

Chapter 10

*Transport*²⁹

Transport is the link in the logistics chain that makes it possible for emergency humanitarian assistance to reach its destination. When designing an emergency supply transport strategy, it is not enough to consider in the abstract the best means of transport or the resources needed to mobilize supplies from A to B. Alternative means, methods, and routes should be considered as a matter of course. The challenge does not lie in eventually getting the supplies to their destination, regardless of when they may be needed—but in making sure that they arrive safely and on time.

The movement of supplies within the country or area of operations is only one part of the process. The arrival of goods from abroad—donated by the international community, or acquired by a disaster relief organization—also imposes its own logistical challenges.

Getting emergency supplies from their point of origin to their final destination involves the combined use of different means of transport over air, land, or water.

Types of Transport and Their Characteristics

The various means of transport have advantages and disadvantages from the point of view of operational needs, ranging from their cost to their capacity and speed (see Table 10.1). When deciding which means of transport to use, we must think of two main issues: the needs on the ground, and feasible forms of transport.

- ◆ **The needs** – How urgently are the supplies needed? What type of supplies are being shipped? How large and heavy is the shipment going to be? What is the destination? What distances must be traversed?
- ◆ **Feasible forms of transport** – What means of transport are avail-

²⁹ This chapter has benefited from the contributions of Médecins sans Frontières (MSF) and Gerard Gómez of MSF's Regional Emergency Response Department for Latin America and the Caribbean.

able? How much do they cost? How much can we afford? How hard is it to reach the intended destination, given the weather and the state of available routes?

Enough resources will not always be available to pay for the ideal form of transportation and it may not always be available, in any case. Even if a particular means of transport is available, conditions in the field may rule out its use. Thus, it is not enough to determine what is needed; we must also know what is feasible. For every means of transport chosen there should be an alternative, should circumstances prevent its use.

Table 10.1. Characteristics of different means of transport

| Type of transport | Characteristics | Advantages | Disadvantages |
|-----------------------|---|---|---|
| Air (Airplanes) | Usually employed when supplies are needed urgently, or when there is no other way to reach the affected area. | <ul style="list-style-type: none"> ◆ Quick and reliable. ◆ Can reach far-away areas. ◆ Makes it possible to come closer to the area of operations. | <ul style="list-style-type: none"> ◆ High cost. ◆ Depending on the size of the plane, cargo capacity may be small. ◆ Susceptible to meteorological conditions. ◆ Requires plenty of space and safe conditions for landing and takeoff. ◆ Requires special fuels, such as Jet A1, which although common are not always available in the area of operations. |
| Air (Helicopters) | Much more versatile than planes. | <ul style="list-style-type: none"> ◆ Can land in difficult areas. | <ul style="list-style-type: none"> ◆ Has limited cargo space. |
| Land (motor vehicles) | Use depends mainly on the physical and safety conditions of the access routes to the delivery points. | <ul style="list-style-type: none"> ◆ Highly flexible. ◆ Inexpensive and readily available (it is easier to find cars and trucks than any other vehicle). ◆ Given its availability, cargo capacity increases. | <ul style="list-style-type: none"> ◆ Routes might be in bad shape, impassable, or simply not exist. ◆ Land travel may be dangerous in certain areas, due to the threat of landslides, floods, earthquake damage, armed conflict, or bandits. |
| Land (rail) | Use, obviously, depends on the existence and route of the railroad and its condition | <ul style="list-style-type: none"> ◆ Large load capacity. ◆ Operating costs are generally quite low. | <ul style="list-style-type: none"> ◆ Frequently awkward to load and offload supplies in railroad yards or stations. ◆ Need to use other transport to take the supplies to the warehouse or operations center. |

Table 10.1 (continued)

| Type of transport | Characteristics | Advantages | Disadvantages |
|-------------------|--|---|--|
| Maritime | Used mostly for transporting supplies from abroad. Requires access to a harbor or pier. | <ul style="list-style-type: none"> ◆ Large load capacity. ◆ Economical. | <ul style="list-style-type: none"> ◆ Slow. ◆ Need to use other transport to take the supplies to the warehouse or operations center. |
| River | Useful for supplying riverside and nearby communities with moderate amounts of emergency aid, or for moving people and supplies in the event of a flood. | <ul style="list-style-type: none"> ◆ Low cost of operations. ◆ Access to areas hard to reach by other forms of transport. | <ul style="list-style-type: none"> ◆ Small load capacity, depending on the size of the vessel. ◆ Use depends on the size and other characteristics of the river or other waterway. |
| Human and animal | It is a solution for small loads, generally in remote areas or places motor vehicles cannot reach. | <ul style="list-style-type: none"> ◆ Low operational costs. ◆ Access to difficult areas. | <ul style="list-style-type: none"> ◆ Limited load capacity. ◆ Slow. |

Commercial vs. Non-commercial Transport

Non-commercial or free transport, sometimes offered by other organizations or volunteer groups, reduces the cost of the operation. In general, however, the owners of the transport do not assume responsibility for the safety of the goods. It makes sense to use such transport, and sometimes it is the only means available, but only if one is capable of taking special security measures to protect the load.

With commercial carriers, special rates can sometimes be negotiated for humanitarian supplies. However, commercial transport is a for-profit business like any other. When hiring such transport, it is wise to bear in mind not only the price but also the reliability, safety, speed and quality of the firm. Since it is a service contract for which we will have to pay, we are entitled to demand that the contract be fulfilled down to its smallest particulars.

Different types of contracts have their own advantages and disadvantages. It is therefore essential to evaluate special requirements of the shipment, and review carefully what is included in the fare, e.g., loading and offloading, the driver's fees, and so on. When planning to hire a firm's transport services, it makes sense to bear in mind the issues outlined in Table 10.2.

Table 10.2. Types of transport contracts³⁰

| Type | Advantages | Disadvantages |
|-------------------------|---|--|
| By the ton or ton/km | Client pays for the transport of the goods regardless of the time the trip takes, or whether the truck is full or not. The cost of the service is clearly agreed upon from the start. | <ul style="list-style-type: none"> - The carrier might include other clients' loads in shipment, which may compromise safety of supplies. - The driver might use a less direct route to add kilometers to the bill. |
| Per vehicle per journey | Client has exclusive use of the vehicle(s). | <ul style="list-style-type: none"> - The carrier might not be interested in filling each vehicle to its maximum capacity, thereby multiplying the number of trips. - The size of the vehicle might not correspond to the size of the load. |
| Per vehicle per day | Exclusive use of the vehicle. Usually the best option for short trips. | <ul style="list-style-type: none"> - The carrier might choose to "take it easy" on each trip. - In the event the truck needs protracted repairs, the daily fee might still be applicable unless stipulated otherwise in the contract. |

30 Adapted from International Federation of Red Cross and Red Crescent Societies (IFRC), *Handbook for Delegates*, Geneva, 1997.

Determining the Type of Transport Needed

To determine the type and quantity of transport needed, certain aspects must be borne in mind:

- ◆ The nature of the supplies to be transported;
- ◆ The weight and volume of the load;
- ◆ The destination: distance, form of access to the delivery point (by air, water, land), and the condition of the access routes;
- ◆ The urgency of the delivery.

Table 10.3 shows a simple procedure for estimating the number of vehicles needed, whether they be trucks, boats, or planes, to transport a load with a known weight and deadline for delivery. Annexes 10.1-10.3 show estimated load capacities for different means of transportation.

Table 10.3. Formula for estimating the number of vehicles required³¹

Calculation procedure:

- How many tons must be moved? By when?
- How long will the vehicles take to take a load from the delivery point to the reception point and return? (Do not overestimate the speed, and include loading and unloading.)
- What load capacity does the vehicle have?

$$\text{No. of possible trips per vehicle} = \frac{\text{Period}}{\text{Duration of round trip}}$$

$$\text{No. of loads} = \frac{\text{Total No. of tons}}{\text{Vehicle capacity}}$$

$$\text{No. of vehicles} = \frac{\text{No. of loads}}{\text{No. of possible trips / vehicles}}$$

Add 25% extra time for contingencies.

This table is based on the weight of the load. However, one must also take into account the volume—that is, the space occupied by the packages depending on their shape and size.

³¹ Taken from J. Davis and R. Lambert, *Engineering in emergencies*, London: Intermediate Technology Publication Ltd., 1995.

If vehicles of different load capacity intervene in the operation, the estimate should be recalculated for each vehicle. Similarly, if the supplies are going to different destinations, each destination requires its own calculation.

Vehicle Control

When circumstances allow it, it is always better to hire a transport company than to have to manage a fleet of vehicles, which is an extremely complex and delicate task. But the reality, in most emergencies, is that the vehicles available are of various types and come from various sources. Some will be diesel, some gasoline models. Some will be in good condition, others in need of repair. Some will come with their own driver; others will require a driver to be hired—or a volunteer to drive them.

The key thing, in any case, is to ensure that the vehicles are in good mechanical condition and to establish maintenance and control procedures to prevent any down time.

Managing a fleet of vehicles is practically a logistics operation in its own right, due to the number of actions required, such as the following:

- ◆ One individual must be entrusted with following up on all matters related to the transport vehicles: supervising the drivers, controlling arrival and departure times, and making sure that all the rules regarding the use and maintenance of the fleet are strictly followed.
- ◆ The use of forms must be implemented to control all matters related to the vehicles used. Ideally, each vehicle should have its own log where all relevant details are noted, such as the condition of the vehicle, its activities, who is responsible for it, what mechanical maintenance has been carried out, what the mileage is, how much fuel is being consumed, and what its itineraries are.
- ◆ A policy of “one vehicle, one driver” must be implemented, to make sure that one person is responsible for the maintenance and control of each vehicle. When several people use the same vehicle, it tends to deteriorate faster, and it is harder to determine who is accountable for its misuse or lack of maintenance.
- ◆ Drivers should get precise instructions about the use of the vehicle’s log, about the daily and regular checkups that are needed and the

attendant maintenance needs, as well as about their responsibilities and expected behavior.

- ◆ Drivers must make a daily review of their vehicles and before starting on their deliveries, particularly if large distances are involved. The supervisor must be notified immediately of any problem regarding the vehicle, mechanical or of any other sort.
- ◆ Drivers and their vehicles should have their papers in order and onboard the vehicle, as well as all necessary insurance and permits.

The following are some examples of the items that must be checked for each vehicle:

1. Daily Vehicle Review

- ◆ Amount of fuel
- ◆ Oil level
- ◆ Radiator water
- ◆ Battery water level
- ◆ Windshield cleaner
- ◆ Brake fluid
- ◆ Hydraulic system fluid
- ◆ Tire pressure (including spare tire)
- ◆ General state of the lights
- ◆ Tension of the fan belt
- ◆ Basic tools

Vehicle Service Control Form

| Service | Details | Date | Mileage | Next service |
|--------------------------------|---------|------|---------|--------------|
| Motor oil | | | | |
| Oil – Gearbox, transmission | | | | |
| Fuel filter | | | | |
| Air filter | | | | |
| Suspension system | | | | |
| Brakes | | | | |
| Fan belt | | | | |
| Change/rotation of tires | | | | |
| Other services | | | | |

The information entered in vehicle service forms (as illustrated above) must be checked periodically by the person in charge of the fleet, to verify that the forms are being used correctly, and monitor the condition of each vehicle.

