THE WARTIME PANAMA THIRD LOCKS PROJECT

The expansion of the Panama Canal, with shipping using new, additional locks, wider, deeper channels (and a greater maximum water level in Gatun Lake) from 2016, was not the first attempt at improving access to the waterway. The Canal, completed by the US (after the original failed attempt under Ferdinand De Lesseps, builder of the Suez Canal) and formally opened in 1914 (but only opened fully to commercial traffic in 1920, following the end of World War 1) had been conceived by the US primarily for the purposes of defence of the Continental US, but became a major factor in international trade[1]. Even by the outbreak of World War 2, the US interest in the Canal remained largely, if not wholly, as part of its overall defence strategies – enabling the faster movement of the fleet from one coast of the Continental US to the other.

Until 2016, the Canal was limited to the so-called Panamax vessels – these being no longer than 965 feet (294 metres), no wider than 106 feet (32.3 metres), no more than 190 feet (59.7 metres) high above the waterline and no greater than 39 feet 6 inches (12 metres) in draught. The chief aim of the new locks was to allow for an increase of some 25% in the maximum length of ships able to use the Canal, a 51% increase in beam, and a 26% increase in draught.

This limitation obviously meant that from the start, the theoretical size limit of battleships (and later other large warships, such as aircraft carriers) was 995 feet in length and with a displacement of 60,000 tons (54,431 tonnes), as the maximum displacement that the Canal was able to handle was said to be 65,000 tons (58,967 tonnes). A more important limit, perhaps, was in width, or beam, with the original locks being 110 feet (33.5 metres) wide. However, such a warship would have been the equivalent of two World War 1 battleships joined end-to-end. A more pertinent problem was that, from World War 1,

[1] The eventual expansion of the Canal in the 21st Century was to be driven entirely by commercial considerations, effectively doubling the capacity of the Canal.

vessels started to adopt anti-torpedo bulges on their hulls, and this greatly increased their overall width. A contemporary article in Popular Science had asked if applying such protection to US warships would mean they could not use the Canal[2].

As we shall see, US Navy planners were planning in 1940 for very large battleships which, together with aircraft carriers of increasing size, would not be accommodated by the existing locks. However, despite some problems being encountered by the Navy's largest battleships using the locks in the pre-war period this was not the only reason for what became known as the Third Locks Project.

In the late 1930s, additional construction had been carried out or planned in respect of the Canal. For example, in an important development in 1935, the Madden Dam[3] was created to prevent the flooding of the Chagres River, which flows into the man-made Gatun Lake – a major section of the Canal[4]. This would reserve water supplies during the country's (all too short) dry season – the river being the main source of water needed to operate the Canal, and would also provide hydroelectric power.

The worsening political situation in Europe in the 1930s prompted renewed concerns about the ability of the US fleet to move between the Pacific and Atlantic. As mentioned, it had been found that the largest US battleships were already experiencing difficulties using the existing locks. At the same time, both exercises and studies had raised doubts about the adequacy of the defences of the Canal.

On 1 May 1936, the US Congress authorised a study into improving the defences and expanding its capacity to handle larger vessels. The Governor of the Panama Canal[5] was

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[2] https://www.popsci.com/article/technology/how-panama-canal-changed-shape-war/

[3] It was originally to have been called Alhajuela, after a nearby settlement, but a resolution of the US House of Representatives in 1928 requested the name Madden be used, in honour of the Congressman who had managed the funds for the project.

[4] https://www.latimes.com/world/mexico-americas/la-fg-panama-canal-timeline-20160622-snap-htmlstory.html

[5] As was the norm, this was a former US Army Engineers officer, Brigadier General Clarence S Ridley.

directed to investigate the means of increasing the capacity of the Canal for the future needs of interoceanic shipping (although, of course, this would also aid new and larger US warships). He submitted a report in February 1939, saying that construction should start within 10-12 years and, for reasons of effective defence, the new locks should be placed some distance from existing ones. The cost was estimated at $277 million[6] (the Canal in its original form had cost the US $375 million to construct[7], the 21st Century expansion would cost $5 billion).

