

THE NASA SHUTTLE PROGRAM: LOCAL AND NATIONAL NEWSPAPER CONTENT
ANALYSIS

By

SVETLANA SHKOLYAR

A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS IN MASS COMMUNICATION

UNIVERSITY OF FLORIDA

2009

© 2009 Svetlana Shkolyar

To my parents, Fianna and Oleg Shkolyar, who always encouraged me to be the best I can be and had faith in everything I did.

ACKNOWLEDGEMENTS

I would like to thank my chair, Debbie Treise, for being greatly supportive through my thesis-writing process and my studies in the science communication program. She was committed to answering my questions on weekends and during late nights. She also allowed me to get the most out of my experience in the program by allowing me to tailor my coursework in and out of the department to fit my unique interests.

My other two committee members, Johanna Cleary and Renee Martin-Kratzer, were also supportive and enthusiastic about the topic I chose for my thesis. They are acknowledged for seeing the potential I could achieve and helping me reach it.

My parents are acknowledged, as well. I would like to thank my mom, Fianna Shkolyar, for being my moral support, problem solver, and even my editor at odd hours of the night during the writing and editing process. She has always been and will always continue to be that person whose support and love has gotten me through everything in my life. I also acknowledge my dad, Oleg Shkolyar, for always encouraging me to be whatever I desired and supporting me every step of the way.

TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGEMENTS.....	4
LIST OF TABLES.....	8
ABSTRACT.....	9
CHAPTER	
1 INTRODUCTION.....	10
Importance of the Shuttle Program.....	11
Criticisms of the Shuttle Program.....	14
Significance of Studying the Shuttle Program.....	15
2 LITERATURE REVIEW.....	16
The Columbia Accident.....	16
Historical Background of NASA Media Coverage.....	17
NASA’s Shuttle Program Since Columbia.....	21
Current Science Communication.....	22
Purpose of Science Communication.....	24
Framing Theory.....	25
Sourcing.....	28
Local versus National Coverage of Science News.....	31
Current Study.....	33
Research Questions.....	37
3 METHODOLOGY.....	38
Newspaper Articles Chosen.....	39
Time Frame.....	40
Search Criteria.....	41
Pilot Study.....	42
Coding and Data Collection Process.....	43
Reliability and Validity.....	45
4 RESULTS.....	48
RQ1: Does The Coverage of the Shuttle Program Differ Between <i>Florida Today</i> and <i>New York Times</i> in Terms of Focus?.....	48

Columbia Details Focus	48
Policy and Funding Focus	50
Mission Status Focus.....	52
Technical and Scientific Focus.....	53
“Other” Focus.....	54
RQ2: Does the Coverage of the Shuttle Program Differ Between <i>Florida Today</i> and <i>New York Times</i> in Terms of Frames?	54
Safety Frame.....	54
Technical and Scientific Frame	56
Industry Frame.....	57
Return to Flight Frame	58
Funding/Budget Frame.....	59
Policy Frame.....	60
Internal Changes Frame.....	61
Lessons from History Frame	62
Astronaut Hero Frame	63
Progress Frame	64
“NASA in the Public Eye” Frame	65
Other Frames	65
RQ3: Does the Frequency and Type of Source Cited Differ in <i>Florida Today</i> and <i>New York Times</i> Shuttle Program Coverage?	67
Types of Sources	67
Comparison of sources cited directly, indirectly, and both ways.....	74
RQ4: Are Any of the Sources More Frequently Associated with Certain Focuses in the <i>Florida Today</i> Shuttle Program Coverage Versus the <i>New York Times</i> Coverage?.....	74
<i>Florida Today</i>	74
<i>New York Times</i>	75
RQ5: Are Any of the Frames more Frequently Associated with a Certain Focus in the <i>Florida Today</i> Shuttle Program Coverage Versus the <i>New York Times</i> Coverage?.....	76
<i>Florida Today</i>	76
<i>New York Times</i>	77
RQ6: Are Any of the Sources More Frequently Associated with Certain Frames in the <i>Florida Today</i> Shuttle Program Coverage Versus the <i>New York Times</i> Coverage?	77
<i>Florida Today</i>	77
<i>New York Times</i>	78
 5 DISCUSSION AND CONCLUSION	 87
Practical Implications of This Study.....	96
Conclusions.....	99
Limitations of This Study	100
Suggestions for Further Research.....	101
 APPENDIX	
A BRIEF CHRONOLOGY OF THE NASA SHUTTLE PROGRAM THROUGH THE CHALLENGER ACCIDENT	104

B SHUTTLE LAUNCHES THE SINCE COLUMBIA DISASTER	106
C CODE SHEET	107
D CODEBOOK	109
LIST OF REFERENCES	114
BIOGRAPHICAL SKETCH	124

