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Australian Marine
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—SAFEGUARDING AUSTRALIA'S COASTLINE—

EMERGENCY OIL SPILL RESPONSE EQUIPMENT TRANSPORTATION

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This address covers those issues which are required to be in place in order for the transportation phase of a response to fully contribute to the overall success of cleaning up the oil. Once oil has been spilt it spreads quickly and weathers. Therefore a most important success factor is the speed in moving resources to where they are needed.

In order to be able to respond to minor spills, ports and terminals have relatively small amounts of readily accessible equipment on-site or even pre-deployed in the water as well as trained staff available to rapidly deploy this equipment. However for larger spills, large amounts of equipment permanently stored in each port cannot be justified and equipment is then stored in a central location to be transported to wherever it is needed. There are a number of very important steps in this transport and each must occur successfully in order for the equipment to reach the spill and serve its purpose.

This address draws on the experience of four of the oil industry international Tier 3 response centres, that is Oil Spill Response Ltd (OSRL) in the UK, East Asia Response Pte Ltd (EARL) in Singapore, Clean Caribbean Corporation (CCC) based in Florida and the Australian Marine Oil Spill Centre (AMOSC) in Australia. These centres are required to move their equipment at short notice to a number of countries and in some cases world-wide.

The steps referred to above form the links of a supply chain; each link of which must be in place for the chain to work.

These links are typically:

1. Call out and mobilisation of personnel;
2. Sourcing of trucks and aircraft;
3. Loading of trucks;
4. Transport of equipment to airport or spill site by truck;
5. Execution of departure formalities;
6. Loading of aircraft;
7. Aircraft flight;
8. Execution of arrival formalities;
9. Unloading of aircraft;
10. Transport of equipment to spill site by truck;
11. Deployment of equipment.

The key links in this supply chain are discussed in more detail below.

Equipment Preparation

Equipment has to be prepared in a way that allows convenient transport by any means, ie road, air or sea. This paper focuses on transport by road and air.

Large stand alone items of equipment such as offshore booms and skimming barges are able to be handled as separate units. However, other equipment is typically transported in box or cage containers. These containers hold either a number of similar items such as booms or a particular piece of equipment which is packed into one or more containers, including all the accessories and spares required. This overall packaging gives confidence that the response team will arrive with a complete unit and will also be able to carry out running maintenance during a response. For example motorised equipment is packed with spare parts, booms have towing bridles attached together with deployment kits holding anchors, buoys and stakes as required.

Containers can be made of wood, mild steel or aluminium. Wooden containers are less expensive than metal alternatives. However international transport with wooden containers can result in quarantine problems and potential delays. AMOSC does not use wooden containers, in order to prevent potential problems with agricultural authorities particularly in the return of equipment to Australia.

Where cost and strength aspects permit, aluminium containers are preferred, due to their light weight.

The containers are typically stacked on each other or stored in racks in the Centre's warehouse, with access carefully considered within the limitations of the warehouse. Fork lift handling pockets on the containers means rapid and safe handling, preferably with fork access to any side of the package where this is practicable.

Road Transport

Road transport is used both to deliver equipment to an airport and to transport equipment directly to the spill site. In some cases where water separates the warehouse and spill site, air may be the only feasible means of transport. In Australia, AMOSC evaluates each particular situation, comparing road versus air transport to establish whether the time saved justifies the extra expense of air transport. Air transport may, for example, deliver the equipment to the spill site in the evening, ready for deployment next morning. A less expensive overnight haul by truck may achieve the same deployment next morning.

For road transport, issues such as container weight and size are less critical than transport by air.

To minimise the time taken before equipment leaves the warehouse, some Centres have a selection of containers already loaded onto trailers and also equipment stored in standard shipping containers which are positioned on trailers.

Some Centres have their own prime movers. Others rely on arrangements with a local trucking company for this service, which must of course be in place and exercised before the trucking service is required during a real incident.

Air Transport

Most constraints to the design of containers and the fixing of the contents are determined by the requirements for air transport. All equipment must be firmly secured inside the containers in order to cope with potential forces while in the air, including being able to resist up to two times the force of gravity in an upward direction.

