THE MISMANAGEMENT OF SHIP CONSTRUCTION, REPAIR AND DESIGN

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Abstract ••••••

The causes and consequences of mismanagement in the design, construction and repair aspects of the marine industry are examined in nine case studies. Selected from actual case histories, the studies focus on representative samplings of mismanagement in the ship design phase, in the design-to-construction transition, in the construction phase, in the construction-to-testing transition, and in the testing-to-delivery transition. Tugs, ferries, chemical carriers, cargo vessels, tankers and special purpose vessels are included. The conclusions focus on (i) the necessity of assessing the benefits and the risks whenever changes in procedure are anticipated or observed, (ii) the reason why non-immediate consequences of both delay and acceleration can be costly, and (iii) how misplaced responsibility can topple a project. The conclusions note that things will go as planned, but it is a question of whose plans -- yours or the proverbial Murphy's?

"Beware misplaced optimism: things will go as planned, but it is a question of whose plans -- yours or Murphy's?"

I. Introduction ••••••

When I was first contacted by the Papers Committee of the International Marine Transit Association, I was asked to present a paper on "The Management of Ship Construction, Repair and Design." In my acceptance, I suggested that the subject be altered to focus on "Mismanagement" instead of "Management," which suggestion was accepted by the Committee. My thinking was this: nearly everyone attending this conference would feel they were competent in the management aspects of the industry for which they were hired, and would not find interesting a paper telling them what they believe they already know. But no one would think of themselves as competent in the mismanagement of their responsibilities -- yet it is far more important to recognize mismanagement than proper or good management. Accordingly, a paper on such a subject would be more useful as well as more likely read.

II. Mismanagement Dominates Good Management ••••••

There are, among educators and followers of professional management techniques, a dozen or so well-recognized management methodologies. These include management-by-objectives, management-by-format, management-by-procedure, management-by-variance, and others. The existence and continued study of all these management methodologies attest to the fact that many persons are attempting to be better managers.

Considering the significant efforts being made to achieve good and/or beneficial and/or proper management, why is it that mismanagement is yet lurking beneath every task, every contract and every project? Why is it that, given the slightest opportunity to come to the surface, mismanagement will dominate, submerge and overwhelm good management? Why is it that, given but a single whiff of oxygen, mismanagement will out-grow, out-breed, out-run and over-run good management?

The answer to these questions is parallel to the world financial community's axiom that "bad currencies

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drive out good currencies." Specifically, *mismanagement drives out good management.* This is generally the result of a mis-perception of the risks of undertaking procedures which are not consistent with proven good management procedures.

In the past decade, our firm has been called upon to analyze numerous causes and consequences of mismanagement in the marine industry, to establish remedies for past mismanagement, to recommend procedures to avoid recurrence of mismanagement, and to mitigate the consequences of past mismanagement.

From among those numerous assignments, I have selected nine examples that appear to reflect the most common forms of mismanagement. In Section III, the general conditions and consequences of each mismanagement are briefly described. In Section IV, an analysis of each of those case histories is presented.

In reviewing these case histories, it becomes evident that most mismanagement is the result of knowledgeable individuals taking actions which, at the time, they perceived as good management, truly in the best interests of their employer. *However, it was a mis-perception.*

III. Nine Examples of Mismanagement ••••••

Consider these examples of mismanagement driving out good management, all of which are true, being taken from our firm's files. Such examples bear witness to the axiom that oft-times truth is stranger than fiction.

III-1. Builder's Risk Insurance: A ship owner, when ordering a new vessel, decided that it would be less expensive to purchase the builder's risk coverage, naming the shipbuilder as an additional assured. This replaced the more usual approach of having the shipbuilder purchase the coverage for the account of the owner, with the owner named as additional assured. The owner's savings in premiums was estimated at $75,000. The policy had a deductible of $25,000 per occurrence.

During the course of ship construction, the policy was called upon for coverage four times, and three other "named" events occurred with costs which came in below the deductible. As the shipowner was the principal assured, he had to ante-up the deductibles each of four times ($100,000) and reimburse the shipyard for the three other events having costs that were below the deductible levels ($36,000 total). Thus, the owner's idea of a "cost savings" of about $75,000 actually increased his expenditures by $61,000. Had the shipyard purchased the builder's risk coverage, the shipyard would have had to absorb the deductibles and below-deductible costs.