LIST OF TABLES

<u>Table</u>	<u>page</u>
1-1 Comparison of the pilot study <i>Florida Today</i> and <i>New York Times</i> frames.....	37
4-1 Frequencies of shuttle program stories in <i>Florida Today</i> and <i>New York Times</i> by year.....	78
4-2 Focus of <i>Florida Today</i> and <i>New York Times</i> coverage.....	78
4-3 Frames of <i>Florida Today</i> and <i>New York Times</i> coverage.....	79
4-4 Sources in <i>Florida Today</i> coverage. N = 587.....	79
4-5 Sources in <i>New York Times</i> coverage. N = 577.....	80
4-6 Total sources in <i>Florida Today</i> and <i>New York Times</i>	80
4-7 Sources cited directly, indirectly, and both ways in <i>FT</i> and <i>NYT</i>	80
4-8 <i>Florida Today</i> source frequency per article focus	79
4-9 <i>New York Times</i> source frequency per article focus	81
4-10 <i>Florida Today</i> coverage frame frequency per article focus.....	82
4-11 <i>New York Times</i> coverage frame frequency per article focus.....	82
4-12 <i>Florida Today</i> coverage total source frequencies per frame.	83
4-13 <i>New York Times</i> coverage total source frequencies per frame	85
B-1 Shuttle launches after 2003 Columbia disaster until March 2008.....	106

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Master of Arts

THE NASA SHUTTLE PROGRAM: LOCAL AND NATIONAL NEWSPAPER CONTENT
ANALYSIS

By

Svetlana Shkolyar

May 2009

Chair: Debbie M. Treise

Major: Mass Communication

Little research had been done on the communication of NASA media coverage, especially coverage of the shuttle program. This analysis adds to the mass communication scholarly literature dealing with framing theory, sourcing, local versus national coverage, and how the mass media shape public opinion, policy, and funding. This study examined post-Columbia shuttle program coverage in *Florida Today*, a local newspaper near the NASA Kennedy Space Center community, *Florida Today*, versus in a national newspaper, *New York Times*. It aimed to develop an understanding of the framing and focuses used in shuttle program coverage through a quantitative content analysis. It explored the sources used in shuttle program coverage and investigated their frequency and range to determine the degree of their diversity and dominance. One conclusion of this study is that the media focused coverage largely on the Columbia accident and its aftermath, including investigations and recommendations for NASA to change its procedures, and not on other notable NASA developments. It is hoped that this study will prompt further studies of how space exploration is communicated in the media and how this affects budget, policies, and public support for space exploration.

CHAPTER 1 INTRODUCTION

The Columbia shuttle exploded on February 1, 2003 as it returned to Earth from a 16-day science mission. All seven astronauts aboard were killed. The cause of the explosion was due to both physical and “space flight program’s culture” reasons, according to the Columbia Accident Investigation Board (CAIB) synopsis of the disaster (Smith, 2003b, p. CRS-2).

An excerpt from *American Editor* describes the rush to cover the disaster of the shuttle Columbia when it broke up: “The Saturday morning calm ended abruptly as reporters, editors, graphic artists and photographers poured unbidden into newsrooms and scrambled to assignments to craft extra editions and expanded Sunday coverage” (Smith, 2003a, p.16). Gustin & Sheehy (2003) and Smith (2003) agree that coverage of the Columbia event was successful. Particularly, these researchers claim that the agency investigators handled the Columbia crisis with speed, broadcasting within an hour of initial developments and sharing the accident coverage with the media quickly and openly. This paper will examine what coverage of the shuttle program has been like since this crisis event that many researchers (i.e., Kauffman, 2005; Smith, 2003a; Gustin & Sheehy, 2003) claim changed NASA by making its PR more respectable and credible.

After Columbia, the agency regained its status as one that effectively communicates crises (Martin & Boynton, 2005). As seen by the communication of this event to the public, NASA was determined to operate in the open, in contrast to the Challenger disaster of 1986, to make both triumphs and tragedies known to the American public (Byrnes, 1994). In general, the loss of Columbia on February 1, 2003, brought issues of space coverage into “sharper focus” (Clark and Illman, 2003, p. 15).

Subsequent research by others has contributed to insight about one specific aforementioned space topic, the shuttle program. Martin and Boynton (2005) who analyzed major newspapers' communication of the Challenger and Columbia shuttle disasters believe that shuttle program communication should examine the long-term impact following initial crisis communication. Indeed, although research has been conducted on the communication of these two NASA crises (for another example, Sumpter & Garner, 2007), little research had been done on the communication of other NASA media coverage. This is especially true for general coverage of NASA's shuttle program.

Therefore, this study aims to contribute to the research on science news by analyzing media's communication of the shuttle program. It will use content analysis to examine the frames, sources, and the focuses found in post-Columbia shuttle program coverage in a local newspaper near the major shuttle program operations facility in the U.S., the NASA Kennedy Space Center community, versus in a national newspaper.

Importance of the Shuttle Program

In the current Space Age, technology is advancing at an ever-increasing rate. Today's researchers believe that space events need to be covered effectively to accurately reflect these changes to society. Weigold (2001) argues that in "an era of unprecedented technological and scientific advances, many of which have the potential to radically change human existence, science news is important" (p. 164). The media are the major source of science news and space affairs information for the public (Goldman, 1992).

There are many reasons why media need to communicate shuttle program developments effectively. Indeed, NASA economists Greene & Miesing (1984) say that the shuttle provides "primary access to the incomparable frontier of outer space, offering virtually limitless potential" (p. 56). Notably, the shuttle is the first spacecraft in history that can carry large satellites to and

from orbit (National Aeronautics and Space Administration, 2008a). It is the main access to outer space and transporter of such technologies as astronomical and defense satellites that are highly relevant to society. These technologies facilitate scientific knowledge, monitor our country's security, create high-demand jobs, and produce valuable geographic data about our earth, among other societal benefits (Greene & Miesing, 1984).

