

ESSAY

**The Desire for the Development of Flight:
A Recurrent Theme for Advanced Civilizations?**

B. REISWIG

D. SCHULZE-MAKUCH

*School of Earth and Environmental Sciences, Washington State University,
Pullman, WA 99164 USA
breiswig@wsu.edu; dirksm@wsu.edu*

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Abstract—The desire to fly is a recurrent theme in human civilizations. This fascination has led to the achievement of heavier-than-air flight in modern times and possibly in ancient history as well. Oral traditions and ancient manuscripts from around the world contain many detailed references to flying machines of various types. Many different artifacts, recovered in the course of normal archaeological excavations, also display many mechanical and aerodynamic features. The worldwide distribution of these artifacts, written manuscripts, and traditions suggests that some civilizations perhaps developed, or were about to develop, flying machines. Thus, fascination and attempts with flight seem to be a recurring theme for the human species.

Keywords: aircraft—flight—vimanas—ancient aviation—SETI—advanced technology

Introduction

There is uncertainty whether technologically advanced civilizations, as a general rule, would engage in space travel and visit other planets. A first necessary step toward space is the development of machines capable of achieving heavier-than-air flight. Here, we examine this question by searching ancient documents and artifacts for insights into whether the interest in flight and the development of flying machines in particular, is a recurrent phenomenon of human history or only resulted once in Western civilization, within the last 150 years.

Throughout history, humankind has enjoyed and cultivated a fascination with heavier-than-air flight. Men and women have watched birds, and other winged creatures in flight, and desired to join them in the skies. This yearning has inspired numerous designs throughout the ages depicting flying machines capable of carrying a person through the air. In 1783, two Frenchmen built and

successfully flew a hot air balloon (Heppenheimer, 2000). Leonardo Da Vinci's works include drawings for many unique flying objects (Laurenza, 2004), while George Cayley built and flew a glider, with his servant as its passenger, in 1853 (Ackroyd, 2002). These experiments culminated in the year 1903 near the small town of Kitty Hawk, North Carolina, with Wilber and Orville Wright building and successfully flying the first airplane for a short distance, proving that building machines to carry people through the air was a possibility (Wright, 1986). Less than seventy years later, in 1969, manned space flight became a reality and the first humans walked on the Moon.

The desire to fly, successfully achieved in modern times, is well-documented throughout human history. Many ancient legends, oral traditions, and documents from across the world might speak of flying machines of various types. Ancient sources of this information are distributed worldwide and typically record the earliest period of the particular culture. Many of these legends describe the exploits of gods or hero kings in which the main character moves from place to place in some sort of flying vehicle. The type of vehicle varies from story to story and from culture to culture, but many consistencies are evident among the stories when closely examined.

In addition to cultural legends, some ancient artifacts from around the world appear to closely resemble airplane-like machines and other flying objects. Archaeologists have unearthed artifacts that they classify as birds, insects, or zoomorphic statues, but which appear to have more in common with mechanical objects than any animal known. Other, more controversial artifacts come in the form of hieroglyphs, cave paintings, and murals. Some of these are highly stylized, making it difficult to understand the recorded event, while some are undoubtedly forgeries done in recent times. However, others are definitely legitimate relics that record something special in ancient times. The question remains whether all these documents and artifacts simply record the desire to fly or if they recorded actual events.

Is Technology for Flight a Reasonable Inference for Ancient Civilizations?

Traditionally, the technology necessary for manufacturing flying machines is not attributed to the ancients. It is widely believed that prehistoric cultures had the expertise to manufacture and use flint knives and other stone tools, but are there data to support a culture advanced enough to build and fly a heavier-than-air machine?

Evidence for advanced technology in a variety of disciplines may actually be widespread. For example, many cultures became experts in textile manufacture and made textiles of a quality comparable to that of modern times (Holmes, 1889). An excellent example of such textiles comes from the graves of Nazca,

Peru (Martin, 2006). The engineering skill of some ancients is yet another indication that these cultures possessed far more technological advancement than is generally thought. Megalithic monuments, such as Stonehenge in England, the pyramids of Egypt, Baalbek in Lebanon, and Teotihuacán in Bolivia and Peru show a mastery of architecture and technology that is amazing for modern times. Other evidence of advanced technology comes from the advanced metallurgy technology. Many cultures were able to smelt very hard alloys of copper (Noorbergen, 1977) and very pure iron (Hedge, 1973). Some documentation exists of aluminum alloys being isolated as well (Vintiñi, 2009). These are only a few examples of a higher technological advancement in ancient cultures than is normally considered plausible.

