned. Arguments advanced included the refer-

ence to their inherently indiscriminate or perfidious nature, and to the fact that, as far as mines were concerned, their use was contrary to the necessity to protect war victims and to evacuate them as soon as possible, a principle expressed in the Geneva Conventions and the Draft Additional Protocols.

255. An expert recognized the possibility for constraints to be placed on the construction or utilization of such weapons rather than on the weapons themselves. Thus, one might consider a ban on airdropped mines while permitting their delivery by artillery. Yet taking into account the need for simple rules to ensure their faithful application, he declared himself in favour of a categorical ban rather than a prohibition or limitation of certain types of use.

256. Other experts were of a different view. They were convinced that a complete ban on such weapons was both impracticable and unjustified, as the weapons could be used in ways that would be neither indiscriminate nor perfidious.

257. At one stage of the debate, it was suggested by the President that there might perhaps exist a consensus on two points: that the use of explosive devices perfidious by their very nature would be prohibited, and that there ought to be a ban on the use of booby-traps representing a grave danger to the civilian population. As examples for the first category he mentioned such objects as fountain pens and children's toys, which would generally be used by civilians rather than combatants.

258. This suggestion drew support from various sides, although certain criticisms were also formulated. As regards the first proposition, it was pointed out that, with the possible exception of toys, objects falling within the category indicated above were often not exclusively used by civilians. It was noted that, even though one might feel great sympathy for the President's suggestion, it needed to be examined rather carefully. As for the second suggestion, several experts felt that, as formulated, it was too vague to be acceptable and needed clarification; it was also stated that, once again, the point at issue here was the method of utilization rather than the inherent characteristics of a given weapon.

259. As for methods of use, it was widely felt that in further deliberations on the subject stress should be laid on use against the civilian population.

VII. FUTURE WEAPONS

VII.1 Technical, military and medical considerations

260. It was stated by a number of experts that, alongside the continuing development of conventional weapons, increasing attention was also being paid to the possibility of exploiting certain phenomena which had not previously been used for direct weapon-effects. Laser weapons, microwave devices, infrasound devices, light-flash devices, geophysical warfare, environmental warfare and certain novel modes of electronic warfare were the possibilities cited by experts. The discussion on each of these is summarized separately and in turn.

Laser weapons

261. Experts noted that lasers had already found military applications in certain range-finding, guidance and communication systems. The opinion was expressed by one expert that certain laser weapons were feasible and might appear rather soon. Other experts, however, stated their doubts about the military practicability of such weapons, citing the high level of complexity and running costs likely to be involved if anything but the most specialized applications were envisaged. With regard to such specialized applications, there was some discussion of the potential of laser radiation weapons in an anti-aircraft or antimissile role; the view was expressed that, having regard to energy requirements and to the transmissivity of the atmosphere at different altitudes to possible wavelengths of laser radiation, laser weapons of this type, if they were feasible at all, would probably only be usable from large aircraft.

262. With regard to the effects on the human body of laser radiation, two types of likely injury were cited. The first was burn injury. The second was ocular injury, already a well recognized hazard to users of existing laser devices, and one which stems from the natural capacity of the ocular lens to focus incident light, thereby concentrating its power, and hence its effect, on the retina. The resultant damage may lead to partial or total blindness. One expert observed that the degree of laser damage to human tissue depended

on the wavelength of the incident radiation, and he stated that the most powerful forms of laser currently available did not in fact operate at the most damaging wavelengths.

Microwave devices

263. One expert noted that current radars made use of powerful microwave generators; and he noted that high-intensity microwave radiation could be generated by maser devices. However, he also stated that, while such devices might conceivably find specialized applications in the disturbance or destruction of electronic circuits, such as those contained in guided missiles, they would also be highly complicated and expensive to operate. Another expert stated that microwave weapons did not appear to be an imminent possibility. Another expert, again, stated that as far as he was aware military research in this area had been abandoned.

264. It was noted by one expert that high-intensity microwaves could cause considerable damage to the human body, as is suggested by their widespread use in the high-speed cooking of food. Radiation in the decimetre wavelength region can penetrate into, and heat, human tissue, and if it is of sufficient intensity it can cause the equivalent of an "internal burn". Higher frequency microwave radiation can burn the skin; in the eye, damage to the cornea, opacity of the ocular medium, and damage to the retina, may occur, resulting in impairment or loss of vision.

