HIGH SPEED VESSELS IN THE USA - AN INTRODUCTION TO THE UNITED STATES' REGULATORY ENVIRONMENT

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ABSTRACT

The authors represent two sides of the regulatory dialogue: Mr. McKesson is a naval architect with the firm of Art Anderson Associates. Art Anderson Associates is a consulting engineering firm actively involved in designing, recommending, and procuring fast ferries and other vessels for US clients. LCDR Lokites is a Naval Architect & Marine Engineer, and an officer of the United States Coast Guard with experience at the CG Marine Safety Center (MSC), USCG Headquarters, and USCG Marine Safety Offices (MSOs) assisting with interpreting and applying domestic and international regulations for commercial vessel safety.

1. INTRODUCTION

The US is seen as fertile ground for the introduction of fast vessels. But this vision is clouded by the knowledge that the American regulatory climate is complex, and may not be the same as that in other countries. In this paper we attempt to bring some clarity to the American scene by outlining the US regulatory environment.

The US has not been a major contributor to the commercial high speed craft industry. Reviewing the attendance lists at previous FAST conferences will show that American attendance is not proportionate to the American population. From the fact that the US is not a leader in commercialization of fast vessels it follows that the US does not have a well established set of rules for fast craft. Indeed, the proposer or user of a fast vessel in the US frequently finds himself in unknown territory, where both he and his regulators are setting precedents.

Further complicating the issue is the truth that the US has some protective legislation which acts as a barrier to simply accepting a foreign-built and -approved vessel. The most clear case is the Jones Act which requires that any vessel participating in commerce (carrying cargo and/or passengers) between US ports must be built in the US.

Further, the US is a strong world player in many other areas, and it is normal for Americans to operate from an assumption of leadership. In this case, however, the fact that we are not a world leader in this area raises another barrier to accepting outside ideas. The US rulemaking "machine" is simply not designed to accept rules from outside.

The result of these factors is that introducing a fast craft into American service is a lot like sailing into treacherous unknown water. There are opportunities in these new waters, but there are also dangers, shoals, and rocks which can easily sink your ship. Our goal in this paper is to offer a chart of these waters.

We begin by providing an overview of the American rulemakers. What is the Coast Guard and how do they work? What is their relation with other rulemaking authorities, whether in the US or abroad?

Following this discussion of the rule writers we delve into the rules themselves. Examples include discussing the relationship between US "Subchapter H", "Subchapter T" and "Subchapter K." When does which set of rules apply? What about the IMO HSC Code? What about differences in US domestic and international tonnage measurement schemes?

We finally present some “tips” or guidelines for navigating the American regulatory maze. These include guidance on how best to ask questions of the Coast Guard, what sort of “homework”, if done in advance, will speed your project, and a list of most-important telephone numbers and addresses.

The course through American approval of a vessel is often unknown and may be feared. Our goal in this paper is to provide a chart through these foreign waters, and offer sailing directions which will lead to an efficient and trouble-free relationship with the regulators.

2. OVERVIEW OF U.S. RULEMAKERS AND ENVIRONMENT

2.1 USCG

The US Coast Guard is an agency of the Department of Transportation. Its responsibility covers many mission areas, including among others; defense readiness, search and rescue, marine environmental protection, and marine safety. The majority of the personnel are active duty members with a strong contingent of civilian government employees and another dedicated group of reservists, or part-time employees. The Commandant is the head of this agency and fully supported by a considerable staff who coordinate all the efforts associated with their respective programs. The program for commercial vessel safety is entitled “Marine Safety and Environmental Protection.”

2.1.1 Mission

The US government has provided the Coast Guard with specific powers and constraints to enforce marine related laws and regulations in a broad marine safety program. The original focus of this enforcement was to tackle the *symptoms* of marine casualties and incidents whereas the CG currently looks at the root *causes*. The intent is to prevent marine casualties and incidents through appropriate legislation (laws) and regulations, coordinated field efforts to implement requirements, and education of the maritime public.

