INTRODUCTION: When the SS UNITED STATES left Newport News Shipbuilding in May of 1952 for builder’s trials, her requisite speed runs were not conducted over a measured mile course far away. Instead, these tests were performed in deep water off the Virginia Capes, saving NNS hundreds of thousands of dollars. This was only made possible by utilizing an ingenious electronic measuring tool...called Raydist...that had been invented, manufactured and made practical for this first-of-a-kind sea-going usage by a small Hampton-based firm; the Hastings Instrument Company.

Raydist is defined as a radio navigation system used in hydrographic and geophysical surveying, and ships' trials which employs phase comparison techniques. When Charles Hastings created this multiuse device in the mid-1940’s, he apparently felt the need to give it a unique name. So he decided to combine the first syllables of the words "radio" and "distance" to form the acronym "RAYDIST."

Today, his invention is almost forgotten; made obsolete by GPS and other 21st century advanced technologies that have greater capabilities. But Raydist remains an integral and important part of an inspiring, all-American success story that deserves recounting.
BOY GENIUS: Charles Edwin Hastings, the inventor of Raydist, became enamored of both electronics and entrepreneurship at an early age. Born in Baltimore, Maryland in 1914, by the age of ten he had been bitten by the radio bug. At thirteen he shelledacked an oatmeal box and wound wire around it to build a crystal radio set.

Then he decided to try his hand at building a transmitter. When his homemade device was ready for testing, he had a friend, Ray Doyle, listen to a radio at the nearby home of Charles’ aunt to see if a test transmission could be heard.

It worked all right, but a little too well. The strong signal from Hastings’ transmitter overrode all local commercial radio broadcasts in Northwest Baltimore. Soon, authorities were searching for the disruptive…and illegal…transmitter. Hastings hastily stopped transmitting and turned his talents to radio repair.

In 1930, commercial radio was a novelty. Receivers were unreliable and often needed repair. Teenager Charles Hastings started making random telephone calls to people who lived within walking distance. When he’d find someone whose radio wasn’t functioning properly, he would rush to their house and convince the owner he could fix it...and did.

Word of his talent soon spread, and his radio repair business flourished during his high school and college years. The money he earned was invested in parts for more experiments. Charles Hastings’ combination bedroom/workshop was filled with radio components, and his room’s window also sprouted numerous antennas.

NACA: His high school years were spent at Baltimore Polytechnic Institute, an unusual secondary school that offered technical subjects for talented students. He then attended John Hopkins University, majored in electrical engineering and graduated in June 1935.

The country was still recovering from the Great Depression. Jobs for electrical engineers were scarce. After a number of tries to find work in his chosen field, Charles took a civil service exam for physicists. In September 1935, he was hired as a Junior Scientific Aide with the National Advisory Committee for Aeronautics (NACA), which years later became NASA.

The position required him to move to Hampton, Virginia. Assigned to NACA’s Hydrodynamics Division at the Langley Memorial Aeronautical Laboratory, he was soon kept busy with routine assignments delegated to new hires. During the next four years, he was transferred to the Instrument Research Lab, where his skills were put to better use. When not working, he acquired even more electrical test equipment for his hobby, which he pursued in a Buckroe Beach cottage that he shared with bachelor friends.
WHEN MARY MET CHARLES: In June 1939, NACA hired a young mathematician named Mary Comstock, who had just graduated from the College of William & Mary with a degree in physics. She was assigned to an office across the hall from where Charles Hastings was located. She caught his attention...big time. Within two weeks, he asked her for a date. Less than a year later, they were married at her parents’ home in the east end of Newport News on March 30, 1940.

They set up housekeeping in an apartment in Southampton. Soon their first child, Robert, was on the way, and Mary’s NACA career came to a sudden and irreversible stop.

RADIO GROUND SPEED SYSTEM: Charles Hastings’ work at NACA often involved finding unique solutions to aeronautically-related problems. One such project involved finding an accurate means of measuring aircraft speeds.

In March 1940, he came up with the concept of a promising device; shown in his hand-drawn sketch to the left. But it only worked at very low speeds.

Undaunted, he proposed to his superiors a more complex measuring method using radio waves. His idea was tested in November 1940, utilizing a plane flying at high speed over Langley Field. It worked, and Hastings was assigned the task of perfecting it.

Called the NACA Radio Ground Speed System, this device, shown to the right with its inventor, was fully developed by 1943. When Doppler radar came into use, it was considered to be more practical, and Hastings’ system was termed obsolete by NACA. But Hastings was convinced his invention could still be useful. A few years later, this concept would evolve into the Raydist system.
WORLD WAR II: Throughout the war, Charles Hastings was kept busy working on a variety of projects for NACA; most of which involved new and novel uses of electronic gadgetry for military use. In the evenings, he taught courses in basic and advanced electronics at the University of Virginia Extension Division in nearby Newport News.