Infrasound devices

265. By "infrasound" is meant inaudible sonic waves in the frequency range 1-16 Hz. One expert stated that, in his opinion, the possibility of using infrasound as a weapon arose, first, from the comparative simplicity of devices capable of generating the sound, and, secondly, from the fact that it would be almost impossible for soldiers to protect themselves: damaging infrasound could reach them even in foxholes or in armoured vehicles. But this expert also noted that the military application of infrasound would be impeded by the size of the necessary generators and by the difficulties of directing the sound discriminately at an enemy in an area occupied by other people as well. Another expert stated that, as far as he was aware, military research in this area had been abandoned, although he and other experts had the impression that its potential applications in riot control were being examined, particularly the use of infrasound in conjunction with stroboscopic light flashes. The latter combination, it was stated, could give rise to strong psychological developments. One expert put forward the opinion that, since this combination was being studied for riot control, it was evidently a humane type of weapon.

266. The severity of the effects of infrasound on the human body depends on intensity. According to one expert, the effects may range from minor sensory disturbances at around 100 dB up to major central-nervous-system effects starting at around 150 dB, including vertigo, disturbance of vision, loss of balance, disturbance of vasomotor control, respiratory embarrassment, and (to judge from 170 dB experiments on dogs) perhaps even apnoea.

Light-flash devices

267. Two categories of potential light-flash weapon were introduced for discussion by one expert. The first, which would be intended to cause temporary or even permanent blindness, might consist of a pyrotechnic flare, and associated reflectors, emitting very high intensity light in the visible or near-infra-red part of the spectrum. "Light-flash bombs" of this type might find applications, in the opinion of the expert describing the possibility, in night-fighting or in the suppression of visually-controlled anti-aircraft fire; dark eye-glasses would be the obvious means of protection, but if they were dark enough to provide protection, they might also have the effect of seriously impeding vision.

268. The second type of light-flash weapon was stroboscopic devices, already considered, so some experts stated, for use in riot control. At a frequency of 5 or 10 Hz, such devices can cause a feeling of uneasiness and may precipitate epileptic attacks in people of epileptic disposition. Experts considered it unlikely that stroboscopic devices would be of much value in battlefield combat.

269. With regard to the effect of light flashes on the eye, one expert stated that, depending on ambient light conditions, a flash of 0.1 s duration that exposed the retina to 0.05-0.5 J/cm² of light energy could induce 5-10 minutes of flash-blindness; permanent retinal damage could ensue at 5-10 J/cm². Optical equipment such as binoculars or gunsights would serve to concentrate the light flash onto the retina.

Geophysical warfare

270. The expert who put forward the subject of geophysical warfare for consideration stated that it included such activities as the modification of weather or climate and the causing of earthquakes. He stated that man already possessed the ability to bring about on a limited scale certain geophysical changes for which military applications were conceivable. In his view these would inevitably be indiscriminate, and could give rise to unforeseeable environmental changes of prolonged duration.

271. Another expert made the observation that any attempt to divert or release forces of nature would require an input of energy equivalent to, or greater than, the amount of energy or force diverted or released.

Environmental warfare

272. The expert who put forward the subject of environmental warfare for consideration meant it to include the modification of the natural environment for the purpose of denying an enemy access to an area, of reducing the availability of natural cover for concealment, or of denying or preventing the growth of food or other crops. He observed that certain of the potential means of environmental warfare, such as chemical-warfare agents, did not fall within the category of conventional weapons. He also stated that environmental warfare, in his understanding of the term, was closely linked with geophysical warfare; other experts preferred to treat the two subjects as one.

273. The view was expressed by one expert that environmental warfare, like geophysical warfare, was by its nature indiscriminate. A distinction might be drawn between intentional and unintentional environmental warfare, the latter denoting the environmental impact of large-scale employment of conventional weapons.

274. One expert drew the attention of the Conference to the draft convention on environmental warfare recently submitted by his government to the General Assembly of the United Nations, the scope of the convention also including geophysical means of warfare. He expressed the opinion that the importance of the convention, which, if agreed internationally, would in his view greatly promote the cause of disarmament, lay in its attempt to prevent, at an early stage, the introduction of a novel and threatening warfare technique. Several experts supported this proposal and this opinion.

