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Learning launch lessons

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AND suddenly, almost overnight, a safe form of travel has become a dreaded one. The cost was affordable and the journey was tranquil except for the noisy engine. To some extent night travelling was convenient. Luggage never seemed a problem in spite of endless loading of goods. The food was good and toilets were not. But all the plusses went thousands of leagues under with two successive launch disasters within a span of three weeks.

MV Salauddin2 sunk in bad weather in River Meghna near Shatnal in Matlab, Chandpur on 3 May 2002 and MV Shuva went under River Baleswar in Mathbaria, Pirojpur twenty days later. 'Nearly four hundred' persons died. We live a wretched life, for till this day we have not been able to ascertain exactly how many perished in the two mishaps. MV Shuva was never salvaged.

These were not the first launch capsizes in the country. The catalogue is long and painful to those who have lost near ones, horrendous to those who live by their conscience. Whether we have heard the last of such grim tales depends a lot on the seriousness of the government to deal with the tragic incidents, sincerity to bring the culprits to the dock, obligation to bar unqualified personnel from all sectors starting from concept through design to construction and operation, commitment to take effective administrative measures to minimise the possibility of any repeats.

We seem to consider any catastrophe as destiny. As if we had no liability, as if there was nothing to be done, as if no one had been enjoying employment in dedicated posts, as if there is no science... there is total lack of humanities.

In civilised societies, as an example, the railway minister resigns after a train accident, not that he was personally at the wheels. But, he resigns because he acknowledges that as minister he was in charge. Acceptance of responsibility breeds from accountability. Here there is apparently none. Here interested quarters hanker to be invited as chief guests and special guests, eager for the bouquets, and ever ready to deflect the brickbats to someone subordinate, someone remote, some scapegoat, not necessarily animate.

Just as in any fire 'short circuit' is the dumb scapegoat, it is 'bad weather' in any launch disaster. That is more a view of a layman, which definition includes passengers, newspaper readers, pilots, politicians, and directly responsible government technologists and officials. Inquiry committees, unfortunately not always manned by worthy, competent and gutsy persons, are now picking up the cue.

There is more to it than meets the eye, and ear. Learned and unprejudiced opinion would lead us to a different understanding. Today we present to our readers two experienced naval architects, both academics, Mr. Abdur Rahim and Dr. M.R.H. Khondoker. Their objective evaluation should provide inroads in resolving the ills of river communication.

Today's issue of AUC is in continuation of The Daily Star's endeavour to probe into the causes and means of prevention of launch disasters in the wake of MV Salauddin2 and MV Shuva, one mode of which was a Roundtable Conference on 29 May at the daily's headquarters in which the Shipping Minister, naval architects, ship owners, and other concerned professionals participated. That group is scheduled to meet again in three months time to review the progress made since. It is hoped that today's contemplation will in some way contribute to that undertaking.

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BUET

Salvaging a sunken vessel : After many a life lost.

FILE PHOTO: STAR

Safer river travel possible

ABDUR RAHIM AND M.R.H. KHONDOKER

THE recent sinkage of MV Salauddin2 and MV Shuva, claiming about 400 lives, calls for serious deliberation on the actual problems faced by the water transportation sector, not that such discussion and writing did not follow previous such accidents.

Bangladesh has a navigable waterway of 8,300 km during the monsoon and 5,200 km during the dry season. These river routes play a vital role in the movement of goods and passengers in a country. There are few thousand registered cargo and passenger vessels of various sizes and types, and thousands of mechanized and non-mechanized country boats operating in the inland and coastal waters.

The most critical area of the poor performance of the water transport sector relates to the safety of inland vessels. On the basis of statistics of reported cases of marine casualties there is on the average over one major accident every month involving passenger vessels. During the last 12 (1991-2002) years there had been about 170 marine accidents involving passenger vessels taking a toll of about 2000 human lives.

Overloading of vessels causes a good number of accidents that are entirely preventable. The other causes leading to loss of property and human lives frequently on the inland waterways are wrong construction and inadequate stability of the inland crafts, incompetence of crew, lack of safety rule, lack of manpower to supervise construction of vessels and navigation errors.