On 11 August 1939, Congress approved a programme to improve the Canal's defences, which included a commitment to rapidly complete planned defensive installations, for improvements to the overall security of the Canal, as well as authorising the construction of the new set of locks that would be capable of accommodating larger vessels. The new plans continued to described the Canal as the keystone to the defence of the Western Hemisphere, and the Canal Zone was also intended to have the greatest air power strength of any of the overseas bases, to protect against direct attacks on the Canal from the sea, or those from of hostile airbases that might be established within striking distance of the Canal.

The Third Locks Project was intended to provide new, larger locks near existing ones at Gatun (at the Atlantic end), Pedro Miguel and Miraflores (the latter two being at the Pacific end), and excavation began near Miraflores on 1 July 1940, when the dredger *Cascades* started excavating the channel leading to the New Miraflores lock site. Dry excavation of the third set of locks began in Gatun sector on 19 February 1941[8].

Construction and planning were placed in the hands of the Panama Canal's administration, not the US Army, although the War Department controlled the finances.

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[6] https://ufdc.ufl.edu/AA00019286/00001/pdf

[7] Including $10 million to the Panamanian Government and $40 million to the French company which had been involved in the abandoned earlier project. This was then the most expensive construction project in US history: https://pancanal.com/es/culminacion-de-la-construccion/

[8] https://www.globalsecurity.org/military/facility/panama-canal-third-locks.htm

The plans called for a series of single locks parallel to, but at some distance to the south from, the existing double locks.[9]

An initial appropriation of $15 million was made for the Project through the War Department Civil Appropriations Act 1941. A Special Engineering Division of the Department of Operation and Maintenance was created to handle the work in close cooperation with the Panama Canal authorities. In fact, Canal employees had been producing plans for the design and construction and selecting potential key employees in the US since authorisation of the project in 1939

Associated work included, by 1942, a moveable (swing) bridge over the southern end of the Miraflores Locks[10] to ensure continued road and rail access to the west side of the Canal. At first, the use of this new bridge was limited to official transportation but, when work on the Third Locks Project was suspended in early 1942, it was opened to the public. Another bridge was constructed across the New Gatun Locks, at the Atlantic end of the Canal, to allow continued access to Gatun town[11].

However, a severe labour shortage hampered the project (made worse due to the parallel programme to improve Canal defences competing for the same labour). In both the Canal Zone and Panama as a whole there was then no industry to speak of, almost no construction equipment, as well as a shortage of skilled workmen. It is said that the only manufactured items that engineers could count upon acquiring locally were structural clay products, such as brick and tile[12].

[9] https://www.globalsecurity.org/military/facility/panama-canal-third-locks.htm
[10] This swing bridge was completed in August 1942.
[11] https://ufdc.ufl.edu/AA00019286/00001/pdf
[12] https://history.army.mil/html/books/010/10-6/CMH_Pub_10-6.pdf

Due to work on the Third Locks Project, Special Improvement Projects (aka Special Item Projects or SIP)[13], and various other war work for the Army and Navy, the Canal's Municipal Engineering Division workforce grew in size from 1,500 employees in 1939 to a peak of 7,600.

This Division was also heavily involved in the construction of airfields, docks, bridges, pipelines and tanks, sewers, drains, highways and a variety of military installations. It had taken over construction of the highway to the Rio Hato airbase in the far east of Panama from the American Bridge Company and the Public Roads Administration, and that alone involved building 14 steel and concrete bridges of varying dimensions. All of this work was in addition to its usual tasks involving municipal utilities, water, sewers and roads in the Canal Zone, all of which needed to meet the growing requirements that followed both the defence improvements and the Third Locks Project[14].