Initially deferred because of his job, in May of 1944 Charles Hastings received notice to report to his draft board for induction into the Army. But he was not worried, knowing that men at NACA involved in military research work, when inducted, were immediately put on inactive status, and allowed to continue their previous work without interruption.

And, so, Charles Hastings, thirty years old and technically a private in the US Army spent the duration of the war at NACA. However, he had already become restless there and began to dream of starting his own business after hostilities ended. He believed many of his ideas had commercial potential; in particular his radio ground speed system. But most of his devices were classified during the war and then there was the question of patents.

Fortunately, security restrictions for his speed measuring device were lifted shortly after the war. Even during the conflict, NACA’s policy was to allow employees to patent their inventions in their own names. In 1944 he proposed applying for several patents, and, in return, allowing NACA to use his inventions royalty-free. They agreed and soon Charles Hastings’ dream became a reality...albeit on a part-time basis in very cramped quarters.

HASTINGS INSTRUMENT COMPANY: When Charles and Mary Hastings concluded that they could start their own company in late 1944, they were living with their two small children in this three-bedroom home at 117 Hampton Roads Avenue in Hampton. Purchased in 1942, the house had an apartment above a garage in the back.

During World War II, housing was extremely scarce on the Virginia Peninsula. The Hastings rented out two of their bedrooms to other NACA employees...until those rooms were needed for their growing family. The apartment was rented to Mary’s brother, Allen, and his bride until the Selective Service summoned Allen. Those sources of extra funding went a long way towards helping the Hastings pay off their mortgage by October of 1944.

Once freed from a monthly mortgage obligation, Charles Hastings converted the apartment into an electronic workshop. He and several NACA associates began to work there at nights and on weekends, developing ideas they felt had future promise.
Charles rented a post office box in September of 1944, using a name more impressive than the fledgling business it represented: the Hastings Instrument Company. Mary ordered some business stationary and some weeks later they got around to opening a checking account for the firm.

Their initial capitalization was $210. They had no paid employees. During normal business hours, Mary and her two preschool children were the only ones on the premises. Although the war was clearly winding down, Charles Hastings was still in the army, still working for NACA.

But armed with an abundance of ideas, determination and enthusiasm, he used vacation time to travel and meet potential customers. By Christmas, 1944, he had landed his first contract; an $800 order with the Naval Aircraft Factory in Philadelphia. More orders soon followed. Hastings took on some paid, part-time help.

**BUSINESS ON A BORROWED SHOE-STRING:** In February of 1945, the ever-confident Charles Hastings, with his wife’s encouragement and support, decided to expand his fledgling business. But he needed capital to do so. Although he was offered loans by friends, he sought financial help from his father, who had previously loaned him money to help buy the house.

Charles’ father, who was in the plumbing business, was not enthused about helping to fund a start-up business for his son in a field which he didn’t understand nor which he felt had much chance of success. When Charles Hastings said he was going ahead, with or without his father’s blessing and monetary support, the elder Hastings reluctantly provided some financial assistance. Despite his father’s misgivings and a dour prediction of failure, Charles Hastings’ business grew rapidly.

By early 1945, the Hastings Instrument Company had several part-time employees that were paid $1.00 an hour. When the apartment became too small, the business spilled over into the Hastings’ garage. Soon, three nights a week, there were up to seventeen employees crowded into the Hastings’ former apartment and garage, all working on developing electronic devices that could be marketed commercially.

In addition to developing demonstration models for the firm’s sales efforts, they also manufactured components for contracts that Charles Hastings periodically was able to acquire. This vintage photograph depicts two part-time workers at work in his garage. In parallel, efforts continued on acquiring patents for several devices. Even with NACA’s support, it was an extremely slow process.
The Company’s activities, by necessity, also invaded the rest of the Hastings’ residence. A drafting table was squeezed into the kitchen, and a card table for bookkeeping and other business activities was set up in the living room. At times, Mary’s oven was used to bake the ‘black crackle’ paint finish on electronic equipment cases.

MARY HASTINGS, INNOVATOR: In addition to caring for two [eventually three] children, running a household and doing the firm’s accounting; Mary Hastings also made blueprints during the day. On one occasion, she also became an innovator.

One morning, Mary told Charles she would spray paint some cabinets for him and have them ready by the time he got home from NACA. When she got started, she discovered their compressed air tank was empty.

Undaunted, Mary drove to a nearby service station and deliberately over-inflated her car’s tires as much as she dared. Back home, she sequentially attached a paint sprayer to the tires and used it until the tires were almost flat. After several repeat performances of this ingenious solution to her problem, the cabinets were painted and ready for her husband’s use that evening.

FIRST FULL-TIME EMPLOYEE: Charles Hastings, whose military service had ended in 1945, continued to work for NACA until January 31, 1946, when he resigned his position and became the Hastings Instrument Company’s first full-time employee. A key factor in his decision to go it alone was arranging in late 1945 with a Boston electrical company to buy the manufacturing rights to some of his inventions.

