Monday, October 13, 2003

Resume of Capt. Archie P. Kelley, USN (Ret) for potential talk on Admiral Rickover

Archie graduated from the Naval Academy in 1941 and was assigned to the battleship *West Virginia* which was sunk in the Pearl Harbor attack. Escaping from a flooded compartment he then spent the next three years in destroyers in the South Pacific and Aleutian Islands participating in seven combat actions.

In 1945, he was selected for post graduate work at MIT to become a Naval Architect and Marine Engineer. While there he became the first naval engineer to add the new discipline of Nuclear Physics to the Navy's curriculum.

This led to his assignment to develop decontamination methods for the target ships surviving the Bikini nuclear weapons tests. Noting this work by Kelley, in 1949, (then Captain) Rickover selected him to join his group pioneering the development of Nuclear Propulsion for naval vessels.

Archie resigned from the Navy in 1956 and was employed in the aerospace industry in positions involving turbine engine research and helicopter applications. As a sideline, Archie taught himself to fly helicopters and became an engineering test pilot. Archie and his wife, Carol, spend summers at the Coronado Shores and winters in Arizona on the Verde River.

In his talk today, Archie will tell us about his first hand experience with the controversial Admiral Rickover and his struggle in developing nuclear power in spite of incredible political and technical obstacles.

Speech for the Coronado Round Table, January 23rd, 2004 by - Capt. Archie P. Kelley, USN (Ret), LOOSE GUN OR GENIUS ? Admiral Hyman George Rickover, THE US NAVY'S MOST HATED OFFICER

If you think I'm exaggerating, then listen to Admiral Elmo Zumwalt, Chief of Naval Operations in a speech thirty years ago,"The United States Navy has three enemies, the Soviet Navy, the Rickover Navy and the Airforce". Zumwalt's opinion of Rickover was widely held in the navy. But Rickover, as target of this hatred, mistrust and fear succeeded in forcing an unwilling navy, to accept his gift of nuclear power, the greatest naval engineering achievement since the replacement of sail by steam. Today's navy is the Rickover navy with all of our key fighting ships, powered by the atom.

Zumwalt's hatred of the AirForce was based upon his jealousy of the strategic mission involving nuclear weapons. Rickover's gift of nuclear propulsion made it possible for the navy to replace the AirForce strategic bombers and missile silos.

While the public is familiar with our nuclear aircraft carriers, we are seldom aware that around the world and around the clock we have, on station, eighteen silent undersea strategic weapons of war, the Trident submarines. Each of these, is ready and willing to respond to the push of a briefcase button by the President and deliver as many as 24 Trident intercontinental ballistic missiles, each with up to 10 nuclear warheads, to any country on the surface of the earth. With this awesome deterrent, which would not be possible without nuclear propulsion, one can't help wondering why any member of the "evil axis" can be considered a serious threat.

Rickover's influence on the navy and civilian power has been enormous. Since the Nautilus signalled "Underway on nuclear power" in 1955, Congress has authorized 212 nuclear powered ships. Over 100,000 sailors and 20,000 officers have been trained in schools set up by Rickover, and an entirely new field of nuclear engineering has been established. Over 2000 technical documents available worldwide on every aspect of the technology have been published under Rickover's sponsorship. This technology is used by today's civilian power industry and most utility nuclear plants are manned by retired officers and enlisted personnel trained in the Rickover navy.

Thanks to Rickover's stubborn insistence upon conservatism in design, zero defects in industrial programs and careful selection and training of his contractors, staff, and the crews of the nuclear ships, the navy's safety record with nuclear power has been flawless-over 6000 reactor years of operation without a single reactor accident and over 130 million nautical miles have been steamed. While we have lost two submarines, the Thresher and the Scorpion, analysis of these tragic accidents has cleared the reactor as a cause.

This record, unmatched by the Soviet nuclear navy is largely due to Rickover's abrasive leadership. One cost of his obnoxious personality, has been the antagonism of legions of naval officers and managers in industry, who were absolutely necessary

to the success of the programs. Another cost was that the hatred of Rickover trickled down to each one of us on his pioneering staff, forcing us to ultimately resign our commissions, or continue with careers frozen in nuclear engineering.

