

Copyright  
by  
Mathew Curtis Bostad  
2010

**The Thesis Committee for Mathew Curtis Bostad  
Certifies that this is the approved version of the following thesis:**

**A Case for Strategic Change in the New Space Age**

**APPROVED BY  
SUPERVISING COMMITTEE:**

**Supervisor:**

---

Kyle Lewis

**Reader:**

---

James Herder

# **A Case for Strategic Change in the New Space Age**

**by**

**Mathew Curtis Bostad, BSME**

## **Thesis**

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

**Master of Science in Engineering**

**The University of Texas at Austin**

**December 2010**

## **Dedication**

I would like to dedicate this paper to my family, who have always supported me and motivated me to do more than I believed I could.

## **Abstract**

### **A Case for Strategic Change in the New Space Age**

Mathew Curtis Bostad, MSE

The University of Texas at Austin, 2010

Supervisor: Kyle Lewis

Since the Space Race of the 1960s the National Aeronautics and Space Administration (NASA) has been the face of the U.S. space industry, responsible for driving aeronautics research, exploring our solar system through human and robotic missions, and inspiring the nation through scientific achievement. NASA and its core group of large aerospace contractors have worked to successfully carry out U.S. space exploration goals and have been responsible for some of the most significant engineering successes in history. Over the past decade or so, however, it has increasingly been the private space sector advancing new markets, capturing the public imagination, and working to reduce the timeline and cost of access to space. As the Obama administration's new space policy begins to put increased emphasis on developing the

U.S. commercial space sector, legacy NASA contractors are starting to see what may be the beginnings of a new competitive environment in the human spaceflight market.

With the end of the Space Shuttle Program looming, and the restructuring of its successor the Constellation Program in progress, NASA continues to look for a way forward for its human spaceflight program. At the same time the agency's contractors are dealing with a loss of significant work statement, a lack of new development programs, and an increase in the number of competitors entering the commercial space market. As Boeing Space Exploration attempts to traverse this turbulent period it must also look ahead to the competitive conditions which may result from these changes. It is critical that companies such as Boeing analyze the current structural trends in the industry and attempt to develop a robust strategy to position the company going forward.

This paper aims to present analysis of the current market challenges faced by Boeing Space Exploration and the emerging competitive environment in the human spaceflight industry. General competitive strategies are discussed along with recommendations on which strategic pursuits might best allow the division to maintain its leadership in the industry and successfully compete in a new, more commercial space market.

## Table of Contents

List of Tables .....	viii
List of Figures .....	ix
List of Acronyms .....	x
Chapter 1: Introduction .....	1
Chapter 2: The Current State .....	4
Space Shuttle Program .....	5
The International Space Station .....	6
The Constellation Program .....	9
The NASA Customer .....	11
Chapter 3: Industry Analysis .....	15
Defining the Industry .....	17
Industry Competition .....	20
Existing Competitors .....	21
New Competition .....	27
The Role of Government .....	31
Chapter 4: Competitive Strategy .....	37
Generic Strategies .....	37
Current Strategy .....	42
Defining a Strategy .....	43
Enabling Success .....	49
Risks and Strategic Pitfalls .....	51
Chapter 5: Conclusions .....	55
References .....	58
Vita .....	60

## **List of Tables**

Table 1: Factors Affecting Rivalry within an Industry .....	22
---	----



## **List of Figures**

Figure 1: Porter's Five Forces that Shape Industry Competition .....	16
Figure 2: Barriers and Industry Profitability.....	29
Figure 3: Three Generic Competitive Strategies .....	41

## **List of Acronyms**

COTS	Commercial Orbital Transportation Services
DOD	Department of Defense
IDIQ	Indefinite Delivery/Indefinite Quantity
ISS	International Space Station
LEO	Low Earth Orbit
NASA	National Aeronautics and Space Administration
SE	(Boeing) Space Exploration

## **Chapter 1: Introduction**

The space industry in the United States is in transition. The Space Shuttle Program is nearing its end, and retiring along with the shuttle fleet will be the country's native access to outer space. Meanwhile the successor to the shuttle program, Constellation, seems destined for dismantling following decisions made by the Obama administration prior to fiscal year 2011. The next steps for the U.S. human exploration program seem less clear than they have in decades. This uncertainty has left companies in the industry unsure of their futures and scrambling to find sources of new work to help fill the void soon to be left by the Shuttle.

As NASA attempts to deal with the unexpected end of the Constellation Program it is also working to plan its next steps under the direction of a new, and somewhat controversial, national space policy. By directing NASA to focus on the use of private space providers for vehicle development and transportation services where practical, the Obama administration has asked the agency to further change the way it operates. Over the last several decades NASA has allowed more and more design and management functions on major systems to be performed by private contractors to help minimize the size of its civil servant workforce. This practice has, in many respects, turned the agency into a large contract management organization. The recent changes in U.S. space policy seem to be taking this approach even further by adding additional divisions between the two workforces. It remains to be seen just how this new policy will impact the space industry as a whole, but for the time being it has left companies who count on government space contracts wondering if the structure of the industry may be drastically changing.

This transitional period has left Boeing Space Exploration, in particular, with significant challenges. Reductions in secured work and competitive uncertainties moving forward are both damaging the company's ability to manage its business. Given the changes being seen in both U.S. space policy and NASA's exploration plans, it is clear that space contractors will need to adapt to remain successful long-term. Although it is a difficult time to focus on long-range planning it is essential that Space Exploration attempt to analyze the competitive environment emerging in the industry and work to chart a strategic course forward. Being successful in a market that has yet to mature following policy change requires understanding the current state of the business and how changes occurring today may dictate how the industry operates in the future.

Acting as a NASA contractor for over 50 years, Boeing SE has made significant contributions to all of the major human spaceflight programs in U.S. history. From the Gemini and Apollo programs to the Space Shuttle and the ISS, Boeing has developed recognized expertise in the manned spaceflight industry through its work with the agency. In the past NASA has defined high-level program requirements and evaluated contractor proposals on the basis of cost, quality, and innovation of content as well as the capabilities and qualifications of the company itself. To be sure Boeing's success on early human spaceflight programs provided the company an advantage over other competitors on subsequent proposals. To capitalize on its experience, and take a lead in the new environment that appears to be developing, a more independent and diverse approach to securing work may be necessary. To wait around for the final impact of policy change to become clear or for further clarity in NASA's plans would be risky. Maintaining current market position as well as emerging as a leader in promising new segments will require anticipation and vision along with proactive changes to traditional business methods. By effectively analyzing the competitive structure of the industry

Boeing can begin to develop a more robust strategy that will allow the company to capitalize on a wider range of business opportunities.

What follows will be a look at the current state of the major programs worked by Space Exploration as well as how the impacts of the Obama space policy may influence industry competition in the future. An analysis of the current competitive structure within the human spaceflight market is also presented along with strategic options the division may take to position itself for future success. Risks associated with suggested strategic choices are also discussed as a means of understanding that competitive strategy is highly dependent on market variables and must be dynamic to achieve a company's mission while also avoiding unintended results.

## **Chapter 2: The Current State**

Since the beginning of the Space Shuttle program in the 1970s, the Boeing Company has benefitted from a strong relationship with NASA. The company's involvement in the design, manufacture, and continuous operation of the shuttle fleet over the past three decades has provided a stable business foundation which has allowed the Space Exploration division to grow its experience and expertise in human spaceflight with the security of a lucrative, long-term contract in place. The successful execution of this contract also aided the company in being chosen, in 1993, as the prime contractor for the design and assembly of the International Space Station.<sup>1</sup> Since the beginning of the ISS program Boeing Space Exploration has been responsible for the design, development, integration, testing, as well as sustaining of all 18 major U.S. components of the Station.<sup>1</sup>

The execution of the space shuttle and ISS contracts has not only provided SE with continuous flight design and mission planning work over the past 30 years, but they have also allowed the division to grow into other areas of the space and defense markets. Clearly the size and length of major NASA contracts can be beneficial for growing not only the size of a company, but also its expertise in human spaceflight design. The difficulty with such contracts, however, is the chasm they leave behind upon completion if a similarly sized replacement is not found. To fully examine the near-term future of Space Exploration, and how the division might best position itself in the evolving market environment, it is essential to first examine the major programs worked by the division and their current status.

---

<sup>1</sup> "International Space Station Backgrounder," Boeing.com, [http://www.boeing.com/defense-space/space/spacestation/docs/ISS\\_overview.pdf](http://www.boeing.com/defense-space/space/spacestation/docs/ISS_overview.pdf) (accessed July 1, 2010).

## SPACE SHUTTLE PROGRAM

Since the orbiter Columbia made the fleet's first flight on April 12, 1981 Boeing has provided design engineering and mission support for NASA's fleet of five reusable space shuttles.<sup>2</sup> Originally designed to launch satellites, conduct scientific missions, and support deployment and service of equipment such as the Hubble Space Telescope and Spacelab, the shuttle program would eventually become focused on the assembly and service of the International Space Station.<sup>3</sup> Construction of the ISS has now been the primary role of the Shuttle for over a decade.

In his 2004 Vision for Space Exploration, then President Bush instructed NASA to begin looking to the future of the U.S. human spaceflight program.<sup>4</sup> He challenged the agency to complete the assembly of the ISS and retire the aging shuttle fleet by the end of fiscal year 2010 stating: "Focus use of the Space Shuttle to complete assembly of the International Space Station; and retire the Space Shuttle as soon as assembly of the International Space Station is completed, planned for the end of this decade."<sup>4</sup> Following almost 30 years in service the remaining three orbiters in the fleet were becoming more and more costly to ready for each mission and their reliability was beginning to come into question. With their primary function of transporting ISS components soon to be unneeded, it seemed reasonable to concurrently retire the fleet. After all, the high recurring costs associated with each flight represented money which would be needed to support NASA's next vehicle program.

---

<sup>2</sup> "Space Shuttle Backgrounder," Boeing.com, [http://www.boeing.com/defense-space/space/hsfe\\_shuttle/docs/shuttle\\_overview.pdf](http://www.boeing.com/defense-space/space/hsfe_shuttle/docs/shuttle_overview.pdf) (accessed July 1, 2010).

<sup>3</sup> Review of U.S. Human Spaceflight Plans Committee, "Seeking a Human Spaceflight Program Worthy of a Great Nation," whitehouse.gov, [http://www.whitehouse.gov/files/documents/ostp/press\\_release\\_files/HSF\\_Cmte\\_FinalReport.pdf](http://www.whitehouse.gov/files/documents/ostp/press_release_files/HSF_Cmte_FinalReport.pdf), October 22, 2009.

<sup>4</sup> George W. Bush, "Remarks at the National Aeronautics and Space Administration," Public Papers of the Presidents of the United States, Book 1 (Washington, DC: Government Printing Office, 2004), 57-58.

