



The Space Shuttle Decision

Michael Rajnik



The Space Shuttle Decision:

The Space Shuttle Decision T. A. Heppenheimer, 1999 *The Space Shuttle Decision* National Aeronautics and Space Administration, T. A. Heppenheimer, 2013-11

The Space Shuttle took shape and won support and criticism as part of NASA's search for a post Apollo future. NASA had grown rapidly during the 1960s and the success of the piloted moon landings brought insistent demands that NASA should shrink considerably. In facing those demands and in overcoming them to a degree, NASA extended our manned presence in space. Before anyone could speak seriously of a space shuttle, there had to be a widespread awareness that such a craft would be useful and perhaps even worth building. A shuttle would necessarily find its role within an ambitious space program and while science fiction writers had been prophesying such wonders since the days of Jules Verne, it was another matter to present such predictions in ways that smacked of realism. This book portrays NASA's search for continued manned space exploration after the success of Apollo. During 1969, with Nixon newly elected and the first astronauts setting foot on the Moon, NASA Administrator Thomas Paine led a push for a future in space that promised to be expansive. He aimed at nothing less than a piloted expedition to Mars propelled by nuclear rocket engines that were already in development. En route to Mars, he expected to build space stations and large space bases. Almost as an afterthought, he expected to build a space shuttle as well to provide low cost flight to these orbiting facilities. Soon after Neil Armstrong made his one small step in the lunar Sea of Tranquility, Paine received a cold bath in the Sea of Reality. Nixon's budget director Robert Mayo chopped a billion dollars from Paine's request. This brought an end to NASA's hopes for a space base and for flight to Mars. It appeared possible, however, to proceed with the space station and the Shuttle as a joint project. The Shuttle drew particular interest within the Air Force, which saw it as a means to accomplish low cost launches of reconnaissance satellites and other military spacecraft. Congress, however, was deeply skeptical toward the proposed shuttle station as both the House and Senate came close to killing it in 1970. NASA responded to this near death experience by placing the station on the shelf and bringing the Shuttle to the forefront. Its officials needed political support that could win over doubters in Congress and they found this support within the Department of Defense. The Air Force now found itself in a most unusual position. Its generals had worked through the 1960s to pursue programs that could put military astronauts in space. These programs had faltered. Yet here was NASA offering the Pentagon a piloted space shuttle. The Air Force gave its political support to the Shuttle and NASA went on to quell the opposition on Capitol Hill. The OMB was a tougher opponent. These critics forced NASA to abandon plans for a shuttle with two fully reusable liquid fueled stages and to set out on a search for a shuttle design that would cost half as much to develop. Budget officials demanded a design that would be smaller and less costly, even though such a shuttle would have significantly less capability than the Air Force wanted. By shrinking the Shuttle, however, NASA won support where it counted. Caspar Weinberger, the OMB's deputy director, gave his endorsement late in 1971. Nixon also decided that the nation should have a shuttle. On the eve of decision, the key player proved to be OMB.

Director George Shultz He decided that since the shuttle was to serve the entire nation it should have the full capability for which NASA hoped and the Air Force demanded Shultz's decision reinforced Nixon's putting an end to the OMB's continuing demands to downsize the design The consequence was the Space Shuttle as we know it today **The Space Shuttle**

Decision T. A. HEPPENHEIMER, 2009-11-18 This significant new study of the decision to build the Space Shuttle explains the Shuttle's origins and early development In addition to internal NASA discussions this work details the debates in the late 1960s and early 1970s among policymakers in Congress the Air Force and the Office of Management and Budget over the roles and technical designs of the Shuttle Examining the interplay of these organizations with sometimes conflicting goals the author not only explains how the world's premier space launch vehicle came into being but also how politics can interact with science technology national security and economics in national government The weighty policy decision to build the Shuttle represents the first component of the broader story future NASA volumes will cover the Shuttle's development and operational histories The Space Shuttle Decision National Aeronautics and Space Administration, T. A.

