Thirty years ago, the liner shipping industry serving the US was transformed by the development of intermodal road and rail links, and the establishment of through services. This allowed ocean carriers to organise their liner schedules around fixed-day-of-the-week rotations and to fully incorporate ‘out-ports’ into their networks.

Initially, this process was fairly localised – eg serving Boston (MA) and Philadelphia (PA), via New York/New Jersey – and involved the use of trucks. However, the introduction of intermodal rail links allowed ports on one coast to be served by rail from another. Suddenly, Houston could be served over Los Angeles (LA), and New York could be served over Seattle (WA).

Ultimately, ocean carriers offered through-service to inland points, as well as ports, largely on the back of improved operating economies. Containerisation, for instance, required significant investment, and it was more cost-effective to introduce a string of five or six vessels serving West Coast of North America (WCNA) from Asia than to offer a nine- or 10-ship loop direct to the US East or Gulf coast ports.

A unique confluence of events drove the development of intermodal solutions during the 1980s. A deregulated US rail industry needed a way to rapidly attract new business, as it sought to equalise high supply and low demand. International trade growth and the emergence of service contracts gave railroads increased volume.

The result has been two decades of record growth. Still, the business model has changed. The railroads have consumed almost all their excess capacity, and large traffic volumes no longer automatically translate into lower on-carriage prices for the shipping lines (see ‘Gauging growth’, pp60-63). This is a contributory factor in driving more all-water services.

In its basic form, intermodal already exists globally. Most containers moved internationally involve a truck move at origin and destination. For instance, while in Europe, barge transfers are important in corridors such as those between Rotterdam/Germany and Antwerp/Germany.

Elsewhere, in China, barge traffic is gaining in significance on the Yangtze River to/from Shanghai and in the Pearl River Delta to/from ports in southern China/Hong Kong.

However, to most in the industry, intermodal is best defined as the movement of containers over long distances by rail. Until now (apart from a few isolated examples), this concept has not been replicated outside of North America.

As the liner shipping industry faces continued growth, increased vessel size and constrained infrastructure, rail intermodal growth is no longer automatic. But several opportunities do exist.

As trade volume increases, existing marine terminals are forecast to run out of space over the next decade, unless they undergo dramatic increases in their acreage, berth capacity and labour productivity. Much like Tacoma in the 1980s, and Savannah in the 1990s, ports that have not been traditional container gateways are seeking to leverage the availability of land for their future gain.

For example, at Jacksonville (FL), MOL recently (August 2005) signed a 30-year lease agreement to develop a 158-acre facility. And North Carolina State Ports is looking to acquire 600 acres of land to build a new container terminal in Brunswick County. Elsewhere, Alabama State Port Authority is developing a new container terminal at Choctaw Point in a joint venture with Maersk Line and CMA CGM.

While these facilities are being constructed in non-traditional ports, they are not noteworthy for factors other than location.

However, is planned developments at Prince Rupert (BC) and Lazaro Cardenas (Mexico) that are of greater interest and potentially of more significance, as they involve transforming these ports into strategic intermodal gateways for the US market.

In many respects, the viability of these new ports has been made possible by rail partners that have undertaken financial engineering to expand their respective networks. The result is almost a ‘back to the future’ rail-port partnership.
Such deals prevailed in the late 1970s and early 1980s, when liner intermodal services were being developed and there were over 50 class-1 railroads in North America. Lacking geographical scope, these railroads, out of commercial necessity, forged partnerships with ports located on their tracks in order to induce intermodal discharge.

Today, there are just seven railroads, and those previous partnerships are moot, because most of them cover a wide range of ports. Hence, a train-operating company no longer has to worry about an ocean carrier diverting cargo through another port and it losing traffic.

In the cases of Lazaro Cardenas and Port Rupert, a symbiotic relationship has emerged among the rail, port authority and terminal operator sectors, and it is this that bodes well for their future development as intermodal hubs.