Electronic warfare

275. By "electronic warfare" the expert introducing the subject meant the deployment of various kinds of sensor to gather intelligence for the purpose of facilitating or, in some cases, automating, military action against the area under surveillance. Other experts noted that the expression already had an accepted and rather different meaning, being used to describe such things as the jamming, confusion and deception of electronic communications.

276. In the view of some experts, the recent introduction of automated sensors, because at their present level of development they could rarely discriminate between combatants and non-combatants, represented a disturbing development insofar as the sensors were used as substitutes for direct human control over the delivery of weapons. Other experts observed that existing sensors did possess a certain element of discrimination; it was stated that seismic, acoustic and magnetic sensors, used together, could distinguish between living things that were or were not carrying metal objects. While the sensors could not dis-

tinguish say, between a shovel and a rifle, the expert who provided this illustration also observed that it was not the sensors that were indiscriminate so much as the interpretation of the information that the sensors provided.

VII.2 Evaluation

277. Some experts were of the opinion that, because the effects of potential future weapons could have important humanitarian implications, it was necessary to keep a close watch in order to develop any prohibitions or limitations that might seem necessary before the weapon in question had become widely accepted.

278. One expert stated that, if a nation was forced into war, its right to throw its ingenuity and technology into the balance could not seriously be questioned. Moreover, States possessing only small armed forces might be expected to rely on technology-intensive weaponry if that were practicable for them. Considerations such as these needed to be taken into account in the evaluation of possible limitations on incipient weapon technologies. Some other experts stated that this argument could never signify a licence for States to disregard the limits set by international humanitarian law.

279. Nevertheless, dangers were also perceived by several experts in the unrestrained advancement of weapon technology into new areas. One group of experts observed that technological progress could produce its own *faits accomplis*: for example, scientific research even in areas of purely peaceful endeavour could sometimes engender techniques or devices having novel military applications; and, merely because it existed, or because others might develop it, governments might feel impelled to take up a new weapon option that had “inadvertently” come forward in this manner. These experts therefore strongly advocated careful and continuing governmental consideration of the implications of technological advances. Such continuing consideration could go some way, in their view, to reducing the development of “unnecessary” weapons by preventing the automatic creation of a rationale for use as weapons of “inadvertent” technological advances.

280. One group of experts stated that the need to assess weapons of the future, as well as weapons of the present, increased the importance, in their view, of securing some measure of agreement on general, balanced, and more sharpened guidelines for comparing the military utility of weapons with their humanitarian implications. These experts noted that all weapons were to a lesser or greater extent “inhumane”. They noted also that other experts had argued with cogency that certain recent developments in weapons might be less “inhumane”.

However, these experts expressed the hope that all States would give serious consideration to ways and means within their national organizations for ensuring that humanitarian considerations, as well as purely military ones, were taken into account in all future domestic weapon programmes.

281. In this regard, a further group of experts stated that their government was currently formalizing procedures for conducting reviews of all new weapons early in the development stage to ensure that they conformed to international law and the practice of States. These experts expressed the view that a review process of this type might be a useful concept for inclusion in international law.

VIII. FOLLOW-UP

282. After a discussion in which many experts took the floor, the President summarized the conclusions which he believed could be drawn from the proceedings. He stressed that his statement was not a decision or even a recommendation, in view of the nature of the Conference, but merely a recapitulation of points on which there seemed to have been broad agreement, namely:

1. The present session has contributed to an increase in knowledge and understanding of the subject.

2. The report of the Lucerne Conference will be presented to the participants at the second session of the Diplomatic Conference and will be an important item on the agenda of the ad hoc Committee; new or revised proposals can also be submitted for consideration by that Committee.

3. Since the newly presented facts need to be digested and further study and research are needed, it was doubted that the ad hoc Committee would, at its next session, be ready to adopt new treaty rules concerning the prohibition or restriction of the use of any conventional weapons.

4. Although the ad hoc Committee would meet for the number of meetings that would be required for it to go through its agenda, it might not prove necessary for it to meet during the full period of the Diplomatic Conference.

5. Further data could usefully be produced and presented in the coming year, e.g. by scientific research agencies, preferably with some international participation or within an appropriate existing international framework.