Despite the delays seen in ISS assembly the current schedule calls for all planned shuttle missions to extend no further than the second quarter of fiscal year 2011.<sup>5</sup> Following more than three decades of operation the shuttle contract will end abruptly leaving behind a large number of skilled space workers, both within NASA and at its supporting contractors, with no comparably sized vehicle program to transition to. NASA, being a government agency, employs large numbers of contract employees to insulate itself from such dramatic swings in labor levels. Government employees maintain a higher level of job security while contractors absorb employment fluctuations. It is the burden of companies such as Boeing to either acquire additional work for its employees or go through substantial lay-offs to reconcile the disparity between employment levels and work statement. A reduction following a long-term vehicle contract not only results in the loss of employees; but also their acquired skills and experience in flight operations. This, in turn, can make winning and successfully executing future vehicle contracts difficult for primary contractors.

Following the decision of the Obama administration to cancel the Constellation Program, a group of vehicles slated to replace the Space Shuttle and return astronauts to the moon, there is currently no new vehicle program on the NASA roadmap. This gap in the agency's exploration program has reduced the ability of many NASA contractors to effectively transition their workforces to new programs; making the retirement of the Shuttle a damaging blow to both the industry, and the space program as a whole.

#### **THE INTERNATIONAL SPACE STATION**

Following the Vision for Space Exploration in 2004, the future of the International Space Station looked relatively bleak from the perspective of many people.

---

<sup>5</sup> "NASA's Shuttle and Rocket Launch Schedule," NASA.gov, <http://www.nasa.gov/missions/highlights/schedule.html> (accessed July 5, 2010).



If NASA proceeded as directed and achieved former President Bush's goal of completing construction of the Station by the end of fiscal year 2010; utilization of the completed station would only last through 2015. Following this brief period the ISS, which took almost two decades to design and assemble, would be decommissioned and de-orbited in early 2016.<sup>3</sup> This plan of action would result in a service life of a mere five years for the most complicated space project ever undertaken. Given the time, effort, and money invested, by both NASA and its international partners, the idea of de-orbiting the station after such a brief period of time seemed like a questionable path forward. How could such a useful resource be so quickly discarded just so the agency could focus on its next directive; specifically the Constellation Program and another moon landing?

Following the election of President Obama in 2008, the Augustine Committee was established to review the U.S. human spaceflight program and offer alternative paths forward. Specifically the committee's goal was to ensure that "the nation is pursuing the best trajectory for the future of human spaceflight – one that is safe, innovative, affordable and sustainable."<sup>3</sup> Sustainability was to be a focus of any changes made in manned spaceflight as the feasibility of continuing the development of Constellation architecture had come into question. As part of their final report the committee reviewed the options of decommissioning the ISS in 2016, as planned, as well as extending its utilization to at least 2020. Although the report made no concrete recommendations, it stated numerous reasons for operating the Station until at least 2020. These included achieving a reasonable return on investment for all involved, preserving international relationships, as well as the opportunity for the U.S. to maintain an area of unchallenged leadership in space.<sup>3</sup>

On June 28, 2010 the Obama administration released its new national space policy in which the 2004 Vision for Space Exploration was, in many ways, cast aside.<sup>6</sup> In the new policy the administrator of NASA is directed to “continue the operation of the [ISS], in cooperation with its international partners, likely to 2020 or beyond, and expand efforts to: utilize the ISS for scientific, technological, commercial, diplomatic, and educational purposes...”<sup>6</sup> This directive is very similar to language in the Augustine Committee’s review of the ISS and its current and future level of utilization. It would appear that the Obama administration, at least at a high level, agreed with the Committee’s assessment that the best course of action is to fully utilize the Station until the time when its design life nears an end.

Along with realizing some of the nationalistic benefits mentioned in the Augustine Report, this new, more long-term, vision for utilization of the ISS will likely allow for continued engineering and mission support work for Boeing SE. At a time when the contract would soon begin to transition from design and assembly to purely sustaining engineering the program may now begin to shift in a more positive direction. The extension of the Station’s service life, and its increased utilization, will likely require various system improvements, increased spare parts, additional maintenance, lifecycle improvements, and the mission support which goes along with any on-orbit work. To accommodate future vehicle docking and possible ISS expansion further design work is also likely, which will help to extend the value of the ISS contract to Boeing. This continued work may, to a limited extent, help bridge the gap between the end of the shuttle program and what may be next on the NASA exploration roadmap.

---

<sup>6</sup> “National Space Policy of the United States of America,” [whitehouse.gov](http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf)  
[http://www.whitehouse.gov/sites/default/files/national\\_space\\_policy\\_6-28-10.pdf](http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf), July 28, 2010.

## THE CONSTELLATION PROGRAM

The Vision for Space Exploration set long-term goals for NASA and its human spaceflight program which included returning men to the lunar surface by 2020 followed by preparation for a possible manned mission to Mars.<sup>4</sup> The Constellation Program was a collection of vehicles and systems with which NASA, over the next two plus decades, planned to meet those objectives. The Orion Crew Capsule and the Ares I launch vehicle were the elements of Constellation that would return NASA's ability to put astronauts into low Earth orbit (LEO) and once again allow the U.S. access to the International Space Station. From early on both elements faced delays in development which could most directly be traced to constantly changing requirements as well as a disparity between program content and available funding.<sup>3</sup>

Upon review of the overall performance of the program, its funding requirements, overall timeline, and goals, the Obama administration proposed to cancel or re-scope major portions of Constellation in 2010.<sup>7</sup> Following over five years of effort and nearly \$13.5 billion dollars in development work, NASA was directed to discontinue a majority of the only agency development program slated to replace the orbiter fleet as the country's access to space.<sup>8</sup> Although development delays and the mismatch between project scope and budget likely provided substantial justification for this action, the timeline of the program as a whole also proved to be damning. The original Constellation schedule planned for ISS support flights to begin in 2012 to minimize the gap in access caused by retirement of the shuttle fleet.<sup>3</sup> At the time of the Augustine

---

<sup>7</sup> Joel Achenbach, "Obama Budget Proposal Scraps NASA's Back-to-the-moon Program," *Washington Post*, February 2, 2010. [http://www.washingtonpost.com/wp-dyn/content/article/2010/02/01/AR2010020102145\\_pf.html](http://www.washingtonpost.com/wp-dyn/content/article/2010/02/01/AR2010020102145_pf.html) (accessed July 5, 2010).

<sup>8</sup> Marcia S. Smith, "NASA's Project Constellation: Fact Sheet," SpacePolicyOnline.com, [http://www.spacepolicyonline.com/pages/images/stories/Constellation\\_Fact\\_Sheet.pdf](http://www.spacepolicyonline.com/pages/images/stories/Constellation_Fact_Sheet.pdf) (accessed October 19, 2010).

Committee's final report, however, schedule delays had changed that target date to 2015, the final year of ISS operation as planned in the Vision.<sup>3</sup> Even with the extension of ISS operation to 2020 it appeared that the Orion capsule would only be available to transport crew for four to five years optimistically. This apparent failure on one of the key goals of the program appears to have helped lead to its reduction.

With at least another decade of ISS utilization to prepare for it is clear that new vehicles will now be required to support cargo and crew transport to low Earth orbit. The decision to restructure Constellation has also made it apparent that the Orion capsule will not be available for that effort. To this end NASA has begun, at the direction of the Obama administration, supporting commercial vehicle development efforts in the hopes of more rapidly closing the gap in the country's access to space. In his national space policy President Obama directs departments and agencies to "purchase and use commercial space capabilities and services to the maximum practical extent when such capabilities and services are available... and meet United States Government requirements."<sup>6</sup>

This new approach to human spaceflight is likely to impact a business such as Space Exploration, and the space market as a whole, in myriad ways. As NASA begins to determine how it will drive the commercial market to supply those capabilities required to achieve its goals, companies who wish to support the agency's efforts will need to learn how to effectively meet those targets. New contract structures, more aggressive schedules, increased contractor accountability and risk acceptance are likely to be just some of the changes defining a new way of doing business. In what may become a unique new market Boeing, and its competitors, will need to find new ways to more effectively manage development projects. Novel strategic approaches will also be

required to grab market share in an industry which may become more dynamic than in the past.

With background on the core business of Space Exploration it is also necessary to look at the company's primary customer, NASA. As the largest buyer in the human spaceflight industry the financial situation within the agency as well as its plans going forward are major drivers of the market as a whole. To understand how the competitive environment may change in the future it is necessary to project how policy change and budget allocation may impact how the agency structures and awards contracts.

### **THE NASA CUSTOMER**

In contrast to the optimistic outlook for exploration earlier in the decade, President Obama's 2011 budget request leaves some doubt as to which direction NASA is to proceed with its human spaceflight program. Significant program cutbacks have threatened to leave the market in limbo as NASA decides on new goals, as well as what role commercial providers will play in achieving those objectives. Forecasts written into the 2011 NASA budget estimates actually tend to maintain the overall budget growth planned in 2004. However, as Constellation funding shortfalls have illustrated, this in no way guarantees those projections will be seen as practical when Congress decides on each yearly request. With no vehicle program to drive new exploration spending, the allocation of available funding for human spaceflight will remain unclear. Once the 2011 budget has made its way through congress, and been amended, NASA will have a better idea of how they may proceed given a new budget and new space policy to guide the human exploration program. If the outcome of this planning is a new deep space destination for manned flights, with specific target dates, the result would be mostly positive for NASA and those contractors impacted by the recent agency turbulence.

So what does the new Obama space policy reveal about those likely next steps in U.S. space exploration? Based on many of the guidelines laid out in the new policy, there is a strong likelihood that the agency will begin to narrow its focus to some extent. NASA has always been, and will likely continue to be, the world leader in human spaceflight. It will also undoubtedly continue to advance its successful robotic exploration programs that have delivered better than expected performance on missions both within the solar system and beyond. In a positive sign for human exploration, the 2011 budget estimates include new funding of around \$3.0 billion over five years to support robotic precursor missions using ‘cost-effective means to scout (human) exploration targets’.<sup>9</sup> These types of information gathering programs will be necessary to prepare the space program for some of the manned exploration missions alluded to in the new policy. The document’s most telling statements related to human spaceflight were included in its civil space guidelines. As part of these general directives for the U.S. space program the President directs NASA to “by 2025, begin crewed missions beyond the moon, including sending humans to an asteroid.” and to “by the mid-2030s, send humans to orbit Mars and return them safely to Earth.”<sup>6</sup> These broadly defined, but ambitious, goals will likely be at the center of any vehicle program planning done by NASA in the coming years and may lead to the type of work its contractors will need to remain engaged with human spaceflight on a traditional supplier basis.