2.1.2 Organization

The organizational structure of the commercial vessel safety program is basically three tiers; Coast Guard Headquarters (CGHQ), the Marine Safety Center (MSC), and the Marine Safety Offices (MSOs). The roles and relationships of each are discussed below.

2.1.2.1 Headquarters

The office of Marine Safety and Environmental Protection fills many roles, including drafting new laws; developing regulations to implement existing, modified or new laws; and also drafting policy to publish accepted interpretations of specific applications of the regulations. CGHQ, the highest level of authority and review, maintains much of the policy guidance that is distributed to the MSC and the field offices; i.e. the Marine Safety Manual (MSM), Navigation and Vessel Inspection Circulars (NVIC’s) and various branch office policy letters.

2.1.2.2 Marine Safety Center (MSC)

The MSC is the centralized Coast Guard office for plan review of all commercial vessel projects (they do not deal with pleasure craft or military vessels). They are the technical experts regarding regulatory compliance at the design stage. This is where all projects start, where existing regulations and policies are applied to review of submitted plans and proposals. If necessary, the MSC will involve CGHQ to evaluate and resolve

any new policy issues or may involve the appropriate Marine Safety Office (MSO), also referred to as the field office, for input regarding the local area wherein the vessel will be operating.

2.1.2.3 Marine Safety Offices (MSOs)

The MSOs are field offices spread throughout the country, staffed with marine inspectors (similar to surveyors) who are responsible for witnessing the construction and testing of the new vessel and ensuring it is built to the approved plans received from MSC, and all other policy and regulations that go beyond plan review capabilities. Field offices also have the responsibility of ensuring that commercial vessels in their area of responsibility are operating in accordance with all regulations.

Once the vessel construction is complete, it may be delivered to a different part of the US to operate. The MSO receiving this vessel, the "Operating MSO" (as distinct from the "Constructing MSO") will be responsible for verifying that the vessel stays in compliance with the applicable requirements for operations, and any subsequent modifications during the vessel's life time. There may also be local policy requirements that must be met based upon the vessel's actual operating environment and intended service. The "Operating MSO" will issue a certificate of inspection on a periodic basis as validation that the vessel is indeed in compliance.

2.2 Other Federal Entities

There are other federal agencies that play a minor role in the overall process of building and subsequently operating a commercial vessel in the US. One is the U.S. Public Health Services (USPHS), which is concerned with the potable water and sanitary systems, and another is the Federal Communications Commission (FCC), which establishes and verifies compliance with communications equipment requirements. Your MSC point of contact can help you contact these agencies as well.

2.3 Classification Societies

The role of the Coast Guard is to protect life and the environment. This is very similar to the role of the classification societies, whose charter may be stated as "to ensure the safety of life, property, and the environment." Navigation and Vessel Inspection Circular 10-82 (NVIC 10-82) recognizes this similarity by extending plan approval authority to the American Bureau of Shipping (ABS.)

NVIC 10-82 gives ABS the plan review and approval authority for vessels classed by ABS. Note that if the decision to class is revoked, then plan review and inspection may need to be repeated by USCG.

The Coast Guard is steadily moving toward extension of this concept to other classification societies, but at the present time it applies only to ABS. However, Art Anderson Associates' experience has been that when plans are reviewed and approved by any other major classification society (such as DNV) they receive a quick review and approval MSC.

2.4 Alternative Compliance Program

A new program has recently come into force after completing a trial period: the Alternative Compliance Program. For the ACP, ABS through completion of their surveys including a supplemental set of rules, fulfills most of the CG inspection requirements. This offers the advantage of practically eliminating all duplication of Coast Guard and classification society efforts, while also reducing an operator's time out of service to

maintain certification. This program only applies to ABS now, but is open to other classification societies if they choose to go through the review and approval process.

2.5 Naval Architects

The Coast Guard is trying to take advantage of all the available expertise in the marine industry. This effort recently included naval architects and marine engineers who are certified professional engineers in the United States. Navigation and Vessel Inspection Circular 10-92 (NVIC 10-92) provides for expedited review of plans if those plans are certified by a licensed professional engineer.

