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Chapter 1 : Consent Form | Popular Science

Understanding The New Sailing Technology A Basic Guide For Sailors Ebook Understanding The New Sailing Technology A Basic Guide For Sailors currently available at esprmeu for review only, if you need complete ebook.

The chief new sources of power were theâ€¦ General considerations Essentially, techniques are methods of creating new tools and products of tools, and the capacity for constructing such artifacts is a determining characteristic of humanlike species. Other species make artifacts: But these attributes are the result of patterns of instinctive behaviour and cannot be varied to suit rapidly changing circumstances. Humanity, in contrast with other species, does not possess highly developed instinctive reactions but does have the capacity to think systematically and creatively about techniques. Humans can thus innovate and consciously modify the environment in a way no other species has achieved. An ape may on occasion use a stick to beat bananas from a tree, but a man can fashion the stick into a cutting tool and remove a whole bunch of bananas. Somewhere in the transition between the two, the hominid, the first manlike species, emerges. By virtue of his nature as a toolmaker, man is therefore a technologist from the beginning, and the history of technology encompasses the whole evolution of humankind. In using rational faculties to devise techniques and modify the environment, humankind has attacked problems other than those of survival and the production of wealth with which the term technology is usually associated today. The technique of language, for example, involves the manipulation of sounds and symbols in a meaningful way, and similarly the techniques of artistic and ritual creativity represent other aspects of the technological incentive. This article does not deal with these cultural and religious techniques, but it is valuable to establish their relationship at the outset because the history of technology reveals a profound interaction between the incentives and opportunities of technological innovation on the one hand and the sociocultural conditions of the human group within which they occur on the other. Social involvement in technological advances An awareness of this interaction is important in surveying the development of technology through successive civilizations. To simplify the relationship as much as possible, there are three points at which there must be some social involvement in technological innovation: In default of any of these factors it is unlikely that a technological innovation will be widely adopted or be successful. The sense of social need must be strongly felt, or people will not be prepared to devote resources to a technological innovation. The thing needed may be a more efficient cutting tool, a more powerful lifting device, a laboursaving machine , or a means of utilizing new fuels or a new source of energy. Or, because military needs have always provided a stimulus to technological innovation, it may take the form of a requirement for better weapons. In modern societies, needs have been generated by advertising. Whatever the source of social need, it is essential that enough people be conscious of it to provide a market for an artifact or commodity that can meet the need. Social resources are similarly an indispensable prerequisite to a successful innovation. Many inventions have foundered because the social resources vital for their realizationâ€"the capital, materials, and skilled personnelâ€"were not available. The notebooks of Leonardo da Vinci are full of ideas for helicopters, submarines, and airplanes, but few of these reached even the model stage because resources of one sort or another were lacking. The resource of capital involves the existence of surplus productivity and an organization capable of directing the available wealth into channels in which the inventor can use it. The resource of materials involves the availability of appropriate metallurgical, ceramic, plastic , or textile substances that can perform whatever functions a new invention requires of them. The resource of skilled personnel implies the presence of technicians capable of constructing new artifacts and devising novel processes. A society, in short, has to be well primed with suitable resources in order to sustain technological innovation. A sympathetic social ethos implies an environment receptive to new ideas, one in which the dominant social groups are prepared to consider innovation seriously. Such receptivity may be limited to specific fields of innovationâ€"for example, improvements in weapons or in navigational techniquesâ€"or it may take the form of a more generalized attitude of inquiry, as was the case among the industrial middle classes in Britain during the 18th century, who were willing to cultivate new ideas and inventors, the breeders of such ideas. Whatever the psychological basis of inventive genius, there can be no doubt that the existence of socially important groups willing to encourage inventors and to use their ideas has been a crucial factor in the history of technology. Social conditions are thus of the utmost importance in the development of new techniques, some of which will be considered below in more detail. It is worthwhile, however, to register another explanatory note. This concerns the rationality of technology. It has already been observed that technology involves the application of reason to techniques, and in the 20th century it came to be regarded as almost axiomatic that technology is a rational activity stemming from the traditions of modern science. Nevertheless, it should be observed that technology, in the sense in which the term is being used here, is much older than science, and also that techniques have tended to ossify over centuries of practice or to become diverted into such para-rational exercises as alchemy. The modern philosophy of progress cannot be read back into the history of technology; for most of its long existence technology has been virtually stagnant, mysterious, and even irrational. It is not fanciful to see some lingering fragments of this powerful technological tradition in the modern world, and there is more than an element of irrationality in the contemporary dilemma of a highly technological society contemplating the likelihood that it will use its sophisticated techniques in order to accomplish its own destruction. On the other hand it is impossible to deny that there is a progressive element in technology, as it is clear from the most elementary survey that the acquisition of techniques is a cumulative matter, in which each generation inherits a stock of techniques on which it can build if it chooses and if social conditions permit. Over a long period of time the history of technology inevitably highlights the moments of innovation that show this cumulative quality as some societies advance, stage by stage, from comparatively primitive to more sophisticated techniques. But although this development has occurred and is still going on, it is not intrinsic to the nature of technology that such a process of accumulation should occur, and it has certainly not been an inevitable development. The fact that many societies have remained stagnant for long periods of time, even at quite developed stages of technological evolution, and that some have actually regressed and lost the accumulated techniques passed on to them, demonstrates the ambiguous nature of technology and the critical importance of its relationship with other social factors. Modes of technological transmission Another aspect of the cumulative character of technology that will require further investigation