With the termination of the shuttle program approaching and space station utilization extended until at least 2020, there is little doubt that commercial LEO transport will play a critical role in the country’s space program in the next decade. Beginning with the decommissioning of the orbiter fleet the U.S. will be without native

---

<sup>9</sup> “Fiscal Year 2011 Budget Estimates,” NASA.gov, [http://www.nasa.gov/pdf/420990main\\_FY\\_2011\\_Budget\\_Overview\\_1\\_Feb\\_2010.pdf](http://www.nasa.gov/pdf/420990main_FY_2011_Budget_Overview_1_Feb_2010.pdf) (accessed September 5, 2010).

human-rated launch capabilities. Replacing this function of the orbiter fleet as soon as possible will be a primary goal for NASA and its potential commercial providers. To provide the cargo and crew transport capacity required to maximize ISS research efforts a significant number of private launches using more traditional launch vehicles will be required. No current systems can provide near the capacity of the space shuttle so it's likely that multiple service providers will be required to provide "safe, reliable, and cost-effective commercial spaceflight capabilities and services for the transport of crew and cargo to and from the ISS."<sup>6</sup> Although the Obama space policy is the first to include such direct guidelines to seek commercial ISS transport, NASA actually began taking steps towards developing the capability in 2008 with the awarding of the Constellation and Commercial Orbital Transportation Services (COTS) contracts.

Won by Space Exploration Technologies Corp. (SpaceX) and Orbital Sciences Corp., the COTS contracts opened up a potentially large, new market for private companies to provide a service to NASA. Rather than just developing hardware to hand over to the agency to operate, the private sector would instead be given the opportunity to sell rides to low Earth orbit for NASA astronauts and cargo. The significance of this type of arrangement is far reaching and provides the most immediate example of how the new space policy may impact the private space industry. By allowing the commercial sector to own and operate human launch systems NASA may help to fund a drastic change in the structure of the human spaceflight market. If a function such as LEO transport can be successfully handed off to several private companies the result will most likely be traditional market competition. This could eventually drive down the cost of accessing space as firms would be incentivized to reduce costs and provide the most efficient services possible. The net outcome of such a change in structure could be a mutually beneficial partnership for both the agency and its new commercial providers.

If the commercial movement started by COTS and recently formalized in the Obama space policy, significantly alters the way NASA approaches hardware procurement, contractors will need to adapt. To compete for hardware and service contracts cost reduction and innovation will become increasingly important. At the same time a more aggressive strategic approach will be necessary to compete as more competitors are encouraged to enter the market. These changes may be especially challenging for companies such as Boeing who have spent years working on large NASA programs. The ability of the company to accurately analyze the competitive environment and make changes proactively could determine its overall market position in the future.



### Chapter 3: Industry Analysis

Given the policy changes being implemented by the Obama administration and the recent surge of new competitors making advancements in the industry, it seems that the structure of the space market may be changing. An industry that has remained relatively static over the past several decades is beginning to shift in ways that will significantly impact both newcomers and incumbent competitors alike. Government policy is looking to nurture new commercial space technologies, and NASA is searching for ways to reduce the cost and timeline of accessing space. This is why companies such as Boeing Space Exploration must begin to assess just how the trends of the current environment may be laying the foundation for the spaceflight industry in the future. If increased commercial competition is to be the norm, how does an experienced company adjust to compete and remain profitable going forward? While NASA works to restructure its human spaceflight program under a new space policy, how might the agency's priorities change and what might that mean for its contractors? Successfully answering these and many related questions will be vital if Boeing is to understand where the industry is headed and how Space Exploration may best compete in the future.

To begin to formulate a competitive strategy it is helpful to utilize a framework that can help guide a company through a thorough analysis of current market conditions. Only after examining the competitive forces which affect the dynamics of a particular industry can a company, or business unit, begin to shift those variables they control to define a successful strategic plan. One of the most accessible and broadly accepted frameworks for developing business strategy is to analyze an industry's structure using Michael Porter's five forces that shape industry competition.<sup>10</sup> Figure 3 provides a

---

<sup>10</sup> Michael E. Porter, "The Five Competitive Forces That Shape Strategy," *Harvard Business Review*, January 2008.

simple graphical summary that shows the interaction between Porter's influential forces. Once a careful examination of each of the five forces has been carried out it may then be possible for a business to understand where within the industry structure it exists, what forces affect its profit potential, and what approach in the future allows it the best opportunity for success in the market.

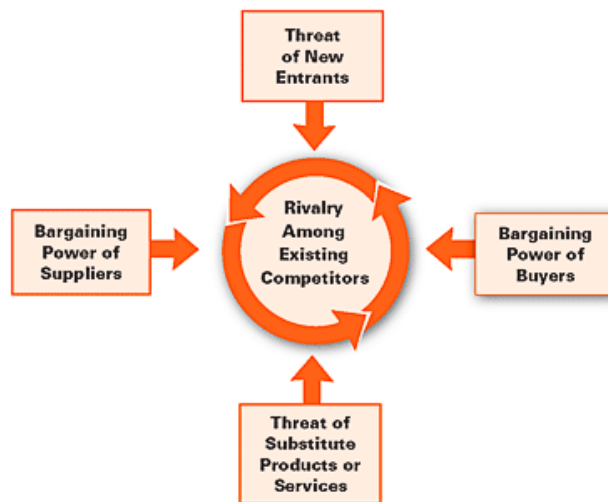


Figure 1: Porter's Five Forces that Shape Industry Competition

Source: Michael E. Porter, "The Five Competitive Forces That Shape Strategy," *Harvard Business Review*, January 2008, 2.

As detailed earlier, Space Exploration will soon be dealing with the loss of a significant portion of its NASA related work statement, for which there is no comparably sized replacement. Along with this downturn in scope there have been a significant number of new entrants into the space industry who are looking to capitalize on emerging markets and better position themselves to service NASA contracts now and in the future. With the new space policy beginning to influence how government space funds will be allocated in the coming years, it seems eminently necessary that established companies

assess what these changes may mean for future industry profitability. What follows are the beginnings of a market analysis using Porter's strategic framework which will examine those variables most directly linked to the mission of Boeing SE. A complete breakdown of the competitive structure of the space industry as a whole is outside the scope of this paper, however taking steps in that direction is not. Gaining insight into those areas which are most dynamic, and which directly impact the business planning of the division, is worthwhile to undertake during a period of such turbulence.

### **DEFINING THE INDUSTRY**

Setting out to identify and analyze the relevant competitive forces in any large market is a daunting task. The most important outcome of any strategic study is an actionable plan that the company feels strongly will improve its odds of future success. To gain practical information with which to plan, however, it is sometimes necessary to narrow the scope of the exercise to a manageable portion of the overall industry most relevant to the business unit's goals.

Defining what segment of the space market is most pertinent is reasonably simple given that Space Exploration is most heavily invested in human spaceflight, and those programs that relate to it. This area has been the focus of the division since its inception and will continue to be based on its stated vision and mission. "Strategy begins with goals, which naturally follow from an entity's mission."<sup>11</sup> If it is the unit's mission to become the leading provider of commercial space exploration, then solidifying or enhancing its position in human space exploration seems the most logical path to achieving success. To reach this goal the company must consider both government and

---

<sup>11</sup> Harvard Business School Press, ed., "SWOT Analysis I: Looking outside for Threats and Opportunities," in *Strategy: Create and Implement the Best Strategy for Your Business* (Boston, Massachusetts: Harvard Business School Press, 2005), 2, Electronic Format.

commercial customers, and competitors and opportunities that align with, and enhance, its core competencies.

The next steps in preparing for an effective strategic analysis are to specify the products of the industry in question as well as the appropriate time horizon across which to focus.<sup>10</sup> In the case of the human spaceflight industry there seem to be several areas of pursuit which will drive products relevant to Space Exploration. These include government vehicle development for deep space human exploration, commercial LEO transportation of cargo and crew, as well as heavy-lift launch vehicles. These three categories appear to capture the majority of market activity relative to human spaceflight and, therefore, will be the product basis for the analysis of the competitive environment going forward.

It is also worth noting that the geographic scope of the products considered will be those developed within the United States, for both government and domestic commercial use. It appears doubtful given the proliferation of space vehicles by developed countries that an international market for human flight will come into existence in the foreseeable future. As other countries begin to develop human-rated vehicles and launch capabilities the impact of international business on the domestic space industry will likely be limited to a reduction in international satellite launch demand.

It is somewhat obvious that the time horizon for an examination of human spaceflight profitability is considerably larger than for the majority of industries. Most vehicles for human space transport feature very long lead times due to their complexity, safety requirements, and partially due to the suboptimal funding they receive annually. It is not uncommon, in fact, for development to last more than a decade. An analysis of the anticipated business conditions in such an industry must take into account that once a

direction is chosen, and contracts awarded for major components, drastic shifts in profitability are unlikely until a new major vehicle program is initiated. For strategic analysis it is difficult and presumptive to attempt to consider a time horizon of more than a decade, so that will be the assumed outlook of this paper. Clearly there are exceptions to the assumption of steady-state market structure over such a time span as unforeseen events can occur due to new political administrations, changing economic conditions and world events. This is why, practically, it is necessary to reconsider the market conditions as often as a significant change occurs in any of the key competitive forces.

With the segment of focus and timeline defined it is worth pausing to look at the overall maturity of the industry before proceeding further. The maturity of the manned spaceflight industry can be reasonably well visualized by the level of funding seen by NASA on a yearly basis. As the agency has been, and will continue to be, the largest source of contract work in the industry it seems practical to characterize the state of the industry based largely on U.S. government spending. With this in mind, the U.S. spaceflight industry has evolved significantly since the establishment of NASA in 1958. The early years of manned spaceflight were distinguished by almost exponential increases in yearly spending. This unsustainable trend was driven by the Apollo program and its goal of landing men on the moon before the end of the 1960s. Between 1958 and 1969 the human spaceflight industry could truly be described as an emerging market, and one with unprecedented growth over the first decade.

The end of the Apollo program, however, marked the beginning of a precipitous drop in the level of funding NASA received. This was largely due to the end of the Space Race and the lack of a sufficiently prominent 'next step' goal for the U.S. space program. The annual budget of the agency eventually leveled off, as a direct result of decreased backing for manned spaceflight. Following the declining market conditions of

the early 1970s human spaceflight settled into a period of more consistent funding commonly seen among mature industries. Since that time, which coincides with the start of the shuttle program, the market has included a very stable group of contractors working defined portions of several large programs. Any disruptions to these stable conditions have mostly been due to political influences rather than internal market economics or shifts in competitive rivalry.

