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THE NAVY INSPECTION SYSTEM

by

Captain Ralph T Hanson (CC), U S N
Inspector of Navy Material,
Pittsburgh District

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My association with your fine College during the past two years has been very pleasant, and also, for me at least, I freely confess, highly educational in many ways. Like Plato, philosophizing with his Academicians, as he strolled through the learned groves of Athens a scant 2300 years ago, your able Director and his predecessor, Colonel Jordan, have permitted me to tramp with them, through many manufacturing plants in that modern Athens, Pittsburgh, on the last two annual visits of the Class to that area; and on two successive annual occasions like this one today, they have graciously invited me to present to you a talk on the Navy Inspection System.

During my 35 years of naval service I have often come into fairly close contact with the country's industrial life, but never before so intimately as during the past 2½ years as Inspector of Naval Material in the Pittsburgh Inspection District. These two associations, - with the Industrial College and with the Pittsburgh industrial area, - make me feel very much at home upon you, - in fact as though I were an affiliate or correspondence student of the College.

Whether Plato in his Academy ever repeated himself to his Athenian listeners I do not know. I suspect he did. And I confess to you at the outset that I certainly shall do so, as during the year since I last appeared before you, there have been no startling innovations in our navy inspection procedure, - unless it be the recent sporadic but violent attack upon its alleged inefficiency by one of my - shall I say "hypercritical" young civilian assistants? - through the columns of the country's press.

Ever since the World War we have all heard much of the necessity for organizing, systematizing and coordinating the material procurement mechanism in industry, in support of our National Defense, and under the able leadership of your distinguished Assistant Secretary of War, we are unquestionably going to hear more and more of it, not so much now in the form of aspiration and wishful thinking, as in concrete accomplishment.

It is scarcely necessary to mention to an audience of your experience, the "Steel Plan" and the thorough survey of industrial establishments throughout the country which has been well advanced during the past five years, and which is still continuing apace. But I cannot refrain from speaking with admiration of the increasing cooperation between the

Army and Navy, in this and in practically all other lines, to assure that when the need comes for high pressure production, - as come it undoubtedly will, - there shall be no "doubling in brass," no figurative thumbing of noses, as to which Service shall have the prior right to the output of any particular plant. I believe our planning experts in this line in both Services have long since sat down around the conference table and come to a most reasonable and satisfactory agreement as to allocation of manufacturing facilities, in such a way as to please the most carpenter-critic of bureaucratic red tape, and of military administration in the broad sense. Never, I believe, have the mutual confidence and respect of the two great arms of our National Defense been so complete as they are at present, due to a better appreciation of the problems and peculiar circumstances of each Service. No doubt a large part of this may be attributed also to the better spirit of "give and take" which I confidently believe permeates the Services to a greater and greater extent as we young bucks have come into positions of responsibility and authority.

The days of iron men and wooden ships were no doubt all right in their way, - God knows our spiritual and professional forebears have drummed their merits into our ears, - and both unquestionably did great things for the country, but unfortunately a great many of the less distinguished among the iron men, who yet had wide authority, were frequently stuffed with sawdust, - which in those days was considered the best possible resistant to penetration by the highest powered projectiles at that time available. I think we are now more open to acceptance of the other man's point of view and a willingness to compromise, wherever principles which appear to us individually to be fundamental, are not sacrificed, - as in the case of higher pay for the greater number and the longer lived for example.

Returning now to "our muttons," the question of material procurement and the Navy Inspection System, I believe that none of you will question the fact that there is a very appreciable difference between the Navy's procurement problem and that of the Army. The Navy is essentially, and must be a "fleet in being" with the whole organization back of it substantially on a war footing so far as practicable numbers of men and ships permit. The Army, as I understand it, is somewhat more in the status of a nucleus which must constantly plan to build itself up quickly to war time proportions, meanwhile supplying itself with such basic items of material, arms and other equipment as are reasonable in peace time, but with the foundations

well laid for rapid expansion. Of course the Navy too must expect to expand in war time, but it is already, by its very nature, much closer to a war time footing, in maintenance and operation, than the Army can ever hope to be in times of peace, under a democratic form of government.

The Navy Inspection Service traces its origin back to the very beginning of our Navy. When the unprovoked attacks of the French on our commerce in 1792 and 1793 prompted us to construct six frigates of the CONSTITUTION - CONSTELLATION class, - the two ships named being still in existence today - the prospective officers of these ships were assigned to select their timbers, to inspect their construction and to pass on their equipage. Those were the days when every U S sailorman worth his salt knew every stay and halliard of his ship; knew the advantages and disadvantages of every form of hull and almost of every spar and timber in her, knew the relative merits of various hull and mast materials, and knew every square foot of canvas aboard and how to get the best out of it. Even before the inauguration of a Federal Navy, our privateersmen and merchant ships, though generally small even for that period, had already in colonial days proven themselves among the best on the seas, made of the best materials, manned by the best sailors and the most competent officers. Necessity and our almost exclusive dependence on the sea for transportation and inter-communication among the Colonies, as well as overseas, had made them so.

As a result of our natural leadership in matters maritime, and with a young but lusty Navy with a fine tradition established by John Paul Jones and his illustrious colleagues, it is little wonder that the six frigates built for our Navy in 1794 were the best of their class anywhere in the world. In 1800 they effectively proved to the French both our intent and ability to protect our commerce, in 1804 they suppressed the Barbary pirates who had long levied a toll on all world commerce entering the Mediterranean, and in 1812-15 they even set back upon her heels the Mistress of the Seas, to her consternation and surprise.

Our Navy was still in its infancy when steam motive power made its first invasion of the sea. Only a Fulton would have dared to believe that steam vessels would eventually displace our magnificent frigates and clipper ships. In 1814 Fulton designed and built the first steam

powered man-of-war in the world, the DEMOLOGOS, later renamed "FULTON THE FIRST". Her hull was of wood, like those of all her contemporaries, but the innovation of steam introduced a new problem in naval inspection which the Navy was ill-prepared to solve. Commander David Porter of ESSEX fame was ordered as prospective commanding officer. His principal contribution to the construction of the ship lay in his insistence on fitting her with sails, which had not been included in Fulton's design. The design and construction of the engines and boilers were left entirely to Fulton. The ship was a huge success from an engineering point of view, but she was never permitted to demonstrate her abilities either in continuous peace time operation or in war, and in 1829 she blew up at her dock at the New York Navy Yard.

