George Washington Goethals:
What Engineers Can Learn From an Exemplary Leader

A speech by
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Thank you, Ms Cazares, for that kind introduction. Welcome everyone!

My sincere appreciation goes out to the ASCE for the opportunity to address this important conference about a topic that is so apropos at this time and place, that is, the 100th anniversary of the opening of the Panama Canal, one of history's greatest civil engineering achievements.

Specifically, I would like to highlight the accomplishments of the Chief Engineer of the Panama Canal, COL George Washington Goethals, particularly his leadership, management, and technical abilities and what insights we can draw from his experience that are applicable to our profession today and in the future.

Every professional goes through a maturation process that shapes their approach to the challenges they face daily. I'd like to frame Goethals' experience within an apprenticeship, journeyman, and expert engineer framework. Goethals, a U. S. Army Corps of Engineers officer, went through this process.

Born in 1858, he grew up in NYC, the son of a Belgian carpenter. Having received a solid education there he won an appointment to the U. S. Military Academy at West Point where he showed a strong aptitude for engineering.

Ultimately graduating second in his class of 1880 (where he was also the class president), his knowledge of the theory of civil engineering was very strong achieving 100% on his final engineering exam at West Point. This led to his commissioning as an engineer.

During this time, the Army did not have many "schools of application", but the engineers did at Willets Point, NY. There Goethals spent a year learning the practical side of engineering which proved to be one of his most important early educational experiences. From Willets Point he was assigned to the Army's Department of Columbia (Washington and Oregon Territories) where he served as THE staff engineer for the commanding general, BG Nelson Miles. In other words, even though he was a very young Lieutenant at the time he was expected to know everything engineering.

For example, floods washed out a critical bridge which had to be replaced. Goethals had never built a bridge before, but he researched it and was successful in rebuilding this critical asset. For this and many other accomplishments in support of Army units in the field, BG Miles recommended him to then Army Chief , LTG Tecumseh Sherman, as "one of the most promising men in the Army" - high praise for one so young. Early recognition of his talents would enable Goethals to serve in positions of greater responsibility throughout his career, but more on that later.

After a few years out West, Goethals was assigned to Cincinnati for his first exposure to the Corps' Civil Works program, specifically Ohio River deepening and lock and dam infrastructure. Although this experience would serve him well later in his career and in Panama, more importantly, he was exposed to a great mentor, LTC William Merrill, the District Commander. In just eleven months Merrill challenged Goethals and maximized Goethals' exposure to the difficulties of river based inland infrastructure and to Merrill's leadership. This shows the importance of mentors in building future generations of great leaders.

Based on his performance both with the field army and on the Ohio River, Goethals was chosen to teach Civil Engineering at West Point from 1885-1889. This is another important aspect of his education because as so many of you know, you can't teach a subject if you don't know it, and Goethals focused on becoming an overall expert through his teaching preparations, tempered by his experience (a common theme throughout his career). This culminates his apprenticeship phase.

Thereafter he began what I term his "vocation phase", that is a period of more responsibility and a broad variety of experience that would not only hone his technical skills, but more importantly, his leadership and management skills.

In 1889 he oversaw lock and dam work on the Tennessee River near Thimble Shoals which included a challenging set of rapids. One feature required a 26 foot high lock, the highest in the nation at that time. However, it wasn't the

engineering challenges that proved most difficult. It was establishing good relations with the locals and with state and Congressional politicians to overcome years of delays and political wrangling that made project completion possible.

We engineers need to think about how important maintaining good relationships is in our daily activities, oftentimes making us the "master integrator" as Goethals did at Thimble Shoals.

His success with the Thimble Shoals project (and with interested constituents) led to his assignment to the Florence, TN office where he was responsible for 260 miles of the Tennessee River even though he was still a Lieutenant in his early 30s.

The Florence projects had been delayed for years, resulting in much local, state and Congressional frustration. Goethals leveraged his previous experience to manage the river and its projects in an holistic way, combining sound technical engineering solutions with good management (organization, personnel, logistics, equipment) and with strong leadership. He sub-divided his area and delegated responsibility, something he would repeat in Panama, which allowed for parallel and simultaneous execution of the project. Great leaders are effective delegators.

His strong leadership of uniformed and civilian government employees and his professional interactions with all stakeholders enabled successful project completion in less than three years. Great leaders are strong communicators.

His reputation as a "git 'er done" problem solving officer led to his assignment to the Office of the Chief of Engineers in Washington, DC in 1894 where, as a Captain (the most junior officer at the HQs) he began his "expert or strategic leadership phase" of his professional development. As a staff officer, Goethals learned how government budgets are built and defended before Congress, how programs and projects are funded, managed government civilian personnel and their professional development, and revised the engineering programs at Willets Point and West Point to make them more relevant.

Between 1894 and 1898 Goethals impressed three Chiefs of Engineers (one who called him "…a man of the highest character, an engineer of marked ability and excellent judgment"). Note that no matter what assignment he was given, engineering or otherwise, Goethals performed exceptionally well in ALL of them.

