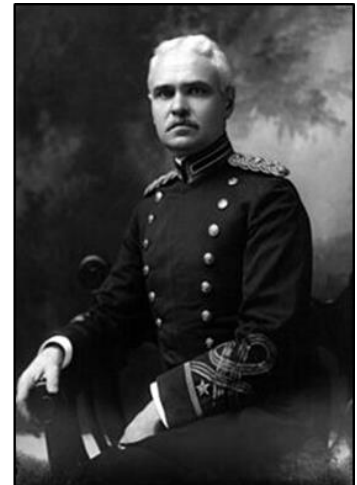
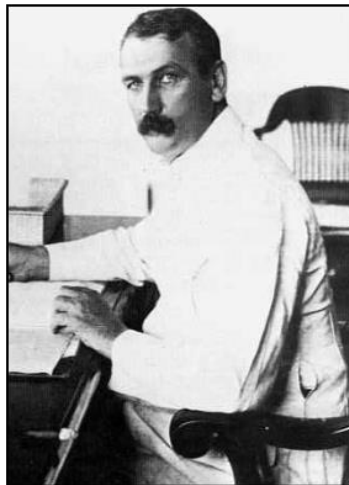
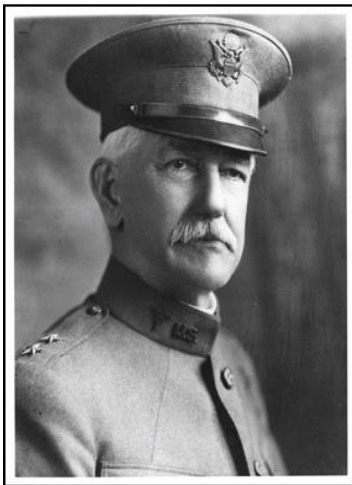




# How to Eradicate a Scourge: Yellow Fever, Malaria, and Construction of the Panama Canal



November 2018



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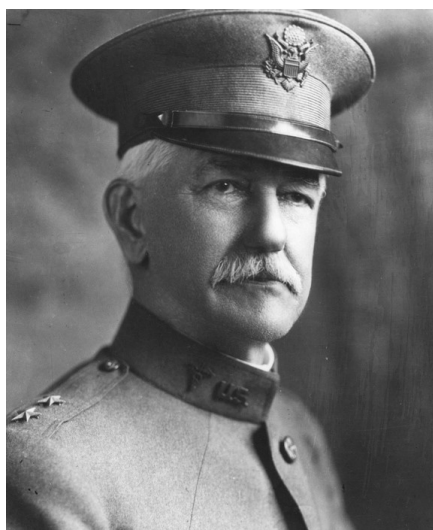
# How to Eradicate\* a Scourge

## Yellow Fever, Malaria, and Construction of the Panama Canal

by Staffs, Lejeune Leadership Institute and Marine Corps History Division

In his 1989 letter to the Commanding General of the Marine Corps Combat Development Command, the CMC, Gen Alfred M. Gray, directed the rapid establishment of a Marine Corps University. Gen Gray outlined his intent “to teach military judgment rather than knowledge.”<sup>1</sup> He foresaw that Marines in the 21st century would need to develop “a way of thinking in and about war that should shape our every action ... [they would require] a state of mind born of a bold will, intellect, initiative, and ruthless opportunism.”<sup>2</sup> Lifelong education for *all Marines* was Gen Gray’s vision. In this vein, this three-part case study analyzes a complex problem from an earlier time when military planners confronted what seemed an intractable problem: how to deal with yellow fever and malaria during construction of the Panama Canal.

French and American engineers learned that in order to complete construction of the Panama Canal, the devastating scourges of yellow fever and malaria would have to be reduced or outright eradicated. These tasks subsequently required great stores of leadership, intellect, moral courage, commitment, and perseverance as well as scientific and statistical analysis of complex data. The military leaders for this mission had to develop the capabilities to deliver and execute commanders’ intent; anticipate, identify, and overcome obstacles; assess and shape the situation; analyze and leverage scientific and statistical data; and break a complex problem down into simple yet executable parts that could be understood and executed by subordinates. They also had to improvise and adapt. As the foundation of our maneuver war-



**“Gorgas’ work did not stop with completion of the canal—he later served as president of the American Medical Association and as surgeon general of the US Army.”<sup>5</sup> (Photograph courtesy University of Florida Digital Library of the Caribbean (dLOC), George A. Smathers Libraries, 2017)**

fare philosophy, *MCDP 1, Warfighting*, explains, “providing intent is to allow subordinates to exercise judgment and initiative—to depart from the original plan when the unforeseen occurs—in a way that is consistent with higher commanders’ aim.”<sup>3</sup> There’s much we can learn from this case.

Gen Gray’s vision for MCU was that “history should be used to teach officers [and NCOs] military judgment.”<sup>4</sup> Accordingly, this case is *not* intended to make you and your Marines experts on yellow fever, malaria, or construction of the Panama Canal, although these subjects are certainly interesting. Rather, as you delve into the details of this fascinating story, consider some of our Corps’ modern “scourges” and how you, as a leader of Marines, will deal

with them. Can we develop and execute a campaign plan? How would we break it down into simple parts and supervise it? How would we aggressively assess its effectiveness? Applying the tenets of maneuver warfare to solving complex problems is what the American people expect from their Marines to get better. The story of the eradication of yellow fever can help us do so.

>Editor’s Note: The three-part case study is available at <https://www.usmcu.edu/lli/marine-leader-development/discussion-topics>.

### Notes

1. Gen Alfred M. Gray, “Letter to CG, Marine Corps Combat Development Command,” (Quantico, VA: July 1989).
2. Headquarters Marine Corps, *MCDP 1 Warfighting*. (Washington, DC: 1997).
3. Ibid.
4. “Letter to CG, Marine Corps Combat Development Command.”
5. Robert Patterson, M.D., “William Gorgas and His War with the Mosquito,” *Canadian Medical Association Journal*, (Online: September 1989), available at <https://www.ncbi.nlm.nih.gov>.



\* “Eradicate” is a strong word. It means not only to drive the incidents of a scourge all the way down to zero, but also to do so in such a way that it never returns. Accordingly, eradication of a scourge is very difficult. This is exactly what Col William Gorgas and John Stevens did to yellow fever in Panama from July 1905 to December 1906—they eradicated it. Their lesson for us is a powerful one: eradicating a scourge seems impossible until someone actually does it.

# ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

## **I. Introduction**<sup>1</sup>

The opening of the Panama Canal in August 1914 forever changed the Western Hemisphere. The canal united the Atlantic and Pacific Oceans, more than halving the distance of sea travel between the ports of San Francisco and New York City (reference the maps on page 2). By succeeding where the French had so disastrously failed, the canal's American builders signaled the coming of the American Century. Apart from wars, construction of the Panama Canal was the single costliest effort ever undertaken by human beings. Its construction engendered major advances in science, technology, engineering, and medicine, along with many other fields. The goods and people that would transit the canal brought profound economic growth to millions. However, like most human endeavors requiring great time and effort, the process leading to the opening of the canal was difficult, turbulent, and spread across several decades.

The construction of the Panama Canal would signify the greatness of the United States' influence throughout the world as a formidable power. President Theodore Roosevelt understood the importance of projecting power with the United States' Navy, and connecting the coasts by a canal played a major role in his vision for the nation's future global strategy. Since 1846, America's leaders had searched for a water crossing of Central America to connect the two great oceans of America's coasts, and in Roosevelt, the country had found a President who could turn ideas into action.<sup>2</sup> However, although the engineering challenges were enormous, the greatest impediments to the canal's construction were not technological but rather the twin scourges of yellow fever and malaria. Malaria was the most common of the tropical diseases and could break out anywhere. In Panama, it never truly went away. For those victims who survived, they would become mentally ill, physically debilitated and depressed. People had come to accept Malaria as a part of life in the tropics. Malaria -- which literally means "bad air" in Italian -- was thought to come from poisonous marsh gas since it always seemed to break out near marshes.<sup>3</sup> Yellow fever, on the other hand, was different. It came and went in waves, which gave the scourge an air of mystery. The mortality rate for yellow fever victims varied from 15-70%, and in Panama hovered around 50%. People at the time thought yellow fever originated from poor sanitation, feces, and urban filth.<sup>4</sup> To construct the canal, both scourges would have to be overcome.

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<sup>1</sup> \*This case study draws heavily from David McCullough's, *The Path Between the Seas*, which captures the extraordinary achievement of connecting the Atlantic and Pacific Oceans with the Panama Canal. This three-part case study also contains a list of short biographies of key players in building the Panama Canal (Annex A), the bibliography (Annex B), and instructor's discussion guide.

<sup>2</sup> Roosevelt, Theodore, *An Autobiography*, (New York, NY, The McMillian Company, 1914) 527

<sup>3</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977), 139-142

<sup>4</sup> *Ibid.*, 140

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This case study explores how President Roosevelt relied on three planners and leaders, Col William C. Gorgas (the Medical Officer), John F. Stevens, and Col George W. Goethals (the Chief Engineers), to develop the plan and capabilities to execute their commanders' intent (his). These leaders were able to anticipate, identify, and overcome obstacles; assess and shape the situation; analyze and leverage reams of scientific and statistical data; and break a complex problem down into simple yet executable parts that could be understood and ruthlessly executed by subordinates. The focus of this case study is to explore how leaders at all levels can think about a complex problem, develop a plan of action, and then execute it to accomplish their commander's intent.



Figure 1 Parallel scale at 20°N 0°E

Figure 1 (<http://www.central-america-map.com/central-america-topo.gif>)  
Figure 2 (Association for Diplomatic Studies and Training <http://adst.org/2016/07/panama-riots-1964-beginning-end-canal/#.WgDJE00U1E8> )

# ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

## **Part A**

### **II. The Context: The French Attempt, November 1876 – June 1889**

The Frenchman Ferdinand de Lesseps planned to construct a sea level canal, similar to the one he had successfully overseen in the Suez, based upon a flimsily conducted survey to Panama by Lieutenant Lucien Napoleon Bonaparte Wyse and two engineer friends. Many French people hoped that construction of a canal through Panama could redeem French honor that had been lost in their military's disastrous defeat to Prussia at Sedan in 1870. The first surveying expedition in 1876 was limited to the Darien region, east of the Panama railroad, as dictated by the Colombian government. After suffering through the six-month venture, "the best [Lt Wyse] could recommend – purely by guesswork -- was a Darien canal with a tunnel as much as nine miles [in] length".<sup>5</sup> De Lesseps was less than pleased with this result and wholeheartedly rejected the report, as he was completely convinced a sea level plan (as had been done at Suez) was the only way to construct a canal.

Lt Wyse and his survey crew departed in 1877 for another expedition to Panama. This time, Lt Wyse went to Bogota to implore the Colombian government to agree to the canal's construction across the isthmus along the railroad and sent another surveyor to conduct "a walk, a ride on the railroad".<sup>6</sup> The second survey lasted only a few weeks and insufficiently documented or analyzed the terrain De Lesseps deemed as the best canal route.

The canal's planned route would follow "The Panama Railroad" - built years earlier by an American engineer, William H. Aspinwall.<sup>7</sup> De Lesseps' passion for the canal and his enthusiastic promotion of the effort drew several financial supporters to his newly formed "Panama Canal Company".<sup>8</sup> On 30 December 1879, de Lesseps sailed into Limon Bay at Colon to personally promote the canal project and conduct a personal reconnaissance of the planned canal route. De Lesseps' enthusiasm drew huge crowds everywhere he went, and his comments and frequent comparisons to the Suez Canal engendered public confidence and made the task seem simpler to all who heard



Ferdinand de Lesseps  
[https://upload.wikimedia.org/wikipedia/commons/thumb/c/c1/Ferdinand\\_de\\_Lesseps.jpg/250px-Ferdinand\\_de\\_Lesseps.jpg](https://upload.wikimedia.org/wikipedia/commons/thumb/c/c1/Ferdinand_de_Lesseps.jpg/250px-Ferdinand_de_Lesseps.jpg)

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<sup>5</sup> Ibid., 62

<sup>6</sup> Ibid., 63

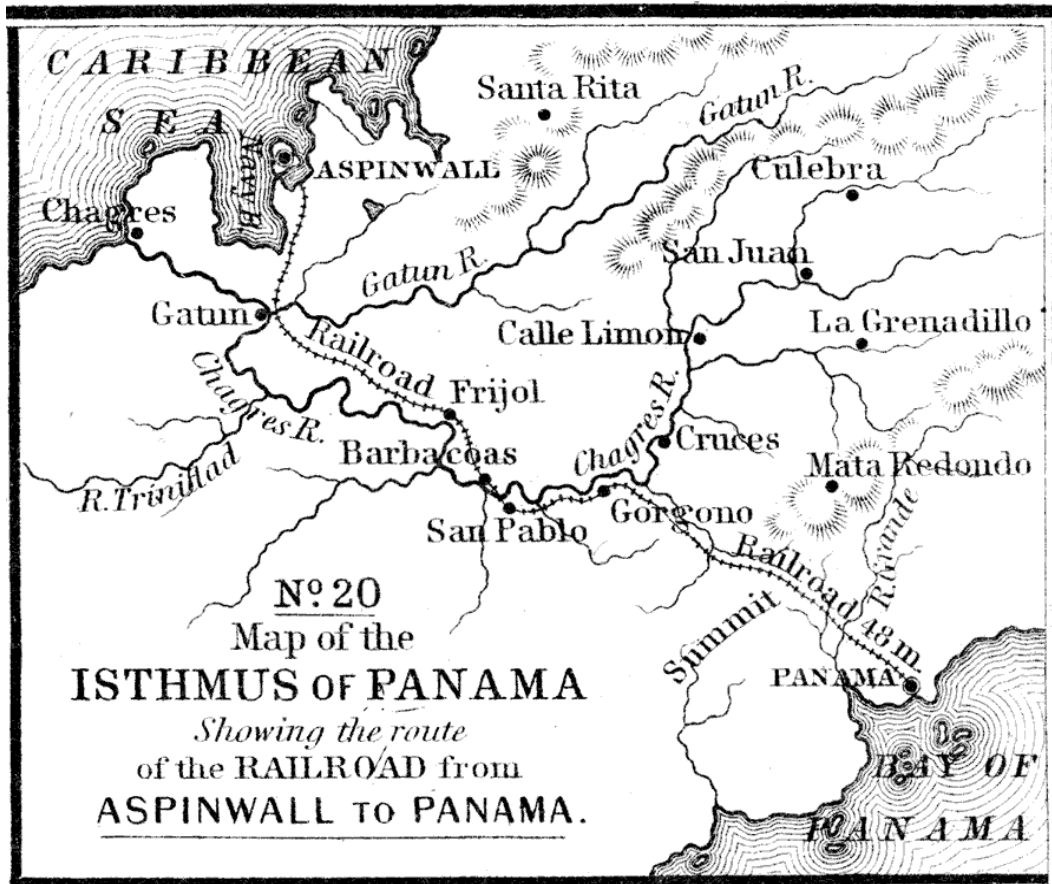
<sup>7</sup> Ibid., 35

<sup>8</sup> Ibid., 262



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him. For example, he often said, "In Suez we had to build everything...here you already have a railroad like this..."<sup>9</sup>