III-2. No Liquidated Damages Clause: A shipyard contracted to construct a combination of two tugs and two barges for an owner. In the course of negotiating the contract, the shipyard was sufficiently confident of its ability to construct the "low technology" vessels on or ahead of schedule, that they intentionally omitted the traditional liquidated damages clause. That clause would have stipulated an upper limit to the amount to be paid back to the owner for late delivery of the vessels, on both a per day basis and for cumulative totals.

However, the shipyard's contract development group failed to perceive that a "high technology" vessel construction program, occupying the same building ways, was falling behind schedule. The effect was to delay the start of construction of the tugs and barges by several months -- too much time to make up by accelerating the tug and barge construction. The owner later presented a "lost opportunity" claim against the shipyard for approximately one-fifth (20%) the total contract value. A conventional liquidated damages clause in the contract could have limited the claim to substantially less than five percent of contract value.

"A good manager will be quite suspicious of potential benefits free of potential risks. Such situations are akin to the achievability of a perpetual motion machine."

III-3. Different Cargoes - Same Structure: A shipyard contracted with an owner to construct a chemical carrier out of the same basic hull as a parcel tanker having a double bottom. Safety considerations resulted in the chemical tanks having cofferdams around them, but the tanks were of the same depth as in the parcel tanker. Whereas the parcel tanker had tanks which vented to the atmosphere, the chemical tanks were not permitted to vent, but had to be a closed containment system. Also, the specific gravity of one of the chemicals carried in bulk was over twice that of the products carried in the parcel tanker.

The combination of higher static head (due to greater specific gravity) and inadvertent over-pressurization of the tank caused the vertical floors in the double bottom under the tank to collapse. That occurred despite having the structural design approved by one of the major classification societies. The modification of the already-built vessel to correct a latent design defect was a costly learning experience for the shipyard.

III-4. Metric to English Units Conversion: A vessel was designed using metric units, including model tests and development of the lines of the hull. The vessel was built using English units. The lines plan developed in metric units had a linear scale of 1:100. The lines plan used by the shipyard had a scale of 1/8th inch to a foot, that is, a linear scale of 1:96.

The vessel was well under construction when it was discovered that the sum of the weights exceeded the planned displacement by about 12-13 percent -- representing the difference between 1:96 and 1:100 linear scales, converted to volumes. Consequently, the vessel carries substantially less cargo than originally intended, with a resultant loss of revenue for the owner over the vessel's entire life.

III-5. Coating Schedules vs. Seasons: A shipyard, constructing a large tanker, was contractually required to coat all of the vessel's ballast tanks with two layers of epoxy coating. The planned master construction schedule indicated the coatings would be applied in early spring, with mean daytime temperatures of about 40°F (4°C). At that temperature, the first layer of epoxy coating would ordinarily require over 96 hours to cure sufficiently for the application of the second layer. As the shipyard wanted to apply the coatings on successive days, the shipyard requested the coating manufacturer to add an "accelerator" to the coatings, so they would cure in 24 hours in an environment of about 40°F (4°C).

Due to slippage in the fabrication of the steel, the coatings were not applied until early summer, with average daytime temperatures of about 65°F (18°C). Because the "accelerator" was already added, the first layer of epoxy in the ballast tanks over-cured before the second layer was applied. Large areas of the second layer slid off the first layer as the second layer cured. Subsequently, it was necessary to sandblast and re-coat the ballast tanks in their entirety at a cost of several million dollars in direct costs, plus about one million dollars more was repaid to the owner due to the consequential late delivery of the vessel.

III-6. Cutting Steel -- Haste Makes Waste: A shipyard, facing a potential lack of new building contracts, negotiated a contract to construct a moderately high speed cargo vessel. Anxious to keep the yard's workers occupied, to minimize the impact of delay on other projects, and to keep cash flowing in, they began to "cut steel" before all designing and planning had been completed. An analysis of potential stern vibration had not been completed when the stern's design was finalized to ensure continuing work for the yard's production staff.

