Issue XIV

La Ola

The student's E-Newsletter Of
Indian Maritime University - Visakhapatnam Campus

COVER STORY

AIR LUBRICATION

In Bubble Drag Reduction (BDR) small bubbles are injected into the boundary layer. The dispersed bubbles act to reduce the bulk density.

SHIP PROPELLER MAINTENANCE

The propeller is by far the most prevalent means of ship propulsion. Invented in the late 1700's or early 1800's it is used in most modern ships.

Featuring this issue:

HOW TO PREPARE FOR THE
GRE®
GRADUATE
RECORD EXAM

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From the Chief - Editor's Desk

La Ola is entering into its fourteenth edition.

Time flies away here at IMU Vizag campus & you never realise it. The month of October evaporated away under the heat of examinations & festivities. The month kicked off with deep anguish among students about the upcoming examinations, students flooding photocopy shops with notes & lessons. There was a sigh of relief & excitement in the air as the 2 weeks of examinations concluded in a weekend of celebrations. Students had a gala time with 'Dandiya' & 'Ravan Dahan' keeping them engaged.

Meanwhile, the final year Undergraduates & Post graduates were gearing up for their campus placement. Integraph Consulting Pvt. Ltd, Hyderabad kick started the placement drive in the campus this year. I congratulate Dhruv Prajapati for his selection to Integraph Consulting Pvt. Ltd., Hyderabad & wish him a very happy & successful career ahead.

It is one year since we lost three of our friends – Girdhar, Om & Shivam. A condolence meeting was organized. Three trees were planted & a candle lighting program was also organised.

This edition of La Ola brings to you lots of informative & thought provoking snippets. The cover-story on 'Bubble Drag Reduction' is an interesting one. 'Submarine Design III' is a continuation of our series on Design of Submarines. Insights into Windows 8, the new Operating system in town is also part of this issue. Also included is a technical article on Ship Propeller Maintenance, in two parts.

Undergraduate life is an important one in deciding your life ahead, hence this issue covers information on Higher Studies in USA (particularly MS) under 'Your Life Ahead'.

La Ola being a campus newsletter offers you the best platform to present your inspiring ideas & views. Therefore, use this space to tell us what you think. We look forward to your contribution, which is what keeps us going.
Team La Ola is committed to giving its readers the best of talent on this campus.

I sincerely thank our beloved Director, Prof. SC Misra & La Ola Advisor Mrs.Padmashree for the opportunity given to my team & me.

Happy Reading!!

AnishChacko,
Chief Editor - La Ola.

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AIR LUBRICATION

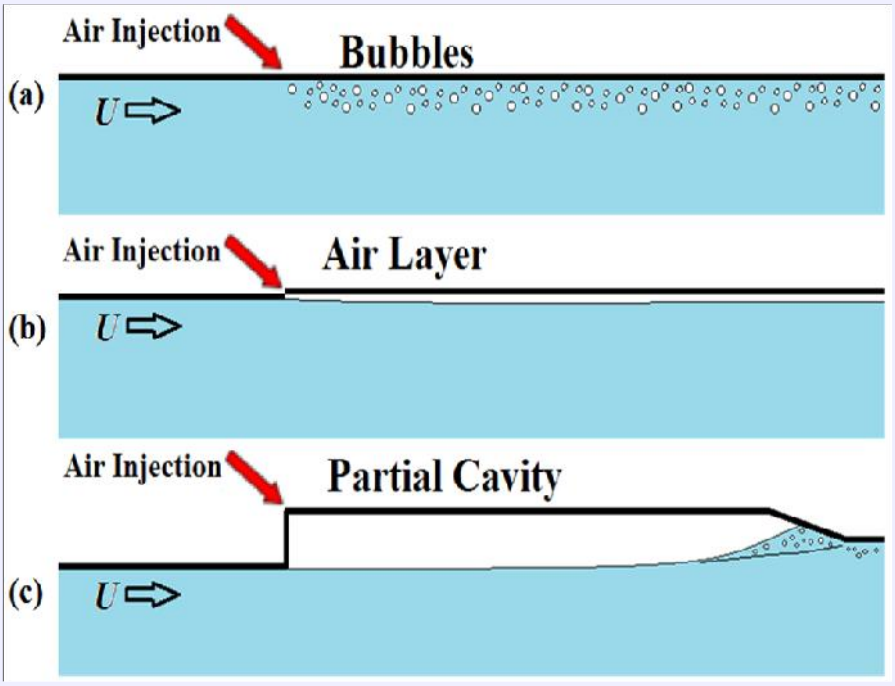
Shipping is vital for global commerce, as it is generally one of the most economical and environmentally friendly transportation methods. In addition to the commercial shippers, the world's navy and numerous cruise lovers need and want, respectively, shipping to be as economical as possible with minimal environmental harm. Since approximately 60% of a typical ship's propulsive power is required to overcome frictional drag, any technique that could significantly reduce a ship's frictional resistance might have a substantial impact both economically and environmentally.

Due to environmental concerns and rising fuel cost, it would be advantageous for the future of the shipping industry to reduce fuel consumption. One potential way to achieve this is by reducing the ships' resistance. Without major hull form changes or decrease in operational speed, the form and wave resistance of a ship are mostly fixed and only frictional drag could be reduced.

As interest in drag reduction has increased over the last two decades, several research projects in the USA, Europe and Asia have investigated the possibility of reducing frictional drag by using air lubrication. Air lubrication is achieved pumping air beneath the hull and thus reducing the area of hull in direct contact with the liquid flow, or in the case of discrete bubbles by modification of momentum transport and average density in the boundary layer. If properly implemented, it is estimated that air lubrication could lead to net fuel saving between 5 and 20%, with the corresponding reduction in NOx, SOx, particulate and CO2 emissions.