Fuel tanks of motorised equipment must be drained and batteries should be sealed or solid type.

Some of the Centres have dedicated aircraft on stand-by and therefore can plan loading of equipment around specific aircraft. However all the Centres can be required to use aircraft from the spot charter market and recognise that packaging arrangements should be flexible enough to allow the use of whatever charter aircraft may be available on the particular day.

All typical commercial aircraft use the standard 125" x 88" (3175mm x 2235mm) aircraft pallet station, so any container system must be compatible with this.

Overall, an example of the break down of the inventory of a response Centre into containers is shown in the AMOSC equipment transport details table, included as Figure 1.

The variation of sizes of containers can cause inefficiencies in the amount of equipment able to be loaded on to the standard aircraft pallet tray and can also slow down the loading process. To help overcome this, Oil Spill Response Ltd (OSRL) has developed a modularised system of containers, four of which are positioned on each standard aircraft pallet tray, ie two on the bottom and two on the top as shown in Figure 2. The top containers are shaped to allow them to fit within the profile of the aircraft while maximising the volume available. Aircraft pallet tray load limitations are crucial and by keeping the total load for each pallet tray under 3000kg it is possible to position any set of pallets in almost any available pallet position in an aircraft, no matter which aircraft is being used. The containers are constructed from aluminium to minimise weight.

The OSRL system currently comprises fifty containers, divided equally between bottom and top types. Each container is able to be handled by fork lift from all sides. The containers are pre-packed with a variety of equipment covering containment, recovery, storage and transfer systems for both shoreline and offshore scenarios, as well as personnel and decontamination requirements. For example, inshore booms are packed along with anchors, chains, buoys, stakes, air-fans, water pumps and other ancillaries.

Overall, aircraft loading times are reduced dramatically by the use of these conveniently sized and shaped containers, designed to fit into the aircraft, containing all the components required to carry out a task and able to be efficiently transported from the warehouse to the spill site.

Requirements for correct paper work are very strict for air transport of potentially hazardous equipment. Some Centres with dedicated aircraft act as their own air-cargo agents and are formally authorised to declare equipment as "known" cargo, thus allowing direct loading onto an aircraft without further security inspection or holding requirements.

In the case of non-dedicated aircraft, standing arrangements with an aircraft broker who has 24 hour access to the aircraft charter market are essential. This broker is also typically able to act as air-cargo agent and can facilitate customs clearance and transport arrangements on arrival. Once again, exercises involving the use of this broker are important before the services are required in earnest.

When equipment from one of the international Tier 3 Centres is moved between countries, it is important that there be no delay in arrival formalities. Resolution of these formalities is the responsibility of the hirer of the equipment as typically the hirer has the contacts and the understanding of the exact requirements.

As discussed earlier, some of the Centres, ie OSRL and EARL, have dedicated transport aircraft on standby. AMOSC and CCC rely on the charter market. In Australia, defence force aircraft are also available to the National Plan authorities and Hercules aircraft have been used very effectively in recent spills to move Marco type skimming craft quickly to the spill site.

Air Transport of Dispersants

The use of dispersants is widely accepted as an extremely effective oil spill response strategy. All of the four referenced oil industry response Centres have equipment in place for application of dispersants from ship and helicopter. In addition, all of these Centres have arrangements in place to apply dispersants using fixed wing aircraft. Three of the Centres, ie OSRL, EARL and CCC, have airborne dispersant delivery systems that fit into dedicated L-382 Hercules aircraft. AMOSC co-funds a national, Australia wide stand-by aircraft arrangement using turbine driven air tractor type agricultural spraying aircraft. The Australian approach is a very practical and cost effective alternative, but few parts of the world have these agricultural aircraft readily and reliably available.

Each of these fixed wing aerial systems are able to apply dispersants to a spill at a high rate and empty their tanks in a few minutes - certainly less than an hour. Therefore resupply of dispersant is fundamental to the success of the overall dispersant response strategy.

