Ministry of Defence
Defence R&D Organisation

STEC PAMPHLET - 11

REGULATIONS FOR CONVEYANCE OF MILITARY EXPLOSIVES BY SERVICE AIRCRAFT

2025

Issued by

Storage & Transport of Explosives Committee
Centre for Fire, Explosive & Environment Safety (CFEES)
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P R E F A C E

Regulations for the transport of Military Explosives by air in Service Aircraft were drawn up and issued by the Storage and Transport of Explosives Committee (STEC) in 1969.

Consequent upon the decision by the Storage and Transport of Explosives Committee to adopt the international system of classification of explosives, it has been necessary to revise the Regulations for the transport of Military Explosives by air in Service Aircraft. Regulations have been framed keeping in view the international practices and requirements of the user organizations discussed and approved by the STEC from time to time.

These regulations are intended for use of different Services/Organisations under the Ministry of Defence and shall be followed while transporting military explosives/ammunition by air in Service Aircraft. Air-dropping of ammunition has been incorporated in this edition.

It is hoped that users will find this revised STEC Pamphlet 2025 simpler, easier to understand and implement, thereby promoting the safe storage and transportation of military explosive. This publication supersedes STEC Pamphlet, 2017 on the subject.

SECTION-I

GENERAL

Scope

1. These regulations apply to transport of Military explosives and ammunition by Service Aircraft within the country as well as lifting of explosives / ammunition from/to abroad.

2. They do not, however, apply to fighter and bomber aircraft which in their course of duty have to carry authorized contingent of explosives.

3. These regulations also hold good, when civil aircraft are requisitioned during a state of emergency or due to operational necessity for Service use, for the transport of explosives. In such cases, loading / unloading operations and provisions of escorts will be the responsibility of the services.

Definition of Terms

4. The terms defined in this pamphlet, with the meanings indicated, are used with particular reference to transportation of Military explosives by Military Aircraft.

Ammunition: A generic term which includes all manner of missiles to be thrown against an enemy, such as bullets, projectiles, rockets, grenades, torpedoes, bombs and guided missiles with their necessary propellants, primers, fuzes, detonators and charges of conventional explosives, nuclear explosives, chemical or other materials.

Aircraft Explosives Area: Any area specifically designated for loading or unloading of explosives from aircraft, and for parking aircraft loaded with explosives, which meets applicable quantity distance criteria.

Cargo Aircraft: An aircraft, other than a passenger or a passenger / cargo carrying aircraft, carrying freight or property.

Classification Code: The alpha-numerical symbol which denotes the complete hazard classification for a particular type of ammunition. The code comprises two digits, indicating the hazard division followed by a letter corresponding to the compatibility group.

Compatibility Group: The classification into separate lettered groups of those explosives and ammunition that may be stored or carried together without significantly increasing either the probability of an accident, for a given quantity, the magnitude of the effects of such an accident.

Dangerous Air Cargo: Any material that requires special handling, restrictions and safety measures during air transportations because it is flammable, corrosive,explosive, poisonous, radioactive or unduly magnetic or contains compressed gases or an oxidising agent.

Dangerous Cargo Aircraft: An aircraft specially designated to carry dangerous air cargo. No passengers are allowed in this aircraft. Escorts, if any, are to fly in the cabin along with the air crew. The aircraft will have specially built cargo compartment which is separated from crew compartment by aircraft locking to prevent any leak of gases, flames etc. However, in case of a fire, the crew should be in a position to operate the fire fighting equipments inside the aircraft without actually entering the cargo compartment.

Explosives: Any chemical compound, mixture or device, the primary or common purpose of which is to function by, or which is capable of, explosion or pyrotechnic effect, i.e. with substantially instantaneous release of gas and heat.

Explosive Area: An area used for the handling, processing and storing of ammunition and explosives. Where there is no fence, it is taken as being the area within a radius of 50m from any building or stack containing explosives.

Hazard Division: The classification of ammunition and explosives into numbered divisions according to the hazard they present. The following hazards are recognized:-

Blast (Hazard Division 1.1), projection effects (Hazard Division 1.2), fire and radiant heat (Hazard Division 1.3), and no significant hazard (Hazard Division 1.4),very insensitive with blast effect(Hazard Division 1.5) and extremely insensitive (Hazard Division 1.6).

Interior Quantity Distance: The minimum permissible distance from a building, stack or cargo aircraft containing explosives to any other such utility within the designated Aircraft Explosives Cargo Area.

Labelling: The display on the outside of each package of government department monogram, authenticity labels, sealing labels, explosives classification and the UN-type

hazard label for explosives. These details may be printed in linen, paper stick-on labels, or stenciled or painted where appropriate.