One of the products he touted to that firm was Raydist. But they were not interested.

After helping the Boston firm start production on several of his devices, Charles Hastings returned to Hampton to devote all of his time to expanding the Hastings Instrument Company. With dogged determination, he tried to find someone that saw a use for the Raydist concept. By March of 1946, he had been turned down or ignored a documented one hundred and three times. Then, on a sales trip to an Air Force installation in Ohio, someone finally said “Yes”.

The Air Force wanted to develop a way to pinpoint their aerial photography and mapping work. Hastings not only convinced them that Raydist could do the job; he boldly stated that it would be ten times more accurate than any other piece of electronic gear then available on the market. If it did not perform as promised, he said they need not pay him!

Impressed, the Air Force agreed to pay him $8,000 for a single-dimensional Raydist system, to be delivered by the end of October. This contact was eight times bigger than any of his previous sales.
GOVERNMENT CONTRACTING: The euphoria of Hastings’ sales success was soon tempered by two realizations. He needed to fill out and get approved a plethora of government forms, and get a bank loan to cover his production costs for that contract.

The government paperwork required information about his firm’s background, financial condition and technical capabilities. The forms presumed the applicant was a company of substantial size; not a home workshop staffed by part-time help. Not sure how to respond, Charles Hastings sought the advice of a NACA associate who dealt with such forms.

His friend advised Charles to leave most of the spaces on the forms blank, and attach whatever information he thought pertinent. Surprisingly, that approach worked and the tiny Hastings Instrument Company became a qualified government contractor which, in turn, helped serve as a basis for the bank loan he needed.

TESTING RAYDIST AFLOAT: Hastings had long dreamed of further applications for Raydist. One of his ideas was to use it to measure ships’ speed. He was confident it would work, but felt that it was necessary to demonstrate his system’s capability in the field in order to convince others. Fortunately, Mary’s father, John P. Comstock, a naval architect at Newport News Shipbuilding, owned a cabin cruiser. He volunteered his boat, named ALMADO, as a base for conducting some experiments.

[ALMADO was an unusual name that John Comstock had concocted by using the first two letters of the given names of his three children…Allen, Mary and Dorothy]

One summer day in 1946, with the help of two employees, Charles Hastings installed a master Raydist station onboard his father-in-law’s pleasure craft. One relay station was set up near Old Point Comfort; another five miles away at the Middle Ground lighthouse.

With John Comstock at the helm (far left) and his son-in-law posing precariously on the cabin cruiser’s bow for this photograph (far right) with his two helpers, they set out to run tests. They made several runs back and forth in Hampton Roads between the two relay stations. In between runs, Charles Hastings adjusted his system. By the end of the day, he was satisfied that the system could accurately measure speeds at sea.
TESTING AND DELIVERY OF RAYDIST SERIAL #1: A couple of months later, the unit that Hastings had sold to the Air Force had been completed. To calibrate it, using known distances, he and some others piled the equipment into the back of a car and drove to nearby Pembroke Avenue. Using a 100-foot tape measure, a paint brush and a can of white paint; they proceeded to mark off a couple of miles of highway with white stripes every one hundred feet. Surprisingly, no one questioned what they were doing or tried to stop them.

By October, the set had been calibrated (i.e., ‘road tested’) and was ready for delivery. Not taking any chances on it being damaged or lost in shipment, Charles Hastings and one of his employees loaded the equipment into a vehicle and delivered it to their first big customer.

ELECTRIFYING GROWTH: The Company’s business grew quickly, thanks to a multiplicity of commercialized electronic gadgets that customers found useful. Sales tripled between 1945 and 1946. With additional projects in development, the firm’s potential was bright. Charles Hastings was impatient for his business to become profitable. The salary he had given himself was barely enough to sustain his family, and without some profits to grow his company, it seemed he might have to go back to NACA.

To become profitable, he decided to not only develop and license electronic devices, but to manufacture them too. The experience gained in building the first Raydist system was useful, but funds to further develop and manufacture additional and more sophisticated units was needed. Hastings decided to incorporate to support his expansion plans.

The Hastings Instrument Company was chartered as a stockholder-owned corporation on February 14, 1947. Many of the stockholders were part-time employees that shared Charles Hastings’ dream. But incorporation formalities aside, the Company itself was little changed, at first…other than to double the number of full-time employees…to two.

Two months later, Hastings landed a $40,000 contract with the Army’s Signal Corps for a two-dimensional Raydist set. The Company needed $25,000 to pay for building the device. Charles Hastings started calling on local banks, instead of potential customers.