During sea trials, the hydrodynamically-induced vibration was so severe the ship could not achieve design trial speed due to the potential of shaking the ship apart. The ship was re-sold for conversion to a slower-speed trade, with the shipyard (and its underwriter) absorbing the considerable loss.

III-7. Equipment Maintenance During Construction: The steam turbine powered generators were installed in a tanker under construction approximately on schedule. The power plant, including the ship's boilers, was also completed and initially tested dockside on schedule. But the ship "failed" its sea trials due to a latent defect in the main thrust bearing. So delivery of the tanker was delayed for over four months while the main thrust bearing was corrected. During that time, the ship's machinery was left cold.

When the re-scheduled sea trials were about to commence, it was discovered that the turbine on the turbo-generator was out of balance due to corroded balance weights. The corrosion occurred due to lack of post shut-down draining of the turbine after the aborted sea trials. Consequently, the turbine rotor was removed from the ship for re-balancing, delaying ship delivery yet another two weeks. This resulted in additional liquidated damages being paid by the shipyard to the shipowner.

III-8. Equipment Procurement Schedules: A shipowner was negotiating for the construction of a vessel requiring extremely long lead time specialized equipment. The shipyard gave the owner a 32-month schedule from contract to delivery, including the design, manufacture and installation of that critical specialized equipment. The owner wanted a 28-month schedule. An independent engineering company proposed to the owner that, as a purchasing agent, it could procure the specialized equipment more rapidly than the shipyard, thus making feasible the desired 28-month construction program. The owner signed an equipment procurement contract with the engineering firm and a separate ship construction contract with the shipyard. The shipyard's contract stipulated the critical equipment as owner-furnished, to be delivered on an agreed schedule. The shipyard was to install the specialized equipment upon delivery of it by the engineering firm.

The engineering firm did not deliver the equipment from its sub-contractor until it was about five months late, which delay the shipyard said created a corresponding delay in the delivery of the vessel. The owner was thus caught in the middle between the shipyard and the engineering firm with a five-month delay in vessel delivery. Moreover, the shipyard lodged a significant claim (several million dollars) against the owner for costs arising from delay and disruption caused by the owner's late delivery of that specialized equipment.

III-9. Shipyard Capabilities: An operator of over twenty short-haul passenger and vehicle ferries was seeking to construct several new ferries. A consulting firm prepared bid specifications, which were sent to a number of shipyards for preparation of their bids. One of the yards that requested and received an opportunity to bid on the vessels was a small ship repair yard, never having constructed anything more sophisticated than a deck barge. In its bid, that shipyard indicated that, if awarded the contract, it would construct a new, modern shipyard in which it would construct the ferries.

That ship repairer/builder was the low bidder. Consequently, it was awarded the contract, and commenced to construct the modern shipyard while commencing the construction of the ferries.

The first several ferries were delivered late, accompanied by a claim by the shipyard for an additional twenty-five percent of the contract fee due to delay, disruption, acceleration, change orders and over-inspection allegedly caused by owner's representatives. Upon delivery of the vessels, the owner had to invest another fifteen percent of contract price to correct construction deficiencies.

IV. Causes of Mismanagement -- Analysis of Examples ••••••

Recital of the above nine examples of mismanagement may be interesting; but it cannot effectively serve to help others avoid similar consequences unless the various causes of the mismanagement are clearly observed. In the following paragraphs, both apparent and non-apparent causes of mismanagement are discussed for each of the nine examples.

It will be seen that often two parties -- not just one -- are responsible for the mismanagement. Frequently, the second party's mismanagement arises from its misplaced notion that the interests of the first party are the same as the second party. That notion is as misplaced as a fish out of water.

"Senior management should be quite suspicious of any 'bonus savings' that the staff says it can bring about merely by procedural manipulations. "

IV-1. Builder's Risk Insurance: The shipowner purchased the builder's risk coverage, with the shipbuilder named as an additional assured. This meant that, for all practical purposes, as far as the shipyard was concerned, the owner became the yard's "full-coverage" insurer -- i.e., no deductibles would apply to the shipyard itself. It also meant that the owner would have to prepare all claims, and absorb the entire difference between the shipyard's statement of costs (possibly inflated) and the amount the owner could recover under the policy from the underwriter.