Marking: The official name or nomenclature of the item(s) inside the package, the official code or stock number, and date of the manufacture. These details may be either stamped, embossed, stenciled or painted on the outside container of the package.

Passenger Aircraft: An aircraft carrying any Service personnel or persons connected with allied Defence Establishment.

Operational Necessity: An operational necessity exists when the use of any mode of transportation other than air prevents the receipt of an explosives store by a specific time, thereby impairing the authorised operational mission concerned.

SECTION II

UN CLASSIFICATION SYSTEM

Hazard Divisions

5. General: In order to promote the safe storage and transport of dangerous goods, an International System of classification has been devised. The system consists of 9 classes (1-9) of which class I comprises ammunition and explosives.

6. Assignment of Hazard Divisions: Class 1 is divided into six Hazard Divisions (HD) to indicate the type of hazard to be expected in the event of an accident:-

I. Blast: Hazard Divisions 1.1

a) This division comprises ammunition and explosives which have a mass explosion hazard.

b) The major hazards of these divisions are blast, high velocity projections and other projections of relatively low velocity.

c) The explosion results in severe structural damage, the severity and range being determined by the amount of high explosives involved. There may be a risk from heavy debris propelled from the structure in which the explosion occurs or from the crater.

II. Projection Effect: Hazard Division 1.2

a) This division comprises ammunition and explosives which have a projection hazard but not a mass explosion hazard.

b) The explosion results in items burning and exploding progressively, a few at a time. Furthermore, fragments, firebrands and unexploded items may be projected in considerable numbers; some of these may explode on impact and cause fires or explosions. Blast effects are limited to the immediate vicinity.

III. Fire and Radiant Heat: Hazard Division 1.3

a) This division comprises ammunition and explosives which have a mass fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

b) This division includes some items which burn with great violence and intense heat emitting considerable thermal radiation (mass fire hazard) and others which burn sporadically. Items in this division may explode but do not usually form dangerous fragments. Firebrands and burning containers may be projected.

IV No Significant Hazard: Hazard Division 1.4

a) This division comprises ammunition and explosives, which present no significant hazard.

b) This division includes items, which are primarily a moderate fire hazard. They do not contribute excessively to a fire. The effects are largely confined to the package. No fragments of appreciable size or range are to be expected. An external fire does not cause simultaneous explosion of the total contents of a package of such items.

V Hazard Division 1.5

a) This division comprises very insensitive substances, which have a mass explosion hazard.

b) This division comprises explosive substances which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport. As a minimum requirement, they must not explode in the external fire test.

c) At present, there are no military explosive substances classified under HD 1.5.

VI Hazard Division 1.6

a) This division comprises extremely insensitive articleswhich do not have a mass explosion hazard and which demonstratenegligible of accidental initiation or propagation.

b) The risk from articles of Division 1.6 is limited to the explosion of a single article.

c) At present, there are no military explosive articles classified underHD 1.6

Compatibility Groups

7. Ammunition and explosives are not stored together with other goods which can increase the hazard to them. Safety of ammunition and explosives would be assured if each kind was stored separately, but this ideal storage is not practicable in aircraft.

8. On the basis of the above principles, all explosives have been divided into 13 groups, A to H, J, K, L and S for the purpose of storage and transport and are termed as Compatibility Groups. These are explained in STEC Pamphlet No.2 and all service explosives have been listed thereto.

Mixing of Compatibility Groups

9. As far as possible, explosives from only one group should be carried in an aircraft.

10. In case the above is not possible, explosives from the following Compatibility Groups may be transported together in cargo aircraft:-

    (a) Inert items and ammunition / explosives of Compatibility Group S with items from any Compatibility Group except Group A and L.

    (b) Ammunition of Compatibility Groups C, D and E.

    (c) Equal numbers of fuzes and other components of complete rounds of ammunition to which they belong. The Compatibility Group in such a case is that of the assembled round.

    (d) Ammunition and explosives of different Compatibility Groups other than Groups A and L, if special circumstances require such combinations. In such cases prior approval must be obtained from the Secretary STEC.

    (e) Service/Experimental explosives required for high altitude trials by DRDO belonging to different Compatibility Groups and Hazard Divisions may be transported together, when inescapable, by the same aircraft provided they are separately packed in suitable packages and accompanied by safety certificate signed by the Head of the Establishment.

Use of Hazard Classifications in Air Transportation

11. It is the responsibility of the consignor to notify the correct Hazard Division and Compatibility Group of each item of ammunition and explosive being transported by air. In case of any doubt Secretary, STEC should be approached for advice.