Air lubrication techniques can be divided into three major categories:

- Bubble Drag Reduction (BDR)
- Air Layer Drag Reduction (ALDR)
- Partial Cavity Drag Reduction (PCDR)



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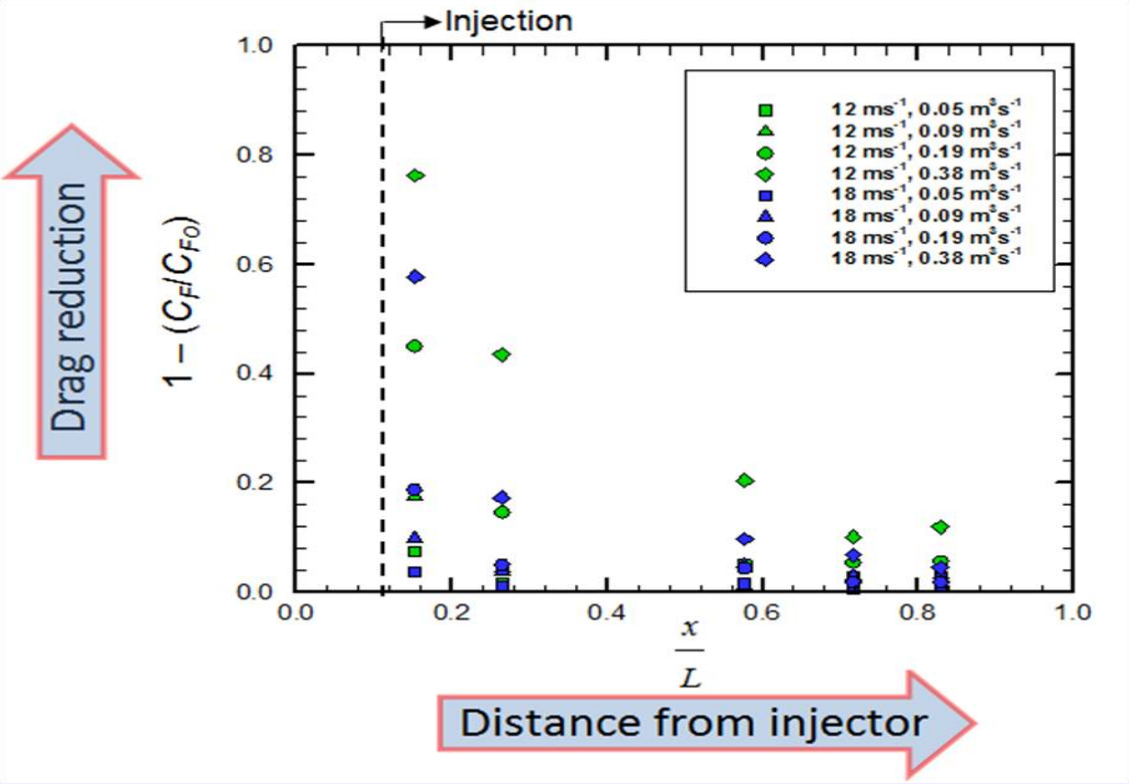
In this article we would be talking about Bubble drag reduction.

Bubble drag reduction



In Bubble Drag Reduction (BDR) small bubbles are injected into the boundary layer as shown in the first sketch of figure 1. The dispersed bubbles act to reduce the bulk density and to modify turbulent momentum transport. The technique is sometimes referred to as micro bubble drag reduction, when the bubbles are very small compared to the boundary layer thickness or wall units. This technique is subject of many studies (Kodama *et al.* 2000 and Sanders *et al.* 2006) and some discuss whether the drag reduction mainly comes from modification of effective viscosity, density change, turbulence modification, or change in momentum transport.

However, many of the early and most promising studies were conducted at the laboratory scale and questions remain regarding the technique's suitability to ship scale; how much gas injection is needed?, what is the maximum possible FDR?, how far downstream from injection site will FDR persist?, how important is the bubble size?, performance in salt water?, what is the best injection method?, etc.

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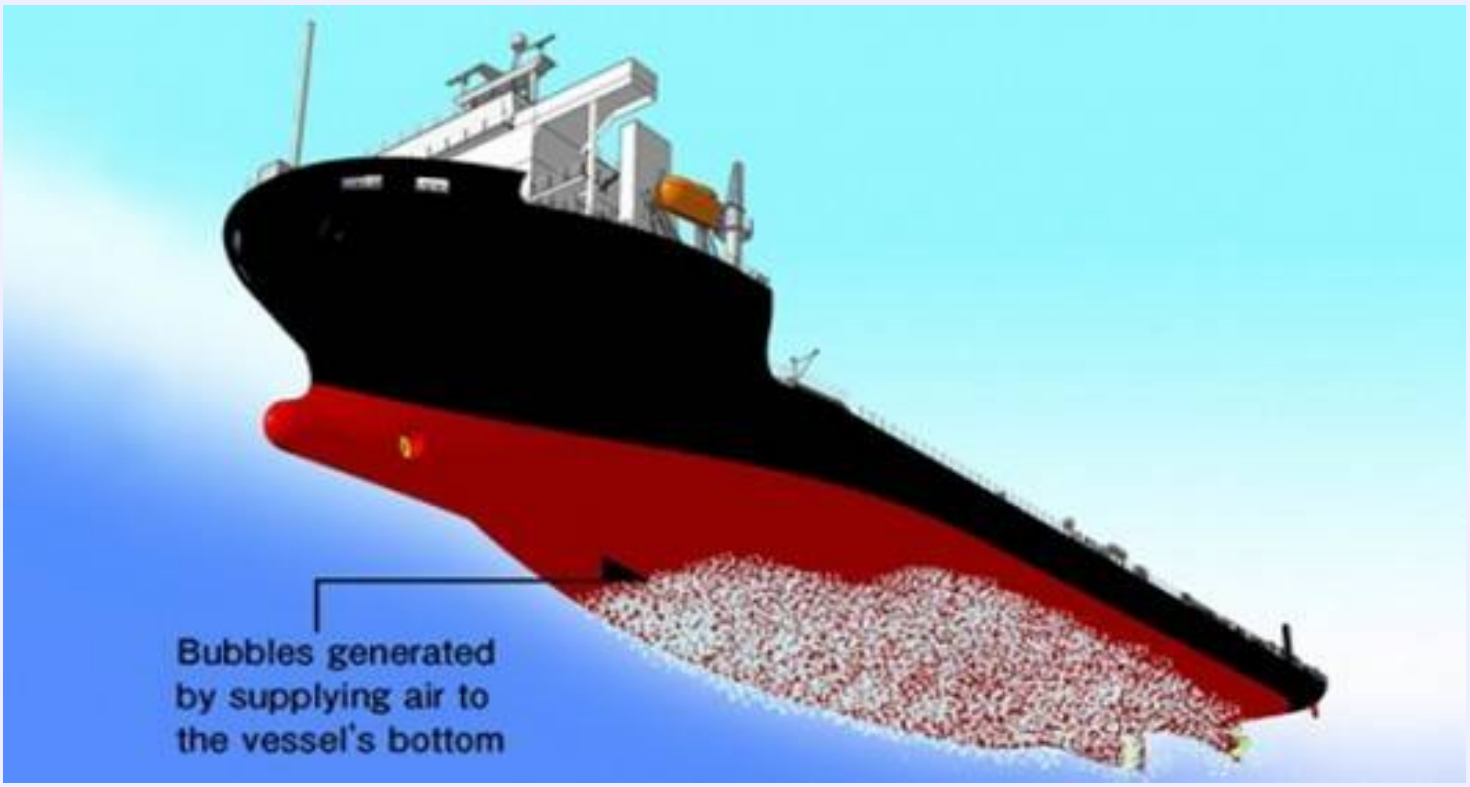