Fuel and Lubricants

Fuel is always in demand, and particularly when it is scarce—a common situation during an emergency. To keep the relief operations vehicles well supplied with fuel and lubricants, a meticulous gas mileage record must be established based on the routes taken.

Sometimes it is possible to get credit at a gas or petrol station, and vehicles are refueled upon presentation of authorized coupons. This is a very

convenient solution that eliminates having to store and supply fuel. However, strict control is required to prevent abuses and pilferage.

- ◆ Vehicles should only be supplied with fuel and oil upon presentation of coupons or purchase orders signed by the authorized person and bearing the seal of the organization. There must be a previous agreement with the gas station about the characteristics of the document. This will be equally useful when it is time to pay the supplier, since only the amounts indicated in the official coupons will have to be paid.
- ◆ The vehicles' fuel and oil consumption must be recorded in their log, indicating the date, time, and mileage at each refueling.
- ◆ The logs should be checked every so often by the person in charge of the fleet, who should look into any anomaly in consumption levels that might indicate mechanical problems or inappropriate use.

Fuel Consumption/Mileage Form

| Refuel date | Mileage | Quantity and type of fuel | Average consumption (Km/liter) |
|-------------|---------|---------------------------|--------------------------------|
| | | | |
| | | | |
| | | | |

Table 10.4 shows examples of average fuel consumption for different types of vehicles. These averages are only for reference, since they can vary depending on the characteristics of the route, the load, the speed, and other factors.

Table 10.4. Average fuel consumption per 100 km³²

| Gasoline Engine | | Diesel Engine | |
|-----------------|--------------|--------------------------------|--------------|
| Sedan | 8-12 liters | Simple pickup | 10-13 liters |
| Pickup | 14-17 liters | 4x4 Pickup | 13-16 liters |
| Land Cruiser | 21-27 liters | Land Cruiser | 14-17 liters |
| Minibus | 15-18 liters | Small truck (3.5 to 8 tons) | 18-28 liters |
| | | Large truck | 35-50 liters |

Transporting Supplies

When a consignment is on the road, it must be protected against damage, the weather, theft, and other eventualities. Applying basic, standardized security measures such as those listed below can guarantee that the goods will arrive at their destination safely.

- ◆ Vehicles should never be loaded beyond their payload capacity. Not only that—when the route is full of potholes, tight curves or other dangers, it is better to apply the safe load concept, i.e., less than the maximum load, to make sure the vehicles are more maneuverable in difficult terrain.
- ◆ In an open vehicle the payload must be covered with plastic or canvas to protect it from dust and rain, and also to keep from view the items that are being transported.
- ◆ The load should be fastened with ropes to prevent its movement, which might damage the packages or bales or destabilize the vehicle.

32 Taken United Nations High Commissioner for Refugees, *Supplies and Food Aid Handbook* (Geneva: UNHCR, 1989).

- ◆ When carrying items that are longer than the bed of the vehicle, such as iron rods, timber, or pipes, the protruding segment has to be marked with a red handkerchief or flag that can be seen clearly by other drivers.
- ◆ Ideally, vehicles should travel with a seal on their cargo doors, which must not be opened except by the recipient of the load. However, many vehicles do not have cargo doors. In those cases, it is essential before the journey begins to discuss with the driver the security measures that must be taken and his or her responsibility for the supplies. The same situation applies if vehicles must remain loaded while parked overnight.

The Transport of Hazardous Materials³³

When transporting hazardous materials, it is crucial to apply to the letter the HAZMAT guidelines for each product. Moreover, some basic measures need to be applied to guarantee the safety of the staff.

- ◆ Hazardous materials must be transported separately from products meant for human consumption.
- ◆ The packages carrying this type of material must be labeled properly, and the vehicle must carry a placard that meets international standards for the transportation of hazardous materials (see Annex 5.1 at the end of Chapter 5). Moreover, the driver must be aware of what to do in the event of an accident or spill.
- ◆ In any case, when transported by commercial carriers, hazardous materials must by law be identified as such so the firm can carry out the necessary safety procedures (see Annex 7.3, Chapter 7).
- ◆ It is necessary to verify the compatibility of chemical products that may be shipped together, to prevent a reaction during the trip.
- ◆ As an added security norm, fuel—particularly gasoline, kerosene, and other highly flammable substances—must be transported in non-metallic containers. If there is no other option, metal drums or other metal containers should be transported on pallets or any other surface so that they do not touch the metal floor or deck, and

33 See Chapter 5, section on Hazardous Materials.

padded or otherwise prevented from coming in contact with each other or metal walls, in order to prevent friction that might lead to combustion.

- ◆ Drums and other containers of hazardous materials must be thoroughly inspected before they are transported anywhere, to locate and prevent any leaks.
- ◆ Aircraft—both airplanes and helicopters—are often banned from carrying fuels as cargo, regardless of how they are stored. Restrictions also apply to the transportation of chemical products.
- ◆ Aircraft will often transport equipment such as electric generators, water pumps, or outboard motors only when they are brand new, since fuel residues in the fuel tank can be risky during flight. Sometimes they will agree to transport used equipment, but only if their fuel tanks are completely empty and have been washed thoroughly.

Convoys or Caravans

The term convoy or caravan applies to a group of vehicles traveling together, for the sake of convenience or safety, towards the same destination. Although it is preferable to avoid convoys, because individual vehicles can move faster and organizing a caravan takes time and a great deal of planning, they make sense when long distances or dangerous conditions—desert routes, inclement weather, hazardous mountain passes, the presence of armed bandits or rebels—make it necessary for vehicles to travel in a group.

In certain cases different organizations combine efforts and use caravans to transport assistance to the operation zone.

Basic Safety Measures³⁴

Emergency operations are carried out in conditions that are, by definition, abnormal. Certain roads may have been destroyed or are in very bad condition, armed groups may hinder freedom of movement, or the

34 On safety aspects of relief missions in conflict zones, a good resource is *Staying Alive* by David Lloyd Roberts (ICRC, Geneva, 1999).

social or political situation may be risky. It is therefore essential to reinforce all security and protection measures.

Given the complexity of an operation of this type, moreover, certain basic norms must be followed to ensure that humanitarian assistance gets to its destination safely. The following measures apply not only to convoys but also to individual vehicles:

- ◆ The vehicles used in the operation must be in optimum mechanical condition, and be checked thoroughly before departure; verify that they have received maintenance recently;
- ◆ For security reasons, it is best to travel during daylight hours;
- ◆ Convoys must travel under the authority of someone capable of enforcing discipline and making decisions in the event of a problem—mechanical failures, accidents, or security risks. The person in charge must be known by everyone participating in the convoy. When a caravan is made up of several organizations traveling together, they must coordinate in advance all aspects related to authority and decision-making during the journey;
- ◆ Safety norms must be established in advance and understood by all the people involved in the operation, to ensure the security of the staff and the supplies. The following are a few examples:
 - ▲ Standards of behavior;
 - ▲ Maximum traveling speed;
 - ▲ Care and safety of the supplies;
 - ▲ Itinerary, including rest stops;
 - ▲ Relations with the authorities on the road.
- ◆ Although military escorts may seem like a good idea, it is important to weigh their pros and cons. In situations of armed conflict, for instance, being escorted by an armed contingent may generate distrust about the neutrality of the relief operation, or even turn a convoy into a military objective;
- ◆ Similarly, it may not always be wise to display the logo or name of the organization on the vehicles, since this might make them a target.

- ◆ The vehicles in the convoy must have some way of communicating among themselves as well as with the departure and destination points;
- ◆ People's ID cards, vehicles' registration papers, and the consignment's shipping documents must be in order and on board during the journey. Drivers must carry a copy of the load manifest and an official authorization from the organization to transport these goods should they be required by authorities along the route;
- ◆ When a national frontier must be crossed, arrangements must be made in advance with the authorities of the countries involved to facilitate the crossing. Drivers and accompanying staff must be chosen carefully to ensure that no one will be turned around or face hazardous conditions in the destination country due to racial, ethnic, or nationalist conflicts;
- ◆ When the route chosen involves going through restricted areas, it is important to obtain in advance the authorization of the authorities in charge of those areas, as well as guarantees of safe passage;
- ◆ When it is people who are being evacuated or transported, it is important for a medical team to accompany the convoy. The team should carry basic equipment to deal with essential health care needs along the way. Water, food, and other basic supplies for ensuring people's welfare must be carried in the same vehicles, and the quantity of these supplies must be based not only on the expected itinerary, but on the possibility that a delay or breakdown should happen en route;
- ◆ Any convoy or individual vehicle must carry basic mechanical and other tools to deal with any problems on the way, as well as personal survival items such as first-aid kits, water, blankets, and food;
- ◆ If the caravan includes vehicles that carry hazardous materials, such as fuel, these must travel at the back of the convoy;
- ◆ At least one small vehicle capable of moving quickly up and down the line toward the convoy's head and rear should form part of the caravan, to help the other vehicles keep pace and remain close to each other and convey any messages in the event of a breakdown in the communications equipment;

- ◆ It is highly desirable for convoys to include support personnel, such as medical personnel, and capable mechanics.

Selecting the Route

Selecting the route to be taken depends on the kind of transport available, the urgency of the delivery, and the delivery schedule (i.e., whether partial deliveries must be made at intermediate points). Following are factors to consider when selecting the route:

- ◆ As a general principle, the safest route must be chosen even if it is not the fastest or shortest one. Many variables may influence this decision, and they should all be discussed and considered as possible scenarios;
- ◆ When deciding on the route to be taken, it is important to identify key services along the way, such as places where one may obtain fuel, food, mechanical repairs or medical care;
- ◆ It is also important to identify potentially insecure segments of the route, such as roads in bad condition, landslide-prone areas, or sectors where bandits or other armed irregulars are known to operate;
- ◆ Any change or deviation from the agreed-upon route, as well as any other special situation that may arise during the trip, must be communicated immediately to the nearest base, whether it is the point of departure, the delivery point, or a base in between.

Management of Air Operations

At times, an organization may have to hire an airplane, or several, to deliver the supplies. At other times, the large number of consignments arriving by air demands that a coordination plan be drawn concerning aircraft landings and the reception and offloading of the supplies at the airport or landing strip.

These tasks require a great deal of preparation. One person must be assigned to handle this work specifically, preferably someone with experience in logistics.