With the discovery of fission, scientists realized that the incredible energy in the nucleus of the atom, could, in theory, be used to power vehicles and power plants. When I strike this match I am releasing a tiny amount of chemical energy per atom. But when a nucleus of enriched uranium or plutonium is fissioned in a bomb or reactor it releases over 100 million times as much energy per atom. This is the difference between chemical and nuclear energy. One pound of fissionable fuel can produce the energy equivalent to 360,000 gallons of diesel oil. Further, since 15 pounds of air are required to burn each pound of diesel fuel, and no air is required for a nuclear reaction, many naval scientists and engineers besides Rickover recognized the potential for submarine propulsion.

Today there is talk of widely available and inexpensive modern diesel submarines that pose a threat to our aircraft carriers in territorial waters, such as the Indian Ocean or the Taiwan straits. When the diesels are shut down and these subs lie still in the water with their batteries, they are very quiet and hard to detect. But they are easy to detect while proceding to their stations. The answer for us is to stay clear of littoral waters with our carriers, and increase our attack submarine hunter-killer force.

The most advanced and modern diesel subs are still, in reality, surface ships with a brief capability of operating submerged. The best German subs in WWII after running ahead of convoys on their diesels or snorkels, could make only 3 to 5 knots submerged on their batteries for a distance of 50 miles. With the latest in battery technology this performance might be doubled. Non-nuclear advances have been proposed such as hydrogen peroxide as a fuel not requiring air, but endurance is disappointing.

The world's first nuclear powered submarine, the Nautilus, steamed 63,000 nautical miles before refueling. We can now design submarines that do not need refueling during their design lifetime. In addition to this incredible submerged endurance, the high speed and maneuverability of the nuclear submarines make them much less vulnerable to depth charge attack than diesel-electric boats. Noise is the subs enemy and our latest FBM subs are nearly as quiet as the ocean background noise when on station.

Rickover was less enthusiastic about surface ship propulsion. However, our nuclear carriers have demonstrated enormous advantages over oil fired propulsion. For example,the carrier John Stennis is designed for twenty years before her first refueling. Compare this with 4 days average steaming for an oil fired carrier. If the Japanese had simply bombed the unprotected fuel tanks at Pearl Harbor, instead of battleship row, the pacific fleet would have been dead in the water in seven days, waiting for tankers to arrive from the mainland. Since our latest destroyers use aircraft type gas turbine engines, our nuclear carriers can refuel their fuel thirsty

destroyer screens with the same jet fuel stored for their aircraft.

How did Rickover achieve so much power in spite of opposition by nearly all of his bosses? Why was he hated then and villified even today by the naval officers and industrial managers who rubbed against him in their careers? How could he possibly rise to the rank of full admiral when the naval brass only wanted him out of the service?

Rickover was born in communist Poland in 1900. His father was a tailor who sensed that a pogrom against jews was in the wind and decided to emigrate to the US, find a job and make enough money to provide steerage passage for his family to New York.

In Chicago, as a teen ager, Rickover contributed to the family income by delivering telegrams for Western Union. In 1916 Rickover managed to get himself assigned as a messenger for the Republican National Convention. Realizing shrewdly (at the ripe age of sixteen!) that the tips would be big in front of the news cameras, he managed to have his picture taken delivering a telegram to future president Warren G. Harding.

This publicity prompted an Illinois congressman to give him an appointment to the Naval Academy. Rickover later said that the two best moments of his life were winning this appointment in 1916 and witnessing the successful startup of the Nautilus prototype power plant in Arco Idaho in 1953. To Rickover, each of these events was an omen that he could achieve greater goals in the future.

At Annapolis, rather than join his classmates in athletic or social activities, Rickover stayed in his room studying. This was probably due in no small part to anti-Semitism which contaminated the navy in those days. After graduation, Rickover seldom went ashore with his fellow officers and spent much of his time studying the engineering systems on board ship. Later after several years in submarines, Rickover advanced to second in command. But when the captain was detached, he was ordered to a minesweeper and an officer from another submarine was given the coveted job. A bitter blow to any officer, to Rickover it was one more chip on his shoulder against the navy.

Disappointed in a sea going career, Rickover applied for postgraduate training at Columbia University in electrical engineering. Obtaining his master's degree, he headed the electrical desk of the Bureau of Ships during WWII. Rickover won a reputation as a hard hitting, knowledgeable and effective technical project manager, though his abrasiveness with the electrical industry and the other naval engineers became legend.