is the manner of transmission of technological innovations. This is an elusive problem, and it is necessary to accept the phenomenon of simultaneous or parallel invention in cases in which there is insufficient evidence to show the transmission of ideas in one direction or another. The mechanics of their transmission have been enormously improved in recent centuries by the printing press and other means of communication and also by the increased facility with which travelers visit the sources of innovation and carry ideas back to their own homes. Traditionally, however, the major mode of transmission has been the movement of artifacts and craftsmen. Trade in artifacts has ensured their widespread distribution and encouraged imitation. Even more important, the migration of craftsmenâ€"whether the itinerant metalworkers of early civilizations or the German rocket engineers whose expert knowledge was acquired by both the Soviet Union and the United States after World War IIâ€"has promoted the spread of new technologies. The evidence for such processes of technological transmission is a reminder that the material for the study of the history of technology comes from a variety of sources. Much of it relies, like any historical examination, on documentary matter, although this is sparse for the early civilizations because of the general lack of interest in technology on the part of scribes and chroniclers. For these societies, therefore, and for the many millennia of earlier unrecorded history in which slow but substantial technological advances were made, it is necessary to rely heavily upon archaeological evidence. The historian of technology must be prepared to use all these sources, and to call upon the skills of the archaeologist, the engineer, the architect, and other specialists as appropriate. Technology in the ancient world The beginningsâ€"Stone Age technology to c. Animals occasionally use natural tools such as sticks or stones, and the creatures that became human doubtless did the same for hundreds of millennia before the first giant step of fashioning their own tools. Even then it was an interminable time before they put such toolmaking on a regular basis, and still more aeons passed as they arrived at the successive stages of standardizing their simple stone choppers and pounders and of manufacturing themâ€"that is, providing sites and assigning specialists to the work. A degree of specialization in toolmaking was achieved by the time of the Neanderthals 70, bce ; more-advanced tools, requiring assemblage of head and haft, were produced by Cro-Magnons perhaps as early as 35, bce ; while the application of mechanical principles was achieved by pottery-making Neolithic New Stone Age; bce and Metal Age peoples about bce. Earliest communities For all except approximately the past 10, years, humans lived almost entirely in small nomadic communities dependent for survival on their skills in gathering food, hunting and fishing, and avoiding predators. It is reasonable to suppose that most of these communities developed in tropical latitudes, especially in Africa, where climatic conditions are most favourable to a creature with such poor bodily protection as humans have. It is also reasonable to suppose that tribes moved out thence into the subtropical regions and eventually into the landmass of Eurasia, although their colonization of this region must have been severely limited by the successive periods of glaciation, which rendered large parts of it inhospitable and even uninhabitable, even though humankind has shown remarkable versatility in adapting to such unfavourable conditions. The Neolithic Revolution Toward the end of the last ice age , some 15, to 20, years ago, a few of the communities that were most favoured by geography and climate began to make the transition from the long period of Paleolithic , or Old Stone Age , savagery to a more settled way of life depending on animal husbandry and agriculture. This period of transition, the Neolithic Period , or New Stone Age, led eventually to a marked rise in population, to a growth in the size of communities, and to the beginnings of town life. It is sometimes referred to as the Neolithic Revolution because the speed of technological innovation increased so greatly and human social and political organization underwent a corresponding increase in complexity. To understand the beginnings of technology, it is thus necessary to survey developments from the Old Stone Age through the New Stone Age down to the emergence of the first urban civilizations about bce. Stone The material that gives its name and a technological unity to these periods of prehistory is stone. Though it may be assumed that primitive humans used other materials such as wood, bone, fur, leaves, and grasses before they mastered the use of stone, apart from bone antlers, presumably used as picks in flint mines and elsewhere, and other fragments of bone implements , none of these has survived. The stone tools of early humans, on the other hand, have survived in surprising abundance, and over the many millennia of prehistory important advances in technique were made in the use of stone. Stones became tools only when they were shaped deliberately for specific purposes, and, for this to be done efficiently, suitable hard and fine-grained stones had to be found and means devised for shaping them and particularly for putting a cutting edge on them. Flint became a very popular stone for this purpose, although fine sandstones and certain volcanic rocks were also widely used. There is much Paleolithic evidence of skill in flaking and polishing stones to make scraping and cutting tools. These early tools were held in the hand, but gradually ways of protecting the hand from sharp edges on the stone, at first by wrapping one end in fur or grass or setting it in a wooden handle, were devised. Much later the technique of fixing the stone head to a haft converted these hand tools into more versatile tools and weapons. With the widening mastery of the material world in the Neolithic Period, other substances were brought into service, such as clay for pottery and brick, and increasing competence in handling textile raw materials led to the creation of the first woven fabrics to take the place of animal skins. About the same time, curiosity about the behaviour of metallic oxides in the presence of fire promoted one of the most significant technological innovations of all time and marked the succession from the Stone Age to the Metal Age. Power The use of fire was another basic technique mastered at some unknown time in the Old Stone Age. The discovery that fire could be tamed and controlled and the further discovery that a fire could be generated by persistent friction between two dry wooden surfaces were momentous. Fire was the most important contribution of prehistory to power technology, although little power was obtained directly from fire except as defense against wild animals. For the most part, prehistoric communities remained completely dependent upon manpower, but, in making the transition to a more settled pattern of life in the New Stone Age, they began to derive some power from animals that had been domesticated. It also seems likely that by the end of prehistoric times the sail had emerged as a means of harnessing the wind for small boats, beginning a long sequence of developments in marine transport. Tools and weapons The basic tools of prehistoric peoples were determined by the materials at their disposal. But once they had acquired the techniques of working stone, they were resourceful in devising tools and weapons with points and barbs. Thus, the stone-headed spear, the harpoon, and the arrow all came into widespread use.