12. Knowledge of the correct Hazard Division of each item being transported by air is necessary for the consignor and consignee to select suitable Aircraft Explosives Cargo Area to meet required quantity distance criteria.

SECTION III

APPLICATION FOR AIR TRANSPORT OF EXPLOSIVES

Competent Authority

13. Air Force Station and Units should submit applications to their respective Command HQ for authorising airlift of explosives within their jurisdiction. The application will be approved by AOC-in-C (or SASO of the Command by special delegation of authority). AOC-in-Cs of the Command may also authorise airlift of explosives stores to and from Unit outside their jurisdiction if the stores are meant for use of Units of their respective Commands. AOC-in-C Maintenance Command (or SASO if delegated the authority) will authorise airlift of stores from stock holding Depots to any other Unit of IAF as per requirements.

14. Services other than Air Force and other States and Central Government Departments will submit detailed applications to the AOC-in-C of the Command within whose jurisdiction airlift of explosives is required in Service Aircraft.

15. Airlift of explosives for Agencies outside the respective Command would require the prior approval of the VCAS. Such applications will be addressed to Air Headquarters Dte. of Ops (T) through Ministry of Defence.

16. The application should include the following particulars:-

a) Description of explosives, Compatibility Group, Hazard Division, Fire fighting class and temperature limitation, if any.

b) Quantity of explosives giving net explosives content and gross weights.

c) Details in respect of place of loading and unloading, consignor and consignee date of airlift and priority assignment, if any.

d) Stowage dimensions of packages.

e) Particulars of the escort if provided by the consignor.

f) Any other details which would be of assistance to the transporting authorities in loading, transporting and unloading.

Safety Certificate

17. Each consignment shall be accompanied by a certificate of safety in triplicate and signed by a qualified officer as detailed below:-

Service/Department	Qualified Officer
Army	Ammunition Technical Officer (ATO)
Air Force	Technical Armament Officer or any officer Qualified for inspection of Air Force Explosives.
Navy	Naval Armament Supply Officer (NASO) or Naval Armament Inspection Officer (NAIO).
DGOF	General Manager of the Factory concerned or an officer authorized by him.
DRDO, DGQA & Min. of Defence	Director/Head of the Establishmentconcerned or an officer authorized by him
Other Govt. Departments	Chief Controller of Explosives, Nagpur or an Officer authorized by him.

18. In the case of explosives procured from abroad, the Safety Certificate shall be signed by the consignor.

19. The format of Safety Certificate is given at Annex `A'.

Freight Manifest

20. Whenever explosives form part of the consignment on an aircraft, the freight manifest shall be prepared with each item of explosives prominently entered including annotation `EXPLOSIVES'. The Commander of the aircraft carrying the freight must be informed and his initial(s) taken against each such entry on the manifest before takeoff.

21. One copy of the Certificate of safety referred to in Para 19 above shall be attached to the freight manifest and the other retained by the Officer-in-Charge of the loading station.

Conveyance of Personal Arms and Ammunition

22. Arms and ammunition may be carried only by those occupants of aircraft who are authorized as such to carry arms, without any other special authority for carriage by air. However, the occupants shall have to declare that they are carrying arms and ammunition to the Commander. The Commander is to keep such weapons / ammunition with him or authorize one of his crew members to keep them in safe custody during the passage in the aircraft.

Type of Aircraft to be used in Carrying Explosives

23. Unless use of passenger aircraft is inescapable, service cargo aircraft should be used for transportation of explosives.

Authorization of Personnel in Aircraft Carrying Explosives

24. The DCAS or the AOC-in-C as the case may be, may authorize journeys of service personnel or the civilians in the Air Force in an aircraft carrying explosives.

25. Journey of persons other than those mentioned in para 24 above by service aircraft carrying explosives may be authorized by the Raksha Mantralaya.

SECTION IV

QUANTITY DISTANCE CRITERIA FOR AIRFIELDS - LOADING AND PARKING OF AIRCRAFT WITH EXPLOSIVES

Quantities of Ammunition Permitted

26. Passenger carrying aircraft: The net explosives content (NEC) permitted in a passenger carrying aircraft shall not exceed 200 kg HD 1.4 (safety class), 25 kg HD 1.2 and 25 kg HD 1.3.

27. In case of mixed consignments involving explosives of different hazard divisions, the total quantity in the aircraft carrying passengers shall not exceed the maximum permissible for the hazard division included in the consignment having the highest limit and further the weight of none of the included hazard divisions shall exceed its maximum permitted.

28. Any quantity of escape aide and jettisoning devices may be carried in a passenger aircraft subject to a maximum of 200 detonators associated with the stores by special permission of the Deputy Chief of the Air Staff (DCAS).