The routes and departure times of charter flights are different from those of commercial airlines, since they are determined by the customer in coordination with the airline company. At other times, it is government aircraft, generally part of the armed forces, that collaborate with the relief effort. Regardless of the carrier, some basic measures should be taken to make optimum use of air transport:

- ◆ The landing site should ideally be an airport, or at least an airstrip, but this is not always possible. If there is no airport, a good place for landing must be identified and used. The length and width of the improvised airstrip depends on the type of plane that must land and take off from the site. Ground conditions should be checked, and repairs or changes must be made to the strip to ensure safe landings;
- ◆ All available information about the characteristics of the landing site (length, width of the runway, the material with which it is paved, its orientation and location), as well as available services (lighting, refueling possibilities) and other important details such as the local weather report or safety information, must be conveyed to those in charge of the aircraft;
- ◆ When using an airport or landing strip, it is indispensable to coordinate with the authorities in charge of the facilities in order to secure access to the various working areas, determine what those areas are, and obtain all other information necessary to manage the operation successfully;
- ◆ All formalities required for landing must be negotiated in advance with local officials, if there are any. It is also necessary to establish what kind of equipment and support will be needed on the ground for landing and offloading the supplies. The question of refueling is significant, since airplane fuel and pumping equipment may not be available at the destination site;
- ◆ The date and estimated time of arrival must be defined clearly in advance. To prevent confusion between a.m. and p.m., it is more convenient to use a 24-hour cycle, so that 1 p.m. is 1300 hours; 2 p.m., 1400 hours, and so on. For flights coming in from a different time zone, it is essential to establish whether arrival time is local time or some other time;

- ◆ The person in charge of the operation, or his or her deputy, must be at the landing site at least one hour before arrival, to check conditions on the ground and remove any obstacles—people, livestock, objects on the runway—that may affect the safety of the landing.
- ◆ It is vitally important to establish a coordination center where flight schedules and routes are defined each day. The center must be manned, at the very least, by the person responsible for air operations, a pilot or representative of the airline, and whoever is in charge of coordinating the relief operation.

Annexes 10.2 and 10.3 describe the main characteristics of various kind of aircraft.

Annex 10.1

Overland Transport Capacities³⁵

| <i>Means of transport</i> | <i>Load capacity</i> |
|-----------------------------------|----------------------------|
| Standard railway car | 30 MT (52 m ³) |
| Standard container 20 feet/6.1 m | 18 MT (30 m ³) |
| 40 feet/12.2 m | 26 MT (65 m ³) |
| Long truck with trailer | 22 MT |
| Long articulated truck | 30 MT |
| Medium-sized truck | 6-8 MT |
| Pickup (4x4) | 1 MT |
| People | |
| Load on head or shoulders | 20-35 kg |
| Load on back | 35-70 kg |
| Pack animals | |
| Camel | 200-300 kg |
| Ass | 50-120 kg |
| Horse | 100-150 kg |
| Carts (pulled by a single animal) | |
| Ass | 200-400 kg |
| Horse | Up to 1,200 kg |
| Ox | 500- 1,000 kg |

Note: MT=metric tons.

These examples are merely illustrative since, in the field, terrain variables including road conditions may affect the safe load capacity of a vehicle; for security reasons, often vehicles may not be loaded up to their maximum capacity.

³⁵ Adapted from United Nations High Commissioner for Refugees, *Handbook for Emergencies* (UNHCR, Geneva, 1988) and J. Davis and R. Lambert, *Engineering in Emergencies* (Intermediate Technology Publication Ltd., London, 1995).

Annex 10.2

Characteristics of different types of aircraft³⁶

| Model | Fuel | Required runway length (meters) | Cargo weight (metric tons) | Cargo volume (cubic meters) |
|------------------------|-------|---------------------------------|----------------------------|-----------------------------|
| Antonov-124 | Jet | 3040 m | 135.90 MT | 840 m ³ |
| B 377/C97 | AvGas | 1520 m | 14.50 MT | N/a |
| B 707-320C | Jet | 2432 m | 36.24 MT | 168 m ³ |
| B-727-100 | Jet | 2128 m | 15.86 MT | 227 m ³ |
| B-727-200 | Jet | 2523 m | 24.92 MT | 227 m ³ |
| B-747-100 | Jet | 2858 m | 101.02 MT | 581 m ³ |
| B-747-200 | Jet | 3253 m | 103.74 MT | 621 m ³ |
| Beach 18 | AvGas | 547 m | 1.13 MT | 8 m ³ |
| Beach 99 | Jet | 532 m | 2.27 MT | N/a |
| C-130 | Jet | 912 m | 11.32 MT | 56 m ³ |
| C-141B | Jet | 1915 m | 18.12 MT | 126 m ³ |
| C-17 | Jet | 1368 m | 40.77 MT | 585 m ³ |
| C-46 | AvGas | 912 m | 5.44 MT | 93 m ³ |
| C-5 | Jet | 2341 m | 58.90 MT | 364 m ³ |
| Caravan | Jet | 578 m | 1.13 MT | 9.5 m ³ |
| Casa C-212 | Jet | 760 m | 1.81 MT | N/a |
| Cessna 185 | AvGas | 426 m | 0.41 MT | N/a |
| Cessna 206 | AvGas | 456 m | 0.50 MT | N/a |
| Cessna 207 | AvGas | 578 m | 0.54 MT | 10m ³ |
| Cessna 340A (Propjet) | Jet | 760 m | N/a | N/a |
| Cessna 414 | Jet | 730 m | N/a | N/a |
| Cessna 421-C (Propjet) | Jet | 730 m | N/a | N/a |
| Dash 7 | Jet | 669 m | 5.12 MT | 59 m ³ |
| Dash 8 | Jet | 821 m | 3.85 MT | 39 m ³ |
| DC-8 51 F | Jet | 2432 m | 27.63 MT | N/a |
| DC-8 54 F | Jet | 2432 m | 43.40 MT | N/a |
| DC-8 55 F | Jet | 2432 m | 43.94 MT | N/a |
| DC-8 61 F | Jet | 2432 m | 37.60 MT | N/a |

³⁶ Adapted from Field Operations Guide For Disaster Assessments and Response. U.S. Agency for International Development. Office of U.S. Foreign Disaster Assistance (OFDA/USAID).

| Model | Fuel | Required runway length (meters) | Cargo weight (metric tons) | Cargo volume (cubic meters) |
|--------------------------------|-------|---------------------------------|----------------------------|-----------------------------|
| DC-8 63 F | Jet | 2432 m | 42.58 MT | N/a |
| DC-8 70 F | Jet | 2432 m | 38.50 MT | N/a |
| DC-8 73 F | Jet | 2432 m | 46.21 MT | N/a |
| DC-9 | Jet | 2128 m | 15.86 MT | 126 m ³ |
| DHC-6 Otter (Propjet) | Jet | 578 m | 1.59 MT | 14 m ³ |
| F-27 (Propjet) | Jet | 1824 m | 3.40 MT | 56 m ³ |
| F-28 (Propjet) | Jet | 1580 m | 6.80 MT | 95 m ³ |
| Helio Courier | AvGas | 186 m | 0.54 MT | 4 m ³ |
| Ilyushin 76 | Jet | 853 m | 3.40 MT | 232 m ³ |
| L-100-10 Hercules (Commercial) | Jet | 1307 m | 11.33 MT | 126 m ³ |
| L-100-20 Hercules (Commercial) | Jet | 1368 m | 16.76 MT | 148 m ³ |
| L-100-30 Hercules (Commercial) | Jet | 1307 m | 18.12 MT | 170 m ³ |
| L-188 Electra (Propjet) | Jet | 1824 m | 14.50 MT | 104 m ³ |
| L-55 Learjet | Jet | 1368 m | N/a | N/a |
| Skyvan | Jet | 456 m | 1.58 MT | 22 m ³ |
| Transall C-160 | Jet | 1003 m | 16.76 MT | 137 m ³ |
| Turbo Porter | Jet | 189 m | 0.63 MT | 4 m ³ |
| Westwind I 124 | Jet | 1490 m | 0.54MT | N/a |

Annex 10.3

Characteristics of Different Types of Helicopters³⁷

| Model | Fuel | Internal load (Kg) | External load (Kg) | No. of passengers |
|---------------------|-------|-----------------------|-----------------------|----------------------|
| B 204 | Jet | 970 kg | 1,156 kg | 10 |
| B 205 | Jet | 970 kg | 1,156 kg | 14 |
| B 206B | Jet | 284 kg | 339 kg | 4 |
| B 206 L | Jet | 362 kg | 362 kg | 4 |
| B 212 | Jet | 970 kg | 1,156 kg | 14 |
| B 214 | Jet | 1,119 kg | 2,611 kg | 12 |
| A Star | Jet | 410 kg | 522 kg | 5 |
| Allouette II SA318C | Jet | 336 kg | 485 kg | 4 |
| Allouette III | Jet | 522 kg | 597 kg | 6 |
| Hughes 500C | Jet | 261 kg | 336 kg | 4 |
| Hughes 500 D | Jet | 261 kg | 336 kg | 4 |
| LAMA SA 315B | Jet | 522 kg | 522 kg | 4 |
| BV-107 | Jet | 2,611 kg | 3,357 kg | Cargo only |
| BV-234 | Jet | 8,393 kg | 8,393 kg | 44 |
| Hiller FH 1100 | Jet | 261 kg | 336 kg | 4 |
| Bell G-47 | AvGas | 298 kg | 373 kg | 2 |

³⁷ Ibid.

Chapter 11

Distribution

The main objective of humanitarian logistics is to provide assistance to the people affected by a disaster or to organizations managing the disaster response. Delivery of assistance must be proportionate to needs, equitable and controlled to avoid abuse and waste.

Key Principles

Distribution cannot be generalized and indiscriminate. On the contrary, it must be proportional and controlled. While every organization has its own policies and motivations for providing assistance to disaster victims, certain criteria must transcend the individuality of the organization and be applied at all times to produce a more equitable and effective distribution.

1. Political or religious beliefs, ethnicity, nationality, or any other form of negative discrimination cannot be criteria for determining the eligibility of the potential beneficiaries of humanitarian assistance.
2. During the most active phase of the emergency, it is imperative to distribute those goods and items that are strictly necessary to cover immediate survival needs or to improve the living conditions of the affected population.
3. Assistance should be delivered only to those who truly need it, in direct proportion to their needs.
4. Humanitarian assistance aims to support people in a situation in which their ability to satisfy their own needs has been suddenly curtailed, so it must cover the most critical needs immediately.
5. Humanitarian assistance cannot resolve a population's entire problems. However, it can support them in finding solutions to their most pressing difficulties, complementing the efforts made by the disaster victims themselves.
6. Humanitarian assistance must be relevant, appropriate, and adapted to local customs and environmental conditions.

7. Humanitarian aid must be temporary. Long-term assistance generates dependency on outside aid and fails to stimulate the economic recovery of the affected area. Even in the case of displaced populations, who will need support for a longer period, the type of aid provided must promote self-sufficiency and a prompt return to normalcy.

Responsibilities and Criteria for Distribution

The distribution of humanitarian assistance is a highly complex activity that demands a great deal of expertise. A poorly run operation can have a negative impact on the very population it is meant to serve. Before engaging in the distribution of relief assistance, it is important to have a clear picture of the responsibilities it entails and the criteria that must govern the distribution of assistance, to ensure that it will bring about a positive change in the living conditions of the affected population.

Criteria

The distribution of humanitarian assistance should never take place until the capacity to meet the organizational requirements demanded by such an operation is in place. The criteria for selecting the beneficiaries, as well as the distribution procedures and methods, must be defined in advance in as much detail as possible.