The owner's staff responsible for new construction saw this as an opportunity to save $75,000 in its budget requirements. The underwriter, all too glad to sell another policy to the owner, didn't perceive the need to tell the owner of the pitfalls of such a change to conventional procedure. The owner's insurance staff was familiar only with the usual shipowner's types of policies. Never having had to deal with a builder's risk policy, the insurance staff was unaware of the lack of wisdom of such a change in procedure. Likely, if the owner's senior management had been told clearly that the change effectively meant that the owner would become the shipyard's insurer, the change would have been effected.

The origin of this problem, then, was (i) the new construction staff's desire to reduce its initial budget requirements without regard to possible and/or probable supplementary requirements, (ii) senior management's lack of recognition that the change meant the owner was the shipyard's full coverage insurer, and (iii) the insurance department's failure to research the history of the shipyard's usage of builder's risk policies to recover certain incurred costs. The lesson to be learned is that the owner's senior management should be quite suspicious of any "bonus savings" that the staff says it can bring about merely by procedural manipulations.

IV-2. No Liquidated Damages Clause: The start of construction of the tugs and barges (low technology) was delayed due to was the late completion of another (high technology) vessel construction project. This is a clear example of the direct impact on other projects that can arise from delay in completing a prior one. (In some extreme instances, the impact can "ripple" down to several consecutive projects.)

The immediate origins of the problem were found to be either (i) a reluctance on the part of the project manager for the high-technology project to admit to shipyard management that the project was irretrievably behind schedule, or (ii) an inability of the high-technology project manager to recognize that fact. Thus, shipyard management was denied the opportunity to identify the need to keep its rear guard up, in the form of a liquidated damages clause, when negotiating the contract. However, shipyard management may have accepted too readily -- due to wishful thinking -- the high-tech project manager's reassurances that the construction would get back onto schedule.

The lesson to be learned is similar to the prior one -- the shipyard's senior management should be suspicious of any construction schedule accelerations that the production staff says it can bring about in a project which is already behind in a tightly-scheduled program.

There is an important, but sometimes overlooked, characteristic of a liquidated damages clause, allowing for possible abuse by the shipyard. Suppose the clause stipulates that in no case will the shipyard be responsible for more than, say, 100 payments of the daily amount for delay. Once the delay exceeds that 100 days then, the shipyard has little or no incentive to further terminate the delay. This potential must not be overlooked when negotiating the contract.

IV-3. Different Cargoes - Same Structure: Partial failure in the double bottom occurred due to structural overloading. The fact that the structural design and cargo loading had been approved by a major classification society is a "red herring" -- it draws attention away from the existence of a fundamental design error by the shipyard.

The shipyard, as a manufacturer, had products -- ships -- to sell; and it wanted to sell them with the least number of changes between successive ships. The senior design management of the yard accepted short-cuts in the design process to enhance vessel producibility. The use of a product carrier design (moderate specific gravity cargo) for a dense liquid chemical was an attempt to achieve an inexpensive chemical carrier. That goal, while an aid to selling ships, was contrary to the experience of other designers of chemical carriers.

Apparently, the shipyard's designers failed to perform sufficient failure analyses as a result of any of (i) lack of understanding how a closed cargo system can be abused; (ii) improper reliance on the operating crew to prevent such a casualty while the equipment they are operating is capable of causing such a casualty, or (iii) a naive belief that other designers have significantly over-designed previous vessels having the same performance requirements.

The lesson to be learned is, once again, comparable to that of recognizing yet another version of what is essentially akin to developing a perpetual motion machine. Specifically, senior technical management of the shipyard must have thought they had invented a new way to achieve an inexpensive chemical carrier where others had not been successful.

"Preservation of corporate pride should not be a goal superior to preservation of corporate profitability."