29. A quantity of 5 kg (NEC) of samples of propellant (NCP) for small arms ammunition (HD 1.1) may be transported by aircraft carrying passengers if packed in the following methods:-

"30 g propellant sample should be packed in a rubberized or plastic bag and this in turn should be further packed in a metal container. A maximum of sixteen such containers are to be packed in a wooden box

Cargo Aircraft

30. The Cargo aircraft may be loaded up to its pay load capacity provided quantity distances as given at Annex-B are available at the time of loading and unloading and when required to be parked at tarmac.

For Mixed Consignments

31. In case of mixed consignment which includes HD 1.1 and 1.3, each hazard division should be loaded away from each other, preferably, with a minimum separating distance of three meters.

(a) “Air armament stores, fuzed ammunition of Compatibility Group ’E’ and fuzes of Compatibility Group D may be transported by service aircraft. The ammunition so transported should comply with the conditions laid down in STEC pamphlet No. 11.”

Limitations

32. Unboxed ammunition shall not be permitted.

33. Detonators, if transported shall be further packed inside a metallic package to the requirements detailed below:-

“The outer box should be of steel at least 2mm thick and of such dimensions that there shall be a clearance of 5 cm all-round the box containing detonators of Compatibility the Group B. theintervening space should be packed with saw dust/cotton waste/paper so that the box containing the detonators is firmly held in position.”

34. WP ammunition (Compatibility Group H) must be inspected 100% for any leakage before dispatch.

Prohibited Explosives

35. The under mentioned items of explosives must not be transported by passenger or cargo aircraft under normal or operational / emergency conditions :-

All pyrotechnic compositions and fuze powders.

Gun cotton	:	Dry
PETN	:	Dry
Styphnic Acid	:	Dry
Lead Styphnate	:	Dry
Initiatory compositions		
Lead Azide	:	Dry and wet
Lead Dinitroresorcinol	:	Dry and wet

All explosives of Comp. Group K

Toxic chemical agents

Quantity Distances

36. Quantity Distances, given at Annex-B are to be observed from a parked cargo aircraft loaded with explosives/ammunition to other aircraft.

37. Distances, given at Annex-B shall be observed from a parked cargo aircraft loaded with ammunition/explosives to an inhabited building, assembly place or public traffic route outside the designated Aircraft Explosives Cargo Area.

38. Aircraft carrying explosives must be armed, loaded, unloaded or parked in a designated explosives parking area. Where possible a designated area should be separated from other such areas and from exposed sites by quantity distances given at Annex-B.

39. Unbarricaded aircraft should be separated from each other by the distances given at Annex-B unless operational considerations dictate otherwise,

40. Aircraft armed with gun ammunition and small rockets only do not require normal quantity distances. A minimum separation of 10m between wing tips of adjacent unbarricaded aircraft should be used.

41. Passenger aircraft, while transporting explosives or during its loading/ unloading shall not be parked within 50 m of offices, public or private utilities or other aircraft.

42. Ideally, aircraft should face the direction involving least exposure of personnel, equipments and facilities to the line of fire of forward firing armament. For practical purposes, aircraft should be parked so that no centre of population exists for 3 km within 10 degree of arc about the line of fire unless this is intercepted by suitable barricade.

43. It is usually better to provide barricades between adjacent aircraft, which may then be located much closer. It should be noted however that although a barricade prevents immediate propagation by high velocity low angle fragments, it does not necessarily prevent subsequent propagation or damage caused by blast, lobbed items or secondary fires.

44. Aircraft shelters hardened against external attack provide a high degree of protection against immediate propagation, provided their end doors are not exposed to fragment attack, although the structures increase the risk of debris from an accidental explosion.

45. From the considerations based on type of protection, quantity distances in metres for HD 1.1 ammunition not exceeding 5000 kg per shelter under different situations can be calculated as follows:

(a) Between aircraft parked in the open but traversed. ---7.2Q1/3
(b) Between aircraft parked in hardened shelters ---3.6Q1/3

Between ready service bunker magazines (Q not exceeding 10,000 kg HD 1.1)

Used to store assembled ammunition for combat aircraft loading

(i) Aircraft parked in hardened shelters ---3.6Q1/3
(ii) Aircraft parked in the open but traversed ---7.2Q1/3
(iii)Aircraft parked in the open only ---12Q1/3

Where 'Q' is the Net Explosive Quantity (NEQ) in kilograms.

SECTION V

SAFETY CONSIDERATION

Low Level Flying Restriction

46. Low level flying of aircraft carrying explosives should be avoided over built up and populated areas as far as possible. In no case, aircraft carrying explosives should fly below 900 m over explosives areas.