In 1946, the Oak Ridge Laboratory invited industry to send representatives to the weapons oriented facility to discuss ways and means of obtaining peaceful power from the atom. Rickover inveigled the navy to order him there for one year deciding that he would be <u>the</u> engineer to develop nuclear propulsion for ships.

Though his orders read that he was to be nothing more than a student of nuclear science, he talked the Oak Ridge management into designating him a deputy administrator. He then used this position to proselytize several young scientists and engineers that he felt could be useful on his future programs. Similarly, Rickover combed the navy's personnel files for officers who had received post graduate training in marine engineering, and managed to have several ordered to temporary duty at Oak Ridge.

When these officers arrived, Rickover greeted them by saying, "As senior officer present, I'll make out your fitness reports!"

At this time in nuclear history, reactors were two story stacks of graphite and uranium called, appropriately, "piles". These were low temperature assemblies incapable of producing useful power, and were primarily for research into behaviour of irradiated materials and the production of plutonium from uranium. The national laboratories under the Atomic Energy Commission were headed by nuclear physicists and mathematicians, engineering was a secondary problem.

The challenge of shoe horning this crude technology into any naval hull, let alone a submarine, convinced Rickover and his kidnapped naval engineers that an entirely new field called "nuclear engineering" would have to be developed. At this early time, it is only fair to say that most Naval Engineers and the Atomic Energy Commission thought Rickover was prematurely pushing a concept that was far into the future.

In fact, no less an authority than Robert Oppenheimer (the father of the A-Bomb) had predicted that it would take 60 years to progress from the weapon to a reactor that could be shoehorned into a submarine hull. This led both the navy and the AEC to put the program on a back burner.

In 1947, the group received a major blow. The Chief of the Bureau of Ships, fearful with good cause, that Rickover would be unmanageable, appointed another engineering Captain as the Bureau's nuclear Czar. Rickover's Oak Ridge Group was broken up and the officers assigned to other duties.

Rickover didn't take this setback lying down. First he talked Admiral Nimitz, then Chief of Naval Operations, into approving preliminary specifications for a future nuclear powered submarine. Second, he pursuaded the Chief of the Bureau of Ships that because of his year at Oak Ridge, he was the only EDO Captain qualified to head the Bureau's Naval Reactors Branch. Third, he drafted letters for the Secretary of the Navy blasting the Atomic Energy Commission for failure to give higher priority to technology that could lead to naval propulsion applications, warning that the navy would "go it alone" if necessary, thus threatening the AEC's jurisdiction.

These tactics led to reluctant acceptance of Rickover as head of a dual AEC-Navy

organization for naval reactor development. In addition, Rickover had been wooing Westinghouse and General Electric to get into the act because of the future potential of nuclear business. Though GE was reluctant, Westinghouse management accepted the challenge and in late 1948 the AEC awarded a contract (negotiated by Rickover's staff) to Westinghouse to build a nuclear engineering laboratory near Pittsburgh to start work on a prototype submarine reactor. This effectively nullified the submarine reactor study program initiated by the AEC at the Argonne National Laboratory. Rickover argued that progress under the national laboratories would be glacial and that the profit motive of the two industrial giants would help accelerate the program

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I arrived on the scene in early 1949, at the beginning of the preliminary design of the prototype power plant for the Nautilus. I had completed the navy's course in Naval Architecture and Marine Engineering at MIT. While there, in 1945 I was allowed one elective and I chose the new discipline of nuclear physics. This was before the first nuclear weapon had been tested at Alamagordo, New Mexico and due to the secrecy of the Manhattan Project, I had no clue as to the feasibility of either nuclear weapons or nuclear power.

Neither did my navy bosses, apparently, since I received a letter suggesting that the navy wasn't interested in nuclear physics and it might be better for me to take my elective in business administration or perhaps, psychology.

Within a month of this advice from the navy, the public heard about the first test of an awesome weapon based upon nuclear fission, and shortly thereafter, the destruction of Hiroshima and Nagasaki with weapons 2 and 3. The fourth shot was an airburst above the moored target ships at Bikini and the fifth and last shot which exhausted our meager stockpile was an underwater burst bathing the target vessels with radioactive water and coral from the atoll.