The problems of material procurement and inspection, so far as they concerned a navy under steam power, lapsed into obscurity from 1815 to 1838. Then, prodded into action by the rapid expansion of the use of steam power in other navies, our Navy Department wisely though belatedly decided to implement an Act of Congress passed nearly twenty-five years previously, - an act which had authorized the construction of three so-called "steam batteries," one of which was the FULTON THE FIRST, - to lay the keel of the first steam vessel actually to be built by the Navy. So limited was engineering knowledge in the Navy at that time that it was necessary to resort to a civilian mechanical engineer to provide an engineer officer for the vessel. The log of the trial trip of this, our first Navy-built steam vessel, U S S FULTON THE SECOND, makes very a plain reading. Among the service observations of the engineer officer may be noted a statement to the effect that the boilers leaked "surprisingly little for new boilers". In those days of copper boilers with steam pressures of 5 to 35 pounds per square inch and straight sea-water feed, it was expected that leaks in new boilers would gradually be effectively plugged with salt deposits, and, needless to say, they were. Meanwhile some years were to elapse before iron, and later steel, were to replace wood for hull construction.

The Navy's problems of inspection materials for the machinery installation of the FULTON THE SECOND, which were so neatly solved by commissioning the civilian engineer who designed the machinery, have long since outgrown copper boilers for 5 pounds pressure and salt water feed. The

express-type boilers used by the Navy today, under pressures upwards of 450 pounds per square inch, require materials representing the latest advances in metallurgy and in fabrication. Similarly, the urge to limit, and wherever possible reduce weight of hull construction and fittings throughout the ship, by the use of the most modern alloys, has been spurred on by successive international conferences on limitation of armaments, - each nation striving to outdo all others in bringing into being "the mostest power for the leastest weight," i.e., securing the utmost possible in fire effect, protection, speed and radius of action within the displacement limits placed on various types of vessels. To meet the exigencies of high steam pressures, high speeds, and great weights of armor and armament under all stresses and conditions of sea service, all materials entering into the construction of a naval vessel and her equipment must conform to specifications drawn up in such a way as to prescribe materials which must also provide greater endurance than is normally required in corresponding commercial practice, - although I believe motor makers and probably many other manufacturers will dispute this statement. It is to insure procurement of materials designed to meet the Navy's special needs, dictated by the corrosive effects of salt air and sea water, and the destructive power of wind and wave, that the Navy maintains its own inspection service to augment, check, and sometimes parallel the manufacturers' inspection force, and also maintains its own testing laboratories in so far as appropriations will permit and the peculiar circumstances of naval service require.

For materials of all kinds there is probably no greater testing laboratory in the world than Uncle Sam's seagoing fleet. The pragmatic test of service under seagoing conditions is one designed to test the mettle of the very best materials. In the Fleet every officer and man is, in effect, an inspector observing the performance of some portion of equipment under his cognizance. The specifications and material requirements under which this equipment is procured are built around the cumulative experience of our Navy over the past century and a quarter from the very inception of steam motive power and iron or steel hulls. It is the function of the Naval Inspection Service to see that the materials furnished by the manufacturers throughout the nation meet the Navy's peculiar and rigid specifications, usually before shipment to the point of use, to the end that failures may not occur on board ship, thus jeopardizing the

National Defense, - not to mention the cost to industry in damage to good will and reputation, and expense and delay of replacement if discarded after delivery to the ship building yards

The total value of material accepted by the Field Inspection Service of the Navy during each of the past three years has closely approximated one hundred and twenty-five million dollars, representing a tonnage of over a million per annum, of which some 25% by value and about 20% by weight, has been inspected and accepted in the Pittsburgh Inspection District. Recently the value of such material in that District alone, has been running at about three million dollars a month.

You are all familiar, I believe, with the organization of the Navy Department. However, at the risk of repetition, I shall refer briefly to the Navy Department's organization in its bearing upon material procurement.

Since the establishment of the present bureau system of administration by the Congress in 1842, the responsibility for funds appropriated for the building and maintenance of the Navy is lodged by statute with various technical, so-called material Bureaus of the Navy Department, including the Bureau of Construction and Repair, the Bureau of Engineering, the Bureau of Ordnance, and the Bureau of Aeronautics, each of which is responsible for the determination of the characteristics and quantities of materials required under its cognizance, including the designs and specifications under which those materials are purchased, and requisitions for such purchase are initiated by the respective Bureaus having cognizance. The procurement of these materials with certain notable exceptions, including new vessels, public works, armament, ammunition and gun forgings, is lodged with the purchasing bureau of the Navy Department, - the Bureau of Supplies and Accounts, - which also has initial cognizance of certain items of material such as food supplies, clothing for enlisted men, and fuel for the Fleet and for Shore Stations. The Bureau of Supplies and Accounts advertises for bids, and awards contracts for all material, except as noted, and after the articles have been inspected and delivered, pays for them and handles or stores them until drawn for service. The Bureau of Yards and Docks awards contracts for public works in general, and the Judge Advocate General of the Navy awards contracts for new ships to be built by private builders, and also for lands.

Until 1927, the Navy Regulations required that each material Bureau inspect all materials for its own use, but for the past twelve years, the interests of the Bureaus as regards inspection have been pooled, so that material for all Bureaus in any one Inspection District, - with certain noteworthy exceptions referred to hereafter, - is inspected under the Inspector of Naval Material for that District regardless of whether he belongs to the Line or the Construction Corps of the Navy, following the general trend of consolidation of activities in the interests of economy

Material procurement for the Navy falls into three principal categories:

First, the construction of ships by private shipyards, including hulls, propelling machinery, certain auxiliary machinery and installation of armor and armament

Second, materials inspected at the source or place of manufacture, - including items of material or equipment either for use in ships under construction, - both those building in Navy Yards and those building in private shipyards, for use in ships already in service; for the routine maintenance and operation of the Fleet, or for stock or use at Shore Stations. Frequently this group includes main propelling machinery, and important auxiliaries referred to in the first group, when, as in the case of submarines and sometimes for vessels of other types, this machinery is manufactured elsewhere than at the plant of the shipbuilder. Another very large single item, in the case of a battleship, is the armor