Heppenheimer, 2013-08 The Space Shuttle Decision NASA's search for a reusable space vehicle National Aeronautics and Space Administration T A Heppenheimer Before anyone could speak seriously of a space shuttle there had to be a widespread awareness that such a craft would be useful and perhaps even worth building A shuttle would necessarily find its role within an ambitious space program and while science fiction writers had been prophesying such wonders since the days of Jules Verne it was another matter to present such predictions in ways that smacked of realism After World War II however the time became ripe Everyone knew of the dramatic progress in aviation which had advanced from biplanes to jet planes in less than a quarter century Everyone also recalled the sudden and stunning advent of the atomic bomb Rocketry had brought further surprises as the Germans bombarded London with long range V 2 missiles late in the war Then in 1952 a group of specialists brought space flight clearly into public view The concept of a space station took root during the 1920s in an earlier era of technical change that focused on engines As recently as 1885 the only important prime mover had been the reciprocating steam engine The advent of the steam turbine yielded dramatic increases in the speed and power of both warships and ocean liners Internal combustion engines powered by gasoline led to automobiles trucks airships and airplanes Submarines powered by diesel engines showed their effectiveness during World War I After that war two original thinkers envisioned that another new engine the liquid fuel rocket would permit aviation to advance beyond the Earth's atmosphere and allow the exploration and use of outerspace These inventors were Robert Goddard a physicist at Clark University in Worcester Massachusetts and Hermann Oberth a teacher of mathematics in a gymnasium in a German speaking community in Romania Goddard experimented much wrote little and was known primarily for his substantial number of patents Oberth contented himself with mathematical studies and writings His 1923 book *Die Rakete zu den Planetenraumen* The Rocket into Interplanetary Space laid much of the foundation for the field of astronautics The Space Shuttle Decision National

Aeronautics and Space Administration (NASA), World Spaceflight News (WSN), U. S. Government, 2017-10-23

This NASA report presents a fascinating history of the decision to proceed with the Space Shuttle program

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The Space Shuttle took shape and won support and criticism as part of NASA's search for a post Apollo future

As with the Army and Navy in World War II

NASA had grown rapidly during the 1960s

Similarly just as those military services saw a sharp falloff in funding in the wake of victory

the success of the piloted Moon landings brought insistent demands that NASA should shrink considerably

In facing those demands and in overcoming them to a degree

NASA established itself as a permanent player in Washington

During 1969 with Nixon newly elected and the first astronauts setting foot on the Moon

NASA Administrator Thomas Paine led a push for a future in space that promised to be expansive

He aimed at nothing less than a piloted expedition to Mars propelled by nuclear rocket engines that were already in development

En route to Mars he expected to build space stations and large space bases

Almost as an afterthought he expected to build a space shuttle as well to provide low cost flight to these orbiting facilities

Soon after Neil Armstrong made his one small step in the lunar Sea of Tranquility

Paine received a cold bath in the Sea of Reality

Nixon's budget director Robert Mayo chopped a billion dollars from Paine's request

This brought an end to NASA's hopes for a space base and for flight to Mars

It appeared possible however to proceed with the space station and the shuttle as a joint project

The shuttle

drew particular interest within the Air Force which saw it as a means to accomplish low cost launches of reconnaissance satellites and other military spacecraft *SPACE SHUTTLE DECISION V1 PB* HEPPENHEIMER TA,2002-05-17

Heppenheimer looks back at the shuttle's technical antecedents such as the X-15 rocket plane and rocket booster technologies and illuminates the principal personalities involved in the space shuttle decision and their motivations. He traces NASA's evolving programme goals, the technical calculations, political maneuvering and fiscal constraints and explains the myriad designs that preceded the shuttle concept. In closing, he looks in detail at the circumstances leading to the politically charged development decision of 1972. *History of the Space Shuttle: The space shuttle decision, 1965-1972* T. A. Heppenheimer, 2002 **DEV M SPACE SHUTTLE** Heppenheimer TA, 2002-05-17 **SPACE SHUTTLE DECISION V1 PB** HEPPENHEIMER TA, 2002-05-17 *The Space Shuttle Decision, Etc., NASA SP-4221, 1999, 1999** SPACE SHUTTLE DECISION V1 PB HEPPENHEIMER TA, 2002-05-17 **The Space Station Decision** Howard E. McCurdy, 2008-01-16