When looking for verification of advanced technology in early societies, it is best to keep in mind how modern devices would fare over time. Perishable objects will decay, and objects that include metals, such as airplanes, would be impossible to find after a few hundred years, especially if exposed to a tropical climate. Plastics eventually break or ultraviolet radiation destroys the material, while animals eat wood and paper. Only a small number of parts from advanced machines would remain for future generations to find, if they in fact existed. In addition, as modern technology has advanced, manufactured parts have become smaller, and this would probably hold true for ancient civilizations as well. Smaller objects are even less likely to survive the ravages of time, and current excavation techniques make recovery more difficult for those that have survived. The most durable evidence for advanced technology would be the art and written traditions that describe certain events, possibly in a dramatized way. Could it be that ancient cultures advanced tremendously in some areas of science and technology and may have developed technology that is difficult to recognize for modern investigators?

Because of composition and environmental factors, artifacts do not last long. As a result, modern researchers looking for evidence of ancient advanced technology can only examine tantalizing remnants that are difficult to interpret. Conquering armies destroyed many ancient documents, and many ancient documents and artifacts were likely intentionally destroyed by the hands of religious zealots, such as the ancient Buddhist statues destroyed by the Taliban in Afghanistan in 2001. It is possible that other texts remain hidden where their guardians placed them generations ago while other scripts are still undeciphered. Translation of many Sanskrit, Chinese, and Russian documents is a very slow process (Müller, 1879), and, in some cases, Western scientists barely know of these documents.

These factors combine to make the discussion of controversial subjects, such as the possibility of ancient flight, extremely difficult. Many people have taken the limited amount of existing data for ancient advanced technology as

evidence for highly speculative theories. For example, many often use evidence of ancient advanced technology as support for the idea of Atlantis (NASCA, 2004) or UFOs. Unfortunately, this tendency to make this data as controversial and sensational as possible causes the scientific world to be apprehensive about pursuing research in these areas. As a result, it is difficult to find published data from peer-reviewed sources and objectively presented information. Here, we attempt an objective and prejudice-free assessment of what evidence for ancient flight exists, and examine whether the desire for developing flight was a universal trait of early societies regardless of the particular culture.

Possible Evidence for Ancient Flight or the Desire To Develop It

Written and Oral Documents

Generally, scholars collectively refer to oral traditions and ancient written documents as mythology since they refer to superhuman feats accomplished by heroes or gods. However, many times Western scientists are too quick to dismiss these legends as completely made up. There are records to show that many, if not a majority, of these legends have their origins in historical facts. Although these traditional stories do contain significant amounts of imaginative license, some of the information presented is likely partially or completely accurate (Müller, 1879). Many archaeologists began to realize the value of oral and written traditions after Herman Schliemann used Homer's *Odyssey* and *Iliad* to confirm the location of the ancient city of Troy (McCarty, 2004). Schliemann's discovery showed that Homer exaggerated and romanticized his retellings of actual events, somewhat similar to the modern ballads and historical novels of today. For this reason, it is logical to scientifically examine legends and oral traditions for information regarding putative ancient flight technology.

Mediterranean

Greek legends contain incidental bits of information within several stories that tell of flight. Much of this folklore speaks of flying sandals or winged animals, possibly remembrances of ancient flying objects as well as a wooden dove-like craft powered by compressed air (Gray, 2004). These references may or may not reflect ancient aviation. However, it is best to keep in mind the way that less-advanced cultures described modern airplanes. Generally, people referred to the airplanes as flying boats, giant birds, or other familiar items. Humans tend to explain unfamiliar experiences and sights in terms with which they are familiar, thus expressing the concept to those around them in an intelligible way. In addition, storytellers may give certain objects different names in order to give the event a religious meaning. The legend of Icarus tells the tale of

a father and son who escape from the island of Crete by flying. The father, Daedalus, was a superior artisan who built wings out of wax and feathers. The legend states that these wings enabled them to fly, but Icarus flew too close to the Sun, which caused the wax to melt, resulting in his fall to the ocean where he drowned (Williams, 2009). According to the National Association for Scientific and Cultural Appreciation (NASCA, 2004), Daedalus, as an expert in his trade, may have made two small aircraft. Daedalus's instructions to his son indicate that he was familiar with the principles of flight even though he was not entirely successful in his endeavors. Although wax and feather wings would not enable someone to fly, this legend may actually record a people's remembrances of an attempted ancient flight over the sea. On the other hand, it might just indicate the ancient desire to achieve the ability to fly, or point out the danger of flight.