Two bankers on the Virginia Peninsula were impressed enough by Hastings’ short track record to pool their resources and loan him the needed funds. The next step was to pass inspection by an Army contracting officer. On the appointed day of that official’s visit, the Hastings’ children went to grandma’s house. Most of the firm’s part-time help took time off from their regular jobs and worked at the Hastings home; giving the appearance of a firm bustling with activity. Impressed, the contracting officer approved the contract.
MARKETING RAYDIST: Charles Hastings demonstrated Raydist whenever potential customers visited. He would make a technical presentation to his guests, and then take them out for a demonstration where white stripes had been previously painted. Stopping precisely on a painted stripe each time the device indicated that a hundred feet had been traveled, his visitors were impressed.

Other demonstrations took place around the country. In one such demonstration, Hastings placed a coin on a roadway and then moved his vehicle several hundred feet away. With a customer sitting in the back, watching the instrument’s dials, Hastings drove slowly forward, stopping when the Raydist system indicated they were back to the coin. They got out. No coin in sight. Hastings moved the vehicle…and…there was the coin, which had been under a front tire! Understandably, this demonstration resulted in another sale.

GROWING PAINS: By 1947, the firm had obviously outgrown the Hastings’ home, which now housed three children. Finding a place to expand was not easy. There was very little suitable real estate available. Limited funds meant that a cheap rental was all Hastings could afford.

Charles Hastings settled for renting an old building that had once housed a brick distributorship. It was vacant and had been for lease for some time…for good reason. It was located in a low-lying part of Hampton where flooding was frequent. The day the Hasting Instrument Company moved in, its employees had to wade through several inches of water…inside and outside…to transfer their equipment. They soon discovered that the roof leaked as well, and they quickly learned not to store anything on the floor.

That same year the firm began to attract attention from companies prospecting for oil in the Gulf of Mexico. They found that Hastings’ products were ideal for accurately mapping areas of interest. Sales began to increase significantly.

By the end of 1947, sales had doubled those of the previous year. But the Company had to report a net loss; in part because of the need to write down the value of its patents, as required by Federal regulation. In addition, some customer-induced delays in accepting shipments of finished products resulted in untimely payments and the need for Hastings to temporarily hold them…and keep them dry. Things turned around the next year, with sales further increasing. In 1948, a profit was finally realized.
A HOME OF ITS OWN: 1948 also marked the first time the Hastings Instrument Company acquired a business home of its own. A 14,000 square foot building owned by Horne Brothers on 39th Street near the Newport News city line was purchased for $55,000. Selling additional company stock provided for a down payment, and a ten year mortgage was obtained.

The building’s owner allowed Hastings to move in a little at a time, between May and September of 1948. Throughout that summer, Hastings’ employees worked on their delicate devices as noisy and dirty sheet steel fabrication work took place in the same building. Eventually, the Hastings Instrument Company had this facility all to itself.

By year’s end, the number of employees had risen to 75, and by the end of 1950, the firm had 118 full-time employees. One of the new employees was Raymond Doyle, Charles Hastings’ boyhood friend who had participated in the illegal radio transmission caper in Baltimore. Enticed by Hastings to leave his job in Maryland and move his family to Hampton, Doyle became production superintendent at Hastings Instrument Company. He stayed with Hastings for the remainder of his career, retiring in 1978.

[In 1954, Raymond Doyle’s son entered the Apprentice School at Newport News Shipbuilding. Raymond T. Doyle, Jr. completed his time as a machinist in 1958.]

Sales rose ten-fold between 1947 and 1950 at the Hastings Instrument Company, and substantial profits were posted. But cash flow continued to be a major problem. The Navy was the firm’s biggest customer, and while they were supposed to make progress payments every two weeks, at times bureaucratic delays meant that the company officers had to wait for their weekly pay checks. But to Charles Hastings’ credit, the production workers were always paid on time, even if short-term loans had to be obtained to do so.

That is, until a political fight in Congress delayed passage of the 1949-1950 Military Appropriations Bill. Charles Hastings had been assured by the Navy that passage of the bill was routine, so he somewhat naively continued to work on multiple contracts for the military; incurring significant production costs.

When the military couldn’t legally make their progress payments, he was forced to lay off almost a quarter of his work force. Eventually, the bill was passed, the past-due payments were made and the laid-off employees returned to work.

It was a lesson in dealing with the government Charles Hastings never forgot.
THE COMMERCIALIZATION OF RAYDIST: As his company prospered, Charles Hastings strove to develop a line of Raydist systems for commercial use. His prior one-of-a-kind units had been customized, limited in utility and not suitable for mass production. In addition, they were all sold to the government as Hastings impatiently waited for the US Patent Office to process his 1945 application for the basic system.

Finally, in 1950, his application was approved, ten years after he had first invented the system. That same year, he sold a standardized Raydist system to the Corps of Engineers. Other orders soon followed.

Also in 1950, Charles Hastings was named as one of America’s Ten Outstanding Young Men for the year 1949 by the United States Junior Chamber of Commerce. One of the other awardees that year was a young Congressman from Michigan named Gerald Ford.