The vessel owner's technical staff also should have been suspicious of such an apparent technological breakthrough. Even though the shipyard would likely have to correct such latent defects, a casualty would adversely impact the vessel owner's service to its chemical shipper-customers. Both the shipyard's and the shipowner's technical staffs were naively -- and erroneously -- relying on other parties to do their homework for them. And the shipyard incorrectly believed that with only minor effort it could generate a high-performance cargo support system from a low-performance one.

IV-4. Metric to English Units Conversion: An apparent error in converting the hull lines of form from metric to English units resulted in a significant loss of deadweight in a vessel. The engineering firm that purchased the metric design from Europe and supplied the English units design to the shipyard had not independently checked on the conversion of the hull lines from metric to English units. Instead, that firm relied on the original designer, accustomed to working only in metric units, to effect the conversion.

The European firm, seeing the conversion from metric to English units as a rather elementary task, assigned it to a relatively inexperienced engineer who received it as a mechanical task without understanding the lines plan itself. The Engineer had taken the drawing in metric units (scale 1:100), and essentially merely assigned it a new scale for English units, 1:96, without changing the drawing. In fact, to change scales on a lines plan, it is necessary to completely re-draw the plan.

Thus, what was to be 1.00 meters (39-3/8") expressed in metric units suddenly became 0.96 meters (37-3/4") expressed in English units. And what should have been 1.00 cubic meter (35.3 cu.ft.) of displacement became 0.885 cubic meter (31.2 cu.ft.). Consequently, the designed hull displacement could not be achieved. And since the steel weight couldn't be reduced, there was a loss of deadweight.

The lesson to be learned is two-fold. First, as in the previous example, no firm responsible for any aspect of the design should rely on the performance of some other firm that is not responsible for that aspect of the design. Second, no matter how elementary the task, if accurate performance of that task is fundamental to the success of a project, it should be performed by experienced, qualified senior members of staff.

IV-5. Coating Schedules vs. Seasons: The second layer of a tanker's ballast tank epoxy coatings failed to adhere to the first layer due to overcuring of the first layer. The overcuring was brought about by the use of a curing accelerator, added for anticipated

cool-weather application even though the coatings were actually applied in warm weather. That caused the curing accelerator to overcure the first layer of epoxy coating, rendering it unsuitable for a second layer. (In general, claims for compensation or re-work originating with coatings problems appear to be the most frequently occurring type of claim in ship construction and repair.)

This costly failure was brought about by two contributing factors. The first factor was schedule slippage in steel fabrication, thus delaying the application of the coating. The second contributing factor was a lack of communication between the shipyard and the coatings supplier -- protecting the shipyard's corporate pride -- not wanting to acknowledge to others that it was behind schedule.

The owner's representatives' initial analysis of the cause of the coating failure was either improper surface preparation by the shipyard or poor product quality control by the coating manufacturer. Those incorrect analyses brought about unnecessary acrimony amongst the parties involved, and delayed the resolution and correction of the problem.

The lesson here is one that is broadly applicable in ship design, construction and repair. The ramifications of delays are not always obvious; they may be quite subtle in early development, but quite costly in their full realization. Early acknowledgment of a delay is essential to a full analysis of all its ramifications and minimization of its consequential impacts. Also, preservation of corporate pride normally should not be a goal superior to preservation of corporate profitability.

IV-6. Cutting Steel -- Haste Makes Waste: The shipyard began fabrication of the stern of a high speed cargo vessel prior to conclusive hydrodynamic model tests to ascertain the vibration characteristics of the hull's shape. Subsequently, vibration of the constructed stern was too severe to allow the vessel to operate in that high-speed trade. The ship was converted to a low-speed trade before it was used commercially.

By the time the vibration was observed in sea trials, it was far too late to make structural changes in the vessel. Monumental effort and expense was ineffectually expended in attempting to make changes to the propeller design and thrust bearing reinforcement.

The cause of this costly design error was not in the design process itself, but in the premature transition from design to construction. The lesson here is the converse of the previous one pertaining to delays. The ramifications of accelerations, whether they be accelerations of transition (from design-to-construction or construction-to-testing) or accelerations within a single stage (design or construction), may be subtle in manifestation, but quite costly in their realization.

