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AN EVALUATION OF THE CIRCUMSTANCES UNDER WHICH IT WOULD BE FEASIBLE TO ESTABLISH CONTAINER REPAIR AND MAINTENANCE ENTERPRISES

82-2-260

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/PREFACE

PREFACE

In an effort to create an environment in which appropriate sectors of Latin American and Caribbean countries can assist each other in the establishment of container repair and maintenance enterprises, CEPAL's Transport and Communications Division, with financing from the Government of the Netherlands, undertook in May 1980 a two-year project entitled "Economic Co-operation Among Latin American and Caribbean Countries in the Establishment of Container Repair and Maintenance Enterprises". The activities programmed within that project include the preparation of this document and the convening of three subregional seminars.

From the outset it should be understood that this document is not a container repair and maintenance manual. It does, however, seek to present broad outlines of some of the more important requirements for establishment of container repair and maintenance enterprises. For the purposes of this document these requirements are grouped under three headings -economic, industrial and operational.

While opinions vary concerning the advantages of steel, aluminium and glass-reinforced plywood (GRP) as construction materials for dry cargo containers, the fact remains that major leasing companies prefer steel containers 1/ as they cost less to build, less to repair and are less prone to damage.2/ It should be noted that the equipment and personnel skills needed by a repair enterprise are directly related to container type and material of construction. For instance, the repair of refrigerated containers with their special insulation, sealing and compressor systems requires substantially different equipment and personnel skills from that of dry cargo steel containers. Moreover, aluminium containers require highly qualified welders to successfully effect needed repairs. As a result, this document is limited to an evaluation of the circumstances under which it would be feasible to establish repair facilities for dry cargo steel containers. Nonetheless many of the concepts presented should be equally applicable for the establishment of enterprises which repair aluminium and GRP containers.

During the preparation of this document the following organizations made important contributions: ALMADELCO; Autoridad Portuaria de Buenos Aires, Argentina; Autoridad Portuaria Dominicana, Santo Domingo, República Dominicana; Autorité Portuaire Nationale, Port-au-Prince, Haiti; Berry's Marine Services Ltd.; Carga de México, S.A., de C.V.; Companhia de Transportes UNICO; Consejo Colombiano de Usuarios del Transporte (CUTMA); Consejo Dominicano de Usuarios del Transporte, Inc. (CODUTI); Container Aid International (CAI); Container Comércio e Indústria S.A.; DELCARGO, Inc.; Flota Mercante Grancolombiana, S.A.; Geoffrey Reyner (Container Repairs) Ltd.; Hempel's Marine Paints A/S; Institute of International Container Lessors (IICL); Inter-Governmental Maritime Consultative Organization (IMCO); International Cargo Handling Co-ordination Association (ICHCA); International Organization for Standardization (ISO/TC 104); Kingston Terminal Operators Ltd.; Lingas S.A.; Mander-Domolac Ltd.; Matson Navigation Company; Moore McCormack (Navegaçao) S.A.; Multimodal S.A.; Overseas Containers Ltd. (OCL); Pandicol Ltda.; Politrans Transportes e Serviços Ltda.; Port Authority of Jamaica; REMAIN (Hamburg); REPCON (UK) Ltd.; Roman Marítima S.A.; Sea-Land Service Inc.; Selecto Flash Inc.; Societé Fosseene d'entretien de Containers; Transportadora Multimodal; and Transporte Combinado, S.A. de C.V.

1/ See III. Industrial Analysis, p. 15.
2/ Cargo Systems, February 1979, p. 56.

/THE CHALLENGE

THE CHALLENGE OF THE 1980s

One of the more important challenges faced by CEPAL's Transport and Communications Division in the 1980s is to assist Latin American and Caribbean countries in their efforts to create a "critical mass" of skills, equipment and supporting institutions which will permit growing participation in new transport technologies and systems such as containerization.

Within a transport system as vast as containerization, countries of this region desiring to participate must carefully select an entry level for which (a) the supportive infrastructures either exist or can be easily established, (b) the undertaking is local in nature, i.e., not subject to international competition, and (c) the work involved is labour intensive. While these criteria for evaluating an appropriate entry level into any technology might seem to preclude participation by some Latin American and Caribbean countries in containerization, such is not the case.

As is demonstrated at some length in this document, the container repair and maintenance industry satisfies these requirements. Nonetheless, since containers continue to be modified to enhance their strength and handling features, they are the subject of ever-increasing levels of technological sophistication. It should be understood that as a transport technology becomes increasingly sophisticated, it will be found more and more expensive, its life span will be shorter, and operational, construction and repair skills will take longer to learn. For developed countries with sufficient financial resources to invest in the necessary facilities and equipment, and qualified personnel to perform repair and maintenance tasks, these rising levels of technology have not created any insurmountable problems. In contrast, due to a scarcity of financial resources, skilled personnel and supportive infrastructures, Latin American and Caribbean countries face the very real risk of being so overtaken by such technological changes that they might be unable to participate effectively in this growing industry. Thus, while repair technology is still within the reach of all Latin American and Caribbean countries, appropriate sectors of each country should evaluate not only the feasibility of establishing container repair and maintenance enterprises but also the usefulness of such enterprises as a technological base from which other areas of containerization might be entered.

I. INTRODUCTION

(a) The importance of containerization for Latin American and Caribbean countries

Cargo unitization consists of grouping various small and medium-sized packages of different forms and sizes into larger homogeneous units so as to facilitate their manipulation by mechanical means and make the transport of goods quicker, safer and more efficient, eliminate the risks of breakages, theft or loss, and reduce the costs for the owner of the cargo and the carrier. Instead of handling innumerable boxes, crates, bales, or loose sacks of varying dimensions and weights, the system makes it possible to handle a small number of standard-size units, which results in a substantial increase in productivity not only of the labour force involved but also that of vessels, trucks, trains and airplanes,

/while at

while at the same time providing an opportunity to considerably reduce, simplify and harmonize trade documentation and consequent formalities.3/

While the container appears to be merely another means of unitizing cargo, such is not the case. Other transport units like pallets and pre-slinging, even though extensively used, have not had such a profound effect on the entire transport chain as the container. For example, the extensive use of containers has resulted in the modification of docks and attendant cargo storage areas, shoreside cargo cranes, cargo handling equipment, ships, trucks, trains, transport documentation and customs procedures in order to facilitate their rapid and uninterrupted movement.

It should be understood that cargo had been loaded into special boxes for ocean transport long before Sea-Land Service, Inc., and Matson Navigation Company introduced large-scale containerization in the mid 1950s -Sea-Land in the Atlantic in 1956 and Matson in the Pacific in 1958. However, they were the first to put the concept within the framework of a system in which cargo would be loaded into a container at the shipper's place of business and move all the way to the consignee without being removed from the box en route. As rising costs of transport operations at that time were forcing freight rates upward, and since carriers had to make major changes to control such upward movement of freight rates and thus ensure continued shipper demand, containerization was an idea which came just at the right time. While the intermodal or through carriage aspects of containerization were comparatively limited in the early development period, containerization nevertheless worked very well. The effect of container transport on freight rates in the West Coast-Hawaii trade 4/ is a good barometer -by 1964 freight rates had been reduced to their 1961 level and there were no more increases until 1971, when inflation finally overtook container operations.5/

While during the early 1960s there was growing recognition of the advantages of transporting cargo in containers, it was not until 1965, when the International Organization for Standardization (ISO) approved standard dimensions which allow the transport of cargo units by any mode, that the use of containers spread really fast. Since the container facilitates door-to-door instead of port-to-port transport, its use found rapid acceptance among shippers and carriers from developed regions, and by 1970 one could speak of "containerization" as not only an established state of transport art but also the predominant transport unit used on liner trade routes. Moreover, while at first containerization was only an innovative shipping technique, it is today a vital part of international commerce, inherently tied to world trade. Containerization has proven repeatedly that, because of its cost efficiency, it can be the single most significant factor enabling trading nations to better sell and compete in world markets. No longer an innovation, containerization has become the essential lubricant that allows the gears of world trade to function more effectively. According to Mr. H. Graf, President of Cast North America Ltd., "Basically, we believe that the ship is just another vehicle in the transport system. It's immaterial. What's material is the container".6/

3/ Tomás Sepúlveda Whittle, International Maritime Transport in South America (E/CEPAL/R.213/Rev.1), Santiago, December 1979, p. 33.

4/ Ocean transport between any two or more USA ports must be in ships constructed in that country, as well as owned and crewed by its citizens: Title 46 USC, section 883.

5/ Transport 2000, November/December 1980, p. 48.

6/ Transport 2000, January/February 1981, p. 24.

/The advantages

The advantages derived by shippers, carriers, consignees and others in the transport chain from the use of containers are now generally acknowledged. While the experience with containers has largely involved those trades linking industrialized countries, many developing countries are rapidly industrializing and can obtain the same benefits, especially where, instead of import substitution, they are pursuing active export-oriented industrialization. The shift from the export of basic materials to more processed and finished goods lowers relative cargo density, and thus boosts demand for container volume.7/ Furthermore, many developing country liner cargoes are well suited to container transport. For example, some developing country export products such as canned fruit have been particularly successful as container cargo, with a very marked reduction in breakage. Indeed, with the passage of time many more cargoes will be found suitable for containerization than was originally thought to be the case.

The rapid spread of containerization is largely due to its semi-bulk nature, faster overall transit times and enhanced cargo protection. As bulk and semi-bulk cargoes present only one type of cargo unit to a port, for example, their handling is easily mechanized. In a similar manner ISO standard containers present port authorities with a uniform cargo unit and an opportunity to change from labour-intensive break-bulk operations to a capital-intensive container handling system. This is accomplished by utilizing specialized equipment such as container cranes, straddle-carriers, fork-lift trucks, etc., which ensure the rapid and efficient loading and discharge of container ships as well as container movements to and from storage areas.

It is interesting to note that whereas a general cargo ship of 10 000 dwt would remain in port at least 5 days discharging all cargo, a cellular container ship of similar tonnage usually discharges the same amount of cargo in less than one day, and while the aforementioned break-bulk vessel would require up to 125 stevedores to discharge cargo, the cellular containership requires only 15. Since the major markets for Latin American and Caribbean exports are those of Europe, North America and Japan, and as stevedoring costs at the ports for those markets greatly exceed similar costs in this region, Latin American and Caribbean exporters must either absorb such costs (thereby reducing their income) or utilize containers.

The movement of goods in containers permits faster door-to-door transit times, not because ships travel faster -there is no fundamental need for containerships to travel faster than break-bulk liners- but because port operations and inland transport services have been rationalized, thereby reducing the time goods spend waiting for on-carriage. For example, Cast North America Ltd., operates its ships in the highly competitive North Atlantic container trade at 14 knots. According to Cast president Mr. H. Graf, "In the final analysis, it's the total transit time from inland origin to inland destination which is of concern to shippers and consignees".8/ It is interesting to note that greater in-movement speed is cost increasing, while a reduction in the time goods spend waiting for on-carriage is cost reducing. Furthermore, faster overall transit times reduce the disadvantage

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7/ Container News, October 1980, p. 17.
8/ Transport 2000, January/February 1981, p. 24.