To the extent possible, we should stick to our organization's "specialty": that which it does best. This discourages us from engaging in activities in which we have no experience, or improvising actions different from those we set out to do.

One must bear in mind as well that, given the evolution of the emergency, initial criteria may need to be revised and adapted to new circumstances. Even so, any change in the intervention strategy must reflect the reality on the ground and be the result of a thorough assessment of how best to contribute to the overall relief effort.

Responsibilities

As already noted, the purpose of humanitarian assistance is to have a positive impact on the survival and living conditions of the affected population. It is therefore the responsibility of disaster managers to make sure all efforts are directed at those goals.

In conditions of scarcity, or in certain political or military contexts, access to humanitarian supplies is central in the struggle for power and control. Politicians and other interested stakeholders will often try to control distribution in order to improve their public image or benefit certain constituencies to the exclusion of others.

Certain groups or individuals may claim to speak for the affected population, and try to usurp the assistance. At the same time, other groups, due to their isolation or for cultural reasons, may experience greater difficulty in reaching the distribution centers, or even finding out that they exist. Such cases must be monitored to prevent exclusion.

Equity in distribution and protection of humanitarian supplies are key responsibilities in ensuring that the assistance is not managed unscrupulously for political or financial gain.

Distribution Systems

Situation of the Disaster Victims

Whenever possible, assistance should be delivered directly to the intended beneficiaries or through reliable intermediaries chosen especially for this task. The distribution system to be adopted depends on the specific conditions of the population in need, as well as the capacity of an organization to handle the distribution.

The state of the affected population tends to vary depending on the type of disaster and the social, geographical, and political context. In fact, in the same theater of operations different situations may arise. Very broadly, these situations include the following:

- ◆ Disaster victims who have suffered damage to their homes and properties but who still live there or in the near vicinity;

- ◆ Disaster victims who due to the severe damage to their community, have had to be sheltered temporarily away from their normal place of residence;
- ◆ People displaced from their communities (generally as a result of violence) and whose return is in doubt;
- ◆ Refugees who have fled their own country out of fear for their safety or their life. The term "refugee" is officially applied only to those who have been recognized as such by the UN High Commissioner for Refugees (UNHCR). However, this does not mean aid should not be given to them before official recognition takes place, since their most basic needs cannot be postponed. What it does mean is that assistance will eventually have to be coordinated by the UNHCR.

Direct Distribution

Engaging in direct distribution requires a good working knowledge of the affected population and the physical and social environment. It also calls for logistical, administrative, and infrastructural capabilities. Direct distribution can provide greater control over the use of donations. However, it can prove extremely challenging if there is a lack of experienced personnel or the capabilities mentioned are not available. Some important factors affecting the success of direct distribution are the following:

- ◆ When distribution takes place in an unfamiliar area, it is important to identify people who know the region well and the community, who can provide guidance and contacts, and who can facilitate access to the community. However, one must be careful not to fall into the hands of individuals who may wish to manipulate the aid for personal advantage, or to benefit a particular group instead of the general population;
- ◆ It is also important to identify community leaders and organizations that are representative of the affected population and who can help coordinate the relief efforts. Care must be taken, nevertheless, not to lose autonomy or control over the emergency supplies;
- ◆ Identifying the pressure groups within the affected population, the

local dynamics of rivalries and alliances, assists in foreseeing possible tensions and conflict scenarios in order to take measures to prevent or bypass them;

- ◆ A system must be implemented for recording and identifying aid beneficiaries. When distribution of humanitarian supplies is first carried out, beneficiaries must receive a document to keep track of future deliveries. Most organizations use coupons, ration cards, or vouchers containing information about the beneficiaries and all assistance given to date. These documents should be presented every time aid is distributed (see Annex 11.1);
- ◆ A visible mark (a stamp, signature, or fingerprint) must be made on the distribution document to certify that the delivery has been made, and to prevent "second helpings;"
- ◆ It is better to register families rather than individuals. The number and age group of household members must be recorded, so that assistance can be provided in an equitable and proportional manner. It is also important to record the special needs of household members, particularly those belonging to vulnerable groups such as children, the elderly, pregnant women, or people with particular ailments or handicaps (see Annex 11.1);
- ◆ Beneficiaries must be treated equitably. Every effort must be made to prevent exceptions, preferential treatment, or nepotism. Such behavior can only lead to conflicts, undermine an organization's standards, and even threaten security;
- ◆ Delivery procedures should not be changed frequently. It confuses the beneficiaries and can reduce the effectiveness of the distribution system;
- ◆ The organization must take steps to prevent the exclusion of people who qualify as beneficiaries but who, for whatever reasons, do not have easy access to distribution points;
- ◆ Distribution areas must be identified with signs or placards, and its perimeters secured, to prevent crowding or the direct contact of the affected population with the supplies;
- ◆ Beneficiaries must be briefed—as often as required—on the distribu-

tion system to be used, including such procedures as standing in line, taking a number, specific daily or weekly delivery times, or the use of loudspeakers;

- ◆ It is important to assign responsibilities to the beneficiaries themselves in tasks related to the distribution of the aid—such as helping with the offloading or carrying of supplies, organizing the queues, or building distribution sites. Sometimes it will be necessary to ask local people, particularly local leaders, to help organize the deliveries, for instance by acting as interpreters or providing advice on how to adapt the distribution process to local or ethnic customs.

Indirect Distribution

When working in unfamiliar places, it is difficult for an organization to distribute supplies properly and fairly in the short time available. In some cases, the operative functions of an organization do not include handling direct distribution. In these circumstances, it is important to find a local, trustworthy counterpart that knows the population and the place, and can handle distribution.

When this approach is used, the distribution of the goods to their recipients must be carefully monitored to ensure fairness and proportionality. Another drawback is that it diminishes the visibility of an organization, something that may be undesirable. If such a course is, nevertheless, chosen, the following should be done:

- ◆ Identify a reliable counterpart with strong contacts on the ground, such as community groups, nongovernmental organizations, local institutions, or neighborhood committees;
- ◆ Avoid organizations that are in conflict with the community or other groups, as well as organizations openly associated with a political party or armed faction. In any case, one should not maintain exclusive relations with any particular group, but aim for a balanced relationship with all relevant organizations to prevent a perception of partiality and to avoid placing the operation in jeopardy;
- ◆ Before anything else, come to an agreement with the counterparts concerning the distribution procedures to be used and the control

and monitoring mechanisms, including any reporting obligations by the counterpart;

- ◆ Remain in close contact with your counterparts, follow up on their actions, get their feedback, and keep a presence on the ground to support their efforts and ensure that distribution follows the agreed principles and standards;
- ◆ Conduct periodic physical and documentary reviews of the supplies that have been distributed and the remaining stocks, and monitor the distribution activities of the counterparts in the field.

Monitoring and Control³⁸

Organizations must ensure that the humanitarian assistance reaches the victims of the disaster, instead of ending up in the wrong hands. Monitoring and control mechanisms must be in place at every stage of the handling of emergency supplies, especially during their distribution.

Documentary Control and Monitoring

Documentation for the arrival of loads at the storage centers, dispatch of supplies from these centers and distribution of supplies should be consistent. Any discrepancies should be immediately investigated.

People in charge of distribution must be made fully aware of the importance of always using the agreed-upon forms (see Annex 11.1). Otherwise, it will not be possible to keep track of the supplies.

At the end of every day, the people in charge of distribution must prepare a report. If there is a warehouse at the distribution center, its inventories must always be kept up to date.

In the case of indirect distribution, the counterparts must always present clear reports on the use of the resources entrusted to them in serving the affected population. It is the responsibility of the organization facilitating those resources to provide the appropriate forms for those reports and ensure that the reports are produced on schedule.

38 See also Chapter 8.

Physical Control and Monitoring

Examining the documents is not enough. It must be complemented with frequent physical reviews at the distribution sites. The purpose is not only to make sure that the books balance, but also to determine whether the procedures employed are the right ones, to identify needs, and to correct any problems that may arise.

Annex 11.1

Sample Beneficiaries Record

| RECORD OF BENEFICIARY FAMILIES | | | | |
|--|--------------------------|-----|-----|---------------|
| Card # | Date and place of record | | | |
| Assigned distribution point / center: | | | | |
| Information about the family | | | | |
| Name | Relationship | Age | Sex | Special needs |
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |
| 11. | | | | |
| 12. | | | | |
| 13. | | | | |
| 14. | | | | |
| Current location of the family: | | | | |
| Explanation of special needs of some members of the family (pregnant women, breast-feeding women, nutritional complement, etc.): | | | | |
| Name and signature of head of household | | | | |

SAMPLE - DISTRIBUTION CARD (reverse of the RECORD OF BENEFICIARY FAMILIES)

ASSISTANCE DISTRIBUTION CARD

Distribution place and date:

Products and quantities received

Beneficiary's signature

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Distribution place and date:

Products and quantities received

Beneficiary's signature

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Distribution place and date:

Products and quantities received

Beneficiary's signature

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Distribution place and date:

Products and quantities received

Beneficiary's signature

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Distribution place and date:

Products and quantities received

Beneficiary's signature

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Annex 11.2

Table for estimating required food quantities

| Daily average ration (grams) | Days | Total consumption per person during the period (kg) | Total required quantity (in metric tons) | | | | | | Quantity of people who can be fed with: | | | |
|------------------------------|------|---|--|------------------|------------------|------------------|-------------------|--------------|---|-----------------|-----------------|--|
| | | | For 500 people | For 1,000 people | For 2,000 people | For 5,000 people | For 10,000 people | 1 metric ton | 50 metric tons | 100 metric tons | 200 metric tons | |
| 10 | 90 | 0.9 | 0.45 | 0.9 | 1.8 | 4.5 | 9.0 | 1,111 | 55,560 | 111,110 | 222,220 | |
| | 120 | 1.2 | 0.6 | 1.2 | 2.4 | 6.0 | 12.0 | 833 | 41,670 | 83,330 | 166,670 | |
| 20 | 90 | 1.8 | 0.9 | 1.8 | 3.6 | 9.0 | 18.0 | 555 | 27,780 | 55,560 | 111,110 | |
| | 120 | 2.4 | 1.2 | 2.4 | 4.8 | 12.0 | 24.0 | 417 | 20,830 | 41,670 | 83,330 | |
| 30 | 90 | 2.7 | 1.35 | 2.7 | 5.4 | 13.5 | 27.0 | 307 | 18,520 | 37,040 | 74,070 | |
| | 120 | 3.6 | 1.8 | 3.6 | 7.2 | 18.0 | 36.0 | 278 | 13,890 | 27,780 | 55,560 | |
| 40 | 90 | 3.6 | 1.8 | 3.6 | 7.2 | 18.0 | 36.0 | 278 | 13,890 | 27,780 | 55,560 | |
| | 120 | 4.8 | 2.4 | 4.8 | 9.6 | 24.0 | 48.0 | 208 | 10,420 | 20,830 | 41,670 | |
| 50 | 90 | 4.5 | 2.25 | 4.5 | 9.0 | 22.5 | 45.0 | 222 | 11,110 | 22,220 | 44,440 | |
| | 120 | 6.0 | 3.0 | 6.0 | 12.0 | 30.0 | 60.0 | 167 | 8,330 | 16,670 | 33,330 | |
| 60 | 90 | 5.4 | 2.7 | 5.4 | 10.8 | 27.0 | 54.0 | 185 | 9,260 | 18,520 | 37,040 | |
| | 120 | 7.2 | 3.6 | 7.2 | 14.4 | 36.0 | 72.0 | 139 | 7,140 | 13,890 | 27,780 | |
| 80 | 90 | 7.2 | 3.6 | 7.2 | 14.4 | 36.0 | 72.0 | 139 | 7,140 | 13,890 | 27,780 | |
| | 120 | 9.6 | 4.8 | 9.6 | 19.2 | 48.0 | 96.0 | 104 | 5,210 | 10,420 | 20,830 | |
| 100 | 90 | 9.0 | 4.5 | 9.0 | 18.0 | 45.0 | 90.0 | 111 | 5,560 | 11,110 | 22,220 | |
| | 120 | 12.0 | 6.0 | 12.0 | 24.0 | 60.0 | 120.0 | 83 | 4,170 | 8,330 | 16,670 | |
| | 180 | 18.0 | 9.0 | 18.0 | 36.0 | 90.0 | 180.0 | 56 | 2,780 | 5,560 | 11,110 | |

Source: United Nations Children's Fund, *Assisting in Emergencies, A Resource Handbook for UNICEF Field Staff* (Geneva: UNICEF, 1986).