This period of reasonable market predictability appears to be threatened by the recent actions of the Obama administration as well as the implications of the new U.S. space policy. Combined with an influx of new competitors these external drivers are likely to create a shift in a mature environment and may actually create the first significant competitive unrest in over a decade. These new factors not only raise the profit uncertainty of the sector as a whole, but they also significantly reduce its structural predictability making strategic planning more difficult. This fact underscores the need for repeated reviews of a company's strategy going forward to validate the plan as the market works towards another period of mature operation.

During such a market transition there are many forces that may be subject to variation. Identifying those that represent the most significant impact to industry, and therefore company, competition is an important first step for an established firm to take. To understand what the company may be facing in the emerging environment requires consideration of what is currently visible and projecting how that condition may be impacted by new market trends.

## **INDUSTRY COMPETITION**

Two of the five competitive forces recognized by Porter are focused on identifying and understanding a company's competition in the market of interest. At the

center of a competitive analysis is the struggle for profit and market share between the company and its existing direct competitors. It stands to reason that high exit barriers and considerable sunk costs will likely compel established firms to remain in a market barring a significant downturn in profitability. This makes fully understanding the existing rivalry between market competitors critical as they will continue to subsist and likely evolve to form the foundation for strategic decision making in the future.

The second force directly relating to market competition is the threat of new entrants. While looking at current rivals is an important first step, it is also necessary to account for possible new threats to a firm's market share. These may come in the form of established companies looking to branch out, recent entrants looking to establish themselves, or possible startups that may be eyeing markets traditionally serviced by the company. While it may be considerably easier to understand and strategize against a competitor that has been in the marketplace for years, it is in some ways more valuable to understand those firms who are looking to enter a market which has long remained static from a competitive standpoint. It is true that strategic takeaways may actually be similar following the analysis of both established competition and new entrants. They should, however, be treated as distinct rivals as to remain inside Porter's basic framework and will be in the analysis to follow.

### **Existing Competitors**

Rivalry among existing competitors, or just industry rivalry, is at the center of Porter's diagram of the forces that shape competition. It is perhaps the force that most directly impacts a company's strategy and also highlights the changes seen in each of the other four forces. This seems to make it a reasonable foundation from which to begin a competitive analysis. As is often the case it is critical to first thoroughly understand

where a company exists within a market, and what strategic approaches have got them there, before it can begin to grasp how to proceed towards achieving its goals. To understand what the current state of competition is within the defined industry it is rational to begin with a look at direct market competitors before expanding the analysis further.

When attempting to analyze the competitive environment within an industry there are numerous market characteristics to consider. These factors interact to set up just how firms within the industry can most effectively compete for potential profit, whether the industry may attract others to enter in, and also whether incumbents are likely to remain in the future. Table 1 provides a summary of some of the common indicators, proposed

	<b>Rivalry is High</b>	<b>Rivalry is Low</b>
<b>Competitors are</b>	Numerous	Few
<b>Competitors have</b>	Equal size	Unequal size
<b>Competitors have</b>	Equal market share	Unequal market share
<b>Industry growth is</b>	Slow	Fast
<b>Fixed costs are</b>	High	Low
<b>Products are</b>	Undifferentiated	Differentiated
<b>Brand loyalty is</b>	Insignificant	Significant
<b>Consumer switching costs are</b>	Low	High
<b>Competitors are</b>	Strategically diverse	Not strategically diverse
<b>Excess production capacity</b>	Exists	Does not exist
<b>Exit barriers are</b>	High	Low

Table 1: Factors Affecting Rivalry within an Industry

*Source:* Michael E. Porter, “The Five Competitive Forces That Shape Strategy,” *Harvard Business Review*, January 2008, 7.



by Porter, to evaluate the intensity of competition within a market. By taking a careful look at some of the underlying drivers of competition a company can attempt to gain an understanding of how best to strategically position itself relative to its rivals in order to claim a larger share of available business.

When beginning to look at the strength of rivalry in the human spaceflight industry it is important to note that a transition has been occurring over the last five to ten years. Since the early days of human exploration in the U.S. there have been a handful of large contractors who have been awarded the majority of significant development programs coming out of NASA. The inherent size and complexity of human-rated vehicle design in some ways has necessitated firms with more engineering resources, larger supply-chains, and experience working government contracts. Due to these factors and others companies such as McDonnell Aircraft, Boeing, and Lockheed Martin seemed best suited to take on development of complex space systems.

Recently, however, several smaller companies have begun to enter the increasingly attractive manned space market. There currently exists political pressure on NASA to develop, through contract distribution, the size and capabilities of the U.S. commercial space market. As a result a new group of competitors has entered what was a stable pool of NASA contractors. These newcomers tend to be relatively small companies focused on narrow sectors of the overall space market and therefore operate under different competitive approaches relative to incumbents. This combination of established contractors and new entrants, each attempting to compete in different ways, somewhat reduces the ease of analysis of industry rivalry. Where some conditions may indicate low rivalry when looking at the more established of the contractor community, the same factor may point toward higher inferred competition when taking into consideration newcomers. Keeping this duality in mind when planning a strategic

approach for Space Exploration will be necessary if the result is to be a robust plan forward.

It seems appropriate that an analysis of direct competition in the manned spaceflight industry begin with the lengthy rivalry between The Boeing Company and Lockheed Martin. In part due to the need for larger contractors to fulfill NASA's vehicle design needs, the two aerospace companies have been in head-to-head competition for years for the majority of primary contractor proposals. Rivalry between the two companies has been focused and intense for a number of reasons, several of which are identified as indicators of high competition in Table 1. Two of these factors are the similar size of both firms and the fact that their shares of the NASA market have been relatively comparable for years. In 2009, in fact, they were one and two on the yearly ranking of top NASA contractors, with Lockheed capturing about 16% of spending and Boeing around 12.7%.<sup>12</sup> With the next closest independent contractor, Jacobs Engineering Group Inc., having under 5% of the nearly \$16 billion market it is reasonable to say that the rivalry between Boeing and Lockheed dominates the industry at present.<sup>12</sup> Due to a lack of external threats this head-to-head competition has continued unchecked for years.

This duopoly at the top of the space industry has allowed both companies to grow their space divisions substantially. Both have had the advantage of knowing that when new NASA vehicle programs were initiated they were assured at least a sizeable portion of the work. Operating under cost-plus contracts from the U.S. government further reduced the risk of loss regardless of program delays. As the scope of major projects changed there was an assurance of funding to make up for the additional work statement.

---

<sup>12</sup> "Top 25 NASA Contractors," Government Executive.com, [http://www.govexec.com/story\\_page.cfm?filepath=/features/0809-15/0809-15s12s1.htm&oref=search](http://www.govexec.com/story_page.cfm?filepath=/features/0809-15/0809-15s12s1.htm&oref=search) (accessed September 13, 2010).

These political and contractual aspects of working within the government contractor system have in some ways actually reduced a competition which otherwise could have become fierce. Porter also notes that, “A history of competing or *continuity of interaction* among the parties can promote stability since it facilitates the building of trust (the belief that competitors are not out to bankrupt each other).”<sup>13</sup> This familiarity between the two industry leaders has allowed them to coexist and profit while competing at the top of the industry.

So although growth in the industry has been minimal over the past decade, a factor which would typically indicate high rivalry, the ability of those few well positioned companies to maintain profitability has persisted. With no major change in the way government space funds were distributed and no influx of competitors there has been little turbulence at the top of the market due to traditional factors of competition. Part of the explanation for this unique situation is due to the role which politics continues to play in the awarding of NASA contracts. The strong presence in Washington, D.C. maintained by both Boeing and Lockheed has long been a key factor in allowing them to maintain leadership positions in the market. By working with NASA administrators and politicians to develop U.S. space goals there is reduced rivalry during contract proposals as some amount of discussion has already occurred as to how work may be allocated across established contractors. Whether this arrangement has been in the best interest of all participants in the industry is, of course, up for debate. Regardless it has worked to reduce rivalry between those contractors who have traditionally served major vehicle programs.

---

<sup>13</sup> Michael E. Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York, NY: The Free Press, 1980), 90.

With factors pointing to both low and high expected rivalry, what can Boeing expect from a competitive standpoint with Lockheed in the near-term future? It seems unlikely that either company will willingly reduce their presence in a market in which they are so heavily invested. While a majority of the drivers of competitive intensity at the top may remain unchanged, there are several other pressures which threaten to drive up the stakes of contract competition at all levels. Mostly as a result of increased competition, the value of each new vehicle contract under the Obama administration will certainly be multiplied. If the new space policy causes NASA to reduce its loyalty to Boeing and Lockheed, newcomers are apt to erode market share from both firms. This pressure from smaller entrants will also challenge the ability of established companies to preserve the price point of the market as lower cost hardware development will become the strategic focus of most challengers.

Both Boeing and Lockheed have been committed to the space contractor market, from a monetary and a reputation standpoint, for decades. One of the advantages they have enjoyed over other competitors in that time has been their large commercial and defense businesses that have provided a constant source of revenue outside of the space market. By relying on the spaceflight industry for a relatively minor portion of overall corporate revenue the two companies have avoided competing too heavily on price, and thus hurting profit potential. In a typical market economy firms often compete fiercely on price when placed in direct competition for leadership. This is especially true when other discriminators such as product and service differentiation are seen as relatively equal by the customer base. The combination of favorable contract structures, diversified business models and lack of viable competitors has allowed both companies to maintain the price of hardware and services well above that of a perfectly competitive market. It

remains to be seen if this level of profitability can be maintained given increasing competition from new entrants.

So the pertinent question becomes whether or not this status quo between the market leaders will change. It stands to reason that just as familiarity reduces competition the opposite would also tend to be true. Speaking to the impact of change on rivalry Porter notes that, "... lack of continuity will raise the chances of competitive outbreaks."<sup>13</sup> Even if it is marginal at first the impacts of the new space policy, the drastic cuts to the constellation program, and the influx of new competition will almost certainly increase competitive tension between Boeing and Lockheed. This should even be expected given the severity of the overall market decline. Given the prevailing conditions this relationship will require increased attention in the coming years. It will be necessary for Space Exploration to monitor Lockheed and how they begin to change their strategic approach following the loss of major Constellation contracts. Should the company take a more aggressive approach, Boeing will have to acknowledge this and act to adjust its own plan appropriately.

### **New Competition**

Clearly the established rivalry at the top of the human spaceflight industry is important to consider when beginning an analysis of Porter's central competitive force. There is, however, another segment of the 'existing rivals' category that has recently begun to threaten the competitive balance. New companies promising lower cost access to space for both cargo and crew have entered the market to compete for U.S. government contracts as well as new commercial opportunities. This influx of competitors, with strategically diverse approaches to gaining market share, may spawn new segments as well as increase competition in existing ones. One thing is certain; the

need to monitor strategic position as a result of existing competition has increased greatly with the addition of these new rivals.