The Canal's Dredging Division also saw growth that began with the expansion programme begun in 1939-40, and particularly from the start of the Third Locks Project in July 1940. Its workforce rose from 1,030 to a peak of 3,173 in April 1943. It was involved in meeting the demand for increased anchorage and for the aggregates required for the various construction programmes. This included the production of gravel from the Chagres River

[13] A series of projects approved in the years before the Pearl Harbor attack were referred to as SIPs. There were about 45 of these emergency projects, mostly concerned with locks structures, installing emergency equipment and generally preparing for wartime conditions. For example, SIP-30 involved camouflage, and this also included non-lock structures, such as fuel storage tanks, as well as lock houses etc. SIP-3 dealt with locks fire protection, and SIP-5 bomb-proofing. Due to the vulnerability of the original emergency dams at Gatun, Pedro Miguel and the Miraflores Locks, SIP-7 provided for underground cofferdams at the upper end of the Gatun and Pedro Miguel Locks and could could be raised to hold back the waters of Gatun Lake. Unlike most other wartime SIP, these cofferdams proved of continued use in maintaining a safe water level and, despite most SIP being dropped in the postwar period, and the original SIP-7 being scrapped in 1953, they were reclassified from being "defense installations" to "emergency spillways" and were only finally abandoned in November 1980. The SIP-7 work alone cost $20.5 million and were completed in the early 1940s: *Security and Defense of the Panama Canal 1903-2000* by Charles Morris, Panama Canal Commission: https://original-ufdc.uflib.ufl.edu/AA00047733/00001/6j

[14] For example, water filtration capacity expanded from 16 million gallons (60.6 million litres) to 26 million (98.4 million litres) daily on the Pacific said, and from nine million (34 million litres) to 14 million gallons (53 million litres) daily on the Atlantic side.

for a stockpile at Gamboa, with 22.5 million cubic yards (17.2 cubic metres) of material removed by dredgers before the Third Locks Project ended.

To cater for the increase in so-called "Gold roll" workers, which were overwhelmingly white Americans, a new site called Margarita was laid out about 2½ miles (4 km) from Cristobal, with the first buildings occupied in January 1941. So-called "tropical", or "Silver roll", workers were to be housed separately (and in less salubrious accommodation) near Gatun. Private contractors were to be responsible for buildings for their own employees' use[15]. No less than three new towns (Caecal, Diablo Heights, and Margarita) were planned for the estimated 6,300 employees and dependents associated with the Third Locks Project.

The work that began in 1940 would have seen new locks large enough to accommodate the planned 58,000-ton *Montana*-class battleships, which had been ordered by the Navy in 1940, with construction of these locks being scheduled for completion by 1946[16]. The new locks were to be 200-feet (61 metres) longer and 30-feet (9.1 metres) wider than the existing ones.[17]

Separate from Navy plans, the US Army had expressed concerns that a ship transiting the Canal could be sabotaged or otherwise used to destroy one or more of the existing locks, and it had agreed with the Navy that a solution or mitigation was to have a third set of locks located some distance away from the original ones. By the time the Third Locks Project was cancelled the Army had already become worried that the new locks would in fact be a further target in an attempt to drain the Gatun Lake, and so cripple the Canal.

[15] https://ufdc.ufl.edu/AA00019286/00001/pdf

[16] Concern of the threat of Japanese bombing also influenced the plans. Whilst the new locks were never completed, the work undertaken would later assist in the Canal expansion project of the 21st Century.

[17] https://www.globalsecurity.org/military/facility/panama-canal-third-locks.htm

On 23 December 1941, the Governor of the Canal Zone reported to the Secretary of War that the proposed schedule, which called for completing the project by 30 June 1946, could be met only by assigning high priority to the construction.

However, on 5 January 1942, the Deputy Army Chief of Staff, argued that there was some question as to whether or not, with shipping and material in such short supply, the construction of this lock should have such a high priority. Nevertheless, since the matter was of primary interest to the Navy, the War Department accepted the opinion of the Chief of Naval Operations (CNO), who recommended "that every effort be made" to complete the project at the earliest date practicable, and not later than 1 January 1946. The Army and Navy Munitions Board agreed to assign the priorities necessary for completing the work on this schedule, and the Governor was instructed to press on with construction as rapidly as he could[18].

THE GOLD AND SILVER ROLLS

The Gold and Silver rolls constituted a segregated system of pay introduced from 1904 during US construction of the Canal; and something that continued long after the Canal was completed and operating. Gold roll workers were white, primarily American, more highly paid, and originally paid in US gold coin. The silver roll workers, who had originally been mainly from the Caribbean islands, but also included those from Spain, Italy, and other European countries, as well Panamanians, were paid much less and in Panamanian silver coin.