Precautions During Transit Storage

47. Adequate safety precautions shall be taken in storing the explosives while awaiting dispatch. The packages, properly protected from the weather, shall be stored away from any other cargo. A placard marked **"Explosives"** in bold letters should be displayed prominently. In the event of fire or accident, the explosives packages should be promptly removed to a place of safety.

48. Storage of explosives/ ammunition should be in accordance with storage principles while awaiting call forward.

49. When called forward for transportation or after unloading particular care should be taken those explosives cargo is segregated from other materials, particularly corrosive.

50. Explosives cargo should not be retained at dispatching airfields longer than is necessary. The controlling air Cargo transportation authority should call forward the Cargo so that it arrives at the dispatching airfield immediately before it is required for loading. Arrangements should also be made for explosives cargo to be collected by consignees as soon as possible after unloading from the aircraft.

51. Explosives in transit, which may be retained at airfields due to exceptional circumstances, should be kept in safe areas.

52. Bays for the palletisation of explosives into aircraft unit loads may be located outside the explosives storage area sited at appropriate QD from aircraft and other essential installations on the airfield.

Fire Control Measures

53. To effectively deal with possible fires involving explosives in storage, loading/unloading or flight, the following minimum scale of equipment should be provided :-

a) In sheds where the freight is kept in storage and during loading / unloading:-

1)	Fire extinguisher, Dry Chemical Powder Type (ABC) 10 kg capacity.	4 Nos.
2)	Drums with dry sand and scoops 200 kg Capacity.	2 Nos
3)	Drum with water 200 liters capacity with 2 Buckets	1 No
4)	Fire hook, 2.5 meters long	1 No.
5)	Fire Beaters	2 Nos.

Whenever loading/unloading operation is undertaken, one number of Manned Truck, Fire Fighting tender, and Large MK II should be made available at short notice

b) In flight:-

1)	BCF extinguishers, 2.5 kg. Capacity	2 Nos.
2)	Fire extinguisher ABC Powder type, 2.5 kg capacity	2 Nos.

Aircraft Safety Measures

54. Before loading or unloading of explosives, the aircraft shall be electrically earthed so that resistance to ground does not exceed 10,000 ohms.

55. All switches in the aircraft MUST be in off position except cabin/cargo compartment light switches when auxiliary power units are used for loading/ unloading assistance.

56. Front and rear chocks MUST be in position.

Display of `Explosives' Placards

57. `Explosives' placards, four in number, aircraft during loading/unloading or where the aircraft transporting explosives is parked, one of the placards shall be placed in front of the nose, one behind the tail and one each on either side of the aircraft. In addition, a red flag shall also be displayed at a prominent position near the aircraft. The placards and the flag are to be removed before the aircraft takes off.

General Safety Precautions

58. The following precautions shall be observed:

a) Explosives shall not be loaded with other dangerous or flammable goods.

b) The floor of the aircraft shall be cleaned before and after use. Anything likely to endanger the consignment must be removed.

c) The packages containing explosives shall not be thrown, dropped, rolled or dragged along the ground or floor of the aircraft but shall be lifted and passed from hand to hand and carefully deposited.

d) Only authorised appliances shall be used for lifting and carrying explosives.

e) There shall be no refuelling of the aircraft while explosives are being loaded/ unloaded.

f) If any WP or ammunition containing toxic chemical is carried, the aircraft shall be cleaned / decontaminated after unloading.

g) Smoking shall not be allowed inside or within 30 m of the aircraft transporting explosives. Smoking materials including matches, lighters, etc. if carried, shall be deposited with the Commander for safe custody. Any other article likely to cause fire or spark shall not be permitted in the vicinity of aircraft unless authorised.

h) Explosives packages shall not be opened or repaired during flight.

i) Loading/unloading operations shall be carried out with due care under the supervision of the escort.

j) Loading and unloading of explosives should be avoided when it is raining or snowing. If this cannot be helped the packages of explosives must be adequately protected.

Stowage of Explosives in Aircraft

59. Explosives shall be loaded in cargo aircraft near the main dispatching hatch or near a jettisoning position in such a manner that jettisoning may readily be done in case of an emergency in the order of Hazard Divisions 1.1, 1.2, 1.3 and 1.4, 1.5 and 1.6.

60. In the case of passenger aircraft, explosives should be stowed in the baggage compartment inaccessible to passengers. Where, however, this is not possible, theescort shall ensure that explosives packages are not handled or tampered with by passengers.

61. The packages MUST be firmly lashed to the aircraft structure or otherwise secured to prevent movement in flight. On no account shall they be stowed loosely on seats or racks.