Mitsubishi Heavy Industries (MHI) has developed a new bulk carrier able to reduce CO2 emissions by 25% using bubbles. Further, the Mitsubishi Air Lubrication (MAL) system will be included in the design of three grain carriers for Archer Daniels Midland Company (ADM) of the U.S.

The MAL system reduces frictional resistance between the vessel hull and seawater using air bubbles produced at the vessel bottom. According to Mitsubishi the ADM vessels, to be built by Oshima Shipbuilding of Nagasaki Japan, will also feature a high-efficiency hull form and a newly designed bow shape that will reduce wave-making resistances. To enhance propulsion, the ships will feature positioning fins forward of the propellers.

Currently at least four other large projects on BDR are going on worldwide. At last Bubble drag reduction has a very promising future especially for the flat bottom ships and with high length-to-beam ratios.

References: 1) Technical Paper—Decreasing Frictional Resistance by Air Lubrication by E J Foeth, MARIN 2) Sustainable Methods for optimal Design & Operations of Shiips with Air Lubricated Hulls (SMOOTH) by Maritime Research Institute of Netherlands (MARIN)

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SHIP PROPELLER MAINTENANCE

By Dilip Singh Kharra, 3rd Year B. Tech (NAOE)
IMU Visakhapatnam Campus

The propeller is by far the most prevalent means of ship propulsion. Invented sometime in the late 1700's or early 1800's nearly all modern ships rely on this handy device to make any progress through the water at all.

The problem of propeller roughness has been well researched and documented, not only in its nature but also in terms of the different causes of the roughness and of the effects that varying degrees of propeller roughness have on vessel fuel efficiency.

When the issue of ship performance occurs, most attention is given to the hull roughness problem which is often cited as the cause of reduction in performance in ship operation. In practice a significant contribution to the reduction in performance may be due to propeller roughness. Alternatively, in absolute terms, propeller roughness is less important than hull roughness, but in terms of energy loss per unit area, propeller roughness is significantly more important. In economic terms, high return from relatively cheap investment can be obtained by propeller maintenance.

Causes of propeller roughness:

There are a number of reasons why propellers can be rough and get rougher in service.

- Manufacture Defect
- Corrosion
- Marine Fouling
- Cavitation Erosion
- Impingement Attack
- Improper Polishing or cleaning
- Mechanical damage from impact with objects

Manufacture

The material used to make the propeller; the method and standard of manufacture are factors that have a significant bearing on the propeller's smoothness or roughness. Today, propellers are made from bronzes or stainless steels. Cast iron has virtually disappeared from use. For the last 20-30 Year's nickel-aluminium bronze has become the material of choice and now accounts for over 80% of the propellers made.

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Impingement attack

A ship's propeller travels at relatively high speed through the water. The tips may be traveling (in circular motion) at 100 km/ hour or faster. Ocean water is far from pure. It contains abrasive particles. The impingement attack is by these abrasive particles as they come in contact with the leading edge region of the propeller, particularly the outer tips furthest from the hub, where the speed is greatest.

Mechanical damage (contact)

Due to its position and shape as well as its speed, the propeller is prone to damage from coming in contact with solid objects. Propeller blades can be bent, broken, cracked, scratched and dented and this will obviously affect the surface smoothness and the fuel efficiency of the propeller. Improper cleaning or polishing whether performed in the water or in dry dock, poor quality propeller polishing can result in increased roughness. When a ship is in dry dock, the propeller can be subject to additional sources of roughness.

Corrosion:-

The propeller is subject to both chemical and electrochemical corrosion. Almost all propellers in use are uncoated, unpainted, bare metal. The moment the propeller is immersed in water it becomes the cathode in the 'hull propeller electrolytic cell'. The electrolysis as well as the simple chemical effect of saltwater on the bronze or other alloy, form a dual corrosive source.

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Calcareous Deposits

After a while in the water, propellers develop a tenacious, hard, rough layer of calcareous chalk.In practice this layer of calcareous deposits can be quite hard and time consuming to polish off. If propeller cleaning is frequent enough, the calcareous build-up is prevented or retarded and the propeller is much easier to be kept clean and smooth.

Cavitation:-

Hydrodynamic cavitation is a phenomenon that accompanies turbulent fluids. In this case, the turbulence in the fluid is caused by the propeller's motion through the water, resulting in areas of greatly reduced fluid pressure. Due to the low pressure, the water vaporizes. This causes small vapour -filled cavities or bubbles in the fluid up to about 3mm in diameter. The cavities travel through the water and the pressure around them increases, causing them to collapse suddenly.

The implosion of the cavities is accompanied by a complex set of physical processes. The collapse of the cavities is accompanied by very high pressure pulses, speeds and temperatures which cause damage to the metal surfaces where this collapse occurs. The cavitation which can wear away parts of the propeller blades comes in different forms. Understanding them is not necessary to appreciate that the damage can be extensive and expensive.

Cavitation erosion, electrolytic and chemical corrosion combine to multiply the damage to the propeller's surface and therefore the roughness of the blades.

Whatever the cause, the effects will be mitigated if the process is caught at early stages of development and addressed promptly with proper cleaning of the propeller.

It is more important for propeller designers to make the distinction among cavitation erosion, electrolytic & chemical corrosion since all of these sources of roughness can be reduced through correct design and fabrication (and possibly coating) of the propeller in the first place.

The next part will cover Effects on fuel consumption; common propeller cleaning mechanisms followed; cost of cleaning.

References: 1) PNA Volume II, 2) Articles on propeller maintenance, 3) Basic Ship Propulsion by Prof. R P Gokarn & Prof. J P Ghose.