Lazaro Cardenas is a well-established gateway for Mexico, and it is only recently that the port’s hinterland potential has been more fully recognised. This has been accomplished by the involvement of Hutchison Port Holdings (HPH), the world’s largest terminal-operating company, and the Kansas City Southern (KCS) railroad.

Lazaro Cardenas Terminal Portuaria de Contenedores (LCT) is a deepwater facility with significant expansion opportunities. Currently capable of handling more than 200,000 TEU annually, its development plan envisions handling 2 million TEU within 20 years.

KCS has been involved in Mexico since 1997 when the government began privatising the national railroad. Initially, KCS and Mexican Maritime Transport (TMM) acquired the north-east portion of the network and created TFM. In 2003, KCS agreed to acquire TMM’s portion of TFM, but only months later, TMM unexpectedly attempted to terminate the agreement. In 2004, KCS won an arbitration case, and reached a final acquisition agreement. The deal was finally closed in 2005, and the former TFM was renamed Kansas City Southern de Mexico (KCSM).

With the railroad integration complete, Lazaro Cardenas is becoming a viable intermodal gateway. However, the question is where to?

A prime market outside of Mexico is Houston on the US Gulf Coast. In recent years, Houston has developed into an import distribution centre, and, although most cargo continues to be routed via southern California ports and overland, the US Gulf Coast port’s expansion programme has led to several all-water Asia/US carriers calling there. These services comprise a mixture of mainline direct and/or feeder relay links over Caribbean hubs.

However, the launch of direct ocean carrier services to/from Lazaro Cardenas and Asia could lead to this becoming a premium intermodal service corridor in the future. Although ship sailing times would be marginally longer than calling at LA/Long Beach, KCS’s rail route is 460 miles shorter than BNSF’s, and 320 miles shorter than Union Pacific’s southern California corridors. In addition, shippers/consignees in Houston have to compete with a plethora of customers in other destinations, which are served from California, and both network and terminal capacity is, therefore, at a premium.

While Houston, Dallas, and Mexico City are large markets, they are not large enough to justify direct vessel service to Lazaro Cardenas. Therefore, KCS has looked at expanding its intermodal hinterland even further. While Kansas City and Chicago (IL) are probably not viable when compared with existing price and service levels over the WCNA, the rapidly expanding south-eastern region of the US offers interesting possibilities.

This appears an even more attractive option, given the joint venture signed between KCS and Norfolk Southern (NS) in December 2005 for the former’s ‘Meridian Speedway’ section of track between Meridian (MS) and Shreveport (LA).

Under the terms of the agreement, KCS will contribute the tracks and retain a 70% interest, while NS will invest USD300 million for a 30% stake. Although this is the most direct rail route into the south-east region, it is mainly single-track and prone to delays. The new deal will add capacity and raise operating speeds into Atlanta (GA), Charlotte (NC) and Florida.

In Canada, Prince Rupert’s main advantages are its extensive land bank, deep water – which is sufficient to accommodate any type of vessel – and ice-free weather, which more than makes up for its generally remote location, 930 miles away from Vancouver (BC) by road.

However, its genuine potential as an inter-modal hub has only come about because of the partnership established between Maher Terminals – a leading operator of container terminals in New York/New Jersey – and Canadian National Railway (CN).

The development of Fairview Container Terminal (FCT) at the port will be a converted bulk terminal. It will be capable of handling 500,000 TEU when it is opened in 2007. And, by 2018, the facility is expected to have a handling capacity of between 3.5 and 4 million TEU.

On the sea side, Prince Rupert offers ocean carriers the shortest distance to/from Asia and the WCNA, its distance of 5,286 nautical miles from Hong Kong comparing with 5,777 miles for Vancouver, 5,768 miles for Seattle, and the significantly longer 6,380 mile route to LA.

Meanwhile, CN offers a fast transit to Chicago, with the port advertising transit times 40 hours faster from Asia to the US Mid-West than current WCNA routeings. CN’s role was greatly enhanced when it won a 60-year lease to run BC Rail – which, in turn, increased Prince Rupert’s network advantage in a combined CN-BC system. A public-private partnership included upgrading the rail network to enable double-stack clearance between Prince Rupert and Chicago.