6. Another conference of government experts could, under ICRC auspices, and preferably in September 1975, usefully be convened. This conference should be well prepared and relevant documentation should be circulated to governments in advance. The conference would both receive and consider new information relevant to the subject matter contributed by the experts and would focus on such weapons as have been—or may become—the subject of proposed bans or restrictions of use, and to study the possibility, contents and form of such proposed bans or restrictions. The ad hoc Com-

mittee of the Diplomatic Conference, which by its discussions will contribute to the clarification of the issues, will consider the programme of work for the 1975 Conference of Government Experts. The report of the 1975 Government Expert Conference would be transmitted to all governments with a view to assisting them in their further deliberations.

7. It is hoped that the United Nations General Assembly will take the foregoing into account when drafting any relevant resolutions.

8. The ICRC would be prepared to convene and organize another conference of government experts on the same conditions as it did for the Lucerne meeting.

IX. DISCUSSION OF THE REPORT

283. The report was discussed chapter by chapter on 17 and 18 October. The remarks presented by experts in the course of that discussion have been duly taken into account.

284. As, for technical reasons, the full report was not available in French and Spanish during the discussion, one of the Spanish-speaking experts—speaking also for others—reserved the right to state views on the report at a later stage.

285. One expert objected to the fact that certain observations he had made with respect to the question mentioned in para. 3 were not, as he had requested, fully reflected in the report. He requested that this lacuna be amended. Some other experts supported this request while others spoke against it. On the argument that insertion of the observations in question would be both in violation of Article 8 (3) of the Rules of Procedure and against established parliamentary usage, the principal rapporteur decided to take note of the objections and the request formulated by this expert.

286. Following the President's statement (see para. 282), one expert indicated his preference for the future discussions by experts to be held within the framework of the forthcoming second session of the Diplomatic Conference (Geneva, February 1975).

ANNEX 1

LIST OF EXPERTS
(*French alphabetical order*)

ALGERIA

M. Abdellonahab ABADA

GERMANY (Federal Republic)

M. Walter FRÖWIS

Chef de la délégation du 24.9 au 4.10.1974

M. SCHNEIDER

Chef de la délégation du 5.10 au 18.10.1974

M. FREIWALD

Colonel Heinz JUNGNICHEL

M. Leo KOSLOWSKI, Professeur, Dr en méd.

M. LEITHOFF, Professeur, Dr en méd.

Capitaine de frégate Helmut MÜLLER

Major LEMB

M. Otto FRANKE

M. Klaus MINBERG

M. ZIOLKOWSKI

AUSTRALIA

Mr. F.J. BLAKENEY, C.B.E.

Ambassador to the Netherlands, Leader of the delegation

Lt. Col. P.J. CAMERON

Legal Officer, Department of Defence

Mr. W. CONNICK

Superintending Scientist, Department of Defence

Col. J.D. KELLY D.S.O.

Director of Artillery

Mr. A.I.C. PRATT

Department of Defence

Wg. Cdr. J.A. TREADWELL
Department of Defence (Air Office)
Miss Shirley HOLLIS

AUSTRIA

Mr. Erich KUSSBACH
Counsellor of Legation, Head of Delegation
Mr. Wilhelm KUNTNER
Major General
Mr. Hans KNITEL
Federal Chancellery
Dr. Gerhard FREILINGER
University Lecturer, Surgeon
Colonel Otto SCHOLIK
Attaché militaire, Ambassade d'Autriche, Berne

BELGIUM

M. Georges BERY
Ministère de la Défense nationale, EMG
Dr André DAXHELET
Médecin
M. Guy GENOT
Ministère des Affaires étrangères

BOLIVIA

M. José SERRATE AGUILERA
Ambassadeur, Représentant permanent, Genève
M. Julio EGUINO LEDO
Ministre, Représentant permanent adjoint, Genève

BRAZIL

Colonel Leo Guedes ETCHEGOYEN
Attaché des Forces armées auprès de l'Ambassade du Brésil, Berne
M. Gilberto FERREIRA MARTINS
Premier secrétaire, Mission permanente, Genève

CANADA

Mr. D.M. MILLER
Director, Legal Operations Division,
Department of External Affairs, Ottawa,
Head of Delegation

Col. A. SOSNKOWSKI
Director Land Requirements/Director of Artillery,
National Defence Headquarters, Ottawa
Deputy Head of Delegation

Col. J.C. DUNFIELD
Commanding Officer, Canadian Forces Hospital,
Canadian Forces Base, Halifax, Nova Scotia