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YOUR LIFE AHEAD....
MS in US !!

Student life in a University is one of the most formative years in one's career. It has a far reaching impact on the person's life – positive or negative. These decisions include prioritizing career options & identifying the best one for you.

'Your Life Ahead' presents a complete story on 'MS in US'

Master of Sciences or MS is one of the most sought after courses by international students (particularly students from India) in the United States of America. Most of the leading American Universities use GRE Scores as a criterion for selection of students to their Post Graduate Program. Furthermore, theses scores are also used for admissions into Doctoral Programs at these universities.

Several Universities in the United States of America (USA) offer Post Graduate as well as Doctoral Programs in Naval Architecture & Ocean Engineering. Universities & institutes offering these programs include:

STEVENS INSTITUTE OF TECHNOLOGY; **VIRGINIA TECH COLL OF ENGG.**; **UNIVERSITY OF MICHIGAN**; **UNIVERSITY OF NEW ORLEANS**; **FLORIDA ATLANTIC UNIVERSITY**; **FLORIDA INSTITUE OF TECHNOLOGY**; **MASSACHUSETTS INSTITUTE OF TECHNOLOGY.**

The Examination:

GRE – Graduate Record Examination, is a test that is conducted by Educational Testing Services, in various centers worldwide & is used by Universities across the world as an entrance criteria for their Post Graduate Programs commonly referred to as MS or (Master of Sciences).

The exam aims to measure verbal reasoning, quantitative reasoning, analytical writing and critical thinking skills that have been acquired over a long period of time and that are not related to any specific field of study.

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The cost to take the test varies between US$130 and $210, depending on the country in which it is taken, although ETS will reduce the fee under certain circumstances. They are promoting financial aid to those GRE applicants who prove economic hardship. ETS erases all test records that are older than 5 years, although graduate program policies on the admittance of scores older than 5 years will vary.

The computer-based GRE General Test consists of six sections.

The first section is always the analytical writing section involving separate issue and argument tasks. The next five sections consist of two verbal reasoning sections, two quantitative reasoning sections, and either an experimental or research section. These five sections may occur in any order. The experimental section does not count towards the final score but is not distinguished from the scored sections. The examinee is free to skip back and forth within sections. The entire testing procedure lasts about 3 hours 45 minutes. One-minute breaks are offered after each section and a 10-minute break after the third section.

The paper-based GRE General Test consists of six sections and is only available in areas where computer-based testing is unavailable. The analytical writing is split up into two sections, one section for each issue and argument task. The next four sections consist of two verbal and two quantitative sections in varying order. There is no experimental section on the paper-based test.

Verbal section

The computer-based verbal sections assess reading comprehension, critical reasoning and vocabulary usage. The verbal test is scored on a scale of 130-170, in 1-point increments (Before August 2011 the scale was 200–800, in 10-point increments). In a typical examination, each verbal section consists of 20 questions to be completed in 30 minutes. Each verbal section consists of about 6 text completion, 4 sentence equivalence, and 10 critical reading questions. The changes in 2011 include a reduced emphasis on rote vocabulary knowledge and the elimination of antonyms and analogies. Text completion items have replaced sentence completions and new reading question types allowing for the selection of multiple answers were added.

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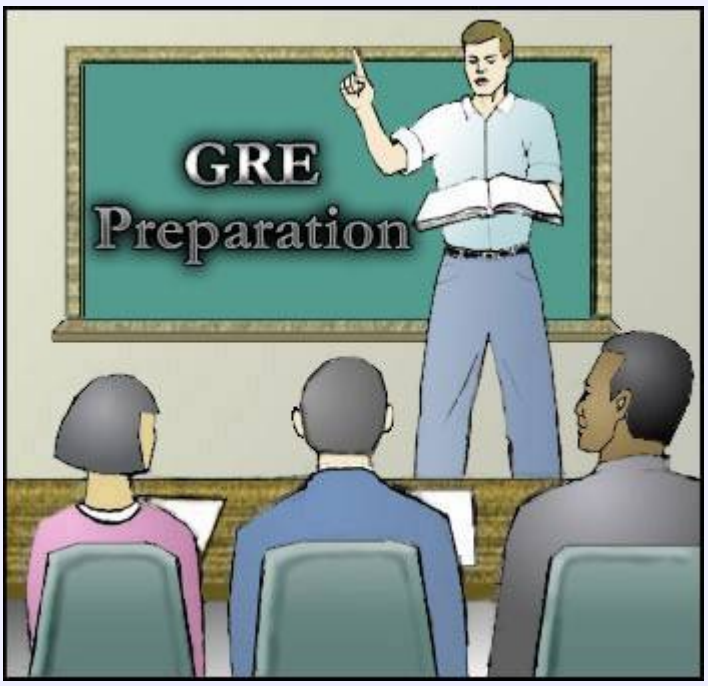
Quantitative Reasoning section

The computer-based quantitative sections assess basic high school level mathematical knowledge and reasoning skills. The quantitative test is scored on a scale of 130–170, in 1-point increments. In a typical examination, each quantitative section consists of 20 questions to be completed in 35 minutes. Each quantitative section consists of about 8 quantitative comparisons, 9 problem solving items, and 3 data interpretation questions. The changes in 2011 include the addition of numeric entry items requiring the examinee to fill in a blank and multiple-choice items requiring the examinee to select multiple correct responses.



Analytical writing section

The analytical writing section consists of two different essays, an "issue task" and an "argument task". The writing section is graded on a scale of 0-6, in half-point increments. The essays are written on a computer using a word processing program specifically designed by ETS. The program allows only basic computer functions and does not contain a spell-checker or other advanced features. Each essay is scored by at least two readers on a six-point holist scale. If the two scores are within one point, the average of the scores is taken. If the two scores differ by more than a point, a third reader examines the response.

Issue task

The test taker is given 30 minutes to write an essay about a selected topic. Issue topics are selected from a pool of questions.

Argument task

The test taker will be given an "argument" and will be asked to write an essay that critiques the argument. Test takers are asked to consider the argument's logic and to make suggestions about how to improve the logic of the argument. Test takers are expected to address the logical flaws of the argument, not to provide a personal opinion on the subject. The time allotted for this essay is 30 minutes. Arguments are selected from a pool of topics.