The Marine Safety Center found that plans submitted by licensed Professional Engineers had fewer areas of noncompliance and the CG mission could be better served in an oversight role in those cases where a PE certifies the plans to be in compliance with the applicable regulations. This policy helps to considerably reduce the turn-around time for plan review which can amount to a considerable savings in man power and materials when a vessel is under contract or construction.

In the United States there is provision for licensing engineers in most disciplines. These licenses are granted by the individual states. Only one state licenses naval architects explicitly (Washington).

When an engineer certifies a drawing he signs a statement that says that he has reviewed the design and that it complies with regulations *thus* and *thus* as required by the law. Note that the engineer must state explicitly what regulations the drawing complies with.

Through a subsequent policy letter from CGHQ, ABS has been afforded the same recognition for stamped vessel plans as is provided for PE stamped and certified plans under NVIC 10-92. This policy too is open for expansion to include other classification societies as demonstrated in a new construction project currently underway: Acceptance has been granted to Det Norske Veritas for this streamlined plan review process for the DNV classed high speed catamaran being constructed by Pequot River Shipworks. It is not foreseen at this time that similar expansion will include individual professional engineers chartered in other countries and not affiliated with a classification society.

3. OVERVIEW OF US REGULATIONS

The Coast Guard writes regulations for US shipping and shipbuilding. These regulations are set forth in the Code of Federal Regulations (CFR). The United States also adheres to international treaties which invoke the regulations of the International Maritime Organization (IMO.) The result is a complex set of overlapping and occasionally conflicting regulations.

3.1 CFR

The Code of Federal Regulations (CFR) presents the requirements applicable to design, construction, and operation of US flag ships. The regulations are promulgated under different “Titles” coincident with the laws they implement, and each addressing a particular discipline. Title 46 addresses shipping. A related title is Title 33 which addresses navigation requirements, aids to navigation, and general ports and waterways safety. For marine designers Title 46 is the most frequently referenced set of federal regulations.

The CFR is divided into subchapters and sections. Figure 1 presents the organization of 46 CFR. For shipbuilders the most important Subchapters are:

Subchapter F - Marine Engineering
Subchapter H - Passenger Vessels
Subchapter J - Electrical Engineering
Subchapter K - Small Passenger Vessels (A)
Subchapter T - Small Passenger Vessels (B)

As may be seen, each subchapter addresses a particular set of requirements, and subchapters overlap and refer to each other extensively. The designer's first task is to determine which subchapters will apply to his project.

This task is somewhat simplified by a matrix which is present at the beginning of each of the major subchapters of 46 CFR. See, for example, 46 CFR section 175.

Passenger craft fall into either Subchapters H, K, or T depending upon the vessel's gross tonnage and the number of passengers carried. Further, Subchapter K is subdivided into two classes, designated K and K' (spoken "K-prime".) To decide into which of these categories a passenger vessel falls into, it is helpful to refer to Figure 2. Fast Cargo vessels will mostly fall into Subchapter I.

3.2 The Jones Act

An important secondary piece of American law is the "Jones Act". This law requires that any commercial ship which sails between two US ports without stopping at a foreign port must be built in the US. This means that it is illegal to purchase, for example, an Australian-built INCAT to be operated between ports on the US West Coast. It is for this reason that some parties, such as INCAT and FBM, have established licensing arrangements with American shipbuilders, which allow those American builders to produce the foreign designs. This gives the American yard access to marketable designs, and it gives the foreign ship builder their only chance of putting one of their products in US service.

There are nuances to the Jones Act, as with any law. The most important is to define what constitutes American construction. The CFR prescribes that, firstly, all major components of the hull and superstructure must be fabricated in the US and secondly, the vessel must be assembled in the US. This allows for foreign supply of flat plate, as long as it is fabricated (rolled, formed, cut etc.) in the US. It also allows for mechanical components and equipment to be foreign made without affecting the US build determination.