Col. J. WOLFE
Deputy Judge Advocate General,
National Defence Headquarters, Ottawa

Dr. R.S. EATON
Adviser on Science and Technology
Bureau of Defence and Arms Control Affairs
Department of External Affairs, Ottawa

Mr. H.C.C. BRIERCLIFFE
Defence Research Establishment
Valcartier Courcelette, Quebec

Mr. G.L. OHLSEN
Arms Control and Disarmament Division
Department of External Affairs, Ottawa

Ms. D.L. HEWENS
Secretary, Permanent Mission of Canada, Geneva

IVORY COAST

M. Béné NIOUPIN
Ambassadeur, Représentant permanent, Genève
Mlle Marie Laure BOA
Deuxième secrétaire, Mission permanente, Genève

CUBA

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Chairman

Mr. Richard MÜLLER
Head of Section, Ministry of Foreign Affairs
Vice-Chairman

Mr. Vesa-Matti LEPPÄMÄKI
Major, General Staff

Mr. Seppo TIKKA
Medical Major, Centre for Social Training

Mr. Jouko KELTANEN
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Médecin-chef de 1^{re} classe André GAYET
Médecin-chef de 1^{re} classe Jacques DESBORDES
Commandant André BARNOLA

GHANA

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Supreme Court Judge
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Conseiller juridique et politique du Département politique fédéral

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M. Nguon TRAN THIEN

M. Pham Van VIET

M. Thai Quang NGOC

VIETNAM (Democratic Republic)

M. Nguyen van LUU

Ambassadeur, Directeur du département des organisations internationales
et du droit international

Ministère des Affaires étrangères

Chef de la délégation

M. Hoang Manh NGUYEN

M. Nguyen van NHAN

YUGOSLAVIA

M. Konstantin OBRADOVIĆ

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M. Kabunda MAKELELE

Major des Forces armées

M. M'Petelo NZANZA

Major des Forces armées

M. Nkeke N'Dongo MANGBAU

Capitaine des Forces armées

NATIONAL LIBERATION MOVEMENTS

Palestine Liberation Organization (PLO)

Colonel Jamal Said EL-KALIL

Seychelles People's United Party (SPUP)

Mr. Ogilvy Yvon BERLOUIS

African National Congress (South Africa) (ANC)

Mr. Graham MORDI

Mr. Antonio GALO

Zimbabwe African People's Union (ZAPU)

Mr. Akimi Mathew NDHLOVU

Pan Africanist Congress of Azania (South Africa) (PAC)

Mr. Benedict SONDLLO

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M. Julian PERRY-ROBINSON

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NATIONAL RED CROSS SOCIETIES

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STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE
(SIPRI)

Dr. Malvern LUMSDEN

INTERNATIONAL CONFEDERATION OF FORMER PRISONERS
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M. Hans GAWLIK

NON-GOVERNMENTAL ORGANISATIONS (NGO)

Special NGO Committee on Disarmament

Mr. John Duncan WOOD

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Mr. J.-L. CAYLA - ICRC. Assistant Secretary-General

RAPPORTEURS

Mr. F. KALSHOVEN - Netherlands. Legal expert
Mr. H.-J. RYTZ - Switzerland. Military expert
Mr. J.W. ARDAGH - New Zealand. Medical expert

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ICRC

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Mr. J.-L. CAYLA. Legal expert, Assistant Secretary-General
Mr. M. VEUTHEY. Legal expert. Press officer
Mr. B. ZIMMERMANN. Legal expert
Mr. U. WASSER. Administrator
Mr. P. EBERLIN. Technical adviser

* * *

Mr. R. RIPPSTEIN. Director, Convention Bureau, Lucerne
Mrs. M. EGGERSTEDT. Convention Bureau, Lucerne
Mr. T. SCHWARZ. Administrator, "Zentrum-Gersag"

ANNEX 2

RULES OF PROCEDURE

Rule 1

1. The Conference is convened and organized by the International Committee of the Red Cross (ICRC) with a view to drawing up a report on conventional weapons that may cause unnecessary suffering or have indiscriminate effects.
2. The work of the Conference shall be organized in accordance with the work programme submitted by the ICRC and approved by the first session of the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts (Geneva, 20 February-29 March 1974).