The spear was given increased impetus by the spear-thrower, a notched pole that gave a sling effect. The ingenuity of these primitive hunters is also shown in their slings, throwing-sticks the boomerang of the Australian Aborigines is a remarkable surviving example , blowguns, bird snares, fish and animal traps, and nets. These tools did not evolve uniformly, as each primitive community developed only those instruments that were most suitable for its own specialized purposes, but all were in use by the end of the Stone Age. In addition, the Neolithic Revolution had contributed some important new tools that were not primarily concerned with hunting. It is not possible to be sure when these significant devices were invented, but their presence in the early urban civilizations suggests some continuity with the late Neolithic Period. The drill and the lathe, on the other hand, were derived from the bow and had the effect of spinning the drill piece or the workpiece first in one direction and then in the other. Developments in food production brought further refinements in tools. The processes of food production in Paleolithic times were simple, consisting of gathering, hunting , and fishing. If these methods proved inadequate to sustain a community, it moved to better hunting grounds or perished. With the onset of the Neolithic Revolution, new food-producing skills were devised to serve the needs of agriculture and animal husbandry. Digging sticks and the first crude plows, stone sickles, querns that ground grain by friction between two stones and, most complicated of all, irrigation techniques for keeping the ground watered and fertileâ€”all these became well established in the great subtropical river valleys of Egypt and Mesopotamia in the millennia before bce. Building techniques Prehistoric building techniques also underwent significant developments in the Neolithic Revolution. Nothing is known of the building ability of Paleolithic peoples beyond what can be inferred from a few fragments of stone shelters, but in the New Stone Age some impressive structures were erected, primarily tombs and burial mounds and other religious edifices, but also, toward the end of the period, domestic housing in which sun-dried brick was first used. In northern Europe, where the Neolithic transformation began later than around the eastern Mediterranean and lasted longer, huge stone monuments, of which Stonehenge in England is the outstanding example, still bear eloquent testimony to the technical skill, not to mention the imagination and mathematical competence, of the later Stone Age societies. Manufacturing Manufacturing industry had its origin in the New Stone Age, with the application of techniques for grinding corn, baking clay, spinning and weaving textiles, and also, it seems likely, for dyeing, fermenting, and distilling. Some evidence for all these processes can be derived from archaeological findings, and some of them at least were developing into specialized crafts by the time the first urban civilizations appeared. In the same way, the early metalworkers were beginning to acquire the techniques of extracting and working the softer metals, gold, silver, copper, and tin, that were to make their successors a select class of craftsmen. All these incipient fields of specialization, moreover, implied developing trade between different communities and regions, and again the archaeological evidence of the transfer of manufactured products in the later Stone Age is impressive. Flint arrowheads of particular types, for example, can be found widely dispersed over Europe, and the implication of a common locus of manufacture for each is strong. Such transmission suggests improving facilities for transport and communication.