Table for estimating required food quantities (continued)

| Daily average ration (grams) | Days | Total consumption per person during the period (kg) | Total required quantity (in metric tons) | | | | | | Quantity of people who can be fed with: | | | |
|------------------------------|------|---|--|------------------|------------------|------------------|-------------------|--------------|---|-----------------|-----------------|--|
| | | | For 500 people | For 1,000 people | For 2,000 people | For 5,000 people | For 10,000 people | 1 metric ton | 50 metric tons | 100 metric tons | 200 metric tons | |
| 125 | 90 | 11.25 | 5.6 | 11.3 | 22.5 | 56.3 | 112.5 | 89 | 4,440 | 8,890 | 17,780 | |
| | 120 | 15.0 | 7.5 | 15.0 | 30.0 | 75.0 | 150.0 | 67 | 3,330 | 6,670 | 13,330 | |
| | 180 | 22.5 | 11.3 | 22.5 | 45.0 | 112.5 | 225.0 | 44 | 2,220 | 4,440 | 8,890 | |
| 150 | 90 | 13.5 | 6.75 | 13.5 | 27.0 | 67.5 | 135.0 | 7,474 | 2,700 | 7,410 | 14,810 | |
| | 120 | 18.0 | 9.0 | 18.0 | 36.0 | 90.0 | 180.0 | 5,656 | 3,780 | 5,560 | 11,110 | |
| | 180 | 27.0 | 13.5 | 27.0 | 54.0 | 135.0 | 270.0 | 3,737 | 1,850 | 3,700 | 7,410 | |

Chapter 12

*Managing Medical Supplies*³⁹

The term "medical supplies" applies to drugs and medical, dental, and laboratory products and equipment. In an emergency, drugs are a top priority: it is necessary to ensure that they are readily available, but also that they are used rationally.

Even in normal times, the health system must optimize the use of resources and make sure they are available to all who need them. When disaster strikes, the same supply procurement and distribution process must remain in place—and it must remain effective in more challenging circumstances, since it must adapt to both the urgency of the situation and the scarcity that often accompanies an emergency.

Drugs and other medical supplies must be selected, procured, stored, and distributed in such a way that the right supplies are available at the right time, that their quality and safety can be guaranteed, and that they are used correctly.

Selection

The objective of the selection process is to develop a list of basic and critical medical supplies to be provided to the affected population in a safe and effective manner.

Selection Committee: A medical supplies selection committee must be appointed, comprising a multidisciplinary team—doctors, nurses, pharmacists—who know the situation at the local level, including the needs of the affected population. Representatives of the ministry of health must also participate in the group.

Selection Criteria: The selection of medical supplies must take into account the health care needs of the affected population, the characteristics of the patients who require treatment, the availability of supplies, and the capacity of the health system to meet these requirements.

³⁹ This chapter was originally written by Dr. María Margarita Restrepo and partially modified to adapt it to the present needs. Dr. Restrepo teaches at the Faculty of Pharmaceutical Chemistry at the University of Antioquia in Medellín, Colombia. She also collaborates with FUNDESUMA and PAHO, with whom she has participated in several emergencies in the region as advisor on medical supply management.

Generally, the medical authorities of the various countries have a list of basic drugs and medical products. Should no such list exist, the one prepared by the World Health Organization (WHO) may be used.

It is also essential to establish the degree of competence required to define a group of drugs or a special therapeutic category, so that sound decisions are made.

Basic List: A basic list of medical supplies must be prepared to deal with the acute phase of the disaster and potential epidemics. To prepare this list, one should take into account the types of risks and the most common pathologies that occur in this kind of situation.

Table 12.1 presents an example of a basic list to respond to those health problems that occur in most disasters.

WHO has prepared standard lists of essential drugs and medical supplies (known as "emergency kits") for use in emergency situations. The purpose of these kits is to ensure the prompt and effective provision of those supplies needed to satisfy priority needs.⁴⁰

The standard kit consists of two parts: a basic unit and a supplementary unit.

The basic unit includes indispensable drugs and medical supplies and equipment for primary health care, and can be used by primary health care workers with limited training.

The supplementary unit contains drugs and medical supplies for 10,000 people, and can be managed only by professional physicians or health workers. The selection and quantification of drugs are based on the guidelines for treatment that have been prepared by WHO technical services.

40 World Health Organization (WHO), *The New Emergency Health Kit*. First Edition, (Geneva, 1990).

Table 12.1. Suggested basic drugs for emergency situations

| | |
|--|--|
| 1. Analgesics, antipyretics, non-steroid anti-inflammatory drugs | |
| Acetylsalicylic acid | Tab 500 mg |
| Ibuprofen | Tab 200, 400 mg |
| Paracetamol | Tab 500 mg, bottle 125 mg / 5 ml |
| Morphine hydrochloride | Injection 10 mg/ml |
| 2. Anti-allergic drugs | |
| Chlorpheniramine maleate | Tab 4 mg, inj 10 mg/ml |
| Dexamethasone phosphate | Inj 4 mg/ml |
| 3. Anti-infectives | |
| 3.1 Anthelmintic and antiparasitic drugs | |
| Albendazole | Tab 400 mg |
| Mebendazole | Tab 100 mg |
| Metronidazole | Tab 500 mg, inj 500 mg, suspension 200 mg/5 ml |
| 3.2 Antibacterial drugs | |
| Amoxicillin | Tab or capsule 500 mg, suspension powder 125 mg/5 ml |
| Penicillin sodium | Inj powder of 1 million UI, 5 million UI |
| Procaine penicillin | Inj powder 1 million UI |
| Cloxacillin sodium | Cap 500 mg, suspension powder 125 mg/5 ml, inj powder 500 mg |
| Chloramphenicol | Inj powder 1 g |
| Trimethoprim-sulfamethoxazole | Tab 80 mg + 400 mg, suspension 40 mg / 200 mg |
| 3.3 Antifungals | |
| Ketoconazole | Tab 200 mg, oral suspension 100 mg / 5 ml |
| Benzoic acid + salicylic acid | Tube 6% + 3 |
| 3.4 Antiseptics | |
| Chlorhexidine | Solution 5% |
| Polyvidone iodine | Solution 10% |
| 4. Respiratory tract, drugs acting on | |
| Salbutamol | Tab 4 mg, bottle 2 mg/ml |
| Theophylline | Tab 200 mg |
| 5. Oral Rehydration Salts | |

Programming Acquisitions

The process of programming acquisitions is aimed at having the necessary health supplies in the quantities required to care for the affected population at the right time, while guaranteeing the quality of the supplies.

In order to plan ahead and forecast the needs of the affected population, a close relationship must exist between the people in charge of supply management and the health workers in the field, by means of adequate exchange of information.

The quality of the supplies must be the chief criterion, independently of the providers, so it is vital to determine what supplies will be needed.

Estimating Needs

In order to anticipate the need for supplies, one must:

- ◆ Identify and clearly define what sources of supplies are available, since it is not wise to depend exclusively on foreign assistance;
- ◆ Carry out an epidemiological assessment to estimate the quantity of supplies needed, bearing in mind not only situations during the acute phase of the disaster but also the potential epidemics that may occur after that phase;
- ◆ Identify the affected population, including if possible its demographic composition, grouped mainly by age;
- ◆ Establish the frequency of each type of illness;
- ◆ Compare the uniform treatment standards for each of the morbidity patterns with the national list, if one exists. Should one not exist, health professionals must be consulted about the supplies needed to deal with each ailment.
- ◆ Estimating the needs can be done as follows: Necessary quantity = Frequency of morbidity x Quantity of supplies needed per treatment;⁴¹

41 Carmen Contreras and Carlos Moreno (Editors) *Gerencia y administración de sistemas de suministros de medicamentos esenciales* (Medellin, Colombia, COHAN, PAHO/WHO Collaborating Center; 1999).

- ◆ It is essential to check the stock report every day, including the donations that have arrived.

Types of Providers

Once the quantity of supplies needed has been estimated, it is necessary to identify and define the various sources of the supplies, including the following:

- ◆ **Local or national purchases:** Have an inventory of local providers and the quantities of the required drugs that they have available for immediate delivery;
- ◆ **International purchases:** International providers can facilitate these purchases, particularly not-for-profit organizations such as UNICEF or PAHO;
- ◆ **Donations:** Considering that this is one of the main sources of emergency supplies, and hence of medical supplies, this issue will be explored at length below.

Reception and Evaluation of Acquisitions

Reception is the process of comparing what was received with what was requested, verifying administrative specifications such as the quality of the items received. This procedure must be applied regardless of how and where the goods were acquired.

Donations

The drugs and other health supplies donated by foreign organizations or countries and local donors can be tailored to the specific needs of the affected population, or they can be the result of spontaneous solidarity. Regrettably, the latter case is the most frequent, which often creates more problems than solutions, including the following:

- ◆ Spontaneously donated supplies may not meet the needs of the affected population. Drugs, in particular, may not be therapeutically useful

for the types of morbidity prevalent in the emergency zone, or else may not match the level of care of the institution receiving them;

- ◆ In most cases, donated drugs may not be correctly classified. The labels may not meet the necessary specifications for identification, such as the international generic name for the drug, they may carry commercial names unknown in the recipient country, lack expiry dates, or be labeled in a language that is not understood locally;
- ◆ Sometimes donated quantities may surpass current needs, putting a strain on storage efforts;
- ◆ Quite often, the drugs received have already expired or suffered some form of decay that makes their consumption dangerous.⁴²

Criteria for Requesting and Receiving Donations

Since drugs are one of the main types of supplies required during an emergency, the World Health Organization (WHO) established a series of guidelines for drug donations, aimed at improving their quality and preventing the difficulties outlined above.