3.3 Other Regulations - SOLAS, MARPOL, COLREGS, ITC

As the US is signatory to SOLAS (International Convention on Safety of Life at Sea), vessel builders/owners may desire to maximize the marketability of their design by choosing to meet all the SOLAS requirements as well as the CFR. This would enable the vessel to be employed on an international run, which also includes voyages from the continental US to Hawaii and Alaska (and between Hawaii and Alaska themselves.)

The MARPOL (Maritime Pollution) treaty is divided into annexes, and the US is signatory to this treaty as well. These requirements come into force when the vessel's voyage brings it into the high seas or waters outside the three mile territorial seas. Many vessels have routes limited to internal US navigable waters, such as rivers, lakes, bays and sounds, and may be exempt from all MARPOL requirements.

The COLREGS, (Collision Regulations) as already mentioned, are incorporated into Title 33 of the Code of Federal Regulations in their entirety for vessels operating beyond

the boundary line and in a slightly modified version for operation on inland waters, those inside the boundary line[1].

Tonnage measurement requirements are a critical and quite complex topic, which themselves warrant a separate paper. Since it is not possible to give you enough details to be accurate on this subject, our remarks should be considered as merely introductory:

Every newly constructed vessel in the US may be admeasured under the US Standard Measurement System (SMS) to determine its tonnage using a complex series of internal measurements and exemptions. An inherent flaw in this system though, is its susceptibility to manipulation, allowing designers to use such features as excessive framing and tonnage openings to artificially reduce gross tonnage. This is never done with an eye towards increasing strength, stability or safety, and, in fact, may have detrimental side effects. Definite down sides to these methods are increased cost and weight, decreased construction efficiency and reduced international competitiveness in the final design.

The US ratified the International Convention on Tonnage Measurement of Ships (ITC) in order to have a system available that provides a genuine representation of a vessel's size. This system addresses many of the negative aspects of the SMS and certainly puts US vessels on the same scale as foreign built vessels. Typically however, a vessel's gross tonnage will be significantly higher under the Convention Measurement System (CMS), which poses a problem for domestic vessels. Many operational requirements in US regulations, most notably manning levels, are keyed on the vessel's gross tonnage. With increased gross tonnage comes increased manning levels, and with that, significantly greater operating costs over the life of the vessel. (As an aside, the USCG is now evaluating options in an attempt to remedy this, and is starting with one particular class of vessel, offshore supply vessels (OSV) which service the mobile offshore drilling units. A process is underway to equate the current regulatory gross tonnage break points for OSV's with the typically greater tonnages. For example, USCG may say that a 6,000 GT OSV under the CMS is functionally equivalent to a 500 GT OSV measured under the SMS. This is an effort to recognize vessel size and complexity without forcing manipulation of a time worn system to artificially lower the GT. It is fully anticipated that similar processes will take place for other classes of vessels and passenger vessels may indeed be next.)

3.4 Industry Standards

Honorable mention in the regulatory overview goes to the impact of industry standards. The CG is moving away from regulating all aspects of vessel construction including equipment fabrication, towards recognition and adoption of industry standards. This is in an effort to eliminate unnecessary CG efforts, to recognize the high standards already established and maintained by industry and to enable the CG to focus its efforts and obtain greater results towards improving safety.

The standards of materials and equipment today are such that casualties due to their failure are low and diminishing. The current focus is on reducing human error as this was determined to be a causal factor in over eighty percent of all vessel casualties. This is the aim of the Prevention Through People (PTP) program and risk-based management objectives.

[1] The boundary line is a legally-designated line between the zone of application of USA law and International law.

To this end, the CG has recognized the value of the IMO's International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM). While voluntary compliance is currently encouraged, compliance may become mandatory in mid-1998 for some vessels, such as large passenger vessels and freight vessels making international voyages. They are also evaluating the benefits of likewise requiring compliance by small passenger vessels and other vessels on domestic voyages.