There is no developed standard for assessing the stability of such vessels. IMO (International Maritime Organization) Criteria A.167 is generally employed. Due to the obsolete computation methods used, it is not generally possible to accurately predict performance of the vessel in real life operation. Vessels involved in accidents apparently possessed poor stability but were found to have satisfactory stability as computed. An evaluation of the method for assessment of stability should be made to arrive at a more realistic basis for this evaluation.

A brief description of the major accidents occurring in the inland waterways of the country is necessary to impact an understanding on the typical circumstances of the accidents, the extent of loss in each incident and also the background of the present awareness on the safety of lives.

Two serious accidents took place in quick succession in 1986. One involved MV "Atlas STAR" on 20.04.86 with loss of 189 lives. The other involved MV Samia on 25.05.86 with loss of 228 lives. Both of the accidents took place in rough weather. The sinkage of MV Rajhongshi due to the collision with MV Jalkapot on 27.12.2000 night caused loss of more than 200 lives. Soon after this, another tragic accident took place involving a passenger vessel in Meghna River under Bhola district in which a small passenger launch capsized under the influence of waves created by a large sized oil tanker passing close to it. The recent sinkage of MV Salauddin2 and MV Shuva due to their inadequate stability and lack of watertight compartment also caused 300 and 100 fatalities respectively. The unofficial figures reported by the press were much higher. These accidents brought to the forefront the importance of ensuring safety of life and property in the inland waterways of Bangladesh by improving the safety standards of life and property in the inland vessels, enforcement of related rules, and emphasized the requirement of the restructuring of the inland water transport administration.

In order to avoid repetition of such accidents and loss of lives, some statutory and operational regulatory measures have been taken during the past decade or so, but with very little success. On the other hand, the issues involved with the highly desired matter of safety are neither intricate nor difficult to identify. Many discussions have taken place in different forums followed by promises of remedies and improvements. However, the final outcome has either been 'no action' or decisions without any follow up.

The safety of shipping requires two things: (i) safe ship and (ii) safe operation. A safe ship can be obtained through a safe design and appropriate construction, and safe operation requires an efficient and knowledgeable administration. It appears that we have not been able to achieve either of the two. But it is possible to improve upon the present situation.

The Issue of 'Safe Ship'

To obtain a safe ship, one must **design** appropriately and **construct** as per the design and marine construction standard. Until both are achieved, no one should expect a safe ship ready for operation. Although construction is supposed to be a translation of the design, in real practice, it is the technique, methodology, quality control, etc. adopted during the construction that makes the difference. Apart from thorough supervision, timely and right decisions of the supervising engineers also contribute a lot towards achieving the objective of the design and improving safety of the ship.

Design

The design of ships has many aspects and all are not related to safety. Again, amongst all the aspects related with safety, all do not have the same priority. An elaborate discussion will certainly be exhaustive and highly technical. Here we will deal with the most important ones stability and structure.

Stability

In technical terms, stability means the capability of a ship to remain upright and resisting capsize when subjected to some action such as strong wind and wave impact. During a crisis and in bad weathers the most serious concern is stability. It is unfortunate that not enough has been done to assess the stability of such vessels. The first issue to be resolved is what criteria are to be adopted to assess stability. There is no International Maritime Organization (IMO) standard for inland vessels. However, the inland water transport administrator of the country has adopted IMO Res-167 as standard for stability of inland vessels. It has already been established that this is not suitable for inland vessels. If this criterion is to be satisfied, the centre of gravity of the vessels has to be kept impractically low. Otherwise, the righting arm reaches its maxima at a too low angle to satisfy the criteria. Extensive studies carried out by the authors that consistently reveal that vessels appearing sufficiently stable by other indices fail to satisfy IMO Res-167. The alternative IMO criteria Res- 469 may be recommended but that too requires further study. It is strongly felt that more in-depth studies, especially into the cases of disasters, preferably with tank testing is essential for evolving a suitable criteria. Sunken deck vessel and small open deck passenger launches present a difficult problem for the naval architects. A useful standard for those vessels cannot be specified without some computations and experimental results on the dynamics of flooding, which may be caused by rolling.