The system was also a *de facto* colour bar, with separate privileges, eating facilities, and building entrances for Gold and Silver workers (and any families). It has been described as an imported version of “Jim Crow”, the racial segregation system of the southern US, and it became the foundation for Canal Zone society and economy until it was phased out

[18] https://www.globalsecurity.org/military/facility/panama-canal-third-locks.htm

during the1950s. Whilst, in 1936, as a new treaty with more favourable terms for Panama was being agreed, President Roosevelt had said he would do away with the discriminatory practices in the Canal Zone, nothing was to change for many years[19].

As mentioned, being on the Gold roll brought with it various privileges and better amenities. This meant not just much higher pay, but also better and more spacious housing facilities for families (and being separated from Silver roll workers' accommodation), excellent and well-equipped schools for their children, better nutrition, better health care, almost free entertainment and recreational facilities, and a generally better quality of life. Other benefits the Gold roll enjoyed included sick leave and "home" leave – the latter being paid return passage back to the US while their job was kept open for them in the Canal Zone. For Silver Roll workers, every aspect of their lives would be segregated from, and generally inferior in quality to, that offered to Gold roll workers, and their separate housing areas developed into distinct communities that were kept apart from those of the Gold Roll workers. Indeed, in the name of public health and disease prevention, "sanitation zones" were created to exclude Panamanians and to contain West Indians.[20]

While some black employees and other non-American members of the Gold Roll were entitled to the "privileges", they were nevertheless still placed on a lower pay scale and denied certain benefits, in particular the sick leave and home leave provisions[21].

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[19] *US-Panamanian Relations Since 1941* by Lester D Langley (Journal of Interamerican Studies and World Affairs, Vol. 12, No. 3, July 1970), Cambridge University Press: https://www.jstor.org/stable/175020?read-now=1&seq=1#page_scan_tab_contents

[20] https://canalzoneclassrooms.wordpress.com/segregation/

[21] https://thesilverpeopleheritage.wordpress.com/2008/05/01/the-silver-and-gold-roll-on-the-panama-canal-zone/

A SPECIALISED CEMENT CARRIER SHIP

The lack of an industrial base and the availability of cement in Panama meant that one of the associated requirements in planning the new locks involved modification of the Liberty Ship design to take cement to Panama[22]. The Liberty Ship programme in the US was to produce hundreds of vessels to both replace war losses and provide the necessary vessels needed for the war effort. In addition to the standard cargo ship layout, there were a number of conversions or modifications, and one such conversion proposed was as a cement carrier intended to supply the Third Locks Project, although no such conversion was ever carried out.

US naval designers Gibbs & Cox were directed to develop plans for the modified vessels, which would be capable of carrying about 10,000 tons (9,072 tonnes) of cement from Houston, Texas to Cristobal. In order to carry this intended load, the ship had to be limited to a fuel capacity for a one-way trip at an average speed of 10 knots. Four hulls were designated for such conversion, but before work began the Third Locks Project was suspended, removing the need for such bulk cement carriers.[23]

THE TWO-OCEAN ACT

The argument for the Third Locks Project was adversely affected by the Two-Ocean Navy Act of 1940 (aka the Seventy-Percent Act, the Vinson-Walsh Act or the Second Naval Expansion Act[24]), which was then one of the largest procurement Bills in the history of the

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[22] Pre-war cement had also had to be shipped from the US to Hawaii for defence projects there. By coincidence, this had involved the former SS *Ancon* (renamed by new owners the SS *Permanente*), the ship that had made the first-ever transit of the Canal by a commercial vessel in 1914. Converted to carry dry bulk cement, she was actually moored in Pearl Harbor when the Japanese attacked, but survived both that and the entire war, only being scrapped in 1950.