To better understand why there has been an increase in the number of competitors in the market it is necessary to mention some of the barriers present in the industry that underlie its profitability. The manned spaceflight market tends to have several barriers to entry which, to this point, have discouraged some firms from entering the market. Most notably there is a substantial investment of capital required to sustain the initial development phase of complex space systems. Funding is needed for research, development and testing of new hardware. Even after progress has been made, the technology that results is often immature and may not prove reliable enough to be commercially practical. Without subsequent financial backing early on it is difficult to reach a point where sizeable contracts can be obtained to sustain the next steps towards establishing a permanent market presence. Also, as has been mentioned, there is an established hierarchy of government contractors at the top of the industry that has made capturing adequate development funding difficult for smaller companies who lack the requisite political influence. Combine some of these entry barriers with relatively low exit barriers and the impetus to remain in such a harsh competitive environment has not been present.

The nature of space hardware development has led to the very profitable position enjoyed by those contractors with experience and significant market share. Figure 4 provides an illustration of how barriers can impact profitability within an industry. The human spaceflight industry has tended towards the lower left quadrant of the grid where firms wishing to compete faced significant barriers to success and relatively low financial penalties for instead exiting the market. This combination of circumstances led to high, stable returns for those companies who were invested in the market but had large revenue

backing from other profitable ventures. Given the long standing stability of competition in the market it stands to reason that a significant shift in one or both types of barrier would need to occur to drastically change the competitive landscape. Given the structure of the industry it seems likely that such change would come in the form of decreased entry barriers, a change that could result from new sources of start-up and development funding.

		Exit Barriers	
		Low	High
Entry Barriers	Low	Low, stable returns	Low, risky returns
	High	High, stable returns	High, risky returns

Figure 2: Barriers and Industry Profitability

Source: Michael E. Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York, NY: The Free Press, 1980), 22.

In fact two significantly different types of financial backing have become prominent that have not been traditionally seen by fledgling space companies. The less traditional source of capital found has been a number of wealthy individual investors who have backed their own space startups, through typically lean early years, using their personal fortunes. This type of sole-source startup funding has given rise to several prominent companies including SpaceX, Blue Origin and Virgin Galactic. Using the private capital of their founders some companies have been able to mature their

individual technologies to the point where both government and commercial funding has become easier to obtain. Although unconventional, this approach has worked well for several firms largely due to the commitment of those individuals providing vision and funding for their businesses.

The other source of financial traction that has allowed some firms a chance at success has been a result of the new U.S. space policy that has made government development funding more available for newcomers. The strength of the companies at the top of the industry is partially due to their political strength which has given them an advantage over newcomers in securing NASA contracts. The recent focus of the Obama administration has been to support and develop the private space industry in the U.S. This change in philosophy at the top has in some ways slanted the industry in favor of smaller companies promising new, more efficient technology and cheaper access for both cargo and crew. As NASA begins to move forward under the direction of the Obama space policy it remains to be seen how truly deep this new way of looking at the industry will penetrate. If the agency can find viable commercial technology to help accomplish its goals with an acceptable level of risk, it may continue to lower the financial barriers present. Should such a change take place it would have implications for all firms in the industry. Rivalry would increase as would the need to successfully execute a well thought out competitive strategy which took into account this change in customer buying habits.

Specifically a company such as Boeing would need to look at making changes to protect against an undercut of the market price of hardware and services. Space Exploration would have to work to improve its ability to differentiate its proposal offerings without losing the ability to differentiate due to price competition with new entrants. In another form of differentiation the company would also have to use its familiarity with NASA's business methods to find a competitively advantageous balance



between traditional government project oversight and traditional commercial development approaches. Business method differentiation could become more and more necessary for companies not built to compete for contracts directly on price. As competition increases it will be up to incumbent leaders to find new ways to control market competition using those advantages that have gotten them to their market position. To drastically change strategic approaches to compete on the strengths of less experienced companies would be dangerous long-term and could result in greater than necessary losses.

For now it remains unknown just how many recent market entrants will find the footing to remain competitive long-term. It seems probable, however, that given the number of firms attempting to carve a niche that several will succeed in establishing themselves as viable contenders in one or more segments. How the survivors impact industry competition and profitability will be dependent on their ability to deliver safe systems, on budget and on schedule while working to both commercial and NASA requirements.

### **The Role of Government**

When analyzing competition within almost all industries the role that government plays in impacting the competitive environment must be taken into account before germane conclusions can be drawn. Although government itself does not appear as one of Porter's five forces it may be invaluable, while examining market conditions, to consider how it affects competition through each of the primary forces.<sup>13</sup> Clearly the idea of government as a driver of competition is not unique to the space industry, however, the role that it plays in setting the competitive stage is perhaps more prominent in the space market than in most. This direct influence is felt by the companies involved not only

because government policies and regulations drive market interaction, but also because government agency is the industry's most prominent customer. Whether it is through policies, regulations, or buying habits it is almost without question that the U.S. government, more than any other single entity, defines how both established companies and newcomers compete for market share. Examining how this influence is bore out currently and how it may change in the future is critical to a company's strategic planning.

Michael Porter notes that although it may not be appropriate to consider government influence as a force in and of itself, developing effective strategy may well involve "treating government as an actor to be influenced."<sup>13</sup> Over the past several decades this approach has been more and more the way that established companies such as Boeing and Lockheed have worked to leverage the fact that NASA drives industry profitability. To be a truly successful space contractor has meant developing a strong presence in Washington D.C. and working alongside government committees, and the administrators of NASA itself, to influence the direction of U.S. human spaceflight efforts and the industry as a whole. It would be a significant undertaking to begin to thoroughly analyze the political interactions between private space contractors, NASA and the U.S. government and that effort is outside the scope of the present investigation. It is, however, worth looking at how current attitudes in government policy may influence each of the main competitive segments of the market mentioned so far.

Although the primary human spaceflight contractors still maintain a major role in helping to drive U.S. space goals and government policy, the recent shift towards decentralization of NASA contract awards has resulted in turbulence for even the most established firms. The Obama administration's push to develop what it considers the 'commercial space sector' has actually resulted in a more challenging environment for

companies such as Boeing who have worked so closely with NASA for decades. Despite technically being commercial companies, the new space policy seems to point NASA and all government agencies towards finding smaller newcomers to work contracts if it is reasonable to do so. It's true that it may be too early to tell exactly how deeply the new attitude towards development of recent market entrants will penetrate. Regardless the change seems to necessitate some strategic modifications on the part of Space Exploration and the other current industry leaders.

While the recent movement towards a more commercial U.S. space industry may sound like a shift away from legacy space contractors it is, more accurately, a drive to streamline access to space. The goals of the country's new space policy do not seem to be targeted directly at cutting larger companies' involvement in the industry. Instead they are aiming at reducing the cost of access, shortening hardware development time, and distributing development costs and risk across more private contractors. It is a general belief, founded or not, that smaller companies may have a better chance at achieving efficiency improvements than larger, more established firms. NASA's vehicle programs in the past have led to schedule and cost overruns and vehicles that were not as cost-effective to operate as the technology of the time allowed. To avoid this, and to make the business of space hardware more efficient, NASA is looking at taking a more hands-off approach to managing development. Although the success of the business model remains to be seen it does not necessarily preclude companies such as Boeing from competing. To do so will simply require a shift in operation towards a more agile design approach with reduced acceptance of requirement and scope creep to realize a reduction in costly design churn.

Space Exploration has more experience working as a NASA primary contractor than any competitor in manned spaceflight. Given this long history, a transition to a

more commercial environment may actually be a welcomed change from working under the often fickle requirements of the agency. If the result of the new space policy is a more hands-off attitude from NASA, companies like Boeing may be freed to focus on differentiating themselves through innovative design, more efficient project management, or even cost leadership. The key may be to take hold of one roadmap function or service, such as LEO transport, and work to prove that if given more freedom the company can deliver novel solutions on schedule and to the accepted safety standards of NASA. For more established companies the challenge is likely to be obtaining that foothold in a core market segment. Following that success will be based on the ability to reduce costs after years of suboptimal performance while working under the guidelines of the cost-plus contract structure.

The impact of the commercial space movement will also be felt by new entrants into the market as it may drive NASA to portion out contracts to companies who historically would have had a difficult time competing with incumbent leaders. By distributing work to smaller companies there exists a chance that several startups which may not have found the necessary investment to reach a technologically competitive level will actually begin to turn a profit and find a permanent foothold in the industry. To successfully accomplish their objectives, while relying on unproven companies, NASA will have to spread similar work across multiple firms to hedge against the failure of one. They have already put this approach into practice with the COTS development work. It is probable that some companies will fail to produce viable technology; however, the net outcome of a sustained investment in this type of industry development will be a larger base of competition. In turn, those companies wishing to lead in the market will be forced to reduce costs while maintaining safety and schedule.

The tendency of space policy to vary with changes in presidential and congressional viewpoints is well documented. It will be critical that newcomers intent on riding the current wave of commercial support are able to deliver useful hardware and services within the timeframe of any initial contract. Despite the infancy of this startup supportive environment, the possibility of a rapid change in course is only as far away as the next election. The chance for new contractors to gain momentum with NASA may be short lived and the possibility of reverting to the established hierarchy of contract awarding will always be present. Despite an approach that attempts to ignore the political undertones of the industry amongst some young companies, it is risky to shy away completely from the government's role in defining competitive balance. Maintaining this commercial momentum long enough to truly establish themselves in the industry will be one of the prominent challenges faced by new competitors.

Obviously a complete analysis of the impact of government policy on the human spaceflight industry would be complex and lengthy and is too broad to fully examine here. An assessment of the competitive environment would also not be very robust without at least mentioning the influence of government on market groups. The dynamic nature of this variable on industry rivalry is such that the validity of a firm's strategy must be constantly tested for consistency both with present and anticipated future conditions. The current climate created by the Obama administration appears to be altering certain aspects of the way companies compete, but there is no guarantee that the vision set forth in the new U.S. space policy will play out as projected. Companies like Boeing Space Exploration must nonetheless continue to diversify into new commercial markets that are not directly related to NASA and its pursuits. By focusing on sectors which show stability and a chance for growth, and that reinforce core capabilities in

human spaceflight design and system integration, the division may be able to better prepare for whatever competitive environment develops out of the current turbulence.

## **Chapter 4: Competitive Strategy**

### **GENERIC STRATEGIES**

The goal of a thorough five forces analysis is to allow a company to identify all of the factors that influence its ability to compete and be profitable in a particular industry. With a complete understanding of the environmental factors at play the firm can then begin the formulation of a successful strategic approach to securing market share. Generally speaking there are a number of strategies that can, if implemented properly, be useful in providing a competitive advantage in any given industry. Some philosophies may be specific to a particular market or a particular set of existing market conditions. Still there are also generic strategies that may be applied more broadly to provide a solid foundation from which to begin tailoring an approach to a specific market situation.