Clean Caribbean Corporation (CCC) have studied the efficiency of the storage and supply of this dispersant and concluded that the most efficient system was to hold dispersant in centralised stockpiles and to have the dispersant stockpiles properly configured for air transport. A normal transport pallet holds four drums of dispersant and two of these pallets fit onto a standard aircraft pallet station. Typically the amount of dispersant able to be carried in an aircraft is limited by the floor space taken up by the pallets rather than the weight of the dispersant cargo. Accordingly CCC have redesigned their pallets to take six drums of dispersant, as shown in Figure 3. Two of these special CCC pallets fit on to a standard aircraft pallet and therefore the payload of an aircraft is increased by fifty percent. Typically therefore an aircraft such as a Boeing 707 is able to carry 27 tonnes of dispersant on 13 aircraft pallets.

Off-Loading of Equipment

Total response times can depend as much on the transport time from the delivery airport to the spill site as it does on the aircraft flight time. The nearest airport with suitable cargo off-loading facilities may be several hours drive from the operational area and may even be in another country. Adequate cargo handling facilities are not as common as often believed, as many airports are based solely around passengers and may only have a small fork lift truck to handle cargo. This factor can greatly reduce the options available for air transport of equipment during a response.

For these situations Oil Spill Response Ltd (OSRL) have developed a self build off-loading system called the Rapid Equipment Delivery and Deployment System (REDDS).

The REDDS system, shown in Figure 4 is designed to travel in the same aircraft as the loaded equipment and to fit onto a standard aircraft pallet station. At the destination, the system is

manually removed from the aircraft, then quickly and easily erected to remove the load. The REDDS is totally self contained and requires no power from the aircraft for its operation. It is designed to be suitable for use with any side loading aircraft with a maximum cargo door sill height of 4 metres from the ground.

The system comprises a scissor-lift powered by a diesel generator, which is used to lower equipment on pallet trays from the aircraft to ground level, together with an aluminium tower which is erected on a steel box frame and extends above the cargo door. The tower is used to offload the scissor-lift into its position within the base frame and to act as a support for the winches that winch the equipment out from aircraft onto the scissor-lift. The complexity of the system requires trained personnel to operate.

Conclusion

This paper has discussed the key links in the supply chain. However it is essential that all of these links through mobilisation, dispatch, transport and arrival at site are in place so that our aim of successful response to an spill can be achieved.

Figure 1

AMOSC EQUIPMENT : SHIPPING AND TRANSPORT DETAILS

Item	AMOSC	Markings		Pack Size	
	Inventory	AMOSC No	Case No	WxDxH (mm)	Mass (kg)
Vikospray Boat Unit - Arms	1	G-030	1	3100x500x500	150
Vikospray Boat Unit - Pump	1	G-030	2	1200x1700x1200	350
Helibucket	2	G 031		1900x1500x2300	420
Dispersant pump	2	G-032		1200x1200x100	200
Disk skimmer 30K head	2	G-050	1	1600x1600x1100	340
Disk skimmer 30K power pack	2	G-050	2	1800x1200x1100	570
Disk skimmer 12K head	2	G-051	1	1300x1300x900	210
Disk skimmer 12K power pack	2	G-051	2	1200x1200x950	300
Ro-Vac	4	G-070		2400x1200x1300	780
Desmi skimmer system-complete	1	G-080	1-3	3000x2400x2400	3600
Desmi skimmer head		G-080	1	1800x1200x1400	300
Desmi power pack		G-080	2	1600x1080x1200	850
Desmi hose reel		G-080	3	1750x1050x1550	390
GT 185 skimmer head	2	G-081	1	1500x1200x1200	430
GT 185 power pack	2	G-081	2	1200x1000x1200	760
GT 185 hose reel	2	G-081	3	1200x1200x1400	510
Ro-skim system-complete	2	G-082	1-4	3000x2500x2600	4500
Ro-skim pump/skimmer		G-082	1	1200x600x1500	300
Ro-skim power pack		G-082	2	1800x1300x1700	1400
Ro-skim hose reel		G-082	3	1700x900x1700	550
Ro-skim aux equip		G-082	4	1200x900x1200	300
Ro-skim boom *(72m)* & winder	1	G-091		2200x2000x1800	1750
Ro-boom *(200m)* & winder *(3000m total)*	15	G-091		2200x2000x1800	3500
Ro-boom power pack	5	G-040		1200x900x1500	570
Beach Guardian Boom *(4x25m/pack - 2000m total)*	20	G-110		1200x1200x1100	380
Beach guardian deployment kit	4	G-130		1200x1200x700	140
Beach guardian shore kit	5	G-132		1700x800x600	80
Zooom boom *(4x25m/pack - 3400m total)*	34	G-111		2400x1200x1000	410