4. COAST GUARD INTERPRETATIONS

Regulations are interpreted and applied by Coast Guard personnel involved in vessel plan review, construction, and eventual operation. This opens the door to individual interpretations and thus differences from one port to the next. In order to minimize these differences the Coast Guard publishes interpretation documents which assist not only the US Coast Guard in plan review and inspection of vessel construction, but also the designers, builders and owner/operators. These documents are published policy that also help interpret the sometimes vague or confusing language of the regulations. They are often times based on problems/issues that have arisen in past projects and include: the Marine Safety Manual (MSM) an eleven volume set of well established policy, with one volume dedicated to commercial vessel safety; Navigation and Vessel Inspection Circulars (NVICs) and CG Headquarters Policy Letters addressing more narrowly defined subjects of precedent setting significance; and CG Marine Safety Center Technical Notes (MTNs) specifically addressing plan review items in hull design, vessel and machinery arrangements, structural fire protection, etc.

4.1 HSC Code equivalency to 46 CFR

46 CFR has a provision for accepting the use of the HSC Code. Under the requirements in Subchapter K the Coast Guard may accept compliance by a high speed craft to the HSC Code as equivalent to compliance with the regulations in this subchapter. This is on a case by case basis. The working group mentioned in section 5.2.1, below, is studying the HSC Code, particularly those areas of the Code which are vague or confusing, or those areas left "to the satisfaction of the Administration" to determine what, if any, supplementary regulations will be imposed.

5. WHICH RULES APPLY?

Which rules apply to which vessels? Let us outline this by considering the application to US Built versus Foreign built vessels, on US versus International routes.

5.1 U.S. Built Vessels

5.1.1 U.S. Built Vessel - Domestic Routes

Let us begin with the simplest case: A US-flagged vessel operating only between US ports. In this case the vessel is subject to the requirements of the CFR and other US regulations.

5.1.2 U.S. Built Vessel - International Routes

For all practical purposes, the rules applicable to both a US built and a foreign built vessel operating on international voyages will be the same. The US built vessel will also be in compliance with the CFR but the number of CFR-imposed additional requirements is

continually decreasing. The USCG has been evaluating many areas of the regulations that differ from international treaty requirements with an eye toward minimizing or eliminating them where appropriate. Policy decisions like these are often published in NVICs or CGHQ policy letters. The goal is to have equivalent standards applied to vessels built anywhere around the globe that will be employed in commerce between nations (dependent of course, on the treaties to which each nation is signatory) to avoid handicapping in the marketplace a vessel of particular origin.

5.2 Foreign Built Vessels

The last option is to describe requirements applicable to a foreign built vessel for operation on a domestic US route. In fact, this cannot happen now since the Jones Act prohibits it. What is possible is to have a foreign designed vessel built in the US which could then operate in the US, or to have a foreign-built vessel operated on an international route under a US Flag.

5.2.1 Foreign Designed Vessels - Domestic Routes

With regard first to the question of a foreign design built under license in the US. The CG has an active working group currently tasked with establishing the rules and regulations of multiple design variations across the globe. The goal/charter of this working group is to establish the rules and applicable regulations for HSC construction and operation, and to enable a vessel of foreign design to be built in a US shipyard with minimal modifications of the original design. This is assuming the vessel is in compliance with the existing, accepted international regulations. This group is utilizing as a basis the HSC Code along with the published rules of various classification societies and is examining all areas for appropriateness. We may logically expect the work of this group to lead to the publication of a NVIC on the subject of HSC Code interpretation.

5.2.2 Foreign Built Vessels - International Routes

The above discussion also applies to the application of foreign built vessels operated under US flag for international routes. When *Victoria Clipper IV* - a Fjellstrand 40m Flying Cat - was placed in service in the US, there was no comprehensive policy for her certification under A.373(x). This will hopefully be alleviated in the future, for HSC Code craft, because there is stated policy accepting the HSC Code, as discussed above. Note again, however, that the HSC will be amplified by additional requirements, probably extracted from 46 CFR.