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Experimental section

The experimental section, which can be either a verbal, quantitative, or analytical writing task, contains new questions ETS is considering for future use. Although the experimental section does not count towards the test-taker's score, it is unidentified and appears identical to the scored sections. Because test takers have no definite way of knowing which section is experimental, it is advised that test takers try their best on every section. Sometimes an identified research section at the end of the test is given instead of the experimental section. No experimental section for the paper-based GRE

A list of important links are as follows:

GRE Website:
http://www.ets.org/gre

List of colleges teaching Naval Architecture & Ocean Engg.

UNITED STATES NAVAL ACADEMY:
http://www.usna.edu/NAOE/links.htm

Comparison of Colleges/ Universities along with ranking & GRE Cut off scores:
http://www.msinus.com/content/gre-universities-486/

STEVENS INSTITUTE OF TECHNOLOGY:
http://archive.stevens.edu/ses/ceoe/Grad/ocean.html

VIRGINIA TECH COLL OF ENGG.
http://www.aoe.vt.edu/graduate/master-of-science-degree.html
http://www.aoe.iddl.vt.edu/App_Reg.html
http://archive.stevens.edu/ses/ceoe/Grad/

UNIVERSITY OF MICHIGAN
http://name.engin.umich.edu/gradu/admission-requirements

UNIVERSITY OF NEW ORLEANS
http://registrar.uno.edu/catalog/1213catalog/graduate_school/grad_engr.cfm

FLORIDA ATLANTIC UNIVERSITY
http://www.ome.fau.edu/oegmsadmiss

FLORIDA INSTITUE OF TECHNOLOGY
http://www.fit.edu/programs/grad/ms_ocean_engineering

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
http://oe.mit.edu/students/academic-programs/
http://meche.mit.edu/academic/graduate/
http://meche.mit.edu/documents/MechE_Grad_Guide.pdf

This information should help you analyse & make a wise decision finally.

Wish you all the very best of luck!!

References: 1) GRE website 2) Book - The Global student by Maya Frost

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WINDOWS 8 - THE REVIEW

Follow Jitenjot Singh, as he reviews the new WINDOWS 8

USER INTERFACE:

Windows 8 tries to tie Windows login to Microsoft account .Windows 8 is designed to be part of an eco system alongside Windows Phone & Windows RT. Microsoft believes in the idea so strongly that it has made the Windows 8 user interface primary interface for Windows Users

The Windows 8 interface acts as the Start menu now instead of appearing as columns of small icons that pop-up when you click the Start button. All the applications show up as titles on the Windows 8 Start Screen.

Its important to realize that the Start screen is no-more the Windows 8 than the Windows 7 or Windows XP. The screen exists as launch pad for applications, not as a desktop replacement That concept is easy to forget, since the Start menu occupies the entire screen space. However not all the desktop applications appear on the Start screen by default.

Live tiles are among the key features of the Windows 8 start screen. While normal(non-live) tiles measure 150x150 pixels , most live tiles are double wide 310x150 pixels and display dynamic information . The People tile for instance shows tweet and Facebook posts from feeds, assuming that you have set them up.

Navigating the start screen is easy if using the mouse with a wheel, moving the wheel scroll left & right , if using a touchpad , swiping left n right scrolls the list. Individual tiles can be dragged to any location .

PERSONALIZING WINDOWS:

If you don't like Windows 8, you can customize it , with some exceptions. Perhaps the most controversial exception is the fact that you can't set Windows 8 to boot directly to

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Since the start menu consist of group of tiles , moving tiles to the left side of the screen is pretty easy . You can also specify the tile size and turn off live-tile updates if you find them distracting, in addition you can group tiles by program type, such as business applications, games & so on.

STORAGE & FILE SYSTEM:

Windows 8 include a new file storage system called ReFE (Re-silent File System) it is compatible with most NTFS file features and as the name suggests , it adds features to improve data integrity .Features left out include Bit Locker , Compression, and 8.3-format short filenames. Windows now provide multiple levels of system repair . "Reset" opinion nukes the hard-drive and reinstalls Windows from scratch. This option can be used to get the machine back to a factory-fresh Windows install, without the need for a new windows key or the Windows setup disk

HARDWARE & DEVICES:

The base PC hardware requirement for windows 8 are the same as they were for Windows 7-prehaps even a little less stringent. That means Windows 8 should run more effectively on for example , machines using the latest Intel-Atom processors , as to be seen on some Windows 8 tablets

Beyond the basics Windows 8 supports the new hardware , the most obvious being touch enabled hardware. Windows 8 supports the full ten-point multi-touch , including support for multi-finger and even two-handed gestures. What seems to be missing at this point is range of desktop displays supporting ten-point multi touch . PC companies are readying a number of all-in-one system with touch, but traditional desktop system with touch display as well as stand alone touch-enabled displays , seems to be nowhere in sight .

FLAVOURS:

Windows 8 -- this is a ordinary version designed for most users , with both 32 & 64-bit versions in the same box as before. It includes live tiles , Window Store , IE 10 , connected stand-by. It includes Encrypting File System & virtual hard disk booting , its the only version that supports the Pro Media Centre add-on and if you have windows 7 ultimate or Pro or windows XP, you can only upgrade to Windows Pro.

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It's Win8 Pro , essentially , with some features to help the IT Department remotely troubleshoot Enterprise, administer and update all the PCs . Win8 Enterprise can be bought if you are part of Microsoft's expensive Software Assurance scheme , which is pointless for home users

Windows RT-- The Windows version you'll use on Tablets. this is cut down version of Windows de-signed for touch screen devices. It comes with Office 2013 and support device encryption but you can't use it for your desktop even if you want it .