Rule 2

1. The following shall take part in the Conference:
 - (a) the experts appointed by the governments of the States invited to the first session of the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts (Geneva, 20 February-29 March 1974);
 - (b) experts appointed by the national liberation movements invited to the first session of the said Diplomatic Conference;
 - (c) representatives of the Secretary-General of the United Nations and of specialized agencies.
2. A number of technical experts shall take part in the proceedings as advisers.
3. In addition, some representatives of National Red Cross (Red Crescent, Red Lion and Sun) Societies and of non-governmental organizations shall follow the proceedings as observers.

Rule 3

The Conference documentation shall consist essentially of the following:

- (a) report prepared by an international group of experts, under the auspices of the ICRC, entitled "Weapons that may Cause Unnecessary Suffering or have Indiscriminate Effects" (ICRC, Geneva, 1973);
- (b) report of the Secretary-General of the United Nations entitled "Napalm and other incendiary weapons and all aspects of their possible use" (United Nations, 1973, A/8803/Rev.1);
- (c) report of the Secretary-General of the United Nations entitled "Napalm and other incendiary weapons and all aspects of their possible use", replies received from Member States (United Nations, 1973, A/9207);
- (d) survey prepared by the United Nations secretariat on "Existing rules of international law concerning the prohibition or restriction of use of specific weapons" (United Nations, 1973, A/9215, volumes I and II);
- (e) any working documents and proposals on the above-mentioned weapons that governments may have submitted for consideration by the Diplomatic Conference, and the report of the ad hoc Committee on Conventional Weapons adopted by the said Diplomatic Conference;
- (f) any documents that governments may make available to the Conference to facilitate its work;
- (g) any studies on the aforementioned weapons which organizations, scientific institutes or individuals may communicate to the Conference.

Rule 4

1. The meetings of the Conference shall not be public.
2. Information on the progress of work shall be regularly supplied to the press.

Rule 5

The secretariat of the Conference, organized by the ICRC, shall provide the necessary services for the Conference.

Rule 6

The Conference shall elect its President and five Vice-Presidents.¹

Rule 7

The President and Vice-Presidents of the Conference, the Secretary-General and a representative of the ICRC shall constitute the Bureau to ensure the smooth working of the Conference.

¹ See report, para. 6.

Rule 8

1. Experts shall speak in their personal capacity, and their statements shall not bind in any way the government that appointed them.
2. The Conference shall not adopt any resolution or recommendation and shall not vote. When differing views are expressed on a point and the discussion does not result in conclusions acceptable to all, note shall be taken of the different opinions expressed.
3. The purpose of the Conference, under the auspices of the Red Cross, shall be the study in depth, from the humanitarian standpoint, of the question of the prohibition or limitation of the use of conventional weapons that may cause unnecessary suffering or have indiscriminate effects; the Conference shall therefore abstain from any discussion of a controversial or political nature.

Rule 9

1. The experts may submit their comments and proposals in writing.
2. The secretariat shall endeavour to translate these documents into the working languages and distribute them to the members of the Conference.

Rule 10

1. French, English and Spanish shall be the working languages of the Conference.
2. The secretariat shall arrange for the simultaneous interpretation of speeches delivered in any of these languages. It shall endeavour to provide the working groups with the same facilities or at least with consecutive interpretation into English and French.

Rule 11

1. The Conference shall prepare a report on its work. It shall appoint one or more rapporteurs for that purpose.
2. Should it not be possible to prepare and adopt a report during the Conference, the ICRC may possibly convene a second brief session, if the preparation and adoption of the report should make that necessary.
3. The ICRC shall send the report to the participants in the Diplomatic Conference as early as possible and in any case before the second session of that Conference.

Rule 12

All cases not covered by the present Rules shall be dealt with on the basis of the Statutes of the International Red Cross and the Rules of Procedure of the International Conference of the Red Cross, as well as by generally accepted parliamentary usage.