Chapter 2 : New technology puts sailing on the map

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A late Bronze Age sword or dagger blade Metallic copper occurs on the surface of weathered copper ore deposits and copper was used before copper smelting was known. Copper smelting is believed to have originated when the technology of pottery kilns allowed sufficiently high temperatures. Bronze significantly advanced shipbuilding technology with better tools and bronze nails. Bronze nails replaced the old method of attaching boards of the hull with cord woven through drilled holes. This technological trend apparently began in the Fertile Crescent and spread outward over time. These developments were not, and still are not, universal. The three-age system does not accurately describe the technology history of groups outside of Eurasia , and does not apply at all in the case of some isolated populations, such as the Spinifex People , the Sentinelese , and various Amazonian tribes, which still make use of Stone Age technology, and have not developed agricultural or metal technology. Iron Age An axehead made of iron, dating from the Swedish Iron Age Before iron smelting was developed the only iron was obtained from meteorites and is usually identified by having nickel content. Meteoric iron was rare and valuable, but was sometimes used to make tools and other implements, such as fish hooks. The Iron age involved the adoption of iron smelting technology. It generally replaced bronze and made it possible to produce tools which were stronger, lighter and cheaper to make than bronze equivalents. The raw materials to make iron, such as ore and limestone, are far more abundant than copper and especially tin ores. Consequently, iron was produced in many areas. It was not possible to mass manufacture steel or pure iron because of the high temperatures required. Furnaces could reach melting temperature but the crucibles and molds needed for melting and casting had not been developed. Steel could be produced by forging bloomery iron to reduce the carbon content in a somewhat controllable way, but steel produced by this method was not homogeneous. In many Eurasian cultures, the Iron Age was the last major step before the development of written language, though again this was not universally the case. In Europe, large hill forts were built either as a refuge in time of war or sometimes as permanent settlements. In some cases, existing forts from the Bronze Age were expanded and enlarged. The pace of land clearance using the more effective iron axes increased, providing more farmland to support the growing population. Egyptians[edit] The Egyptians invented and used many simple machines, such as the ramp to aid construction processes. Egyptian society made significant advances during dynastic periods in areas such as astronomy, mathematics, and medicine. They also made paper and monuments. The Egyptians made significant advances in shipbuilding. Astronomy was used by Egyptian leaders to govern people. Indus Valley[edit] The Indus Valley Civilization , situated in a resource-rich area, is notable for its early application of city planning and sanitation technologies. Mesopotamians[edit] The peoples of Mesopotamia Sumerians , Akkadians , Assyrians , and Babylonians have been credited with the invention of the wheel , but this is no longer certain. They lived in cities from c. The walls of Babylon were so massive they were quoted as a Wonder of the World. They developed extensive water systems; canals for transport and irrigation in the alluvial south, and catchment systems stretching for tens of kilometers in the hilly north. Their palaces had sophisticated drainage systems. Many records on clay tablets and stone inscriptions have survived. These civilizations were early adopters of bronze technologies which they used for tools, weapons and monumental statuary. They enabled meticulous astronomers to plot the motions of the planets and to predict eclipses. Major technological contributions from China include early seismological detectors , matches, paper , sliding calipers, the double-action piston pump, cast iron , the iron plough, the multi-tube seed drill , the wheelbarrow, the suspension bridge , the parachute, natural gas as fuel, the compass , the raised-relief map , the propeller, the crossbow , the South Pointing Chariot and gunpowder. Other Chinese discoveries and inventions from the Medieval period include block printing , movable type printing , phosphorescent paint, endless power chain drive and the clock escapement mechanism. Greek[edit] An illustration of the aeolipile , the earliest steam-powered device Greek and Hellenistic engineers were responsible for myriad inventions and improvements to existing technology. The Hellenistic period , in particular, saw a sharp increase in technological advancement, fostered by a climate of openness to new ideas, the blossoming of a mechanistic philosophy, and the establishment of the Library of Alexandria and its close association with the adjacent museion. In contrast to the typically anonymous inventors of earlier ages, ingenious minds such as Archimedes , Philo of Byzantium , Heron , Ctesibius , and Archytas remain known by name to posterity. Ancient Greek innovations were particularly pronounced in mechanical technology, including the ground-breaking invention of the watermill which constituted the first human-devised motive force not to rely on muscle power besides the sail. The newly devised right-angled gear and screw would become particularly important to the operation of mechanical devices. That is when the age of mechanical devices started. The compartmented water-wheel, here its overshot version, was invented in Hellenistic times. In time-keeping, the introduction of the inflow clepsydra and its mechanization by the dial and pointer, the application of a feedback system.