[23] *Workhorse of the Fleet A History of the Liberty Ships* by Gus Bourneuf Jr (American Bureau of Shipping) 1990 & 2008: https://ww2.eagle.org/content/dam/eagle/publications/company-information/workhorse-of-the-fleet-2019.pdf

[24] The first had been the Vinson-Trammell Act of 1934 (aka the Naval Expansion Act), which provided the first major expansion since World War 1. This had added 65 destroyers, 30 submarines, an aircraft carrier

US Navy. It sought to increase by 70% the Navy's combat tonnage at a cost of $4 billion. It also set into motion a strategy that is still relevant today – having separate US fleets in both the Pacific and Atlantic Oceans. Thus, the vital need to be able to transfer a single fleet, or the balance of it, from one side of the US to the other was undermined.

The Bill was introduced in June 1940, and provided for 200 combatant and 20 auxiliary ships. While in his testimony to Congress the CNO, Admiral Stark, did not provide numbers, he was expecting that this would translate into an additional seven battleships, 18 aircraft carriers, 27 cruisers, 115 destroyers and 43 submarines, and to allow the Navy to maintain or purchase up to 15,000 "useful" naval aircraft.

The increases would (at the least) allow the US Navy to engage in offensive action against an enemy navy in one ocean while carrying out successful defensive operations against an opposing navy in the other ocean. It would lead to Navy's warship numbers exceeding the limitations imposed by the Washington Treaty of 1922 and would end years of having a declining fleet[25].

POSTPONEMENT AND CANCELLATION

Changed priorities on the part of the US Navy saw it postpone indefinitely, and before any keels had been laid, the construction of the larger battleships for which the new locks

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and 1,184 naval aircraft. There had also been the National Industrial Recovery Act (NIRA) of the mid-1930s, which saw $237 million set aside to construct warships to help improve the economy with increased employment. The Navy responded by contracting to build 20 destroyers, four submarines, four light cruisers and two aircraft carriers. The Naval Expansion Act 1938 added to the inventory with $1 billion for a dirigible, two light cruisers, an aircraft carrier, a large and two smaller seaplane tenders, minelayers, minesweepers, two oil tankers, two fleet tugs, and an indefinite number of speedy, experimental torpedo boats (which became the wartime PT boats). The Naval Expansion Act of June 1940, aka the Eleven Percent Act increased the Navy's warship fleet by 11%, concentrating mostly on aircraft carriers, submarines and cruisers: https://usnhistory.navylive.dodlive.mil/2014/07/19/as-war-in-europe-escalated-1940-naval-expansion-act-came-when-platformsmatter-ed-most/

[25] https://usnhistory.navylive.dodlive.mil/2014/07/19/as-war-in-europe-escalated-1940-naval-expansion-act-came-when-platformsmatter-ed-most/

would have been necessary, and this effectively dealt a fatal blow to the Third Locks Project in May 1942[26].

After construction of the new larger battleships was cancelled (and in the light of the Two-Oceans Act), the Commanding General of the Army's Panama Canal Department, General Andrews, recommended that the Third Locks Project also be deferred. Both the War Department and the Navy agreed and, therefore, in May 1942, the Secretary of War directed the Governor of the Canal Zone to modify the programme and, except for some of the dredging and excavating work that had already been started, and the Miraflores bridge, all construction work was halted.[27] In any case, the new larger *Midway* Class aircraft carriers, which would prove to be vital for the war in the Pacific, had a superstructure so wide[28] that these vessels could not use the Canal's locks[29].

After World War 2, the US Navy's new capital ships, its aircraft carriers, grew progressively larger, with *Forrestal* Class, the USS *Enterprise* and the later *Nimitz* Class super-carriers, which were far too large to use the Canal in its original form, or indeed the larger locks that had been envisaged by the Third Locks Project. The replacements for the *Enterprise* and the *Nimitz* ships, the *Gerald R Ford* Class ships would be too large for the Canal, even after the expansion of the 21st Century.[30]