The navy changed its mind about nuclear physics and with this course on my record I was assigned to assist in the development of methods of decontaminating warships that might, in future wars, be exposed to nuclear weapons. This work was at the San Francisco Naval Shipyard using surviving target ships which had been towed from Bikini.

Rickover was aware of this work, and made an appointment to interview me in San Francisco. When we met in the officer's club he started right in with two questions that would be typical of his future interviews. The first was, "Are you smart?". Knowing two of the engineering officers already on his staff, I said, "I'm dumber than Roddis, but smarter than --------". He liked that answer since he had already decided to transfer the second name on my list. Then he asked, why did you apply for MIT? I responded "It seemed like the best way to get back home from three years of combat in the South Pacific."

He couldn't help but accept that as an honest answer, so I was hired on the spot.

When I reported for duty in Washington, DC I found that Rickover had an office with the AEC on one side of Constitution avenue and a navy office on the other side of Constitution avenue. As an obvious slight to Rickover, his navy office was in the former women's rest room in the old navy building.

Rickover's dual AEC and Navy positions, though they were at very low levels in both organizations, turned out to be one of his best ploys. To meld in with the civilians we wore civilian clothes, and were soon accepted as employees of both organizations. I bought a Brooks Brothers gray suit and a pink shirt, a conservative tie and Florsheim shoes. Rickover sent me back home to change the color of the shirt.

With our AEC hats on we would write critical letters to the navy department urging (for example) acceleration of a lagging program, and then go to the other side of the street to write an answer. Though we were nineteen levels below the secretary of the navy, and a minor entry on the AEC's organization chart these letters were carried by Rickover to the top brass in each organization and were usually signed by executives who didn't want to reveal their technical ignorance of the program.

Rickover immediately ordered me to Oak Ridge, Tennessee to receive training in the infant field of reactor physics. Enrico Fermi,(who had fled Italy because his wife and her father, of Jewish descent, were in imminent danger) wrote the lectures for this course based upon his design of Chicago Pile One, the worlds first self sustaining nuclear reaction.
Rickover also sent me to Los Alamos to find out what, if anything, we could learn from the weapons experts.

Upon my return, Rickover had me draft a highly technical letter to Dr. Zinn, of the Argonne National Laboratory who , at that time, had the AEC responsibility for the submarine reactor study. Rickover hated Zinn, and plotted to take over his responsibility. Rickover needed my letter to help show his AEC bosses that Zinn would delay the program. Our argument was that Zinn had specified that the naval reactor should be designed to breed nuclear fuel, a major and unnecessary complication. Rickover joked that the navy does not breed on board ship.

When I took my letter to Rickover, he held it to the light like this, and said, "This is an excellent quality paper, but you have ruined it with this drivel!" I soon discovered that he enjoyed this kind of bugging of his staff and that his bark was worse than his bite.

Rickover could be surprisingly human at times, and entertained the entire group at his apartment on several occasions. He paid attention to our wives, and after these affairs more than one wife would say, "That man is charming, I don't understand why you don't like him."

With the approach of Xmas in 1949, we engineers decided to have an office party. Rickover declined our invitation, and we assumed he went home. After a rough

year, several of us had brought in bottles of booze(strictly against naval regulations) and poured drinks for the secretaries and Waves in our group. The party began to take off when suddenly Rickover appeared. Without saying a word, he took the remaining booze and poured it into the glasses of the male engineers and told us to "chug a lug". Party's over!

Rickover knew that our little party could have been blown into just the kind of scandal that his detractors were searching for. However, this was not out of respect for navy regulations, because Rickover frequently made fun of them. For example, he would quote the regulation, "Sailors on motorcycles need not salute when passing officers, but they must remain seated at attention."

Rickover worried that the girls typing our highly technical and classified reports had no clue as to what they were typing, and this resulted in excessive delays to edit their errors. So he flew them all out to Arco Idaho for two days with the Nautilus prototype. There they not only learned first hand about pumps, valves, reactor controls and other things they were typing but more important, after the work day, they were entertained by the lonesome sailors training at this god-forsaken site.