A group of international organizations have established a forum that also aims to set standards and create better conditions for requests and donations of this type of supply. Their Web site, <http://www.drugdonations.org>, includes a series of useful documents, such as guidelines for the correct disposal of drugs, conditions for requesting specialized medical equipment, and others. It is possible to subscribe to an electronic newsletter to get up-to-date information and news on the subject.

The WHO guidelines for drug donations⁴³ are based on four key principles:

1. The maximum benefit for the recipient: This implies that donations must be based on expressed needs, and donations that have not been requested should be avoided;
2. Respect for the wishes and authority of the recipient: Donations must conform with official policies and administrative regulations;
3. Identical standards of quality for all: If the quality of an article is unacceptable to the donor country, it is also unacceptable as a donation;

42 Ibid., p. 228.

43 WHO *Guidelines for Drug Donations*, (Geneva, May 1996).

4. Effective communication between donors and recipients: The chief goal is for donations not to be sent without prior notice.

Bearing in mind these four principles, the following are some of the guidelines donors should heed before sending any shipments.

Selection of Drugs

- ◆ All drug donations should be based on an expressed need and be relevant to the disease pattern in the recipient country;
- ◆ All donated drugs or their generic equivalents should be approved for use in the recipient country and appear on the national list of essential drugs, or, if a national list is not available, on the WHO list of essential drugs, unless specifically requested otherwise by the recipient country;
- ◆ The presentation, strength and formulation of donated drugs should, as much as possible, be similar to those commonly used in the recipient country.

Quality Assurance and Shelf-life

- ◆ All donated drugs should comply with the quality standards of both the donor nation and the recipient country;
- ◆ No drugs should be donated that have already been issued to patients and then returned to a pharmacy or elsewhere, or given to health professionals as free samples;
- ◆ After arrival in the recipient country, all donated drugs should have a remaining shelf-life of at least one year.

Presentation, Packing and Labelling

- ◆ All drugs should be labeled in a language that is easily understood by health professionals in the recipient country; the label on each individual container should contain:

- ▲ The International Nonproprietary Name (INN, or generic name);
 - ▲ Batch number;
 - ▲ Dosage;
 - ▲ Strength;
 - ▲ Name of the manufacturer;
 - ▲ Quantity in the container;
 - ▲ Storage conditions; and
 - ▲ Expiry date;
- ◆ To the extent possible, donated drugs should be presented in the largest quantity units available, as well as in hospital packs;
 - ◆ All drug donations should be packed in accordance with international shipping regulations, and be accompanied by a detailed packing list that specifies the contents of each numbered carton by INN, dosage form, quantity, batch number, expiry date, volume, weight, and any special storage conditions. Drugs should not be mixed with other supplies in the same package.

Information and Management

- ◆ Recipients should be informed of all drug donations that are being considered, prepared, or actually underway;
- ◆ The declared value of a drug donation should be based upon the wholesale price of its generic equivalent in the recipient country, or, if such information is not available, on the wholesale world-market price for its generic equivalent.

Storage Systems

The purpose of storage is to ensure that health supplies retain their quality and effectiveness by creating the necessary physical, hygienic and infrastructural conditions. Adequate storage conditions guarantee:

- ◆ The quality of the drugs until they are used;
- ◆ Their therapeutic effectiveness;
- ◆ The prevention of accelerated aging or decay.

The warehouse or other storage site must be well-ventilated and easily accessible and receive regular cleaning and maintenance.

Storage Areas

The place where supplies are stored should make it possible to separate drugs from other health supplies.

The drug storage area must be divided into several zones:

- ◆ A zone dedicated to storing drugs for immediate distribution, preferably on shelves and located close to the exit;
- ◆ A zone to locate full boxes of supplies;
- ◆ Another zone to store drugs that do not require priority distribution.

In each zone, the drugs should be organized by expiry date, placing the ones that will expire soonest nearer the front of the pile.

Boxes should be placed on platforms or pallets and not directly on the floor.

Storage Conditions⁴⁴

Drugs and medical supplies and equipment in general require much greater care than other types of supplies. Guidelines must be followed with the utmost rigor, and strict monitoring must be applied to ensure that the products are well conserved until they are needed. It is important to control the following environmental conditions under which the goods will be stored:

- ◆ **Light:** Many drugs are sensitive to light, or photosensitive, and spoil when exposed to excessive light; they must be kept away from direct sunlight and lamps.

44 Amariles, Pedro, et al., *Guía integral para el funcionamiento y mejoramiento de un servicio farmacéutico* (Medellín, 1999).

The packages in which drugs come have been designed to protect the drugs they carry. The type of package is taken into account when estimating the useful life of the drug: it must never be destroyed before drugs are distributed. On the contrary, efforts must be made to preserve the original package;

- ◆ **Humidity:** Another factor to control in drug storage areas is humidity. A highly humid environment can promote the growth of microorganisms such as fungi and bacteria, as well as precipitate chemical reactions such as the oxidation of the drug's components. Tablets may soften, as well;
- ◆ **Temperature:** Maintaining the right temperature is essential for the stability of the drugs. Every type of drug has a range of temperatures within which it can be stored without losing its properties. This temperature range should be indicated on the package; if it does not appear, the assumption is that the drug should be kept at room temperature, guarding against extremes of heat or cold.

The wrong temperature can have two main effects on drugs: loss of strength or chemical reactions that render them toxic.

Correct storage temperatures are the following:

- ▲ Room temperature: 15-30° C.
- ▲ Cool: 8-15° C.
- ▲ Refrigerated: 2-8° C.

Freezing (temperatures below 0° C) or temperatures above 30° C should be avoided, because they generally lead to loss of strength or of the physicochemical characteristics of the product.

Vaccines—indispensable for controlling epidemics in a disaster—require a strict control of the cold chain all the way from the point of acquisition to the place where they are administered to patients. Freezers or refrigerators are needed, as are thermometers to verify the internal temperature; should this equipment be unavailable at one or more links of the cold chain, insulated boxes are to be used with ice thermometers.⁴⁵ It is advisable to attach a form to the refrigerator door or the side of the cold box to record daily temperatures.

45 Gel packs now available on the market are more effective than ice. They do not melt, they are reusable, and they eliminate the problem caused by ice coming in direct contact with the medicines.

Controlling and Monitoring Products in the Storage Centers

- ◆ Stock levels. Keeping track of stock levels helps to determine whether any given item is oversupplied or becoming scarce. Drugs should be kept in storage for the shortest time possible, but the stock of a given product should never be allowed to reach zero while it is still required. Using a system of minimum and maximum stock levels might not be feasible when responding to a disaster, but during the recovery phase enough supplies must be at hand to cover all needs, which calls for estimating the level of stocks required to cover the affected population during that period.
- ◆ Stock level estimates. Estimating the stock levels needed to provide basic health care to the affected population calls for collecting data on morbidity, the number of people affected, the patterns of drug use, and the span of time during which the population will be cared for.
- ◆ Stock control. This process is directly linked with the acquisition process. It ensures that adequate quantities of necessary drugs are requested and are received. Effective stock control should ensure that stocked drugs do not spoil due to overlong storage or outlive their shelf life.
- ◆ Shelf-life control: It is important to monitor regularly the expiry dates of stored drugs and keep a record. Short-dated drugs should be distributed first. If any drugs are found to be past their expiry date, they should be discarded in a safe manner. Under no circumstances should an expired drug be administered, since it may be ineffective or harmful—unless a qualified professional can state otherwise.

Identifying Signs of Decay in Some Drugs

Certain physical signs can reveal loss of potency or decay in drugs, and people entrusted with managing drug stocks should be on the lookout for them. They include:

- ◆ Spots on tablets;
- ◆ Hardening or softening of capsules;

- ◆ Presence of non-dispersed particles in liquid;
- ◆ Opaque solutions;
- ◆ Changes in color;
- ◆ Presence of bubbles in liquid;
- ◆ Swollen or bulging containers.

Distribution

In disaster situations, distribution is one of the key steps in the management of health supplies. Its purpose is to ensure that medical supplies are quickly made available to the people who need them, preserving the quality of the supplies and preventing waste and the inappropriate use of resources.

For distribution to be carried out effectively, the various organizations receiving supplies must coordinate their efforts, particularly with government agencies responsible for health care, such as the ministry of health.⁴⁶

This calls for the development of an information system that records the number of people affected, the health problems that require care, current stocks in each of the warehouses or storage facilities, and the deliveries that have been made or are expected in the near future.

Supplies must be distributed based on the demand for them and on the existing stock. To ensure effective distribution, the following issues should be considered:

- ◆ A reliable transport system must be in place. The vehicles of the public health system or agencies such as the Red Cross can be used. Sometimes it may be possible to negotiate with suppliers delivery of the products directly to health care units or other sites where they are required;
- ◆ Delivery schedules must be based on identified needs, stock levels and consumption patterns, the transport system and the time and distance involved in making each delivery.

46 Management Sciences for Health, *The Supply of Drugs* (Boston, 1989).

Although an emergency situation is, by definition, exceptional, patients must still be provided with information about correct drug use. Patients taking medicines and persons prescribing them should be monitored.

Discarding Pharmaceutical Products

Discarding or destroying expired or ineffective drugs and other medical supplies, as well as those that have been damaged in transport, handling, or through deficient storage, entails a series of economic, social, environmental and logistical consequences. Annexes 12.1 and 12.2 summarize recommended methods for safely carrying out these tasks. These tables have been taken from a document that should be obligatory reading for all staff involved in the management of medical supplies: *Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies*.⁴⁷

47 The product of a joint effort by the World Health Organization (WHO), other UN agencies involved in the issue, and a group of international NGOs, this document can be found at <http://www.drugdonations.org/eng>, or by contacting Department of Essential Drugs and Other Medicines, World Health Organization (WHO), Avenue Appia 20, CH-1211 Geneva 27, Switzerland; Tel: 41 22 791 3528, Telefax: 41 22 791 4167.

Annex 12.1

Summary of Pharmaceutical Categories and Disposal Methods During and After an Emergency⁴⁸

| Category | Disposal methods | Comments |
|----------------------------------|--|---|
| Solids Semi-solids Powders | Landfill Waste encapsulation Waste inertization Medium and high temperature incineration (cement kiln incinerator) | No more than 1% of the daily municipal waste should be disposed of daily in an untreated form (non-immobilized) to a landfill. |
| Liquids | Sewer High temperature incineration (cement kiln incinerator) | Antineoplastics not to sewer. |
| Ampoules | Crush ampoules and flush diluted fluid to sewer | Antineoplastics not to sewer. |
| Anti-infective drugs | Waste encapsulation Waste inertization Medium and high temperature incineration (cement kiln incinerator) | Liquid antibiotics may be diluted with water, left to stand for several weeks and discharged to a sewer. |
| Antineoplastics | Return to donor or manufacturer Waste encapsulation Waste inertization Medium and high temperature incineration (cement kiln incinerator) (chemical decomposition) | Not to landfill unless encapsulated. Not to sewer. No medium temperature incineration. |
| Controlled drugs | Waste encapsulation Waste inertization Medium and high temperature incineration (cement kiln incinerator) | Not to landfill unless encapsulated. |
| Aerosol canisters | Landfill Waste encapsulation | Not to be burnt: may explode. |
| Disinfectants | Use To sewer or fast-flowing watercourse: small quantities of diluted disinfectants (max. 50 litres per day under supervision) | No undiluted disinfectants to sewers or water courses. Maximum 50 litres per day diluted to sewer or fast-flowing watercourse. No disinfectants at all to slow moving or stagnant watercourses. |
| PVC plastic, glass | Landfill | Not for burning in open containers. |
| Paper, cardboard | Recycle, burn, landfill | -- |

48 Based on WHO et al., *Guidelines for Safe Disposal of Unwanted Pharmaceuticals in and after Emergencies*. First Edition. Geneva, 1999.