Middle East

Several intriguing stories come from the ancient lands of Babylon and Sumer. In the record of Babylonian laws called the *Halkatha*, is a passage stating that the operation of a flying machine is a privilege and that this ancient knowledge was a gift for saving lives (Noorbergen, 1977). This code of laws is one of the earliest found and apparently refers to flight in an even earlier time. Other documents, such as the *Sifr'ala*, which are old and fragmentary, appear to contain detailed instructions on the construction and operation of a flying machine (NASCA, 2004). Unfortunately, the fragmentary text and incomplete translation of these documents make it difficult to reconstruct accurately the information contained in it. However, some sections appear to discuss vibrating spheres, graphite rods, and copper coils (Gray, 2004) which may relate to experimentation in flight. Other sections appear to describe the effects of wind resistance and other important variables of flight (Noorbergen, 1977).

The *Epic of Etana* is another tantalizing piece of information from ancient Babylon. According to Horowitz (1998), this epic dates to at least the Old Babylonian period, or approximately 2003–1595 BCE (Frayne, 1990). This epic describes the journey of the shepherd-king Etana on the wings of an eagle up to heaven. Unfortunately, many portions of the epic are missing, but the journey's destination is apparently Venus, the mythological home of the goddess Ishtar (Jastrow, 1910). The story describes the appearance of Earth at various heights during the flight. For example, after reaching one league (5.6 km) above the Earth, the eagle describes the Earth as a mountain while after three leagues (16.5 km), land is described as a gardener's ditch (Knipe, 1967). These descriptions are obviously somewhat fanciful, but do indicate that the author was aware that water surrounds the land with more water being visible the farther up one went. Unfortunately, the epic is fragmentary and many lines are missing, included more descriptions of the earth from different elevations. No known

version is complete, thus making it impossible to fill in the missing pieces at this time. However, many copies of the epic exist and the descriptions of Earth are somewhat similar to those of modern pilots. Possibly, the original author of the epic had himself been on a trip reaching higher altitudes or was recording the first-hand experience of someone who had. Or, the author was simply very smart in theorizing on the views one might encounter when ascending to high elevations above ground. The eagle might be a later change in the epic to make the aircraft more understandable to later readers or to give the text a religious meaning. In a modern context, official documents or codes frequently refer to aircraft using avian names.

Gray (2004) reported a Hittite story describing the search for a missing person in which the ruler dispatched a “swift eagle” to assist in the hunt. Once again, this may be another reference to an airplane under the guise of an animal. An Iranian text refers to an early king visiting a Caucasus Mountain cave while riding a winged horse (Gray, 2004). Still other texts from the Mesopotamia area record people flying on the wings of birds and rising from low horizons to great heights (Gray, 2004). While these texts are highly stylized, and not intended to record technological information, the matter-of-fact way in which the authors mention human flight and the prevalence of these references may indicate some familiarity with aviation. Or, these descriptions may simply reflect a routinely discussed wish to fly.

India, Nepal, and Tibet

The most frequently discussed descriptions of ancient aviation come from the Sanskrit writings of ancient India, Tibet, and Nepal. Vedic texts contain hundreds of references to gods and heroes who knew the secret of flight (Londhe, 2001). Other Sanskrit documents are extremely technical and refer to the operation, construction, and maintenance of vimanas, some type of flying machines (Leonard, 2002). The amount of literature from this area that refers, either directly through physical and mechanical descriptions, or indirectly through references, to flying chariots, people, or animals, is staggering. Many of these descriptions include references to other advanced technology such as sophisticated-sounding weaponry (Childress, 1993).