Refueling and Maintenance Procedure

62. Refueling of the aircraft must be done before loading. Refueling is prohibited while loading and unloading is in progress. If the aircraft is to undergo minor or major repairs in the aircraft explosives cargo area, then the explosives cargo should be unloaded and stored in accordance with the principles of storage in a safe area.

SECTION VI

OPERATING INSTRUCTIONS FOR FLIGHT CREWS

General

63. All explosives consignments in aircraft must be escorted. The escort should be a responsible official duly authorised.

64. When explosives are to be airlifted to/from foreign countries the escort shall be an Air Force Officer of AE(M) Branch having adequate experience of handling explosives/ammunition or a Logistics `XF' a member of the crew.

65. In the case of safety class ammunition or small quantities of Air Force explosives (100 kg gross or 10 kg NEQ whichever is less) a member of the crew may be entrusted with the responsibilities of the escort.

Duties and Responsibilities

66. The escort member of the crew carrying out the duties of the escort shall be fully conversant with the explosives / ammunition being escorted including their temperature limitations, etc., so that he may advise the Commander of the aircraft, if required.

67. The escort shall be briefed properly and escort-orders given in writing. The escort shall be responsible for the safe custody of the explosives and to see that no unauthorised person is permitted access to the explosives being transported or to act in a manner prejudicial to the safety of the explosives. At the time of unloading, the escort shall examine the packages and set aside broken, damaged or doubtful ones and record brief statement thereon for information of the consignee. Any spilt explosives shall be carefully collected and disposed of by technical personnel under appropriate precautions. He shall also advise the Commander of the aircraft on fire fighting in regard to the explosives on board. He shall be conversant with the operation of emergency doors and jettisoning procedures.

68. The crew member should assume the following responsibilities when necessary:-

a) Loading/unloading: In an emergency when a qualified officer is not available.
b) Security and safety in Flight and Intermediate stops: Under the direction of the Commander of the aircraft.
c) Jettisoning: When ordered by the Commander of the Aircraft.
d) Advice to the Commander of the aircraft: On all questions concerning the explosives carried provided that the crew member responsible for a consignment of explosives is qualified to handle explosives.

69. **Security and Safety at Intermediate stops**

(A) **At a Service Airfield**

(1) During stay the crew member concerned is responsible for ensuring that explosives being carried are off loaded if :-

a. A night stop is being made.

b. The aircraft is to undergo a minor repair in the vicinity of the explosives storage position, or a major repair in any part of the aircraft.

c. The Commander of the aircraft considers if necessary.

(2) The Explosives so unloaded are to be placed in an appropriate locked building. If this is impossible, they may be placed in the open, suitably protected against the weather, at required quantity distances (safe distance) from any building, installation or aircraft. When stacked in the open, explosives are to be guarded at all the times. Compatibility groups are to be segregated as far as practicable.

(3) When it is not necessary to off-load explosives or when the Commander of the aircraft considers that it is not practicable, the aircraft is to be positioned at required quantity distances, as given at Annex-B from buildings, installations or other aircraft. A red flag is to be prominently displayed and a guard is to remain with aircraft.

(B) **At a Non-Service Airfield**

In case stop is made at a non-service airfield, explosives are not normally to be off-loaded, and the aircraft is to be parked and guarded in the manner detailed in para 69(A) (3) above. If the Commander of the aircraft considers it necessary to off-load explosives, the assistance of the nearest service unit should be obtained. In a foreign country, the Commander of the aircraft should obtain local assistance through the Indian Military, Naval or Air Adviser/Attaché.

70. **Unloading**

(a) The supervision of the unloading of explosives from an aircraft should be the responsibility of a qualified officer of the destination airfield. The following precautions are taken:-

(1) All explosives are handled with care.

(2) All explosives packages listed in the cargo manifest(s) are unloaded from the aircraft.

(3) After unloading, a physical check of the aircraft is made to ensure that all explosives have been unloaded.

(b) In an emergency, if a qualified officer is not available, the responsible crew member should ensure that all explosives packages are unloaded from the aircraft after taking the above precautions into account.

71. **Stowing**

The physical handling on the ground and loading of explosives into the aircraft must be under the supervision of a qualified officer. The following precautions are taken:-

(a) Packages: The seals of the explosives packages should be intact. Damaged packages should not be accepted.

(b) Stowage: Explosives should be segregated from other dangerous goods and stowed near exits.

(c) Order of stowage: When a consignment of explosives consists of more than one Hazard Classification Code, the items to be jettisoned first should be loaded nearest to the exits.

SECTION VII

GENERAL CONSIDERATIONS FOR PACKAGES TRANSPORTED BY AIR

Physical Phenomenon

72. Difference between Air and Surface Modes: Transporting materials by air presents conditions, such as atmospheric temperature, pressure and vibration frequencies, which differ from those normally encountered in the surface mode.