Thus, there are many beneficial scientific uses of the shuttle program. The original fleet of five NASA shuttles has transported many observatories, space-based telescope, and satellite laboratories that have greatly enhanced humanity's knowledge about not only the universe in which we live but also about ourselves. Satellites launched from shuttles contribute to aerospace technology and space life science research and development (National Aeronautics and Space Administration, 2004). For instance, the Hubble Space Telescope has been able to look back to the early universe and greatly advance our understanding about it, confirming that black holes exist (Space Telescope Science Institute, n.d.). Some of the other launches that successfully studied space and brought back useful astronomical data included the Compton Gamma Ray Observatory, which completed the most comprehensive astronomical survey of the galactic center of our Milky Way Galaxy and the Galileo Spacecraft, which explored the planet Jupiter (National Aeronautics and Space Administration, 2008a).

Besides making many advances in astronomy, shuttle experiments have made strides in the disciplines of cardiovascular/cardiopulmonary science, neuroscience, the effects of space travel on living things, material properties in space, weightlessness, cell biology, physiology (National Aeronautics and Space Administration, 2008a), and even geography, among other sciences. For example, the shuttle *Endeavour's* Radar Topography Mission, launched on January 31, 2000, made a radar map of the planet's surface "about three times more detailed than 90-meter data

commonly available for most parts of the world” (Leary, 2000). This data, the *New York Times* news article explained, “could be a boon to everyone from military planners to weekend backpackers.” Leary (2000) also noted that five other space shuttle missions have flown valuable radar-mapping instruments.

Similarly, another major focus of the shuttles is to transport crews to and from orbiting stations such as the International Space Station. This effort has benefited the 15 countries involved because it “represents a quantum leap in the capability to conduct research on orbit” (National Aeronautics and Space Administration, 2007b, p. 1). As a result, scientific researchers can perform these commercial, scientific, and engineering research experiments without gravitational and atmospheric limitation.

The shuttle program provides benefits for the nation’s security, as well. For example, the U.S. Air Force’s Defense Support Program (DSP) launched one of the monitoring and sensing satellites aboard the shuttle Atlantis on November 24, 1991. These satellites monitored missile, spacecraft, and nuclear activity. DSP detected the launches of Iraqi missiles and provided timely warnings to military forces during the Persian Gulf War from 1990 through 1991 (Space, 2000).

Furthermore, NASA economists Greene and Miesing (1984) claim that the shuttle has “far-reaching implications” to improve the U.S. economy and the job market. For instance, a current analysis of NASA’s Florida economic activity released in 2007, stated that total earnings for contract and civil service workers at the Kennedy Space Center (KSC) were \$1.1 billion in fiscal year 2007, and almost all of these wages were paid to Brevard and other Central Florida county residents (National Aeronautics and Space Administration, 2007a), showing how much financial impact all NASA activities have on the Kennedy Space Center Space Coast community alone. The same report also stated, “the total injection of outside money into Florida’s economy by all

KSC based activities was \$1.8 billion in FY [fiscal year] 2007” (National Aeronautics and Space Administration, 2007a, p. 14). Furthermore, 14,950 workers were employed at KSC in 2007 (National Aeronautics and Space Administration, 2007a). The benefits of the shuttle program are clear, considering the jobs and incomes created by the Kennedy Space Center for Florida.

Likewise, the economic impact of NASA’s shuttle operations in communities near other NASA centers is significant, as well. The NASA Marshall Space Flight Center in Huntsville, Alabama plays a key role in engineering shuttle components and their payloads (National Aeronautics and Space Administration, 2008b). The center employs over 7,200 personnel and generated more than \$1.1 billion in economic impact for Alabama in Fiscal Year 2007 (National Aeronautics and Space Administration, 2008b). Also, the Johnson Space Center in Houston, Texas, another leading center in shuttle and supporting operations, employs over 16,000 workers and has a current spending budget of over \$3.5 billion (Bay Area Houston Economic Partnership, 2008). By these figures, it is clear that many stakeholders in local NASA center communities as well as nationally, are invested in the shuttle program.

Criticisms of the Shuttle Program

While in the past some researchers such as Greene and Miesing (1984) regarded the shuttle as a “revolutionary technological facilitator,” (p. 63), other researchers are currently criticizing the shuttle program as being inefficient and costly. Many argue that private space flight is more efficient than the government-funded activities of NASA’s shuttle program. Forbes (2005) and other critics of NASA’s shuttle program claim that the program has been too slow in making breakthroughs as a government-funded program, and too costly, wasteful, and time-consuming for the mere four shuttles per year that it had been launching. Forbes (2005) goes on to say that NASA is too occupied with bureaucracy, hinders scientific innovation, and even monopolizes U.S. space activities that the private sector could carry out more successfully. Lawrence

Williams, vice president for international and government affairs for Space Exploration Technologies, agrees. He states that innovation and low prices can lead private industry and private entrepreneurs to change the space industry if the government would change its financially ineffective policies and assist with open competition for private space business and exploration (David, 2007).