The *Mahabharata* and *Ramayana* are the two longest and best-known of the Vedic texts. The *Mahabharata* tells the story of the struggle for the throne of India (Buck, 1973) while the *Ramayana* tells of a battle fought to free a kidnapped queen. During these battles, both sides utilized vimanas to attack the enemy (Mazumdar, 1958). According to B. A. van Nooten (in the Introduction to Buck, 1973), the Indian calendar, which begins with the events mentioned in these epics, gives a date of roughly 3102 BCE, but the events more likely occurred in approximately 1400 BCE.

Both the *Mahabharata* and *Ramayana* describe vimanas in incidental ways, as the story is unfolding, while other Sanskrit documents provide detailed information on construction, flight training, and some information on propulsion. One document describes a vimana as circular with four wheels while other texts describe vimanas as having the ability to become invisible (Burrows, 2009)—possibly suggesting that the craft was hidden by clouds at times. Descriptions in these ancient documents also suggest that vimanas were able to go up, down, forward, or backward at will and were very fast (Burrows, 2009). One vimana, in addition to being invisible at times, appeared to multiply, and could move on water, land, or in the air, according to the ancient description. The *Ramayana* and other texts contain many other incidental references to flying machines as well as descriptions of flight and the use of flying machines in warfare. The most common description of a flying machine in the *Ramayana* is one that could hide behind the clouds and become invisible. While the abilities ascribed to the vimanas, such as invisibility, may be imaginative elements added for a good story, the descriptions of flying machines may reflect actual objects used by this culture.

Based on the wide variety of descriptions found in various Sanskrit texts, it is likely that the term *vimanas* was a broad one, possibly similar to the English term *aircraft*. Some texts describe circular flying machines, others were oval, while others seem to have multiple decks. Given the lack of complete technical descriptions, it is difficult to separate the fact from mythology when researching vimanas. In addition, the wide variety of forms which these machines are described as having makes reconstructing an image of them difficult.

Construction of the aircraft is the focus of many of these ancient texts, which provide more details regarding how to fly the machines and how they functioned. Texts are deliberately vague however on certain portions of construction, and are particularly silent concerning propulsion. As the texts state, this is to prevent someone who is not initiated from discovering the secret of flight and using it for war. Another possible explanation for the vagueness is that the technology was not actually developed to the point that these elements could be described in detail. One text, the *Samarangana Sutradhara*, states that construction materials for the body must be lightweight while other construction materials can be iron, copper, and mercury (Ringer, 2007). The *Samarangana Sutradhara* describes how to join the wings to the body as well as some description on the propulsion system. It also describes the gear and training of pilots as well as techniques for flying different kinds of vimanas (Noorbergen, 1977). Many fragmentary references to propulsion and guidance systems seem to imply that native mercury, a yellowish white liquid, and “antigravity technology” are integral parts of the aircraft (Childress, 1993), while some texts refer to possible laser technology as part of the engine (*Samarangana Sutradhara*, in Leonard,

2002). Descriptions that appear to describe things such as antigravity or high-quality lasers may more likely represent the imagination of the storyteller, additions added to improve the power of the hero or god, or biases on the part of the translator. However, the technical descriptions that are available are very detailed. The mercury appears in connection with an iron framework, and the method for use is currently unknown (Childress, 1993). We do not know of any construction of the type spoken of in these texts. Unfortunately, the fragmentary nature of these manuscripts prevents reconstruction of the described propulsion system, thus limiting our understanding of the possible mechanism.

The numerous writings from India, Nepal, and Tibet indicate a familiarity with the principles of flight that is surprising. The construction materials and propulsion systems are sometimes different from those used in modern times, but appear highly advanced and are certainly detailed. Some texts appear to describe aircraft similar to modern hovercraft or helicopters. The described vimanas came in many different types, all of which were different in shape, use, and construction. Some descriptions of these ancient craft are so technical and detailed that it is impossible simply to dismiss them as wholly fantasy. Additionally, many of the texts, independently found and translated, describe a craft with the same features. These texts appear authentic, suggesting that flight or the possibility of flight preoccupied the minds of many people during ancient history. Whether this preoccupation went as far as actually developing the technology for flight is uncertain, however.