Rickover cultivated key individuals in Congress, a tactic that most officers wouldn't be caught dead doing. Rickover, and his staff, favorably impressed Congress by providing detailed answers to questions about the programs and proving time and again that he could meet his self-imposed strict schedules and budgets. Later, Rickover invited congressmen to take short cruises on the nuclear ships.

Rickover arranged for our group to consult with the best brains in nuclear weapons development and pile physics.
Among these were Robert Oppenheimer, Edward Teller, Eugene Wigner and Samuel Goutsmit. All of them had helpful suggestions to make about our program and passed on to us the latest knowledge about nuclear materials and fission.
Dr. Teller helped by telling the AEC that, Oppenheimer was unduly pessimistic. Teller thought Rickover could produce the Nautilus in 10 years. (actually it took six).

Wigner, who had designed the Hanford reactors for the production of plutonium, warned us of a problem found at Hanford that following shutdown the reactor could not be restarted for several days. Thanks to Wigner our earliest Naval reactors could override this problem and restart without delay.

On one of Wigner's visits, Rickover invited me to join the two of them for lunch. I soon found the reason for my presence was to obtain clearance from the CIA and FBI for Wigner to visit his ailing mother behind the Iron Curtain in Germany. This was obviously a no-no for a physicist with his extremely classified knowledge, and a no-no for me to conjure a reason for the visit.

The solution to this problem was to give Wigner an undercover assignment to bring back with him from his former office in East Germany documents that might be

useful to the navy's propulsion program.

During this same luncheon, Wigner and Rickover discussed "the big one", which referred to the proposed hydrogen bomb. Oppenheimer opposed it and Teller and Wigner were for it. Rickover asked Wigner how many of these monstrous weapons it would take to poison the entire earth's atmosphere. Wigner pulled out his pencil and for several minutes made calculations on a paper napkin. When he was through, he handed it to Rickover. Rickover looked at the number and said, "I am surprised the number is so small!" and stuck the napkin in his pocket without showing it to me.

We had selected two radically different approaches for the submarine plant in the hopes that one or the other would work. The most conservative was the pressurized water reactor, and Westinghouse would be the lead design agency, for the Arco, Idaho prototype and the reactor for the Nautilus. The pressurized water approach had the disadvantage of heavy piping and components to contain water at several thousand pounds per square inch and a massive reactor pressure vessel.

The other approach was liquid sodium as a coolant favored by GE. This would be used for the second submarine, the Seawolf as well as the prototype which would be built at West Milton, New York, north of Schenectady.

Sodium is an alkaline metal with a low melting point (about the boiling point of water). It has extremely good heat transfer properties and a boiling point high enough so that the piping systems and reactor vessel could be much lighter than the pressurized water approach, and the steam conditions could be more advanced. It was plentiful and cost about the same as milk. As a coincidence, Jules Verne fueled his ficticious Nautilus with sodium.

Unfortunately sodium would become highly radioactive with a half life of 14.5 hours. This meant that access to the reactor compartment for repairs would be delayed for days following shut down, whereas with pressurized water, access could be in minutes.

Rickover sent me to the West Milton site to supervise the construction and initial startup and test of the prototype Sea Wolf power plant. GE had refused to use the Arco Idaho Site. The Reactor Safeguards Committee under Dr. Teller finally gave in to GE but required that since the reactor was so close to Schenectady, it would be necessary to house it in the worlds largest sphere, 225 feet in diameter.

This sphere could contain the maximum credible accident to the reactor. Those of us inside the sphere would be cooked, but Schenectady would be saved.

Shortly after my arrival at the West Milton site, the prospective crew of the second submarine, the SeaWolf, reported to me for training with the prototype. Future president Jimmy Carter arrived as one of the officers in the prospective crew. The prospective commanding officer, Dick Laning would not report until after startup

and initial testing.

Jimmy Carter and the other officers and crew had just completed a brief indoctrination course in nuclear physics. Unfortunately, Jimmy's father died while we were completing the prototype, and he decided to resign from the navy. Thus, contrary to historical implications, Jimmy had no operating experience with nuclear power, but was a strong supporter of Rickover during his presidency.