Fresh Generation of Devices which can use WINDOWS 8:

HP Elite 900 Tablet
HP Envy Ultrabook 4
HP Envy All-in-One
Fujitsu Stlistic Q702
Lenovo ideaCentre A720
Acer Iconic W700 Tablet
Microsoft Wedge Touch Mouse & Wedge Mobile Keyboard
Samsung Series 7 Slate

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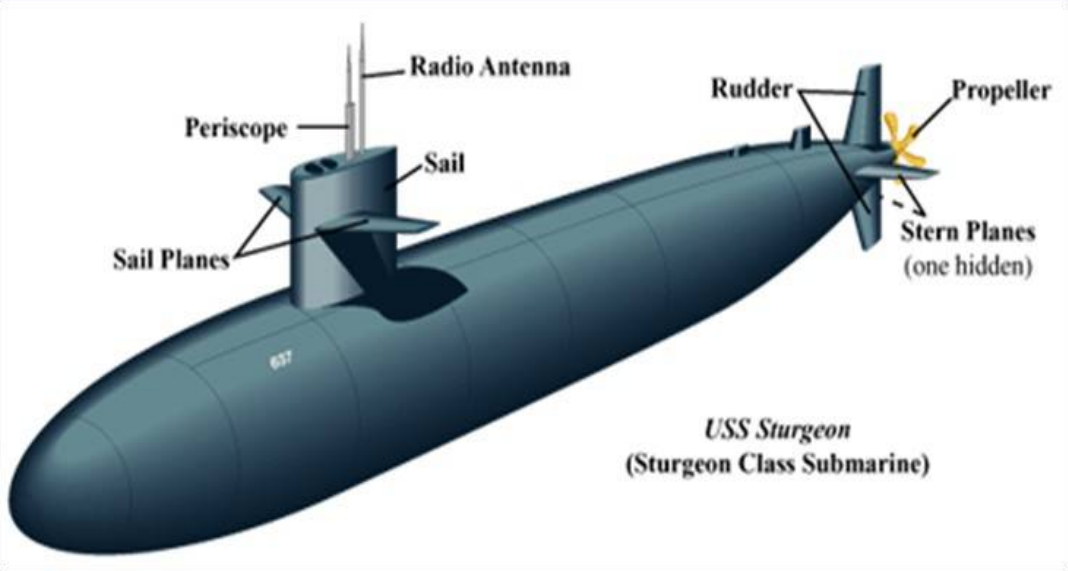
SUBMARINE DESIGN PART III

CONTROL SURFACES:

Some appendages are necessary for control and cannot be eliminated. These are the forward hydroplanes needed for accurate depth keeping. Bow mounting gives better control especially on the tear drop hulls where the bows tend to rise near the surface. They also provide more rapid diving. Fin mounting creates less water & hydraulic noise near the bow sonar but does not give good control.

The aft control surfaces may be either X or cruciform. Mounting forward of the propeller produces a noise-producing wake from each control surface, affecting smooth propeller behavior. Aft mounted control fins when fully movable (because they are operating in a thick boundary layer at the aft end of the submarine) would suffer boundary layer separations on the low pressure side of the fin when it is angled for course corrections. These separations would cause unwanted noise and drag. If this is the case, then a non-moving cuff would take better care of the flow problems at the fin-hull intersections.

A disadvantage of the fully moving sail-mounted forward fins comes from the loading on the shaft and bearings that have to operate when under full hydrodynamic bending loads. To absorb these very high bending loads in the encased mounting requires both large diameter shafts and wide spacing between the double bearings. This mitigates against any desire to narrow the width of the sail, an example of the consequences of a design decision.



Alternatively, the forward fin could have a fixed forward portion, the transverse beam (spar) carrying the bending loads could extend through the sail, therefore carrying the bending loads in an efficient manner, the sail could then be narrower, the sail drag would be smaller and the diving control would occur through the adjustable portions hinged aft of the main spar. Any changes in control surface arrangement need to be studied by CFD and wind tunnel tests to check the effects on turning circles and dynamics and control.

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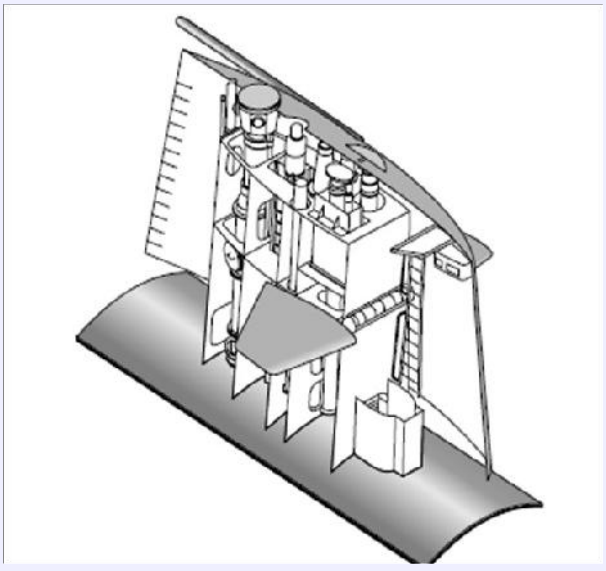
SAILS:

The major appendage is the fin (sail, conning tower, bridge, fairwater), which is a large contributor to the overall drag. A large sail may contribute up to 30% of total resistance and a fully appended hull may have between 20 to even 60 % more resistance than a bare hull.

Now, you may consider using a small sail, which contributes only 8-10% of the total resistance. However this will lead to other problems and is an example of the conflict in design. The small size of the sail restricts the number of sensor masts for proper operational functioning; the required number cannot be accommodated.

The sail has a number of important functions, it provides:
•Stowage and support for the masts when raised,
•A conning position when in harbor for berthing,
•Safe transfer to the open deck at sea without swamping,
•Underwater handling stability, and
•An ability to operate covertly while submerged at shallow depth.



Thus, there needs to be a balance in choosing sufficient sail height. If it is too short there won't be enough support for the masts or the boat speed will be restricted with raised masts. It is desirable to keep the submarine as deep as possible while using the periscope especially in bad weather. On the other hand if the sail is too tall the snap roll can be excessive.

The sail plays an important part in the dynamic stability of the vessel. Where it has been located in the past has been determined to a large extent by the needs of the hull penetrating periscope.

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The drag on the sail is composed of pressure drag, skin friction drag and interference drag, which originates at the join of the sail to the top of the main body. The interference drag is common to all appendages joined to the main. When operating at an angle of incidence as in a turn, further drag is created by the tip vortex and is called induced drag.

According to Richard Von Mises –"If to a well streamlined body, some appendage is added, the resultant drag is larger than the sum of the two drag forces that are found when each part is tested independently. The surplus depends on the location of the disturbing part and reaches its maximum when the location is aft of the maximum cross-section of the main body. The drag contribution due to the interference is on average 30% and in the worst case it is more than 50% of the separate drag of the additional body.

Skin friction is minimized by keeping the sail as small as possible. The skin must be as smooth as possible with no obtrusive edges, joins or holes. All masts should fit smoothly into the outer skin.

Pressure drag is minimized by a proper streamlined shape with maximum thickness about45-50% of chord. Whether laminar flow can be achieved on the fore part of the sail is uncertain. The thickness-to-chord ratio should not be greater than 12.5%.