Asia

China also has numerous stories detailing flight. Not only do the texts describe flying machines similar to airplanes and helicopters, but also references include the testing of a parachute (Noorbergen, 1977). Chinese chroniclers from the reign of Emperor Shun (2258–2208 BCE) to as late as 400 AD described flying machines of various types and accurately described the regions over which they flew. Ko-Hung, writing in approximately 400 CE, tells of a flying machine made out of wood with rotating blades that caused the machine to rise off the earth (Noorbergen, 1977). Moreover, the Chinese language already had a word for an airplane meaning “flying chariot” when modern airplanes came into use (Gray, 2004).

The Chinese placed great importance on chronicling their history accurately (Chan, 2009). In addition, the Chinese have always had one of the most advanced civilizations of the ancient world. In fact, many of our inventions, such as gunpowder, stem directly from Chinese science. Because the Chinese were so careful to record accurately what they observed, these reports of flying machines in China deserve serious consideration.

Other Regions of the World

There is a rich tradition of flying found in Celtic legends and in Druid traditions. Druid legends speak of machines that could travel on land, in water, and in the air (Gray, 2004). Other Celtic traditions speak of flying ironclad animals without bones that did not need food and of flying machines that did not touch the water and could travel from Ireland to England in one night, or tell of air travel from Britain to Greece (Gray, 2004). One legend surrounding Stonehenge suggests that the transport and placement of the stones used aircraft (Noorbergen, 1977). These stories are fanciful descriptions of Celtic history, and likely indicate a period in their early history which document the strong desire of these cultures for achieving flight. Or, possibly they are a description of the various attempts that they made to achieve flight.

Ethiopia has an ancient tradition dating to the fourteenth century, called the *Kebra Nagast*. In this document, there is an account of King Solomon presenting the Queen of Sheba (Ethiopia) with a flying machine (*Kebra Nagast*, cited in Gray, 2004). Egypt also has its stories of ancient flying vehicles. One tells of a king who was inside of a white bird that came down with a trail of fire (Gray, 2004). These stories may not be as noteworthy as some others mentioned in other cultural manuscripts simply because they are less realistic in their descriptions. However, they do fit in the general trend of documentation of the desire for flight in a wide variety of cultures.

The Polynesians and Aborigines of Australia both have oral traditions of visitors from the West who came in flying boats above the ocean. On Mangareva in the Gambier Islands, the native inhabitants describe a flying canoe with wings that could fly long distances (NASCA, 2004). From Easter Island comes the tradition of flying men in hats (Gray, 2004). Could this be the inspiration for the enigmatic statues found here? In New Zealand, legends describe the north island of New Zealand as shaped like a ray-fish (Gray, 2004), although this feature of the island is only visible from high above ground level.

The Hopi of North America tell a story of nations that had aircraft and used them for warfare, while Piute Indians tell of peoples who had large, quiet airplanes with weapons (Gray, 2004). In addition, documents from Mexico record the arrival of flying ships and an Aztec king who designed an airplane (Gray, 2004). The stories originating in North America are quite similar to the Indian epics in their description of aircraft associated with war technology. They are recently recorded oral traditions, written down before aviation became a common technology. In addition, these stories depict flight as an incidental part of the story instead of a central feature. This makes it more likely that the flight was an actual event that had occurred or was anticipated rather than embellishment by the storyteller. Clearly, many ancient cultures were intrigued by the possibility of achieving heavier-than-air flight.

Artifacts Possibly Depicting Flight

Certain artifacts that may represent flying or gliding technology from ancient times, or that indicate some steps toward the development of that technology, are known from around the world. The most intriguing of these examples are discussed below in detail.

Columbian Artifacts

These artifacts come from Central and South American and date to the Sinu culture between 500 and 800 CE (Janku, 1996). All of the artifacts recovered so far have wings and most accurately represent known flying creatures, such as birds, insects, or bats, generally identifiable to the species represented. However, there are fourteen of these zoomorphic models displaying features of a more mechanical nature, which do not fit the features of any known flying animal (Janku, 1996). These out-of-place models resemble model aircraft in many of their features with one such artifact that is approximately five centimeters long, possibly originally a pendant or amulet. The deltoid-shaped wings have very straight edges and are located too far back on the body to accurately represent any known flying animal. From an aeronautical viewpoint, it appears that the object may have had an engine (Noorbergen, 1977) and is well-designed for flight. These models have spirals on both wings and the nose, and spirals, in Native American cultures, may represent ascent if right-oriented and descent if left-oriented (Janku, 1996). If this is so, then the artist may have placed the spirals on the wings and nose to show that these parts were most intimately involved with the flight of the craft. Regardless of the type of plane that the object may represent, the objects have definite mechanical features and resemble manmade flying objects. Major archaeological expeditions unearthed the Columbian artifacts, which do not appear to be forgeries. World-renowned museums authenticated these artifacts, some of which are currently housed at the Smithsonian Museum.