Accelerations in ship construction or repair programs are a form of risk-taking. If the possible consequences of an adverse outcome are too severe to accept, the risk should not be taken no matter how attractive the consequences of a favorable (though potentially elusive) outcome may appear to be.

IV-7. Equipment Maintenance During Construction: Delivery of a tanker was delayed two weeks due to the necessity of removing the rotor of a turbo-generator for re-balancing after the balancing weights were found to be corroded. The corrosion occurred during a four-month delay (to correct the main thrust bearing) because the turbine had not been properly drained after initial tests.

It may be observed that this is one of those non-obvious but ultimately-costly ramifications of a delay in the transition between testing and delivery. It is also a consequence of the shipyard concentrating on the production and testing of a vessel, whereas it was actually being called upon, in this instance, to put the turbo-generator, among other items, into lay-up condition. This illustrates the need for a shipyard to be continuously alert to all possibilities that may affect the vessel in its care, whether during construction or repair.

The owner's representatives also had a duty to the owner which was not properly performed. The shipyard would have to take the responsibility for improper vessel maintenance during that temporary lay-up. But the shipowner would bear the immediate consequences of non-availability of the vessel. The function of the owner's representatives during construction is to protect the owner's interests -- even at the risk of offending the shipyard by double-checking on the yard's staff. Lack of exercising that duty may be perceived as a partial failure of the owner's representatives to perform their appointed role.

"The possible recovery of funds from a performance bond is not a logical substitute for proper initial evaluation of all factors pertinent to the bidding process."

IV-8. Equipment Procurement Schedules: A shipowner contracted with an engineering firm to provide specialized, long-lead-time equipment to achieve a scheduled 28-month construction program. Had the shipyard that provided that equipment, a 32-month construction program would have been scheduled. A 33-month construction program resulted

due to the five-month delay by the engineering firm in delivering that equipment.

The vessel owner apparently accepted at face value the engineering firm's statements that it could obtain the specialized, long-lead equipment considerably faster than the shipyard could, as well as at reduced costs. The owner's staff failed, however, to investigate the basis for those statements. It did not analyze the reasons why a shipyard -- well experienced at major equipment procurement -- could not achieve the same procurement schedule as the engineering firm.

The vessel owner's staff was exercising wishful thinking to achieve -- on paper, at least -- a shorter (28-month) ship delivery. The staff should have been exercising its analytical capabilities instead. Again, it is the situation analogous to a perpetual motion machine being offered in a different form. The owner should have been suspicious of representations showing that a significant schedule shortening could be achieved merely by manipulation of contractual responsibilities. It doesn't happen.

IV-9. Shipyard Capabilities: An essentially non-existent shipyard was awarded a contract to construct several ferries, based on being the low bidder. The shipyard was constructed as ferry construction commenced. The actual direct cost to the owner for procuring the ferries was approximately fifteen percent over the contract price due to the necessity of correcting construction deficiencies. The availability of the vessels for service was 2-8 months later than contract dates due to the combination of (i) late delivery by the yard and (ii) time to make those corrections to construction deficiencies.

As in the previous example, the owner's staff accepted at face value statements and assurances given by another party that could have been analytically confirmed or adjusted. In this case, the statements were made by the non-existent shipyard pertaining to cost controls, schedule and quality of construction. Yet there was no experience on which to base those assurances. Other long-experienced shipyards had bid. But experience was not factored into the bid evaluation process. Again, it was a case of the bid evaluation team, on behalf of the owner, exercising wishful thinking, rather than developing a creative analysis to include the "experience" factor.

Also missing from the bid evaluation was an identification of risk factors that were quite unequal between the low bidder (high risk due to non-existent shipyard) and other bidders (low risk due to already existing facilities and experienced shipyard management and production staff). Although a performance bond was required for the contract to be awarded, the possible recovery of funds from that performance bond cannot be considered a logical substitute for proper initial evaluation of all factors pertinent to a bidding process.

"When elements of mismanagement begin to assert effective control of a project, there is a tendency for each party to immediately cast blame on others."