The public also agrees that space exploration is costly. In one National Science Board (2002) study of public perceptions of science and technology, 48% of those surveyed in 2001 thought spending on space exploration was excessive. This percentage was almost twice as high as the number of those who felt government was spending too much on national defense and “at least 65% of those surveyed thought the government was not spending enough on other programs, including programs to improve health care, help senior citizens, improve education, and reduce pollution” (National Science Board, 2002, p.7-15).

Significance of Studying the Shuttle Program

By the time the shuttle program is retired in 2010, it is estimated that more than \$173 billion will have been spent on it (David, 2005). To date, the shuttle program has cost more than \$150 billion for its 126 missions, excluding \$100 billion worth of transported International Space Station parts, and employs more than 10,000 engineers to staff each launch (McKie, 2006). Put in these terms, the shuttle’s budget becomes relevant to U.S. taxpayers as stakeholders in the program.

CHAPTER 2 LITERATURE REVIEW

The Columbia Accident

A brief chronology of NASA's major events is outlined in Appendix A. Refer to it for an overview of events before the Columbia accident. Until 2003, all of the shuttle missions since Challenger's last flight in 1986 were successful. Then, on February 1, 2003, the Columbia shuttle exploded as it returned to Earth from a 16-day science mission. All seven astronauts aboard it were killed. The CAIB was created shortly after the Columbia accident to investigate the causes and make recommendations for further improvements to the technical and managerial personnel. It was chaired by Adm. Herold Gehman and released its first report on August 26, 2003 (Smith, 2003b).

According to a CAIB synopsis of the disaster, the cause of the Columbia failure was due to both physical and "space flight program's culture" reasons (Smith, 2003b, p. CRS-2). Physically, there was damage to Columbia's wing caused by a piece of insulating foam that detached from it (Smith, 2003b). Smith cited other factors of the program's culture that played at least some role in the disaster including weakened safety regulations, scheduling pressures, budget constraints, and limited personnel.

Six out of the 29 recommendations made by the CAIB were *organizational* in nature and included such changes as reorganizing the Space Shuttle Integration Office (Smith, 2003b). In fact, in the case of both the Challenger and Columbia shuttle accidents, managers overruled technical warnings and decided to go forward with the launches (Smith, 2003b). This could suggest that a lack of communication was one probable cause of the Columbia's failure and that effective communication among managers and technicians is instrumental in accomplishing successful launches. Likewise, the agency's effective communication to the press and the public

is also necessary for financial, public, and government support. The next section will explore why this is true.

Historical Background of NASA Media Coverage

NASA's public image has evolved over time. It has fluctuated throughout its history from the nationalistic Space Race efforts of the Cold War and moon-landing Apollo 1 era to the morale-impeding Challenger and Columbia shuttle losses.

During the Cold War era, both the media and the public pressured NASA to compete with the Soviet Union's advancing space program. NASA was "employed by both Cold War and domestic politics" and prominent media outlets such as *Life* magazine criticized NASA for not going to the moon faster (Greenberg, 2001 p. 281). Media coverage at that time became what historian Walter McDougall called a "media riot" over the launch of the first Russian satellite, Sputnik (1985, p. 145).

After the 1967 Apollo 1 capsule fire, NASA's crisis communication became ineffective. The agency's public relations team did not report the accident in a way that maintained public trust, according to NASA communication expert and communication assistant professor James Kauffman (1999). During Apollo 1, the agency was criticized for trying to be in control of the accident investigation by hiring its own members for the investigation board (Kauffman, 2005). Another flaw in the communication of the Apollo accident, according to Kauffman (1999), was that NASA failed to utilize the three basic steps that organizations in crisis should use: respond quickly, tell the truth, and provide a constant flow of information.

According to Kauffman (2001), NASA's image declined after Apollo 1 but recovered after Apollo 13. Since the Apollo program, there has been an optimistic interest in the "romantic pursuit of exotic and dangerous adventure," coupled with the public's nationalistic support for the American space program (Dombrowski, 2006, p. 239).

The moon landing especially “had great rhetorical value in romanticizing and concretizing the ‘frontier’ of space” (Kauffman, 1994, p. 35). On the other hand, Kauffman (1994) also cites many critics who considered media’s coverage of the early space program and the moon landings as “uncritical,” having “political motivations,” and not having had an “in-depth analysis of the administration’s arguments in favor of the space program or its rhetoric as it may have influenced congressional debate over funding” (Kauffman, 1994, p. 7).

There has also been a great deal of criticism over the communication efforts surrounding the Challenger crisis two decades later. Some claim that the Challenger event is an example of a crisis communications failure because it failed to follow a crisis communication plan after the explosion (Marshall, 1986). Other researchers say that the Challenger disaster led to the media pressuring NASA to justify the tragedy in terms of immediate answers and “bureaucratic indictments” rather than technical reasons (Broad, 1986, p. 40). Still other investigators concluded that the media’s flawed coverage factored into the disaster, increasing the pressure to launch Challenger (Sumpter & Garner, 2007). Historian William Burrows wrote, “the Challenger was lost because NASA came to believe its own propaganda. The agency’s deeply impacted cultural hubris had it that technology – engineering - would always triumph over random disaster if certain rules were followed” (1999, p. 560). Sumpter & Garner (2007) added that the result of this was a “distorted public image” and reliance on media “sources that would say the right things” (2007, p. 457).