Third, a considerable quantity of miscellaneous materials, many of which are more or less definitely standardized and some of which are even of commercial quality, and may or may not require inspection of the source, but which must undergo inspection of one sort or another before acceptance and use by the Navy, whether at a Shore Station or in the Fleet. Included in this group are gasoline, fuel and lubricating oils, prospective bidders' samples of which are tested annually at the Engineering Experiment Station at Annapolis prior to opening of bids and award of annual contract. Also in this category are clothing and small stores, provisions, including fresh meats and vegetables, medical supplies, surgical instruments, musical instruments, incandescent lamps, vacuum tubes, etc. Many items in this group, some 500 at present, are covered by the Navy Department's "Acceptable List of Approved Materials," both the composition and merits of which have

been demonstrated by tests at a naval laboratory, and thereafter require inspection only for quantity, and periodic comparison with standard samples, so long as they continue to give satisfactory performance in service. If subsequent failure on comparative check test indicated deterioration in quality of product, the item is removed from the approved list. The manufacturers are naturally very anxious to avoid such a contingency, and make every effort to maintain the high standard of their product, on which inclusion in the Acceptable List was originally based.

Notable exceptions to procurement by the Bureau of Supplies and Accounts, as stated above, are certain items of ordnance, - including gun forgings, armor and ammunition, - for whose procurement the Bureau of Ordnance is directly responsible, public works for Shore Stations, including buildings, dry docks, fixed and traveling cranes, and railway equipment, - for whose procurement as well as their design the Bureau of Yards and Docks is directly responsible, and lands, and new vessels, contracts for which are let by the Judge Advocate General.

In the main, the three categories or groups of materials, described above as governing procurement, likewise indicate and govern the inspection procedure accorded them.

For inspections in the first category named above, - that is, inspection of ships under construction at the commercial shipyards not holding contracts with the Navy Department, - the Government maintains offices of a Superintendent Constructor, an Inspector of Machinery, and an Inspector of Ordnance, who also usually inspect navigational material. In addition, where ships were constructed on a "cost plus" basis as during the War, a Naval Cost Inspector was detailed to each yard to check and audit the company's accounts. Under the terms of the Vinson Bill by which shipbuilders are limited to a 10% profit, this function has been revived with reference to private shipyards, the Cost Inspector reporting to the Compensation Board in the Navy Department. Inspectors of Machinery and Inspectors of Ordnance are likewise maintained at certain outlying plants manufacturing major units of machinery and armament or armor.

The Inspector of Machinery, the Superintendent Constructor, and the Inspector of Ordnance are the representatives in the building yard of their respective technical Bureaus of the Navy Department, namely, the Bureaus of

Engineering, Construction and Repair, and Ordnance, and each is responsible directly to his own Bureau and serves as the intermediary between that Bureau and the contractor on all matters affecting compliance with design, specifications, workmanship, etc

The first two, the Inspector of Machinery and the Superintending Constructor, having by far the greater volume of inspection work, have each a staff of assistants whose size depends on the amount and magnitude of construction in progress at the shipyard, but usually comprising at least one or two commissioned assistants (officers of the Engineering and Construction branches, respectively), a considerable force of draftsmen (up to a score or more), and a force of civilian inspectors numbering anywhere from four to a dozen

All detailed plans prepared by the contractor require careful check - for compliance with the Department's contract plans and specifications, - and also the Inspector's approval stamp (or in some cases, reference by him to his Bureau for final approval) before being issued to the shipbuilder's shops. The Inspector's drafting force likewise scrutinizes and in some cases initiates, rather elaborate test memoranda to cover snore and installation tests on practically every piece of machinery, all piping and electrical installations, interior fittings, etc, which enter into the construction of the complete ship. The staff of civilian special mechanics, usually under the supervision of an officer assistant, follows continuously the fabrication or manufacture, and the installation of practically every part and system entering into the ship, including main, secondary and anti-aircraft batteries and their fire control systems, and also witnesses installation and completion tests including tightness tests of compartments, main and auxiliary machinery tests, etc

It is thus seen that work prosecuted under each technical Bureau is continuously checked and inspected by the staff of Naval Inspectors in the builder's plant from the time the contract for the ship is awarded and the contract plans and specifications received by the contractor, until the vessel is delivered to the Government upon satisfactory completion and commissioning, - and in a measure even until the expiration of the guarantee period for satisfactory operation, usually one year after delivery

Reimbursement to the contractor is usually

divided into some forty or fifty equal payments based on the degree of completion of the vessel, and requires certification by the appropriate Inspector that work has been satisfactorily completed up to this stage and the payment stipulated by the contract has been earned. This is particularly necessary on account of the heavy capital outlay now involved, - over \$50,000,000 for a single battleship (exclusive of cannon and armament), whose total cost is now upwards of \$70,000,000, - six or seven times what it was when I joined the Navy in 1903.

Usually also, at least one ship of a class is completely weighed (by weighing component items of material) as construction proceeds, and this weighing is a function of the Superintending Constructor's office.

Upon completion of new vessels, whether built under private contract or at a Navy Yard, and before their entry into service, these ships are subjected to very rigid full power trials, tests and thorough over-all inspection by a permanently constituted Board of Inspection and Survey for Ships, of which one section, for the East Coast, bases on Washington, D. C., and one for the West Coast, on Long Beach, California. These Final Inspection Boards, if we may so describe them, comprise highly qualified and skilled technical officer members to the number of some ten or twelve, with a Rear Admiral or senior Captain of the Line of the Navy as Senior Member -- each member being a specialist in his line, whether engineering, gunnery, naval construction or whatever it may be, and I can assure you that this Board puts each new ship through her paces in a most thorough and exacting manner, before she is permitted to join the Fleet. Inspection of ships does not stop even at this point. All vessels in service continue to receive thorough over-all inspections by the Board of Inspection and Survey throughout their commissioned life at intervals prescribed by regulations as not in excess of three years, - this in addition to more frequent inspections by the forces afloat.