V. Conclusions ••••••

The difference between good management and mismanagement in the marine industry is often subtle -- but costly. At a time when most participants in the marine industry are struggling for fundamental survival, the costs of errors of mismanagement are likely fatal to the organization's continued existence. Moreover, such costly errors of mismanagement are most likely to occur at middle-management levels, oft-times disguised as "well-researched" ideas or even covered-up to avoid the more-perceptive scrutiny of senior management.

The mismanagement of ship construction, repair and design is not going to vanish. Even if everyone reading this paper were to henceforth avoid mismanagement -- which is itself not very likely -- there will soon be new faces in the industry. Those new managers will be tempted to succumb to the false enticements of mismanagement: lower costs, more rapid schedules, less workload, less responsibility.

V-1. Benefits vs. Risks: It is obvious that, with the passing of time, new managers will appear who will be attempting to achieve good management while avoiding mismanagement. But there will also appear persons new to the industry that, in one way or another, for one reason or another, may be trying to sell an unachievable goal, hastening the mismanagement so costly to the industry.

The "sales pitch" may promise cost savings merely by changes of contractual responsibility; or it may promise greater reliability achieved merely by earlier procurement. It may offer earlier delivery by simply changing purchasing agents. The sales pitch may suggest better quality by altering purchasing practices and safeguards.

Not all the "sales pitches" will be without merit -- but many of them will attempt to suppress your analytical capabilities in favor of exercising wishful thinking, turning good management into mismanagement. A good manager will be quite suspicious of potential benefits free of potential risks. Such situations are akin to the achievability of a perpetual motion machine.

Optimism is a form of risk. Beware misplaced optimism: things will go as planned, but it is a question of whose plans -- yours or the proverbial Murphy's? In the planning of ship design, construction and repair, there really is no place for either optimism or pessimism -- only for careful, realistic and consistent analysis of risks.

V-2. Delay and Acceleration: The practices of ship design, construction, testing and repair each have well-defined stages, as do the transitional areas between design-to-construction, construction-to-testing and testing-to-delivery. Either delays or accelerations within any stage or across a transition phase are high-risk events. They must be considered coldly, carefully and analytically when accelerations are planned or delays are observed.

The ramifications of both accelerations and delays are not all obvious, to say the least. The most costly effects of accelerations or delays may not appear until much later in the project; and may inadvertently affect other projects as well -- the "ripple" effect.

The apparent benefits of accelerations, without regard to the risks, will rapidly seduce a good management team into mismanagement practices. The imagined perception of the immediate impacts of delay as being the only impacts of delay will also set the stage for the toppling of good management practices into the abyss of mismanagement.

V-3. Responsibilities: The tendency to pass off responsibility is a pervasive one as it also reduces the workload. However, no party other than yourself will take on your responsibilities with the same perspectives, goals and constraints that you will.

Approval by a classification society or the U.S. Coast Guard is not a substitute for good design practice nor for quality of workmanship in ship construction. When adverse events occur, the designer or builder will have to answer for those events. The classification society likely won't be in the picture.

The shipyard's quality control staff can never be a substitute for an alert owner's representative; but neither can the owner's representative be an adequate substitute for a yard's quality control staff -- they are two different functions, having two different goals.

The owner's approval of plans cannot make up for latent deficiencies in the yard's design practices. And all the planning papers that can be developed in anticipation of a project are grossly misplaced if they are not built on a foundation of measured and proven experience.

Lastly, if any single event, design detail or calculation is crucial to the success of the project, it should be performed by persons who have the experience and proven capabilities to justify accepting the responsibility. Assignment of such tasks to persons having lesser qualifications is an unnecessary risk which could topple a project as well as the professional reputations of firms and persons.

V-4. Observation: When elements of mismanagement begin to assert effective control of a project, there is a tendency for each party concerned to immediately cast blame on others. Each party then commences detailing every inadequacy, real or imagined, of the other parties, using inconsistent 'logic' to relate each inadequacy to the manifestation of mismanagement. This series of actions and reactions only serves to make mismanagement more dominant.

In most cases, this would not arise if each party periodically re-read the fine print in the contract identifying the responsibility of each party as it pertains to the pending situation. The consequences of mismanagement would thus be minimized, and the project would progress to a more satisfactory completion.

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