In terms of general strategies Porter indicates three possible approaches to “create a defensible position in an industry:”<sup>13</sup>

1. Overall cost leadership
2. Differentiation
3. Focus

Each of these strategies offers different advantages and can be used to take offensive or defensive positions within a market. While proceeding it is worth mentioning the key aspects of each and how they may relate to the formulation of a promising strategic plan in the human spaceflight industry.

It is reasonably clear that the idea behind using overall cost leadership as a strategic goal is to offer a competitive product at a price below the market average for a similar product. By aggressively reducing the costs of production the price of goods can be lowered in order to capture the low-price portion of the market or to attract customers from higher priced competitors, or both. This type of strategy can also be used to drive

competitors out of the market if a firm is able to lower prices to a level where others can't realistically afford to compete. By effectively driving down the overall price of goods in a market through price competition a valuable barrier to entry can also be created which may help to maintain market share gained through the effort.<sup>13</sup> This type of strategy is often seen in the consumer goods market where many options exist and product differentiation is low. In such conditions price is the natural discriminator and profit margins typically become low due to fierce competition.

It is difficult to identify a company in an industry such as manned spaceflight which can be legitimately termed a low-cost provider of space hardware or services. The nature of the industry just does not lend itself to the type of all-out price competition that more traditional consumer industries see. Looking at the strategic approaches available, cost leadership does not seem to be a reasonable option for a company such as SE. Even if such a path were chosen Boeing would likely find it difficult to compete with smaller firms directly on price due to the relative size of the company and the organizational structures in place. Although this may not be a desirable way for the company to gain or defend market share, it is worth considering how such a strategic approach may be used by another company as a competitive weapon. Any approach taken by Space Exploration must therefore consider this possibility and the company must be confident that its position is defensible against price attacks from new entrants. Obviously companies such as Boeing and Lockheed Martin are established well enough to remain viable in the market; however, it is realistic that with a larger percentage of reusable hardware and more efficient design processes a competitor could successfully damage profitability at the top of the industry.

This is an especially important consideration presently given the number of new firms beginning to enter the human spaceflight market. If this trend continues under the



Obama space policy it will be vital that Boeing recognize how these new competitors are attempting to gain traction in the industry. Despite occupying a strong position of leadership there is significant risk in allowing new competition to grow unchecked. To defend against price competition Space Exploration will likely need to rely on its experience in the industry to offer reasonably priced solutions that exceed others in safety, reliability and innovation.

One alternative to all-out price competition is to find a way to offer uniquely desirable products relative to competitors. Companies who attempt to employ a differentiation strategy usually work to gain an advantage in the market by developing a desirable aspect or feature of their products that can be considered uniquely theirs. Differentiation can be based on any number of product or company characteristics such as: innovative product design, cutting edge technology, customer service, reliability, or luxury.<sup>13</sup> The goal of using differentiation in a competitive sense is to capture market share while creating brand loyalty, overtime reducing the price sensitivity of buyers and ultimately building further barriers to entry.<sup>13</sup> This strategy requires careful consideration of the other products in the marketplace as well as an intimate understanding of the wants and needs of target customer groups. To position the company to fill a specific need in the industry there must also be confidence that the targeted segment of the market will remain large enough to generate desired profit levels. Effectively executing a differentiation strategy takes time and commitment from the company. This means that the resulting market and share targeted must be worth the effort that will be necessary to realize the benefits.

When considering Boeing's history and current role in the human spaceflight industry, the differentiation approach seems to offer advantages that make it a reasonable option to consider. The experience gained working on all of NASA's major vehicle

programs has provided the company with a strong set of core capabilities in the development of safe, reliable space hardware. Space Exploration has a long-standing reputation in the industry along with the diverse backing of The Boeing Company as a whole to allow the division to pursue one or several areas of differentiation. If implemented this strategy would best be tailored to specific programs pursued within the sector of manned spaceflight, which is closer to the definition of the third generic strategy, focus.

Whether or not differentiation is, in fact, the most advantageous approach for the company to pursue in the current competitive environment is dependent on the specific long-term goals of the business. Is the primary objective to maintain leadership in the human spaceflight sector of the market or to capture maximum market share across the space industry as a whole? Is continuing to cater to its NASA customer more important than diversifying the division to insulate it from downturns in agency spending? These questions and others must first be answered by company management before a successful plan based on differentiation could be formulated. Developing a strategic plan of this nature which targeted multiple customer groups would be challenging but also necessary in the current market. Meanwhile pursuing a model with NASA as a core customer and then attempting to operate commercial services may prove even harder as such an approach would dilute the advantage of this type of strategy.

The third, and final, generic strategy is described by Porter as “focusing on a particular buyer group, segment of the product line, or geographic market.”<sup>13</sup> The idea behind successfully executing this approach is that by concentrating efforts on serving one buyer or market segment the company can do so more proficiently than its competitors. By tailoring the functioning of the company to serve a very narrow area, a combination of the other two generic strategies can be achieved within the targeted

segment. As illustrated in Figure 5 the focus strategy theoretically allows a firm to achieve perceived uniqueness as well as a lower cost position within its narrow segment of the market. While focusing a business in this way does not allow a company to attain

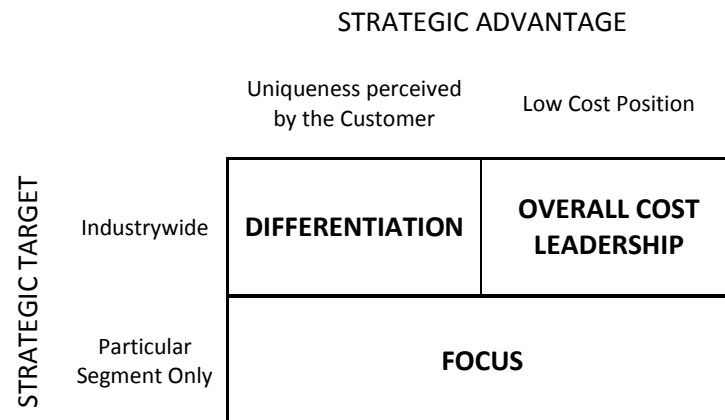


Figure 3: Three Generic Competitive Strategies

Source: Michael E. Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York, NY: The Free Press, 1980), 39.

low cost leadership or differentiation relative to the overall market, it can drive towards achieving both within the target segment.<sup>13</sup> This type of strategy can be useful in areas where competition is strong and product and services are, for the most part, comparable between several competitors. By effectively focusing a company can develop a stronghold on a particular niche in the market. If a firm is successful driving competitors out of this area they can then defend their position and work to improve profitability where possible. Companies that have been successful in executing a focus strategy have actually shown the ability to return above-average profits relative to strategically broader competitors.<sup>13</sup>

## **CURRENT STRATEGY**

When comparing the three generic strategies it seems that the focus approach most parallels the operation of Boeing within the human spaceflight market over the past several decades. While operating in a number of different sectors of the market the division has focused on one customer, NASA, to provide the foundation for its business. By focusing on servicing the mission of its NASA customer the company has been able to secure itself a significant portion of each of the largest programs in the agency's exploration program. While successfully executing on the contracts received from NASA the company was also able to grow its influence in Washington D.C. and work towards securing the significant overall market share it maintains currently.

Until recently this approach has been an obvious choice given the overwhelming size of NASA as a buyer in the industry. While growing expertise with the largest industry customer Boeing has been able to achieve several advantageous positions relative to competitors. A competitive balance has been found with its main competitor, Lockheed Martin, which has allowed both companies to profit and coexist. At the same time new entrants have been minimized due to the size, capabilities and influence of both leaders. This has helped eliminate the need for severe cost competition and allowed competition based more on proposal merit and service.

With the trend towards a more commercially driven spaceflight market envisioned by the Obama administration, there may be more justification than ever for a company such as Boeing to step back and consider the validity of continuing with a customer-based focus strategy. While NASA begins to rethink the way it distributes work across the industry many new commercial opportunities are maturing into viable markets worthy of pursuit. Along with this come different customer groups with slightly different needs, new contract and organizational structures, and business models to fit into.

The agency will continue to be the largest buyer in the market for the foreseeable future; however, as the population of available contractors increases current profitability will be difficult to maintain for less diversified companies. If an industry's major buyer is changing the impetus is on its contractors to do the same. To proceed forward in a traditional fashion will only put Boeing at a disadvantage when competing against better positioned competitors in key sectors. Moving forward there seems to be two valid options to consider. The division could pursue a differentiation approach and attempt to capitalize on its experience and reputation while competing broadly in the industry. This approach maintains multiple markets and customers as sources of work and requires further development of the company's core expertise. The other strategic option is to continue to utilize a focus-type approach but to evaluate the current customer model as well as other areas of focus that may better position the company in the future. Choosing between the two may be a matter of balancing market conditions and the high-level goals of Space Exploration.

#### **DEFINING A STRATEGY**

The dynamic nature of the space industry at present makes the identification of a strategic plan difficult for a company regardless of size or specific business segment. Attempting to take into consideration all of the pertinent variables seems challenging during this time of unprecedented industry turbulence. Nevertheless companies across the human spaceflight market are having to rethink the way they approach the task of securing work in an industry that is transitioning to a new, and somewhat uncertain, competitive structure. So how might Boeing begin to put together the strong strategic plan it will need to defend its market position as well as bolster it through diversification into promising new commercial opportunities?

The overarching goal of strategy development should be to use all presently available information, along with well-reasoned market projections, to define a strategic plan which is robust and forward-looking. Although most long-term planning is carried out with only a best guess estimation of what the future state of competition may be, the human spaceflight industry presents an especially challenging situation. Due to the need for more time to understand the impacts of the Obama space policy, it will be especially critical that any plan forward possesses a flexibility which allows the company to compensate for unforeseen changes. To assume that a strategy developed under one administration will mature as planned, or even be valid under the next, would be irresponsible. Also given the current number of new competitors in the market there is likely to be a significant change in industry rivalry over the coming years as some firms find success and others exit the market. In an unstable environment flexibility and vigilant observance of market conditions are necessary to avoid making decisions based on outdated information and to keep from following the wrong path for too long.

Given what is known so far about the new direction of the industry, does the company's current approach seem reasonable? Considering that Boeing's role in the space industry has long been as a primary contractor on NASA development programs it is natural that the company's strategic focus has been on serving the needs of the agency as effectively as possible. Over the years changes have been made in the way the company operates often with the intention of improving its ability to meet NASA performance targets and maximize profit while operating under cost-plus contracts. Given the changes that the new space policy is aimed at bringing about, the validity of continuing to follow a focus strategy based on a single customer must be taken into consideration. To more effectively allow Space Exploration to leverage its capabilities in human spaceflight across commercial ventures, as well as government programs, it may

be necessary to adjust. A strategic approach that will allow the division to step back from its present level of interdependence with the agency might allow for acceleration in schedules and decreases in cost. Of course if a proven strategy is to be abandoned a promising new approach must be available to the company.