Railroad map, Mitchell's School Atlas (Philadelphia, PA: E. H. Butler & Co., 1863) Maps ETC  
<https://etc.usf.edu/maps/pages/000/23/23.htm>

Privately, and in stark contrast to his public statements, de Lesseps admitted that construction of the canal in Panama would be considerably more difficult than the one at Suez. After the survey, he modified the plan to have a breakwater at Colon, a dam to hold the Chagres River in check, and a tidal lock on the Pacific side, but continued with his intent to build a sea level canal.<sup>10</sup> When the President of the United States, Rutherford B. Hayes, announced, "The policy of this country is a canal under American control," de Lesseps chose to interpret this to mean that the Americans would guarantee security of the Canal Zone.<sup>11</sup> He followed his Panama visit with a barnstorming tour of the United States further promoting his canal project, taking the train from Philadelphia to St Louis, San Francisco, Chicago, Niagara Falls, and Boston.

<sup>9</sup> Ibid., 110

<sup>10</sup> Ibid., 117

<sup>11</sup> Ibid., 121

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His nearly five months in Panama and the United States had shored up enormous public support for the canal and secured financial backing for his Panama Canal Company.

While Panama might have seemed an easier task than Suez by simply looking at the distances on a map, in fact, building the canal at Panama would be much more difficult. For example, at Suez the digging had been mostly through sand; at Panama it would be through a wicked combination of rock and mud and sludge that often stuck to shovels. At Suez, the climate had been hot and dry; at Panama, it would be hot and humid for more than eight months out of the year. At Suez, the terrain was flat and did not rise past 50 feet above sea level anywhere along the canal line; at Panama, mountains and swamps covered the ground, and rose in some places to more than 330 feet above sea level. Finally, at Suez, the chief logistical problem was in transporting enough water to the construction sites to keep work going, as rainfall had been about 9 inches annually; at Panama, annual rainfall was more than 10 feet on the Atlantic side and 5-6 feet on the Pacific side. This water, which of course was everywhere in Panama, was where mosquitoes laid their eggs, which would have far-reaching implications.<sup>12</sup>



Coffins at a railroad station in Panama

[http://archie.kumc.edu/xmlui/bitstream/handle/2271/1422/12.d%20coffins\\_lr.jpg](http://archie.kumc.edu/xmlui/bitstream/handle/2271/1422/12.d%20coffins_lr.jpg)

<sup>12</sup> Ibid., 130



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The first 40 French engineers arrived in Colon in January 1881 and began work in February. The engineers cleared a path 50 feet wide across the isthmus to site the canal line in preparation to start digging. By May, the French engineers had cleared the canal line from Colon to Panama City and buildings started to pop up in Colon to house the influx of workers and equipment that would come to start the digging. By summer 1881, there were more than 200 French/European engineers on the isthmus and 800 local workers employed. Enthusiasm was high. However, it became apparent that summer that the scourges of yellow fever and malaria had returned to haunt the project. The young, ambitious engineers De Lesseps and the expedition enticed began to succumb to the diseases. One was Gaston Blanchet, their best field engineer, who died of malaria. As disease and sickness started to take away the best young French engineers, onlookers felt powerless to prevent the spread of the scourges.<sup>13</sup>



*Working on the Panama Canal*, American Experience Series, PBS,  
<http://www.pbs.org/webh/americanexperience/features/panama-canal-working-panama-canal/>

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<sup>13</sup> Ibid., 131-136

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The digging of the "Great Trench" -- La Grande Tranchee -- began in earnest in January 1882.<sup>14</sup> As the digging began, the death toll from the twin scourges of yellow fever and malaria continued to mount. An earthquake on the isthmus killed even more people. Progress that year was set back constantly, culminating in the resignation of more talented engineers. Charles de Lesseps and a new Chief Engineer, Jules Isidore Dingler (pronounced Danglay), arrived in March 1883 to inspire the flagging effort. Dingler, buying into the common beliefs of the era on yellow fever (that it was caused by urban filth), contemptuously announced, "Only the drunkards and the dissipated take the yellow fever and die there."<sup>15</sup> Dingler immediately injected energy and organization into the effort, and after surveying the whole line, developed a master plan for the canal. He planned to construct a tremendous earth dam across the River Valley at Gamboa to handle the Chagres River, and a tidal lock on the Pacific side to maintain a constant water level in the canal from Colon to Panama. He also changed the slope of the canal to be more gradual, which dramatically increased the amount of actual excavation required. At least there was now a viable plan for the canal.<sup>16</sup>

Dingler began signing multiple contracts to bring in large amounts of equipment and workers to complete his new canal design, and equipment and people surged into Panama at an unprecedented rate. In fact, in the fall of 1883 Dingler even brought his own family to the isthmus after a period of home leave, which included his wife, son, daughter, and the daughter's fiancé. As more and more people surged into Panama, the scourge of yellow fever, which had never really been brought under control, claimed more and more lives. In January 1884, Dingler's daughter caught the disease and died. One month later, Dingler's son got it and died too. As the Chief Engineer tried to endure these personal tragedies by consuming himself more and more in his work, the daughter's fiancé soon caught the scourge and died as well. Yet Dingler pressed on, earning the admiration of his fellow French engineers for his stoic commitment to the canal project at any cost.<sup>17</sup>

As the work went on, the biggest engineering challenge to emerge was the Culebra Cut on the west side of the canal. The more the excavation proceeded, the worse the mudslides became. The terrain of Culebra varied enormously, and while it might have been fascinating to a geologist, it was an engineer's worst nightmare. The worst part was in the Cucaracha formation, which contained red and dark-green clays, lava mudflows, gravel, and shale rock. For the original estimate, excavation was to be 45 degrees; that is one meter down for one meter out. Dingler's re-estimation calculated a 25-degree

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<sup>14</sup> Ibid., 147

<sup>15</sup> Ibid., 154

<sup>16</sup> Ibid., 154-155

<sup>17</sup> Ibid., 160

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slope; one meter down now meant four meters out. The amount of excavation required thus increased exponentially. To accomplish this, the French built small railroads to haul away the spoil, and as they got deeper and deeper into the cut, they would pick up the old track, relay it on the new bed lower down, and then repeat the process. It was all terribly burdensome and inefficient.

Moreover, the fundamentally flawed plan relied upon newly terraced and less stable rail-beds than the newly cut slopes. In the rainy season, the terraces would give way and the tracks and trains became buried by mud, which would then block the natural watercourses and drainage patterns, which of course would create new pools of standing water – which were *perfect breeding grounds for mosquitoes*. The French never did comprehend that the digging of the Culebra Cut was more of a transportation problem -- moving the rock and dirt out of the way -- than it was an excavation problem. The French's lack of a knowledgeable railroad engineer on the project would turn out to be one of de Lesseps' most glaring oversights.



Landslide in the Panama Canal excavation

[http://thechronicleherald.ca/sites/default/files/imagecache/ch\\_article\\_main\\_image/articles/B97356382Z.120140815175025000G5G6AQH9.21.jpg](http://thechronicleherald.ca/sites/default/files/imagecache/ch_article_main_image/articles/B97356382Z.120140815175025000G5G6AQH9.21.jpg)

By the fall 1884, approximately 20,000 workers were on the job - which amounted to a small expeditionary force. On New Year's Eve 1884, Dingler's wife died of yellow fever. After her funeral, Dingler took all of his family's horses up into the hills and shot them. The scourge of yellow fever, which had

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previously come and gone, now stayed for good and took more and more lives.<sup>18</sup> Even then, malaria remained the most deadly killer. Phillippe Bunau-Varilla estimated that out of 100 new arrivals, 20 would die quickly from disease while those who did recover remained permanently debilitated; only about 20 of those remaining from the initial 100 would emerge able to do any real work. The hospitals were overflowing with the sick and dying while many of the field workers -- in other words, the vast majority of people working on the canal -- buried the dead in the ditches alongside the canal.<sup>19</sup>

When a fire erupted in Colon on 31 March 1884, a popular uprising erupted from the chaos. With the help of American naval strength and a contingent of Marines guarding the railroad, the French quelled the riots and upheaval, but the French effort had really begun to fall apart. In late August 1885, Dingler -- who had become increasingly abusive and short-tempered with his staff -- resigned and sailed for France. He departed completely alone, defeated, and broken, having buried his entire family on the isthmus. Maurice Hutin, the next Chief Engineer in line, lasted only one month before he too quit. This placed the 26-year old Philippe Bunau-Varilla in charge as the Chief Engineer of de Lesseps' canal.

De Lesseps, sensing the endangerment of his grand enterprise, departed for a second trip to Panama. He hired a new Chief Engineer, Armand Rousseau. Rousseau applied a fresh set of eyes to the problem and soon concluded the sea-level canal plan was fundamentally flawed. He also released his report to the French public. In 1887, Bunau-Varilla offered a temporary solution to the friction caused by the controversy over whether it was possible to construct a sea-level canal: he would subdivide the whole canal line into a series of locks, upon which the builders could float the dredges to dig a canal essentially all the way down to sea level. It thus kept the old grand design of a sea-level canal alive, but achieved it by constructing a series of temporary locks.

De Lesseps recruited Gustave Eiffel -- who had designed a gigantic iron tower under construction on the Champs de Mars in Paris -- to the canal engineering effort. This temporarily re-energized faith in the enterprise despite the problems that had plagued the effort, but the French's enthusiasm was lagging. The Panama Canal Company's stock went into free-fall and the public became increasingly skeptical. During this time, the downward spiral continued in Panama with yellow fever and malaria taking ever-greater tolls of lives. On 4 February 1889, the Panama Canal Company collapsed and was liquidated, leaving de Lesseps for all to see as a public failure.

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<sup>18</sup> Ibid., 171

<sup>19</sup> Ibid., 171-172

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### **III. Enter the Americans, September 1901 - July 1905**

On 14 September 1901, an assassin, Leon Czolgosz (pronounced shol-goss), shot and killed President William McKinley, elevating the 42-year old Theodore Roosevelt to the Presidency. Roosevelt had a vision of America being a commanding power on two oceans, and saw the canal across the isthmus as an indispensable way to achieve this. Like most others in America, he saw the ultimate location for the canal as being best in Nicaragua.



The Culebra Cut circa Dec 1904 [http://www.czbrats.com/Construction/Culebra\\_Gold\\_Hill.JPG](http://www.czbrats.com/Construction/Culebra_Gold_Hill.JPG)

Two Presidential Canal Commissions continuously debated the pros and cons of building a canal in Panama versus Nicaragua. For a variety of political reasons, the odds against trying to construct a canal in Panama, where the French had failed so disastrously and publicly, seemed to be about 100:1 in the United States Congress. That is, until 14 May 1902, when word came in to the United States that a volcano had erupted at Momotombo in Nicaragua. Word spread soon afterwards that an earthquake had dumped a completed



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dock into Lake Managua too. With Roosevelt firm in his belief that the United States Congress should determine the route (as long as he got his canal), debate continued in the United States Senate. In the meantime, while debate raged in Congress, Roosevelt conducted his own inquiry with respected engineers as to which route would be the best. These engineers gradually and methodically convinced the President of building the canal in Panama. On 26 June 1902, the House passed the Spooner Bill by 259 to 8. Roosevelt signed it into law two days later, predicting that the Panama Canal would be “the great bit of work of my administration, and from the material and constructive standpoint one of the greatest bits of work that the twentieth century will see.”<sup>20</sup>

Panama was then a *provincia* of Colombia. Negotiations with the Government of Colombia to build the canal across the Panamanian isthmus were tedious and cumbersome. Not until January 1903 was, an agreement finally reached. When the Colombian Government subsequently refused to ratify the agreement to let the Americans build the canal across the isthmus, however, Roosevelt became furious. Philippe Bunau-Varilla, who never forsook his dream of seeing a canal built across Panama, helped to foment the revolutionary fervor already rampant in Panama by communicating with key leaders he had known when he was Chief Engineer under de Lesseps. Bunau-Varilla also communicated his designs and knowledge to the United States Secretary of State, John Hay. Roosevelt had meanwhile dispatched two Army officers to the isthmus to conduct their own reconnaissance and report directly to him, which they did telling him that a revolution was imminent.<sup>21</sup> When the *USS Nashville* appeared off the coast of Colon and signified what the revolutionaries construed as American support for their cause, the revolution was, indeed, imminent.<sup>22</sup>

As a regiment of Colombian troops landed at Colon and insisted on crossing the isthmus to Panama to put down the fledgling revolution, the American who ran the railroad said he did not have transportation to move the troops, but would move the commanders most expeditiously in a private car. Before the Colombian generals could really understand what was going on, they were off in a private railcar while their troops remained at the station house at Colon. Without the military means to suppress the revolutionaries, and the *USS Nashville* and a contingent of Marines led by Captain John A. Lejeune preventing movement of either insurgents or Colombian government forces across the isthmus, the revolution was over within a week. On 6 November 1903, the United States recognized the new Republic of Panama.