The outbreak of the Korean War brought large military contracts to Hastings. Demand for Raydist system units was strong. Between 1950 and 1953, Company sales almost tripled, topping one million dollars for the first time. The number of employees grew to almost 200, working in three buildings on the Virginia Peninsula.

The Raydist system was so successful in multiple applications, that the Company formed two separate entities to concentrate on and service the petroleum and marine industries. Offshore Raydist, Inc. and the Raydist Navigation Company were created for these purposes.

To support all this expansion, office personnel were hired locally. But in order to refine existing products and develop new ones, employment ads were placed in major newspapers all over the Southeast. Ray Doyle went on several successful recruiting trips to places like Oak Ridge, Tennessee, where hundreds of skilled scientists and engineers were on the government payroll.

In addition, two of Charles Hastings’ NACA associates who had worked with him part-time for years accepted key roles in the Hastings Instrument Company.
HASTINGS’ TRIALS BEFORE THE SEA TRIAL: The majority of the Company’s attention in the early 1950’s was focused on Raydist. Demonstration of the system’s multiplicity of capabilities was sought at every opportunity. In 1951, a unique opportunity presented itself locally when the Hastings Instrument Company got involved in measuring the speed of the world’s fastest ocean liner; the SS UNITED STATES.

But convincing Newport News Shipbuilding and others of the system’s capability to accurately determine ships’ speeds at sea wasn’t easy. Without the help of Hastings’ father-in-law, John P. Comstock, Raydist might not have been considered at all.

Traditionally, in order to determine top speed, large vessels had to go hundreds of miles to run a measured mile course in either Maine or Cuba. That was a time consuming and expensive effort, and one that NNS hoped to avoid. In addition, the Maine location was too confined, and the waters in Cuba were too warm to permit the UNITED STATES to reach her much-anticipated full potential.

The shipyard’s Research Committee was tasked to look for a better way. One member of that committee was Comstock, who was the shipyard’s assistant naval architect and also the man in charge of the detailed design of the UNITED STATES’ sleek hull.

Comstock had seen what Raydist could do, during the system’s proof-testing onboard his cabin cruiser in 1947. He thought Raydist offered great promise for determining the new liner’s speed. Trying hard not to be pushing his son-in-law’s interests, Comstock merely suggested to other committee members that they might investigate using Raydist.

As to propose a method for running such a test off the Virginia Capes, Charles Hastings responded by suggesting that relay equipment be installed on free-floating buoys, with a master station installed in the liner. That way, the ship’s speed could be accurately determined as it steamed towards or away from the buoys. Charles Hastings predicted results more accurate than attainable by running a measured mile course.

Intrigued, the Research Committee had a test conducted. In November 1951, a master station was installed onboard the tug HUNTINGTON. Relay equipment was placed on the end of a shipyard pier. The tug then ran past the pier several times as Hastings recorded its speed. The results were not as good as anticipated, due to some unanticipated interferences, such as the close proximity of several large steel hulls. Charles Hastings, every bit as good a salesman as he was an inventor, presented valid reasons for every aspect of the poor performance and how he could eliminate the problems encountered.
A VINDICATION TEST: The committee was not entirely convinced. But they didn’t want to give up on the idea of conducting speed trials nearby; thus avoiding an expensive and lengthy trip to a measured mile course that had undesirable restrictions. If Raydist worked, the liner could sail for miles in any direction in the open ocean, after building up speed. They decided to hold another test. A measured mile course for small vessels in the upper Chesapeake Bay was selected. A buoy was provided for Hastings’ relay equipment. A small vessel carried the master station back and forth as data was collected and compared with measured mile data simultaneously obtained by conventional means.

That test was a complete success. Raydist was approved for use during the UNITED STATES sea trials. But just to be sure, the shipyard provisioned the vessel to go to Cuba and back, should Hastings’ system fail at sea. Charles Hastings had no intention of failing. He provided two complete Raydist systems for use during the trial trip. In addition, a third buoy was lashed down on the liner’s fantail, along with a construction crane. Not used, it probably was the only crawler crane ever to go on a sea trial!

A SEA-GOING SUCCESS: A Coast Guard buoy tender accompanied the UNITED STATES to sea. After placing two instrumented, free-floating buoys in the ocean, she served as a photographic platform as the UNITED STATES made several passes. The weather was bad. With gale force winds and 20-foot seas. Nevertheless the new ocean liner performed magnificently, easily surpassing her design speed.

Onboard the UNITED STATES, five Hastings Instrument Company employees monitored the Raydist master station. They studied strip chart results for each run as the liner steamed away from one of the buoys in very stormy seas. Their data closely matched the shipyard’s predictions.
In this photo, Charles Hastings is in the foreground, left. Facing him is Allen Comstock, Charles’ brother-in-law.

Allen, now 92, retired and living in Newport News; is a former pre-World War II employee at NNS who obtained an electrical engineering degree after serving in the Navy during the war. He recently recalled that the vessel handled the rough seas well, even when steaming into the wind at flank speed when the relative wind velocity was almost 80 knots. He also remembered getting very little sleep that trip.