Annex 12.2

*Disposal by Incineration*⁴⁹

“The European Union Directive on the incineration of hazardous waste (Ref. 12) states that:

‘All incineration plants shall be designed, equipped and operated in such a way that the gas resulting from the incineration of the hazardous waste is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions anticipated, to a temperature of at least 850°C, as achieved at or near the inner wall of the combustion chamber, for at least two seconds in the presence of at least 6% oxygen; if hazardous wastes with a content of more than 1% halogenated organic substances, expressed as chlorine, are incinerated, the temperature has to be raised to at least 1100°C.’

“Article 7 of the same Directive gives emission limit values for the exhaust gases from incineration plants. The values provided are to prevent emissions into the air giving rise to significant air pollution. In addition to temperature and residence time other operating conditions must also be followed to combust pharmaceuticals safely and efficiently (e.g. treatment and handling of ash).

“Studies by Pharmaciens Sans Frontières in 1996 in Mostar have shown that the donated pharmaceuticals, in mixed boxes, had a halogen weight content (i.e. the elements chlorine, fluorine, bromine, iodine, and the isotope astatine), of approximately 0.1% of the total weight including associated packaging. This is well below the 1% threshold given in the EU Directive. The very low halogen content reported for the donated pharmaceuticals indicates that the lower temperature of 850°C could be adopted for these types of pharmaceuticals.”

49 Extract from WHO et al., *Guidelines for Safe Disposal of Unwanted Pharmaceuticals in and after Emergencies, First Edition* (Geneva, 1999).

Chapter 13

Transparency and Information in Emergency Supply Management

Transparency

The actual use of emergency supplies—whether they reach the affected population or are wasted or diverted for profit or political advantage—sometimes raises suspicion among the public, and even among international donors. Instances of donation mismanagement feed this suspicion, although in many cases it is caused by lack of information regarding the final destination of the aid.

All organizations that intervene in relief efforts must embrace transparency in the handling of supplies, particularly when they have called on national and international solidarity to complement the resources available at the local level, turning these provisions into public goods.

Transparency requires the existence of reliable mechanisms to verify that the management of supplies at every stage is correct, fair, and effective and to keep donors informed about the results of their assistance. It is the best way to maintain confidence and open new doors for the resources we need to expand our actions and save more lives.

Information

Information about the supply management operation must be disseminated from the very start of the emergency, when needs are assessed and requests go out for national and international cooperation. Throughout the course of the operation, interim reports must be published about the supplies at hand and those that are needed. Disseminating such reports from an early stage prevents rumors of negligence or mismanagement.

In addition to the reports published by the mass media, it is important to consider the information that is shared directly in the field with the various stakeholders. Those responsible for supply management must be forthcoming in providing oral or written reports to local organizations, the affected population, and other actors.

Reports to Donors

Donors involved in humanitarian assistance—whether governments, large corporations, international organizations, or individuals—need, and wish, to remain informed of the final use to which their resources are put. They want to know whether these resources were used correctly and their contribution has been useful.

For their part, humanitarian organizations continue to rely to a considerable extent on the generosity of donors to cover the assistance needs of the people they serve, and they need to have some assurance that this assistance will be available for future interventions.

It is therefore essential for a reliable resource management system to be in place that can show clearly how the aid was handled and what its final destination was. In short, donors must be kept informed.

The first step is to send confirmation to the donors as soon as their contributions have arrived, whether in cash or kind. How the notification is effected depends, among other things, on the type and location of the donor. These are some of the possibilities:

- ◆ Notifying the local representative of the donor, whether an embassy, a country office, or a commercial subsidiary;
- ◆ Notifying the donor's headquarters directly, if it is possible to make contact;
- ◆ Many donations come from the public or small donors who may not be individually identifiable. The mass media must be used to issue general expressions of gratitude and report on donation figures and how the supplies are being used. Organizations with electronic media such as Web sites can use them to publish their donation reception and distribution reports.

Public Information

Public information can serve the most diverse needs, from promoting a particular attitude in the population to easing tensions caused by ignorance of the aid operations under way.

- ◆ The population must be kept informed about the types of supplies needed, and actively discouraged from sending unnecessary items. Reception points for donations must be identified, and any other facts must be made public that may help potential local donors and reduce the number of unwanted donations;
- ◆ Similarly, the affected population must be informed of the needs that are being met and the attendant details, such as when and where distribution is taking place, and who are the people or organizations responsible for the distribution, so that those in need of humanitarian aid can have access to it;
- ◆ The public needs to know about the types and quantities of supplies received and distributed, the operations underway, the results of these operations, and the challenges that remain. This makes it easier for the public to understand—and sometimes even provide support—when logistical complications make it difficult to complete particular relief efforts.

Reports must be succinct but thorough. Some thought must be given to the specific media outlets that can best reach the target audience, and to liaison efforts with media representatives in the field. A few examples of the most effective type of media in these circumstances are:

- ◆ Commercial broadcasters (radio and television);
- ◆ Community radio stations;
- ◆ Local newspapers and bulletins;
- ◆ Community mural newspapers displayed in places where community groups meet;
- ◆ Churches, neighborhood committees, local associations.

Relations with the Press

The media play a key role as watchdogs during an emergency, and they tend to focus on where the relief supply system fails rather than on where it succeeds. This tendency can be reversed by adopting an effective communication strategy towards the press, including abundant information,

press releases, press kits, and the like, so that the media end up as partners in getting important messages out. For instance, the mass media can be one of the most effective mechanisms for providing feedback to donors about the real needs on the ground and the importance of abstaining from sending unwanted donations.

Those in charge of supply management cannot wait until the media ask for reports. They must take the initiative by determining as soon as possible the content of the information that will be released, the way it will be presented (press releases, press conferences, interviews), how frequently they will be issued, which media outlets must be targeted, and who will act as official spokesman. In this way, the organization will be playing a proactive role in information dissemination, rather than letting journalists set the agenda.

It is advisable, even when information is provided orally—say at a press conference—for it to be presented also in print after careful verification of all the facts. Reports may be general, about the entire zone or region affected, or provide details of specific locations, depending on whether the media outlets targeted are local, national, or international.

Finally, public information should not be seen as an undesirable additional load, but as a tool that can benefit and facilitate relief efforts. Donors, media outlets, and the public can be the best allies when well informed and when operations are transparent and accountable.

Chapter 14

*Telecommunications*⁵⁰

Reliable communication among the various sectors that intervene in relief and aid activities, connecting the various places where these activities take place, is imperative for the success of any operation. The transmission of data, the exchange of information, the confirmation of supply movements, the request for new deliveries, and the safety of the teams on the ground—these are only a few of the needs that telecommunications can serve during logistical supply operations.

The first thing to consider is that telecommunications are governed by laws, codes, rules and procedures, both national and international, and that the use of radio frequencies is closely linked with issues of national sovereignty.

It is equally imperative to bear in mind that the information transmitted over telecommunication networks is often sensitive, confidential, or otherwise not suitable for indiscriminate dissemination. Therefore, the use of telecommunications equipment must be subject to appropriate procedures and strict guidelines for users.

The Communication Strategy

The communication network must link the various operation centers:

- ◆ The logistical operations coordination center;
- ◆ The distribution centers;
- ◆ The bases of operation in the field;

⁵⁰ The document by the United Nations Development Program, *Emergency Relief Items. Compendium of Generic Specifications* (UNDP, New York, October 1995), is highly recommended for those interested in this topic. The book includes a catalog of standardized equipment as well as technical advice on how to decide on the most appropriate equipment. Also recommended is the *ITU-D Handbook on Disaster Communications*, by the International Telecommunications Union (ITU). It describes the national and international organizational and regulatory frameworks of disaster communications and the technical operational procedures to be followed in such situations. It can be obtained as documents 2/167 and 2/168 at the following site: http://www.itu.int/ITU-D-StGrps/SGP_1998-2002/SG2/Documents/DocList.htm.

- ◆ Ports, airports, land borders, and any other place where supplies will be coming in or will be mobilized;
- ◆ Mobile and convoy units;
- ◆ Central and peripheral warehouses.

If international organizations are involved, moreover, contact must be guaranteed with the national body that coordinates emergency activities.

Similarly, deciding which telecommunications systems and equipment to use depends on several considerations, such as the following:

- ◆ The needs to be met must be carefully analyzed to determine what system will be used and what equipment will be required;
- ◆ The equipment must be well adapted to the characteristics and context of the area in which it will be put to use;
- ◆ The various types of equipment must be compatible. Think of an integrated communications network, not of individual solutions;
- ◆ An expert must analyze the context and equipment needs and supervise its installation and any training that may be required;
- ◆ The use of radio equipment and its respective frequencies requires permits from the national authorities.

Telecommunications Systems⁵¹

It is highly likely that the local telephone network in the affected area (if there is telephone service, which is not always the case) will be down depending on the type and intensity of the disaster, and restoring full service may be a matter of hours—or months. Similarly, the various types of communication systems cater to different needs and have different capabilities ranging from voice transmission to the exchange of text and graphics. For this reason, various options must be taken into account to maintain active communications.

51 Based on the section on telecommunications of the chapter on “Logistics” of the *Handbook for Delegates*, International Federation of Red Cross and Red Crescent Societies (IFRC), Geneva, 1997.

Telephone: As already noted, the telephone service may remain indefinitely affected; access may be very limited or unreliable, and in the worst case may not exist at all. This may also be true of mobile phones. However, when the service is available, it is a flexible and reliable solution;

Fax: Less and less used since the arrival of the Internet, electronic facsimile technology remains a low-cost option for sending text and low-grade graphical information as long as there is access to telephone lines;

Satellite Communications : An option that is quite expensive, although it is extremely reliable. The equipment itself may not be that costly, but connecting to the network is not cheap. At present, there is equipment that in addition to being reasonably portable can hook up to the Internet, making it possible to transmit graphical and other types of data as well;

Radio: It is perhaps the most flexible, dynamic, economic and widely used solution in the field. There are several options:

- ◆ **HF Radio:** High frequency, or short-wave, radio equipment makes it possible to communicate over short, medium or long distances, depending on the modulation. HF radio may be used for voice transmissions—the Single Side Band or SSB System—or for the transmission of text data (the PACTOR System—more on this below). The quality of the connection depends on the carrier wave, which varies with the time of day, the weather, sunspot activity, distance, and other factors.