Extra drag is created along the internal corner between the top of the hull and the side of the sail, which is where the angle between the two surfaces is less than 180 degrees.

Contra-rotating vortices are formed along longitudinal corners as well as the skin friction increasing. The interaction of the two boundary layers, one on the body, the other on the appendage, can create higher pressure-drag.

FLOOD OPENINGS:

Flood openings, holes in the hull & casing represent a measurable and unwanted source of noise and drag. The sail and casing can contain a large amount of water, which has an adverse effect on stability when surfacing until it drains. It is essential that it drain very quickly.

Holes are a source of noise as well as drag. Special attention has to be paid to the shaping and alignment of these openings to avoid additional drag.

A less costly and complicated solution is to arrange venetian grills which present an acute angle to the oncoming flow but allow a large area for cross-flow of water to/from the internal volumes.

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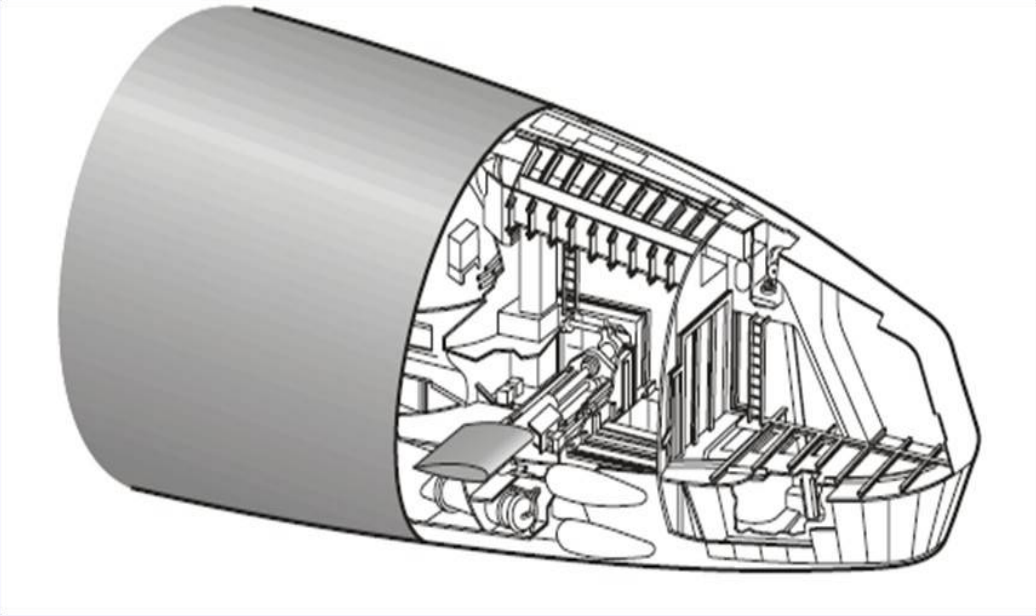
NOSE SHAPE:

The shape of the nose is most important, as it is associated with the positioning of acoustic sensors and torpedo tubes as well as the starting conditions for the flow around the hull. One solution is to place both major items one above the other and wrap a shape about them as a cover. This may lead to some unfortunate consequences.

One solution could be passive sonar located in an isolated point well ahead of all other items. In order to achieve higher speeds and lower noise levels a more careful design of the hull form is required which leads to a more slender shape of the fore-body. The resistance may increase substantially if a hydroplane dome is not properly integrated in the fore-body.

Mr.Sten Hellstrom, a Swedish scientist in his paper on Hydrodynamic aspects in Submarine Design said – “It is vital to have perfect flow around the submarine. Building costs demand a short full submarine and as the required propulsive power follows the magnitude of the wetted surface and only to some extent the fullness, a full form with small wetted area will still have low resistance. The full form will also have a higher mean wake and hence a higher propulsive efficiency. A short submarine is also more maneuverable.



However, increasing the fullness is risky as we approach the limits in all respects.

Full fore-body with risk of separation, unfavorable pressure distribution and transitions at vital areas.

Full after-body close to flow separation and more sensitive to flow disturbances from appendages, deck and keel endings necessitating extreme propeller designs

Short hulls close to instability with high requests on manual steering and autopilot.

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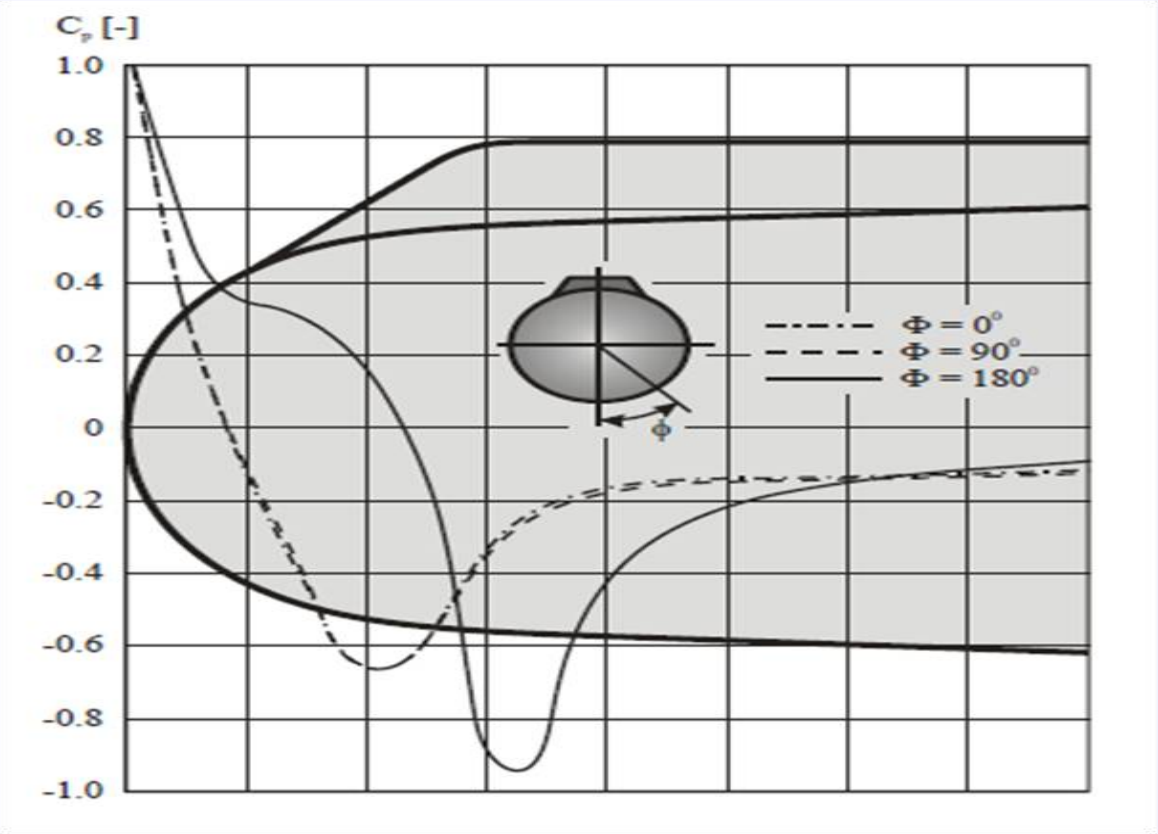