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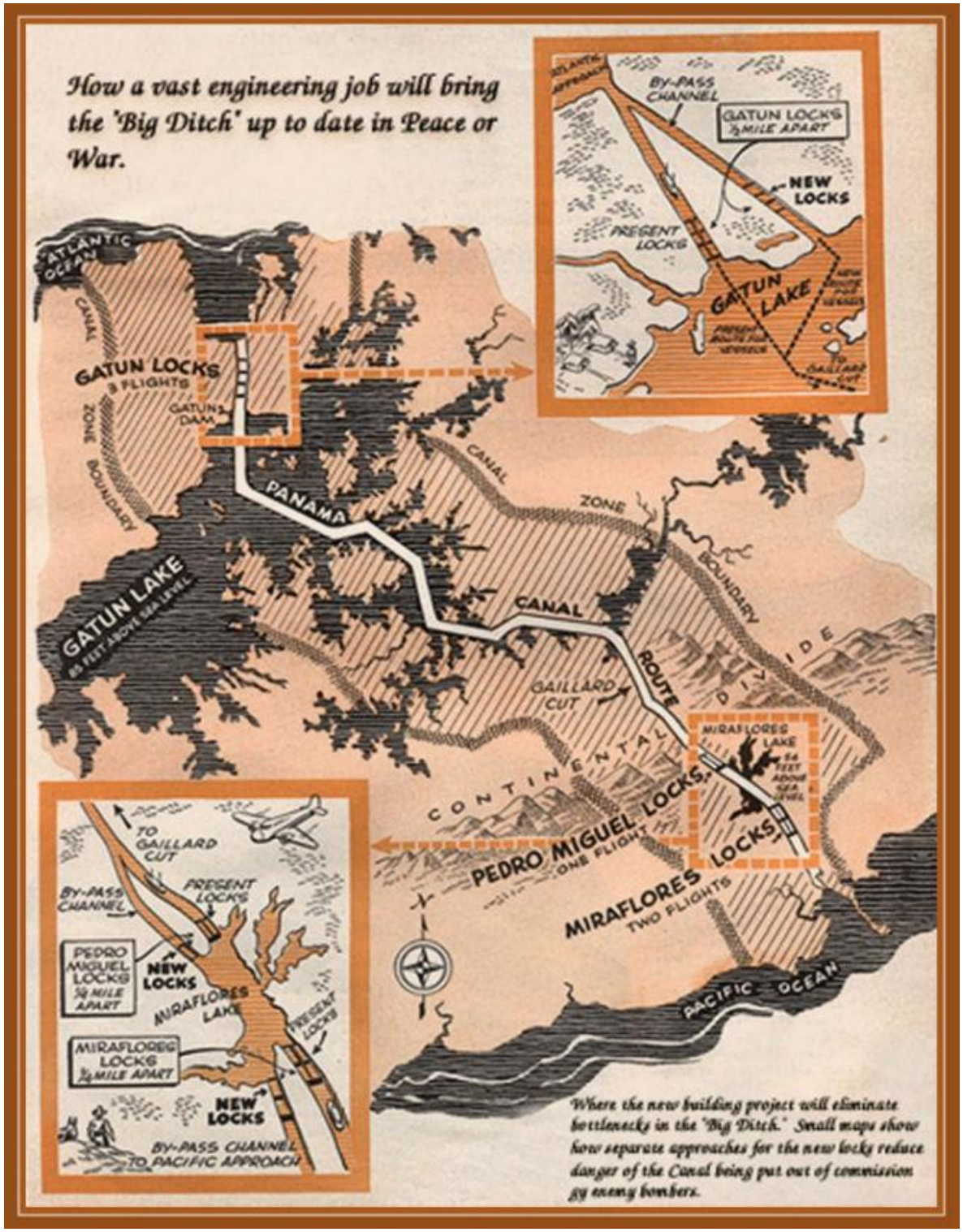
[26] https://apps.dtic.mil/dtic/tr/fulltext/u2/a388262.pdf
[27] Ibid.
[28] At 136 feet (approximately 41.4 meters). The Canal locks at the time were 110 feet (33.5 meters) wide.
[29] *Wasting Asset: The U.S. Re-Assessment of the Panama Canal, 1945-1949* by John Major (Journal of Strategic Studies), 2008
[30] https://www.popsci.com/article/technology/how-panama-canal-changed-shape-war/

The September 1940 issue of *Popular Science* carried an article and a useful illustration explaining the Third Locks Project -