One option which may position the company well to capture both hardware development and service contracts in the future would be to maintain a focus approach but shift from customer to market segment. Similar to Porter's suggestion that a focus strategy can be based around a specific segment of a product line, the focus of Space Exploration could become a particular segment of the human spaceflight industry. By taking advantage of its substantial experience the division could work to corner one area of the market and, within that segment, attempt to achieve the differentiation and cost advantages as illustrated in Figure 3. This may come at the expense of opportunities in other areas, but this tradeoff would have to be considered as part of the development process. It seems reasonable that ceding certain industry segments while at the same time working to capture large share in others could be an effective approach if an appropriate target is available.

The success of such a strategy is clearly dependent on a number of factors. The first, and most important, step is to identify the market segment to be focused on. One must be chosen which both fits with the company's core capabilities and is the right size to support the business. Next it is critical to determine how broadly the boundaries of the segment will be defined. This will establish how far the company wishes to expand into that segment's adjacencies. If boundaries are not established or profit potential is not high enough this will inevitably lead to the need to expand further into adjacent segments. If this occurs the efficiencies promised by a focus strategy can be diluted due

to expanding business scope. Success when implementing this type of approach can only be achieved if the company can learn to redefine itself as a large-scale specialist of sorts.

The primary advantage offered by this type of strategy is the flexibility it might provide, at a time when the space industry is beginning to demand it. For a company like Space Exploration to attempt to continue its strategy of catering exclusively to NASA's way of business, while at the same time making efforts to operate effectively in new commercial pursuits, is unrealistic. Transitioning from customer focused operation and turning instead towards a selected segment of the space industry would potentially allow the company to service that segment while supplying both government and commercial customers.

The implications of such an opportunity are more significant than is immediately obvious. The ability to develop hardware and services to aggressive schedules and at reasonable costs is a requirement in a truly commercial market. If the company were putting efforts into streamlining processes and innovating in a narrower segment of the market such improvements would be possible. At the same time the underlying goal of the Obama space policy is to bring that type of cost effective development mentality to NASA programs. By transitioning to a segment focused approach Boeing may actually be able to more effectively serve its largest government customer, and help them reach their cost reduction goals, while developing systems that have commercial viability. In addition, such a change may allow the company to more readily defend its market share in the focus segment against new entrants. By developing a strong position the attractiveness of the segment to competitors could also be reduced, thereby limiting the likelihood of substitute products entering the market. If creating a defensible position is desirable then making such a strategic change may provide this benefit.



The strategic advantage provided by a focus strategy based on market segment is something that would be new to a large contractor such as Boeing. It is naturally true that new entrants tend towards this type of operation, at least early in their development, because it offers a way to gain footing in an industry. Only after becoming a more established and accepted part of the industry does a company tend to expand to other segments in an attempt to further capabilities and boost profits. For a company which has been in an industry for decades it may seem like a step backward to consider such a strategy, after all, focusing on one segment means neglecting the broader industry approach which has been the baseline strategy for large contractors. This concern is potentially valid only if the company chooses a market segment that is too narrow to support the business or does not reinforce and expand on internal capabilities. If a proper area of focus is chosen, and the organization can be structured around it, profit levels can be maintained.

So the question remains as to which area of the market may serve as a reasonable focus for a division the size of Space Exploration. Given the history of the company in human spaceflight it's logical that the core segment considered should involve the transport of cargo and crew to space. Also, within the framework of the space policy there is a substantial market for LEO transport now that NASA has joined the list of customers looking for such a service. The advantage offered by this segment is the potential size of the business which may be determined by how the company chooses to define it. Obviously working to secure government and commercial space station transportation would be a core business goal. Along with that effort there is also the traditional satellite launch market which could be included as well as provide the launch capabilities required for the commercial crew business. This would necessitate the

updating of an appropriate launch vehicle to be included in a human-rated system but such a technology refresh will likely be required in the near future regardless of strategy.

Due to the positive trends recently there are obviously other companies working to capture portions of the promising LEO transport segment. Competition will therefore be present, and there must be reason to believe that Boeing can become an independent leader if this strategy is to be effective. Fortunately the company has unparalleled history in several required areas including launch operations and unmatched expertise in human-rated hardware development. Working to focus on such a market would allow the company to leverage its head start in human transport as well as force it to invest in more cost effective launch vehicles to remain viable long-term. One advantage of focusing on transport services is that launch capabilities enable the whole of the space industry and a reliable and cost effective vehicle can be used to sell a variety of services to a wide range of customers regardless of payload.

The main question to be answered will be how well such a strategy can be reconciled with the contracts already being worked by the company. The extension of ISS utilization will continue to provide a substantial amount of business for Space Exploration. Along with ISS work statement there is the possibility of expanding the company's partnership with Bigelow Aerospace to advance a new commercial space station design. Can these types of LEO habitat efforts be pursued while working towards a strategy truly focused on LEO transport? Although orbital habitats seem to be an adjacent market they are also a substantially complex pursuit which may limit the company's ability to achieve the level of strategic advantage required to justify a change. Lack of strong focus could limit Boeing's ability to defend the segment against competitive attacks and lower strategically beneficial barriers to entry. This is why

determining whether these two segments are compatible may be the key to successfully choosing the correct path to follow.

## **ENABLING SUCCESS**

Successful strategic approaches include high-level market goals which can be obtained only through focused improvement in key enabling areas of the business. To focus a strategy on a market segment means that a company must then demand improvements in every aspect of the business that impacts that core pursuit. In the space industry at present the goal appears to be finding a place in the market where a company can effectively serve both traditional commercial and government customers. At a high level the first steps towards that goal can be accomplished through strategy, acquisitions and partnerships. To reach a position of strength in the future requires additional attention to improving those areas that enable this dual customer approach to be most profitable.

As the Obama administration attempts to grow the U.S. commercial space industry, it is also shifting NASA towards a role less centered on low Earth orbit. The agency is instead being asked to focus on increased technology innovation and deep space human and robotic exploration. The thought is that by turning over certain activities to the private sector NASA will be able to focus on more efficiently innovating and pushing the country's reach deeper into space. To do so will require new propulsion and materials technologies that NASA is well equipped to develop. At the same time this means that companies looking to position themselves as providers in the launch and transport sector of the industry will need to do the same within that market. To reduce the costs associated with launching both cargo and crew to low Earth orbit, new technologies will be required. A concerted effort will also be needed to either incorporate

those advancements into existing launch platforms or develop new ones with comparable safety. Remaining competitive both domestically and globally will require significant advances in hardware reusability as well as reductions in the cost of launch services. This need for more efficient launch vehicles is at the heart of any strategy hoping to succeed in the LEO transport market.

One way to effectively manage this need for advancement is to focus the company on the development of gap-bridging technologies which show potential for both commercial LEO transport use and for deeper space applications. As NASA further develops its plans for operating within the space policy it will begin to identify a more comprehensive list of technology requirements to support its efforts in the next decade. This will help companies such as Boeing identify those technologies which may be matured for traditionally commercial use, but also have follow-on value for agency exploration missions in the future. By investing in these types of development efforts, and working to capture NASA funded technology demonstrations with similar potential, Space Exploration can begin to find efficiencies in a narrower portion of the market. Such an effort could help provide a commercially acceptable return on research and development investment.

An example of this general approach to developing crossover technology may be seen in the coming years as Boeing works with NASA to extend the operational life of the ISS. Hardware, software and systems will be upgraded as part of this effort and much will undoubtedly be learned about how station components have aged through their intended lifecycles. The knowledge gained, and improvements that can be made as a result, will undoubtedly be valuable as Space Exploration partners with Bigelow Aerospace on the design of its inflatable commercial space complexes. Crossover use

such as this between the two generic customer groups within the market will be prevalent and must be leveraged both within SE and across Boeing as whole.

Along with the need to successfully manage technology investment, it will be essential for Space Exploration to reduce its cost structure and utilize more flexible organization structures to compete. Even if all out cost leadership is not the goal it must be part of the segment-focused strategy to drive the company to become more cost efficient within its narrower product base. As government budgets continue to be tightened it is foreseeable that there will be an increase in the number of indefinite delivery/indefinite quantity (IDIQ) contracts used by NASA to procure services, such as LEO transport. This type of procurement does not provide the stability that has typically been enjoyed by contractors in the space industry. Whereas commercial satellite launches are for one or a set number of launches, and are often scheduled over a year in advance, IDIQ contracts could introduce more irregularity in the level of work seen. To be successful operating under multiple contracts of this type Boeing will need to improve its ability to manage workforce levels and effectively level-load despite changing demands. This may be one of the most difficult transitions to make for a company which has spent so many years working long, cost-plus government contracts where funding was well defined over extended periods. The company's ability to make these types of transitions towards more traditional consumer market business practices may ultimately determine its success.

## **RISKS AND STRATEGIC PITFALLS**

With the implementation of any strategic approach there are a staggering number of ways that even the most robust plans of a company can be undermined and become obsolete. It is mandatory that while modifying a company's strategic plan that those

responsible for steering the organization keep in mind the most likely ways that companies fail in such efforts. This is difficult in practice as the pitfalls encountered tend to vary based on the strategy chosen, the structure of the industry being considered, and the organizational characteristics of the firm itself. To be sure, there are two common sources of failure which can be seen across multiple approaches and industries. These barriers to success create the need for constant monitoring of company progress and the market overall.

One of the most common causes of strategic failure is a company actually “failing to attain or sustain the strategy” which was held up as the goal.<sup>13</sup> It seems relatively obvious that if there is a lack of commitment to the plan within the company that it will be difficult to execute a chosen strategy. If employees and managers constantly make decisions that are inconsistent with the advertised objectives, issues will inevitably arise. Inconsistent strategic choices will lead to outcomes that counteract each other rather than reinforce the high-level plan. Managers and employees will lack the definitive direction they require to make decisions that are in the best interest of the company as a whole. To be successful while pursuing a specific strategy a commitment is required at all levels of an organization. The more different the new plan is relative to the company’s traditional way of doing business, the more difficult it will be to sustain the required change. This is likely why companies, especially those that have been successful for long periods, tend to stick to the way they’ve always done business. Striking out on a new course is risky and there exists a chance of failure with a sacrificial cause that can be clearly identified.

The oversimplified lesson in regards to avoiding such a setback is to perform a due diligence analysis of the industry or market, choose and define a strategy with the best chance of success given what is known, and stick to it. The lack of unified effort towards reaching a common market strategy will result in the company being caught in

between two or more approaches. This situation is akin to having no real strategy at all and will all but certainly lead to loss of market share in any competitive commercial environment.