Chapter 3 : New Atlas - New Technology & Science News

*Understanding the New Sailing Technology: A Basic Guide for Sailors [Sven Donaldson] on www.nxgvision.com *FREE* shipping on qualifying offers. Advances in hull design and construction, keels and rudders, rigs, and sails, deck gear, and electronics are explained for the amateur sailor.*

The following is the introduction to a special e-publication called Civil War Innovations. Published in September , the collection draws articles from the archives of Scientific American. Any Civil War buff is familiar with the technological advances of that era: Fewer people realize, however, that a similar explosion in technological creativity occurred away from the battlefield. Newspapers became tools of mass communication in the s with the invention of the rotary press and the application of steam power to printing. These and other innovations brought down the price of newspapers; by the s and s newspapers such as the trio of New York papers founded during this timeâ€"the Tribune, the Sun and the Heraldâ€"were sold for a penny and reached massive audiences. The development of the telegraph in the late s sped the gathering and distribution of news; the Associated Press was founded in to take advantage of the new technology. The gradual knitting together of the nation by railroadsâ€"especially in the North and Midwestâ€"further hastened communication. During the antebellum years, these communication technologies facilitated the anti-slavery campaign that started in earnest in the early s, allowing abolitionist broadsides, brochures, books and newspapers to be distributed cheaply and widely throughout the North and helping Frederick Douglass and other abolitionist speakers spread their message to northern towns large and small. Indeed, it could be argued that the rapid expansion of communication technologies in the decades leading up to the war, which made it easier for reformers to get their arguments out, gave abolitionists a far greater role in the sectional conflict than their numbers would suggest. Once the war started, communications technologies ensured that Americans would have much better access to war reports and images than in any previous war. Although often wildly inaccurateâ€"newspapers ran stories without checking facts or independently confirming accountsâ€"they pulled civilians into the war. Readers could see lines of battle or columns of retreating men, dead and wounded soldiers, freed slaves and war heroes. Like other weeklies of the time, the Scientific American covered the Civil War extensively, with a lengthy section of each issue devoted to reports of the latest skirmishes and assessments of the situationâ€"including naval activities along the coast. In addition to these field reports, the magazine also published hundreds of articles about the new technologies that were being deployed during the war or tested for possible use. Almost every issue that appeared during the war years contained multiple articles on the newest developments in the construction of warships and weaponry. A sampling of those articles, which focused on the technology of the war rather than its chronology, appears in this Scientific American Classics compilation. If the development of mass communication technologies during this period made the war seem more real to civilians, a very different stream of technological innovation reflected the grim actualities of war during the years afterward. The thousands of men maimed by the improved arsenals of both armies inspired entrepreneurs to design new and improved prosthetic limbs. The Patent Office granted patents for artificial limbs and other prosthetic devices between and ; at the same time, the federal government and many states also established programs that distributed artificial arms and legs to veterans free of charge. The empty sleeve and the crutch became the most obvious symbols of patriotism and sacrifice in the years following the war. Perhaps 60, men survived the war as amputees, and inventors and investors sought to make the prosthetics industry more profitable by turning out more realistic-looking artificial arms and legs. They used natural woods, dyes and leather covering to make artificial limbs appear more natural, but also tried to make them more functional by inventing new types of joints, ball bearings, springs and rubber bands to substitute for ligaments and tendons, and other mechanical innovations to try to create a natural gait and to allow men to conceal their disability if they so desired. A promotional book by one manufacturer of prosthetic limbs attributed the growing markets for entrepreneurs and inventors to the bloody, increasingly industrialized wars of the s, s and sâ€"when the British, French and Russians fought in the Crimea; the United States and Confederacy fought in America; and Prussia crushed France. Most of the inventions and ideas reported by the