Nazca Lines

The Nazca lines are geoglyphs drawn into the soil of the Nazca Desert in southern Peru. These glyphs remained undiscovered until the 1930s when commercial airlines began flying over the region. The Nazca lines are difficult to see from the ground, but are easily discernible from the air. Many of these glyphs depict animals, while others are straight lines that run for kilometers (Nazca Lines, 2009). The purpose of these drawings remains an open question, as does the method of construction. Because it is difficult to see the glyphs from the ground, it has been suggested that the construction of the lines utilized

directions from someone who was in the air (Nickell, 1983). In the 1970s, Jim Woodman and colleagues from the International Explorers Society conducted a test flight with a hot air balloon built entirely of and heated with materials available to the Nazcan people. The balloon construction used cloth replicated from surrounding tombs and the basket from reeds found on Lake Titicaca (Nickell, 1983). While the flight was not smooth, it was successful and showed that the technology was available to the Nazcans, whether they utilized it or not. Many local stories and historical reports from this region of the Nazca Desert appear to discuss hot air balloons as well (*Time Magazine*, 1975). More research is necessary to either confirm or disprove the theory that aerial technology was critical to the construction of the Nazca lines.

Saqqara Bird

In 1891, excavators discovered a unique artifact among the contents of a tomb located in the Saqqara Necropolis, Egypt. The tomb dated to 200 BCE (Jochmans, 2008). At the time of discovery, the researchers classified the artifact as a bird, and along with other bird objects taken from this tomb stored it in the Egyptian Museum. The artifact remained in storage until 1969 when the late Dr. Kahlil Messiha came across it (Noorbergen, 1977). Messiha was a model plane enthusiast and immediately recognized the Saqqara Bird as being very similar to a model aircraft. Further detailed examination revealed that the Saqqara Bird had eighteen-centimeter wings of a reverse dihedral nature, smooth, pointed nose, and a vertical tail (Messiha et al., 1991, Jochmans, 2008). The smoothed body shows no evidence of carved or painted feathers or feet (Messiha et al., 1991). The vertical tail is flattened on top and possibly broken on the bottom, indicated that something else might have been part of the tail that has since disappeared (Jochmans, 2008). Due to Messiha's findings, the Cairo Museum asked a panel of Egyptian aeronautic engineers to examine the craft. They concluded that the Saqqara Bird showed advanced features indicative of low-speed flights with large loads of freight (Noorbergen, 1977). An external engine attached to the tail may have powered the Saqqara Bird, or it may have had an internal engine not depicted on the model. To us, the model most likely represented a glider (Figures 1 and 2).

The model glided very well in tests done by Messiha as reported by Jochmans (2008). The development of a glider would be reasonable given the other technological achievements of the Egyptian society and also indicate not only the desire to fly but also experimentation. In order to understand what the Saqqara Bird is portraying, reexamination of the artifact in light of today's technology is necessary.