At the end of the day, Charles Hastings was delighted with the performance of his equipment. Their data was accepted by Maritime Administration officials without hesitation. NNS officials onboard, including John P. Comstock were equally pleased. The UNITED STATES returned to Newport News without the necessity of going to Cuba.

When the UNITED STATES was delivered to her owners in June of 1952, Charles Hastings and John Comstock, plus other NNS officials and prominent Virginia Peninsula citizens were onboard. In this photo, taken by John Comstock, Charles Hastings (left) appears on deck…all decked out.

For several years thereafter, all of NNS’ sea trials were run using Hastings’ Raydist system. Soon, other shipyards were asking to use the system. Within a few years, Charles Hastings’ Raydist systems dominated the sea trial business in the United States.

**BIG PROGRESS...AND BIGGER PROBLEMS:** Throughout the reminder of the 1950’s, the Hastings Instrument Company continued its rapid growth, offering a wide range of technological products all over the world. Although Raydist captured the public’s imagination, the sales of another Hastings invention, a vacuum gauge superior to anything else available in American industry, vied with Raydist as the sales leader.

In 1954, the Company was selected to participate in H-bomb tests in the Pacific. A complex tracking system was set up on atolls near the test site, with a manned master station located on a naval vessel stationed a safe distance from ground zero. Two years later, the Hastings Instrument Company returned to the Pacific.
To support the more extensive weapons’ testing conducted in 1956, elaborate electronic gear was installed in three large vans by the Hastings Instrument Company, which were transported to the Pacific and placed on the flight deck of an escort carrier. Twenty Company employees spent six months living onboard ship and working long hours at monitoring stations inside the vans. That project was the largest contract Charles Hastings had ever obtained up to that year; three-quarters of a million dollars.

Unfortunately, during those years a patent infringement law suit against Hastings put a huge drain on the firm’s finances. Hastings ultimately prevailed, but the court did not award any damages. A few years later, when denying an appeal by the loser, a Federal District Court found the complainant’s charges so ‘vexatious and unjustified’ that court costs and legal fees totaling $80,000 were subsequently awarded to Hastings.

But that was no help in 1954. Plus, the Company had become embroiled in a series of costly disagreements with government cost inspectors and auditors. As other firms have experienced, government officials from various agencies contradicted one another, disallowing costs previously approved. They almost drove the firm into bankruptcy.

Even worse, the end of the Korean War brought drastic reductions in military appropriations. That source of revenue for Hastings almost disappeared. Collectively, these problems forced personnel cutbacks and the closing of a Hastings’ production plant.

As a result, Charles Hastings decided to get out of government cost-plus-fixed-fee development work. Turning away from the base upon which the firm had been founded; he concluded the company needed to limit future work to commercial customers.

In late 1954, after much discussion, his Board of Directors agreed. Short term, they trimmed budgets, shut down facilities, laid off many engineering and production personnel and reduced salaries. Charles Hastings took a 50% cut in salary; the other officers’ wages were reduced by 33%. Still, it was not clear the company could survive.

**SURVIVAL AND A RAPID RECOVERY:** As bad as things seemed at the end of 1954, the next year quickly brightened. Most of the government’s disallowances were overturned. Commercial sales increased and the Hastings Instrument Company began hiring again.
Amazingly, by the end of the 1955, the company was in sound financial condition. Total sales were somewhat less than the previous year, but the profit margins were higher. All remaining government cost-plus-fixed-fee contracts were completed.

To help celebrate the quick turnaround in the fortunes of the Company, all employees were given a cash bonus and the firm’s stockholders got a big dividend.

In addition, Hastings splurged and had a professionally printed annual report prepared; the first the firm’s history.

**GTH 1-4:** After the last government development work was completed, Mary Hastings created new company policies. These included only offering products at fixed prices, not allowing buyers into Hastings’ work areas, or to review the company’s internal quality control procedures, or to have access to any cost information. No exceptions.

When she showed them to Ray Doyle, he said: "Each one needs a number to identify it."

"What do you suggest?" she asked.

Doyle replied, "As far as I’m concerned, they can be Go To Hell Forms One, Two, Three, and Four."

"We can't very well write that on them."

"No, but we could call them GTH 1, 2, 3, and 4."

"And what if somebody asks what GTH stands for?"

"Well, we'll tell them it stands for General Terms of Hastings!"

And so they did.

The Company’s new ‘GTH’ policies resulted in often informing incredulous government procurement agents that they could only buy Hastings’ products without demanding the customary plethora of paperwork, inspections and audits the government usually required. Otherwise, there would be no sale. Government agents thought Hastings could not survive without doing business their way. They were wrong.
Asked to explain why he had taken that stand, Charles Hastings appeared before a Senate committee and related in grim detail how the GAO had nearly driven his company into bankruptcy. The Senators were outraged. GAO was defensive. Nothing changed...except that Hastings only sold his products after that to the government on his terms.