Passing now for a moment from the first to the third category of inspections, - necessary but possibly relatively less important than the other two, and much less in value of tonnage of material inspected, - this category covers material ordinarily of such standardized character as to require chiefly inspection for quantity at the point of delivery, usually a Navy Yard or Fleet Supply Base. As previously stated, a great many materials in this category are procured from manufacturers who have demonstrated their

capacity and integrity and good faith in supplying materials to standard specifications and have been placed by the Navy Department on a so-called "Acceptable List of Approved Materials " Inspection of materials in this category is usually made only for quantity, workmanship and surface condition If this inspection has been made at the source, a check inspection for quantity and satisfactory condition on receipt is usually made upon this as well as on other materials by the comparatively small civilian inspection forces at Navy Yards and other Depots where the materials are delivered A guaranty or sworn affidavit is customarily obtained from the contractor stating that the material submitted for inspection is equal to the sample previously submitted to the Naval laboratory for the original acceptance test, on which inclusion in the Acceptable List of Approved Materials was based A representative sample is then selected and forwarded to a laboratory or Depot at which standard samples are maintained, for comparison with approved samples The comparison tests are usually conducted by the same Naval laboratory which conducted the approval test A check on material such as lubricating oil and gasoline, delivered on blank annual contracts, is maintained by periodically conducting check tests on samples forwarded from designated Naval activities It has occasionally happened that material covered by a contract requiring inspection at the source has been reinspected for condition as well as quantity by the Yard inspection force at point of delivery although not specifically provided for in the contract This has sometimes raised somewhat embarrassing but not insurmountable differences of opinion between field and Yard inspection forces, resulting in what has really proved to be a very healthy inquiry into the reasons for these differences of opinion

In this category also may be included certain special materials which are inspected for the Navy by other branches of the Government, and those inspected by employees of the Navy Department's Inspection Service after delivery, - the former including fresh meats and vegetables inspected by employees of the Bureau of Animal Industry of the Department of Agriculture, and incandescent light globes inspected by the Bureau of Standards of the Department of Commerce The latter includes dried and tinned provisions, clothing, textiles, garments, mess-gear, and musical instruments inspected by representatives of the Bureau of Medicine and Surgery Timber, which is still required by the Navy, although in diminishing quantities, is usually inspected at the source (the mills) although the tendency is to extend

the policy of purchase under the specifications and grading rules of the various national lumber associations and to accept it under their excellent inspection systems wherever available, subject usually to check inspection for quantity and condition at the point of delivery

We now return to the second category of inspections, covered in their entirety by the Field Inspection Service of the Navy Department and applying to a very large quantity of material (large in both tonnage and aggregate value), regardless of whether procured by the purchasing agents of shipbuilders for incorporation in vessels building under contract, or whether initially contracted for by the Bureau of Supplies and Accounts of the Navy Department, - or as in the case of certain special materials indicated above, by the technical material bureaus and offices having specific cognizance of procurement as well as design and determination of requirements

Of course you are all aware, as I suggested earlier, that vast progress has been made in naval design over the past thirty or forty years, - particularly since the World War, when the metallurgical and engineering sciences have contributed so much toward weight reduction imposed by the Washington and London Treaties (in order to secure the maximum efficiency, fighting value and radius of action within minimum displacement), and concurrently, manufacture of materials for naval construction has gone far afield from the seaboard to industrial centers like the Pittsburgh Area, - points often, and in fact usually, remote from building yards, Fleet Supply Bases and Naval Shore Stations. It is of course obviously wise and economical to inspect as much of this material as practicable at the point of manufacture, - the source, - and to reject any unsatisfactory material there, instead of after shipment, (frequently over long distances) to the points where the materials are to be assembled and used

It is this branch of the Naval Inspection Service, the Field Inspection Service, to which I am at present assigned

For the purposes of this Field Inspection Service the continental United States is divided into twelve Inspection Districts based partly on geographical and partly on industrial lines, centering about the most important industrial cities in their respective areas and without particular regard to the boundaries of the fifteen so-called

Naval Districts into which the United States and its out-lying possessions are divided for purposes of naval, i. e., military administration. For example, my own Inspection District extends into four different Naval Districts, but this causes no difficulties of administration such as might be supposed from casual observation. The Pittsburgh Inspection District is by far the largest of the twelve in tonnage and value of material inspected and accepted annually, handling, as I said before, about 25% of the total by value, and about 20% by tonnage. In geographical extent or area it lies at about the middle, owing to the fact that certain Inspection Districts in the southeast, southwest and northwest cover very large geographical areas but contain relatively less numerous or less important industrial activities. The Pittsburgh District extends roughly from Detroit, Michigan and northwestern Ohio on the west, to Rochester, New York on the east, and from the Great Lakes south to western Maryland, the middle of West Virginia and the Virginia State Line. It comprises a total area of nearly 100,000 square miles.

The cost of field inspection for all Districts now averages about \$1.50 per ton of material accepted, or in terms of cost per dollar of value of material, the cost of inspection is on the average about 8 of a cent, - that is, the inspection of each dollar's worth of material accepted costs on the average, considerably less than 1% of its value. Monthly summaries of inspection costs, both by tonnage and by dollar value, are compiled for each Inspection District by the Inspector of that District, collated in the Navy Department for all Districts, and a summary of costs by Districts disseminated to the various Inspectors of Naval Material, so that they may see themselves on a comparative or competitive basis, - it then becoming a natural point of pride with each Inspector to cut his inspection costs down as low as practicable, in comparison with costs in other Districts, so far as this can be done without sacrifice in quality of inspection. And the Inspector worth his salt is usually alert to find points in his inspection procedure in which further economies can be effected.

The twelve Inspection Districts to which I have referred above are designated by the names of their principal industrial centers, as the Boston, Hartford, Schenectady, New York, Bethlehem, Philadelphia, Pittsburgh, Cincinnati, Chicago, Atlanta, San Francisco, and Seattle Inspection Districts. For purposes of administrative control, they are allocated six to the Bureau of Engineering, five to the

Bureau of Construction and Repair, and one to the Bureau of Ordnance, the division of assignments between the first two Bureaus named, being more or less arbitrary, inasmuch as since 1927, as I previously stated, all material procured in a single District comes with few exceptions under the inspection of a single Inspector of Naval Material regardless of the Bureau under whose specifications and plans the material is procured. In other words, the Inspector of Naval Material is the representative within his own Inspection District of all Bureaus of the Navy Department procuring material in that district, with the exception of naval aircraft and certain other materials which I have indicated. The Bureau of Aeronautics conducts the inspection of aircraft under construction, due to the fact that this is a relatively new and very highly specialized industry, its inspections are conducted through some thirteen offices of Inspectors of Naval Aircraft, situated seven in the East, three in Ohio, one in Kansas, and two on the Pacific Coast. However, the various Inspectors of Naval Material are also frequently called on to conduct inspections on materials entering into the construction and equipment of Naval aircraft.