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<sup>20</sup> Maurer, N. & Yu, C, *The Big Ditch; How America Took, Built, Ran and Ultimately Gave Away the Panama Canal*, (Princeton, NJ Princeton University Press, 2011), 97

<sup>21</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),355

<sup>22</sup> *Ibid.*, 359-364

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Had there been no US gunboats off the coast of Colon and Panama City, the new republic would probably not have lasted a week. While there were many critical turns of events in the Panamanian Revolution, and many instances that could have derailed the entire effort, its architect was undoubtedly Roosevelt, as he later publicly acknowledged. Shortly after the revolution, Panama selected Philippe Bunau-Varilla as their envoy to the United States to negotiate a treaty with the United States for them to construct a canal across the isthmus. The 1903 Hay-Bunau-Varilla Treaty cleared the way for Roosevelt to achieve his dream of making America into a two-ocean power. When Yale professors questioned the constitutionality and legality of the enterprise, Roosevelt responded: "Tell them I am going to make the dirt fly!"<sup>23</sup>



With his diplomatic hurdles now cleared, Roosevelt issued guidance to the chair of his new Isthmian Canal Commission: "As you know, I feel that the sanitary and hygienic problems...on the Isthmus are those which are literally of the first importance, coming even before the engineering...." <sup>24</sup> He instructed Secretary of War William H. Taft that "every possible effort be made to protect

<sup>23</sup> Ibid., 408

<sup>24</sup> Ibid., 406

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our officers and workmen from the dangers of tropical and other diseases, which in the past have been so prevalent and destructive in Panama.”<sup>25</sup> Roosevelt, who had served as a Colonel of the “Rough Rider” Regiment during the Spanish-American War and had seen combat duty in Cuba while surviving malaria, knew that the threat from disease could be greater than enemy action. In his *Autobiography*, he had heaped scorn upon those in command of the expedition:

The health of the troops was not good, and speedily became very bad. There was some dysentery, and a little yellow fever; but most of the trouble came from malarial fever. The Washington authorities had behaved better than those in actual command of the expedition at one crisis.<sup>26</sup>

Roosevelt saw how senior military officers were not prepared to deal with the issue of sanitation in a large expeditionary force. Roosevelt ended up writing a letter to the 5<sup>th</sup> Army Corps Commander, General William R. Shafter, describing the deplorable health conditions under which his troops were living. The letter was then provided to the media. Roosevelt was a Chief Executive who thought for himself, and his guidance clearly prioritized health and sanitation above the actual engineering for the canal.

The Spooner Act required a seven man commission to supervise construction of the canal, of which four had to be skilled engineers with at least two former military officers -- one Army and one Navy, Admiral Walker and General George Davis. The civilians on the body were engineers and businessmen. Not one commission member had any medical experience, and all seven were to have equal power, reporting to Roosevelt. Roosevelt subsequently called upon an old friend from Johns Hopkins University – Dr. William Welch -- and this doctor convinced the President to assign a medical man to serve as sanitary officer reporting directly to the Commission. Roosevelt instructed Admiral Walker to find the “very best medical man in the country” for the assignment, and that he was not to make the choice without first consulting his friend, Welch.<sup>27</sup>

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<sup>25</sup> Bishop, Joseph B. , *The Panama Gateway*,( New York, NY, Charles Scribner’s Sons, 1913), 145

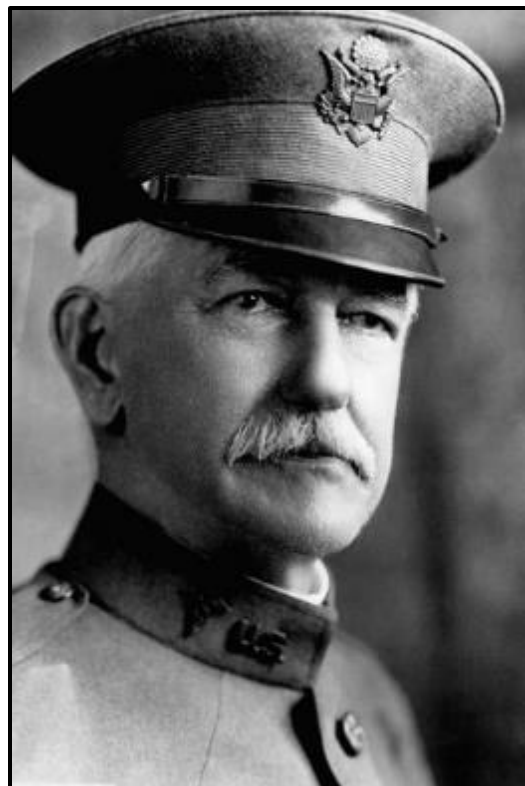
<sup>26</sup> Roosevelt, Theodore, *An Autobiography*,( New York, NY, The McMillian Company, 1914), 250

<sup>27</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),407

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Upon Roosevelt's direction to the Panama Canal Commission to find "the very best medical man in the country,"<sup>28</sup> their choice was an Army doctor, a 49-year-old Army Colonel William C. Gorgas. Gorgas was the son of Confederate General Josiah Gorgas and had received his college degree from the University of the South at Sewanee, Tennessee. He was a popular student and, although he had his degree, still desired to become an Army officer and applied to West Point. When West Point rejected him, he went to study at Bellevue Medical College in New York so that he could eventually become an Army doctor. His early Army career took him to many tiny outposts out west where he developed a hardiness and physical ruggedness that would prepare him well for practicing medicine in adverse conditions. At Fort Brown, Texas, he and his wife had also contracted yellow fever early in their lives – before they were even married -- and thus developed an immunity to it that would serve them well in later years.<sup>29</sup>

In December 1900, Maj Gen Leonard Wood appointed LtCol Gorgas as the Chief Sanitary Officer of Havana, Cuba.<sup>30</sup> By the end of 1901, Gorgas achieved his biggest triumph by developing and executing a plan that had completely eradicated yellow fever from Havana, Cuba. In 1900, there had been 1,400 cases of yellow fever in Havana; in early 1901, there were 37 cases; by October of that year, there were none.<sup>31</sup> Gorgas was a voracious reader and was always reading three books concurrently: one history or classical, one scientific, and one light fiction, with him reading each for precisely 20 minutes before moving on to the next one.<sup>32</sup> With the former Rough Rider Roosevelt in the White House, Gorgas was a clear choice to supervise sanitation for Roosevelt's canal project.



Colonel William C. Gorgas

Image from this source, Gillet, Mary C., *The Army Medical Department, 1865-1917*, (Washington, DC, 1995) accessed through UNITED STATES Army Medical Department, Office of Medical History, <http://history.amedd.army.mil/booksdocs/spanam/gillet3/pic92.jpg> on 26 October 2017

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<sup>28</sup> Ibid., 406

<sup>29</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., United States Army.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ),5-6

<sup>30</sup> Ibid., 6-7

<sup>31</sup> *The Panama Canal: An Army's Enterprise*,( Washington, D.C., Center of Military History, 2009),29

<sup>32</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),426

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In 1900, Gorgas had been in close contact with the Walter Reed Board that had been inquiring into the causes of yellow fever. This Board released its findings in 1901, which included the following:

1. Yellow fever is conveyed from man to man only by the bite of the female stegomyia mosquito. To become infected, the mosquito must bite the human yellow fever patient after the first three days he/she has the disease.
2. After the mosquito has bitten its human victim, anywhere from 12-20 days must elapse before the mosquito is able to then infect another human being with its bite. This period is called extrinsic incubation.
3. After the non-immune human has been bitten, there is an incubation period from 3-6 days before that human will begin to show the signs of yellow fever.
4. Blood taken at the proper time and injected into a non-immune human being will also cause yellow fever, thus proving the mosquito theory.
5. Yellow fever is caused by a sub-microscopic parasite.<sup>33</sup>

Armed with these findings, Gorgas thought that he could *completely eradicate* yellow fever in a geographic area if no yellow fever victims were bitten after the third day that they had contracted the disease. He also observed that the disease could not be spread if the female stegomyia mosquito could not bite another non-immune human being within the 12-20 day window it was carrying the disease. Based on this scientific and statistical analysis, Gorgas determined the following to combat yellow fever:

- First, they must destroy the stegomyia mosquito.
- Second, they would protect all yellow fever victims within screening to prevent mosquitos from biting them and transmitting the disease.
- Third, that would prevent stegomyia mosquitos from biting all non-immune human beings.<sup>34</sup>

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<sup>33</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., United States Army.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ) 11

<sup>34</sup> *Ibid.*, 13



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Gorgas' biggest obstacle, as he correctly foresaw, would be overcoming decades and decades of misinformation that had held filth, poor sanitation, and bad air caused yellow fever. Gorgas tested his theory as the Chief Sanitary Officer of Havana from 1 February 1901 to 15 September 1901 after a virulent outbreak of yellow fever. In Havana, Gorgas went about it deliberately and methodically. He released a set of regulations that instructed everyone who had yellow fever was to be transported to a central hospital in a screened ambulance, where they would be kept in a screened ward and thus could not be bitten. Screening squads worked night and day to screen homes for



Ancon Hill Cemetery <http://www.panamahistorybits.com/article.asp?id=2012-04-26b>

patients who could not, or would not be moved.

At the hospital, one officer sat in a vestibule in between two screen doors and ensured that only one screen door opened at a time when people were coming and going to prevent any mosquito from possibly entering to bite a victim. Second, fumigation was used extensively to wipe out mosquitos everywhere. Third, any standing water anywhere, in homes or outdoors, that could house mosquito larvae was oiled to kill the larvae. Fourth, to prevent fresh yellow fever patients from entering the population, all entrants by ship

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were quarantined and the ships were fumigated. Non-immune humans were quarantined for a period of 6 days before being released.<sup>35</sup>

Gorgas himself wrote, "Destroying mosquito larvae is essential; everything else is secondary to it. In the built up portions of a city such as Havana, caring for the cisterns, water barrels, and containers is the essential work; but as you approach the suburbs, pools and puddles become more frequent and this character of mosquito breeding places should be drained; though oiling in this class of work has a very useful field."<sup>36</sup> Gorgas's plan -- ruthlessly executed and supervised in a small urban area -- had a devastating and dramatic effect on not only the stegomyia mosquitos in Havana, but also on the anopheles mosquito, which carried and propagated malaria.

When Gorgas was appointed by The Canal Commission (in reality, Roosevelt) to be the Chief Sanitation Officer for the Americans' Panama Canal Construction Project, he was very confident that he could succeed in carrying out Roosevelt's guidance, if he was properly supported. Gorgas's plan was simple: he would concentrate on yellow fever first, and then tackle malaria, which he considered the far greater threat. Gorgas knew the anopheles mosquito propagated malaria, which is a much different type of insect than the stegomyia mosquito. While the stegomyia mosquito thrives in human populated, urban environments, the anopheles mosquito thrives more in marsh and swampy areas, with a much greater range than the stegomyia. Before going to Panama, Gorgas spent several months in early 1904 in Paris analyzing the records of the defunct Panama Canal Company to determine as closely as possible how badly disease had thwarted the French effort.

Before departing for Panama, Gorgas asked the Commission for people and resources to implement his plan. They told him to deploy with a small team and that his supply request would require further study. Gorgas landed at Colon in June 1904. What he found was a "mosquito paradise."<sup>37</sup> Stegomyia mosquitos were breeding everywhere and the even more numerous anopheles swarmed every edifice. Throughout the city Gorgas found jars of household drinking water filled with larvae; open cisterns and rain barrels outside of every building filled with mosquito larvae; pools of standing water everywhere which contained numerous larvae; plants in the gardens created by the French with crockery rings to protect their flowers from ants teemed with larvae; even in Ancon Hospital, the legs of the hospital beds stood in pans of water to keep the ants out but filled with mosquito larvae. French habits from

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<sup>35</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., United States Army.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ), 12-18

<sup>36</sup> *Ibid.*, 18

<sup>37</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977), 416

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Suez on handling water further contributed to making the isthmus a paradise for mosquitos.<sup>38</sup>

Within their first month, the entire American medical team was down with malaria. Gorgas deployed a powerful analogy to describe the way yellow fever surged and then dissipated: he said yellow fever was an exhausted fire with concealed embers lying in wait for fresh supplies of fuel; the arrival of several thousand non-immune human beings would be the equivalent of heaping fresh and dry kindling on the fire; nothing would happen at first, then the victims would be bitten and the disease would flourish. As the American build-up of men and equipment began, Gorgas knew that time was of the essence for if he did not rid Colon of the stegomyia mosquito soon, heaps of kindling would soon be thrown onto the fire.<sup>39</sup>

Yet Walker, Davis, and the Canal Commission balked at supporting Gorgas's requests for materials and support. In August 1904, Walker and some of the Commission members came for a visit and were doubtful about Gorgas's plan. His requests for more supplies and resources went unanswered. Walker and Davis did not believe in the mosquito theory. They thought that squandering valuable resources ridding the jungles of mosquitos was an irresponsible way of spending precious taxpayers' dollars. Meanwhile, Dr. Ronald Ross – the British Nobel Laureate who had discovered that the anopheles mosquito was the propagator of malaria – had visited Panama in the fall of 1904 and thought that Gorgas's plan was not only sound, but could also serve as an example for the whole world. But Ross's observation went largely un-noticed by Gorgas's leadership.<sup>40</sup>

When Gorgas realized the Commission was not supporting his plans, he returned to Washington to plead his case directly to Walker. Admiral Walker called the mosquito theory "balderdash". He insisted that the correct answer was better sanitation, cleanliness, and better leadership. Gorgas' luck with General Davis was no better. When confronted with Gorgas' plan, Davis asked, "What's that got to do with digging the canal?" Davis then told Gorgas, "On the mosquito you are simply wild...All who agree with you are wild. Get the idea out of your head."<sup>41</sup> Disappointed, Gorgas returned to Colon. He had seen this attitude before in the military and, while several of his friends urged him to resign, he steadfastly returned to his work. As the workers thus surged into Colon in greater numbers to press ahead with the work, the disease reared its ugly head, as Gorgas had foreseen. By November 1904, there were 3,500 people at work in Panama, and the numbers were growing and another

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<sup>38</sup> Ibid., 416

<sup>39</sup> Ibid., 421

<sup>40</sup> Ibid., 426

<sup>41</sup> Ibid., 422-423

## ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

problem developed: the Chief Engineer, John Wallace, became terrified that he would soon catch a disease and die. The first case of yellow fever occurred in Panama City on 21 November 1904. Exacerbating his fears, Wallace had moved into the old French Chief Engineer Dingler's residence, and heard soon enough from the household staff the complete tragedy that had befallen the Dingler Family.