Structure

Although structural failures do not cause frequent accidents in Bangladesh but structural integrity is important to prevent flooding of the hull in case of any accident or in adverse weathers. The most serious difficulty faced by the naval architects for designing and constructing inland vessels is that the conventional rulebooks are meant for larger vessels having characteristics and operating environment quite different from inland vessels. As a result, the design methodology described in the standard classification rulebooks very often exerts unrealistic demand on the designers. The design process becomes difficult and the designers have to use his intuitive and qualitative judgment that always has chances of mistakes. For example, for a vessel of size 50 x 12 x 2 (draft) m, designed in longitudinal scantling, the depth of the deck beam and the floor are found to be 400 mm. Although this hull is uncommon (ration of breadth to draft = 6) but is a common one in Bangladesh because of the limited draft available in many rivers during winter. This scantling is unrealistic and even do not allow the necessary man-height between the beam and the floor. Such unrealistic scantlings are found in many cases. Also, it sometimes leads to unending controversies between designers and design approving authorities. Recently it is being well acknowledged that the rulebook is neither the only basis of design nor even a good and a rational one.

In developed countries more emphasis is given to designing ship structures directly using theories of structural design to obtain more rational and economical design. Any design process must have one objective or a series of prioritised objectives. Cost minimization is generally the most prior one. The other may be weight, production time, space occupied by the structure etc. Recent studies show that structural theory based designs are usually more economical and rational than theories based on rulebooks. However, rulebooks and structural theories should not be considered as contradictory, rather supplementary. Initially rules were based purely on experience. Those rules were later modified and rationalized with the help of advances in the field of structural design and analysis. Since such research and studies are exclusively centred on larger ocean going vessels, rules are routinely undergoing improvements. As a result, rulebook based design and results of direct computation are converging gradually.

Unfortunately there have been little studies with small inland vessels. The naval architect still largely use purely experience-based rulebooks although some modifications are periodically done on the rulebooks. That is also based upon experience of failures in rulebook based designed vessels. Such process often dictates stronger scantlings in places where failures or cracks have been observed. This methodology has some inherent drawbacks. Such visual observations generally do not indicate the actual mode of failure and also do not indicate any possible location of over-design. As a result such modifications monotonously lead to generally over-design of the structure instead of making it more economic.

The size, type and other features of inland vessels are undergoing gradual changes. This itself calls for a detailed understanding of the engineering theories and its application in ship design. Such theories are versatile tools for structural design taking direct consideration of the geometry, loading combinations, structural layout, forms, etc. A general drawback involved in design that is not based on rational theories is non-uniform distribution of materials. In this process, use of heavier scantlings does not always result in a stronger vessel. Since design should be always object oriented, a rational design process should incorporate an optimisation of algorithm.

The authors, from their experience, feel that there is a necessity to relax the minimum plate thickness restriction in inland vessels imposed by the existing rulebooks. Similarly the standard spacing specified at the rulebooks sometimes misleads the designer and consequently he cannot arrive at a potential improved design. Situation is similar in the construction sector where there is no set standard for construction practice. The process of setting standard for structural and machinery design as well as construction practice requires extensive theoretical and applied research works. However, painful it is, there is no alternative and a useful standard should be found.

Desperation overriding safety.

PHOTO : AMRAN HOSSAIN

Inland vessels are built in Bangladesh with steel from ship scrap. The reason is economics. New shipbuilding plates being extremely expensive, the ship owner cannot make viable investment by building ships with new plates. Since scrap plates of uniform thickness are not available, vessels built with such materials generally suffer from overweight requiring extra investment, loss of carrying capacity and consequent revenue penalty as well as extra fuel consumption. In spite of such odds, the return on the investment appears to be in favour of such vessels. Moreover, ships built with scrap steel have not shown any serious limitations. Where the design standard is not set, no one can confidently blame the materials for poor strength. However, it is the designer and the construction engineer who has to take the brunt of. The optimum standard has to take into consideration the investment capabilities of the ship owner it can be picked up, the level of machinery utilization in shipbuilding industry etc.