ANNEX 3

STATEMENT OF CONTRIBUTIONS AS AT 31 OCTOBER 1974

(French alphabetical order)

	Sw. Fr.
Germany (Federal Republic of)	34,740
Austria	16,393
Australia	25,000
Belgium	10,000
Canada	30,000
Denmark	10,000
Egypt	3,000
Spain	5,000
Finland	10,000
France	18,000
Ghana	1,310
India	15,000
Iraq	5,705
Iran	5,000
Ireland	3,000
Italy	15,000
Japan	30,000
Luxembourg	1,000
Mexico	2,400
Norway	20,000
New Zealand	10,000
Pakistan	3,000
Netherlands	15,000
United Kingdom	8,000
Sweden	30,000
Switzerland	100,000
Vietnam (Republic)	2,000
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	428,548
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ANNEX 4

DOCUMENTS DISTRIBUTED AT THE CONFERENCE

Expert of the Federal Republic of Germany	On the medical aspects of burns.
Australian experts	Incendiary munitions classification (proposal) (français, español).
Australian experts	Definition of "perfidiously used weapons" (proposal) (français, español).
Canadian experts	Marking of minefields (proposal) (français, español).
Expert of the United Kingdom	Legal criteria for the prohibition or restriction of use of categories of conventional weapons (français, español).
Expert of the United Kingdom	Projectile trauma. An enquiry into bullet wounds (résumé français, resumen español).
Swedish expert	Calculations of the behaviour of small-calibre, spin-stabilized projectiles penetrating a dense medium (résumé français, resumen español).
Experts suisses	Classification des armes incendiaires (proposition) (English, español).
Expertos de Venezuela	Clasificación de las armas incendiarias (propuesta) (français, English).
Expert de la République démocratique du Viet-Nam	Armes incendiaires toxiques (English, español).
Expert of the Democratic Republic of Vietnam	Antipersonnel weapons (résumé français, resumen español).

International Confederation of
Former Prisoners of War
(ICFPW)

Special NGO Committees on
Human Rights and Disarma-
ment, Working Group on the
Development of Humanitar-
ian Law.

SIPRI Expert

SIPRI Expert

Memorandum addressed to the Confer-
ence of Government Experts on Weapons
(français).

Extracts from Memorandum on the two
draft Additional Protocols to the Geneva
Conventions (français)

Toxic effects of white phosphorus (WP)
munitions (résumé français, resumen
español).

Burn wounds.

ANNEX 5

REPORT FROM THE WORKING GROUP ON INCENDIARY MUNITIONS CLASSIFICATION

- I. 1. Consensus has been reached on the following *definition of incendiary munitions*:

“For the purposes of this Conference, an incendiary munition has been considered to be any munition which is primarily designed to set fire to objects or to cause burn injury to persons through the action of flame and/or heat produced by a chemical reaction of a substance delivered on the target.”

2. Consensus has also been reached on the following *statement*:

“The working group also recognized the existence of some categories of munitions which may have secondary or incidental incendiary effect but which do not fall within the definition stated above.

Some examples are:

1. Illuminants
2. Tracers
3. Smoke
4. Signalling systems
5. Fuel-air explosives.”

3. A third group of munitions has caused some concern to the working group. Many experts suggested the following *statement*:

“The working group recognized the fact that there exist incendiary munitions such as certain armour-piercing and anti-aircraft projectiles that combine their incendiary effect with other destructive effects which assist in achieving the purposes of the munition.”

Some experts however suggested the word “incendiary” in front of “munition” be deleted. The reason for this suggestion is that the expression “incendiary munitions” would *a priori* constitute these types of munitions as incendiaries even if the incendiary effect is very limited and highly secondary.

II. Proposals made to the working group on possible ways of classifying incendiary munitions that fall within the definition given under I.1.

1. *Type of munition*

Examples are:

- A. — bombs and bomblets
 - rockets
 - artillery and mortar projectiles, hand grenades and rifle grenades
 - landmines
 - flamethrowers
- B. — incendiary bombs
 - firebombs
 - ground flame munitions
 - anti-armour and anti-aircraft projectiles.

2. *Method of use*

Examples are:

- A. — Antipersonnel incendiary munitions:
 - Munitions primarily designed or used in such a way as to cause burn injury to persons.
 - Antimatériel incendiary munitions:
 - Munitions primarily designed or used in such a way as to damage matériel targets through the action of flame and/or heat.
- B. — Munition systems designed to have antipersonnel or anti-equipment effect through fire.
 - Munition systems containing inflammable matter the purpose of which is to intensify the intended effect of the system.
- C. — Tactical munitions
 - Strategic munitions
 - Paramilitary munitions

3. *Type of incendiary agent*

Examples are:

- metal-based munitions
- pyrotechnic munitions
- pyrophoric munitions
- oil-based munitions.