EXTRA DRAG FROM NON-SMOOTH CROSS-SECTIONAL SHAPES:

Consider a 'Chine' (The angle where the bottom of the ship/ boat meets the side.) If a chine is carefully aligned with the flow, a pair of contra-rotating vortices is formed and the skin friction is increased near the corner. If the chine is not properly aligned with the flow then only one vortex is formed on that side of the chine where the pressure is lower.

Von Mises describes the results of the drag on two ideal streamlined bodies, one of circular cross-section and the second of square cross-section. The second body is composed of four chines. The cross-sectional area of the two models is the same. The drag coefficient for the round cross-section was 0.045 and for the square cross-section 0.055,which is over 20% greater.

It is therefore necessary to make the cross-sectional shapes along the hull as smooth as possible, even with the added shape of a casing and to check the transverse pressure distributions which can generate the cross-flows and associated vortices..

References: 1) Aspects of Submarine Design By Prof. P N Joubert.
2) Concepts in Submarine Design by Burcher & Rydill.

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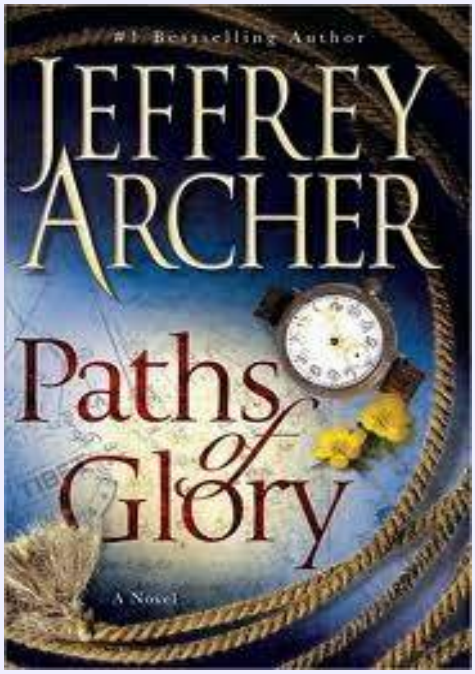
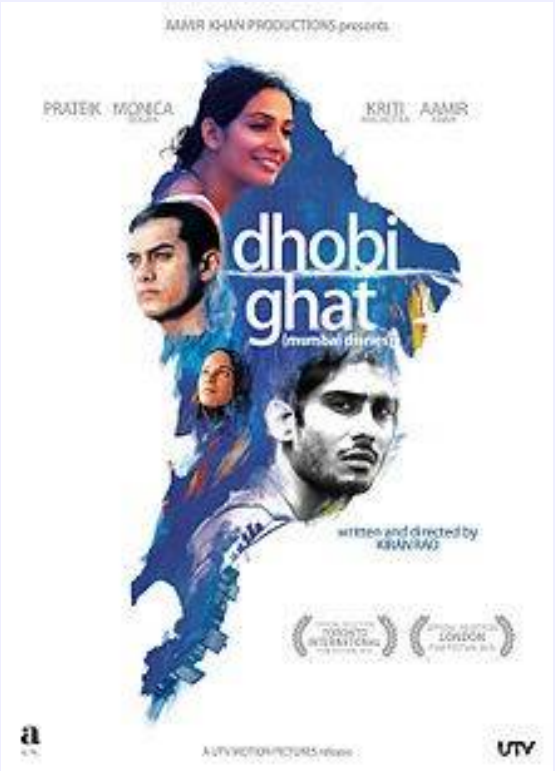
KILL YOUR TIME...

MUST READ- **PATHS OF GLORY** (JEFFREY ARCHER):

A name vanished from the history. A story of a man who loved two women and one of them was the reason for his death. Inspired from true story paths of glory is one of finest books written by the great Jeffrey Archer. But not until you have turned the last page you will not be able to tell if George Leigh Mallory's name should be added to history...because if his name is added then another would have to be removed.

Go for it...relives history.





MUST WATCH – DHOBI GHAT:

Another magnificent work from Aamir Khan Productions – DHOBI GHAT is a beautiful representation of Mumbai on the celluloid. Kiran Rao has done the job of director well. The story chronicles the lives of four characters from different strata of society and how their lives are intertwined forms the rest of the story. With brilliant performances by Aamir Khan, Kriti Malhotra, Monica Dogra and Prateik Babbar as supporting actors the hero of the film is Mumbai. And as Aamir Khan puts it- 'To Mumbai my inspiration my Muse'.

Watch it to relate to the characters and imagine a life in Mumbai.

CONTENTS

CAMPUZZZZ.....

- The Mid Semester Examinations were held during the second & third week of October. The campus had gone into a study mode.

- Campus Placements in the campus kicked off. Dhruv Prajapati of B. Tech (NAOE) was placed in Intergraph Consulting Pvt. Ltd., Hyderabad. La Ola wishes him a very happy & successful career ahead.

- The Campus celebrated Gandhi Jayanti in which an elocution was conducted for the students. The students spoke on 'Sailings of Mahatma Gandhi around the world'.

- Vijaya Dashmi & Durga Puja was celebrated with a lot of pomp in the campus. A Dandiya/ Garba was organized in the campus. All the students enjoyed the programs & had a gala time.

- On 7th November, 2012, A condolence meeting was organized in the campus in memory of our three friends - Girdhar, Om & Shivam. Tree plantations were done in the campus & a candle lighting was organized near the seminar hall.

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