The second concern which is present in a dynamic industry is that the advantage provided by a chosen strategy will be eroded through industry evolution.<sup>13</sup> This is, again, intuitive as the competitive structure within an industry can change rapidly due to a number of variables outside of the company's control. Changes in the number of competitors or their movements into and out of market sectors can influence rivalry. Changes in government regulations or policies can change the way business is done throughout an industry, either to the benefit or detriment of certain participants. Seemingly small changes in any of Porter's five forces can have a ripple effect on other areas of the competitive structure. When several interrelated factors change at once it can be extremely difficult to identify the net outcome and plan adjustments accordingly.

The space industry is currently going through a number of competitive changes, many of which cannot be fully understood due to their recent nature. If the long-term direction of the industry is not significantly impacted by the Obama administration any strategic planning done as a result of its space policy will be unsound. Clearly there is a need to constantly reevaluate strategy in an industry that is global, heavily politically influenced, and increasingly competitive. The nature of human spaceflight is also such that any major accident can result in drastic and immediate alterations to the industry for years to come. Events such as this are difficult, if not impossible, to plan for and further illustrate the need to rethink a company's strategy following any change which impacts Porter's competitive forces.

While monitoring the overall industry for structure changing events, there are also notable setbacks that must be guarded against specifically while operating under a

segment focus strategy. If Space Exploration were to move towards such an approach it would be necessary to monitor the advantages being realized as a result of its implementation. If the overall value of cost savings or product differentiation achieved relative to the rest of the market were not significant the division would have to rethink the validity of plan. For example, if Lockheed Martin was competing more broadly across the industry, and was able to offer products in the LEO transport segment that were sufficiently interchangeable with those offered by Boeing, the advantage of a focus strategy would be lost. Somehow a balance must be struck between allowing time for a strategy to develop and knowing when it has lost its potential due to changes in the market or lack of execution.

In a segment-based approach there is also the risk that competitors may move into the focus segment and target its submarkets in an attempt to steal share from within.<sup>13</sup> In Boeing's case it is possible that the LEO transport segment, while being sufficiently large to sustain the company, may be too large for the company to effectively defend from such attacks. If competitors were able to erode profits through this method it would be difficult to compete against smaller companies with more easily focused strategic plans. If this were to occur to a large enough extent the options to further narrow the segment or to change strategies entirely would have to be considered. Preventing such internal segment erosion would require establishment of a defensible position through substantial differentiation within the segment. Only through firmly positioning Boeing as a dominant market leader would it become prohibitive for other competitors to enter.



## **Chapter 5: Conclusions**

There are myriad challenges facing all companies working to position themselves in the space industry of the next decade. Some issues faced by industry participants predictably vary depending on whether the company is an established leader or a relatively new competitor. Others, such as policy changes, are more universal. For Boeing Space Exploration the end of the space shuttle program combined with the cancellation of the majority of the Constellation program have left the company with a major reduction in work statement. Complicating this loss are the uncertain long-term human exploration plans of NASA. During a time when some assurance concerning future contract opportunities would be most valuable there are more questions than concrete plans forward.

At present the future goals for U.S. human spaceflight are being revised by NASA under the direction of the new Space Policy of the U.S. Although the eventual outcome of this planning will remain unknown for some time, the programs which result will likely be a combination of traditional NASA vehicle work and several more commercially-structured opportunities. As the agency attempts to reduce the cost of its development work it will have to adjust the way it awards and manages large contracts. This will, in turn, create new hurdles for any contractor wishing to support its efforts in both LEO pursuits and deep space exploration.

Despite Space Exploration's leadership in manned spaceflight it will be necessary for the company to adapt to this emerging environment in the industry. To maintain strength in current market segments and take advantage of new opportunities the division will have to remain flexible while constantly reevaluating competitive conditions. To the extent possible it must also work to steer the direction of NASA's plans through the

company's efforts in Washington, D.C. If the country's plans for future exploration align with the core competencies possessed by SE the effort required to secure work could be significantly reduced. This is not to say, however, that future success will be assured once a few contracts are secured. To survive as a government contractor over the next decade will require aggressive cost control and a focus on efficient, long-term project management. Finding ways to continuously reduce the cost structure of the division while maintaining the level of service that NASA has come to expect will be critical. Boeing must continue to work to improve outdated and time consuming development methods to compete with companies whose background does not include restrictive NASA contract work.

Along with finding new and efficient business methods it will be important for Boeing to define a strong strategy for capturing work across all customers, both government and commercial. The long-standing approach of focusing on NASA and their programs has been effective largely due to the length and cost structure of the contracts handed out by the agency. If those favorable aspects of working government contracts begin to change, the validity of operating this way will have to be reexamined. Focusing so heavily on NASA's pursuits may, in fact, place Space Exploration at a disadvantage when attempting to bid commercial work in the future. A new strategy aimed at treating NASA as a more commercial customer may help provide the agency with the cost and schedule improvements it will be looking for moving forward.

To position the division for a new competitive state the potential benefits of focusing on a particular business segment may be worth evaluating as one option for catalyzing change. The segment of the human spaceflight industry suggested was the low-Earth transport market. To make such a dramatic shift in organizational direction would be imprudent, however, without first allowing time to better understand the

tangible effects of the Obama administration's space policy. If the commercial tones of the policy have the intended effects on NASA programs and contract management, a change may be justified. If this is not the case and business with the agency continues on in a more traditional fashion, a less drastic approach may be more appropriate.

Whatever the policy's outcome on the agency's future plans, Space Exploration must continue to find a proper balance between maximizing profit and accepting additional project risk. As NASA begins to focus on cost cutting it will do so by attempting to offload some of the risk associated with development overruns and schedule slips to its contractors. To remain profitable companies such as Boeing must work with the agency to find a compromise that will allow near commercial profit margins for contractors while improving the agency's exposure to late development efforts. This will be challenging unless NASA is able to step back from the intense project oversight it has demanded in the past and move towards allowing its contractors freedom to pursue efficiencies in the design process and limit scope creep.

Choosing a strategic plan to compete in the new space age will be challenging even for a company with the legacy of Boeing Space Exploration. During such a dynamic time in both the U.S. and international space industry it will be those companies willing to adapt who will remain as or emerge as leaders in the future. When a company possesses all of the critical skills required to remain competitive, success becomes a matter of making well-reasoned strategic choices and moving forward while constantly planning for what may be ahead. Competitive plans developed now may not be valid in the market even a few years in the future. Nevertheless, by making informed changes as early as possible the adjustments in course required to maintain a leadership position will not be as drastic or damaging in the future.

## References

- “International Space Station Backgrounder.” Boeing.com.  
[http://www.boeing.com/defense-space/space/spacestation/docs/ISS\\_overview.pdf](http://www.boeing.com/defense-space/space/spacestation/docs/ISS_overview.pdf)  
(accessed July 1, 2010).
- “Space Shuttle Backgrounder.” Boeing.com. [http://www.boeing.com/defense-space/space/hsfe\\_shuttle/docs/shuttle\\_overview.pdf](http://www.boeing.com/defense-space/space/hsfe_shuttle/docs/shuttle_overview.pdf) (accessed July 1, 2010).
- Bush, George W. *Public Papers of the Presidents of the United States: George W. Bush, 2004. Book 1*. Washington, D.C: Government Printing Office, 2000-2004.
- “Fiscal Year 2011 Budget Estimates,” NASA.gov,  
[http://www.nasa.gov/pdf/420990main\\_FY\\_201\\_%20Budget\\_Overview\\_1\\_Feb\\_2010.pdf](http://www.nasa.gov/pdf/420990main_FY_201_%20Budget_Overview_1_Feb_2010.pdf)  
(accessed September 5, 2010).
- Harvard Business School Press, ed. “SWOT Analysis I: Looking outside for Threats and Opportunities.” In *Strategy: Create and Implement the Best Strategy for Your Business*. Boston, Massachusetts: Harvard Business School Press, 2005. Electronic Format.
- “NASA's Shuttle and Rocket Launch Schedule.” NASA.gov.  
<http://www.nasa.gov/missions/highlights/schedule.html> (accessed July 5, 2010).
- “National Space Policy of the United States of America,” whitehouse.gov  
[http://www.whitehouse.gov/sites/default/files/national\\_space\\_policy\\_6-28-10.pdf](http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf), July 28, 2010.
- Porter, Michael E. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York, NY: The Free Press, 1980.
- Porter, Michael E. “The Five Competitive Forces That Shape Strategy.” *Harvard Business Review*, January 2008.
- Review of U.S. Human Spaceflight Plans Committee, “Seeking a Human Spaceflight Program Worthy of a Great Nation,” whitehouse.gov,  
[http://www.whitehouse.gov/files/documents/ostp/press\\_release\\_files/HSF\\_Cmte\\_FinalReport.pdf](http://www.whitehouse.gov/files/documents/ostp/press_release_files/HSF_Cmte_FinalReport.pdf), October 22, 2009.
- Smith, Marcia S. “NASA's Project Constellation: Fact Sheet.” SpacePolicyOnline.com.  
[http://www.spacepolicyonline.com/pages/images/stories/Constellation\\_Fact\\_Sheet.pdf](http://www.spacepolicyonline.com/pages/images/stories/Constellation_Fact_Sheet.pdf)  
(accessed October 19, 2010).

“Top 25 NASA Contractors.” Government Executive.  
[http://www.govexec.com/story\\_page.cfm?filepath=/features/0809-15/0809-15s12s1.htm&oref=search](http://www.govexec.com/story_page.cfm?filepath=/features/0809-15/0809-15s12s1.htm&oref=search) (accessed September 13, 2010).

Turabian, K. L. *“A Manual for Writers of Term Papers, Theses, and Dissertations.”* 7th ed. Chicago: The University of Chicago Press, 2007.

## **Vita**

Mathew Curtis Bostad was born in Grand Forks, North Dakota. After completing his work at Grand Forks Central High School, Grand Forks, North Dakota, in 1999, he entered The University of North Dakota in Grand Forks, North Dakota. He received the degree of Bachelor of Science in Mechanical Engineering in May 2005. Following this he was hired as a manufacturing engineer with Boeing Commercial Airplanes in Everett, Washington. Over the next two years he worked in manufacturing and design while completing graduate work in aircraft composite structural analysis and design at the University of Washington in Seattle, Washington. In 2008 he transferred to Boeing Space Exploration in Houston, Texas to work in mechanical and structural design. In January, 2009, he entered the Graduate School at the University of Texas at Austin.

Permanent address: [mbostad@gmail.com](mailto:mbostad@gmail.com)

This thesis was typed by the author.