Construction

Most of the vessels operated in the inland water of Bangladesh are constructed in a wrong procedure in mushroom dockyards. In many cases these are built on the basis of wrong designs. Building the vessel first and then obtaining designs approval is also a very common practice. As a result, the actual principal dimensions, hull forms, structural scantlings are different from approved designs. These vessels are built in dockyards with a lack of required technical infrastructure, qualified naval architects and skilled technical manpower. Consequently, the construction remains full of faults, a lot of which are much beyond acceptable limits. In 1986, the government formed a 'Panel of Supervisors' consisting of qualified naval architects and the panel was entrusted with the construction supervision of inland vessels. Unfortunately, due to incompleteness in the definition of responsibility, authority, accountability and liability, the system finally turned up to be a futile exercise. It was found that just one or two naval architects claimed to have thoroughly, extensively and regularly supervised construction of hundreds of vessels every year. This is totally impractical and unacceptable although the Department of Shipping accepted all such declarations without any question. One of the major shortcomings in actual construction is the lack of water tightness of the hull. The BIWTA approved drawings strongly instructs that the hatch openings be watertight. Although this has not directly caused any accident but has accelerated the process of capsize of the vessel causing huge loss of lives.

Use of Scrap

An important issue in the construction of inland ships is the use of ship scrap plates. Usually such plates are used in thickness of 6mm and above. The plates have the inherent drawback of non-uniform thickness and in places reducing by more than 50% of the average or nominal thickness. This has double effects:

(i) The structure can become weak at many isolated locations creating many potential locations for initiation and propagation of cracks

(ii) Due to uneven surface, the scrapings and paintings cannot be done efficiently. The deposits on the surfaces are not removed properly for application of the paint. The paints cannot be applied uniformly too.

In shipbuilding, scrap plates are used from financial point of view. The commercial banks and development financing institutes have identified the shipping sector as a sick sector and thus are reluctant to invest in the same. Almost all vessels are financed with cash resources of the owners. Such resources are generally very stringent and do not allow to procure right quality of materials for the purpose. Second hand plates require frequent repair and replacement. For the same reason, second hand engines are also very common; this too results in huge repair and maintenance cost.

Second hand plates are considered economic for the following purpose

(i) Due to lack of finance, scrap plates are the only option available to the owner.

(ii) There is a lack of quality control in shipbuilding and stringent classification or any other statutory requirement. Hull with very poor standard can pass though the annual fitness survey tests since the resources available to the surveyors are very limited.

(iii) Due to dull business environment, the ship owners do not have to pay penalty or loss revenue due to breakdown or maintenance time. Thus there are no incentives for good vessel and no penalties for poor quality vessel. In such conditions, the scrap plates are all right.

Quality Control

One of the major problems with the construction of ships is the lack of quality control. Although quality control does not exist in case of shipbuilding but a ship owner can buy quality if he wishes. In the above context the commercial practice in the private shipbuilding industry need to be mentioned. Under the presently adopted practice, the ship owner supplies the steel and other shipbuilding materials, including electrode, to the builder. The builder arranges for the site, labour, and electricity, and charges a certain amount for each ton of steel material fabricated. This charge varies widely amongst the contractors. It can be as low as Tk. 12,000 per ton of steel to Tk. 30,000. The difference lies in the quality of shipbuilding. An owner can procure a rightly constructed vessel at a cost, but only if capable of getting the right job done by the builders.

On the micro scale, there is a wide variation in the skill of the workers and foreman. Most of the yards have no adequate infrastructure and equipment, nor naval architect and skilled manpower. In the absence of regulatory procedure or skill certification requirement, people can enter the workforce without having ensured quality. In the 'open market' poor quality workers are hired at lower wages for building ships at lower costs.

The problem with the quality of materials has been elaborated earlier in the article. As regards arc welding electrodes, the main joining material in shipbuilding, there is also a wide variation in the quality. Although, some well-famed and good quality brand rods are used, poor quality electrodes are used in low-cost shipbuilding.

Another major problem in the quality of shipbuilding is the poor electricity supply. There are frequent power failures and thus when power supply is available, the works and the foremen are in a hurry to finish the construction works in order to meet the completion deadline. The quality naturally suffers. During power crisis, drop in the voltage is also common. This causes poor melting of the electrodes resulting in incomplete penetration of the welding, insufficient heat input, and poor crystallization during cooling, all resulting in poor quality construction.