Selected by Choice Magazine as an Outstanding Academic Title Outstanding Academic Title 1991 Choice Magazine Although building a space station has been an extraordinary challenge for America's scientists and engineers, the securing and sustaining of presidential approval, congressional support and long-term funding for the project was an enormous task for bureaucrats. The Space Station Decision examines the history of this controversial initiative and illustrates how bureaucracy shapes public policy. Using primary documents and interviews, Howard E. McCurdy describes the events that led up to the 1984 decision to build a permanently occupied international space station in low Earth orbit. As he follows the trail of the space station proposal through the labyrinth of White House policy review, McCurdy explains the evolution of the presidential budget review process, the breakup of the cabinet system, the proliferation of subcommittees and Executive Office interagency involvement, the involvement of White House staff in framing issues for presidential review and the role of bureaucracy in advancing administration legislation on Capitol Hill. Comparing the space station decision to earlier decisions to go to the moon and to build the space shuttle, McCurdy shows how public officials responsible for long-term science and technology policy maneuvered in a political system that demanded short-term flexibility. **History of the Space Shuttle, Volume Two** T. A. Heppenheimer, 2014-09-30

Basing his work on virtually untapped NASA archives, T. A. Heppenheimer has produced the second volume of his definitive history of the space shuttle. Volume Two traces the development of the shuttle through a decade of engineering setbacks and breakthroughs, program management challenges and political strategizing culminating in the first launch in April 1981. The focus is on the engineering challenges: propulsion, thermal protection, electronics, onboard systems and the author covers in depth the alternative vehicles developed by the U.S. Air Force and European countries. The first launch entailed a monumental amount of planning and preparation that Heppenheimer explains in detail. *SPACE SHUTTLE DECISION V1 PB* HEPPENHEIMER TA, 2002-05-17 **Hearings** United States. Congress. House. Committee on Science and Astronautics, 1972 **1973 NASA Authorization, Hearings Before ...** United States. Congress. House

Science and Astronautics,1972 Columbia Accident Investigation Board Report United States. Columbia Accident Investigation Board,National Aeronautics and Space Administration,2003 CD ROM accompanying vol 1 contains text of vol 1 in PDF files and six related motion picture files in Quicktime format *Spies and Shuttles* James E. David,2015-01-27

Revealing the connections between NASA and the United States defense community In this real life spy saga James E David reveals the extensive and largely hidden interactions between NASA and U S defense and intelligence departments The story begins with the establishment of NASA in 1958 and follows the agency through its growth not only in scope but also in complexity In *Spies and Shuttles* David digs through newly declassified documents to ultimately reveal how NASA became a strange bedfellow to the Department of Defense DoD and the Central Intelligence Agency CIA He tracks NASA s early cooperation supplying cover stories for covert missions analyzing the Soviet space program providing weather and other scientific data from its satellites and monitoring missile tests that eventually devolved into NASA s reliance on DoD for political and financial support for the Shuttle David also examines the restrictions imposed on such activities as photographing the Earth from space and the intrusive review mechanisms to ensure compliance The ties between NASA and the intelligence community have historically remained unexplored and David s riveting book is the first to investigate the twists and turns of this labyrinthine relationship *Exploring the Unknown* John M. Logsdon,1995 **Space Policy in the Twenty-First Century** W. Henry Lambright,2003 Though more than forty years old the space age has just begun and questions about its future abound What will replace the Space Shuttle Will the International Space Station justify its 100 billion potential cost Are asteroids real threats to Earth or just the subject of science fiction movies Will humans land on Mars Will the search for extraterrestrial life be rewarded In *Space Policy in the Twenty First Century* W Henry Lambright brings together ten top ranking observers of United States space exploration to address these and other issues relating to the future of the space program While the U S no longer competes with the Soviets for technological firsts they argue ideology and national image remain at the core of space policy with other factors playing subordinate roles Reminding readers of the historical highlights the authors pose searching questions about the priorities and applications of space science manned vs unmanned flights and commercial access to the space enterprise Contributors include Christopher F Chyba SETI Institute and Stanford University Ronald J Deibert University of Toronto Daniel H Deudney the Johns Hopkins University W Henry Lambright Syracuse University Roger D Launius NASA Karl A Leib Syracuse University John M Logsdon George Washington University Howard E McCurdy American University Scott N Pace White House Office of Science and Technology Policy and Debora L VanNijnatten Wilfrid Laurier University