When the final welds were made on the reactor coolant piping, one weld was so difficult that GE had only one experienced welder capable of accomplishing it. When I told Rickover this, he called Karl Van Tassel, the general manager of KAPL and told him this welder was more valuable to the program at this moment than the CEO of GE. "Pick him up each morning in the company limousine", said Rickover. And as an after thought "and give him one of your cigars".

Days before it was time for the first startup of the reactor, all GE workers in Schenectady went on strike and the sphere was surrounded with pickets.

Rickover decided that the navy crew under my supervision would break strike and operate the reactor with only the white collar physicists advising. He also contacted the union leaders, stressing the importance to the nation of the program and talked them into allowing the SeaWolf crew and the GE physicists access to the sphere.

Now I must tell you that starting up a new and unknown nuclear reactor is a hairy experience. One doesn't really know until the first startup if the system has an unwelcome instability. The Chernobyl disaster was due to such an unknown instability which occured during a special shutdown test of the reactor.

Let me give you a simple but good analogy. Say you and your spouse are in bed on a cold night with an electric blanket that has dual controls. Unfortunately whoever made the bed reversed the controls.

In the middle of the night the wife feels cold and turns up her control thus in reality heating up her husband. He feels hot and turns down his control thus further freezing his wife. They both get mad and turn their controls full tilt and in this case minor disaster occurs.

This, of course, is positive feed back and if a reactor design permits this to happen it can spoil your whole day. My example was of temperature feedback, but there are others. The Chernobyl accident was due to the unexpected formation of steam bubbles in the reactor core. These increased the nuclear reaction which led to more steam bubbles which led to higher power which caused more steam bubbles, a feed back process which rapidly led to disaster. I want to assure you that all US naval and civilian reactors have negative (meaning safe) feedback.

During this startup crisis, which took several weeks, Rickover was calling me nightly usually after my late wife and I turned in. Since I was teletyping him, daily,

voluminous progress reports, I resented these invariably abrasive, sleep robbing calls. One night I lost my cool and called him a "son of a bitch" and hung up. On his next trip to witness the startup he said to me, with a smile, "Kelley, any other admiral would have you courtmartialed for what you called me, but I knew you were only telling the truth!"

This story was later printed in Reader's Digest in 13 different languages. In Arabic, "son of a bitch" became-"your beard is scraggly". In Spanish it was "your mother wears army shoes!".

Fortunately for us inside the sphere, the startup went well and the reactor went flawlessly to a 100 hour full power run. (Normally, new ships are only required to demonstrate a 4 hour full power run). Rickover insisted upon being present when we first went to full power, however we had cheated and briefly gone full throttle the night before his arrival. The Nautilus prototype in Idaho had several problems during it's power test, so at first, the liquid metal looked promising. However, during later testing, leaks developed in the steam generating equipment. Though we were able to plug these with a compound similar to radiator stop leak for cars, this incident further tilted Rickover's bias against liquid metal, since the same leaks could have been tolerated in a water plant, but were risky with sodium.

Nevertheless, the submarine Sea Wolf operated for over 76,000 miles and two years with it's sodium power plant before it was replaced by a pressurized water reactor. The Soviets also used liquid sodium in a number of their submarines, but had some bad accidents with it.

In July of 1951, a secret navy selection board passed over Rickover for promotion to admiral. In 1952 he was passed over a second time by the secret selection board. Unlike baseball, two strikes are out and dictate retirement. Congress and the press were furious. Congress refused to endorse all other promotions until the navy selected a captain "who was thoroughly competent in nuclear power". With no other choice, the navy finally promoted Rickover to rear admiral.

When it came time to select the commanding officer of the Nautilus, Rickover saw a chance to get even with the school tie navy he hated. He deliberately bypassed naval academy submariners and picked a reserve officer, then Commander Dennis Wilkinson, now a retired Admiral in north county.

Dennis was a very good choice, and did some amazing things with the Nautilus. On the Nautilus first trial voyage of 1350 miles submerged, Dennis accidentally hit a deep sea trawlers net and dragged the terrified skipper backwards for fifteen miles. In the first exercise with an aircraft carrier to see if a destroyer screen could protect a carrier from a nuclear submarine assault, Dennis dove under the carrier's wake and stayed with it for three days and nights, completely hidden from the destroyer's sonars.