After serving by request in the field during the Spanish-American War as the First Army Corps staff engineer in Tennessee and in Cuba, where he organized and built camps for thousands of soldiers (skills that again would serve him well in Panama), Goethals was assigned to Newport, RI. Here he managed coastal fortification construction (again projects he had not heretofore been exposed to), while working closely with the Navy to maximize facility effectiveness during a period of severe budget constraints. This illustrates Goethals' ability to manage (art of orchestrating things) and to lead (the art of influencing people).

This led to his being assigned to the very first Army General Staff which was formed as part of Secretary of War Elihu Root's Army reform efforts. Here Goethals helped lead this new staff in its responsibilities to plan and provide oversight of all Army programs (doctrine, war plans, manning, equipping, training, logistics, budgets, facilities, etc). This broad exposure, to include Congressional interaction, was to prove invaluable later in Panama.

As a coastal defense expert, Goethals next served on the National Coastal Defense Board as secretary/recorder which was chaired by Secretary of War, William Taft. It was also at this time that the United States had become interested in Panama and the opportunity to build a canal, whose purpose initially was to address the tyranny of distance between the U. S. Atlantic and Pacific fleets that delayed the ability to reinforce each other during the Spanish-American War.

MAJ Goethals so impressed Taft (and Pres. Roosevelt) that his name first came up as early as in 1905 as a potential Panama Canal Chief Engineer.

As you may know by 1907 there had already been two U.S. canal Chief Engineers, John Wallace and John Stevens. Both built on the previous French experience in Panama to lay the groundwork for a successful project. They encountered great challenges, including poor infrastructure, lack of adequate and sanitary housing for the required thousands of workers, disease (malaria and yellow fever), and scope uncertainty (sea level vice a lock canal).

Both would ultimately resign, which opened an opportunity for Goethals (unbeknownst to him at the time) to replace Mr Stevens. In fact one could say that every apprentice, vocational, and strategic opportunity (on the frontier, on our rivers, and in Washington, DC) prepared him to lead the construction of a 400 year old dream, the Panama Canal.

Here's how his selection occurred. On 18 Feb 1907 he was summoned to War Secretary Taft's office and told that Mr Stevens had resigned, that he (Taft), Chief of Engineers Mackenzie, and the President had discussed Goethals as a replacement and that the President would likely call for him that evening. Surely enough, at around 10PM that evening, the President received Goethals and offered him the job.

Being an Army officer Goethals accepted "as a matter of duty".

You might ask, why did the President select now LTC Goethals? It wasn't just his credentials, which were impeccable, but more importantly Roosevelt had struggled for years to get three organizations (Isthmian Canal Commission, the Panama Railroad, and the Chief Engineer's office) properly manned and coordinated to build the canal. After Wallace's and Stevens' resignations he was determined to put someone in charge of all three of these entities with both the responsibility and authority to ensure unity of effort, and who could not quit. Therefore the Commander-in-Chief picked one of his own, an Army officer, to perform this task.

By placing Goethals in charge of all three entities, Roosevelt ensured that the task would be properly managed now that he had the right person. I am sure he also made it clear that Goethals' mission was to complete the canal and that he should expect to stay until it was done. As a "borrowed" asset from the Army, Goethals did not serve in his capacity as a Corps of Engineers officer (so the idea that the Corps built the canal is false), but rather as an engineer leader in his own right.

One could also say that Goethals' entire career, his professional development, the connections he made serving in such a broad variety of jobs, and his tremendous reputation made him the right person to lead the canal's construction. However, his task was much greater than merely building such a challenging project. It included personnel, logistics, finance, housing for the workers, sanitation and health (to reduce effects of disease), civil administration, RR operations, planning and design, prefabrication, construction, Congressional, Executive Branch, and Panamanian relations, and finally, project operation.

Only a person with broad experience and the qualifications that Goethals possessed could have successfully managed a project of this magnitude. We should think about how important a combination of a strong academic foundation and experience is to our profession.

It wasn't just his management and technical skills that made him successful, it was the power of his leadership that truly made the difference. His style was to strike the right balance between being intimately involved in the details of the project without micro-managing, that is, use of strong delegation skills. First, he started out by declaring that building the canal was a "war" and he was leading the Army of Panama, but he reassured everyone that he was not going to run the enterprise like an Army. He simply said he that he expected everyone to do their very best to contribute, demonstrating that great leaders unite people toward common goals.

Focusing on the infrastructure so necessary to the prosecution of the work, Goethals built on Wallace's and Stevens' efforts to finish the housing, sanitation, and other amenities to ensure a healthful, adequate environment for those working on this enterprise. He completed Stevens' efforts to make the Panama RR a viable capability to move millions of cubic yards of earth while delivering laborers, explosives, equipment, and cement throughout the Canal Zone.

This required a sophisticated RR control system and the daily coordination of complex RR movements to maximize efficiency, all managed by young engineer, LT Mears. Working closely with U. S. Army MAJ (Dr) William Gorgas, Goethals ensured that sufficient funding was available to help Gorgas greatly reduce the incidents of malaria and yellow fever, saving lives and enhancing productivity.