Many researchers (e.g., Kennedy, 2005; Martin & Boynton, 2005) have conducted comparison studies between media communication of the Challenger and Columbia accidents and agree that the crisis communication after the Columbia disaster was handled better than that of the Challenger, in terms of getting information out to the public openly and diligently. NASA

developed, updated, revised, and even rehearsed a crisis plan regularly for each shuttle flight, according to Sean O’Keefe, NASA Administrator during the Columbia accident (2003). The open way NASA handled the Columbia crisis “ultimately helped to maintain confidence and trust in the space agency,” said Kauffman (2005, p. 273). Gustin and Sheehy (2003) claim that the agency investigators handled the Columbia crisis with speed, broadcasting within an hour of initial developments and sharing the accident coverage with the media faster and more openly than compared to its “abysmal” response to Challenger 17 years earlier (Kauffman, 2005, p. 268).

According to Thomas Kunkel, president of the *American Journalism Review* and former dean of the University of Maryland’s Philip Merrill College of Journalism, the Columbia tragedy was “proof positive that we have moved from the Space Age to the Media Age” (2003, p. 4). He claimed that media spread news of the disaster to the public faster than technicians spread the information to NASA engineers. Also, Larry Rasky, a Boston public relations and communications consultant, believed that more effective communication after the Challenger event meant NASA’s management was portrayed as being more open and honest (Jurkowitz 2003).

Many comparative studies have analyzed NASA’s crisis communication efforts during the agency’s disasters. One such study was done by Martin and Boynton (2005), who conducted a crisis communication content analysis of coverage after the Columbia and Challenger disasters. They found that NASA received much more positive news coverage in four national newspapers following the Columbia disaster than it received in the aftermath of the Challenger explosion. They also stated that “NASA’s inability to retain what it learned from the Apollo 1 and 13 crises may make the agency’s Challenger mistakes even more egregious in the eyes of NASA’s

stakeholders” (Martin & Boynton, 2005, p. 259-60). Furthermore, some researchers claim that during both the Apollo 1 and Columbia accidents, the media and Congress criticized NASA for appointing its own employees to investigate them in order to protect NASA’s image (Kauffman, 1999).

Some researchers have regarded coverage of NASA as overwhelmingly positive. Coverage that dominated the space arena in the past few decades emphasized the “hero astronaut” frame (Nelkin, 1995). Boot (1986) similarly argued that bringing space journalists together for coverage of launches at the Kennedy Space Center in Cape Canaveral, Florida, caused that coverage to focus on the “astronaut-hero” and “new frontier explorations” as the prevalent media topics. Typically, between 200 and 300 media representatives are present at launches, according to Bruce Buckingham, news chief at the Kennedy Space Center (Hand, 2005).

On the other hand, some have criticized as NASA as being too “publicity – savvy” (Rutenberg, 2003, p. A.23) and “P.R.- hungry” (Houston, 1999, p. 17). For instance, the agency “maximized favorable public relations” of the Mercury mission astronauts by hiring experienced publicists and by allowing them to sign “exclusive contracts” with *Life* magazine (Sumpter & Garner, 2007). Similarly, NASA communication researcher James Kauffman says that the agency purposely scheduled launches, mission celebration parades, and astronaut appearances at strategic times to influence Congress’ votes on its budget (Sumpter & Garner, 2007). Furthermore, Sumpter and Garner say “sensational aspects of manned space flight,” were manipulated by the space agency’s public relations efforts.

In summary, as seen by the history of the agency’s communication efforts, times of high scrutiny and pressure by the media and the public, especially following shuttle disasters, can

affect NASA's reputation and decision-making abilities. Kauffman (1999) asserts that NASA should be careful of its public image not to cause distrust among the public and media. Likewise, Greene and Miesing (1984) believe that to reap the full benefits from space technology, "the U.S. is to regain its industrial and marketing momentum internationally, [and] our government must take bold and effective action in marketing space-shuttle opportunities" (p. 59). As these researchers show, the communication of the program clearly affects the way funding, public, and policy of the program perceive, fund, and support the program. Effective shuttle program coverage by the media in both triumphant and tragic events over the course of the program is crucial to maintain moral support from the public, financial support from Congress, and credibility from the media (Kauffman, 1999).

Many researchers have also noted that effective coverage of the shuttle program is necessary to maintain program funding. For example, Neal Lane, former director of the science-funding agency the National Science Foundation, believes that without public support of science and technology, funding does not happen (Cialdini, 1997). It is important to keep the public scientifically literate and interested in the continued success of scientific programs, according to a National Science Board (2002) study on public perceptions about science and technology. That study indicated that space exploration was one of the issues that received less support for increased spending than scientific research.

NASA's Shuttle Program Since Columbia

After Columbia, the financial affairs of NASA and the shuttle program were shaky. NASA's shuttle budget was decreased due to the difficulties of maintaining an aging shuttle technology and because other projects needed funding, such as the International Space Station (Dombrowski, 2006).