To keep pace with advances in engineering, naval science and industrial practice, the Navy Department has from time to time found it necessary to add to the facilities of its Inspection Service testing laboratories for various types of material. Such testing laboratories are now maintained in conjunction with the Naval Inspection Service and located at the Navy Yards at New York, Philadelphia, Norfolk and Mare Island, at the Engineering Experiment Station, Annapolis, the Naval Research Laboratory at Bellevue, D. C., the Naval Powder Factory at Indianhead, Maryland, and at the office of the Inspector of Naval Material, Pittsburgh District. The Naval Proving Ground at Dahlgren, Virginia, conducts gun-fire tests on armor and projectiles. All of these laboratories perform inspection tests on various types of materials and in addition, carry on research and development in connection with the improvement of materials for naval use, in both design and composition, to the end that the Naval Service may keep abreast of the times and be assured of the most efficient and most effective materials for its purposes. The Navy Department also for purposes of inspection tests, accepts analyses from accredited commercial laboratories.

The Pittsburgh District may be taken as fairly typical of the larger and more important Inspection Districts, except that, being centered in our largest and most important industrial area, it includes chemical and metallurgical

laboratories for both routine inspection tests and for research, which the other Districts do not possess. The main administrative office of this District is for more or less obvious reasons situated at Pittsburgh, and is actually located in the small town of Munhall across the Monongahela River, in an office building closely adjacent to and rented by the Government from the Carnegie-Illinois Steel Corporation, where a considerable amount of structural steel, large steel forgings, and armor plate for the Navy is produced. This District as a whole comprises a staff of seven commissioned officers of the Navy, or about one-eighth of the total number of officers assigned to the Field Inspection Service, eighty-five civilian inspectors, twenty laboratorians, and a clerical force of forty-eight.

The main administrative office at Munhall is staffed by five commissioned officers, some twenty-five civilian inspectors, twenty laboratorians, and a clerical force of thirty-four who handle the coordination of reports from the outlying branch offices, as well as the local inspection reports, and all administrative business of the District. Owing to its great geographical extent and the numerous somewhat scattered industrial centers, the Pittsburgh District maintains twenty outlying offices comprising staffs varying from a dozen inspectors with a Resident Inspector in Charge, and a clerical force of three or four, down to a single inspector with no clerical assistance. Of these, four so-called Branch Offices with fairly large staffs are maintained at Buffalo, Erie, Cleveland and Detroit, and there are Resident Inspectors at sixteen other points, including three rather highly specialized offices, - one at the East Pittsburgh plant of the Westinghouse Electrical and Manufacturing Company, one in Cleveland, - the "General Motors Corporation, Cleveland Diesel Engine Division" - which is specialized on diesel engines for submarines, and one at Vickers, Inc., at Detroit, a subsidiary, I believe of the Sperry Corporation, - which produces a considerable number of highly important electro-hydraulic auxiliaries for the Bureau of Ordnance and Construction and Repair. The East Pittsburgh office being close to and under the direct observation of the Inspector of Naval Material, is staffed exclusively by civilians especially qualified in the inspection of electrical equipment, each of the others has a specially qualified officer assigned as Resident Inspector, under the general supervision of the main or Munhall Office. It is desirable, and I have frequently recommended, that the larger Branch Offices at Buffalo, Cleveland, and Detroit have a commissioned officer assistant in charge, but up to

the present time it has not been found practicable to do so

I believe that your course includes both lectures and study on the various forms of Naval and other contracts and I therefore here mention very briefly in passing five rather distinctive clauses peculiar to many Naval contracts:

(1) the "Liquidated Damage Clause" providing for the assessment of a penalty for delay in delivery of material beyond the contract date,

(2) a clause included in every contract or order over \$10,000 in value requiring statement of compliance with the provisions of the Vinson Act which prohibits a profit in excess of 10%,

(3) a clause included in all contracts of \$10,000 value or over, summarizing requirements of the Walsh-Healy Act prescribing hours, wages and working conditions,

(4) the tax exemption clause which permits manufacturers to claim exemption from Federal excise and State taxes on materials used in the execution of a contract, and

(5) a clause in contracts for secret or confidential material, stipulating a penalty of \$10,000 fine or two years' imprisonment or both, for wilfully transmitting or through gross negligence permitting to be transmitted to anyone not entitled to receive it any confidential or secret information entrusted to the contractors, - quoted from the so-called Espionage Act, enacted by the Congress on 15 June 1917, and resembling somewhat the British "Defense of the Realm Act," known popularly throughout England as "Dora "

The most common form of Navy contract specifies some definite quantity of specific items of material. I shall not bore you with a statement of the detailed procedure for handling contracts and orders through my own central office, and into the hands of the individual inspectors assigned to the job in the field.

I should like, before closing, to refer briefly to one vitally important factor in the administration of an Inspection District, namely the personal factor of human relationships between the Inspector and his civilian staff of assistant inspectors, and between the Government's inspection force and the various contractors. It involves those qualities which go to make up leadership.

Among all of my assistants, I insist upon a scrupulous regard and consideration not only for the contractual rights of the contractor, but for his feelings and probable reactions as a human being, - realizing that the best business relations can be maintained only where there is a mutual feeling of respect and liking, and mutual confidence as to good intent and good faith. I think that in the mechanism of Government - government officialdom and red tape, if you like, - some of us are prone to overlook or forget the human factor and to presume upon what we might call the Government's right of eminent domain.

As a corollary, I try to impress upon my inspectors the necessity for avoiding an arbitrary or unreasonable or "high hat" attitude. This impulse, as you all know, is very strong in some individuals vested with a certain authority, who believe themselves also to have unlimited Government backing. It all boils down to the old colored man's definition of "good judgment" - "Good Judgment, Kristus," he said, "is the result of 's'perience, and 's'perience is the result of bad judgment."