Item	AMOSC	Markings		Pack Size	
	Inventory	AMOSC No	Case No	WxDxH (mm)	Mass (kg)
Boom anchor kit *(12x30kg anchors)*	6	G-131		1500x1200x1100	1000
GP transfer pump	3	G-120		1200x1200x1000	250
Fastank	4	G-140		1700x500x600	90
Vikoma tank	2	G-141		1500x700x600	70
Lancer Barge	3	G-142		1200x1200x1300	470
Sorbent boom *(20x3m lengths/cage)*	23	G-150		1300x1150x1170	150
Sorbent pads *(12x100 sht bales/cage)*	7	G-151		1300x1150x1170	170
Snares *(33 bags of 30/cage)*	3	G-152		1300x1150x1170	240
Ro-mop 240 winder and pump	2	G-160	1	1300x800x1300	350
Ro-mop 240 accessories	2	G-160	2	2000x400x400	100
Ro-mop 260 winder and pump	2	G-161	1	1800x900x1400	600
Ro-mop 260 accessories	2	G-161	2	2000x400x400	100
Egmopol barge complete	1	G-162			9800
Egmopol pontoon		G-162	1	10250x1200x1200	2500
Egmopol pontoon		G-162	2	10250x1200x1200	2500
Egmopol centre tank		G-162	3	10250x2400x2200	4800
Egmopol pontoons joined		G-162		10250x2400x1200	5000
Site Kit Trailer	1	G-183		1700x1900x1450	500
Electric/steam generator	4	G-260		3900x2000x1600	1100
Beach Wash-down Kit	1	G-261	1	1300x1150x1170	250
Beach Wash-down Kit	1	G-261	2	1300x1150x1170	250
Decontamination Kit	1	G-262		1500x1200x1200	320
VHF/UHF Base Station	1	G-290		600x 600x700	65
VHF/UHF Base Stn. equip	1	G-290		3000x500x700	210
UHF Radios *(3 per box)*	2	G-292		680x550x180	23
VHF Radios *(3 per box)*	2	G-293		620x680x180	23
VHF Portable radio airband	1	G-294		55x30x22	5
Satellite Comms. Equipment	1	G-300		300x 40x300	35
Satellite Support Equipment	1	G-300		840x550x480	41
Oiled fauna kit	1	G-330		1500x1200x1100	320
Dispersant- *200l drums (4/pallet)*	50t	G-600		1200x1200x1050	800
Dispersant- *1000l containers*	100t	G-601		1200x1000x1150	1000