6. TIPS AND TRICKS

The first time we work in a new system, whether it's a new job and a new employer or a new shipyard in a new country, we expect to experience some anxious moments and possible setbacks as we learn and make adjustments. With the information we present here, we hope to reduce the amount of discomfort you'll experience as you venture into this new market.

6.1 How and when to talk to USCG

It is advisable to bring the Coast Guard into the project as early as possible. The first point of contact is the Marine Safety Center (MSC). It is not too early to confer with them the day the contract for a construction project is signed. In fact, if you will be requesting special plan review arrangements, or if the vessel design is unique or complex,

your interests would be best served getting the Coast Guard involved during the conceptual design phase of your project.

6.1.1 MSC on board to chart the course

MSC is the first stop for all new construction projects and will establish very early the scope of plan review and the applicable regulations and policy. When necessary they will enlist the aid of CGHQ to address issues not already clearly covered. They will work closely with your single point of contact located in the United States and will coordinate the Coast Guard efforts to get the project underway.

6.1.1.1 Time frame

How long does it take to get a design approved by the USCG? The answer is: It depends. There are three major parameters which will significantly affect turn around time, each discussed in a subsection below. Utilizing the provisions of NVICs 10-82 or 10-92 certainly expedites the process. On the other side, novel hull designs submitted through the in-house naval architect could require additional time for proper modeling and analysis by MSC. The same can be said for unique mechanical systems and material applications.

Every effort should be made to ensure your plan submittals are complete and accurate. Supporting documentation and calculations are often helpful, especially when the design software utilized is unfamiliar to the plan reviewer at MSC. With this in mind the average turnaround time for plans submitted for the typical domestic vessel construction is about 8 weeks.

By contrast, Art Anderson Associates' experience is that one can consistently get turnaround in 2 to 4 weeks if you: Call ahead, provide copies of the computer files, maintain an active dialog with the reviewer. Remember, the reviewer is another engineer with training and background similar to your own. They are very easy people to talk to, on an equal level. In fact, as US engineers we sometimes find that our reviewers are old college classmates or former coworkers.

6.1.1.1.1 Novelty of design / Equivalencies to existing policies

The Coast Guard recognizes the impossibility of the regulations keeping up with technology. The MSC will always entertain proposals for alternative arrangements, material selection, and new designs when requested. The key is to address the level of safety provided by what is proposed, as well as to define the risks associated with this alternative. MSC, with CGHQ if necessary, will analyze the proposal taking into consideration the existing regulations and policy, and also factor in their intent and the period in which they were drafted. It is important that you factor in the time necessary to accomplish this extra review which will vary based upon the complexity of your proposal. As was previously mentioned, a significant equivalency is written into the regulations regarding the HSC code, but this is far from a "rubber stamp" approval.

6.1.1.1.2 Waivers

It is possible to request waivers from specific regulations. Provision is made for CGHQ or MSC to evaluate such a proposal, and it is also, in some cases, within the authority of the commanding officer of the operating Marine Safety Office. Again, your request will need to address the risks associated with noncompliance and the level of safety afforded by the vessel or system as designed to enable the Coast Guard to evaluate whether a departure from specific requirements is warranted.

6.1.1.1.3 Submittal Completeness

Art Anderson Associates routinely experiences rapid turn-around and approval of submitted documents. We believe this to be due to our attention to the completeness of our submittal. We will routinely offer not only the required document, but supporting calculations and documentation which make the reviewer's job easier. Our approach is two pronged: To present our work with a clarity which makes it easy to review, and to present our work with a professionalism which causes the reviewer to assume that we are probably correct in our conclusions.

While we have no contrary experience, we believe that work that is submitted part-complete, sloppy, or poorly documented, raises in the reviewer's mind the question of whether the submitter truly "knows his stuff." Once this question is raised the reviewer will then naturally carry his analysis to a greater level of detail, with an attendant delay in approval.