Politically, the program's future in the time surrounding Columbia was also unstable. The nation had not fully recovered from the September 11, 2001 events and the conflicts in Iraq (Columbia, 2003). At the same time, NASA was suffering from a broken promise made back in President Nixon's administration that the shuttles would be flying more routinely and under a smaller budget (Columbia, 2003).

Internally, the shuttle's future was unclear, as well. NASA was preoccupied with privatizing the shuttle program (Dombrowski, 2006). Furthermore, in the 1990s, shuttle management became decentralized due to administrative decisions, and soon NASA downsized the number of employees working for the shuttle program (Dombrowski, 2006). Based on the Columbia Accident Investigation Board report (Dombrowski, 2006), and the communication of the Challenger Mission Management Team (Garner, 2006), the hierarchical nature of NASA's management, internal communication, and especially risk and safety assessment were believed to be ineffective and continued to be downsized.

Current Science Communication

Whether internally within an agency or externally to the public, effective science communication is crucial for many reasons. It "can provide the public with information essential to forming opinions about public policy and about the costs and benefits of governmental expenditures on science" (Treise & Weigold, 2002, p. 311). Also, effective science communication is needed not only to educate the public about the world in which they live, but also to inform them about personal decisions, consumer choices, and environmental actions. Similarly, this communication inspires science career choices to be generated among inspired youth (Treise & Weigold, 2002).

However, in the field of science communication many issues exist that prevent information not only about the shuttle but also about general science events from being delivered accurately

and objectively. Science writers in general are rarely trained in science and their stories receive little scientific worth by non-science journalists (Weigold, 2001). Both Weaver and Wilhoit (1996) and Ismach and Dennis (1978) found that only three percent of American journalists with college degrees majored in a math or science field.

There are other current problems in science communication. Some researchers believe that often the omission of both key ideas (Weigold, 2001) and understandable language (Treise & Weigold, 2002) prevents understanding of scientific ideas. Also, in their open-ended survey mailed to 850 science communication writers and scholars about issues that would advance science communication, Treise and Weigold (2002) cite many experts who believe that the public's disinterest and lack of knowledge are other barriers to science communication.

Does coverage of space-related stories in prestigious newspapers such as the *New York Times* reflect these communication problems? In 2003, technical communication researchers Clark and Illman conducted a content analysis of *New York Times* stories of space in the year 2000. They found that 75% of space articles appeared in the business, commercial, national, or international sections rather than the science sections, and were written by correspondents of those sections. The national desk covered most of the space related stories, not the science and technology desk. According to these facts, Clark and Illman (2003) concluded, "journalistic practices may be lagging behind the pace of change in space affairs" because space coverage is scattered across topics and written by desks other than the science one (p. 31).

Houston (1999) believes that in general, current space coverage is evolving to include more science developments and to emphasize the significance of the science behind those events. However, Clark and Illman (2003) add, "if the space beat does evolve eventually along the

course that Houston envisaged, however, the question of how to adequately prepare the next generation of writers about space will need to be addressed” (p. 31).

Purpose of Science Communication

U.S. Department of Energy Director of Communications Rick E. Borchelt (2001) wrote a research roadmap for science communication along with a team of communication experts. Such studies as this one are useful, according to communication experts. Nelkin (1995), for example, believes that science-related organizations should collaborate with public relations and communication professionals to further media interest and media research.

Borchelt and his team analyzed this evolution and current state of science and technology communication. His team was established by the NASA Marshall Space Flight Center’s public affairs office to research issues in science communication. The team surveyed current science communication practices of other scientific research institutions to be used as a model for this NASA center and other similar organizations. They found three primary purposes for science communication in an extensive study of how NASA’s research is communicated.

According to the team, the first purpose for science communication is informing citizens on issues important to their quality of life or other issues or problems. Borchelt (2001) cites reporting information to the public on resources from the National Park Service as an example of this purpose. Another example given by Borchelt is information released by a medical institute, such as the National Institute of Health (NIH), on the results of a current medical study about which the public should be aware. A third example of this purpose of communication is information released by the Department of Agriculture on the safe use of pesticides.

The second purpose of science communication is to provide citizens with information to be able to formulate policy opinions. For example, according to the team, information from the Department of Energy about current energy resource needs or information from the Food and

Drug Administration about genetically modified foods would fall under this category. Borchelt (2001) notes that this type of communication can be persuasive, explanatory, or opinionated in its presentation.

The third purpose is to “provide descriptions and explanations of scientific work to enhance the level of scientific or biomedical literacy in the recipient” (Borchelt, 2001, p. 197). An example of this purpose is museum programs (Borchelt, 2001). Other examples given include the communication of agency visitor centers and the Web sites of medical and scientific agencies and societies. For this discussion, the “purpose” of the coverage will be defined as the “focus” to clarify any ambiguity.

Framing Theory

For an analysis of shuttle program coverage, this study employs a content analysis. One aspect of this analysis will look at the way the program is framed. Framing gained popularity in the 1970s and has since been used as a theoretical and research approach to understand media coverage, public debate, and public policy influences (Entman, 1993). Entman (1993) defines framing as selecting aspects from a certain reality and making them more “salient” in the culture. Crawley (2007) explains that this means they are more noticeable, understandable, or emotionally charged – in other words, they have more cultural resonance and thus also have the greatest likelihood to influence” in communicating text to promote a certain definition, treatment, or evaluation of that text (p. 324). Frames elevate the salience of an issue by highlighting certain information and by placement and repetition (Entman, 1993).