**ONE OF THE BOYS:** Hastings occasionally played harmless practical jokes on his associates, when they were on travel together. They ‘returned the favor’, confident that Charlie, ‘one of the boys’, would accept their antics in good humor. Hastings also participated in a number of additional sea trials, following the SS UNITED STATES’ success. It wasn’t that he had to; he just wanted to stay involved. As one of his employees, Floyd Gibbs, later reflected:

“He wasn’t above getting right in there with you and doing the hard, time-consuming work that’s connected with a ship trial. It takes something out of you to go out there and bounce around in a ship in the ocean, and not even go to bed for 24 or 36 hours”.

**HASTINGS-RAYDIST, INC:** In 1956, the Raydist Navigation Corporation and Hastings Instrument Company were consolidated. There was no need for two separate and expensive corporate structures to be maintained, once Hastings’ cost-plus government work had been completed.

Under this new banner, the Company continued to flourish for the next several years. Additional products were developed and sold in ever-increasing numbers. When transistors and printed circuits began to replace vacuum tubes and hand wiring in electronic equipment, Hastings invested heavily in new equipment and retraining for the firm’s employees. As a result, by 1960 the size and weight of Raydist and other instruments was substantially reduced. Reliability also increased dramatically.

Throughout the early 1960’s, ship testing, oil prospecting and hydrography were the mainstays of the Raydist business. When the Navy began building Polaris submarines, Raydist gear was used to evaluate the critical navigation and speed computation equipment installed in each new submarine.

The first submarine to use Raydist was the USS SAM HOUSTON, a NNS-built Polaris sub. Several Hastings employees, including Allen Comstock, spent days at sea in her and numerous other ‘boomers’.

When the Poseidon class of subs followed, Raydist was also utilized for the same purpose. Hastings [left] received a Polaris burgee by the Navy in 1964, followed by a Poseidon burgee a few years later.
By the late 1960’s, the firm was reporting sales, profits and dividends that were simply astronomical. The company’s net worth, graphically illustrated on the right, reflects the great success that Hastings-Raydist enjoyed during the 1960’s.

Further expansions took place, even more profitable products were developed and sold, and Charles Hastings began to use some of his firm’s cash flow to invest in smaller companies in the electronics field.

One of these ventures resulted in a huge profit for Hastings. After investing in a small instrument manufacturing company in Charlottesville, Virginia, that firm was acquired by Teledyne, Inc. As a result, Hastings-Raydist received a block of Teledyne shares, which it sold for a ten-fold gain in 1966.

The next year, Teledyne approached Hastings-Raydist with an offer.

**TELEDYNE HASTINGS-RAYDIST:** Charles Hastings had been asked before about selling or merging his company. Those inquiries had all been turned down. But by 1967 Charles Hastings was ready to accept help in running the business end of his company. He wanted to go back to inventing. So he responded to the request from Teledyne.

Those discussions quickly led to a tentative agreement in late January of 1968 for Teledyne to buy Hastings-Raydist. The agreed-to selling price was $10.6 million…not bad for a firm whose assets had been $210 just twenty-three years earlier.

Although the stockholders of Hastings-Raydist overwhelmingly ratified the agreement on March 27th, there were some mixed feelings. One stockholder present had this to say:

“All of us here have a tremendous amount of sentimental attachment to you and the business. It’s a home-town-boy-makes-good story, and we are proud to have been part of it. As my wife and I were driving here tonight I said to her, ‘We go out so seldom, we go only to weddings and wakes—I’m not sure which we’re going to tonight.’"
Joining Teledyne actually brought relatively few changes to the operations of Charles Hastings’ company. Teledyne had wisely agreed to let Hastings continue to run what was now renamed in 1968 as Teledyne Hastings-Raydist without interference. Joining the Teledyne organization turned out to be more of a wedding, rather than a wake.

**APOLLO 11:** In July of 1969, when NASA’s historic Apollo 11 mission blasted off, bound for the moon, Hastings-Raydist equipment was onboard. Two specially-built boxes destined for use to bring moon rocks back to Earth had been evacuated and sterilized before flight. A critical feature of these boxes was their vacuum-tight seals.

Hastings-Raydist was chosen to provide the equipment for measuring the vacuums. Not only did this equipment have to survive the stresses of lift-off and atmospheric reentry, it also had to go through a pre-launch sterilization process that included chemical and ultrasonic cleaning. Preventing contamination from the earth’s atmosphere was vital.

Working with NACA’s successor agency must have been very meaningful to Charles Hastings. Not only did his device function perfectly, the boxes were used over and over on future flights to the moon. Each time, purely as a precaution, the boxes were fitted with new Hastings-Raydist equipment. In appreciation, NASA presented Hastings with one of the devices that went to the moon on the Apollo 14 mission. It was placed on display in the company’s lobby, where it still resides.