73. Temperature: Very low temperatures are common in air transportation than in surface transportation but heaters in the cargo compartment can be used to protect stores susceptible to freezing. Very high temperatures occur in aircraft only when they are parked.

74. Vibration: Vibrations encountered in aircraft extend to higher frequencies (300 Hz) than in surface transportation (25 Hz). The primary cause for concern is their effect upon glass and metal containers and closures. The precautions taken to prevent opening of screw type closure in surface transportation should be the same where air transportation is concerned. However, high frequency vibration or repeated flexing of flat surfaces of metal containers can cause fatigue failure and / or opening of seams. To prevent this, the standard practice is to pack metal containers to present a tight, firm fit in the exterior transportation container.

75. Pressure: The reduction in atmospheric pressure encountered in air transportation presents the one condition which should receive the most consideration by the consignor and transporting agency. The following principles are based upon a maximum flight altitude of about 15,000 m. It is possible that the internal pressure in a container that does not leak air at this altitude will attain a value equal to the difference between the pressure on the ground and the atmospheric pressure at 15,000 m. For a perfectly sealed container the internal pressure can attain a value of about 9 kPa (0.9 kg/cm2) at 15,000 m altitude. This does not take into account the temperature of the air within the void space of the container. In the case of a sealed metal container of a volatile liquid, which has been stored in the sun for a prolonged period of time, there is an increased internal pressure due to the increased temperature within the container. Therefore, if this container is put aboard an aircraft and transported within a short period of time after its removal from storage, the resultant internal pressure in flight consists of both the increase in pressure due to the reduced atmospheric pressure at the flight altitude. Due to adjustment of the temperature within the container to that of the cargo compartment of the aircraft, the effect of the ground storage temperature is minimised. Since this temperature adjustment is relatively slow, it is recommended to reduce the temperature within a container, before loading aboard aircraft, to that of the air at ground level.

Packaging

76. **General:** The packaging should take account the following requirements:-

1) The material of the container should be compatible with the material being carried, i.e. the container material should not react with the substance being carried.

2) Plastic bags or pouches should not be used. Where plastic containers are acceptable, only containers constructed of rigid plastic should be used.

3) The inside containers should be of suitable shock absorbent material to prevent movement, breaking or leakage.

4) The closure should be resistant to loosening by vibration during transportation.

5) The containers should be leak proof regardless of temperature, humidity and altitude changes.

6) A minimum ullage of 5 to 10% should be left in containers holding explosives liquids, to allow for any expansion of the contents on a buildup of vapour pressure.

77. All explosives for air transport except as provided for in Para below, shall be in Service packages. The packages shall have clear marking indicating the following:-

a) Service nomenclature

b) Net Explosive Quantity

c) Gross Weight

d) Compatibility Group

e) Hazard Division

f) Any other relevant details pertaining to the ammunition / explosives.

78. Where the quantities are too small for use of Service packages or pertain to R&D development trial stores, they shall be packed in packages approved by the officer qualified to render Safety Certificate, as detailed in paras 17 & 18.

79. Screw-cap Closures for Metal Containers: Such a closure does not leak at high altitudes provided that the containers have a new or sound gasket. When a container has been in stock for a long time the gasket may loose resiliency, so leakage can occur when transported by air. However, when gaskets have been replaced, as required, and screw caps securely and properly closed, no serious difficulty should occur during air transportation of metal containers with screw-cap closures.

80. Hermetically Sealed Metal Containers: These containers are frequently used for transporting explosive items. If properly constructed, containers should withstand approximately 100 kPa (1 kg/cm2) internal pressure with bulging being the only noticeable effect. Therefore, the transportation of such containers by air should not impose a hazard to flight personnel.

81. Electro Explosives Devices (EED): Prior to their being sent forward for movement by air either as normal dangerous cargo or on operation and exercises, all EED must be so prepared that there is no danger of accidental initiation arising from RF or electrostatic hazards. A safety certificate should be obtained from the concerned Directorate of Air Headquarters that the item is packed / prepared in proper condition for transportation in accordance with the regulations. Examples of the preparation and methods which are employed to achieve electromagnetic compatibility (EMC) include one or combination of the following:-

a) Fitting of metal blanking caps
b) Utilising the screening effect of the skin of the store itself.
c) Bonding in cartridge clips
d) Isolating firing circuits
e) Disconnecting pre-selected electric leads
f) Screening certain electric leads to prevent them acting as pick-ups
g) Presence of suitable RF filters
h) Screening the whole store by enclosing it in a metal container with solder seal or tight fitting metal lid.