Yellow fever spread very quickly amongst the Americans. And while Gorgas had found mosquitos in nearly every office in Wallace's own Headquarters Building, Wallace – like Walker and Davis -- did not trust the mosquito theory either, and thought Gorgas's efforts were experimental. Despite being told numerous times to screen his buildings, Wallace refused to do so. Wallace had even written that he had "little faith in modern ideas pertaining to yellow fever transmission."<sup>42</sup> General Davis, who had taken up residence in Panama as Governor of the American worker towns, claimed that conditions were improving but then went down hard with malaria himself.

Roosevelt was unsatisfied with the lack of progress and unhappy with Congress for failing to do anything to modify the Spooner Law. He asked for the resignations of the entire Canal Commission and appointed seven new member. This time he put real decision-making authority into three of the men, with the remaining four serving in an advisory capacity. With rumors spreading stateside about chaos and disease running rampant on the Panamanian isthmus, Wallace took an extended two-month vacation in Illinois, even granting an interview in New York in which he said things were going well on the isthmus and that there were climatic effects that a "clean, healthy, moral American" could withstand.<sup>43</sup>

While the Chief Engineer Wallace had been enjoying his extended vacation, yellow fever had broken out in his own Headquarters Building. Several key Americans caught the fever and died. As the fever spread that spring, resignations started to increase and the feeling of panic spread. The scare spread quickly, and before the situation could be quelled, three quarters of the Americans on the isthmus, – more than 5,000 people – had decided to quit and head home. Then, at the very height of the panic, Chief Engineer Wallace and his wife packed their belongings and sailed for home too, telling Secretary Taft that he had personal business to discuss with him. After Wallace fled Panama, word leaked out in summer 1905 that a patient had died in Ancon Hospital from bubonic plague.<sup>44</sup>

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<sup>42</sup> Ibid., 449

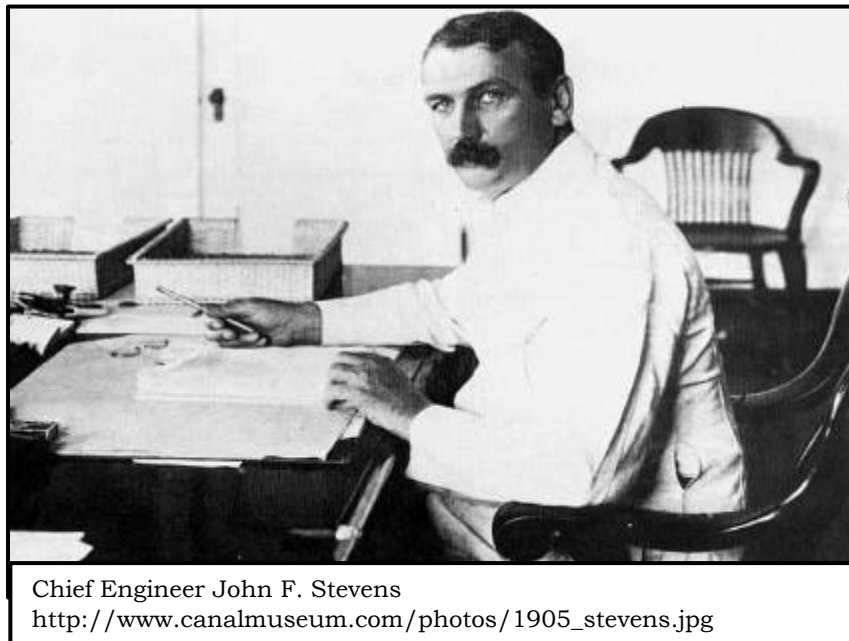
<sup>43</sup> Ibid., 451

<sup>44</sup> Ibid., 454

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Genuine panic now set in. Wallace went back to see Secretary of War William H. Taft and told him that he wanted to quit, but remain in an advisory capacity, insisting that he had "done his duty."<sup>45</sup> Taft, who was furious, lectured Wallace on "duty"<sup>46</sup> and, after accepting Wallace's resignation and hand delivering it to Roosevelt, followed his Chief's orders and had his entire conversation with Wallace reprinted in the media. Wallace was finished in Panama. With Wallace gone, a new Chief Engineer named John Stevens was hired and sent to Panama with the Commission's new Chairman, railroad businessman Theodore Shonts.<sup>47</sup>

Meeting with Gorgas and the leadership of the American canal team, Shonts said, "Our sole purpose...is to build the canal, so keep your eye on the ball" and then, to Gorgas, "We are not here to demonstrate any theories in medicine, either."<sup>48</sup> Like his predecessors, Shonts was contemptuous of Gorgas's mosquito theory. Shortly afterwards, Shonts recommended to Secretary Taft that Colonel William C. Gorgas be relieved of his duties as Chief Sanitation Officer for, among other things, poor executive ability and failure to prevent the panic that had consumed the Americans at Panama. Thus, after a little less than one year, the first Canal Commission had been asked to resign by Roosevelt; the Chief Engineer had fled his post and quit amidst a panic; and the Chief Sanitation Officer – emplaced more or less personally by Roosevelt -- was being recommended for relief to the President because he had failed to successfully perform his duties. For all of their bluster prior to beginning the



Chief Engineer John F. Stevens  
[http://www.canalmuseum.com/photos/1905\\_stevens.jpg](http://www.canalmuseum.com/photos/1905_stevens.jpg)

<sup>45</sup> Ibid., 457

<sup>46</sup> Ibid., 457

<sup>47</sup> Ibid., 457

<sup>48</sup> Ibid., 464



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canal, the Americans had been less brave, less organized, and less proficient than the French, and now appeared to be headed towards the same destination.

**Part A Questions for Discussion**

1. Discuss the French failure to construct the Panama Canal. Specifically, to what extent did de Lesseps' success at Suez lead to faulty assumptions, insufficient planning, and poor execution in Panama? Can achieving success in one type of problem actually reinforce habits of action that are a liability in another problem? How can we prevent this? How did de Lesseps undermine the ability to succeed in new tasks?
2. Discuss the Americans' efforts to construct the Panama Canal during their first year. Did President Roosevelt give clear guidance to the Commission? Was it properly followed and executed? What factors can cause a commander's guidance to be diluted, watered down, or even executed poorly on the ground? What can/should a commander do to prevent this from happening?
3. Discuss the Americans' efforts to construct the Panama Canal during their first year. Did President Roosevelt give clear guidance to the Commission? Was it properly followed and executed? What factors can cause a commander's guidance to be diluted, watered down, or even executed poorly on the ground? What can/should a commander do to prevent this from happening?

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**Part B, Construction of the Panama Canal: July 1905 – December 1906**

Roosevelt's effort to construct the Panama Canal was collapsing, and he was not happy about it. Republican Party luminaries began to fret over the political damage that the Administration would suffer in the event of a catastrophic failure similar to the French's. Commission Chairman Theodore Shonts had not only recommended to Taft that Gorgas be relieved, but he had also found a replacement – a Johns Hopkins man named Hamilton Wright. Taft concurred, thinking that Gorgas had “no executive ability” at all.<sup>49</sup> While Shonts went to see Roosevelt to tell him what he intended to do, the new Chief



Drilling through the rock <http://www.will-robson.com/Jamaica/Historical-Jamaica/i-76vcqx6>

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<sup>49</sup> Ibid., 467

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Engineer in Panama – John Stevens – had gotten off to a very strong start with Gorgas and told him that he was going to give him all the support he needed.

Stevens thus declared, “The digging is the least thing of all”.<sup>50</sup> He also wrote a letter to Taft stating that his focus of effort was to prepare well before starting construction, “regardless of clamor or criticism”, adding for good measure that, “as long as I am in charge of the work...and I am confident that if this policy is adhered to, the future will show its absolute wisdom.”<sup>51</sup> Stevens, who thought he was in lock step with Roosevelt’s intent, wrote in protest to Shonts from Panama insisting that Gorgas be kept on. The stage was thus set for a crucial test for Roosevelt.<sup>52</sup>

Roosevelt again asked his old friend, William Welch from Johns Hopkins, for a letter of recommendation on Hamilton Wright, Shonts’ proposed replacement. The President instead received a very strong endorsement of the man he already had on the job in Panama – Colonel Gorgas. “Would to God there were more men in America who had the moral courage to write honest letters of recommendation such as yours,” Roosevelt replied<sup>53</sup>. Roosevelt then went to his old friend and hunting companion, Dr. Alexander Lambert, who bluntly told him:

Smells and filth, Mr. President, have nothing to do with either malaria or yellow fever. You are facing one of the greatest decisions of your career. You must choose between Shonts and Gorgas. If you fall back upon the old methods of sanitation, you will fail, just as the French failed. If you back up Gorgas and his ideas and let him pursue his campaign against the mosquitoes, you will get your canal.<sup>54</sup>

Roosevelt made his decision on the spot: Gorgas would stay with the support he needed. Promptly calling Shonts to the White House, Roosevelt told him to “get back of Gorgas”.<sup>55</sup> Now with the support of Roosevelt coming through the Commission Chairman, Chief Engineer John Stevens, Col Gorgas, and his team attacked the problem of yellow fever, malaria, and public health as if they were at war. The Gorgas-Stevens team unleashed a campaign against the stegomyia and anopheles mosquito that was unlike anything the world had ever seen; theirs was a plan conspicuous for its vigor, intensity, and utter comprehensiveness. Here is what they did.

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<sup>50</sup> Ibid., 465

<sup>51</sup> Ibid., 465

<sup>52</sup> Ibid., 465

<sup>53</sup> Ibid., 467

<sup>54</sup> Ibid., 467-468

<sup>55</sup> Ibid., 468

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First, Shonts made the Sanitary Department an independent bureau reporting directly to the Commission Chairman (himself). This put Gorgas on an equal footing with Stevens, the Chief Engineer. Supplies now poured into Gorgas with Stevens' full support. Their relationship was now co-equal, and best thought of in terms of "supported" and "supporting," (Gorgas was the "supported"): Stevens had up to 4,000 people working in direct support of him. Significant amounts of money were spent: \$90,000 for screening alone, whereas Gorgas' prior budget totaled only \$50,000; 50,000 gallons of kerosene oil per month were brought in to cover standing water; 300 tons of sulfur for the same; the influx of all matter of supplies – lumber, fumigation canisters, wire gauze, water piping -- was simply unprecedented.<sup>56</sup>

Second, the Gorgas-Stevens team placed each of the 25 districts along the canal line under the supervision of a sanitary inspector who had 20-100 workers underneath him to perform the various tasks necessary to destroy mosquitoes. Responsibility and accountability at the district level was ruthlessly enforced. These districts varied from 15-35 square miles in area, and sanitary work was generally limited to within only one mile of the canal, but it was extremely thorough. Workers cleared all brush and undergrowth



Spraying oil stagnant water  
<http://www.armyengineer.com/history/panama/projects/Sanitation/Images/Gaillard%20Photo%20Albums045%20-%20Large.jpg>

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<sup>56</sup> Ibid.,466

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within 200 yards of houses and villages, thus depriving mosquitoes of the protection they needed from wind and sunlight to survive. Instead of fumigating houses when a yellow fever case arose, Fumigation Brigades would come in and fumigate whole rows and streets of houses at once, sometimes hundreds at a time. To handle the influx of un-acclimatized workers who were constantly streaming into Colon, Gorgas resorted to quarantines and blood



Fumigation Brigade

<http://www.kumc.edu/school-of-medicine/history-and-philosophy-of-medicine/clendening-history-of-medicine-libraru/special-collections/panama-canal/sanitation-of-panama.html>

tests to detect infected patients. Those who reported yellow fever cases received rewards.<sup>57</sup> All people were educated on the hazards of yellow fever. The sanitation workers relocated yellow fever patients within screened enclosures (either hospitals or their homes) and monitored the infected around the clock.<sup>58</sup>

Third, the team looked constantly after drainage and water issues to deny mosquitoes any areas in which they could lay their eggs. As Gorgas saw in Havana, this proved to be the most difficult part of the campaign. Workers filled ditches with stones or covered them completely with concrete. Crews paved streets to improve the drainage. Where drainage was difficult or impossible, workers oiled the water with kerosene and later crude oil. When

<sup>57</sup> *The Panama Canal: An Army's Enterprise*, (Washington, D.C., Center of Military History, 2009),39

<sup>58</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., United States Army.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ) 29

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this was impracticable, they used carbolic acid and rosin to destroy the mosquito larvae. Because Panamanians depended on rain for their water supply, the locals' habits of life had to be changed. Gorgas issued an order that "Breeding of mosquito larvae (wigglers) is prohibited within the limits of the city of Panama and the occupants of premises will be held accountable for violation of this regulation [through fines]."<sup>59</sup> Inspectors 'mosquito-proofed' water containers throughout the Canal Zone, covering them with wire gauze and replacing water scoops with spigots. Sewage and water systems and running water were installed, first in the cities of Colon and Panama City, and then in smaller cities all along the route. During the construction of the water systems, Stevens organized the delivery of potable water via rail into Panama City on his completely over-hauled Panama Railroad.