The Issue of 'Safe Operation'

Safe operation of ships depends on a good administration and availability of skilled manpower for operation as well as routine maintenance of vessels.

Administration

The major shortcoming in the inland ship safety administration is the shortage of qualified manpower for various jobs beginning from field level administration to planning and development. This has not only directly affected the safety of the inland water transport vessels but also the sector itself is suffering because of lack of proper planning, forecast, need assessment etc. This is perhaps the reason why there has been very little investment in the sector and the sector is loosing its contribution to the transport sector. In another way, the lack of infrastructure development in the sector has been one of the major reasons of decline and worsening of the safety scenario.

It appears that the procedure for the approval and examination of design, supervision of construction and survey are all in a mess. The first step of the administration is approving the design and drawings of the vessels. The owner submits a set of drawings of the design of a vessel prepared by a qualified naval architect for BIWTA's approval. It is a pity that even in these days BIWTA is performing these duties and responsibilities without being assisted by a computer and relevant software. As a result, many of the faults in the drawings remain undetected. Flaw in the ship operation starts from this very first stage.

The irregularities committed by the Panel of Supervisors have been elaborated earlier. Moreover, although surveyors of the Department of Shipping are assigned to supervise in several important stages of ship construction, the task is never performed. It is also a pity that there are only two ship surveyors with the Department of Shipping to survey 8,000 vessels annually. Two more surveyors have been made available to the Department on deputation from other organisations. Even this is not adequate. In this perspective it is needless to say that in most of the cases, the surveys are mere paper work and have at best little relation with reality. To say that the surveyors should also survey vessels under construction is nothing but an unrealistic proposition.

It is a misfortune that both the Ministry as well as the Department of Shipping are guided by a seriously faulty conception on the qualification requirement of surveyors. There are three distinct disciplines in the maritime sector: (i) graduate naval architects and marine engineers (BUET graduate or equivalent), who are specialised in design, construction, testing and commissioning of ships, (ii) marine engineers (from Marine Academy) with certificate of competency for operation and routine maintenance of seagoing ships and (iii) Master Mariners (from Marine Academy) specialising in commanding ships and navigation.

For reasons totally unknown to anyone except perhaps those who made the provisions, the recruitment rule for surveyors recognises persons with background in engine and machinery operation and routine maintenance in ocean-going vessels as the most important and useful qualification. The graduate naval architects are offered only junior positions and the master mariners are totally disqualified. The reality on the ground, however, is that no inland vessel in Bangladesh has as yet met with an accident for engine failure. Accidents are due to faulty design, errors in navigation or operation. In fact, designers, builders and inspectors are most appropriate to test the plying worthiness of a vessel. Maritime administration in the developed nations and classification societies (Lloyds Register of Shipping, American Bureau of Shipping, Nippon Kaiji Kyokai) employ more graduate naval architects as surveyors than those from any other discipline.

The rule of 1980 offered all the three professionals equal opportunity. Under the darkness of military rule, without consulting the stakeholders, the recruitment rule was modified. It is high time the damaging rules are amended forthwith.

Manpower

Shortage of skilled manpower in operation of vessels is also a serious major cause of concern for the safety of inland water transport. Wages and social status of workers being low, educated youths do not seek employment. Training facilities are minimal. Enforcement of law is very poor. Steps must be taken to ensure availability of skilled and educated manpower in the sector.

Conclusion

Shipbuilding has become a neglected sector in Bangladesh due to lack of coordination amongst the agencies involved. There remains always a very big difference between the approved design and the actual ship. There is need to develop an appropriate knowledge base for the type of vessel, standard for the strength in way of rulebook, an appropriate stability criteria and a criterion for the shipbuilding methodology. Construction supervision and quality control must be ensured by defining responsibility, authority and accountability of concerned persons and institutions. Manning the maritime administration by qualified personnel from relevant disciplines is a must.

Safety costs money and perfect safety is never attainable. On the other hand, even with no effort, some safety is always available from nature. The exercise is thus to arrive at the optimum at a cost that is affordable.

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