FCT will be an entirely intermodal operation. Port president and CEO Don Krusel boasts that there will not even be a gate. In theory, the operation will be a model of simplicity, and, unlike other WCNA operations, vessel discharge priorities cannot be disputed. There is no local cargo, and all intermodal cargo will go on single railroad (CN) to a single destination (Chicago).

The all-intermodal arrangement will require advance logistics planning. Inventory deferral will no longer be available by WCNA transloading, so customers must plan for intact inland movement. Return cargo will comprise either intermodal export or empties returning to Asia.

The arrangement for local export must be addressed. Historically, exports were the raison d’etre of Pacific North West services. Import intermodal loads were returned as empties, and loaded with forest products and agricultural commodities. The likely operating plan will call for empty containers to be railed to Prince George, loaded for export and moved by rail to Prince Rupert.

There will also be the issue of how carriers will rotate their vessels to incorporate calls at Prince Rupert. Schedules, for instance, will probably not incorporate more than one North American port, as such a deployment pattern would consume the transit time advantage and provide an alternative westbound container outlet. CN’s Intermodal Excellence (IMX) concept has no tolerance for imbalanced operations.

Although an ocean shuttle service to/from China could probably be retained a 28-day round trip with 5,000 TEU vessels, the use of larger vessels creates unique alternatives. Existing vessel alliances might or might not fill an 8,000 TEU vessel by itself – without expanding port calls.

They (or other ship operators) might, therefore, decide to run a combined shuttle service between the Pearl River Delta (Hong Kong and Shenzhen ports) – or Yangtze River Delta (Shanghai and Ningbo) – and Prince Rupert.

In China itself, intermodal rail transport is set for a bigger future, with container traffic volumes expanding at a rapid rate.

China Railway Container Transport Centre (CRCTC) is developing an improved national intermodal network, which will be anchored by 18 major intermodal logistics parks and 48 major intermodal facilities.
Recently, China’s 11th five-year plan recognised the importance of rail intermodal as part of the national infrastructure, and a key to economically developing western (interior) areas of the country.

The opportunities are immense. Consider, for example, that in 2005:

- China had over 75 million TEU of import and export traffic
- Of this international traffic, less than 10% was handled by rail
- Intermodal represents less than 3% of rail tonnage
- ISO marine containers represent less than 10% of the country’s intermodal business.

In the past decade, the Chinese Government has implemented a ‘Go West Strategy’ to promote more balanced growth across all the nation’s regions. As a result, some areas such as south-western China (Sichuan, Yunnan, Guizhou and Guanxi), northern China (Xinjiang, Gansu, Ningxia and Inner Mongolia) and Tibet and Qinghai – have experienced significant growth.

Some locations, such as Chongqing – the largest city in the world – have modal choice. Containers can be shipped down the Yangtze River to Shanghai. However, many inland cities are landlocked. Hence, rail or truck transport is required to move freight to an eastern port. The geographical paradox is shipping goods east, so that they can be moved west.

CRCTC has been innovative in developing international partnerships, so that goods can move directly west. In exploring alternatives, the company has considered several overland routes:

- Following the ancient silk route, trains would move to and from Kazakhstan, and cross at Alataw Shankou.

- Connecting with the Trans-Siberian Railway (TSR), trains might move to/from Russia and cross at Manzhouli; or move to/from Mongolia (for further connection to the TSR) and cross at Erlienhot.

Significant infrastructure investment will accompany these initiatives. The network from Lanzhou (a major transit yard) and Urumqi (near the Kazakhstan border) is being upgraded to double track, and will also be able to handle two high-cube containers in double-stack configuration.

It is this movement that offers an alternative to the Asia/Europe and Asia/US waterborne trades. For example, when import goods arrive in Europe, they must move east (from northern European ports) or north (from Mediterranean ports.) This means the waterborne distance is actually greater than between the actual origin and destination of the cargo, and, as origins and destinations move further inland, all-rail movement could viably substitute for vessel movement.