Fourth, Gorgas' workers screened several thousand buildings to make them 'mosquito-proof'. New houses and buildings included complete and permanent screens encompassing the entire house to ensure proper circulation of air and preventing areas in which mosquitos could enter. The effort greatly exceeded in size and scope what Gorgas had done at Havana. Gorgas' work began in earnest in July 1905 upon the arrival of Stevens and his retention by Roosevelt; by the fall of 1906, the American team was achieving considerable progress. By September 1906, the epidemic had succumbed to the Sanitation Department's efforts with only seven cases and four deaths of yellow fever that month.<sup>60</sup>

The progress against yellow fever had further helped to rid the Isthmus of fear. Stevens liked to say, "There are three diseases in Panama. They are yellow fever, malaria, and cold feet; and the greatest of these is cold feet."<sup>61</sup> Stevens brought "The Railroad Era" to Panama.<sup>62</sup> The progress made against yellow fever was mutually reinforcing to progress building the infrastructure of Panama, of which Stevens' railroad was the linchpin. Stevens completely rebuilt the Panama railroad to include double tracking the main line and putting down stronger rails to handle industrial strength locomotives and equipment, which flowed in from the states. Stevens' vision was that the railroad would support everything that happened on the canal line, and nothing would be done anywhere without involvement of the railroad. Stevens' emphasis on the railroad enabled him to view construction of the canal, as a transportation problem involving moving large amounts of dirt with as little disruption as possible, and the yard system he designed at the Culebra Cut was masterful at achieving this.

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<sup>59</sup> *The Panama Canal: An Army's Enterprise*, (Washington, D.C., Center of Military History, 2009),39

<sup>60</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., United States Army.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ) 32-33

<sup>61</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),464

<sup>62</sup> *Ibid.*, 468



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As the Gorgas-Stevens team made progress on the isthmus, Stevens' effort began to shift. He wrote on 5 August 1906 that, "from now on, everything should be made subordinate to construction..."<sup>63</sup> That summer, Roosevelt, decided to go to Panama to check on the canal's progress. For the first time a sitting president would travel outside the United States while in office. Roosevelt and his wife sailed from Washington on 9 November 1906 on the *USS Louisiana*, arriving in Limon Bay on the 14th. The next morning at 0730, as Stevens and his team gathered on the dock to greet their distinguished guests, they heard a loud "Good Morning" from behind them, and discovered President Roosevelt had rowed himself ashore two hours earlier and was already having a grand time "exploring".<sup>64</sup> At his first stop on the railroad, Roosevelt spotted Gorgas in the crowd and called him into a waiting covered carriage, then had Gorgas take him directly to Ancon Hospital. Following this tour, Roosevelt ignored the large luncheon scheduled in his honor and instead went to La Boca Mess Hall to have lunch and talk with the canal workers. Almost all of the questions he asked were about disease and sanitation.<sup>65</sup>



Hauling spoil from an excavator [https://ufpcmcollection.files.wordpress.com/2015/06/aa00023855\\_00063.jpg](https://ufpcmcollection.files.wordpress.com/2015/06/aa00023855_00063.jpg)

<sup>63</sup> Ibid., 491

<sup>64</sup> Ibid., 494

<sup>65</sup> Ibid., 493-495

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Roosevelt inspected work sites and questioned workers everywhere he went, asking a barrage of questions of everyone about everything he saw. His pace eventually wore out Stevens and all who tried to keep up with him. The highlight of the visit was when Roosevelt operated a huge steam shovel on the Culebra Cut for about 20 minutes, insisting upon having the controls himself while asking several questions of everyone around him to understand how everything worked.<sup>66</sup> On his last day in Panama, Roosevelt – immensely satisfied -- addressed a group of workers at Cristobal:

When your fathers were in the fighting, they thought a good deal of the fact that the blanket was too heavy by noon and not quite heavy enough by night, that the pork was not as good as it might be....and that they were not always satisfied with the way in which the regiments were led.... But when the war was done -- when they came home, when they looked at what had been accomplished, all those things sank into insignificance, and the great fact remained that they had played their part like men among men; that they had borne themselves so that when people asked what they had done of worth in those great years all they had to say was that they had served decently and faithfully in the great armies...I cannot overstate the intensity of the feeling I have...I feel that to each of you has come an opportunity such as is vouchsafed to but few in a generation...Each man must have in him the feeling that, besides getting what he is rightfully entitled to for his work, that aside and above that must come the feeling of triumph at being associated in the work itself, must come the appreciation of what a tremendous work it is, of what a splendid opportunity is offered to any man who takes part in it.<sup>67</sup>

Roosevelt also noted the absence of mosquitos; he and his party had seen only one in three days on the isthmus.<sup>68</sup>

On 17 December 1906, Roosevelt wrote a "Special Message to Congress Concerning the Panama Canal," praising the work of Stevens and Gorgas.<sup>69</sup> Roosevelt highlighted that the triumph over yellow fever would "stand as among the very greatest conquests, whether in peace or war, which have ever been won by any of the peoples of mankind."<sup>70</sup> Around the same time, Gorgas and his team were about to conduct an autopsy on a cadaver at Ancon Hospital. Gorgas told the assembled doctors, "take a good look at this man,"

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<sup>66</sup> Ibid., 496

<sup>67</sup> Ibid., 508

<sup>68</sup> Ibid., 502

<sup>69</sup> Ibid., 500

<sup>70</sup> *The Panama Canal: An Army's Enterprise*, (Washington, D.C., Center of Military History, 2009),45

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for he would be the last yellow fever victim they would see in their lifetimes.<sup>71</sup> By December 1906, yellow fever had completely disappeared from the isthmus and, with the exception of one case in May 1907, *never returned*. The team of Colonel William Gorgas and John Stevens and the Americans in Panama had eradicated yellow fever from the isthmus – *forever*.<sup>72</sup>



Operating Room [http://4.bp.blogspot.com/\\_qsrkzI8XK9I/TiROzwI6MXI/AAAAAAAAisk/z1NYRxhHVks/s400/Panama168%2Bhospital.jpg](http://4.bp.blogspot.com/_qsrkzI8XK9I/TiROzwI6MXI/AAAAAAAAisk/z1NYRxhHVks/s400/Panama168%2Bhospital.jpg)

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<sup>71</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977), 468

<sup>72</sup> *Ibid.*, 468

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### **Part B Questions for Discussion**

1. In an essay about Colonel Gorgas, the Mayo Brothers wrote, "Men who achieve greatness do not work more complexly than the average man, but more simply. Their mastery of a situation is not the result of mental photography of many details, but of mental perspective, the ability to see the whole, adjust rapidly the mass of details, and reach the main facts directly. Such characteristics were typical of General Gorgas. In dealing with complex problems, with the simplicity natural to him he went directly to the point, unaffected by the confusion of details in which a smaller man would have lost himself."<sup>73</sup> What do you think of this statement? Does the same hold true today, in an Information Age that is saturated with ever-increasing mounds of data? How important is it for a Commander to "see the whole"?
2. Discuss the actions of Roosevelt, Stevens, and Gorgas when faced with the potential collapse of the Panama Canal Project. What were the obstacles to executing Roosevelt's intent? What did he do about it? How important was John Stevens to the eradication of yellow fever? Could it have been done without him? Discuss the various elements of Colonel Gorgas's plan against mosquitoes. How would you break it down and describe it? Would it be possible to execute a similar plan in this day and age? Why or why not?
3. As the eradication of yellow fever in the Canal Zone proves successful and cases of malaria are greatly reduced, what should happen to the organization and focus of the Americans' canal team? Has the context changed considerably since Gorgas-Stevens took over in summer 1905? Is it time to bring in new people, with fresh ideas, to complete the project? What should Roosevelt do now?

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<sup>73</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C, United States Army.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ), 62

## ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

### **Part C, Construction of the Panama Canal: January 1907 – August 1914**

Roosevelt's December message to Congress had expressed complete confidence in the work of Stevens and Gorgas in Panama. It thus came as a complete surprise when Stevens visited Washington that same month and started talking about having Colonel Gorgas relieved. Theodore Shonts, the Commission Chairman, resigned on 22 January 1907 to head the Interborough Rapid Transit Company in New York City. Then, inexplicably, on 30 January 1907, Stevens wrote a 6-page letter to Roosevelt that in essence was a letter of resignation as Chief Engineer. Stevens had been working 18-hour days for a year and a half, and the most plausible explanation seemed to be that he had simply broken down with exhaustion and overwork.<sup>74</sup>



<sup>74</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977), 503



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Some speculated that Stevens' skills did not surpass railroad construction. His critics claimed construction engineering involving hydraulics, concrete, or lock construction were beyond him and with the infrastructure of Panama complete, he was ready to move on. Possibly, it had to do with his desire for constant challenge and change: after all, Stevens had shown this pattern throughout his career. He himself wrote that his reasons were purely personal, and he never revealed what they were.



**Panama Canal locks under construction** [http://mashable.com/2015/11/15/panama-canal-construction/#8\\_XsDwDN88qN](http://mashable.com/2015/11/15/panama-canal-construction/#8_XsDwDN88qN)

Roosevelt moved quickly to put an Army man in charge – someone who would not and could not quit on him as his two prior chief engineers had done. Roosevelt's choice was Lieutenant Colonel-select George W. Goethals. Roosevelt further moved to centralize authority in the person of Goethals by making him the Commission Chairman to fill the vacancy left by Shonts and Chief Engineer to fill the vacancy left by Stevens. When appointing his new commission members, Roosevelt instructed them simply:

In appointing you, I have only one qualification to make. Colonel Goethals here is to be chairman. He is to have complete authority. If at any time, you do not agree with his policies, do not bother to tell



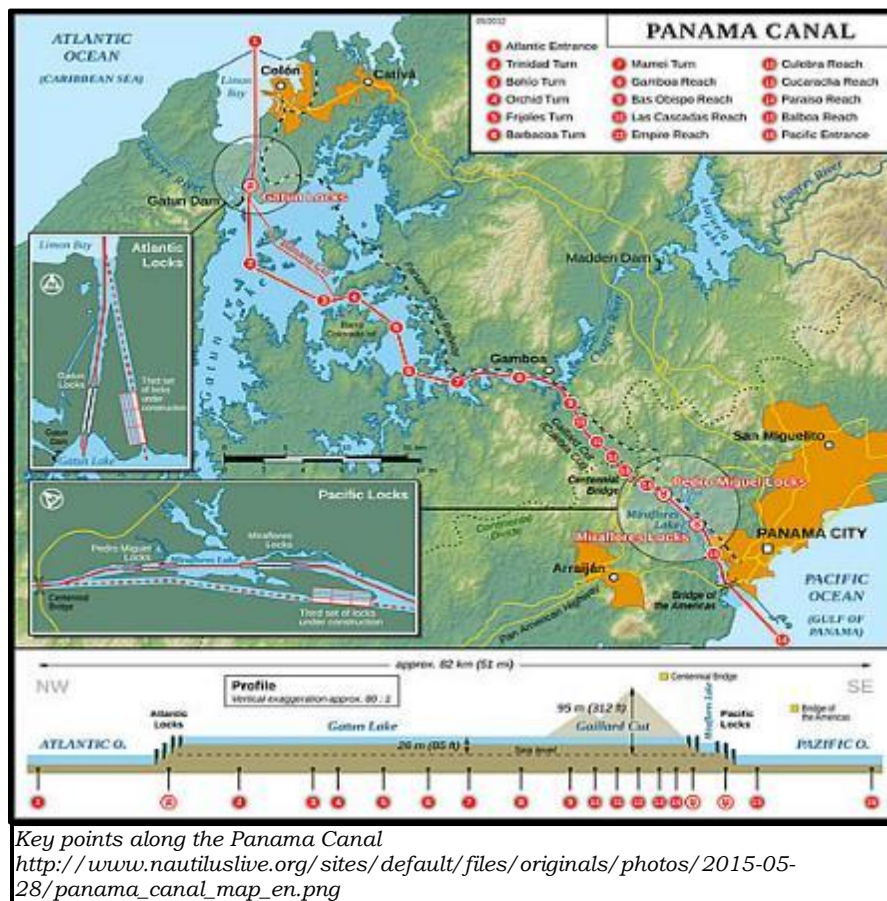
## ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

me about it – your disagreement with him will constitute your resignation.<sup>75</sup>

Roosevelt’s making Goethals “Czar of the Zone” placed him in supreme command of the canal effort.<sup>76</sup>

Within a year of taking command of the canal’s construction, Goethals implemented several changes in the canal’s plan and reorganized his work force. His planned construction changes were as follows:

- Expanding the bottom width of the channel at the Culebra Cut from 200 to 300 feet.
- Expanding the width of the lock chambers from 95 to 110 feet to accommodate the largest battleship then projected for the United States Navy. Constructing a breakwater on the Pacific side reaching three miles across the mud flats to Naos Island. Constructing the Pacific locks at Pedro Miguel and Miraflores.<sup>77</sup>



Key points along the Panama Canal  
[http://www.nautiluslive.org/sites/default/files/originals/photos/2015-05-28/panama\\_canal\\_map\\_en.png](http://www.nautiluslive.org/sites/default/files/originals/photos/2015-05-28/panama_canal_map_en.png)

<sup>75</sup> Ibid., 511

<sup>76</sup> Ibid., 510-511

<sup>77</sup> Ibid., 539

## ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

Organizationally, Goethals did away with the functional departments used by Wallace and Stevens and instead organized his force geographically. He placed an Army Engineer Officer in command of the Atlantic Division; another Army Engineer officer in command of the Central Division; and a civilian engineer whom he had worked with on the Muscle Shoals Canal in Alabama in command of the Pacific Division. Goethals' intent was to spur competitiveness and increase production across the Canal Zone, and it worked brilliantly.<sup>78</sup>



*Lieutenant Colonel-select George W. Goethals*  
[https://upload.wikimedia.org/wikipedia/commons/thumb/4/42/George\\_W.\\_Goethals\\_cph.3a02121.jpg/220px-George\\_W.\\_Goethals\\_cph.3a02121.jpg](https://upload.wikimedia.org/wikipedia/commons/thumb/4/42/George_W._Goethals_cph.3a02121.jpg/220px-George_W._Goethals_cph.3a02121.jpg)

It was perhaps inevitable that as the context changed, yellow fever eradicated and malaria reduced in the Canal Zone that the two Army colonels on the isthmus would come into conflict with each other. Once Roosevelt had

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<sup>78</sup> Ibid., 509

## ***How to Eradicate a Scourge:***

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yellow fever licked, he gave primary authority on the Commission and in Panama to Colonel Goethals, while Colonel Gorgas remained only a commission member. Gorgas still desired a free hand to rid Panama of what he considered as the greater threat – malaria – but the context had changed. Goethals, meanwhile, had a mandate from the President to complete the canal and jealously guarded his executive power. Goethals systematically reduced Gorgas's staff and gradually transferred mosquito mitigation measures to his Quartermaster staff, which accomplished the work at much less cost. Gorgas, for his part, resented getting his staff reduced and would remark years later that his efforts against malaria could have been more successful had he been better supported by Goethals. Gorgas's wife offers an anecdote – perhaps apocryphal, yet still illustrative – of the tension between Goethals and Gorgas. Goethals allegedly asked Gorgas, “Do you know, Gorgas, that every mosquito you kill costs the United States Government ten dollars?” to which Gorgas responded, “But just think, one of those ten-dollar mosquitoes might bite you, and what a loss that would be to the country.”<sup>79</sup>



507-D - The Panama R.R. Station, Gatun.