POSTWAR

After World War 2, the Panama Canal would go on to play only a limited role in US military ventures, so that from a military perspective, its costs began to exceed benefits. In fact, the military costs of defending the Canal had always been much higher than anyone had anticipated. A 2008 book[31] revealed that President Truman had even proposed giving the Canal to the United Nations in 1945. The same 2008 book maintained that the US was "reluctantly stuck managing the Canal through the 1950s, 1960s, and 1970s and was facing increasing costs of doing so".[32]

In respect of the Canal, the immediate postwar planning debate came to focus on two things –

- a sea-level canal (similar to the Suez Canal), instead of one with locks, which was seen as having a better ability to withstand an attack (as it lacked the vulnerable locks and their supporting framework)[33]; and
- protection of the Canal from a nuclear strike[34] (and/or its ability to withstand or recover from one).

In December 1945, the then Governor of the Canal Zone, Joseph C Mehaffey[35], was authorised by the US Congress to report on how best the Canal could be adapted to meet the needs of merchant shipping and national defence, and to report his conclusions by

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[31] *What T. R. Took: The Economic Impact of the Panama Canal, 1903– 1937* by Noel Maurer and Carlos Yu (2008).

[32] The book attributed to increasing costs (presumably aside from military/naval defence costs) as being the constant rise in transfers to Panama used to placate the increasing aversion to the U.S. presence in Panama and the rising inefficiency of the Canal management. A reviewer from the University of California San Diego, in its Journal of Economic History, disagreed with the authors' comments re the increasingly inefficient running of the Canal by the US, with rising costs and falling revenue, arguing that Panama boosted its profitability chiefly from higher tolls: https://econweb.ucsd.edu/~vramey/research/The-Big-Ditch-Review-Published.pdf

[33] Given that, in 2021, a container ship managed to block the Suez Canal for several days, causing great disruption to international supply chains, might suggest that sea-level canals are not necessarily any less prone to disruption.

[34] https://econweb.ucsd.edu/~vramey/research/The-Big-Ditch-Review-Published.pdf

[35] Like all Governors, he was a US Army Corps of Engineers officer,

December I947[36]. Meanwhile, in May 1946, another, and quite separate study was initiated by the US Navy and headed by a Captain Miles P DuVal, who had himself published an important book on the Canal, and had made proposals for improvements[37]. He was opposed to a sea-level canal and clashed with Mehaffy, who was committed to that idea.

Nevertheless, and despite differing views within the various departments of the Navy, underlying all views was the tacit assumption in the immediate postwar period that the Canal was still a vital element in US defence policy[38].

In November 1946, the Navy referred the question of the size of the locks, and any expansion, to the advisory General Board[39]. The General Board effectively ended the idea of a sea-level canal, that concept had been undermined anyway by studies that showed that the effects of a nuclear explosion and fallout contamination on a sea-level canal offered no real advantage over the existing canal system[40].[41]

[36] *Wasting Asset: The U.S. Re-Assessment of the Panama Canal, 1945-1949* by John Major (Journal of Strategic Studies), 2008

[37] He had proposed in 1943, a major improvement in its facilities by the creation of a summit-level anchorage in Miraflores Lake close to the Pacific terminal, in order to remove the bottleneck of the Pedro Miguel locks.

[38] *Wasting Asset: The U.S. Re-Assessment of the Panama Canal, 1945-1949* by John Major (Journal of Strategic Studies), 2008

[39] Abolished in 1951, the General Board was an advisory body originally established in 1900, and composed of senior admirals who, without operational responsibilities and nearing the end of their careers, were relied on to provide expert, but dispassionate advice.

[40] *Wasting Asset: The U.S. Re-Assessment of the Panama Canal, 1945-1949* by John Major (Journal of Strategic Studies), 2008

[41] The 1947 Mehaffey report gave an example of the Canal being closed to traffic for four years from the attack of two A-bombs of 20 KT (as used on Nagasaki), whereas a similar attack on a sea-level canal would mean closure for not more than a month after mobilisation of the necessary equipment and personnel to effect repairs.

Ray Todd

Panama City

Republic of Panama

25 September 2022