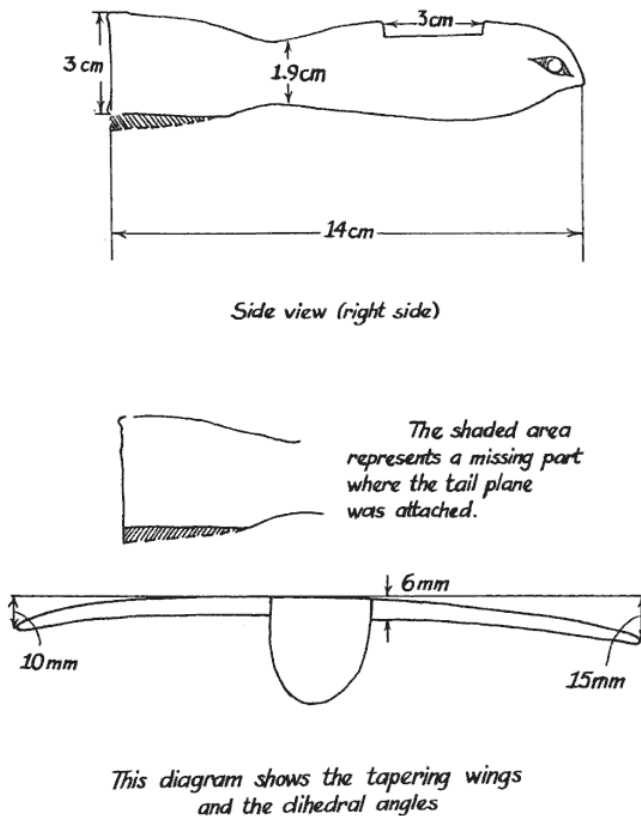


Figure 1. Drawings showing the side and front view of the Saqqara Bird (from Messiha et al., 1991).

Mission To Find Conclusive Evidence for Ancient Cultures' Developed Flight

Finding undisputable evidence for ancient aviation is unlikely even if it has existed, due to the poor preservation of likely construction materials. However, there are several ways to further analyze current documents and artifacts and several places to look for additional physical evidence. Archaeologists have excavated an extremely small portion of known ancient sites, and analysis by experts is even more limited due to time and funding constraints. Western scientists do not have access to many Asian documents, and many oral traditions are lost before recording is possible. In order to continue the search for evidence pointing to the development of ancient aviation, we need to take measures to remedy these obstacles.



Figure 2. Side view of the Saqqara Bird, clearly showing the vertical tail and bird-like head (photograph from Dawoud K).

First, existing artifacts need in-depth analysis by competent scientists. For example, the claim that the Saqqara Bird and Columbian artifacts portray actual airplanes is quite common. In order to determine the validity of this claim, a panel of aeronautic engineers and other aviation experts needs to examine carefully all the supposed aerodynamic features of the models. Building larger replicas or computer-generated models is a possible method of testing airworthiness. As scientists, we need to accept the possibility that our current theories of human development may be in need of revision and then, with open minds, consider the evidence. After testing existing artifacts, results may indicate that the models are not aerodynamically sound and simply represent highly stylized winged zoomorphic figures. If that is the case, then it will be unlikely that ancient legends record anything more than humanity's fascination with flight.

Second, the recording of oral traditions is critical. As these traditions are lost, so is a vital part of our heritage that tells us about human history. These stories are important sources of information for locations in which to search for artifacts relating to primitive aviation and other evidence. These traditions are being lost at an alarming speed as the rush to develop modern technology and to stay up to date with the modern culture reduces the number of people learning

the old tales. Recording and studying these traditions can pinpoint locations where advanced civilizations existed in the past. This information can then guide researchers toward useful areas of excavation.

Third, current documents need in-depth study by scientists and some, such as the Indian epics, by aviation experts. Completing the translation of many documents quickly before the ravages of time destroy the delicate palm leaf paper is important also. Thousands of ancient manuscripts were lost as conquering armies burned libraries, including the Alexandrian library in Egypt and the Mayan Codices in Central America. As we have very limited numbers of these ancient documents left, we should make every effort to preserve those that remain and the knowledge they contain.

Fourth, examining all zoomorphic figures and models currently housed in the museums of the world is necessary. Through a thorough examination of museum collections, searchers may find additional misclassified artifacts showing possible evidence toward the development of ancient flight. Many of these zoomorphic figures may represent stylized remembrances of a more advanced period.

As the above discussion indicates, very little conclusive evidence is available for the existence of ancient aviation. Each piece of information when taken alone is weak, but when examining the data as a whole, a picture more strongly in favor of the development of ancient aviation, at least to the glider stage, emerges. However, these separate threads of research may simply indicate that ancient cultures were advanced enough to understand the technical requirements of flight, without actually being able to fly. An example of this situation is found in our own time with the story of George Cayley, mentioned earlier, who developed rudimentary flying machines but was hindered in his research by the limited technology available to him at that time.