/of distance

of distance from the market. That is to say, there are less goods in transit at an "average" moment and so less capital is committed.9/

The number of cargo damage and loss claims presented to ocean carriers has decreased considerably since the advent of container services, so much so that large reductions in insurance premium costs have been possible. This is, of course, due to the physical protection containers provide cargoes from damage by crushing, negligent handling, scuffing, etc. Moreover, as the number of occasions on which containerized cargo is handled is usually reduced -normally only upon stuffing and stripping of containers- this in turn reduces the opportunities for damage, delay, errors in sorting and pilferage.10/

No industry has obtained more benefits from a technological innovation than ocean transport has from containerization. Cellular containerships are loaded or discharged in one-sixth of the time formerly required, and containers can be moved off the piers in minutes compared with the hours and even days required to load trucks. Overall productivity in major ports has trebled with the advent of containers.11/ Despite the extra capital costs for container docks, storage areas, cranes and other handling equipment, these berths can handle each ton of cargo at 60% below the capital costs per ton of a conventional general cargo berth.12/

According to a survey prepared in May 1979 by the OAS/CEPAL Maritime Transport Programme, the tendency to use cargo containers is generalized throughout Latin America, and is increasing, in certain cases at a spectacular rate, compared with information collected for a similar study prepared by LAFTA in 1970.13/ As can be seen from the following table, 10 of the 11 ports evaluated in the two periods have increased their volumes of containerized cargoes and in only one -Cartagena- has it decreased slightly. Among the most spectacular increases, mention should be made of Buenos Aires, from 3 000 to 335 000 tons; Santos, from 13 000 to 507 000; Rio de Janeiro, from less than 3 000 to 116 000; Valparaíso, from 6 000 to 78 000; Guayaquil, from 23 000 to 64 000; and Callao, from 15 000 to 52 000.14/ As Latin American and Caribbean countries cannot afford to neglect potential developments in the containerization of their trades and the profound changes in transport planning, management and operations which this technology requires, the question now seems not to be whether to containerize but rather how to adapt to containerization.

9/ International Chamber of Commerce, The development of international container transport: Its application in developing countries, 1977, p.6.

10/ Ibid.

11/ Transport 2000, September /October 1980, p. 18.

12/ Department of International Economic and Social Affairs. Office for Programme Planning and Co-ordination, United Nations, Transport Newsletter, Volume 3, No. 1, September 1980, p. 6.

13/ Tomás Sepúlveda Whittle, Bases para el estudio sobre transporte en contenedores. Plan de acción de ALALC (ALALC SEC/PA.44), Montevideo, June 1973, pp. 19-21.

14/ Tomás Sepúlveda Whittle, op. cit., E/CEPAL/R.213/Rev.1, p. 30.

/Table

Table

CONTAINER TRAFFIC IN THE MAIN PORTS, 1969-1978

(Units and metric tons of cargo)

Port	Year	Total movement		Containers shipped			Containers unshipped		
		Number	Tons	Full	Empty	Tons	Full	Empty	tons
				Number			Number		
Argentina									
Buenos Aires	1969	...	3 050	421	...	590	415	...	1 50
	1978	21 427	334 761	9 809	467	1 26 577	7 721	3 400	146 230
Brazil									
Santos	1969	2 605	13 294	568	722	4 194	1 049	266	9 100
	1978	56 322	506 581	17 907	9 020	226 322	20 124	9 271	280 159
Río de Janeiro	1969	928	2 808	217	...	760	585	126	2 049
	1978	9 725	115 991	5 831	3 183	58 630	662	49	57 361
Manaus	1978	7 252	43 660	289	3 376	9 195	3 535	22	34 465
Salvador	1978	2 299	43 205	1 857	97	33 897	269	76	9 308
Río Grande	1978	8 433	38 100	3 917	184	28 942	320	4 012	9 158
Sao Sebastião	1978	1 655	30 996	1 614	5	30 570	30	16	426
Paranagua	1969	463	3 737	310	23	2 637	128	...	1 100
	1978	4 690	8 803	2 167	232	4 683	382	1 909	4 120
Vitoria	1978	1 273	6 587	562	...	4 670	49	662	1 917
Malhado	1978	809	6 391	254	113	5 319	12	430	1 072
Recife	1978	609	4 859	88	156	1 550	289	76	3 329
Other ports	1978	2 957	11 258	408	912	5 640	312	1 235	5 618
Chile									
Valparaíso	1969	3 827	6 683	588	811	1 710	1 700	728	4 973
	1978	12 932	77 946	2 428	2 868	24 854	6 540	1 096	53 092
Antofagasta	1969	930	2 870	30	312	110	302	286	2 760
	1978	1 377	5 236	101	191	3 344	50	550	1 894
Arica	1969	804	1 454	...	398	...	406	...	1 454
	1978	930	3 385	95	654	2 013	158	23	1 372
Iquique	1978	2 784	13 960	8	1 087	3 050	1 689	...	10 910
San Antonio	1978	556	2 943	126	32	1 383	344	34	1 560
Talcahuano/ San Vicente	1978	401	4 352	230	32	3 551	79	60	801
Punta Arenas	1978	260	2 710	34	...	450	226	...	2 260
Colombia									
Buenaventura	1969	...	86 200	...	...	22 900	...	...	13 300
	1978	5 406	42 182	1 557	1 040	20 898	1 600	1 209	21 284
Cartagena	1969	...	20 800	...	...	1 400	...	...	19 400
	1978	2 614	13 747	86	515	6 984	749	464	6 763
Barranquilla	1978	888a/	6 218	296a/	...	1 950	592a/	...	4 268
Santa Marta	1978	2 767	2 334	1 170	1 019	230	122	456	2 104
Ecuador									
Guayaquil	1969	4 620	23 025a/	1 075	1 025	6 525a/	2 460	60	16 500a/
	1978	9 566	63 900a/	1 495	3 251	18 500a/	4 475	345	45 400a/
Manta	1978	4 991	38 600a/	1 492	969	14 000a/	2 451	59	24 600a/
Mexico									
Veracruz, Ver.	1978	5 338	52 016	1 762	340	19 426	2 956	280	32 990
Tuxpan, Ver.	1978	5 457	50 906	2 486	...	15 143	2 971	...	35 763
Tampico, Tam.	1978	2 242	18 619	994	407	12 251	520	319	6 368
Manzanillo, Col.	1978	622	3 309	241	69	2 471	7	305	838
Mazatlán, Sin.	1978	108	1 537	108	...	1 537	...	...	...
Perú									
Callao	1969	...	15 500	...	...	8 500	...	...	7 000
	1977	5 403	52 115	1 924	1 007	25 329	2 472	...	26 746
Uruguay									
Montevideo	1977	2 446	...b/	1 100	76	...b/	1 130	140	...b/

Source: Tomás Sepúlveda Whittle, El empleo de contenedores en América Latina, CEPAL, November 1978, prepared for the Fifteenth General Assembly of ALAMAR (Viña del Mar, November 1978).

a/ Estimate.

b/ No register kept of container tonnage.

/(b) Regional

(b) Regional container transport activities

While those persons involved in Latin American and Caribbean ocean transport might have different opinions as to how quickly containerization will be utilized in each country's trades, there is agreement that the experience of the other regions, such as the Middle East and South Africa, indicates that the process could be quite rapid. The degree of container penetration and its timing will differ from country to country, but the process of containerization itself is inevitable. Naturally, the current excess container tonnage will play a part in this, as these vessels will be looking for employment.15/ There are still some major areas of the world that have barely been touched by containerization, and since certain Latin American and Caribbean countries, as well as numerous nations in Asia and Africa, are just starting to utilize containers, one should see great changes during the 1980s in these areas.16/

Although the ocean transport of containers has still to make a heavy impact on the total tons of goods carried in the Latin American and Caribbean trades, many countries have recognized the inherent advantages of this technology and begun to utilize cellular vessels in appropriate trade flows. For example, during February 1981 the Argentine national line placed a cellular container vessel in its trade between Buenos Aires and Santos, Brazil.17/ Furthermore, Latin American national lines are investigating the feasibility of joint ventures with extra-regional companies. For instance, Nippon Yusen Kaisha (NYK), Kawasaki Kisen Kaisha ('K' Line) and Compañía Chilena de Navegación Interoceánica S.A. have signed an agreement to start a joint full container service from the Far East to South America during 1981. Each line is to contribute one vessel in the 500 to 600 TEU class to provide an initial service of one sailing a month.18/

There has been marked growth in the use of multipurpose tonnage suitable for containers in Latin American and Caribbean trades. For example, it was recently noted in a specialized maritime transport magazine that 'K' Line is to introduce such tonnage with TEU capacity up to 500 units on the run from Japan and the Far East to the West Coast of South America; the Euroflot line is utilizing four vessels of 200-300 TEU capacity from North European ports to Santos, Rio de Janeiro, Buenos Aires and Montevideo; and Current Marine, Inc. is to offer multipurpose tonnage from the United States Gulf Coast to the Eastern Caribbean and North Coast of South America.19/ Finally, during 1979 Lloyd Brasileiro began services with the 12 000 dwt multipurpose vessels Calandrini and Cantuaria, both offering spaces for 390 TEU, of which 72 can be refrigerated.20/ Furthermore, Lloyd Brasileiro has announced that six of its "Ita" class -fast and heavily geared vessels constructed between 1969 and 1972- are to be converted into fully cellular geared containerships during 1982.21/

15/ Container News, October 1980, p. 17.
16/ Container News, May 1980, p. 2.
17/ Informativo ALAMAR No. 293, 16-22 February 1981.
18/ Seatrade, March 1981, p. 32 and El Mercurio, 22 April 1981.
19/ Fairplay International Shipping Weekly, 24 July 1980, p. 11.
20/ Fairplay International Shipping Weekly, 27 March 1980, p.8.
21/ Fairplay International Shipping Weekly, 9 April 1981, p. 11.

/In response

In response to increasing shipper demand for more sophisticated tonnage, most of the major liner companies serving South America are switching to more modern, container-oriented tonnage. For example, during March 1980 Hamburg Sud introduced the first fully cellularized container vessels on these routes, the Monte Sarmiento and Monte Olivia, both with 530 TEU capacity, of which 300 can be refrigerated. These vessels are to maintain a monthly sailing schedule between Hamburg, Bremen, Rotterdam, Antwerp and Santos, Montevideo and Buenos Aires.22/ Similarly, Nedlloyd has switched two of its 1978-built multipurpose vessels, which offer a 676 TEU capacity and are fully self-sustaining, onto its trades from the Far East to Central and South American ports.23/ The remaining two vessels of this class will also be switched to the South American run during 1981.

All the indications are that Mexico will be the point of concentration for the next stage of containerization in the Caribbean. Although containerized cargo on Mexico's Gulf coast is running at encouraging levels, the liner trade between Europe and the Caribbean region as a whole retains its traditionally unbalanced character. However, this imbalance is perhaps not so marked as it once was, and there is now somewhat more cargo for the eastbound trip. This has partly been fostered by the introduction of containerization -opening up as it has a wider market for agricultural products from certain areas- and partly through the introduction by the Association of West India Trans-Atlantic Steam Ship Lines (WITASS) of promotional rates for "non-traditional exports". The latter has had a positive effect in attracting "new" exports of manufactures and agricultural products from Jamaica, Central America and Colombia.24/

Many Latin American and Caribbean countries, such as Argentina and Uruguay, have planned large investments in their transport infrastructure, with special emphasis on containerization. For example, the Government of Argentina has recently made a decision to upgrade its container facilities at Buenos Aires. As a result, the authorities in Buenos Aires plan to lease a major pier to private interests for operation as a container facility. A study by the General Administration of Ports (AGP) has determined that Pier One can be extended and equipped to handle general cargo vessels with containerized freight. The study suggests that with the installation of two automated container cranes, four straddle carriers and an improved dock structure, the pier could handle up to 80 000 containers a year working three or four ships simultaneously. This project is expected to cost more than US$ 30 million.25/

In view of the formation of container consortium such as CAROL providing such services to Caribbean countries and the dramatic annual increases in the number of containers handled in Latin American ports, it is evident that the use of containers and their repair and maintenance will be major growth industries in the region during the 1980s and even beyond.

22/ Fairplay International Shipping Weekly, 27 March 1980, p. 8.
23/ Fairplay International Shipping Weekly, 18/25 December 1980, p. 11.
24/ Ibid., p. 29-31.
25/ Container News, May 1980, p. 8.