In August, 1958 the Nautilus under her second skipper, William R. Anderson, made

a Jules Verne fantasy come true by steaming from Hawaii to England passing under the North Pole. At the president's request, Anderson was flown to Washington to participate in a Navy-White House celebration. Rickover was pointedly uninvited.

Congress was so furious about this slight to the man who had made the Nautilus possible that they forced the navy to promote Rickover to Vice Admiral.

In March, 1959 the third submarine, the Skate surfaced at the North Pole having been fitted out with special equipment for breaking through the ice.

During this voyage a strange incident occurred. As the Skate approached the North Pole from the Atlantic side, the sonar operators, bored from days of hearing nothing but natural marine life noises were startled to hear a noise that incredibly sounded like an outboard motor. The submarine surfaced cautiously in a small polynya(eskimo for lake in the ice) and sure enough there was a small boat with Airforce personnel fishing. They were from a secret observation post on the ice near the polynya. The submarine invited them on board for a steak dinner in shirtsleeve comfort and upon departure gave them 5 gallons of icecream.

Later, Cdr. Ned Beach, in the Triton, circumnavigated the earth totally submerged except for a brief surfacing to unload by helicopter a crewmember who had burst his appendix. As you can see, these early nuclear subs were setting up all kinds of records for the navy. In fact the adjective "fantastic" wasn't good enough, so the submariners coined the word "fandamntastic".

In 1959, Rickover cagily invited his Soviet counterpart, Frol Kozlov, to tour the first civilian reactor, which was developed under Rickover's guidance at Shippingport, Pa. Reluctantly returning this invitation, the Soviets permitted Rickover to tour their first nuclear powered ship, the icebreaker Lenin. While the Soviets had claimed that the Lenin was a peaceful "civilian" application of nuclear propulsion, Rickover, during his tour, confirmed that he was seeing a submarine reactor.

In February 1956, after my experience in starting up and testing the Seawolf prototype at West Milton, NY, Rickover asked me if I would be willing to move to Arco, Idaho to direct the construction and start up of the Aircraft Carrier Prototype reactor.

At about this time I had a bull session with the other engineering officers in the Naval Reactors Branch. We all agreed that our futures looked bleak, since we predicted Rickover would live forever and the navy's hatred for him reflected on down to each of us. Furthermore, we were frozen in the nuclear power business by a letter he had drafted for the Secretary of the Navy.

Consequently, one by one, each of us resigned.

Rickover, in indoctrinating us, had warned about what he called "little people".

They can bring you down he said. He meant secretaries, security personnel, minor executives and bureaucrats, etc.

Prophetically, his career was terminated by evidence given the Secretary of the Navy by a "little person"in General Dynamics.

This disgruntled manager had kept a detailed record of every free lunch, every use of a company limousine, every model built for Rickover's office, and every trinket such as the submarine tie clasps handed out by Rickover to visitors and members of congress.

This information was passed to the Secretary of the Navy, who, at the time, was one of many both in government and industry who wanted Rickover out of the way, and took the side of General Dynamics in the cost overrun disputes with Rickover.

President Reagan called Rickover to the White House, thanked him for his service to the country and told him that it was time for him to retire. Rickover knew that his enemies had finally gotten the President's attention, and had he resisted, the President would pull out the evidence that Rickover had accepted gratuities from a contractor.

At age 86, Rickover's health began failing. One of his civilian assistants, Ted Rockwell, visited him at his bedside. Rickover said, "They tell me I'm dying. I guess you are supposed to be embarrassed and I am supposed to be scared. Hell, it's no big deal. There's nothing to it!".

.Rickover's 64 years of active duty greatly exceeded that of any other officer in naval history. His career, as unwanted czar of the nuclear Navy, spanned seven presidents, twelve secnavs, nine cnos, ten chief bushipsand ten chairmen of the AEC. Three ex-presidents attended his funeral.

The replacement of Rickover's position since his enforced retirement in 1982, has taken three four star Admirals, none serving more than 6 years and none as career engineers. However, they have all strived to maintain Rickover's high standards. With much more pleasing personalities, I might add.

Let's face it, Rickover was a loose canon in the ultimate bureaucracy. Few organizations can handle this type of disruptive genius. While I am proud of my contribution to his incredible achievement, I would not want to work for more than one Rickover in a lifetime.

Thank you

Archie Kelley