The prevalence of oral traditions and ancient documents is puzzling if the ancients did not achieve some type of flight. However, if one or several ancient cultures were able to achieve some sort of flight or came close enough to leave technically accurate mythology behind, then the worldwide distribution of these myths becomes understandable. The highly technical nature of these sources also indicates a basis in fact, as it is unlikely that a writer could invent accurate technological data without some background technology on which to base it. Documents from such diverse places as India and Australia agree on details such as the shape of the aircraft, which very likely indicates a common event or history behind the stories. Thus, these stories are unlikely to be ancient science fiction with no basis in reality.

Artifacts worldwide share many features with modern aerial craft. Just as is found in ancient oral and written traditions, it appears unconvincing that artists in so many places concocted all of these artifacts without some sort of technical

background. The streamlined shapes remain recognizable today and are similar to all others around the world. This similarity between artifacts from various parts of the world is unique to those appearing to describe some sort of air flight and does not translate to other types of ancient relics. For example, new world and old world metallurgy is extremely different in technology and appearance (Lechtman, 1977), thus not showing the same similarity as might be seen in ancient aviation-type objects.

This trend toward similarity reaching beyond cultural boundaries extends into the realm of anthropology as well. Technology, science, religion, and all other aspects of society diverge and change when in isolation from other groups of people. As a result, artifacts and stories tend to be dissimilar if the stories are entirely fiction. That they are similar, argues for some basis in reality. Based on current data, it is possible that one or more ancient cultures possessed enough technical ability either to achieve heavier-than-air flight or to author relatively detailed and accurate stories and did so routinely in the distant past. Open-minded researchers, who are willing to reevaluate current theories about cultural development if necessary, are needed before we will be able to decide the issue conclusively.

Discussion

An important consideration when evaluating evidence for and against ancient flight is the possibility of technology being lost. Any technology, especially advanced technology, requires specialized knowledge. Maintaining this pool of knowledge is vital for retaining the technology, and if the people with this knowledge do not pass it on to a younger generation then the knowledge will be lost completely. A familiar modern example, according to DeLong (2004), is found in the NASA space program. Due to budget cuts, the engineers responsible for building the equipment to successfully launch the lunar missions were encouraged to retire. Unfortunately, the knowledge and experience of these engineers was not passed on, making a return mission to the Moon much more difficult (DeLong, 2004). This is an example of how quickly knowledge can be lost if it is not shared. An ancient example can be found in Old Kingdom Egypt. The earliest pyramids, such as the Step Pyramid and Bent Pyramid, show increasing technological skills and knowledge, which culminates with the construction of the pyramids of Giza. However, later pyramids, such as those built by Pepi II near the end of the Old Kingdom, due to their shoddy construction indicate that the ability to build great monuments like the Great Pyramid was disappearing (Malek, 1986). Regarding the possible development of ancient flight, this is an important principle because in many societies, such as India, documents state that the knowledge of how to build and fly airplanes was accessible only to members of certain secret societies and that even within

those societies the knowledge was carefully guarded. When these societies died out or leadership was handed to younger members, the ability to build and fly airplanes may have easily been lost. The ease with which technical knowledge can be lost may explain why so many artifacts and documents seem to refer to the development of flight in ancient times, and that this knowledge had to be rediscovered in modern times.

There is fascinating, but highly controversial evidence for the development toward flight in the ancient past. Unfortunately, very little scholarly research is available for the documents and artifacts mentioned above. In order to determine whether ancient humans took to the air, and if they did how often and with what technology, will require very detailed analysis of the evidence from artifacts and ancient texts. Ultimately, if enough information is present in the texts, testing ancient designs in the field becomes important to determine whether they do work. Building working models based on ancient descriptions is the only way to truly understand how advanced the described technology really is. Overall, though, our research points to the fact that flight is a feat that several ancient civilizations attempted several times, and in some of the cases probably successfully, at least in the form of lightweight gliders. Regardless, the fascination and attempts with flight seems to be a recurring theme for the one species on Earth that is able to do so, and implies that at least some intelligent species that may have developed elsewhere in our universe may follow this same path.

Conclusions

There is no conclusive evidence that ancient societies ever developed heavier-than-air flight. However, many oral traditions, written documents, and even artifacts clearly indicate that the fascination with flight was a broad theme in many advanced societies of the ancient past. It also appears that at least in some cases steps were undertaken toward the actual technological development of flight, at least to the stage of a lightweight glider. Thus, for many cultures, the development of flight is a recurrent theme.

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