II. THE ECONOMIC ENVIRONMENT

(a) National economic policies and trade flows

In certain countries of the region governments have pursued import liberation policies in an effort to stimulate their national economies. While these policies have been largely successful, they have also created a healthy domestic demand for goods manufactured outside the region, which, in turn, has brought about large inflows of such goods in containers. Moreover, for many developing countries the trade pattern is to import manufactures and export produce and commodities. In this situation few trades are likely to be completely balanced -that is, the number of loaded containers entering a country or trade area equals those leaving with export cargoes. This is important, because container service costs are more sensitive to an imbalance than those of break-bulk services, for the simple reason that empty journeys for containers are unremunerated journeys. In order to avoid unremunerative relocation of containers, domestic industries must be able not only to satisfy national demand for their goods but also to produce additional goods for export. Furthermore, national currency exchange rates must be sufficiently favourable in relation to those of their major customers to assure that the prices of such goods are competitive in world markets.

In order to better understand the impact of container trade flow imbalances on the demand for repair services, a brief evaluation of the situations in Argentina and Panama is presented. The containerization of Argentina's general cargo trade began in 1967 and is now well under way. By 1980 container throughput at Buenos Aires reached 122 655 TEU, five times that of 1978. While the total container throughput appears healthy, it should be understood that such figures mask a serious container flow imbalance in favour of imports. For example, during 1980 only 31 607 TEU left Buenos Aires loaded.26/

Since 1976 Argentine governmental authorities have steadily reduced export taxes and liberalized imports in an effort to stimulate the economy. Nonetheless, the problem of internal inflation remains. As the Argentine peso was not devaluing against the United States dollar at a sufficiently high rate to offset such inflation, the price of Argentine manufactured goods rose in world markets, with obvious detrimental effects on that nation's industry and its export potential.27/ If the exchange rate were favourable the manufacturing sector would have an incentive to export, thereby utilizing part of the container inflow. Moreover, if part of this inflow were utilized for Argentine exports, there would be a need for container inspection, cleaning and repair services. In this sense, Mr. R. Distefano, General Manager of Multimodal, a container repair enterprise at Buenos Aires, indicated that due to the Argentine container trade-flow imbalance and the unfavourable exchange rate between the Argentine peso and the United States dollar, the demand for repair services has been dramatically reduced. However, Mr. G. Macmillan of Transamerica ICS, a major container lessor, mentioned that the only reason for not repairing containers where damaged would be that either the repair facility could not properly effect this type of work or that such work could not be carried out in a timely manner.

26/ Informativo ALAMAR No. 313, 6-12 July 1981, p. 4.
27/ Cargo Systems, October 1980, p. 25.

/The Panamanian

The Panamanian container trade-flow imbalance is principally due to that country's geographical position as an entrepot, which leads to a natural availability of manufactured goods, limited industrial production for export, and a natural reluctance on the part of shippers and their agents to change from a known transport system to one which, to them, is unknown. Mr. A. Cano, General Manager of Sea Shops, a container repair facility located at Colón, Republic of Panama, mentioned that this situation, combined with a decision by certain leasing companies to store their containers in another Caribbean basin country with a greater demand for their export use, has nearly eliminated the demand for repair services. Consequently, it is those countries which have containerizable exports and favourable exchange rates with the United States dollar which may be considered possible areas of growing container utilization and should be evaluated to determine the economic, industrial and operational feasibility for establishment of container repair/storage facilities.

Due to trade flow imbalances, the costs incurred by leasing companies in repositioning containers held on master lease agreements 28/ have greatly increased. These costs for Sea Containers rose by US$ 10 million between 1978 and 1979 to nearly US$ 39 million -almost four times the amount of five years ago.29/ As trade imbalances show no signs of going away in the foreseeable future, there has been growing recognition among lessors that containers can be repositioned only 2 or 3 times before such costs equal or even exceed the purchase price of new equipment manufactured in the Far East.30/

In order to reduce repositioning costs lessors have a number of means at their disposal to correct the effects of trade flow imbalances on container movements. First, while a master lease purports to permit lessees to drop off and pick up as desired, such is not entirely the case. To avail themselves of this contractual right, lessees must pay a drop-off charge which varies from a minimum of US$ 25 to a maximum of US$ 625. This charge is utilized by the leasing companies to pay for container repositioning costs. Second, lessors offer a bonus of up to US$ 50 to lessees who drop off containers at ports where there is a heavy export demand. Third, certain leasing companies permit lessees to avoid drop-off charges by effecting direct interchanges -a container is transferred from one lessee to another without going off-lease. In this situation containers should, nonetheless, go through equipment interchange inspections to determine possible damage and responsibility for payment of repair work. Finally, lessors store containers at designated depots until they have a sufficient number to justify the charter of an entire vessel for their relocation. Additionally, leasing companies have undertaken negotiations with ocean liner conferences to obtain more favourable freight rates for the carriage of empty containers.

28/ Under the master lease arrangement lessees guarantee to use a minimum number of TEUs for a specified number of years with the option to pick up and drop off as required. In the opinion of leasing companies, the pick-it-up and drop-it-there service is the most useful one they perform for shipping lines. According to CTI, some of its customers would have to purchase 40-60% more containers if they had to do their own repositioning.

29/ Container News, November 1980, p. 50.

30/ Container News, February 1981, p. 14.

/The impact

The impact of a container trade flow imbalance and attendant drop-off charges at the national level is most clearly demonstrated by evaluating the Paraguayan situation. While this country's principal port, Asunción, has only one fixed crane for container loading and discharge operations, there was nonetheless a throughput of 1 500 TEU during 1980. Moreover, as a former rail ferry, the Tabare, has been converted to carry 130 TEU in a feeder service between Asunción, Buenos Aires, Argentina, and Montevideo, Uruguay, this container throughput should continue to increase.31/ While Paraguay largely exports agricultural products, there are a number of commodities which can be easily containerized. For example, cotton may be press-baled, thereby making its transport in containers cost-efficient. Nonetheless, more than 90% of these containers leave Asunción empty. The utilization of these containers in the Paraguayan export trades is of paramount importance to avoid unremunerative relocation charges. One container leasing company currently charges lessees US$ 625 to relocate an empty unit from Asunción to demand areas such as Brazil or Colombia. As a result, the price for Paraguayn containerized imports must be increased by nearly US$ 1 million to pay for this "dead freight". It is interesting to note that the Captain-General of the port of Buenos Aires, in an effort to avoid this situation, has promulgated a measure 32/ requiring that all forms of unitization, including containers, be employed in the Argentine import and export trades.

(b) The cost structure of and demand for container repair services

Latin American and Caribbean countries face four aspects of containerization: (i) route conversion; (ii) cargo conversion, (iii) inland cargo terminal establishment, and (iv) port infrastructure conversion. The first of these, route conversion, involves the use of cellular container tonnage by ocean transport companies serving ports of this region. Second, the employment of cellular tonnage on these trade routes would require shippers, freight forwarders and others to convert cargoes to be carried from general to containerizable. Third, as the clearance of containerized cargoes at ports of entry has resulted in major congestion problems, certain countries of this region 33/ have begun to emulate those of Europe by establishing cargo terminals at origin for export and destination for import cargoes. These cargo terminals offer the same full range of complementary services normally found in ports, thereby permitting the clearance as well as the consolidation and deconsolidation of containerized cargoes. Finally, port infrastructure must be converted to permit the efficient unloading and loading of capital-intensive cellular container vessels as well as the uninterrupted movement of containers between such vessels and consignees or shippers.

As is obvious, the common denominator for each of these aspects is the container. Not equally obvious, however, is the pivotal role container repair and maintenance enterprises play in ensuring that containerized cargoes are protected from the weather, that damaged containers once repaired may continue to be handled with standardized cranes, fork-lift trucks, etc., and that they may fulfil their maximum economic lives.

31/ Cargo Systems, October 1980, p. 29.
32/ C.G.P. No. 14/80 of 16 April 1980.
33/ Cargo Systems, October 1980, p. 20.

/The domestic

The domestic container repair industry reflects domestic container needs, flows and export usages. If the export container usage for any given country is dynamic, stagnant or depressed, then so will be the container repair industry. Moreover, it should be noted that container repair sales areas are geographically distinct: land, labour, customers and competition will vary considerably from one geographic location to another. The expansion of repair activity can only be done by opening new facilities in new locations, thereby proportionally increasing overhead expenses.

A container repair facility is something of an anomaly within containerization -it is localized, serving a specific area usually near a port or large industrial centre, while the rest of containerization is of an international nature. Furthermore, as each case of container damage is more or less unique, the opportunities for mechanization are minimal. For example, a breakdown of container repair costs shows that for the average repair, material cost is about 30% of the total, while labour can account for two-thirds.34/ As a result, the container repair industry is predominantly labour-intensive in a highly capital-intensive field, thereby centering the individual facility around people and their skills rather than equipment and materials.

As container repair and maitenance is a labour-intensive industry, its costs are basically of a fixed nature. Repair work supplied on a peak and trough basis logically leads to significant fluctuations in the work force, bringing with it social and other disruptive consequences, or to pricing structured to generate sufficient funds in the peak days to cover unavoidable losses in the troughs. In order to create and maintain a skilled and experienced workforce, the owner of a repair facility must be willing to accept that a high percentage of his costs are fixed. Coping with these changes in repair volume is fundamental to the professional repairer. Nonetheless, the posssible impact of these high fixed costs with changes in volumes of repair work can be lessened if a facility works for numerous container owners. For example, Dr. W. Greverath, General Manager of REMAIN at Hamburg, Germany, believes that his firm is able to offer better repair services by working for as many customers as possible. Furthermore, other facilities such as Sea Shops, at Colón, Panama, have also undertaken the repair of trailers so as not only to offer a complete range of services to operators and lessors but also to have an income source which might offset the cyclical nature of container repairs.

A peak or high volume of repair work provides the industry with an incentive to invest in more land, plant and equipment. If investments are made to properly service this peak volume of work, however, the trough will be all the more marked when it comes, as the increase in capacity will be chasing a reduced volume of work. Nonetheless, it is interesting to note that the non-utilization of the container fleet in 1979 due to the lack of adequate repair facilities around the world rose from 10% in 1978 to 12%, while some leasing companies had up to 16% of their fleet awaiting repair. The relocation of empties accounted for another 6-8% of unutilized containers. Thus, during 1979 approximately 20% of the world container fleet was non-utilized. Moreover, damaged containers tend to sit around awaiting repairs for considerable periods of time. As a result there has been an increase in the relocation of empties to meet the cargo demand, and this in turn has led to the construction of new containers. In some places, especially in developing

34/ Cargo Systems, April 1978, p. 33.

/countries, containers

countries, containers tend to be used as temporary warehouses, which again increases the demand for new containers.35/

As a container repair facility has a high percentage of fixed costs, not the least of which is labour, fluctuations in the amount of repair work can make it difficult to determine an adequate pricing level. The fluctuation of demand against a fixed cost background is thus by far the most important factor in determining workshop pricing.

(c) Criteria for establishment of and investment in container repair enterprises

The majority of container repair and maintenance enterprises tend to be relatively small but highly flexible concerns which have entered the industry through performing related services for container owners. Quite a few repairers, such as Geoffrey Reyner (Container Repairs) of Manchester, United Kingdom, have come from the road haulage industry and, in competing for the road transport of containers, have offered to store them, which has led to their repair.

As the basic skills involved in the repair of steel containers are not difficult to acquire and require only a small initial investment, it is one of the fastest growing containerization industries. Nonetheless, it must be understood that many inexperienced enterprises have started up quickly and failed just as quickly. Many have not suffered this fate, however, and have survived the uncertainties of container damage work-flows to emerge in a relatively strong position.