Framing is a theory that uses interdisciplinary content analysis. It analyzes how the elements of a story are worded, headlined, sourced, and structured in a specific way to highlight and influence the way individuals receive the information they read in the media (Entman, 1993; Miller & Reichert, 2001).

In framing analyses, many researchers have found word structure, placement, and absent words all influence reader perceptions. Word placement affects the processing of information and helps to define the ultimate themes and meanings of that text (Entman, 1993). The absence as well as the presence of specific words distinguishes specific frames (Entman, 1993; Tankard, 2001).

Many researchers have examined the important connection between framing and reader perceptions of framed media. Miller & Reichert (2001) define framing as an “ongoing process by which ideological interpretive mechanisms are derived from competing stakeholder positions . . . [in which the] frames are manifest in the choice and range of terms that provide the context in which issues are interpreted and discussed” (p. 109). They add that framing is a way of conceptualizing the processes involved in competing definitions (Miller & Reichert, 2001). According to Tankard (2001), headlines and selection of sources or affiliations, as well as other techniques such as figurative words and images, and symbols, wording, and concluding statements, all play a role in identifying the frames of stories. Miller & Reichert (2001) further establish that policy-makers tend to implement the viewpoint of the dominant frame presented in media and gain support for the view by shifting perspectives toward those dominant frames. Their “Spiral of Opportunity” position argues that “attempts to frame issues interact with fundamental human values in ways that affect the relative attractiveness of policy and policymakers” (Miller & Reichert, 2001, p. 108-9). They emphasize, “framing becomes more apparent when stakeholders compete for support” (p. 110). Tankard (2001) agrees that “the media can frame an issue in ways that favor a particular side without showing explicit bias” (p. 96). Both Entman (1993) and Christen & Huberty (2007) agree with these claims that policymakers use news reports to gauge public opinions to influence the development of policy.

A 2007 framing pilot study was conducted on the post-Columbia communication of *Florida Today* versus the *New York Times* to determine how the shuttle program was framed since Columbia (Shkolyar, 2007). In that study, the following frames were found. The “program policy” frame discussed the future of the shuttle program in terms of the changes that would be made to it, and what effects the Columbia failure and Congress’ decisions would have on it. The “funding and economic future” frame discussed Congress’ decisions on funding changes for the shuttle program and the overall economic future of the program. The “Return to flight” frame discussed the recommendations of the Columbia Accident Investigation Board for future shuttle flights, along with NASA shuttle management, budget, and safety changes so that the shuttle would fly again. The “internal organizational changes to the agency” frame included articles that addressed the post-Columbia recommendations of the CAIB to change the management structure of the shuttle program in an effort to return to flight more effectively. The “program industry” frame is defined by discussions of how the shuttle program impacted NASA center communities, Florida’s aerospace industry, or other NASA-related industries such as contractor companies that provide outsourced support to NASA. The “safety” frame refers to any article dealing with the safety of mission launches, landings, and rescheduled launches in terms of weather conditions, official decisions or documents, or other safety reasons and details or any articles expressing safety concerns, changes, or procedures. The “NASA in the public eye” frame refers to articles dealing with the public’s perceptions of NASA. It discussed the public’s reactions to the NASA shuttle program in general. The “technical and scientific frame” discussed any scientific or technical ideas such as tank problems of the 2005 Discovery launch (Shkolyar, 2007).

The pilot study analyzed a very small (N = 41) random sample of shuttle program newspapers articles in the post-Columbia time period. Nineteen articles were analyzed from the

New York Times and 22 were analyzed from *Florida Today*. In this study, the technical aspects frame was the most prominent frame, appearing in 33.3% (N = 6) of the sample *New York Times* articles, followed by the program policy frame, appearing in 16.7% (N = 7). The program policy frame, the most prominent in *Florida Today*, appeared in 27.3% (N = 6) of the sample articles, followed by the “NASA in the public eye” frame, appearing in 22.7% (N = 5). Miller & Reichert’s (2001) idea that stakeholders try to frame issues to affect the attractiveness of policy to policymakers seemed to be supported at least by that small sample since the policy frame was found relatively frequently in both papers (Table 1-1).

From the small sample size of that study, two main ideas were left unanswered. It was unclear if leadership and safety changes within NASA were being made in response to the CAIB’s recommendations and expressed by NASA to the media (Shkolyar, 2007). Also, the idea that progress for shuttle program improvements were being made and may have gained public support was unanswered (Shkolyar, 2007). Although a content analysis alone could not answer these questions, a supplementary survey given to shuttle employees or an analysis of official shuttle program reports might provide more insight on these areas.

Sourcing

Sourcing is another crucial aspect in a content analysis that employs framing techniques. In this discussion, sources refer to experts or official documents released by those experts who are cited as speaking in the articles, not the sources that produce the news, such as the organization under study.

