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Orientation and Navigation Device in Ancient Time

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1. Introduction

Orientation and navigation was done without any special devices in the ancient. People observed natural phenomena by experiments and obtain results for determining orientation. Avian Navigation and Orientation is a good example. It is typically accomplished only by ‘experienced’ birds - birds that had become familiar, on a smaller scale, with a local area or, on a larger, migratory scale, have successfully completed a migratory journey at least once [1].

In the ancient Nabataean people used the stars for orientation in the sea or desert . Arabs measured the altitude above the horizon to a known star, and then deduced from this the altitude of the Pole Star, (since the Pole Star was the one star that did not move in the sky) [2].

Another very simple navigation method that was used by many early dhow captains was simply the position of the Sun or North Star above the boat. By standing on various locations on the boat, they could place the Sun or North Star above, right, left or behind the dhow. As long as they kept the stars at a correct position above the rigging they were assured that they would arrive at their destination.

Besides that from an Arab perspective there are three basic monsoon winds. First of all, from April to June, the Kaws wind blows southwest. Later the Dammani SW monsoon blows from August to the middle of October. At this time, the monsoon changes direction, and the Azyab monsoon blows in a NE direction [2].

2. Examples of orientation and navigation devices

2.1. Kamal

A more accurate, but still simple instrument was known as a kamal. This was a small parallelogram of horn or wood measuring about one by two inches with a string inserted in the center. On the string were nine knots at measured intervals**.**

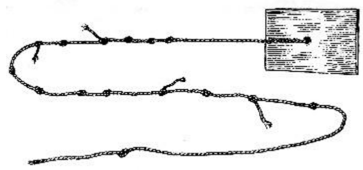

Figure 1 - Kamal

The end of the string was held in the teeth. The lower edge of the horn was placed on the horizon while the horn was moved along the string until the upper edge touched the required star. The knot at which the horn covered the exact distance signified a certain number of isba' of altitude of the star. The altitude of the Pole Star could then be deduced from the rahmani. An alternative way of using a kamal was to move the knots through the teeth until the piece of horn or wood covered the required star altitude. Vasco da Gama's pilot from Malindi used a kamal, and the Portuguese adopted it and eventually modified the spacing of the knots to measure degrees. Sometimes Arab and Indian seamen added extra knots marking the latitudes of particular ports of call, or they simply used a kamal on which all the knots indicated particular ports of call [2].

2.2. Astrolabe

The astrolabe was developed at a slightly later period. It was a chart was based on the rising and setting of fifteen fixed stars. Later astrolabes also included the addition of North and South. This method probably pre-dated the introduction of the magnetic compass. However, when used on the compass, each star name division came to signify one rhumb or 1/32 division of the compass.

The astrolabe was also known as a windrose, and traditionally it had many Persian names for stars. (eg. qutb al-gaah, mutla' al-silbaar, khaan (rhumb) etc., which the Arabs must have taken from a Persian windrose. However, many other names are Arabic and in some cases an older Arabic name was displaced by a Persian one. Eg. The Ursa Minor constellation (Ursa Minor and Major) was banaat na'sh before it became qutb algaah.

Figure 2 - Astrolabe

On the astrolabe, latitude was determined by the height of the sun or the pole star, which was measured by the qiyas figure system. Astrolabes were quite difficult to use at sea because of the rolling of the ships, which made it hard to determine the vertical line accurately. However, they could be used on shore, and the latitude of every port and headland must have been recorded in the books of nautical instruction or rahmaanis [2].

2.3. Namesake

It's found all over its namesake country, and Vikings could have used it to depolarize light, which means the crystal is able to split light along different axes. How is that useful for navigation? Well, Viking sailors simply had to place a dot on the top of the crystal and then look up at it from below. The incoming light would hit the dot and seemingly duplicate it. That optical effect, amazingly enough, was all ancient navigators needed to locate the Sun, even when it was completely hidden from view [3].

Figure 3 - Namesake

2.4 Compass

The magnetic needle was known in China from ancient times, but there is little mention of it being used as a nautical instrument before the tenth century. It is likely that the compass was not considered very important in the east, as the skies over the Indian Ocean were usually very clear, especially during the times that the Arab sailors traveled with the monsoons. It was only under the clouds of the North that it was eagerly made use of [2].

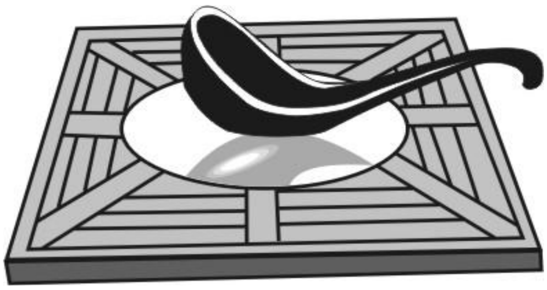

Figure 4 – Compass

3. Conclusion

In this work the navigation and orientation devices used in ancient time were studied. Some examples of orientation determination such as Kamal, astrolabe, namesake, and compass were given. Except that is possible to use natural phenomena to determine the position of object and to navigate.

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Requirements for Life-Sustaining Activity in Space Vehicles

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Active space exploration began in the second half of the XX century. In April 12, 1961 Yuri Gagarin made the first manned flight into space. The flight lasted 108 minute. It confirmed that a man can successfully endure the conditions of space flight keeping ability to work. At that time, the life support system provided flights lasting up to 10 days. However, the space research required more time. Thus scientists were actively involved in improving the conditions for life-sustaining activity in space vehicles. Despite the fact that space is extremely hostile environment to human life, the record for the longest flight is 803 days. The optimal conditions for life on a spaceship and a good training program for astronauts contributed to the record. [1], [2], [3].

Even now, when the experience of near-Earth flights is amounted to years, life support in space remains an extremely difficult technical and medical problem. Life-support system includes devices and supplies for the uninterrupted supply of the crew with air, water and food. Let us consider the factors that influence the effective work of the crew.

The essential component to support life is air. It is necessary not only for breathing, but also for the guarantee of the external pressure. Besides air transfers heat which is continuously emitted by the human body. Depressurization is one of the most serious dangers in space leading to the loss of air. To maintain the atmosphere, carbon dioxide and water vapor are removed by physical and chemical methods using various sorbents [3].