Scientific American during this crisis probably failed to earn fortunes for anyone. But they were nevertheless part of the grim yet creative application of technology to the challenges and opportunities created by the Civil War. He is currently working on a biography of James R.

Chapter 4 : ASA's Sailing Challenge App - iOS and Android

Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.

Maritime history Throughout history sailing has been instrumental in the development of civilization, affording humanity greater mobility than travel over land, whether for trade, transport or warfare, and the capacity for fishing. The earliest representation of a ship under sail appears on a painted disc found in Kuwait dating between and BCE. There were improvements in sails, masts and rigging ; improvements in marine navigation, including the cross tree and charts of both the sea and constellations, allowed more certainty in sea travel. From the 15th century onwards, European ships went further north, stayed longer on the Grand Banks and in the Gulf of St. Lawrence , and eventually began to explore the Pacific Northwest and the Western Arctic. According to Jett, the Egyptians used a bipod mast to support a sail that allowed a reed craft to travel upriver with a following wind, as late as 3, BCE. Such sails evolved into the square-sail rig that persisted up to the 19th century. Forces on sails The physics of sailing arises from a balance of forces between the wind powering the sailing craft as it passes over its sails and the resistance by the sailing craft against being blown off course, which is provided in the water by the keel , rudder , underwater foils and other elements of the underbody of a sailboat, on ice by the runners of an ice boat , or on land by the wheels of a sail-powered land vehicle. Forces on sails depend on wind speed and direction and the speed and direction of the craft. The speed of the craft at a given point of sail contributes to the " apparent wind "â€"the wind speed and direction as measured on the moving craft. Depending on the alignment of the sail with the apparent wind angle of attack , lift or drag may be the predominant propulsive component. Depending on the angle of attack of a set of sails with respect to the apparent wind, each sail is providing motive force to the sailing craft either from lift-dominant attached flow or drag-dominant separated flow. Additionally, sails may interact with one another to create forces that are different from the sum of the individual contributions each sail, when used alone. Apparent wind velocity[edit] The term " velocity " refers both to speed and direction. As applied to wind, apparent wind velocity VA is the air velocity acting upon the leading edge of the most forward sail or as experienced by instrumentation or crew on a moving sailing craft. In nautical terminology , wind speeds are normally expressed in knots and wind angles in degrees. All sailing craft reach a constant forward velocity VB for a given true wind velocity VT and point of sail. Likewise, the directly downwind speed of all conventional sailing craft is limited to the true wind speed. As a sailboat sails further from the wind, the apparent wind becomes smaller and the lateral component becomes less; boat speed is highest on the beam reach. In order to act like an airfoil, the sail on a sailboat is sheeted further out as the course is further off the wind. In order to act like an airfoil, the sail on an iceboat is sheeted in for all three points of sail. Down wind with detached air flow like a parachuteâ€" predominant drag component propels the boat with little heeling moment. Up wind close-hauled with attached airflow like a wingâ€"predominant lift component both propels the boat and contributes to heel. Lift force and Lift-induced drag Lift on a sail, acting as an airfoil , occurs in a direction perpendicular to the incident airstream the apparent wind velocity for the head sail and is a result of pressure differences between the windward and leeward surfaces and depends on angle of attack, sail shape, air density, and speed of the apparent wind. The lift force results from the average pressure on the windward surface of the sail being higher than the average pressure on the leeward side. As air follows a curved path along the windward side of a sail, there is a pressure gradient perpendicular to the flow direction with higher pressure on the outside of the curve and lower pressure on the inside. To generate lift, a sail must present an " angle of attack " between the chord line of the sail and the apparent wind velocity. This occurs as the angle of attack increases with sail trim or change of course and causes the lift coefficient to increase up to the point of aerodynamic stall along with the lift-induced drag coefficient. At the onset of stall, lift is abruptly decreased, as is lift-induced drag. Sails with the apparent wind behind them especially going downwind operate in a stalled condition. Sails act in two basic modes; under the lift-predominant mode, the sail behaves in a manner analogous to a wing with airflow attached to both surfaces; under the drag-predominant mode, the sail acts in a manner analogous to a parachute with airflow in detached flow, eddying around the sail. The stagnation streamlines red delineate air passing to the leeward side top from that passing to the windward bottom side of the sail. Each sail configuration has a characteristic coefficient of lift and attendant coefficient