Do good work, make the reviewer's job easy, make your work a pleasure to review, and you will receive quick reviews.

6.1.2 Role of the MSO

The Coast Guard's efforts during vessel construction and eventual operation are handled by the local marine safety office (MSO). As previously mentioned, it is possible to have two MSOs involved, one where the vessel is built and another where the vessel will be operated. It is advisable to consult with the MSO in the operating area to address issues of local concern that may impact vessel design or outfitting. The local MSO to the constructing shipyard will automatically be informed of all the results of the MSC's review efforts and will also take the initiative to obtain necessary information from MSC and other MSOs.

6.2 How to keep current

We have discussed many tools that CG uses in the commercial vessel safety program. The regulations, 46 CFR, are reissued on a yearly basis. While soft cover book is available from the government, they are also available from commercial suppliers on compact disc. NVICs, MTNs and Policy Letters are published as issues arise. Hard copy of existing documents is available (you can refer to the Figure 3 for the appropriate office), but taking advantage of the computer technology, they are also available from the internet by accessing the CG web site (http://www.dot.gov/dotinfo/uscg/hq/g-m/gmhome.htm).

7. CONCLUSIONS

US Regulations may be confusing at times, but it is possible to gain a working knowledge of them with practice. It is important to understand the rules and apply them. Help in interpreting them is available in the form of NVICs, the MSM, etc. Coast Guard personnel are also happy to assist the industry in understanding the regulations. Fear of the regulations should not inhibit anyone from developing fast ships for American waters.

8. ACKNOWLEDGEMENTS

The authors wish to thank firstly their employers for their gracious consent to the preparation of this paper. The assistance of the United States Coast Guard clearly shows that organizations desire for open and clear communication with all interested parties. Art Anderson Associates welcomes the introduction of foreign technology to American waters, and looks forward to closer correspondence with our offshore colleagues.

9. AUTHORS' CIRRULA VITAE

Chris B. McKesson received a Bachelor of Science of Engineering in Naval Architecture and Marine Engineering from the University of Michigan in 1979. In 1990 he was Head of the US Navy's Advanced Vehicle Design Section. He later joined Art Anderson Associates where he is Principal In Charge of Naval Architecture.

McKesson has represented the United States as a technical expert to the North Atlantic Treaty Organization (NATO) Special Working Group on Advanced Marine Vehicles. In 1989 he was a representative of the US Navy to the government of France as part of an engineer exchange program. While in France he participated in the AGNES NES 200 project. At Art Anderson Associates he has participated in the SLICE commercial advanced vehicle project. He also lead the installation of gas turbines in the passenger ferry Victoria Clipper IV.

Lieutenant Commander (LCDR) Ronald Lokites received a Bachelor of Science in Ocean Engineering from the US Coast Guard Academy in 1980. Subsequently he received a Masters of Science degree in Naval Architecture and Marine Engineering from the University of Michigan in 1987.

LCDR Lokites has worked at all levels in the marine safety program dealing with commercial vessel safety. He was assigned as a staff naval architect at MSC as well as in offices in CGHQ, in plan review and drafting and implementing policy. He recently completed an assignment as senior marine inspector overseeing all vessel new construction and major modifications at MSO Puget Sound, in Seattle Washington.

FIGURE 1 - Outline of 46 CFR
Code of Federal Regulation, Title 46 - Shipping, Chapter I - Coast Guard, Department of Transportation

SUBCHAPTER A: PROCEDURES APPLICABLE TO THE PUBLIC

SUBCHAPTER B: MERCHANT MARINE OFFICERS AND SEAMEN

SUBCHAPTER C: UNINSPECTED VESSELS

SUBCHAPTER D: TANK VESSELS

SUBCHAPTER E: LOAD LINES (§41-47)