As a case in point, CRCTC has begun train services from Huhehot, an industrial city in Inner Mongolia, to Frankfurt. This traffic would most likely have moved by vessel via Tianjin and Rotterdam or Hamburg, with door-to-door transit times of 35-42 days. Rail can accomplish the move in less than half the time, about 16 days.

Opportunities also exist for cities in the former Soviet republics of central Asia. And a single rail move is simpler than multiple transhipment options over Mediterranean or Mid-East Gulf ports. For that reason, rail could be used to transport cargo between the ‘stans’ of central Asia and Japan and South Korea (handled through a Chinese port such as Lianyangang or Qingdao).

Beyond the European hinterland, service to North America can be developed. CRCTC has run services to Rotterdam, where containers can connect with transatlantic services. Non-traditional gateways, such as Narvik in Norway, have also been considered, with a possible connection to Halifax (NS). Transit time on this route (25-35 days) compares favourably with existing services.

Elsewhere, the Panama Canal Railway Company (PCRC) – which, through a joint venture of KCS and Mi-Jack Products, has been completely rebuilt – is now considered an integral part of Panama’s transport system, along with the canal and its modern ports.

Clearly, the canal is the magnet, with 13,000 vessels carrying 4-5% of the world’s annual seaborne trade transiting the artery.

Despite selected capacity enhancements and business improvement solutions over the past six/seven years, since ownership passed to the Panamanians, the canal has limits both in terms of the size of ships and cargo volumes it can handle.

Hence, the Panama Canal Authority’s (ACP) plan to construct a third set of locks – an estimated USD6-$8 billion dollar project that is expected to take eight to 10 years to complete, but which still awaits approval of a national referendum. In the meantime, ACP has been raising tolls in accordance with the perceived value of the transit – and further toll increases are scheduled for 2007. Given a stable base rate, every toll increase makes PCRC more attractive on certain trades.

In addition to the canal, Panama has developed an extensive port industry, in an effort to make the country the natural crossroads of hemispheric trade. Annual throughput at the country’s ports is now 4 million TEU. On the Atlantic coast, terminals are run by Stevedoring Services of America (Manzanillo International Terminal), Evergreen International (Colon Container Terminal) and Hutchison Port Holdings (Colon Port Terminal). Hutchison also runs Panama Port Terminal on the Pacific coast. Further development is also planned. A new megaport is intended for the Pacific side, and an extensive multimodal logistics and services centre is intended for Colon.

PCRC neatly complements the ports and the canal. Initially, the railway allowed vessels transiting the canal to unload containers to accommodate weight or line of sight restrictions. However, the business model has grown more sophisticated as it has sought to accommodate the canal’s leading container trade lanes, such as Asia/USEC, Europe/West Coast of South America (WCSA) and USEC/WCSA.

The Asia/USEC liner route is growing rapidly. While the number of all-water services continues to grow, it is conceivable that some transpacific services could eliminate the canal transit in favour of rail and an Atlantic vessel connection.

While some see rail transit as an interim step prior to the canal’s expansion, others see it as a way to avoid USEC mega-port congestion, by serving the multitude of smaller ports. Large vessels sailing directly to USEC gateway ports will continue, but the trade expansion possibilities are intriguing. And, unlike the WCNA, the Atlantic seaboard has viable container ports located nearly every 100 miles up and down the coast.

The Asia/USEC is a trade that can support large vessels with relatively few port calls. But the WCSA trade is different, with smaller, geared ships often deployed. Beyond reducing the number of vessels deployed, a PCRC transit could generate economies of scope and scale. By limiting the Pacific operation to a distribution effort, smaller vessels could generate economies of scope. On the Atlantic side, larger vessels (enjoying economies of scale) could sail between Panama and numerous USEC and European points, again achieving economies of scale.

In conclusion, intermodal rail services have become highly successful in various parts of the world, the concept’s development having been seen in the context of transportation providers’ efforts to better meet customer requirements using existing infrastructure.

Although the US has been at the centre of intermodal innovation over the past generation, this is changing. Regardless, intermodal will continue to impact liner shipping vessel deployment and inland routing.

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