

# The Space Shuttle Decision

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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 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 outer space 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

this nasa report presents a fascinating history of the decision to proceed with the space shuttle program contents chapter 1 space stations and winged rockets the collier s series background to the space station winged rockets the work of eugen sanger the navaho and the main line of american liquid rocketry the x 15 an airplane for hypersonic research lifting bodies wingless winged rockets solid propellant rockets inexpensive boosters dyna soar a failure in evolution chapter 2 nasa s uncertain future technology bypasses the space station apollo applications prelude to a space station space station concepts of the 1960s early studies of low cost reusable space flight two leaders emerge max hunter and george mueller nasa and the post apollo future chapter 3 mars and other dream worlds nuclear rocket engines a new administrator thomas paine space shuttle studies continue space shuttle policy opening gambits paine seeks a space station space shuttles receive new attention space task group members prepare plans agnew leads a push toward mars chapter 4 winter of discontent the sixties mars the advance mars the retreat the turn of congress paine leaves nasa chapter 5 shuttle to the forefront the air force in space the air force and nasa a new shuttle configuration station fades shuttle advances the space shuttle main engine chapter 6 economics and the shuttle why people believed in low cost space flight the shuttle faces questions change at nasa and the bureau of the budget the fall of the two stage fully reusable shuttle chapter 7 aerospace recession the boeing 747 the supersonic transport sst the lockheed l 1011 aftermaths chapter 8 a shuttle to fit the budget the orbiter convergence to a good solution the booster confusion and doubt end game in the shuttle debate taos a new alternative a time to decide chapter 9 nixon s decision nixon and technology space shuttle the last moves the hinge of decision loose ends i a final configuration loose ends ii nerva and cape canaveral awarding the contracts 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

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 tranquillity 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

long before the nasa was the throes of planning for the apollo voyages to the moon many people had seen the need for a vehicle that could access space routinely the idea of a reusable space shuttle dates at least to the theoretical rocketplane studies of the 1930s but by the 1950s it had become an integral part of a master plan for space exploration the goal of efficient access to space in a heavy lift booster prompted nasa s commitment to the space shuttle as the vehicle to continue human space flight by the mid 1960s nasa engineers concluded that the necessary technology was within reach to enable the creation of a reusable winged space vehicle that could haul scientific and applications satellites of all types into orbit for all users president richard m nixon approved the effort to build the shuttle in 1972 and the first orbital flight took place in 1981 although the development program was risky a talented group of scientists and engineers worked to create this unique space vehicle and their efforts were largely successful since 1981 the various orbiters atlantis columbia discovery endeavour and challenger lost in 1986 during the only space shuttle accident have made early 100 flights into space through 1998 the space shuttle has carried more than 800 major scientific and technological payloads into orbit and its astronaut crews have conducted more than 50 extravehicular activities including repairing satellites and the initial building of the international space station the shuttle remains the only vehicle in the world with the dual ability to deliver and return large payloads to and from orbit and is also the world s most reliable launch system the design now almost three decades old is still state of the art in many areas including computerized flight control airframe design electrical power systems thermal protection system and main engines this significant new study of the decision to build the space shuttle explains the shuttle s

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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 program 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

this greatly enlarged third edition adds many previously uncovered early designs details the latest modifications to the operational vehicles and provides expanded coverage of the first 100 missions

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

access no single word better describes the primary concern of the exploration and development of space every participant in space activities civil military scientific or commercial needs affordable reliable frequent and flexible access to space to reach the high frontier details the histories of the various space access vehicles developed in the united states since the birth of the space age in 1957 each case study has been written by a specialist knowledgeable about the vehicle described and places each system in the larger context of the history of spaceflight the technical challenge of reaching space with chemical rockets the high costs associated with space launch the long lead times

necessary for scheduling flights and the poor reliability of the rockets themselves show launch vehicles to be the space program's most difficult challenge

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 subcabinets and executive office interagency 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

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