The Space Shuttle Decision Book Review: Unveiling the Power of Words

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The Space Shuttle Decision Introduction

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web in this two part activity students explore the idea of common ancestry by making hypotheses about relatedness among

whales deer tigers seals and sharks they use an evolutionary tree to keep track of their hypotheses and observations about these animals

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web 12 when two groups of organisms independently evolve similar adaptations it s called convergent evolution sharks and whales both have streamlined bodies and tail flukes how do we know that these similarities are because of convergent evolution hint whales are tetrapods are sharks

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web whale whale has a much shorter and thicker humerus radius and ulna much longer metacarpals whale fin needs to be longer to help in movement through water thumbs are not necessary as they don t need to pick up and grasp things cat curved humerus shorter thinner humerus and ulna and radius smaller metacarpals and phalanges

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web d have students discuss the answers for completeness and to hear about how others compare and contrast the fossil animals to today s animals iii whale evolution timeline a explain to students that a timeline is a way to show or map something that has happened whether in recent times or in the past b show powerpoint whale evolution

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web jan 27 2023 description of the activity assignment for this written assignment the students outline the evolution of whales from land dwelling animals to aquatic beasts rather than an essay they produce a detailed outline of the major modifications that occurred during this transition such as hearing propulsion shape limbs and several

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web jul 3 2020 in the secular worldview the currently accepted whale evolution model is that the hippopotamus is the closest living relatives of whales but supposed early whales have little in common with hippos or living whales

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web the evolution lab answer key one small step 6 it helps them to see and catch prey above them in the water 7 d 8 this tree or an equivalent 9 c origin of whales 10 a 11 b 12 sample answer because sharks and whales are not closely related and did not inherit these traits from a common ancestor whales evolved from tetrapods sharks

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web cetacea balaenopteridae humpback whale eschrichtiidae grey whale physeteridae sperm whale delphinidae dolphin

monodontidae beluga whale phocoenidae porpoise sirenia dugongidae dugong trichechidae manatee proboscidea elephantidae elephant perissodactyla equidae horse tapiridae tapir rhinocerotidae rhinoceros artiodactyla

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web lab 5 activity 3 whale evolution time estimate 90 minutes the basics in this activity you will be constructing a phylogenetic tree using three different criteria habitat and diet skeletal morphology and dna sequencing before you begin go to nova labs and complete mission 1 training tree to learn how to build a phylogenetic tree

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web in this unit students will study the evolution of whales from four limbed land dwelling mammalian ancestors to modern two finned aquatic mammals through a virtual or in class simulation lab this activity will teach them more about how fossils homologous structures and dna analysis provide evidence for macroevolution evolutionary theory

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web whale evolution lab answers modified and using material from becoming whales experiencing whale evolution discoveries today students complete their simulated whale evolution lab using dna to search for the whale s closest living relative they will use classification groups and fossil homology to narrow the search down to a key family group

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web the evolution of whales the first thing to notice on this evogram is that hippos are the closest living relatives of whales but they are not the ancestors of whales in fact none of the individual animals on the evogram is the direct ancestor of any other as far as we know that s why each of them gets its own branch on the family tree

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web these worksheets contain questions for each level and video of the evolution lab and provide assessment on topics like cladograms fossil evidence of evolution dna and genetics biogeography

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web in this lab you ll puzzle out the evolutionary relationships linking together a spectacular array of species explore the tree of life and get a front row seat to what some have called the

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web c this picture of whale evolution was about all we had until 1983 when the first of a series of discoveries began to fill the empty gap between land animals and whales that first discovery reported by whale specialist philip gingerich and others was pakicetus place the pakicetus strip 3 on the timeline

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