Items Activated by Moisture

82. The under mentioned items may only be carried in dangerous Cargo aircraft. In addition to the precautions attaching to any explosive content present, the fillings also include chemicals which are activated by water. Accordingly, these stores must be kept dry at all times during transit and transport. Aircraft crews are to be provided with respirators.

Item		**Containing**
Markers Marine No.2 Mks 1 & 2	:	Magnesium Aluminium Phosphide and Calcium Phosphide.
Markers Marine No.3 Mks 1 & 2	:	
Markers Marine No.4 Mk 1	:	
Markers Man Overboard		
Flame Floats, Aircraft Navigation	:	Calcium Phosphide
No. 2 Mk 2		

SECTION VIII

OPERATIONAL AND EMERGENCY REQUIREMENTS

83. Operational requirements

The necessity for transportation of ammunition by air in order to meet the requirement of military operations as defined by respective Service HQs will fall under this category, however it does not cover routine peace time activity. Following is permitted under such circumstances

a) Transportation of fuzes of CG "B" and fuzed ammunition of CG "F" may also be transported by service aircraft to meet the operational requirement. The ammunition so transported should comply with the conditions laid down in STEC pamphlet No. 11
b) In addition to fixed wing Service aircraft, service helicopters may also be utilized to meet operation requirements.

84. Emergency requirements

Any necessity for transportation of ammunition by air in order to meet the requirement which emerges due to national emergency, war or national calamity will fall under this category; however it does not cover routine peace time activity. Sanction for air transportation during such emergencies will be accorded by the local formation commander.

85. Airdropping of Ammunition

Only those items should be airdropped, for which fit to airdrop certificate is issued by the competent authority/OEM/AHSP{CQA(A)} and accepted by CFEES.

ANNEXURE 'A'

CERTIFICATE OF SAFETY AND SPECIAL HANDLING INSTRUCTIONS

Cargo Identification

	Description	Hazard Division	Compatibility Group	Net Explosives Quantity (kg)
1.				
2.				
3.				
4.				

2. Special Handling Instructions (when required by nature of the explosives cargo)

3. Certification of Safety

This is to certify that the contents of the packages in this consignment are correctly described by their name and are suitably packed, labelled, marked, wrapped and are in a proper condition for air transport in accordance with regulations in force.

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Date and Place	Appointment in capitals	Name in capitals

NOTE

Use of form

a. This form must be completed in triplicate by the consignor.

b. The form should be amended or a new form should be completed when there is a change in the cargo manifest to take account of all the aircraft explosives cargo.

c. This form should accompany the following documentation as appropriate:
   1. Airway bill No.

2. Other documents

d. One copy is retained by the Controlling Air Movement Authority, one copy by the departure airfield and one copy accompanies the cargo to the destination airfield.

INSTRUCTION FOR COMMANDERS OF AIRCRAFT TRANSPORTING AMMUNITION AND EXPLOSIVES

1. Normal Tower Reporting Procedures

Prior to take-off or landing, the aircraft Commander must advise airfield control of cargo identification in paragraph 1 of front-page.

2. Emergency Tower Reporting Procedures

The aircraft Commander must advise the airfield control of the Net Explosives Quantity of each hazard division in the cargo. Information at columns (a), (b) and (c) below must also be provided at airfields where non-military fire-fighting personnel may respond to aircraft emergencies. Additionally, any information considered pertinent to the cargo may be provided to the airfield control.

Hazard Division 1.1 (a)	Hazard Division 1.2 (b)	Hazard Division 1.3 (c)
Hazards: Mass detonation with blast and high velocity projections.	Hazards: High velocity Projections.	Hazards : Fire, possible mass fire with intense radiation and minor Explosions. The fire hazard is no greater than that presented By a burning aircraft.
Fire Fighting: Tackle fire only during incipient stage, abandon scene when explosives are involved in fire.	Fire Fighting: Tackle fire during Incipient stage. Retreat when explosions begin, unless protection is available, and tackle secondary fires keeping at least 300 m from source ofexplosion.	Fire Fighting: Tackle fire during Incipient stage. Retreat if fire cannot be controlled, unless protection is available and tackle Secondary fires.

ANNEXURE 'B'

QUANTITY DISTANCES
(Refer Para Nos. 36 to 38)

The table prescribes quantity distances for different hazard divisions from a consignment of explosives to another aircraft, installation, inhabited building, and place of assembly or public traffic route.

Net Explosives Quantity (kg) Not exceeding	Distance (m)	
	HD 1.1 & 1.2	HD 1.3 & 1.4
2000	270	135
3000	300	150
4000	350	175
5000	380	190
6000	400	200
7000	420	210
8000	440	220
9000	460	230
10000 and above	480	240