During the 1970’s, Teledyne Hastings-Raydist continued to develop new versions of its Raydist technology for a wide variety of navigational uses for both the military and commercial interests. Some systems were sold outright, others were leased.

Thirty-three Raydist devices were used in minesweeping operations in North Viet Nam in 1973. Additional units were utilized in clearing mines from the Suez Canal the next year.

**1976:** During America’s bi-centennial year, both Mary and Charles Hastings unexpectedly passed away within a few months of one another. Mary suffered a stroke in late April and succumbed on June 15th. Charles, seemingly in good health, followed her on October 10th; the victim of a cerebral hemorrhage.
As tragic as those two events were, Charles Hastings did get to enjoy not one, but two ‘last hurrahs’ that year. On May 5, 1976, President Gerald Ford invited Hastings and the other Outstanding Men of 1949 to the White House for a reunion. It was the first time they had all been together since meeting twenty-six years previously. In this photo of the group, Charles Hastings is the fourth from the left; President Ford is the second individual on the right.

Five months later, Charles Hastings attended a reunion in Asheville, North Carolina, for everyone who had ever worked for NACA; from its beginning in 1917 until it became NASA in 1958. He was accompanied by several others who had worked with him at NACA and who had also been a part of Hastings’ company start-up.

Following that happy event, on the way to the airport, Charles Hastings suffered his fatal attack and died a few hours later in a local hospital. He was only 62 years old.

**HASTINGS’ LEGACY:** Throughout his career, Charles Hastings received many public acknowledgements of his accomplishments and was accorded numerous awards from peers in his chosen field. In addition, his name lives on in the use of the term “Hastings gauge” for the type of vacuum gauge he invented.

But he probably might say that the most important testament to his life’s work is the company he and Mary so audaciously founded, which even today, continues to improve its products and expand into new areas of interest that would have intrigued and motivated Charles Hastings, had he lived into the 21st century.

In time, as other technologies inevitably took its place, the market for Raydist diminished. Eventually, that part of the business was discontinued and the firm’s name was changed to Teledyne Hastings Instruments, which still makes a modern version of the Hastings’ vacuum gauge in a wide variety of models.

The firm remains in business. Located a few miles from Langley Field, where Charles Hastings once worked and met Mary Comstock; it is close to their home where the Hastings Instrument Company was founded.

In the 1960's, Mary and Charles Hastings made several contributions to help start up Thomas Nelson Community College in Hampton. After they passed away, Teledyne made a substantial contribution in their memory. Hastings Hall, appropriately the home of the school's technology departments, and a scholarship are named in their honor.
POSTSCRIPT: In 1952, I didn’t understand how Raydist worked, but I was intrigued by stories of the unique way in which the SS UNITED STATES’ speed was determined. Sixty years later, I still didn’t understand how it worked. I decided it was time to find out.

Seeking info on the Internet, I found that a book had been written in 1979 about Hastings-Raydist by the only daughter of Mary and Charles Hastings. I was delighted to discover that she had created an online version of the book in 2010.

I contacted the author, who graciously gave me permission to extract anything I desired from her work, and several interview tapes she shared. This story is the result; albeit much condensed and written to be understandable by those as electronically-challenged as I.

For any one who might like to learn more about this inspiring, all-American success story, go to http://www.carolmendel.com/hastings-raydist/. You’ll find lots more interesting stuff about the man, the firm…and the lady behind them both. There are also many more vintage photographs included there for your enjoyment. Her book also includes an appendix that discusses how Raydist and his other inventions work.

On a more personal note, although I never had any professional association with Charles Hastings, I did have some slight contact with him, many years ago. I’ll explain.

Sometime in the mid-1950’s my friend Will Bonnett and I got interested in skin diving. Not satisfied just using a snorkeling mask and fins, Will bought one of the first aqua-lungs sold on the Peninsula. We proceeded to teach ourselves how to use it; blissfully ignorant of the possibility of injury or even death associated with misuse of the device.

We occasionally were permitted to use the Hotel Chamberlain’s indoor pool to practice. Others that shared our interest joined us there, alerted by word-of-mouth. One of the people who showed up a few times was quite a bit older than the rest of us nautical neophytes. An inquisitive fella who asked technical questions we usually couldn’t answer. Yep…Charles Hastings.

I don’t recall that he ever mentioned his business or his successes. I made no connection, then, between Raydist and that non-pretentious fella who, in spite of a big age difference, told us kids ‘just call me Charlie’. It’s taken me a long time to connect the dots…

Bill Lee
August 2012
...IT SHALL BE THE DUTY OF THE ADVISORY COMMITTEE FOR AERONAUTICS TO SUPERVISE AND DIRECT THE SCIENTIFIC STUDY OF THE PROBLEMS OF FLIGHT WITH A VIEW TO THEIR PRACTICAL SOLUTION...

ACT OF CONGRESS, APPROVED MARCH 3, 1915.