Gatun Railroad <https://ufocmcollection.files.wordpress.com/2014/08/2001-074-001-012.jpg>

Still, even as the engineering challenges of canal construction became the top priority, by the time Gorgas had left the Panama Canal Zone in 1913 he had achieved the following results against malaria:

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<sup>79</sup> Ibid., 573

## ***How to Eradicate a Scourge:*** **Yellow Fever, Malaria, and Construction of the Panama Canal**

- In 1906, 821 patients out of 1,000 had malaria.
- In 1907, 426 of 1,000.
- In 1908, 282; 1909, 215; 1910, 187; 1911, 184; 1912, 110; and finally by 1913, the number was reduced to 76.<sup>80</sup>

Colonel Goethals successfully supervised the completed construction of the Panama Canal and, during World War I, became Quartermaster General of the United States Army. Colonel Gorgas, who successfully eradicated yellow fever and significantly reduced malaria in Panama, became Surgeon General of the United States Army during World War I. Of all the men who constructed

the Panama Canal, President Roosevelt would pay the following tribute in the closing of his *Autobiography*:

A finer body of men has never been gathered by any nation than the men who have done the work of building the Panama Canal; the conditions under which they have lived and have done their work have been better than in any similar work ever undertaken in the tropics; they have all felt an eager pride in their work; and they have made not only America but the whole world their debtors by what they have accomplished.<sup>81</sup>



SS Kroonland passing through the Culebra Cut 2 February 1915.  
[https://commons.wikimedia.org/wiki/File:Kroonland\\_in\\_Panama\\_Canal\\_1915.jpg](https://commons.wikimedia.org/wiki/File:Kroonland_in_Panama_Canal_1915.jpg)

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<sup>80</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., United States Army* (Chicago, IL, Gorgas Memorial Institute, 1929) 33.

<sup>81</sup> Roosevelt, Theodore, *An Autobiography*, (New York, NY, The McMillian Company, 1914) 543

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**Part C Questions for Discussion**

1. Discuss the organizational changes made by Roosevelt and Goethals.  
How important is the context for an organization's distribution of power?  
Do you think it was correct for Roosevelt to shift the balance of power away from Gorgas once yellow fever and malaria were under control?  
Should Roosevelt have appointed a new Chief Sanitation Officer?
  
2. Discuss what you have learned from this case study? What leadership, tactics, techniques, and procedures have you added to your kit bag?  
How will you assess the context you are commanding in and what are some of the steps you will consider as you realign and adjust your unit's priorities?



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**Annex A**  
**Biographical Information**

**Ferdinand de Lesseps – President, Panama Canal Company (Compagnie Universelle du Canal Interoceanique de Panama).** De Lesseps was a very charismatic Frenchman born in 1805 into a wealthy and aristocratic family. He loved books, music, horses, his family, and life in general. De Lesseps began his career as a diplomat and had successful tours in both Tunis and Egypt, tours that were aided considerably by his father. De Lesseps' interest in canals began during his tour in Egypt when he came across an enterprising group of young French engineers who were then surveying a site to build a canal across the Suez Desert. After his diplomatic career stalled when he was 43 years old, de Lesseps renewed his interest in the Egyptian Canal project. Due to a series of bizarre political events occurring nearly concurrently in both France and Egypt, to include the murder of the Egyptian Pasha and the subsequent ascension of de Lesseps' old friend from Egypt, Mohammed Said, de Lesseps was invited back to Egypt in 1854 to advise his old friend on how he could begin his reign with some grand enterprise. Thus, the Suez Canal was born. From 1854 to 1869, de Lesseps – with no construction experience, no rank or official position, no technical schooling, and no official backing company – became the driving force behind the successful construction of the Suez Canal, after which he became known as “The Great Engineer.” When French interest surged in the construction of a canal across the Panamanian isthmus in the years after their disastrous defeat at Sedan in 1870, de Lesseps was the name on everyone's minds. He had defied the skeptics and cynics before at Suez, and who better to restore French Honor with *La Grande enterprise* in 1880? His son, Charles, tried to talk him out of it:

What do you wish to find in Panama? Money? You will not bother about money at Panama any more than you did at Suez. Glory? You've had enough glory. Why not leave that to someone else? All of us who have worked at your side are entitled to a rest. Certainly the Panama project is grandiose....but consider the risks those who direct it will run! You succeeded at Suez by a miracle. Should not one be satisfied with accomplishing one miracle in a lifetime?<sup>1</sup>

Nevertheless, de Lesseps had made up his mind. He would build a canal across Panama.

**Jules Isidore Dingler (pronounced Dang-lay), Chief Engineer, Panama Canal, 1883-1885.** He was in his mid-40's when he arrived in Panama in

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<sup>1</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),68



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March 1883 to direct the construction of de Lesseps' great canal. He had finished at the top of his class at the *Ecole Polytechnique* and had risen rapidly working as an engineer for the French state. De Lesseps was very happy to have enrolled him in the cause and it was rumored that one of the deciding factors in Dingler's decision was the fact that he had a very ambitious wife – who agreed to accompany him to Panama with their family. Dingler was short, bald, wore a mustache, had a soft round face, and had small, drooping shoulders. But he was very organized, and a tireless worker. He showed his commitment to the cause by bringing over his wife, their son and daughter, and the daughter's fiancé. He was openly contemptuous of yellow fever, declaring before leaving for Panama that “only drunkards and the dissipated take the yellow fever and die there.”<sup>2</sup>

**Phillipe Bunau-Varilla, Chief Engineer, 1885-1889, and Envoy of Panama to United States** He was a very bright young French engineer who graduated from the *Ecole Polytechnique* at the age of 20. In his last year at the school, he had sat in the front row when de Lesseps came to lecture the students following his tour of Panama on the greatness of the canal task ahead. After serving in North Africa and looking for a greater engineering challenge, he sailed for Panama in 1884 on the same ship that Dingler and his wife were on following a period of home leave for them. Energetic and capable, Dingler placed Bunau-Varilla in charge of engineering operations at Culebra on the Pacific end of the canal. Dingler would be an inspiration to Bunau-Varilla. Bunau-Varilla would become Chief Engineer of the Canal at the age of 26 and one of the most fascinating characters in the canal's subsequent construction. President Roosevelt would later write of him: “his services to civilization were notable, and deserve the fullest recognition.”<sup>3</sup>

**Theodore Roosevelt, POTUS, 1901-1909.** Theodore Roosevelt became POTUS on 14 September 1901 upon the assassination of President William McKinley. Then 42 years old, Roosevelt suddenly became the youngest President in American history. By the time he became President, Roosevelt had already been a rancher in North Dakota, Assistant Secretary of the Navy, Colonel of a Regiment of “Rough Riders” in the Spanish-American War, Chief of Police in New York City, Governor of New York, and Vice President of the United States He was also a Harvard-educated historian who had published an excellent book on *The Naval War of 1812* and a survivor of malaria from his days in uniform. During a lecture Roosevelt gave at the Naval War College on his book, he met a naval officer named Captain Alfred Thayer Mahan, and the two became fast friends and correspondents. When Mahan published his groundbreaking *The Influence of Sea Power Upon History* in 1890, Roosevelt was the first person of influence to take notice, penning a very favorable review

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<sup>2</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),154

<sup>3</sup> Roosevelt, Theodore, *An Autobiography*, (New York, NY, The McMillian Company, 1914)539

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of it for *The Atlantic*. An unabashed fan of sea power, Roosevelt wholly embraced Mahan's arguments for concentrating the fleet to achieve greater sea power and thus became an enthusiastic supporter for a Central American canal to enhance American naval power. After the French effort had failed, Roosevelt enthusiastically wrote to Mahan that the United States should build a canal across Nicaragua at once and commission 12 new battleships. When Roosevelt became POTUS, he saw the canal as essential for the future of American power, and would put his personal stamp upon the project.<sup>4</sup>

**John Stevens, Chief Engineer, July 1905 – 31 March 1907.** John Stevens was about to leave with Secretary of War William H. Taft for a railroad engineering assignment in the Philippines when his name was mentioned to President Roosevelt as the best candidate to become Chief Engineer for construction of the Panama Canal. Stevens was then 52 years old, and had amassed a long and distinguished career as a railroad engineer, but had no canal experience. Physically rugged and largely self-taught, Stevens had come up as a track hand in Texas, New Mexico, Minnesota, and British Columbia. He had served as Assistant Principal Engineer for construction of a railroad line across Michigan's Upper Peninsula, from Duluth to Sault St Marie, and was used to working in very adverse conditions. Afterwards, he became one of the best locating engineers for the Great Northern Railroad (today's "BNSF") and in the winter of 1889, he found the "Marias Pass" over the Continental Divide. Due to this incredible success, he became Chief Engineer of the Great Northern Railroad in 1895 and went on to build literally thousands of miles of railroad across the toughest terrain imaginable, including bridges, tunnels, switchbacks, and passes. When the situation in Panama became critical, Roosevelt intervened before Taft could take Stevens to the Philippines with him to fix the railroads there. In Roosevelt's interview with Stevens, the President told him Panama was in a "devil of a mess" and he would best get busy fixing things immediately.<sup>5</sup>

### **Colonel George Washington Goethals, Chief Engineer, 1907-1913.**

Goethals was 48 years old when he became Chief Engineer of the Panama Canal Project in 1907. His record up to that point had marked him as one of the best officers and engineers in the United States Army. He finished second in his class at West Point in 1880 and achieved early distinction by supervising construction of the Muscle Shoals Canal in Alabama, setting a world record by building locks that rose barges and boats 26 feet.<sup>6</sup> He served with distinction in the Spanish-American War and was one of the first 42 officers in the Army to be selected to serve on the newly created Army General Staff. Working in this capacity, he came to the attention of Secretary of War William H. Taft, and

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<sup>4</sup> Ibid

<sup>5</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),462

<sup>6</sup> Ibid., 509

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was recommended by him as an assistant to the Panama Canal's new Chief Engineer, John Stevens. While Stevens turned down the offer of Goethals' assistance, when Stevens unexpectedly walked off the job in 1907, Roosevelt decided to appoint a Chief Engineer who could not and would not quit on him when the going got tough – so he selected an Army man.<sup>7</sup>

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<sup>7</sup> Ibid., 510-511

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Figure 1, Map of Panama

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Ferdinand de Lesseps

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Operating Room

<http://4.bp.blogspot.com/-qsrkzI8XK9I/TiROzw16MXI/AAAAAAAAIsk/z1NYRxhHVks/s400/Panama168%2Bhospital.jpg> .

*President Roosevelt with his hands firmly on the controls during his visit to the Culebra Cut in November 1906.*

[https://upload.wikimedia.org/wikipedia/commons/0/0f/Roosevelt\\_and\\_the\\_Canal.JPG](https://upload.wikimedia.org/wikipedia/commons/0/0f/Roosevelt_and_the_Canal.JPG)

*Panama Canal locks under construction*

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*Key points along the Panama Canal*

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*Lieutenant Colonel-select George W. Goethals*

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Gatun Railroad Station

<https://ufpcmcollection.files.wordpress.com/2014/08/2001-074-001-012.jpg>

Gatun Locks

[http://mashable.com/2015/11/15/panama-canal-construction/#8\\_XsDwDN88qN](http://mashable.com/2015/11/15/panama-canal-construction/#8_XsDwDN88qN)

*SS Kroonland passing through the Culebra Cut 2 Feb 1915*

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# *How to Eradicate a Scourge* **Yellow Fever, Malaria, and Construction of the Panama Canal**

## **Annex C: Instructor's Discussion Guide**

As you read this material, think about the foundation of our Maneuver Warfare philosophy in *MCDP-1 Warfighting*. *Warfighting* explains, "Providing intent is to allow subordinates to exercise judgment and initiative -- to depart from the original plan when the unforeseen occurs -- in a way that is consistent with higher commanders' aims".<sup>1</sup> The 29<sup>th</sup> Commandant, General Alfred M. Gray Jr, wrote to the CG, MCCDC in 1989 about his intent "to teach military judgment rather than knowledge," writing, "I want Marine NCOs and officers who know how to think about – and in war, who know how to conceptualize an engagement, a battle, and a campaign, and then execute the concept".<sup>2</sup> General Gray foresaw that Marines in the 21<sup>st</sup> Century would need to develop "a way of thinking in and about war that should shape our every action . . . [they would require] a state of mind born of a bold will, intellect, initiative, and ruthless opportunism."<sup>3</sup> Over two decades, the construction of the Panama Canal required great stores of leadership, intellect, moral courage, commitment, and perseverance, as well as scientific and statistical analysis of reams of complex data.