of drag, which can be determined experimentally and calculated theoretically. Sailing craft orient their sails with a favorable angle of attack between the entry point of the sail and the apparent wind even as their course changes. The ability to generate lift is limited by sailing too close to the wind when no effective angle of attack is available to generate lift causing luffing and sailing sufficiently off the wind that the sail cannot be oriented at a favorable angle of attack to prevent the sail from stalling with flow separation. Drag predominance parachute mode [edit] When sailing craft are on a course where the angle between the sail and the apparent wind the angle of attack exceeds the point of maximum lift, separation of flow occurs. In addition to the sails used upwind, spinnakers provide area and curvature appropriate for sailing with separated flow on downwind points of sail, analogous to parachutes, which provide both lift and drag. Spinnaker cross-section trimmed for a broad reach showing transition from boundary layer to separated flow where vortex shedding commences. Symmetric spinnaker while running downwind, primarily generating drag. Symmetric spinnaker cross-section with following apparent wind, showing vortex shedding. Wind variation with height and time[edit] Further information: Wind shear affects sailing craft in motion by presenting a different wind speed and direction at different heights along the mast. Wind shear occurs because of friction above a water surface slowing the flow of air. Additionally, apparent wind direction moves aft with height above water, which may necessitate a corresponding twist in the shape of the sail to achieve attached flow with height. So, one can expect gusts to be about 1. This, combined with changes in wind direction suggest the degree to which a sailing craft must adjust sail angle to wind gusts on a given course. In points of sail that range from close-hauled to a broad reach, sails act substantially like a wing, with lift predominantly propelling the craft. In points of sail from a broad reach to down wind, sails act substantially like a parachute, with drag predominantly propelling the craft. For craft with little forward resistance ice boats and land yachts , this transition occurs further off the wind than for sailboats and sailing ships. The apparent wind â€”the wind felt by an observer on a moving sailing craftâ€”determines the motive power for sailing craft. A sailboat on three points of sail The waves give an indication of the true wind direction. The pennant Canadian flag gives an indication of apparent wind direction. Effect on apparent wind[edit] Main article: Apparent wind velocity provides the motive power for the sails on any given point of sail. Sailing craft B is on a beam reach. Sailing craft C is on a broad reach. Boat velocity in black generates an equal and opposite apparent wind component not shown , which adds to the true wind to become apparent wind. Apparent wind and forces on a sailboat. As the boat sails further from the wind, the apparent wind becomes smaller and the lateral component becomes less; boat speed is highest on the beam reach. Apparent wind on an iceboat. As the iceboat sails further from the wind, the apparent wind increases slightly and the boat speed is highest on the broad reach. The sail is sheeted in for all three points of sail. Ice boats typically have the least resistance to forward motion of any sailing craft. The higher the boat points to the wind under sail, the stronger the lateral force, which requires resistance from a keel or other underwater foils, including daggerboard, centerboard, skeg and rudder. Lateral force also induces heeling in a sailboat, which requires resistance by weight of ballast from the crew or the boat itself and by the shape of the boat, especially with a catamaran. As the boat points off the wind, lateral force and the forces required to resist it become less important. Predicting the availability, strength and direction of the wind is key to using its power along the desired course. Ocean currents, tides and river currents may deflect a sailing vessel from its desired course. Downwind, certain high-performance sailing craft can reach the destination more quickly by following a zig-zag route on a series of broad reaches. Negotiating obstructions or a channel may also require a change direction of with respect to the wind, necessitating changing of tack with the wind on the opposite side of the craft, from before. Changing tack is called tacking when the wind crosses over the bow of the craft as it turns and jibing or gybing if the wind passes over the stern. Wind and currents[edit] The ocean currents Winds and oceanic currents are both the result of the sun powering their respective fluid media. Wind powers the sailing craft and the ocean bears the craft on its course, as currents may alter the course of a sailing vessel on the ocean or a river. Wind â€” On a global scale, vessels making long voyages must take atmospheric circulation into account, which causes zones of westerlies , easterlies , trade winds and high-pressure zones with light winds, sometimes called horse latitudes , in between. Along coastal areas, sailors contend with diurnal changes in wind directionâ€”flowing off the shore at night and onto the shore during the day. Unfavorable wind shifts are called headers. Ice boats and land yachts minimize lateral motion with sidewise resistance from their blades or wheels. Wind shown in red.