And here I desire to pay a tribute to what I believe in the main to be the very high caliber of our civilian inspection force, - (all of whom I may add are obtained through examination and certification by the Civil Service Commission) - as regards integrity - (that must always come first) - experience, ability, conscientious application to their jobs, devotion to the Government's interests, and adaptability. They are not as a group, highly paid, and I believe that in the main they do an excellent job. Among them we find all varieties of training and experience, including college trained Bachelors of Science, electrical experts, mechanics, former railway inspectors, timber experts, etc. But regardless of training, a sound knowledge of psychology and of human nature is after all one of the prime requisites of a good inspector as it is of a good officer or a good man in any walk of life. Bad psychology and lack of tact in an inspector can do the Government almost as much harm in its procurement relations as ignorance or stupidity. Recent sensational press reports to the contrary, I believe our inspection system to be a generally very efficient one. It is maintained at reasonable size, adequate to the requirements, and gives generally good results - in the final analysis the best criterion.

In conclusion it is desirable to consider briefly the acceptability of the Naval Inspection Service, as at

present organized, for expansion to a war-time basis. Such an expansion, involving the recruitment of the required large number of additional civilian inspectors, and their indoctrination in Naval requirements and procedure, will not prove a simple matter, particularly in view of competing demands for inspectors in other Government Departments and for experienced mechanics in Navy Yards, private shipyards and among munition manufacturers of all sorts. However, many men are available throughout the country whose age or some physical disability renders them unsuitable for enlistment in the armed forces, but whose experience and integrity make them generally suitable for inspection work. It remains to determine the priority of claim for inspection over production. It would also probably be necessary, as was the case in the World War, to replace many of the officers now assigned to inspection duty, with retired officers and those available and qualified for such duty among the officers of the Reserve.

In this connection, and as I intimated at the beginning, one great difference which exists between the procurement problem of the Army and that of the Navy, involving a radical difference in magnitude and scope, if not in character of peace time inspection, is that the Navy comprises not only a substantial "Fleet in Being," with all its auxiliary services and shore-based supports, but also at present at least, a large and active program of New Construction, - which it is true would be greatly expanded on threat of war, - so that except for such expansion, and maintenance of the fleet on a war basis, the procurement problem of the Navy in war time would not be so greatly different from that which confronts us already, in peace time. Therefore, our problems of expansion to suit war conditions, while unquestionably considerable, would probably be nowhere near so great as those which would confront you of the Army. In other words, the transition from a peace to a war footing is possibly less difficult for the Navy than for the Army owing to the fact that the building and maintenance of the fleet and the naval establishment in time of peace covers the same general types of manufacture as would be required to meet greatly increased quantity, but not change in character, of output.

Thank you

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Discussion Following Lecture by
Captain Ralph T Hanson (CC) U S. N.

December 19, 1938

Colonel Miles I told you you would get a fine talk, and I think we have had it Captain Hanson has not only included the inspection but also the procurement system of the Navy As a matter of fact, I think that Captain Hanson's talk is useful not alone because of the excellent treatment of the inspection end but also because it ties in the inspection end with the procurement end in a very comprehensive and useful manner.

Q Captain Hanson, our Army Regulations state something to the effect that there was an agreement between the Secretary of War and the Secretary of the Navy that the Naval inspection districts would perform inspection work on request for the War Department.

A That is correct.

Q I am wondering if there is any specific administrative procedure to go through asking you to perform that inspection?

A The simplest possible, a letter from the commanding officer of the arsenal or other activity desiring inspection and forwarding the plans and specifications. We then take over immediately and assign an inspector qualified for that sort of work and carry it out. We are doing that sort of work in the Pittsburgh District now, not only for the Army but for a number of other activities of the Government.

Q In this connection, when inspection is requested is it necessary to quote the funds for expenses of your inspection, or is that an automatic charge back against the Army?

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A It is desirable, if not necessary, to give the appropriation to which chargeable because we then charge our inspector's time, plus any small amount of clerical work involved, to that appropriation, and the appropriation chargeable is usually given to us with the request for inspection and we make a monthly return to all departments other than the Navy Department under which we are conducting inspections, tabulating the cost so that they are currently and continuously informed how much it is costing.

Major McPike Captain Hanson, with regard to the liquidated damage clause of the contract, how do you reconcile change orders with the Government your liquidated damage clause?

A It doesn't ordinarily ~~become~~ cause great trouble and it is a matter of adjudication by the board on changes in the Navy Department provided the contractor and the administrative, or rather the appropriate bureau, who is appropriation is involved can't come to an amicable understanding before it reaches the state of adjudication by the board on changes. It doesn't ordinarily cause great trouble. I suspect that there may be some implication of a force measure exercised by the Department although not complicitly or actually either. But a contractor realizes that, particularly if he has had many Government contracts and is hopeful of getting many more he won't be too fussy or finical about the assessment of liquidated damages where there is a very strong implication that he is responsible for the delay. It isn't a matter of great controversy or great trouble in the inspection service.

Q I should like to inquire whether peace-time sabotage is found to be a particular problem

A We are on guard against it all the time. I believe that there is practically none in peace time, but we are on the lookout, if there should be any national emergency. Furthermore, we find that the manufacturers are coming more and more to restriction, in fact, there is now a complicity Navy Department requirement that no aliens shall be employed on confidential or secret contracts naturally, and contractors, I find as I go about my district, are gradually working out aliens and pressing those who have indicated intention to become naturalized to do so As a matter of fact, I am inclined to believe that such danger of sabotage as might develop in war time exists among certain native born Americans, much as I hate to say it, as among aliens who have worked themselves into employment on Government contracts or foreign born naturalized Americans. There is bound to be the appeal among a certain morally low class of employees to fatten their compensation by accepting what are sometimes vulgarly called "belly-rides" on the part of foreign agents and representatives. In the Pittsburgh District, incidentally, one of the points on which I feel the greatest apprehension is the very large number of foreigners who come in as student representatives of foreign firms with whom the American manufacturer has a business working arrangement, foreign inspectors, and casual foreign visitors of whom we have had a perfect flood, formerly of Germans, Japanese, and Russians alike Now the Japanese are sort of easing themselves out of the picture, but there has been a great increase of German visitors. One first tried to get in the back door and then when he found he couldn't he actually came in the front door and said he wanted

to see our battleship armor and we turned him down on that and he even came over to me We had a very pleasant half hour's conversation but he didn't see the armor

Q It seems that in war time it would be of great advantage to the Army to accept the services of Naval inspectors Do your war plans contemplate any plans to take care of further Army expansion in war time?