How did the Americans, eventually led by two Army Colonels, overcome such insuperable odds to get it done? How did they not only drive the incidents of yellow fever all the way down to zero, but also do so in such a way that the scourge of yellow fever never returned? How did they combat malaria? What lessons can we learn from the Panama Canal's builders' synchronization of leadership and science as we wrestle with our own increasingly complex and seemingly intractable problems in the 21<sup>st</sup> Century?

### **Questions For Discussion**

#### **Part A**

1. Discuss the French failure to construct the Panama Canal. Specifically, to what extent did de Lesseps' success at Suez lead to faulty assumptions, insufficient planning, and poor execution in Panama? Can achieving success in one type of problem actually reinforce habits of action that are a liability in another problem? How can we prevent this? How did de Lesseps undermine the ability to succeed in new tasks?

- *MCDP-1 tells us that, "We should try to understand the unique characteristics that make the enemy system function so that we can*

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<sup>1</sup> Headquarters Marine Corps, *Marine Corps Warfighting Doctrine-1 Warfighting*, (Washington, DC 1997), 89

<sup>2</sup> General Gray, Alfred M., Letter to Commanding General, Marine Corps Combat Development Command, 1 July 1989

<sup>3</sup> Headquarters Marine Corps, *Marine Corps Doctrinal Publication-1 Warfighting*, (Washington, D.C, 1997), 96

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*penetrate the system, tear it apart, and, if necessary, destroy the isolated components.”<sup>4</sup>*

- *De Lesseps and the French team did not frame the problem well enough and this resulted in the liquidation of two French companies, the loss of thousands of laborers and scores of talented engineers.*
  - *The surveys Lt Wyse and his team conducted did not provide a clear map of the terrain, elevation changes, or waterways through which the railroad, and soon to be canal path, crossed.*
  - *The French also lacked a railroad expert who could advise Dinger and other engineers on the movement of the spoil from the cut more efficiently.*
  - *The French lost over 22,000 people in a decade to yellow fever, malaria, and accidents. The lack of understanding the causes of malaria and yellow fever were not just a French problem.<sup>5</sup>*
2. Discuss the Americans' efforts to construct the Panama Canal during their first year. Did President Roosevelt give clear guidance to the Commission? Was it properly followed and executed? What factors can cause a commander's guidance to be diluted, watered down, or even executed poorly on the ground? What can/should a commander do to prevent this from happening?
- *Warfighting describes Commander's Intent as "A clear expression and understanding of intent is essential to unity of effort. The burden of understanding falls on senior and subordinate alike."<sup>6</sup>*
  - *President Roosevelt picked his commission hastily and told them, "what this nation will insist upon is that the results be achieved."<sup>7</sup>*
  - *From his experiences in Cuba, Roosevelt knew establishing the health and medical facilities and capabilities would need to come before any real work could start. He appointed LtCol Gorgas as the Chief Sanitation Officer for the Panama Canal Construction Project.*
  - *When Gorgas was appointed by The Canal Commission (in reality, Roosevelt) to be the Chief Sanitation Officer for the Americans'*

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<sup>4</sup> Headquarters Marine Corps, *Marine Corps Doctrinal Publication-1 Warfighting*, (Washington, D.C, 1997),77

<sup>5</sup> *The Panama Canal: An Army's Enterprise*,( Washington, D.C., Center of Military History, 2009),31

<sup>6</sup> Headquarters Marine Corps, *Marine Corps Warfighting Doctrine-1 Warfighting*,(Washington, DC 1997),90

<sup>7</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),408

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*Panama Canal Construction Project, he was very confident that he could succeed in carrying out Roosevelt's guidance, if he was properly supported.*

- *The Commission visited the Canal Zone in August 1904. Miffed by Gorgas' plans to destroy the mosquitos, they only focused on the technological issues surrounding the completion of the canal. Col Gorgas pleaded with the commission members, Gen Davis and Admiral Walker, for the resources, monies and material required to destroy the mosquitos. They regarded Gorgas' theory as "balderdash" and did not provide the necessary support.*<sup>8</sup>
3. What should Roosevelt do now? Should he relieve Gorgas? Should he raise the Chief Sanitation Officer to a position equal to the Chief Engineer, reporting directly to the Commission? Does the current command structure support Roosevelt's intent?
- *"Subordinate commanders must make decisions on their own initiative, based on their understanding of their senior's intent, rather than passing information up the chain of command and waiting for the decision to be passed down. Further, a competent subordinate commander who is at the point of decision will naturally better appreciate the true situation than a senior commander some distance removed."* MCDP-1 *Philosophy of Command*<sup>9</sup>
  - *Meeting with Gorgas and the leadership of the American canal team, Shonts said, "Our sole purpose...is to build the canal, so keep your eye on the ball" and then, to Gorgas, "We are not here to demonstrate any theories in medicine, either."*<sup>10</sup> *Shonts recommended to Secretary Taft that Colonel William C. Gorgas be relieved of his duties as Chief Sanitation Officer for poor executive ability and failure to prevent the panic that had consumed the Americans at Panama.*
  - *General Davis confronted Gorgas's plan asking, "What's that got to do with digging the canal?" Davis then told Gorgas, "On the mosquito you are simply wild...All who agree with you are wild. Get the idea out of your head."*<sup>11</sup>

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<sup>8</sup> Ibid., 422

<sup>9</sup> Headquarters Marine Corps, *Marine Corps Warfighting Doctrine-1 Warfighting*, (Washington, DC 1997), 78

<sup>10</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977), 464

<sup>11</sup> Ibid., 423

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#### **Part B**

4. In an essay about Colonel Gorgas, the Mayo Brothers wrote "Men who achieve greatness do not work more complexly than the average man, but more simply. Their mastery of a situation is not the result of mental photography of many details, but of mental perspective, the ability to see the whole, adjust rapidly the mass of details, and reach the main facts directly. Such characteristics were typical of General Gorgas. In dealing with complex problems, with the simplicity natural to him he went directly to the point, unaffected by the confusion of details in which a smaller man would have lost himself."<sup>12</sup> What do you think of this statement? Does the same hold true today, in an Information Age that is saturated with ever-increasing mounds of data? How important is it for a Commander to "see the whole"?

- *MCDP-1 states, "Maneuver warfare is a way of thinking in and about war that should shape our every action."*<sup>13</sup>
- *Dr. Gorgas' intimate exposure to yellow fever and malaria made him keenly aware of the human capital at stake in the Panamanian jungle. By shaping the environment and changing the conditions in a way that the mosquitos could not adapt to quickly, Dr Gorgas was able to set the conditions to solve the technological endeavors faced by the engineers. The root of the problem faced by the builders was not just getting through the Culebra Cut, but keeping a workforce alive and free from disease...no humans, no canal.*

5. Discuss the actions of Roosevelt, Stevens, and Gorgas when faced with the potential collapse of the Panama Canal Project. What were the obstacles to executing Roosevelt's intent? What did he do about it? How important was John Stevens to the eradication of yellow fever? Could it have been done without him? Discuss the various elements of Colonel Gorgas's plan against mosquitoes. How would you break it down and describe it? Would it be possible to execute a similar plan in this day and age? Why or why not?

- *Dr. Lambert told President Roosevelt, "Smells and filth, Mr. President, have nothing to do with either malaria or yellow fever. You are facing one of the greatest decisions of your career. You must choose between Shonts and Gorgas. If you fall back upon the old methods of sanitation, you will fail, just as the French failed. If*

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<sup>12</sup> Martin, Franklin H., *Major General William Crawford Gorgas, M.C., UNITED STATES.*, (Chicago, IL, Gorgas Memorial Institute, 1929 ) 62

<sup>13</sup> Headquarters Marine Corps, *Marine Corps Warfighting Doctrine-1 Warfighting*,(Washington, DC 1997),96

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*you back up Gorgas and his ideas and let him pursue his campaign against the mosquitoes, you will get your canal.”<sup>14</sup>*

- *Roosevelt made his decision on the spot: Gorgas would stay with the support he needed. Promptly calling Shonts to the White House, Roosevelt told him to “get back of Gorgas”.<sup>15</sup> Now with the support of Roosevelt, the Commission Chairman, and Chief Engineer John Stevens, Gorgas and his team attacked the problem of yellow fever, malaria, and public health as if they were at war.*
  - *Stevens, who thought he was in lock step with Roosevelt’s intent, wrote in protest to Shonts from Panama insisting that Gorgas be kept on. The stage was thus set for a crucial test for Roosevelt.<sup>16</sup>*
  - *Shonts made the Sanitary Department an independent bureau reporting directly to the Commission Chairman (himself). This put Gorgas on an equal footing with Stevens, the Chief Engineer.*
  - *Organizationally the Gorgas-Stevens team placed each of the 25 districts along the canal line under the supervision of a sanitary inspector who had 20-100 workers underneath him to perform the various tasks necessary to destroy mosquitoes.*
  - *The team looked constantly after drainage and water issues to deny mosquitoes any areas in which they could lay their eggs. The Fumigation Brigade screened several thousand buildings to make them mosquito-proof. New houses and buildings were planned to be completely and permanently screened in, with screens extending completely around the house to ensure proper circulation of air and no areas in which mosquitos could enter.*
6. As the eradication of yellow fever in the Canal Zone proves successful and cases of malaria are greatly reduced, what should happen to the organization and focus of the Americans’ canal team? Has the context changed considerably since Gorgas-Stevens took over in summer 1905? Is it time to bring in new people, with fresh ideas, to complete the project? What should Roosevelt do now?

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<sup>14</sup> David McCullough, *The Path Between Two Seas*, (New York, NY: Simon and Schuster, 1977),467-468

<sup>15</sup> *Ibid.*,468

<sup>16</sup> *Ibid.*, 465

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- *As the Gorgas-Stevens team made progress on the isthmus, Stevens' effort began to shift. He wrote on 5 August 1906 that, "from now on, everything should be made subordinate to construction..."<sup>17</sup>*

#### **Part C**

7. Discuss the organizational changes made by Roosevelt and Goethals. How important is the context for an organization's distribution of power? Do you think it was correct for Roosevelt to shift the balance of power away from Gorgas once yellow fever and malaria were under control? Should Roosevelt have appointed a new Chief Sanitation Officer?
  - *Within a year of taking command of the canal's construction, Goethals implemented several changes in the canal's plan and reorganized his work force. His planned construction changes were as follows:*
    - *Expanding the bottom width of the channel at the Culebra Cut from 200 to 300 feet.*
    - *Expanding the width of the lock chambers from 95 to 110 feet to accommodate the largest battleship then projected for the United States Navy.*
    - *Constructing a breakwater on the Pacific side reaching three miles across the mud flats to Naos Island.*
    - *Constructing the Pacific locks at Pedro Miguel and Miraflores.<sup>18</sup>*
8. Discuss what you have learned from this case study? What leadership, tactics, techniques, and procedures have you added to your kit bag? How will you assess the context you are commanding in and what are some of the steps you will consider as you realign and adjust your unit's priorities?
  - *The construction of the canal seemed to many as an unlikely feat that could not be achieved, except it was. President Roosevelt created a once in a lifetime opportunity for a nation to become the formidable power in the Western Hemisphere. The men he chose to carry out the endeavor came from an array of backgrounds and experiences, and so were their interpretations of Roosevelt's intent. It would be hard to say if Gorgas, Goethals, or Stevens were not in the equation, the canal would not have been completed.*

#### **Essay Question**

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<sup>17</sup> Ibid., 491

<sup>18</sup> Ibid., 539



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9. In keeping with the principles of MCDP-1 *Warfighting* that we have discussed, what lessons can we apply from this case study towards our own “scourges” in the Marine Corps? What is the “standing water” that may be right before our eyes us that’s hurting, demoralizing, and in some instances killing Marines? Write your answer in two pages.



# Appendix 1: Case Study User's Guide



## Case Study User's Guide

**“We need every Marine and Sailor to seek creative solutions to today’s and tomorrow’s complex problems.... to ensuring we can Innovate, Adapt, and Win!” *Marine Operating Concept***

**1. Purpose:** Provide unit leaders with information on how to lead small group case studies.

**2. Intent:**

**a. Purpose:** The purpose of case studies is to use historical scenarios as an analytical guide for: 1) professional discussion and debate in pursuit of solutions to current real-world problems and leadership challenges; and 2) developing the critical thinking and creative decision-making abilities of participants. Case studies are also an effective way to rehearse the practical application of leadership and ethical principles (reps and sets), to demonstrate the value of diversity in decision-making, to connect Marines with their legacy of character and competence in a meaningful way, and to strengthen team cohesion.

**b. Methodology:**

(1) Case studies are conducted in a Socratic, student-centered learning environment where the students take the lead in the discovery process, guided by the instructor. Rather than serving as a lecturing “sage on the stage,” the instructor functions as a facilitator, moderator, devil’s advocate, and fellow-student who guides discussion with thought provoking questions intended to draw out key themes and principles and to exploit teachable moments that emerge from the dynamic interaction. Unlike lectures, case study discussions unfold without a detailed script or pre-determined outcomes -- the aim is to teach participants how to think rather than what to think.

(2) Successful case study discussions rely heavily on both preparation and spontaneity. A precondition for a successful case study is all participants have thoroughly studied and analyzed the associated historic narrative, supporting materials, and assignment questions and are prepared to challenge the group with their unique experienced-based insights. Additionally, the instructor must be prepared to stimulate thought-provoking discussion through targeted, thematic, open-ended questions; all-hands prompting; cold-calls; follow-ups; and summations. Thorough preparation and effective moderation in an environment of mutual respect set the conditions for a rich free-exchange of ideas and unconstrained learning.