The greatest advantage for Latin American and Caribbean repair facilities lies in their competitive labour costs. Most developed country repair and maintenance enterprises must pay higher wages than those of this region. These higher wages, when combined with the labour-intensive nature of container repair and maintenance, create an uneconomic and uncompetitive situation for such business.

Although this might not seem immediately obvious, it is the small repairs to containers which are the most profitable. In fact, it should be noted that holes and dents account for approximately 80% of all repair work.36/ While a leasing company inspector will readily authorize repairs costing US$ 20-50, he will be more thorough for a US$ 500 repair and call for several estimates.37/ This has the effect of reducing the profit margin for the repairer, since he must compete against normally strong opposition. In these cases, the smaller repairer with lower overheads will have a cost advantage over other companies which have made substantial investment in plant and equipment. It can be quite frustrating for the latter companies to see the more lucrative work go to small enterprises which are often unable to undertake major structural repairs. Nonetheless, it should be understood that while container owners do not require large enterprises to effect needed repairs, they do require competent repairers who will carry out the job to the desired quality standard, at an acceptable price and within a reasonable period of time.

35/ Cargo Systems, January 1980, p. 41.

36/ Based on CEPAL interviews with Caribbean, European, Latin American and North American container repair enterprises.

37/ Cargo Systems, September 1979, p. 53.

/Apart from

Apart from a repairer's investment in people, his largest financial requirements involve land, buildings and equipment. While the skills and investment required to enter the business in a small way are minimal, the repair facility can be expensive with the high costs for buildings and equipment such as cranes, fork-lift trucks, service vans, shotblasting and spray-painting. Nonetheless, it should be understood that there are entry levels through which most repair enterprises have successively passed -storage, repair and finally refurbishment.38/ While container storage requires only a small investment for companies with appropriate handling equipment, such as that for trucking and stevedoring, with each successive level the financial requirements become greater.

The level of investment required to establish a container repair facility is difficult to quantify as there are so many variables involved. Nonetheless, once it is determined that the export container flow in the area where a facility is to be located is adequate, inquiries can be made as to the purchase and leasing costs of suitable land, buildings, fork-lift trucks, welding equipment, compressors, steel cutting and bending machines, shotblasting and spray-painting equipment, as well as the necessary administrative infrastructure. It should be understood that if capital is scarce -and this is almost always the case- then investment should be made not in specialized equipment, which cannot be efficiently employed in a variety of jobs, but in a system which is as flexible as possible.

With an investment of this magnitude, many repair enterprises consider that container leasing companies and shipping lines should offer them long-term repair contracts which provide sufficient security for the required investments. However, due to the fortuitous nature of container damage, it is difficult if not impossible for owners to guarantee or contract with only one repairer, as they have no way of knowing where a unit may be when it is damaged. Moreover, the transport costs needed to comply with such a contract would be prohibitive.

One of the most important factors for setting up an efficient repair and maintenance enterprise is recognition of the fact that every hour, day, or week that a container is out of service means revenue lost to its owner. The time factor in container repair depends on:

(a) the extent of damage,

(b) the repair facilities available,

(c) the distance the container has to be transported to be repaired, and

(d) whether the container has to be unstuffed before the damage can be repaired

It should be understood that the transport of a container any distance to undergo repair work not only increases the length of time it is out of service, but also increases the cost of such repair due to transport charges. In order to reduce unremunerative transport costs in respect of damaged containers, most leasing companies have a policy of repairing such containers at facilities close to the place where the damage occurred.

In summary, the criteria for establishment of a container repair and maintenance enterprise are (a) low wages, (b) low taxes, (c) national sources of repair materials and equipment or favourable excise duties for their importation, (d) availability of skilled workers, (e) good conditions for investment -stable political, economic and labour situations, (f) a favourable geographical situation relative to export container flows, (g) favourable currency parity with the United States dollar, and (h) availability of suitable land for establishing the repair facility.

38/ For further discussion of container refurbishment see Annex 1.

III. INDUSTRIAL ANALYSIS

(a) Principal characteristics of the world container inventory

While there are many aspects of the world container inventory that should be given careful study in determining the feasibility of establishing repair and maintenance enterprises, some of the more important for this discussion are (i) size and growth potential, (ii) age, (iii) scrappage rates, (iv) type and material of construction, and (v) ownership.

(i) Size and growth potential

It should be understood that the world container inventory has grown quite rapidly. For example, from the end of 1970 to the end of 1977 the total world container inventory virtually quadrupled.39/ Several recent surveys indicate a current inventory of between 2.1 million TEU and almost 2.5 million TEU.40/ The world container inventory is expected to continue increasing to a level of around 4.1 to 4.3 million TEUs by the end of 1985, an increase of 72%.41/ The container inventory has probably now reached a figure in excess of 2.5 million TEU and may, by some estimates, even be approaching a figure as high as 3 million TEU.42/ According to data compiled by Containerization International, a specialized container magazine, the present inventory could increase to about 6 million TEU by the end of this decade if the current trend for door-to-door services continues to use up more containers on the inland ends of the transport chain. As a result of this inland use of containers, there has been a steady increase in the ratio of containers to vessel slots from 2.9:1 in 1970 to 4.6:1 in 1979.43/

Estimates for future growth of the world container inventory vary somewhat:

	Sources	
	(1) "Containerization into the 1980s"	(2) "Containerization International Yearbook 1979"
1980	9.0	12.0
1981	6.0	9.0
1982	4.0	6.0
1983	4.0	6.0

Beyond 1983 these sources differ in growth rate projections. Whereas the first predicts an increasing growth rate, the second foresees a flat growth rate through the 1980s.

39/ Cargo Systems, October 1979, p. 53.

40/ The State of Containerisation 1979, Flexi Van Corporation; and Containerisation into the 1980's; Cargo Systems Research Division.

41/ Container News, May 1980, p. 104.

42/ Transport Newsletter, Volume 3, No. 1, September, p. 19.

43/ Seatrade, June 1980, p. 129.

/(ii) Age

(ii) Age

With rapid growth in the 1970s, it is not surprising that the world container inventory is quite young.

Year built	TEU ('000)	% of end-78 fleet	
58 - 67	89	3.6	12+ yrs. old: 89 000 TEU 3.6%
68	85	3.5	
69	96	3.9	
70	122	5.0	6-11 yrs. old: 878 000 TEU 36.0%
71	162	6.6	
72	202	8.3	
73	211	8.7	
74	201	8.3	
75	197	8.1	1-5 yrs. old: 1 463 000 TEU 60.4%
76	215	8.8	
77	350	14.4	
78	500	20.6	
Total	2 430	100.0	

Source: "Containerisation International Yearbook 1979".
Similar figures appear in "Containerisation into the 1980's".

The average age of the inventory at the end of 1978 was 4.9 years. As approximately 300 000 TEU were constructed in 1979, the inventory increased its average age to 5.2 years at the end of 1979. Since annual construction is expected to remain near 1979 levels until well into the 1980s, the average age of the world container inventory should continue to increase.

(iii) Scrappage rate

While the British Standards originally estimated the life of a container at three years,44/ certain operators such as Japan's K Line and Mitsui OSK Lines and several leasing companies such as CTI and Sea Containers are now estimating serviceable life to be in excess of 15 years with at least two refurbishments during that period.45/ These life expectancies have to be modified, however, for trades between developed and developing countries. For example, Johnson Line has encountered a service life of 8 years for steel containers in such trades, and a major lessor only 5 years.46/

44/ Shipping World and Shipbuilder, January 1968, p. 34.
45/ Cargo Systems, March 1981, p. 34.
46/ Cargo Systems, May 1977, p. 27.

/It should

It should be understood that such service lives are averages and that numerous containers are sold for scrap each year due to:

(i) damages in excess of economic repair cost;

(ii) old age - DRP becomes structurally unsound after 8-10 years
- excessive corrosion for steel containers renders them structurally unsound and refurbishment is too costly;

(iii) obsolescence - phasing out of 8' high TEUs in favour of 8'6" high units.

As the average serviceable container life has been increasing, "Containerisation into the 1980's" predicts the following scrappage rates:

Year	TEU scrapped
1980	73 000
1981	83 000
1982	91 000

Since containers eligible for scrappage can either be refurbished or replaced, these estimates provide an indication of the potential worldwide refurbishment volume. As can be seen, the refurbishment volume is not large. Furthermore, as the replacement price for a steel TEU produced in the Far East is approximately US$ 2 200-2 400 47/ owners have an incentive to replace instead of refurbishing containers.

(iv) Type and materials of construction

In reviewing the world container inventory by equipment types and construction materials, it is evident that the majority of containers are dry cargo steel vans and, therefore, the majority of repair work involves such containers.

Types		Construction materials	
Dry cargo van	84.5%	Steel	58.0%
Refrigerated	6.1%	Aluminium	35.0%
Tank	0.4%	GRP	7.0%
Other	9.0%		100.0%
	100.0%		

Source: Containerisation into the 1980's and Containerisation International, November 1978.

47/ Cargo Systems, April 1981, p. 55.

/As can

As can be seen from the above table, the world inventory of GRP, aluminium, tank and refrigerated containers is sufficiently small for the newly established enterprise to wish perhaps to consider the advantages -such as reduced capital investment and repair skills- of repairing only dry-van steel containers. Once workers are efficiently performing repair work on steel containers, the facility could expand its services if necessary to include these other container types and materials of construction. There is already a marked preference for steel as a container construction material, and the dominance of steel should increase, as the majority of new construction orders are for steel containers.

(v) Ownership

An analysis of container ownership indicates that leasing companies have become the dominant class of owners.

	Share of ownership		
	End 1977	End 1978	End 1980
Leasing companies	40.3%	51.0%	61.0%
Steamship lines	58.6%	44.5%	39.0%
Other (railroads, shippers military)	1.1%	4.5%	
	100.0%	100.0%	100.0%

Sources: Container News, June 1979, p. 18.
Containerisation International, May 1978.

It is interesting to note that from the first oil price increase in October 1973 up to the present the world has gone through a series of recessions which have had a dramatic effect on the ocean transport industry. As a result of each round of oil price increases, shipping lines have been less inclined to commit themselves to the financial burden of buying their own containers. Given these factors, then, it is understandable that more and more shipping lines have begun to utilize leased containers.

In response to this situation, during the 1970s leasing companies instituted aggressive building programmes. While leasing company ownership growth to the level of 61% by the end of 1980 was an optimistic estimate, it is very probable that such level will be reached during the early part of this decade.

(b) Major customer groups

Prior to the mid-1960s, owners of general cargo vessels merely supplied the transport capacity -i.e., cargo holds- to prospective shippers. However, by 1970 vessel owners in developed countries, if still in business, were offering not only transport capacity but also uniform transport units -i.e., containers. While the cost of specialized vessels with cellular construction for the transport of

/containers has

containers has by itself greatly increased the vessel owners' financial needs, it must be understood that the container has permitted the realization of the through transport concept -door-to-door- thereby greatly increasing the requirements for containers. To gain an idea of such requirements it is necessary to understand that container vessels require approximately five containers for each slot. If it is assumed that a container vessel with a useful life of 20 years has 1 000 slots, that the useful life of a container is ten years, that 20% of the containers over the vessel's life will be "lost" or damaged beyond repair, and that the cost of a new container will average US$ 6 000 over the vessel's life, then the shipowner's financial requirement for the purchase of containers would be approximately US$ 72 million, without including costs such as repair and insurance. The increased capital outlay of shipping lines implicit in the ratio of containers to slots has prompted them to look to others to finance the extra burden of paying for containers not only to fill their ships but also to satisfy inland transport requirements.

The rapid growth of the container leasing industry is a result of the profound changes brought about in ocean transport due to the widespread use of containers. While container lessors have come to provide a myriad of services to owners of container vessels, perhaps two of the most important relate to container acquisition and the correction of trade flow imbalances.