Chapter 5 : Sailing - Wikipedia

Understanding the New Sailing Technology: A Basic Guide for Sailors by Sven Donaldson (, Hardcover) Be the first to write a review. About this product.

Ideal for those students studying for their ASA certification. Or for any old salt looking for a challenge without getting wet! Watch as the player takes on the "Harbor Tour" trying to set a record time. Now Available on The Big Screen! Get ready to experience Sailing Challenge like you never have before â€" on the large screen of your desktop computer! Now the Sailing Challenge App is available on more devices. Whether you want to sail on your iPhone while waiting in line at the post office, or on your Android tablet on the commuter train, or on your Windows laptop while flying somewhere exotic, or even just your iMac at home â€" Sailing Challenge is available for your enjoyment in all these places and more! There is no question â€" this app will make you a better sailor! Then round the buoy and sail back to the same place you started! Tacking Master Course Tacking a sailboat is slow! Navigate around the docks and mooring fields on this course while trying to minimize the number of tacks needed to get to the finish! Earn Achievements Every learning module and sailing course now has 3 different levels of achievements! Are you good enough to collect 3 stars on every single module? Zoom out to see the big picture, or rotate the camera to check your tacking angles. Challenge Your Friends Nothing like a little something to bring out the competitive spirit in everyone! Post your fastest sailing times on social media and challenge your friends to see if they can beat your fastest time! Maximize your efficiency by trimming your sails and see how fast the boat can go! Realistic Boat Wake Just like a real boat, as soon as you start to move, the boat puts out a realistic wake enhancing the sense of speed. Now all you need to do is play in front of a fan so you can feel the wind! Points of Sail To become a sailor you need to understand the points of sail â€" the orientation of the boat relative to the wind. This module first teaches you the points of sail before testing your knowledge with a fun game. Apparent Wind This module illustrates apparent wind â€" the combination of true wind and the wind effect of motion as felt aboard a moving sailboat. Players are able to turn the boat onto different points of sail, as well as adjust the speed of the wind, in order to see the changes in apparent wind. In this module the player learns how to trim the sail for maximum efficiency on the different points of sail. This module teaches the player how to tack back and forth in order to achieve that goal. The second half of the module deals with jibing. This module introduces some common scenarios encountered when sailing. Docking Approaching a dock under sail can be one of the most intimidating parts of learning to sail. In this module players can experience different docking scenarios and understand the principles involved so they can dock perfectly every time!

Chapter 6 : History of technology - Wikipedia

The accelerated pace of technological advancement in sailing today is viewed by most amateur sailors as either exciting or alarming, but few are genuinely indifferent to the rapid changes in our oncetraditional recreational pursuit.

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