(3) Effective case study leaders guide students to discover unchanging principles applicable to current challenges, alternatives to conventional wisdom, and new approaches to problem solving across key themes and focus areas relevant to the Marine Corps. The following are examples of pertinent interest areas which should emerge naturally from case narratives and provide direction for continued discussion and debate:

**(a) Warfighting Themes**

- Nature/Character of Warfare
- Command and Leadership
- Strategic and Military Culture
- Learning and Adaptation
- Maneuver Warfare
- Geography
- Sustainment
- Unity of Effort

**(b) Advance to Contact -- Five Vital Areas**

- People
- Readiness
- Training/Simulation/Experimentation
- Integration with the Naval and Joint Force
- Modernization and Technology

**(c) Marine Operating Concept – Five Critical Tasks**

- Integrate the Naval force to fight at and from the sea
- Evolve the MAGTF
- Operate with resilience in a contested-network environment
- Enhance our ability to maneuver
- Exploit the competence of the individual Marine

**c. Desired Outcomes:** Case studies are intended to achieve the following goals:

- (1) Develop student skills in critical thinking, creative problem-solving, decision-making, communication, and leadership.
- (2) Involve more personnel in the pursuit of solutions to current operational and leadership challenges.
- (3) Provide personnel with an effective way to rehearse the practical application of leadership and ethical principles (reps and sets)
- (4) Demonstrate the value of diversity in decision-making.
- (5) Educate Marines on the nature of war and the principles of warfighting.
- (6) Encourage students to have more responsibility for their learning, and promote skills, practices, and disciplines that enable lifelong learning and independent problem-solving.
- (7) Demonstrate an effective method of teaching that can be replicated by participants with future students.
- (8) Connect Marines with their legacy of character and competence in a meaningful way.
- (9) Strengthen team cohesion.

### 3. Case Study Preparation.

**a. Student Responsibilities:** The primary responsibility of students preparing for a case study class is to thoroughly study and analyze the associated historic narrative, supporting materials, and assignment questions. The goal of preparation is not simply to be prepared to regurgitate facts and chronologies but rather to – understand the “big picture” as well as the game-changing “little details”; identify key themes and principles as well as their applicability to current challenges; identify key causal relationships in their complexity; identify the primary problems and dilemmas faced by protagonists; and identify key decision makers, factors which influenced their decision-making calculus, consequences of their decisions, and alternative approaches to their decisions and actions. Drawing from their personal knowledge and experiences, students should prepare to contribute insightfully and creatively to the group learning environment. If possible students should seek opportunities to discuss the materials with other students before the case study session.

**b. Case Study Leader Responsibilities:** In preparing for the discussion, the leader must become fully conversant with the facts of the case, and should conduct the same analysis he/she expects the group to engage in. Beyond that basic requirement, the leader must prepare both content and process, including a clear set of teaching/learning objectives, a call list, a board plan, an opening question, discussion probes, transitions, follow-up questions, and closing comments. The leader must also prepare the discussion venue – audio/visual requirements, seating arrangement/assignments, supplemental materials, etc. Thorough preparation includes learning about the backgrounds of the students (ideally a small group) in order to develop an informed call plan that maximized the richness of their diverse experiences. Case study leaders should be prepared to start and end the session on time while ensuring all-hands participation and adequate time to summarize group outcomes. Finally, case study leaders should have a plan to collect and share post-event critiques.

### 4. Case Study Execution:

**a. Student Responsibilities:** Students should be ready to start on time and to positively contribute to the learning environment, understanding that there are no passive observers in case study sessions. Effective participation balances active, analytical listening with constructive comments, critique, and debate that draws out and expand upon major learning points. Students must be ready to take intellectual risks and to challenge status quo and group think, while remaining receptive to differing viewpoints and while maintaining mutual respect among participants. Critical thinking must never devolve into cynical thinking, and animated discussions must never become aggravated discussions.

**b. Case Study Leader Responsibilities:** The case study leader (CSL) sets the stage by introducing the material, establishing the learning objectives, explaining the rules of engagement, and starting the discussion pasture. The case study leader actively manages class flow and structure, while responding flexibly to student comments. The CSL poses challenging questions, cold/warm calls, and follow-ups to promote high quality class discussion; stimulates thoughtful student-to-student discussion and encourages participation from all students; draws on student

background information in guiding the class discussion; provides closure to discussion segments with appropriate transitions; and finally, concludes the session with appropriate synthesis, takeaways, and recommendations for further study and actions.

**5. Keys to Success.** The quality of a case study session is determined by the quality of the questions asked and answers given. Harvard Business School Professor C. Roland Christensen described case method teaching as “the art of asking the right question, of the right student, at the right time—and in the right way.”

The “right” questions promote learning and discovery, pique student interest, and yield dynamic discussions. Questions themselves cannot exist in isolation, but instead form part of the basic triad of questioning, listening, and responding. Asking a question entails active listening and a thoughtful response—often in the form of another question or follow-up probe. Good questions take into account the specific audience (What are the students’ needs, interests, and abilities?), the pedagogical goals of the class (What are the key learning objectives? Why should students care?), and the content and class plan (Which case features are relevant, surprising, confusing, etc.? How is the material sequenced?). Whether it calls for analysis, encourages debate, or solicits recommendations for action, a question is most effective when it fits the needs of a specific class context and helps guide students individually and collectively towards discovery and learning.<sup>1</sup>

The below sample questions (a slightly modified list from Harvard Business School) are provided for consideration.<sup>2</sup> These sample questions are organized into four main categories, which mirror the four major ways in which a discussion leader uses questions:

**a. Starting a discussion:** Framing students’ approach to the case study. At the beginning of case discussions, questions involving assessment, diagnosis, or recommendation/action tend to be more effective for stimulating learning than purely descriptive questions such as “What is the situation?” or “What are the issues?”

**(1) Assessment:**

- “How serious is the situation?”
- “How successful is this [protagonist]?”
- “How attractive is the opportunity under consideration?”
- “What’s at stake here?”

**(2) Diagnosis:**

- “What is the most significant problem/challenge faced by the [protagonist]?”
- “Who or what is [responsible/to blame] for the crisis faced by the [protagonist]?”
- “Why has the [protagonist] performed so well/poorly?”

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<sup>1</sup> “Questions for Class Discussions”, C. Roland Christensen Center for Teaching and Learning, Harvard Business School

<sup>2</sup> Ibid. Note: The list of questions provided, along with their explanations, are only slightly modified from the above reference, though detailed quoting and footnoting has been omitted to avoid confusion to the reader.



“As [the case protagonist], what keeps you up at night? What are you most worried about?”

**(3) Recommendation/Action:**

“Which of the [three] options presented in the case would you pursue?”

“What would you recommend to the [protagonist]?”

“What would be your plan of action?”

**b. Following up:** Responding to student comments by probing for more depth (drilling down), opening up the discussion to more participants (moving laterally), or asking for generalization/reflection/synthesis (linking up). Case study leaders should consider that, while follow-ups are necessary to guide the discussion and challenge students, excessive interventions can lead to instructor-focused, hub-and-spoke exchanges. Greater depth of analysis can be achieved through general probes and questions exploring underlying assumptions and boundary conditions.

**(1) General probes:**

“Why?”

“Could you say a little more about that?”

“Could you walk us through your logic/thought process?”

“What leads you to that conclusion?”

“How did you come up with that estimate?”

“Do we have any evidence to support that?”

“How did you interpret that exhibit/quote/data/information?”

“Why is that important?”

“What are the implications?”

**(2) Underlying assumptions and boundary conditions:**

“What indicators/measures/criteria are you using to support your analysis?”

“What are you assuming with respect to [x, y, z]?”

“Do you have any concerns? How might they be addressed?”

“If we assume [x] instead of [y], does that change your conclusion/recommendation?”

“What would it take for you to change your conclusion/recommendation?”

“Was the outcome inevitable?” “Could it have been prevented?”

“To what extent was the [protagonist] just lucky?”

“Is that consistent with [another student’s earlier point]?”

“How does this compare with what we discussed/concluded previously?”

**(3) To open the discussion to other students:** Although the instructor may call on another student without responding at all to the previous comment, it is often helpful to provide some guidance for the subsequent contributor. It is particularly useful to indicate whether the next student should respond directly to the previous comment or not.

**(a) The questions may be prefaced by framing statements such as:**

“Let’s stick with this”

“[Student X] is arguing [y].”

“Any reactions?”

“What about that?” “What do you think?” “Is that right?” “Any concerns?” “Do you buy that?” “Any questions for [previous student]?”

“Who would like to build on [previous student]’s point?”

“Does everyone agree?”

“Does anyone see it differently?”

“Can someone help us [work through this analysis, resolve this confusion]?”

“Can anyone address [student x]’s concern?”

**(b) Broadening the discussion:**

“Other perspectives?”

“Are we missing anything?”

“Are there other issues we should consider?”

“Who can reconcile these different interpretations/conclusions/points of view?”

**(4) To encourage generalization, reflection, or synthesis:** Case study leaders can help students integrate new concepts and internalize takeaways by challenging them to link key learnings to broader leadership issues or experiences from their own lives:

“What do you take away from today’s discussion/case?”

“What’s the moral of this story?”

“Why should leaders care about these issues?”

“In what other situations would the lessons/principles of today’s case apply?”

“Has anyone confronted a similar challenge in their own work experience?”

**c. Transitioning:** Bridging the current situation with the next discussion block, which may include checking for student comprehension before moving on. Transitions are often preceded by two types of questions: 1) comprehension-checking questions that invite questions or final thoughts, and 2) framing questions that link the current situation to the new one.

“Have we missed anything important?”

“Any final comments before we move on?”

“Before we get into [x], are there any questions?”

“Is everyone comfortable moving on to [...]?”

“Now that we’ve established [x], what about [y]?”

“In light of our discussion of [x], what should we do about [y]?”

“What are the implications of [x]?”

“So we’re clear on [x]—shall we move on to [y]?”

“Before getting into the details, how do we think about how we should approach the analysis?”

**d. Handling special challenges:** There are a variety of student contributions that can create challenges for discussion leadership. Examples include tangential, non-sequitur, long, complex, and/or confusing comments. Instructors also may find it difficult to know how best to respond to incorrect answers or the use of offensive or inappropriate language by a student. In many of these instances, it may be difficult to redirect or refocus the comment without interrupting the student. To capture the student’s attention and reduce the likelihood of causing offense or embarrassment, it is helpful to begin the response by making eye contact, saying the

student's name, and offering a neutral-to-complimentary observation such as –

“That’s an interesting perspective,”

“You’re raising some important issues,”

“I hear you saying that [ . . . ].”

**(1) Tangential or non-sequitur comments:**

“How does that relate to what [previous student] was saying?”

“Let’s hold off on that for the moment. Can we first resolve the [issue/debate] on the table?”

“We’ll get to that a little later in the discussion. Let’s stay with [previous student]’s question.”

“Let’s park that [on the side board], and I’ll look for you when we get to [later discussion topic]”

**(2) For esoteric contributions:**

“Why don’t we take that off-line.”

**(3) Long, rambling comments:**

“You’re raising a number of issues. Let’s focus on [x].”

“It sounds like you’re concerned about [x]. Let’s explore that.”

“So you basically disagree with [the previous student] because [x, y]. [To previous student]: would you like to respond?”

“I hear you saying [x]. Does everyone agree?”

“What’s the headline?”

**(4) Complex or confusing comments:**

“Let’s slow this down for a minute.”

“Let’s take it one step at a time.”

“How would you explain that to someone unfamiliar with technical language?”

“Let’s keep it simple.”

“Before digging into the numbers/details, let’s make sure we understand the basic intuition.”

“You mention [x]. I’m not sure everyone is familiar with that concept. Could you clarify?”

“I just want to make sure I understand your argument. You’re saying [ . . . ]?”

**(5) Incorrect answers:** Incorrect answers might stem from a lack of preparation, legitimate confusion, or other causes, such as ambiguous questions or lack of clear direction. For factually incorrect comments containing minor inaccuracies not central to the discussion, it is often appropriate for the instructor to respond with a gentle correction. Faulty or incomplete analysis can serve as a learning opportunity for the student and the class. Ideally, the instructor will 1) not abandon the student, 2) not confuse other students by letting incorrect answers pass unchallenged, and 3) address the reason for the misperception, not just the misperception itself. When possible, the instructor should guide the student or his/her classmates to correct the error.

“Where in the case did you find that?”

“Could you walk us through how you came up with that?”

“Did anyone come up with a different answer?” “Let’s see if we can reconcile these different results.”

“This is a particularly complex analysis. Let’s make sure the basic assumptions are clear.”

**(6) Offensive or inappropriate language:**

“Would you like to take another shot at/rephrase that?”

“Hold on just a second. Do you want to try that again?”

“In less colorful language?”

**6. Conclusion:** Past is prologue – history sets the context for the present. Case studies are a highly effective and enjoyable way to learn lessons from the past and apply them to future current and future challenges. Case studies provide valuable reps and sets for the development of critical thinking and creative decision-making abilities, while promoting teambuilding and collaborative problem-solving. Importantly, effective case studies require rigorous preparation and pre-work by all participants. Students must come fully prepared to positively contribute to a dynamic group learning environment through thought provoking commentary, active listening, real-time analysis, and constructive discussion and debate. Case study leaders must be prepared stimulate and sustain fruitful discussion and debate through questioning, while managing the discussion through the artful balance of structure and flexibility. While adroit case study leaders know how to bring a case study session to a logical conclusion, a successful case study should leave participants with a sense that the discussion has only just begun, and everyone should walk away with heightened interest in autonomous learning and problem-solving.

**Officers are expected to have a solid foundation in military theory and a knowledge of military history and the timeless lessons to be gained from it. *MCDP 1***



Lieutenant General Thomas Holcomb poses with Major General A. A. Vandegrift, Major General Roy C. Geiger, and their commanders and staff on Guadalcanal.