In many trades, especially those between developed and developing regions, there is a flow of manufactured goods in one direction and of raw materials and agricultural products in the other. Containers utilized for the transport of manufactured goods are seldom used for raw materials, however, and only under certain circumstances are they employed in the transport of agricultural products. As this type of trade flow creates an imbalance in the utilization of containers, there is only one short-term response -unremunerative relocation of the containers. It is interesting to note that every trade is imbalanced to some extent, which was the raison d'être for the lessor in the first place.48/

The owners of container vessels have recognized these aspects of containerization and have turned to leasing companies for their container needs. These companies have provided vessel owners with containers at a reasonable lease rent per day, with the option to drop them off and pick them up as their requirements dictate. While companies such as Zim Container Service and Matson Navigation Company maintain that it is less expensive to buy containers than lease them, since 1979 container leasing companies have acquired 50% of all TEUs. Furthermore, industry spokesmen have indicated that they expect the leasing companies' share of the world container fleet will continue to increase, to reach 75% by the end of the decade.49/

While both leased and carrier-owned containers are physically capable of travelling anywhere, containers owned by carriers are generally captives: they do not often leave the control of their shipping line owner and are not diverted to supply demands beyond their line's routes. A container owned by a shipping line normally travels back and forth over the line's own routes, thus substantially increasing the likelihood that trips in one direction will be made empty.

48/ Container News, June 1980, p. 20.
49/ Ibid., p. 14.

/Leasing companies

Leasing companies encourage their customers (lessees), generally shipping lines, to inspect containers when they take possession of them under a lease. During the term of a lease, containers are in the exclusive possession and control of lessees in order to provide maximum flexibility in container use, and lessees are responsible for repair and maintenance while the containers are on lease. At the end of a lease or upon return of the container, the leasing company and lessee once again perform the task of inspection. If any damage is discovered, repairs are generally carried out at this time. In order to assist these operations, the leasing industry has prepared a series of inspection and repair publications.

As can be seen from the industry analysis, the main customer group is the leasing industry. This group requires depots which offer a full range of services including repair, inspection, handling, storage and, at times, refurbishment. This group of customers is stable, and once aligned with a repairer a leasing company will not readily switch to another repairer. Within the container industry, this group is a high growth sector. On the other hand, the secondary customer group consists of shipping lines. This group requires repair work and some refurbishing but without interchange inspections or storage. Nonetheless, only a small proportion of shipping lines' repair work is contracted out to independent repairers. Repair work for shipping lines is unstable, since they will contract such work on a least-bid basis and move from repairer to repairer. This group is a low growth sector.

The principal characteristics steamship lines and leasing companies look for in repair enterprises are high quality repair work at a reasonable price. Inadequacy in either of these areas can be sufficient to cause a change in repair organizations. If quality and repair costs are adequate, then turnaround time becomes the deciding factor.

Usually, leasing companies have found that their container depots in developing countries go through two stages in providing services. First, their activities are limited to receipt, inspection, handling, storage and minor maintenance of containers. Once a depot is performing these tasks adequately, it may be asked to undertake the repair of damaged units.

Leasing companies, in particular, are very concerned about the lack of repair facilities and are committed to assisting persons in appropriate locations with the establishment of such facilities in order to speed up the repair of damaged containers, raise the utilization rate and reduce costs for the relocation of empties. In an area where there are no container depots, leasing companies often encourage local trucking and setevedoring enterprises to undertake depot operations, as they usually have the necessary container transport and handling equipment. Nonetheless, one German repair enterprise indicated that much overcapacity in the European repair and refurbishment industry was caused by container owners such as leasing companies who have encouraged new entrants into this field.

An enterprise which seeks to provide repair, maintenance and storage services to the leasing industry should be aware of the documentation and information processing requirements of this sector. For example, both lessor and lessee

/require documentation

require documentation 50/ for the pick-up and return of containers at depots. Further, inspection reports and repair estimates must be provided prompty and in detail. Additionally, certain leasing companies require daily or weekly reports on container movements, repair activity, and depot inventories.

In summary, the leasing companies' characteristics are as follows:51/

- They need a full range of services -inpsection, handling and storage, in addition to repair and, at times, refurbishment;
- They form a stable customer group -once aligned with a repairer, they change infrequently; price is not as critical as with shipping lines;
- The volume of repair work is unsteady -week-to-week and seasonal fluctuations are great;
- They are a homogeneous customer group -the leasing industry is very concentrated 52/ and has similar repair specifications, container designs and documentation. Repair work is more comparable among leasing companies than among shipping lines;
- A wide range of repairs is needed -very minor to major repairs; both vital and cosmetic work required;
- The volume of refurbishment work is unsteady -leasing companies tend to contract this type of work on a least-bid basis;
- Special documentation requirements are involved -documentation must be provided for both leasing companies and lessees and periodic status reports to the former.

(c) Customer relations

The relationship between a repair facility and leasing company is formally created through the execution of a Depot Agency Agreement.53/ Nonetheless, this relationship is also controlled by other instruments such as instructions for the operation of a container depot, IICL repair guidelines and the commercial terms or trading rules utilized by the facility in accordance with its national commercial code.

The Depot Agency Agreement should be viewed by a repair facility and its legal representative as a basis for discussions rather than as an instrument which must be either totally accepted or rejected. As leasing companies have prepared these agreements in the manner most favourable to their own interests, each clause must be studied with care and, if found to create an uncommercial business environment for the repair facility, necessary modifications or counter proposals must be prepared. While there are many provisions in a Depot Agency Agreement which must be studied with care, some of the more important relate to (i) free storage days, (ii) responsibility for payment of repairs, (iii) responsibility for negligent repairs, (iv) repairs effected by third parties, (v) amount of public liability insurance, (vi) responsibility for personal injury or damage to property, (vii) applicable law, and (viii) prices charged to customers.

50/ See IV (f) Specific operational aspects, (iii) Documentation, p. 33.

51/ For further discussion of the special needs of the container leasing industry see Annex 2.

52/ The seven principal container lessors are Container Transport International (CTI), Flexi-Van, Interpool, Itel, Sea Containers, Transamerica ICS and Xtra.

53/ See annex 3 for a copy of a Transamerica ICS Depot Agency Agreement.

/All major

All major leasing companies normally seek an exemption from the payment of container storage charges until damaged units are repaired. The reason for this is to accelerate a process they view as largely controlled by repairers -that is, container inspection, preparation of repair estimates, and utimately the execution of repairs. Nonetheless, the commercial reality is somewhat different in that containers are usually inspected upon arrival at a facility, with a repair estimate and request for authorization to effect repairs being dispatched within hours. Further, this process is not entirely controlled by repairers as there may be delays in the granting of repair authorizations by leasing companies to repair enterprises. As a result, leasing companies usually compromise by accepting an exemption from the payment of container storage charges for the time period between receipt of a repair authorization by a repairer and the completion of such work.

Since responsibility for payment of container repairs is, pursuant to the agreement executed between leasing companies and lessees,54/ an obligation of the latter, depot agency agreements normally require that repair facilities must seek such payments from the appropriate lessees. While these agreements would seem to make only lessees liable for the payment of repairs to containers, such is not entirely true, however. The prevailing commercial practice is that the party requesting the repairs -whether it be the lessor or lessee- is primarily responsible for payment of such repairs. For example, where a lessor requests repairs to a container which has entered a repair enterprise and terminated its lease, that lessor must pay for such repairs even though the damage might have occurred during the lease term and even though the lessee may be liable to the lessor for repair costs. Likewise, where the lessee requests repairs to a container from a repair enterprise during the lease term, that lessee must pay for such repairs even though he is not owner of the container. Nonetheless, in this latter example a situation could develop in which the lessee who requested the repairs cannot make the required payment -for whatever reason- and there is no specific provision in the depot agency agreement through which the enterprise may receive payment from the leasing company. To avoid this situation the repair enterprise would be well advised to include in its depot agency agreement a statement to the effect that if the lessee fails to pay for repair work, the leasing company will respond.

Normally, leasing companies incorporate into their depot agency agreements a clause through which repair enterprises agree to idemnify the former for "any and all claims" arising out of their negligence in the performance of repairs. While leasing companies have every right to expect that repairs shall be properly effected, the use of such an indemnification clause does not take into account current business practices. It should be understood that leasing companies not only publish container repair standards but also maintain qualified surveyors to review damaged units and approve estimates of repair and, even more important, to approve the repair work effected. Therefore, as repair facilties and leasing

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54/ See annex 3 for a copy of the Institute of International Container Lessors (IICL) "Conditions of Lease".

/companies are

companies are both intimately involved in the repair of containers, the former might wish to consider eliminating the phrase "any and all claims" and limiting such indemnification to the amount of the repair in question.

Depot agency agreements usually provide that designated facilities will permit third parties to effect container repairs on their premises. To correctly evaluate the impact of this provision it is necessary to understand that container repairs can be effected with very little capital investment by persons possessing the requisite sheet-metal and welding experience. Nonetheless, an enterprise which offers a full range of services -storage, repair and refurbishment- requires a substantial capital investment. As a result, the small open-air or mobile repairshop has much lower operating overheads and can price its work substantially less than that of enterprises which offer an enclosed workshop with a paved storage area and a full range of services. If a repairshop is permitted to carry out container repairs on the premises of another facility it would, in effect, be utilizing the overheads of the facility without making any contribution thereto. The economic impact of this provision would therefore appear to require careful evaluation before acceptance.

Most depot agency agreements require repair facilities to maintain public liability insurance policies in amounts of, for example, US$ 1 000 000. As these provisions do not take into account local business practices, national commercial codes nor the high premium cost of such policies in developing regions, repair enterprises should seek to negotiate appropriate policy amounts which take these factors into account.

While it would appear administratively efficient for a leasing company to have all of its disputes subject to the same legal régime, it must be recognized that these companies not only have representatives in regions with significant container flows but also receive benefits from those regions served -e.g., income from the use of their equipment and protection by the police and fire departments. Moreover, as newly established repair enterprises in developing regions normally lack sufficient funds to send a representative to jurisdictions selected by and most convenient for leasing companies, such enterprises might wish to consider the advantages of having depot agency agreements subject to the jurisdiction and legal régime of their national courts.

The remuneration for services rendered by repair enterprises should be the result of free and open negotiations between such enterprises and their prospective clients. Nonetheless, leasing companies include a provision in depot agency agreements to the effect that the prices they are charged shall be the lowest prices charged to any customer for similar services. This provision effectively eliminates the possibilities of growth through promotional pricing, as any lower prices must be immediately extended to all other leasing company clients. The acceptability of such a provision should therefore be carefully evaluated.

Many repair facilities have found that once their estimates for repair of damaged containers are received by leasing companies, negotiations usually commence between such companies and the relevant lessees to determine which damage or parts thereof might be considered fair "wear and tear" and who is to pay for the repairs. Once these negotiations are completed, the leasing companies normally

/notify repairers

notify repairers by telex, telephone or through their local representatives as to who will pay which part of the repair work and authorize the facility to carry out designated repairs.

In negotiating with repair enterprises over the prices at which their containers are to be repaired, leasing companies do not discuss the price for a completed repair but rather break these overall prices into individual components -number of days containers are stored free, hours to effect each repair, hourly rate for repair workers and material costs- and negotiate each separately. In this way leasing companies not only exercise a greater degree of control over their repair costs but are also formidable negotiators. For example, the management of a European repair enterprise indicated that the lack of bargaining power vis-à-vis container leasing companies has created the situation illustrated in the following table:

	Repair time (hours)	US$/hour	Materials	Total
England	10	20	50	250
Germany	6	30	100	280
Latin America	22	8	70	246
Lessor	6	8	50	98

While the overall differences between total bid prices for England, Germany and Latin America are small, container lessors will select the lowest amount for each bid item and then seek to have the work done at that price -i.e., US$ 98.00. Therefore, repair enterprises would be well advised to generate cost, material and man-hour data which can be utilized during such negotiations to justify their prices.