SUBCHAPTER F: MARINE ENGINEERING (§50-64)
§50 General Provisions
§51 (Reserved)
§52 Power Boilers
§53 Heating Boilers
§54 Pressure Vessels
§56 Piping System and Appurtenances
§57 Welding and Brazing
§58 Main and Auxiliary Machinery and Related Systems
§59 - Repairs to Boilers, Pressure Vessels and Appurtenances
§60 - Reserved
§61 - Periodic Tests and Inspections
§62 - Vital System Automation
§63 - Automatic Auxiliary Boilers
§64 - Marine Portable Tanks and Cargo Handling Systems

SUBCHAPTER G - DOCUMENTATION AND MEASUREMENT OF VESSELS (§66-69)
§66 - Reserved
§67 - Documentation of Vessels
§68 - Documentation Vessels Pursuant to Extraordinary Legislative Grants
§69 - Measurement of Vessels

SUBCHAPTER H - PASSENGER VESSELS
§70 - General Provisions
§71 - Inspection and Certification
§72 - Construction and Arrangement
§75 - Lifesaving Equipment
§76 - Fire Protection Equipment
§77 - Vessel Control and Miscellaneous Systems and Equipment
§78 - Operations
§80 - Disclosure of Safety Standards and Country of Registry
§81-89 - Reserved

SUBCHAPTER I - CARGO AND MISCELLANEOUS VESSELS
§90 - General Provisions
§91 - Inspection and Certification
§92 - Construction and Arrangement
§93 - Stability
§94 - Lifesaving Equipment
§95 - Fire Protection Equipment
§96 - Vessel Control and Miscellaneous Systems and Operations
§97 - Operations
§98 - Special Construction, Arrangement, and Other Provisions for Certain Dangerous Cargoes in Bulk
§99 - Special Construction, Arrangement, and Other Provisions for Nuclear Vessels
§105 - Commercial Fishing Vessels Dispensing Petroleum Products

§106 - Ocean Thermal Energy Conversion Facilities and Plantships

SUBCHAPTER IA - MOBILE OFFSHORE DRILLING UNITS
§107 - Inspection and Certification
§108 - Design and Equipment
§109 - Operations

SUBCHAPTER J - ELECTRICAL ENGINEERING
§110 - General Provisions
§111 - Electric Systems - General Requirments
§112 - Emergency Lighting and Power Systems
§113 - Communication and Alarm Systems and Equipment
§114-139 - Reserved

SUBCHAPTER K - SMALL PASSENGER VESSELS CARRYING MORE THAN 150 PASSENGERS OR WITH OVERNIGHT ACCOMMODATIONS FOR MORE THAN 49 PASSENGERS
§114 - General Provisions
§115 - Inspection and Certification
§116 - Construction and Arrangement
§117 - Lifesaving Equipment and Arrangements
§118 - Fire Protection Equipment
§119 - Machinery Installation
§120 - Electrical Installation
§121 - Control and Miscellaneous Systems
§122 - Operations
§123-139 - Reserved

SUBCHAPTER N - DANGEROUS CARGOES (§140-149)

SUBCHAPTER O - CERTAIN BULK DANGEROUS CARGOES (§150-155)

SUBCHAPTER P - (Reserved) (§156-158)

SUBCHAPTER Q - EQUIPMENT, CONSTRUCTION, AND MATERIALS: SPECIFICATIONS AND APPROVAL (§159-165)

SUBCHAPTER R - NAUTICAL SCHOOL SHIPS (§166-169)

SUBCHAPTER S- SUBDIVISION AND STABILITY (§170-174)
§170 - Stability Requirements for all inspected vessels
§171 - Special rules pertaining to vessels carrying passengers.
§172 - Special rules pertaining to bulk cargoes
§173 - Special rules pertaining to vessel use
§174 - Special rules pertaining to specific vessel types.

SUBCHAPTER T - SMALL PASSENGER VESSELS UNDER 100 GROSS TONS (§175-187)

SUBCHAPTER U - OCEANOGRAPHIC RESEARCH VESSELS (§188-199)

SUBCHAPTER V - MARINE OCCUPATIONAL SAFETY AND HEALTH STANDARDS (§197-199)

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