A That is one of the points on which I will exercise inexperience and bad judgment by saying that I don't believe that there is a specific provision for that, but there is no doubt a tacit understanding that our expansion would include such additional War Department inspection as we were requested to make It is certainly obviously inefficient and unnecessary to maintain two big inspection staffs, one for the War Department and one for the Navy Department in the same plant or the same area on certain classes of material Various divisions of the War Department prefer to maintain their own inspection and in others we are requested to make inspection and do gladly, and we try to maintain our force at a size capable of taking care of that I think possibly some of the other officers of the Navy Department here might be able to answer your question as to whether the war plans specifically contemplate inspection of the Army by the Navy inspection force

Comdr. McDowell No, sir, they do not.

Q. Captain Hanson, what contact, if any, do you have with the Army procurement districts in time of peace?

A Personally, very close and delightful, officially, a considerable change of information on industrial plans We have been exceptionally

fortunate in the Pittsburgh District to have officers of the Ordnance Corps and the Chemical Warfare Service of the very highest personality. They have endeared themselves alike to manufacturers and to officers of other branches who come in contact with them, and our cooperation is the closest possible. We see each other practically weekly. I have had invitations and the privilege of attending meetings of the Pittsburgh Ordnance Procurement District and the Chemical Warfare Service, and I am sorry to say that I have had to inflict on them annually one of these effusions such as you have listened to today, in a somewhat abbreviated form. The relations are excellent.

Colonel Miles. I might say that he has only spoken of the Army side. I think we can all realize after listening to Captain Hanson, that the personality of the Navy inspection force, if it is reflected by the chief, must be in large part responsible for the good relationship.

Q. Concerning the actual details of inspection, assuming that a particular company has contracted to build a certain item and that item has a large number of drawings and on those drawings are a large number of dimensions and those dimensions have very small tolerances, and you send an inspector who is supposed to have an organization to inspect this equipment and see that it complies with presumably these drawings, as well as any specifications. How do you conceive of the function of this inspector? Is his job to inspect all of these dimensions or is his job to see to it that the contractor has his own inspectors who inspect and therefore his job is to inspect the inspectors rather than the material?

A. A good deal of both. We expect the contractor to give his product

100% inspection On certain classes of material, notably ordnance material, some machinery, with very close working tolerances, some C & R auxiliaries, if the units are relatively few in number we expect the inspector to familiarize himself with those tolerances and if in his judgment it is necessary, to give 100% inspection supplementing the contractor's inspection If, on the other hand, there is so great a number of any one item that it would be manifestly impracticable or, I might say, impossible, for a reasonable force of inspectors to make 100% inspection he exercises judgment, picking at random what may be five or ten percent of the total contract Sometimes that percentage is specified in the instructions to us for inspection on which he must inspect throughout for tolerances, in addition to a much larger surface inspection That involves a question of judgment as well as integrity of the contractor. I referred to one of our assistants who had sounded off in the press that he couldn't conscientiously undertake the stipend offered him by the Navy because it was impossible for him to make 100% inspection of all articles for which he had to sign certificates of acceptance In my talk I called him hypercritical As a matter of fact, I believe it was another kind of critical. He had seven years' experience in the inspection service, he knew that it wasn't humanly possible or expected that he would give 100% inspection to every piece of material that went out That is where common sense and judgment come in I begin to feel, after two years, that I know my inspectors, know those on whom I can rely, can trust, and I know, within limitations, the various contractors whom we can trust and rely on. When I find that an inspector is either so dumb or exercise such bad judgment

or what not as to feel that he must, but cannot, make 100% inspection, I feel that the best thing is to get rid of him and let him apply his talents somewhere else in the industrial world.

Q. If the Government inspector has inspected a certain part and pronounced that part satisfactory, then later a collection of such parts is put into the assembled item and the Government inspector then turns the whole thing down, aren't you unjust to the manufacturer? In other words, should you ever inspect any parts, should you not rather require that the manufacturer inspect all parts and you see that he has an adequate inspector and not do it for him?

A. I am afraid I can't agree with what is clearly your opinion, from the nature of the last part of your inquiry. We have to be very careful to avoid relieving the contractor, both of the one hundred percent inspection and the consequent implied contractual responsibility for the perfection of his output. We ran into precisely that case with one contractor. He gradually reduced his inspection force, and because certain administrative officials beyond me insisted on practically 100% inspection by the Government force. It was a very bad principle to initiate, and with the termination of that contract I stopped it and I hope permanently. But I can't agree with you that our taking over the inspection relieves the contractor for the accuracy and high quality of his product. Furthermore, the responsible contractors, not jobbers nor fly-by-night manufacturers, are so proud of their output and so anxious to retain their standing with the Navy Department in getting future contracts that ^{when they see that} some items have crept in a shipment that are obviously unsatisfactory or bad, they want to get them back. It isn't a question of fighting to insist on their retention by the Government.

They ask to have them returned. Sometimes, of course, it doesn't work out as happily. Then I, as the inspector in the district, the procurement bureau and S and A all get into a merry scrap. We all come through with heads sometimes bloody but unbowed, and I am afraid the contractor in the end takes the rap although if it is a strict case of justice, the Navy Department and the Government are almost as honest as they require the contractor to be in acknowledging the error and compensating him for a mistake made on the part of the inspectors. I have been mortified sometimes by a product that has passed. The most recent case was one in which the inspector, one of my most reliable and, I believe, one of my most honest men (I might say that under the Civil Service requirements we have to work our men beyond the period of peak vigor of mentality, as well as bodily vigor up to seventy), vowed to me that he had carried out a very rigorous test and that the equipment had passed. I had two successive check tests made, both failed, and then to my utter confusion the bureau, which had been laughing up its sleeves all the time, told me that the contractor had admitted that he couldn't meet that specification. Of course I had this inspector on the carpet but I couldn't call him a liar, I don't believe he was one, there was some curious fluke about his inspection by which the material appeared to be satisfactory when it wasn't. That sort of thing will happen and the only thing to do is to be honest, to recognize occasional flaws in humans, certain mistakes, none of us can claim perfection in inspection work.

Q As I understand it, you have a liquidated damage clause in all of your contracts?

A. Not all contracts, and the contractors are very anxious to get

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those liquidated damage clauses eliminated as much as possible on account of what they consider the undue risk that they are taking in this mundane sphere of change and labor trouble, shipping difficulties, etc.

Q. In other words, ordinarily they do increase their price of the article they have manufactured due to that chance they are taking of being assessed a penalty?