As spare parts utilized in the repair of damaged containers are normally charged by repairers to container owners at cost plus a percentage mark up in recognition of the opportunity costs in such inventory, certain owners have begun supplying their own spare parts, thereby eliminating this source of revenue. Many repair facilities have found that the key to their profitability is not agreeing upon prices but rather agreeing upon what work is included in the estimate for each repair, thereby avoiding "free" repairs.

(d) Repair standards

The Institute of International Container Lessors (IICL), which counts all the major leasing companies among its members, is one of the few organizations which gave an early lead in preparing manuals for container repairs, though many shipping lines and classification societies have subsequently followed this initiative. The IICL manuals define terms such as "slight", "moderate", "heavy", "acceptable" and "unacceptable" damage and provide recommended procedures for repairs. Nonetheless, these manuals are not mandatory, and as stated in the

/introduction to

introduction to the repair manual for steel freight containers: "The Institute expects to continue to issue revised editions of its publications from time to time and welcome suggestions as to improvements or omissions which should be taken into account in the next edition".

While the IICL manuals do make a major contribution to the effectiveness and standardization of container inspection and repair, they are regarded only as guidelines, and leasing companies are fully aware that as such they are subject to varying interpretations. Therefore, many leasing companies supplement these manuals with detailed programmes of seminars, films, etc.

It should be noted that leasing companies make frequent checks to assure full compliance with their repair standards. To accomplish this, such companies normally have a representative who, depending on the volume of work, is either on-site permanently or visits a number of facilties on a regular basis. For the newly established enterprise, these representatives can easily provide much-needed technical advice at no direct cost to such enterprise.

As different owners and users of containers expect different standards of repair, less responsible repairers also exist, since there is no control over repair standards and they can often make sub-standard repairs at low prices. Major repairers and owners are aware of this situation and agree that more control is needed over repair standards. For example, OCL has prepared a written repair manual but found that problems arising from language and regional attitude differences have made it necessary to convert it into a pictorial manual, thereby reducing the amount of written description which can lead to misinterpretations.

Many repairers do work to established standards and have gained the approval of classification societies like Lloyd's Register of Shipping, Germanischer Lloyd, Bureau Veritas, etc., but there is no compulsion for them to do so. In fact, many repairers believed that the classification societies who approve new container would subsequently recommend that, when damaged, they should go to approved repair companies, but this is generally not the case. Indeed, classification society-approved repair companies have made little impression on certain owners who have large technical staffs and prefer to do their own "approvals".

There have already been various attempts at establishing repair standards. Container Aid International (CAI) was founded in 1968 as a worldwide association of container repair enterprises. While full membership is limited to those repair organizations which have been approved by a classification society, associate membership is available to all repairers and other parties interested in the industry. The main purpose of this association is to make available the broad experience of its members and associates to facilitate the provision of efficient repair services, and to have the repairers' view taken into consideration in the preparation of standards for the design, repair and safe handling of containers. Some repairers believe that repair standards change with company financial results -when owners have the money the standards go up, and when they haven't, standards go down. The whole question of the standard to which repairs should be carried out remains a confused one. For example, some owners do virtually nothing to their containers at any time, with the repairer shotblasting and painting mammoth creases in panel sections rather than straightening them out, in contrast with leased containers just off hire which are repaired to the highest standards.55/

55/ Cargo Systems, March 1980, p. 29.

/Due to

Due to the abundance of container repair standards, the container repair industry has evolved the following general rule which dictates the nature and standard of repair work: in all cases it is necessary to replace damaged material with spare parts of the same strength and type. Where like for like replacement is not possible the repairer will supply certificates on steel gauge and quality, while the customer, for his part, is able to specify exactly the material gauge and quality required.56/

The differences between repair standards of leasing companies and other container owners such as shipping lines are due to the nature of the former's business. As a result of the lease relationship, unless lessees receive containers in "like-new" condition there would be endless negotiations concerning when the damage occurred -either before or after acceptance by lessees- to determine who is responsible for repair costs. For this reason, leasing companies normally require even cosmetic repairs during refurbishment to ensure that lessees will receive containers in "like-new" condition. By way of comparison, other container owners such as shipping lines require only that their containers have no structural defects which might render them unsafe or unable to be handled with specialized equipment, and that they be wind and water tight to protect cargoes transported.

While container repair facilities have test equipment which can assure that, for example, the International Organization for Standardization's (ISO) new construction tolerances have been met, neither the container owners nor the repair industry believe they should pay for such tests.57/ The container lessors have indicated that the repair industry should absorb the cost of such tests, as they would be testing the effectiveness of their own repair work.

(e) Sources of container damage

There is wide agreement that of the operational phases capable of inflicting container damage, those involving the actual handling of containers at terminals are the most significant. This is due to the nature of container handling facilities -they require a high throughput to justify their installation and rely heavily upon operator dexterity for safe operation of container handling equipment. Furthermore, it should be understood that container stuffing and stripping areas, such as those found in interior cargo terminals (ICT) and shipping departments of major exporters, are generally congested, thus creating another source of container damage.

A recent study 58/ indicated that 45% of all damage to containers is related to mishandling in terminals. Damage during railroad, highway and sea transport amounted to 30%, while improper stowage was responsible for the remaining 25%.

56/ For a more complete discussion of container repair standards and the International Convention for Safe Containers (1972), see annex 4.

57/ Cargo Systems, March 1980, p. 29.

58/ A Study of Intermodal Container Safety, Cushing, C., Kimball, P., and Higgins, M., prepared for the United States Coast Guard, Washington, D.C., 1976.

/Since most

Since most damage in terminals occurs during handling, which is only a short period of time in the total transport cycle, it is evident that areas near such terminals might be a productive location for establishment of a container repair enterprise. Nonetheless, it should be understood that since the majority of containers handled at marine terminals are subject to further on-carriage, any damage will be only temporarily repaired to permit such onward transport. Only when the containers are unstuffed can final repairs be undertaken, as welding and other repair procedures can damage the cargoes carried.

While it might appear that regions which have had over 20 years of container experience would have only minimal container damage, such is not the case. For example, Matson Navigation Company has found in its service between the West Coast of the United States of America and Hawaii, which is basically a closed-loop transport operation with little on-carriage, that with each handling -e.g., unloading from a ship and transfer to a storage area- 10% to 20% of the containers are damaged. Further, Overseas Containers Limited (OCL) has found that 39% of its containers utilized between developed regions are returned to the United Kingdom damaged, with an average repair cost of US$ 140, and that in its service to the Persian Gulf area 54% are damaged with a repair cost of US$ 160-475.

Both Matson and OCL employ cellular vessels for the transport of containers, but a recent unpublished master's thesis by L. Collantes and E. Silva of the Catholic University of Valparaíso, Chile, provides an important insight into the percentage of containers damaged where general cargo vessels and non-specialized port facilities are utilized. This thesis indicates that where containers are transported on the hatch covers of general cargo vessels which call at numerous ports on the West Coast of South America prior to final dischage at Valparaíso, Chile, an average of 78% were found to be damaged when finally unloaded at the latter port. This high percentage of container damage is due to the employment of non-specialized vessels and port facilities, lack of experience on the part of longshoremen, and the need to temporarily off-load containers at each port to gain access to cargo holds for loading and/or discharge operations.

IV. OPERATIONAL ENVIRONMENT 59/

(a) Location

While there are many important factors that should be taken into account when evaluating the proper location for a container repair facility, some of the more important for this discussion are (i) container flows, (ii) export usage and (iii) transport costs to repair facilities.

A port may have a large throughput of container traffic, but such throughput may be largely unrelated to its productive hinterland and therefore provide very little work for a repair facility. For example, any containers damaged while utilizing the port of Antofagasta, Chile, in transit for La Paz, Bolivia, the land bridge between Salina Cruz and Coatzacoalcos, Mexico, or Kingston, Jamaica, as transshipment centres would be temporarily repaired to protect the cargo, with permanent repairs effected when the container has completed its journey and is unloaded. In this situation, these port authorities might wish to consider the benefits which could result from the setting aside of a small area within their ports where temporary repairs might be effected. These repairs would assure that any transport delay due to container damage is minimized and that the cargo is immediately protected.

Although ports such as Buenos Aires, Argentina; Valparaíso, Chile; and La Guaira, Venezuela, may have substantial container throughputs, they would be considered potential locations for repair enterprises only if they have or are close to productive hinterlands which utilize containers in their export trades. When containers are employed in a country's export trade, they must be first inspected and, if necessary, repaired to ensure that the cargo will be protected.

Since many Latin American and Caribbean countries have productive hinterlands adjacent to or near their major ports, and as the use of master lease agreements is increasing, which provide containers at locations convenient to shipping lines, an evaluation of possible facility sites might begin with port areas. However, in evaluating possible locations it should be kept in mind that the most economic repair facilities would be those sited close to major trade flow terminals where containers are stripped and stuffed.

Container repair facilities located close to major trade flows have another advantage, in that the transport costs for damaged units are minimized. For example, Dr. W. Greverath of REMAIN at Hamburg, Germany, indicated that he would not consider siting a facility more than three kilometres from a port or productive hinterland. It is true that there is a facility ten kilometres from the Hamburg port area which specializes in major container damage, but this specialization was considered justified because transport costs to and from the facility represent a smaller percentage of repair costs than for minor container damage.

(b) Physical plant

While there are many factors that should be taken into account when planning the physical plant of a container repair and maintenance enterprise, some of the more important for this discussion are (i) the workshop, (ii) storage area and (iii) administrative offices.

59/ For further discussion of the establishment and operation of a container repair enterprise, see annex 5.

/Although European

Although European container repair facilities have fully enclosed workshops, in many Latin American facilities such as Lingas, Reparación do Contenedores and Politrans the repair areas are only covered by a roof.60/ The use of a roof for the workshop provides workers with a dry place to effect repairs during the rainy season, but at the same time reduces needed investment. As an example, Lingas began operations with only a small covered workshop, under which approximately eight containers might be repaired simultaneously. As the demand for repairs has grown, it is planned to double the covered workshop area.

While workshop floor areas for European and most Latin American repair facilities are of cement, LLOYDBRATI at Santos, Brazil, has utilized removable 2 metre square reinforced concrete "rafts" for its workshop floor. These concrete squares require only a levelled sandy base, can be installed in a minimum of time and may be reutilized at other locations. Their advantage is that they may be easily lifted by a fork-lift truck for rapid installation or removal to another location. Nonetheless, if they are exposed to the weather, joints must be carefully sealed or water will enter, permitting the "rafts" to rock and thereby pumping a mixture of sand and water to the surface.

As the covered repair area for the newly established enterprise will be relatively small, it is necessary to ensure that this area is not used for the storage of containers or spare parts. The covered repair area should be viewed as the most important revenue-generating area and, therefore, utilized for the repair of damaged containers to its fullest extent.

In order to attract repair work from leasing companies, repairers must offer sufficient container storage area. There are no mathematical formulas which will assist in determining the total area needed for a container repair and storage facility. The relevant factors which should be considered, however, are (i) the desired container stacking heights in relation to the cost of handling equipment and storage area surfacing, (ii) the average time during which the containers will remain at the facility -both for repair and storage, (iii) the proportion of 40' and 20' containers at the facility, and (iv) the number of customers and their requirements. With reference to the latter, most leasing company depot agreements require storage space for a specific number of containers, such as 850 TEUs.