Due to their high energy consumption, there are no HF walkie-talkies. However, it is possible to install HF radios in vehicles when mobility is important.

When working with SSB systems, two frequency bands are available: the Upper Side Band (USB) and the Lower Side Band (LSB).

- ◆ **VHF Radio:** Very high frequency (VHF) radio is used for local voice communication. Manual equipment (walkie-talkie) is available, but its coverage is limited to fairly short distances. Hence, a VHF network requires radio bases with fixed antennae, mobile radios in vehicles, and relay stations to link the various ground stations;
- ◆ **UHF Radio:** Ultra high frequency (UHF) radio is similar to VHF, but leads to better results in densely built urban areas;

- ◆ **VHF Relay Stations:** A relay station is essentially a radio set that serves as an automatic link between other radio equipment operating in the same frequencies. In fact, repeaters need two frequencies. They need to be placed on high ground so that their coverage is as broad as possible. It must also be borne in mind that technical failure of one relay station will leave the whole network out of service. Another aspect to bear in mind is the security of the relay equipment, since it must often be installed in isolated or remote places;
- ◆ **TOR:** The Telex-Over-Radio (TOR) system is used to transmit text over HF radio. It is quickly being replaced by PACTOR (PACKET TOR) technology, which employs the same data packet switching protocols developed for the Internet;
- ◆ **PACTOR:** PACTOR can be used to send text and other data over HF radio. It requires a PACTOR modem connected to the radio transceiver and a computer, either a desktop or a laptop computer on which special software called GLPLUS must be installed. PACTOR can also communicate with plain TOR stations as long as only text is transmitted;
- ◆ **E-mail:** Electronic mail is an efficient system that brings together telecommunications and computer science. It makes it possible for individuals and organizations to communicate in writing and exchange digitalized data (graphics, audio, video). However, its use is currently restricted by the availability of telephone lines. Although satellite telephones can also be used to send e-mail, sending large, complexly formatted messages or file attachments must be discouraged because of the long time they will take to transmit and the resultant line saturation;
- ◆ **The Internet:** The Internet is a global "network of networks" which can transmit information around the world in seconds. E-mail is one of the main components of Internet traffic, but many other services are available. The most prominent example is the World Wide Web. Nowadays, it is rare to find an organization that does not have its own Web site or "home page", with information about its activities, facts about the emergencies it is involved in, and appeals for contributions to relief efforts. These sites can be visited by all computer users with an Internet connection, regardless of where they happen to be. (See

Annex 4.1, at the end of Chapter 4 for the addresses of selected humanitarian organizations.)

Basic Procedures

Regardless of the communications systems used, or the combinations thereof, basic procedures must be established for the safe and efficient use of these systems. The following are just two examples:

- ◆ *Training:* All members of a relief mission must be provided with at least basic training on the use and care of the various types of communications equipment that will be used during the mission. This must include the ability to send and receive messages unassisted;
- ◆ *Rules and codes:* There must be clear, explicit rules for the transmission of information. For instance, when the radio equipment in use is such that transmissions can be heard by anyone with a receiver, it is essential to make this clear to those who will be sending information. They must understand which information is confidential and should not be transmitted, or should be transmitted using code words or any other appropriate vocabulary. In situations of heightened security, it is useful to have pre-established times for the various stations to communicate with each other, as well as code names and passwords. In all cases, a log must be carefully kept of all contacts established, all issues discussed, and all messages received.

Chapter 15

*The Application of New Technologies to Emergency Logistics*⁵²

Regardless of whether the delivery of a many-ton shipment or of a small envelope is at stake, identifying and following up on these items en route and certifying that they have been delivered to their rightful recipient has always been a challenging, sensitive task. Commercial shipping ventures employ a series of tools that enable them to document and confirm the delivery of a shipment to the right destination within the stipulated time, or else to determine with a fair degree of certitude at which point of its journey the shipment may be at present. These tools have evolved over time with advancements in technology, and today many options are available for the monitoring and control of consignments. Bar codes, magnetic strips, and optical character recognition, to name a few, make it easy to capture and convey relevant information with near-perfect precision.

While these technologies are chiefly used in the trade sectors, it is not unrealistic to expect that humanitarian agencies will also employ them eventually to follow up on their consignments in the field and, in general, to keep track of their humanitarian assistance operations and the routine management of their logistical activities.

The purpose of this chapter is to provide brief descriptions of some technological applications currently available and consider how they might be used in the everyday logistical management of emergency supplies.

⁵² This chapter has benefited from the contribution of John Price II, of the Defense Logistics Agency (DLA) of the United States. His responsibilities include overseeing the transport of various supplies, mostly military, from the United States to many destinations abroad and following up on their distribution. He also has considerable experience in the design and management of storage sites.

Bar Codes⁵³

Bar code labels make it possible to represent alphanumeric characters (letters and numbers) by means of bars and blanks of varying widths that can be "read" automatically by optical scanners. The system recognizes and processes these symbols, compares their patterns with those already stored in computer memory, and displays the information it has interpreted.

This standardized coding system means that there can be a one-on-one, unique, non-ambiguous relationship between the pattern and that to which it refers. There can thus be no two identical bar codes around the world, any more than there can be two identical sets of fingerprints.⁵⁴

Bar codes can be printed on paper, plastic, metal, or other materials. They can go on stickers, packages, documents, etc. The codes can be read at various distances—from direct contact to several feet away—depending on the scanning equipment, the symbols used and the size of the bar codes.

Thanks to the use of magnetic ink in the printing of bar codes—a technology known as magnetic ink character recognition, or MICR—character legibility can be retained even when the bar codes have become smudged or have been stamped over. At present, bar codes are mostly used in:

- ◆ Product packages;
- ◆ Identification cards;
- ◆ Catalogs or price lists;
- ◆ Product labels;
- ◆ Forms, receipts and invoices.

The components of bar code technology are the following:

- ◆ **Optical scanning** : This makes it possible for bar codes to be "read", the essential component of this technology. Scanning is carried out by means of a photoelectric sensor that can detect the contrast between the shadows (the bars) and the light (the empty space between the bars). Once the pattern has been captured, it can be decoded to get at the information originally encoded in the bar code. Several instru-

53 Other sources for this chapter include *Códigos de barras. Eficiencia y Rapidez en la Captura de la Información*, by Jaime Alcides Carrillo Balderrama, and various Internet sites.

54 Diana P. Quintero Muñoz, *¿Qué es un código de barras?* <http://atenea.udistrital.edu.co/egresados/dquinter/>.

ments can be used for this purpose, such as laser and non-laser hand-held and fixed-position scanners, pen scanners, CCD readers, camera-based scanners, and so on.

- ◆ **Decoding:** The information on a bar code label has been encoded employing a "language" of patterns having to do with the size and location of the elements visible to the naked eye as bars and spaces or black and white bars. In some codes, only the width of the bars has meaning; in others, the space between the bars is also significant in decoding the information.
- ◆ **Check digit:** Also known as the control character, it is generally the last in the series and is used to verify the validity of the code label as a whole. The value of the check digit must match the sum of the values of all the preceding characters; it is recalculated on the spot to verify that the scanning has been successful.
- ◆ **Symbol Sets:** Given the great variety of applications and needs for bar codes, there are several sets of symbols available. Alphanumerical and numerical are some of the most common. Alphanumerical involves the use of both letters and numbers. Examples include:
 - ▲ **Code 39:** General purpose code used around the world. Makes it possible to convey digits from 0 to 9, letters from A to Z, and other ASCII characters.
 - ▲ **Code 93:** Similar to Code 39.
 - ▲ **Code 128:** Highly reliable, excellent density, used around the world.
 - ▲ **LOGMARS:** Similar to Code 39, but used exclusively by the United States Government.

Numerical only convey numbers. Examples are:

- ▲ **EAN-13:** Used in Europe for numbering retail products. Can convey digits from 0 to 9;
- ▲ **EAN-8:** Compressed version of EAN-13, for smaller packages;
- ▲ **UPC-A:** Universal Product Code, used in the United States and Canada for retail sales;

- ▲ Code 11: Mainly used for telecommunications equipment. Can convey digits from 0 to 9.

Printing bar code labels nowadays is easy. Labeling software is available that works with ink-jet and laser printers, both in DOS and Windows. Many programs can design and print code bar labels. Necessary software can be downloaded from the Internet (enter “bar codes” or “barcodes” for Internet search engines).

Bi-dimensional Barcodes

Bi-dimensional or 2-D barcodes can store as many as 1,800 printable ASCII characters or 1,100 binary characters per symbol. The Portable Data File (PDF) 417 format can encode an enormous amount of information on a small surface and ensures a high level of error correction, so that even partially damaged bar code labels can be read. These bar codes can encode your average shipment information, such as stock number, quantity, priority, presentation unit, source and destination port, consignee, required delivery date, price per unit, and any other type of information required.

Logistics information encoded in 2-D format can be decoded without reference to an external database, since all the information is stored on the tag itself.

In the field, the 2-D format is ideal for storing large amounts of information about specific products, such as the expiry date of medical products, information about the manufacturer, lot number, dosage, and so on, making it possible to have immediate access to these data.

The use of bar codes in the delivery of consignments can increase speed, productivity, and precision by reducing the likelihood of human error. Managing warehouse inventory is greatly enhanced when bar code scanners are employed.

AMS Laser Cards

The automated manifest system (AMS) laser cards have been developed by the Defense Logistics Agency (DLA) of the United States Government to store substantial amounts of information about shipments. The size of a

standard credit card (8.5 x 5.5 cm), they can contain up to 1,200 pages of text, including information such as:

- ◆ Stock number;
- ◆ Requisition number;
- ◆ Shipment date;
- ◆ Quantity;
- ◆ Consignee.

AMS cards are attached to the shipment's pallets and containers. The consignee simply inserts the card in the card processing unit, a hardware item that can read the card and write on it (employing PC software) and can forward or print all the information regarding a shipment.

They are ideal for multiple-load shipments, air shipments and full containers. They are inexpensive and reusable. A warning is activated when a card is full (2.8 MB). There is practically no interference due to magnetism or extreme weather.

Radio Frequency Identification Tags and Labels

The distribution warehouse of the Defense Logistics Agency, in Pennsylvania (United States), was the site of the first test of RFID or Radio Frequency Identification Tags and Labels. They were originally tried on shipments headed for Somalia and Haiti in 1993, and began to be used regularly in April 1995. RFID tags are attached to pallets, trucks, and large containers to monitor the location of shipments en route. The manifest information is stored on the label (in conjunction with AMS laser cards). These labels can store up to 128 Kilobytes of information.

RFID Interrogators

RFID Interrogators, or tag readers, are positioned along the delivery route and can read the tags or labels as they go through each position, whether on a truck, airplane or ship. The tags "wake up" and report their specific

ID number to the 644 MHz interrogator, which reports the time, date, and label details to a common server that can be accessed by the consignee to gain instant information about the current position of that particular shipment.

On the ground, a manual interrogator can search for the relevant tags in several pallets or containers and produce a warning sound when it locates a specific shipment.

RFID tags are relatively inexpensive and can be reused.

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