Figure 2

MODULARISED AIR TRANSPORT CONTAINERS
OIL SPILL RESPONSE LIMITED

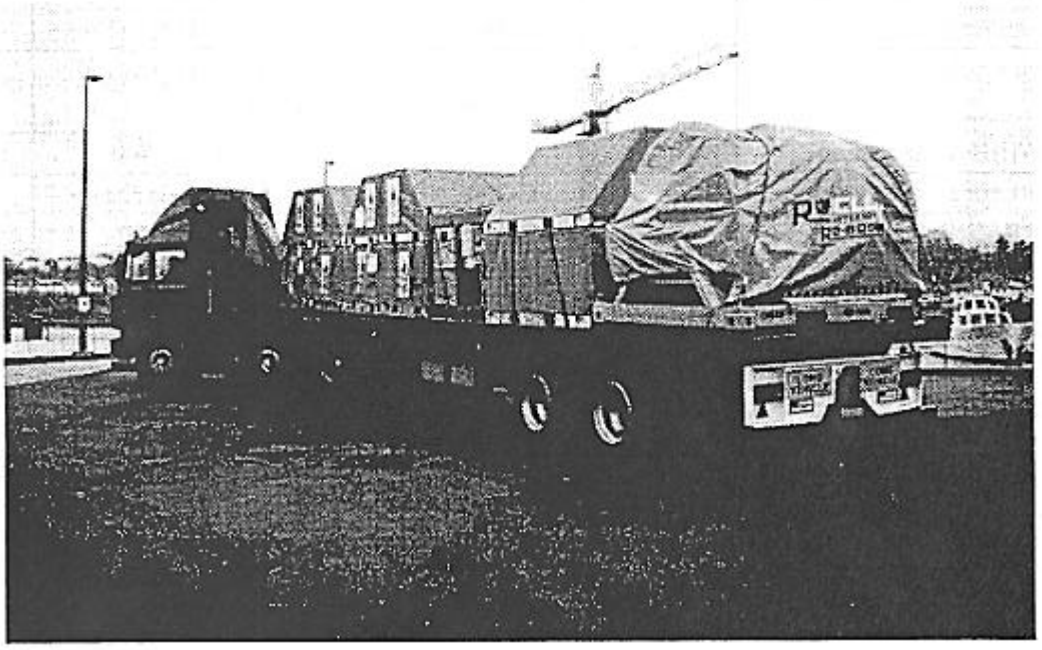
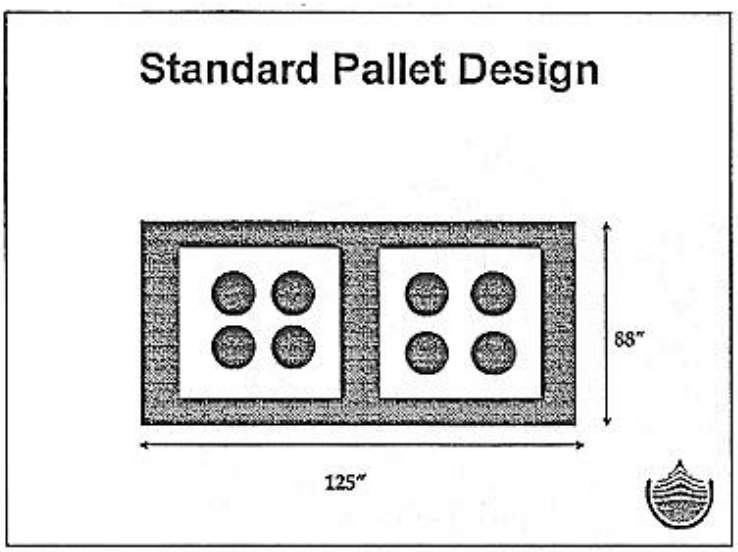


Figure 3

REDESIGNED AIR TRANSPORT PALLETS
CLEAN CARIBBEAN CORPORATION



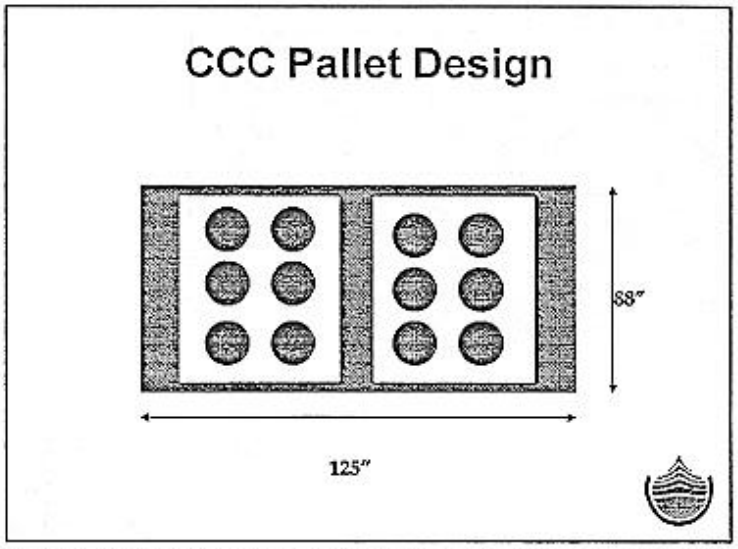


Figure 4

RAPID EQUIPMENT DELIVERY AND DEPLOYMENT SYSTEM
OIL SPILL RESPONSE LIMITED