While opinions vary as to what type of surface covering is needed for a container storage area, Mr. J. Evans of Geoffrey Reyner (Container Repairs) Ltd., at Manchester, United Kingdom, indicated that the land must be self-draining to protect wood floors and must have a gravel surface, thereby making it serviceable in all seasons. On the other hand, Dr. W. Greverath of REMAIN at Hamburg, Germany, considered that a flat-cement type of surface for the storage area was necessary to reduce the costly wear and tear on container handling equipment such as fork-lift trucks. Another alternative which could be utilized to achieve surfacing economies would be placement of the aforementioned concrete "rafts" under container corner fittings. In this manner these "rafts" could be utilized to reduce pavement costs by providing pads for supporting container corners, with unsurfaced gravel in between.

The majority of new repair facilities utilize containers for office space, storage of spare parts and tools, and to provide sanitary and lunch room facilities for employees. For example, Politrans at Rio de Janeiro, Brazil, has utilized three FEUs and two TEUs in a stacked combination to create moveable workshop and office areas on a leased site no more than 500 metres from the dock area.

60/ At Buenos Aires, Argentina; Santos, Brazil; and Santos, São Paulo and Rio de Janeiro, Brazil, respectively.

/In summary,

In summary, the physical plant for a newly established container repair facility should include the following:

(i) a roof for the workshop area;
(ii) a cement floor for the workshop and adjacent handling area;
(iii) a gravel surface for the storage area; and
(iv) three to five modified containers for an office, spare parts and equipment storage, sanitary facilities, etc.

(c) Equipment and spare parts

While the newly established repair enterprise might greatly reduce its equipment needs by purchasing instead of fabricating spare parts, this would result in greater operating expenses which could, in a highly competitive situation, make the facility less profitable or even unprofitable. Consequently, persons evaluating the feasibility of establishing a repair facility might wish to consider the acquisition of, inter alia, the following:

(i) Argon, MIG and stick welding, and propane gas cutting equipment;
(ii) Electric drills, hacksaw and disc grinder;
(iii) Twenty-ton hydraulic jacks and steam cleaner;
(iv) Portable lights, extension cords, rivet guns, ladders;
(v) Air compressor and air lines;
(vi) Steel cutting shear and bending press;
(vii) Fork-lift truck with adjustable spreader for empty 20 and 40 foot ISO containers;
(viii) Circular saw for wood; and
(ix) Truck tractor and trailers.

As the steel bending press, cutting shear, fork-lift truck, truck tractor and trailers require large capital expenditures for their acquisition, most Latin American repair enterprises have avoided such expenditures by sub-contracting the transport of containers to and from the facility and the fabrication of spare parts to other metal working shops, and by renting appropriate fork-lift trucks. For example, Multimodal at Buenos Aires, Argentina, began repair operations in 1970 and has not, as yet, found it necessary to purchase a steel bending press and cutting shear. Likewise, Reparación do Contenedores of Santos, Brazil, contracts the movement of containers through a local truck owners' association and rents two of its fork-lift trucks.

The availability of spare parts is a critical problem for repairers. Many spares are difficult to obtain, especially for old containers or containers manufactured in remote locations. Repairers are often forced to purchase and cannibalize scrapped containers for spare parts or to fabricate spares themselves. For lack of parts, repairs can be held up for long periods of time. This means lost revenue to the repairer's customers, and chronic parts problems can cause customers to change repairers. In an effort to avoid this situation, many repair facilities have acquired steel bending and cutting equipment for the fabrication of needed spare parts.

As a container repair organization could hardly be expected to carry spare parts for every conceivable type of container likely to pass through its facility, it may contract depot services for one or more container leasing companies and thus know what types of spare parts to have available. While the repair industry has moved a long way towards becoming self-sufficient in the fabrication of

/container spare

container spare parts, it is still in many ways dependent on external sources of supply. This dependence is due to a number of factors, such as the insistence of container owners that damaged areas be repaired with specific types of components, and the proliferation of container types has somewhat reduced the feasibility of container repairers fabricating all needed component parts. It is, then, important for repairers to keep in close contact with sources of supply for various types of components, and in particular those sources which can offer a fast delivery service.61/

As a result, the newly established repair facility must determine the availability of needed supplies such as paints and steel plates in the national and international markets. If these supplies are not available locally and can be imported at a reasonable price, the facility must then be assured that its sources of supply respond rapidly to requests, offer products of unvarying quality and utilize adequate packing for protection during transport.62/

(d) Personnel skills

The repair facility must have a trained work force with a comprehensive range of skills. Moreover, repairers must provide continuity of service, which means a stable work force, administration and management capable of adapting quickly to varying work loads.

As seen by container repairers, container owners have four principal needs. First, a comprehensive range of container repair and maintenance services with the availability of additional services such as storage and transport. Second, flexibility of service. The types of service that owners need and expect are extensive and volumes vary considerably. The flexibility of service also includes other requirements such as personal contacts and repairs, if needed, outside normal working hours. Third, convenience of service. The requirements of container owners vary greatly but, as a general rule, repair facilities must be near their base of operations and sufficiently near the centres of freight movement. The reason is obvious -to reduce empty container transport costs. Finally, while most container owners have their own repair manuals, they need to be assured that repair work undertaken will be completed to desired standards. Further, one might add the overall requirements of repair work accomplished rapidly and at a reasonable price.

While the skills needed by workers to repair dry cargo steel containers are many, some of the more important are experience with metalworking hand tools, bending and cutting sheet metal, gas, electric and inert gas welding systems, and familiarity with the use of blueprints and wiring diagrams. Furthermore, repair workers are usually assisted by specialists such as an electrician to service appropriate systems for tools, trailers, fork-lift trucks, etc., a maintenance man to service mechanical tools, engines, etc., a man to issue, store and order needed spare parts, an inspector to review containers upon arrival for damage and complete equipment interchange and damage reports, a foreman to schedule, inspect and approve repair work, and a carpenter to replace damaged flooring. While

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61/ Cargo Systems, March 1981, p. 53.

62/ For further evaluation of the physical plant requirements as well as those for equipment and spare parts, see annex 7.

/these specialists

these specialists might seem to create a heavy monetary demand on the enterprise, it should be understood that many of these functions may be combined and are often performed by the repairmen themselves.

Although a repair enterprise relies upon the services of many skilled workers, the estimator occupies a pivotal role in the overall functioning of such a facility. If the estimator bids too low for certain repair work the possibility of a reasonable return on invested capital will be reduced or even eliminated, and if his bid is too high the facility runs the risk of not receiving such work. As candidates for this important function, many repairers select fabricators and welders, who have a good working knowledge of containers, and place them with an experienced estimator for about three months. While at the end of this period the newly-trained estimators can begin to work alone, an active dialogue should be maintained with their experienced counterparts to resolve any doubts, thereby ensuring that bids are neither too high nor too low.

As the newly-established facility will not have a pool of experienced repairmen from which estimators might be selected, the enterprise may wish to investigate the feasibility of training its estimators at other facilities in the region. Nonetheless, Mr. H. Haight, General Manager of Société Fosséenne d'Entretien de Containers, Fos-sur-Mer, France, was of the opinion that an estimator could be trained at an established repair facility by making use of industry standard work times and costs for effecting specific repairs. He indicated that the estimator could compare actual container damage with such standards to estimate the cost of repair work.

(e) Mobile repair units

In order to determine the circumstances under which mobile repair units would find their best application, it is necessary to evaluate the sources of container repair work and the way in which those sources normally seek repair services. The sources of container repair work are (a) leasing companies, (b) shipping lines, (c) port authorities, (d) interior cargo terminals (ICT), (e) major exporters and (f) freight forwarders. While leasing companies and shipping lines usually seek repair services from designated depots, ICTs, major exporters and freight forwarders could utilize mobile services at their facilities, as they may damage containers during stuffing or stripping operations. However, for countries which have not as yet established ICTs and where major exporters and freight forwarders do not make wide use of containers, the demand for mobile repair services would probably be limited to on-dock repair services (if such units are permitted in the port area).

When a sealed container is damaged during port handling operations, consideration should be given to whether the journey might be continued by effecting such repairs as will suffice to protect the contents until they reach their destination. It should be understood that having a container unsealed by the appropriate governmental authorities means delay, increased handling costs, and the possibility of breakage and pilferage. Therefore, where containers are damaged during transit or transshipment operations -for example, between Salina Cruz and Coatzacoalcos, Mexico, and Jamaica- temporary repairs should be effected at such locations for protection of the cargo and to permit the on-carriage to be completed.

/A mobile

A mobile repair service must be prepared to operate on board ship, at dockside, and at depots. As some locations may have restrictions on welding, alternative means for effecting needed repairs must be available. According to Mr. R. Game of Overseas Containers Limited (OCL), 80% of their container repairs -50% by value- are effected by mobile units. It is interesting to note that such units permit the elimination of the transport and lifting costs involved in the transfer of containers to stationary facilities for all repairs other than major structural damage. Nonetheless, Dr. W. Greverath of REMAIN at Hamburg, Germany, indicated that mobile units lose their cost-effectiveness unless backed-up by a stationary facility with appropriate equipment for the fabrication of spare parts.

To profitably employ a mobile repair unit, the enterprise should be assured of enough work, such as a minimum of one day at each repair location. This means that mobile units do not provide emergency repair services but planned services to meet consistent demands. An emergency service can be, and often is, provided, but such service should be costed on a different basis. The work carried out by mobile units on containers has three main limiting factors:

(a) the lack of equipment to effect major structural repairs,

(b) the need for a control system which assures the same repair quality as for those effected at stationary facilities, and

(c) the need for special cost and time control systems, as mobile unit repair personnel function away from the stationary facility.

As a result, the person in charge of a mobile repair service must not only be a reliable technician but must also be able to work independently, have a good understanding of port and depot working requirements, and have a capacity to schedule work.

There are two principal types of mobile repair units: (i) a motor vehicle with a van body equipped as a workshop and (ii) a container similarly equipped, which can be transported on a trailer.63/

(f) Specific operational aspects

As was stated in the introduction, this document does not purport to be a manual of methods by which containers might be repaired. Nonetheless, during the collection of information from container repair facilities and their major customers as well as suppliers of spare parts and paints, certain working features came to light which those persons considering the establishment of such facilities might wish to evaluate. Of the many features of this work encountered, some of the more important include (i) the nature of the container repairs, (ii) container inspection, (iii) documentation, (iv) surface preparation and painting, (v) container markings, (vi) worker productivity programmes, and (vii) cost control and profitability.

(i) The nature of the container repairs. As repair work on a particular container depends on the damage, the type of container, its construction material, standards of repair and the customer, each task must be tailored to fit the situation. Due to the unique nature of each repair and the consequent need for flexibility, repair work is very labour-intensive. Moreover, the work force must be moderately skilled and versatile. While some mechanization is possible with the use of hydraulic rams for straightening, automatic welding and painting, and some

63/ For further discussion on the establishment and operation of mobile repair units see annex 5.

/jigs and

jigs and fixtures, it must be understood that these devices are merely used as aids to an otherwise manual operation. Automation or assembly line techniques have little application in container repair. Only rarely will a task be repeated in exactly the same manner more than a few times. The design, construction, and condition of containers vary so much that jigs, fixtures, and special tools cannot be utilized to achieve assembly line repairs. Even containers of the same design and from the same manufacturers become unique after repeated damage and repair.

(ii) Container inspection. While container inspection involves an extensive range of human judgement and other factors such as varying commercial attitudes,64/ the importance of careful container inspections cannot be too strongly emphasized. The inspection, repair and storage needs of the container leasing industry differ from those of other container owners in that careful inspection and repair serve important commercial purposes. In fact, the interest of both the leasing industry and its customers require competent container inspections and repair. The industry recognizes two distinct situations in which responsibility for the condition of containers shifts between lessors and lessees. Until containers are accepted by by lessees, lessors are, of course, responsible for all damage. If a container is not in proper condition on delivery, the lessee may reject it; if it is not in proper condition on return, the lease agreement provides that the lessee is financially responsible for repair costs. As a result, once containers are accepte by lessees they become responsible for all damage. Thus, the delivery of containers by lessors to lessees and redelivery to lessors are the recognized acts which sift legal responsibility for container damage.