A. It probably works somewhat to that effect, says I, with my eye cocked on the commander who has struggled with this problem of liquidated damages. I think the bureaus choose to retain them. There is some question as to whether you pay more than the clause is worth or not.

Commander Dunham. Captain Hanson, in case of large expansion of the Naval inspection service, would you care to tell in general terms what type of man you would go after, as regards education and other characteristics, to augment your inspection force.

A I am not sure whether the Civil Service question would answer that for me or not. I know the sort I would go after I would go after men of fairly wide mechanical experience between the ages of thirty and forty, who have actually worked in some line of manufacture, preferably a varied line, preferably but not necessarily with some advance schooling. I find that the best inspectors are not those who have passed fifty. That sort of rules me out as inspector if it were applied all the way up the line, but the men who come in around fifty-five, in fact those who have been in for twenty or thirty years, after they pass sixty begin to look to the retiring age ten years hence and they don't bear down as heavily as the younger and active who have the incentive of some advancement. I try to keep that

incentive alive and recognize promising young ones even if they haven't had many years of experience. If they show good judgment, are anxious to learn, are active, have a reasonable amount of electrical or mechanical experience, those are the things. I don't think that College training, which many of them curiously enough have, is in itself an endorsement because if they have gotten to a fairly advanced age it is rather a stigma that they haven't made the most of the educational advantages they acquired in their youth, and they are sort of back numbers or down-and-outers that haven't kept up with the procession. That is a bit of a generalization as to what sort of men I would go after in case of rapid expansion. When it comes down to brass tacks we take what we can get and try to take the best of them, in that case. That is actually what we do under the Civil Service ruling. In that connection, I am a believer in Civil Service but it is sometimes awkward and sometimes what you might call rather hidebound. After a number of years, not only in the inspection service but in the navy yards and elsewhere, I have about come to the conclusion that I can judge a man almost as well by his mug as it shows in his passport picture as I can from the long and impressive list of experience that he tabulates in his application and the endorsements of fellow workers who scratch his back because they know sometime they may want him to scratch theirs.

Q Captain Hanson, you spoke of the Navy Board on Changes. Would you care to explain that?

A I can't in very much detail. It is a board comprising representatives from the various bureaus who receive the claims of contractors for reimbursement for additions after acceptance of the contract or award of the contract, with recommendations and detailed supporting or un-

supporting data from the inspectors concerned on the job, and I believe that after they have studied all these matters their adjudication is final unless the contractor is so unreconciled that he chooses to carry it on to a court of claims. You have hit a very weak spot in my armor because I haven't come closely in contact with the Board of Changes.

Q What I am really wondering is if they had changes in the contract prior to any disagreement between the contractor --

A You mean before the contract is awarded?

Q After the contract has been awarded and the article is in process.

A. It is my understanding they constitute merely a board of review and they are not an administrative or executive activity That rests in the bureaus charged by statute with technical details

Captain Furer I think you have already had such a big meal to digest, but I have had some experience myself on that same job I was in the Pittsburgh District and made Captain Hanson a visit, and I was surprised to see how large the child had grown I think possibly one of the trickiest things about an inspection, as Captain Hanson mentioned, is this. The contractor submits an article that doesn't comply quite with the specifications and he says to us as an inspector, "But this item will meet your requirements, in fact it is better than what you have specified " And sometimes you have to admit that it is better or will meet the requirements but not the specifications Then the question is what to do. We have to take the view, of course, that the article must meet the requirements and the specifications even though it might be used if it didn't The reason for that is you go right back and violate the principles of

competitive buying if you allow the contractor to submit something that does not meet the requirements of the specifications even though it may serve the purpose. Coming back again to having specifications of the right kind, and perfect specifications are something which no one has yet devised, they are changed all the time. But that is probably one of the trickiest things about inspection, and it sometimes seems very unreasonable to insist on absolute conformity with the specifications when one knows that it is something that won't make any difference, but it does violate the principles of competitive buying because someone else might say, "If I had known that I could have submitted a lower price and I could have had the contract."

Captain Hanson: There is one point in connection with that, of which Captain Furer is well informed of, that the Government exercises or indulges in what I think is a somewhat scottish trick of getting around that by accepting the material at a lower cost to the Government. It, of course, doesn't meet squarely the unjust feature that competitive bidders have already been ruled out but it does save the Government's conscience to the extent that it is getting a darned good bit of material at a bargain price perhaps. It is just one of the little things, -- One point interested me greatly. I spoke earlier in my talk of the fact that motor makers and some other manufacturers would dispute the contention that the requirements of the Government are more rigorous and exacting and its specifications higher than of any comparable commercial outfit. I ran into that, particularly in Detroit, the heart of the motor making industry. It was maintained that Chrysler and Ford and others had what they claimed to be, and I think it is

true, the finest staff of metallurgists to be found anywhere in the world and that their specification requirements are fully as rigorous, and probably more rigorous, than those of any Government department. Naturally I couldn't admit that to them in the interests of my cloth and profession, but there is no question but that by its quantity production, methods and concentration on one product, the automobile industry has perfected an extremely high set of specifications and has developed some extremely fine products of the metallurgical science. I think that we of the Government would make a mistake if we claimed that our specifications were perfect in every detail. The best procedure, I think, is to meet your manufacturer as you meet your assistant inspectors, on a common ground of human nature with some give and take in matters that are not fundamental and do not compromise the whole situation. They are men like ourselves. I believe that in the main they are just as honest in their intent and purpose as we are.

Colonel Miles You know that in time of war the Army is going to be faced with tremendous expansion in procurement activities, and one of the very serious problems is going to be how to do the inspection. Captain Hanson has given us a very interesting discussion of Navy inspection which, as he says, in time of peace very closely approximates what it would be in time of war, and certainly, therefore, very closely approximates what our problem in the Army is in time of war. I personally regard what Captain Hanson has to say here each year as of first importance to us because it brings within our ken the practical considerations which would be involved in one of our greatest war problems.

In the last war I had something to do with Army inspection and started out with myself as the inspector of a particular kind of material and ended up with myself and five thousand others on an inspection. So personally I have some idea of the complexity of war-time inspection, and I want to tell you gentlemen that if you absorb what Captain Hanson has said here this morning, particularly that which has to do with the necessity for integrity and for those human attributes which should be present in every inspection service, you will have really absorbed something which is very much worthwhile.

I want to thank you again, Captain Hanson, for this fine talk.