The decision to go with a lock canal (vice a sea level one) had been made on Mr Stevens' watch (which Goethals supported). Using his strong delegation skills, Goethals divided the project into Atlantic, Central, and Pacific sectors and put the best talent in charge of each (MAJ Sibert, MAJ Gaillard, and Mr Williamson (VMI 1884) respectively).

By the way, Goethals knew Mr Williamson from Ohio and Tennessee River days - a testament to his confidence in the abilities of his mostly civilian workforce. He even used the publication of a newsletter, the Canal Record, to communicate work progress to everyone and to encourage friendly competition between the geographic sections leading to improved productivity.

Having worked with the Navy in coastal defense work, Goethals was successful in his close working relationship with RADM Rousseau who was responsible for the development of docks, warehouses, terminals, coaling stations, dry docks, machine shops, and coastal defense.

Finally, LTC Hodges headed up the design effort, a monumental undertaking given the scope of the canal, the size of its locks, and its auxiliary facilities, including hydropower for the locks and other CZ needs.

Goethals was a "manage by walking around" type of leader. Every day at 7AM he caught a train to visit one of the geographic areas. He spent mornings ascertaining progress, talking to people on site to gain insights into problems encountered and to see how they were being solved. The power of his presence was palpable and nearly everyone working on the project knew who he was and how determined he was to see the project through to completion (which affected everyone's attitude in a positive way).

In the afternoon he returned to his HQs area where he visited the design, RR, construction management, and logistics teams to ensure that those efforts were synchronized with current and future efforts in the field. This is another example of leadership uniting efforts toward common objectives.

Every Sunday morning Goethals held what we call in the Army an "open door" session. For over two hours he listened to all who came; laborers, technicians, administrators alike. This allowed him to understand the problems and views of those who came to see him while offering them an opportunity to understand their leader better, facilitating communication across all levels in the organization.

Although he didn't solve every problem or satisfy everyone, that wasn't the point. His willingness to invest time in everyone demonstrated his caring, if demanding, leadership to all. He did this despite the fact that he was most likely an Introverted, Sensing, Thinking, Judging (ISTJ) person on the Meyers-Briggs personality scale. What a surprise – he was, after all, an engineer!

He sponsored many Congressional visits and his willingness to return to Washington to testify before Congress was critical to project success. This helped maintain the Federal Government's financial support so crucial to the project (that is, a predictable funding stream), but it also ensured that Congress was kept informed as to the true nature of canal problems and of progress.

The confidence he engendered with Congress, the Executive Branch, and with the Panamanians enabled the success of the project and demonstrates the high level of strategic leadership that he had attained at this point in his career (again based so much on his previous experience). Most importantly he finished a "clean" project, or in his words "… no scandals, no graft, no corruption…".

Despite many difficult technical challenges, including the deepest canal cuts and the largest locks up to that time, Goethals' leadership, management, and technical skills enabled the project to be completed nearly a year ahead of time in August 1914. He then remained as the first Canal Zone administrator (one might say the first project operator) until January1917.

So what are the implications of Goethals' experience for the rest of the 20th Century and indeed for our profession today?

I believe that ASCE's Vision 2025 provides a good foil for addressing this question, in particular, the call to be a Master Builder, that is, one who plans, designs, constructs, and operates the built environment for the benefit of society. Goethals was an innovator, a prudent risk taker, ahead of his time in personnel management, and a leader of his profession. All of these are true, but I think it was his character and integrity which was shaped by sound academics, practical experience, and life-long learning that made him so successful.

His willingness to share knowledge and give those working with him the flexibility to make decisions and perform within parameters that he established are the mark of a highly self-confident leader whose legacy included several future Chiefs of Engineers and impacts on such 20th Century mega-projects as the Hoover Dam.

Goethals' ability to do the right thing, for the right reason, and most importantly in the right way, to work with and lead people, establish high standards, to communicate his intent clearly, and his sense of fairness helped maximize the contributions of everyone.

What I think we need to take from his experience is that leading large complex projects is as much art as it is science and like any craft leadership only improves with practice. All projects face technical challenges, but often it is not the technical that proves most difficult. Getting clarity of scope from the owner, locking in financing, choosing the appropriate delivery method (DB, DBB, ECI, etc), coordinating multiple primes or project efforts simultaneously, dispute resolution, change and risk management, logistics, safety, quality, and politics all come into play.

There is no manual to teach us how to lead and manage all of these activities successfully. Only the right combination of academic preparation, experience, and life-long learning (or apprenticeship, journeyman, and expert experience) can give

us the best chance to become, as Goethals did (in my view), a master builder. Do you think Goethals fits in this category of master builder?

So if you have aspirations of becoming a master builder (which is not for everyone nor for the faint of heart), my advice is to do as Goethals and so many others have done: do ALL assigned jobs well; if you don't know, then figure it out; obtain a solid academic foundation; actively gain a broad, practical experience base; seek mentors to help you along the way and likewise invest your time to develop people with potential; and remain committed to life-long learning. I like to say that when you stop learning, it's time to do something else (or something new).

Thank you again for the honor of addressing you and I hope you can tell why I so enthusiastically agreed to use Goethals as such a great example for our profession.

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