Due to the worldwide nature of container leasing, it should be understood that repair enterprises, in carrying out container inspections, play a major role in determining responsibility for container damage. As lessors cannot themselves receive from and deliver to lessees their many thousands of containers, they have executed depot/storage agreements with repair enterprises for that purpose. In this situation, lessors must rely upon the inspections carried out by such enterprises with, of course, occasional checks by their own surveyors. The primary problem with the inspection of leased containers appears to lie not so much in failure to inspect such equipment as in the fundamental determination of when the damage occurred, thereby placing responsibility for its repair.

In order to assist with the execution of inspections, the IICL has prepared and published a Guide for Container Equipment Inspection which is applicable to both the leasing industry and its customers -the same inspection criteria apply for containers delivered to and returned by lessees. While lessees are encouraged by leasing companies to conduct on-hire inspections to assure that containers received are in an undamaged condition, many repair facilities have indicated that off-hire inspections outnumber those for the on-hire situation 50 to 1. Moreover, off-hire inspections often involve negotiations between lessees and lessors with regard to the cost of repair, who is responsible, what is permissible "wear and tear", container repositioning costs, and those locations at which containers are regarded as off-hire.

All major leasing companies maintain a worldwide network of surveyors to verify damage estimates and approve repairs. While the managements of many repair facilities indicated that these surveyors provide useful technical advice concerning

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64/ Cargo Systems, November 1979, p. 101.

/various methods

various methods by which damaged containers can be repaired, others considered their technical ability to be too limited to permit them to do more than verify the existence of damage and its subsequent repair. Nonetheless, newly established repair enterprises should make every effort to utilize the experience and technical skills of such surveyors.

While most leasing companies have their own inspectors for the review of repaired containers, the most important are those employed by the enterprise itself, since these inspectors normally determine what is to be done and the resulting quality of repairs before the leasing company inspectors have a chance to review the work.

As most containers are inspected at the inbound or outbound stage of transport operation, maintenance and repair of an individual container is an ongoing, continuous process. Regular inspection with a view to preventive maintenance and repair is essential, bearing in mind the financial implications of the extremes of container maintenance and repair versus replacement policies.

(iii) Documentation. The documentary aspects of container inspection, damage estimation, repair costing and administrative control, which make possible a frequent and accurate flow of information to customers, must be a priority concern of those enterprises which seek to provide repair services to leasing companies and many shipping lines. The documentation utilized by a repair facility is normally composed of the following elements:

Container receipt:
- telex or telephone message from owner to depot requesting acceptance of container;
- gatehouse receipt signed by driver delivering container, container number recorded in overall master book and given job number;

Container inspection:
- equipment interchange receipt (EIR) completed and sent to appropriate leasing company;
- estimate of repair (EOR) completed for all damaged containers and sent to owner or lessee depending on who under the terms of the lease is responsible for damages. In all cases an informational copy of the estimate is sent to the lessor;

Container repairs:
- telex from container owner authorizing repairs;
- copy of EOR;
- individual container work card for hours and materials used; T-cards for the job control board;
- repairmen's time sheets, and
- repair materials requisitions;

Container billing:
- invoice for billing.

When a container arrives at the repair facility it should be checked for receipt against an "acceptance list". This list contains the numbers of the containers that each customer has requested the facility to receive. Thereafter an "acceptance note" is prepared and signed by the person delivering the container -usually the driver of a truck. The container is then unloaded and thoroughly inspected for damage. If undamaged, the container is placed in storage; if damaged, it should be placed in an "awaiting repair" location near the shop. In both situations the storage charges should start immediately after the inspection is completed.

/The "acceptance

The "acceptance note" is delivered to the repair facility office and the information contained thereon is transferred to the appropriate customer's equipment interchange receipt (EIR). The EIR is sent to the customer with, if the container is damaged, an estimate of repair (EOR) requesting authorization to commence repair work. Also, the container number and date received are entered in chronological order in a "master book". A "T-card" is then prepared with the customer's name and container number, and placed on the control board under "awaiting repair authorization".

In order to effectively programme the overall flow of work, most repairers utilize a job control board on which individual container T-cards are placed under the following appropriate headings:

1. awaiting inspection
2. awaiting repair authorization
3. repair authorization received
4. under repair
5. under refurbishment
6. completed and transferred to storage.

When authorization for repair is received, the details are entered in the "master book" and on the container control T-card. The authorized repair work can now commence and a "work card" is given to the repair crew. This card shows the repair work to be undertaken and the maximum hours allowed. Furthermore, time sheets and material requisitions are prepared to ensure correct costing and pricing for repair services rendered.

Upon completion of repair work the "work card" is returned to the facility office and dated. This date is also entered in the "master book". The customer is then notified that the container has been repaired and the date of notification is entered in the "master book". Finally, the container is placed in storage and the last entry in the "master book" occurs when the container leaves the facility.

The repair facility normally provides a daily repair completion report and weekly status report to its customers. In order to provide this information repair facilities must have ready access to telex and telephone services.

(iv) Surface preparation and painting. Modern marine paint technology is a very specialized field largely created by the introduction, in the late 1950s, of large oil tankers, followed a few years later by sophisticated container ships. As a result of the high capital investment involved, there was a pressing need at that time for improved protection against corrosion and fouling in order to ensure that such vessels were kept at sea for longer periods. It should be understood that the first containers introduced in marine service were little more than standard highway trailers without chassis or wheels. As these trailers lacked surface preparation for the marine environment, steel members corroded rapidly.

During the last 30 years tremendous advances have been made in protective coating technology. These developments have brought about the availability of coating systems which, either by themselves or in combination with others, have potential service life expectancies of five, ten and even fifteen years -often under harsh environmental conditions.

Despite the availability of these materials, however, the common experience is that coating systems fail prematurely in service. In cases of premature coating failure the cause can seldom be attributed to the material employed. Almost invariably premature coating failure is due to inadequate regard for surface prepartion and, somewhat less frequently, to poor workmanship in the application of a coating system, or to the application being carried out under

/adverse environmental

adverse environmental conditions. It is now widely understood that the achievement of 100% coating system efficiency will depend 65% on surface preparation, 25% on quality of application -such as adequate coating thicknesses at sharp edges and angles, freedom from voids and misses in the coating, etc.- and only 10% on the actual coating material.65/

In repair or minor maintenance situations other factors come into play to exert an influence over the success of a coating. Particularly notable is the fact that a coating used in this situation must be compatible with the original coating. The surface preparation and painting of repairs may be accomplished with an electric wire brush and disc sander, and the appropriate paint may be applied with a hand brush. Only when a repair facility also offers refurbishment of containers does it become necessary to utilize shot blasting for surface preparation and spray equipment for painting.

Many different types of coatings are used to protect containers from corrosion. While two coats are normally applied, a primer and a top coat, single-coat systems have given good results in some tests. Usually container owners select the paint system desired. The majority of paint companies such as Hempel's Marine Paints and Mander-Domolac provide free technical assistance to assure that their paint systems are correctly applied. Furthermore, many paint companies have prepared engineering drawings and other specifications for container construction and refurbishment plants which persons desiring to establish such facilities might be allowed use, provided that these companies' products are utilized preferentially.66/

(v) Container markings. Container owners mark their units to satisfy various legal requirements as well as for advertising purposes. To accomplish these purposes owners usually employ vinyl markings. There are two types of vinyl markings -cast and calendered. The former is produced in a liquefied form and allowed to flow into a mould. Calendered markings, on the other hand, are produced by rolling a plastic material out until the desired thickness is obtained. Cast vinyl will not shrink after it has been applied to the container. However, calendered markings will sometimes shrink and curl. Most manufacturers indicate that their products will last from five to seven years.67/

The application of container markings requires the indicated area to be free of oils, greases and silicones, the proper temperature, and a knowledge of the manufacturer's installation techniques. If a decal fails to stick, it is not usually because the product is unsatisfactory but rather because of improper surface preparation or the fact that the container is too cold or wet. Furthermore, a skilled applier may not have been available for the job. It should be understood that the need for a skilled applier is paramount, not simply because such a person can work faster, but because there will be less wastage. For example, an experienced applier might utilize a soap solution which permits markings to be slid into the proper position, after which the solution is pressed out.68/

65/ Cargo Systems Container Technology Conference, December 1978, "Corrosion in containers - its causes and prevention", J. Dave Griffiths, Deputy Managing Director, R.J.P. Nicklin & Co. Ltd., UK.

66/ For further discussion of surface preparation and painting requirements, see annex 9.

67/ Cargo Systems, August 1977, p. 23, and August 1979, p. 41.

68/ For further discussion of container markings, see annex 8.

/(vi) Worker

(vi) Worker productivity programmes. While it might appear that each repair enterprise is at liberty to determine the hours and materials needed to effect repairs, such is not the case. Within the container repair industry there are maximum allowable hours and repair standards which determine the materials needed for each type of repair. As repair enterprises in this situation can control their costs only through worker productivity, a few repairers have instituted programmes whereby employees are given a bonus for effecting repairs in less than the standard time. For example, Geoffrey Reyner (Container Repairs) Ltd., at Manchester United Kingdom, employs a productivity programme in which "the total time for repair" of a container forms the basis. This factor is obtained by adding the individual times for repairs on a container. When the leasing company authorizes a certain container to be repaired, a copy of the "total time for repair" -without times for individual elements- is given to the workshop. Each week a ratio is produced which compares the "total time for repair" of all workers directly involved in repair work with their total attendance hours. This ratio is then expressed as shop performance:

$$\frac{\text{Total time for repair}}{\text{Attendance hours}} \times 100 = \text{Shop performance}$$

The management of Geoggrey Reyner Ltd. has found that, depending on the performance reached by the repair shop as a whole, this can result in the individual repair workers being paid an enhanced hourly rate which may, for an exceptional performance, double their earnings.

Of course, this productivity plan might be modified somewhat to include a quality control factor. In this situation the total time for repairs would be reduced by the time needed to rework any containers. Thus, the repair workers should have an incentive not only to be productive but also to ensure that their work fully complies with industry standards.

$$\frac{\text{Total time for repair - time needed for rework (if any)}}{\text{Attendance hours}} \times 100 = \text{shop performance}$$

(vii) Cost control and profitability. As container repair and maintenance facilities have only four sources of income -from the inspection, repair, storage and transport of containers- each of these sources should be maximized to assure the greatest overall profitability. While many customers will request free storage days for their containers, this request should be granted only when it is determined that such free days would make a greater contribution to profitability than storage income. Another factor to be taken into consideration is that many repair facilities offer substantial container storage space in order to protect themselves from the worst effects of varying repair volumes. For example, the management of Seashops at Colón, Panama, has found that when repair income has fallen, storage income as well as that from the repair of trailers has permitted the facility to remain profitable.

Although container lessors and shipping lines normally provide transport for a damaged unit to the selected repair facility, such facilities are often asked to transport containers for the performance of repairs or storage. For example, Geoffrey Reyner (Container Repairs), REMAIN and REPCON all have appropriate container transport equipment, with the latter charging US$ 2.50/mile for this service.

/In addition

In addition to maximizing the income from each of the above sources, it should be understood that the profitability of a repair facility can be enhanced and is often determined by effective cost control. Some of the measures which can be taken to control repair facility costs include:

1. Constant re-examination of container repair operations to determine where the use of jigs, fixtures and pre-fabrication of container sections would reduce repair times;

2. Minimizing the number of containers which must be returned to the workshop for "touch up" work;

3. Keeping in touch with repairmen to determine repair "bottlenecks" and methods by which they might be reduced or eliminated;

4. Minimizing the number of times a container must be moved within the repair facility, and

5. Minimizing the administrative overheads-secretaries, accountants, messengers and management personnel.