Many have researched the effects of sourcing on influencing news frames. Gamson (1988) claims that sources, including industrial organizations, strategically cultivate resources to influence news frames. The “choice of actors presenting information,” those who are “privileged to speak” in a story, and those who “are mere spectators,” are all indicators of central conflicts of

that story (Hertog & McLeod, 2001, p. 148). Sources have “immense power” to influence newsworthiness (Sumpter & Garner, 2007, p. 457). Berkowitz and TerKeurst (1999) state that since sources determine what makes news, the degree of source influence on policy and society depends on the nature of the community under study.

Direct quotes by sources tend to have more influence on reader opinions, according to some researchers. Gibson and Zillman (1993) and (1998) reported that readers exposed to directly quoted opinions were more likely to agree with those opinions and give them more weight than indirect quotes. Therefore, studying direct versus indirect sources would provide useful information within a framing study.

The research on sourcing during the Columbia disaster by communication professors Sumpter and Garner (2007) highlighted many important aspects of NASA-related sourcing. They analyzed the content of the *Washington Post*, *Houston Chronicle*, and *New York Times* to study the sources used in Columbia reporting. They believe that news media tend to use more dependable sources, while eliminating undependable ones, and these dependable sources thus gain a great deal of credibility and power to determine newsworthiness. These sources are dependable because they tend to be “affiliated with businesses, bureaucracies, or other social groups that subsidize the preparation of news” (Sumpter & Garner, 2007, p. 457). Their study also found that contractors who were the main builders of the shuttle, astronauts, and other investigators not affiliated with NASA or the CAIB were the least frequently used sources. They concluded that this led to an “incomplete account, account, one which deletes needed context from any explanation of how the Columbia was lost” (Sumpter & Garner, 2007, p. 470).

Furthermore, Sumpter and Garner (2007) believe that the “Columbia disaster in 2003 as well as the subsequent investigation and troubles with the two shuttle missions afterwards raised

new questions about the media's ability to use a balanced menu of sources to fashion complete stories about complex scientific issues" (p. 456). Also, in terms of shuttle program coverage, do more sources appear to be business-related versus management or technical sources? The answer to these questions would have many implications for the way the program is perceived by its audiences.

Many other researchers have analyzed the significance of source influence in media framing studies of scientific news. One study by Crawley (2007) analyzed the frequency of sources cited in biotechnology news. She conducted a quantitative content analysis of agricultural biotechnology coverage appearing in a collection of local newspapers in Northern California and Missouri between 1992 and 2004. She found that the frequency of sources cited in the news articles did not necessarily determine their influence in how the story is framed because a more thorough investigation of the sources' direct and indirect quotes was necessary.

Other researchers have examined the influence of expert scientists as sources in science coverage. For instance, in an analysis of American elite press biotechnology news, Nisbet and Lewenstein (2002) claim that industrial and commercial interests or scientists dominate science news. Another study of all science news, including physical, biological, earth, and social science, between 1986 and 1987 in newspapers representing various Canadian regions showed that scientific (38%) and government sources (18.7%) were the most frequently cited primary sources (Einsiedel, 1992). From the study, Einsiedel (1992) concluded, "scientists as sources also suggests some amount of scientists' control over the media agenda" (p. 100). On the other hand, Sumpter and Garner (2007) found that news sources in reporting of NASA events tended to be spokespeople (such as public information officers) rather than scientists and engineers as

well as NASA and government officials. They claim that overall, “government- and NASA-affiliated sources told the Columbia story” (Sumpter & Garner, 2007).

Communication researchers have found that official and elite sources tend to dominate and influence news and frames and are favored more than other sources. Soloski (1989), who conducted a participant observational study of a daily local newspaper staff, concluded that elected or appointed government officials made up 56.3% of the primary sources in the articles. Also, Brown, et. al. (1987), who conducted a similar study that analyzed front-page stories of the *New York Times* and *Washington Post*, reported that government officials were cited most frequently. Similarly, Miller and Reichert (2001) claim that elite sources, such as government officials or scientists, influence policy because “decision makers set public policy to conform” to the frames that dominate debate (p. 113).

Local versus National Coverage of Science News

It would be useful to examine whether the local and national frames about post-Columbia shuttle coverage are different within a content analysis study that employs framing techniques. There are several reasons to believe that the two types of coverage for science news may frame stories differently.

Some research suggests that national news is perceived to be more reliable than local news. For example, Christen and Huberty (2007) conducted a survey study comparing the perceived reach, or “belief that numerous others are reading, viewing, hearing, or otherwise being exposed to similar news reports” of local and national news (p. 316). They asked participants to provide their personal, political, and public opinions about local and national news articles with both favorable and unfavorable news slants. They concluded that participants viewed local papers as less credible sources of news. According to the researchers, this was because participants

assumed that fewer people were being exposed to local articles and thus their perceived opinions of the article's reach were lower.

Also, in one study of French reporting, Neveu (2002) performed a study of local versus national coverage about a group of French farmers' protest about certain crop prices in the French press in 1998. He believes that regional news does not focus closely on the relationships between sources and journalists. Neveu states that local journalists are interdependent on each other so local press tend to report events similarly, more cautiously, concisely, and objectively. Furthermore, Neveu observed that the local press is more often a reflection of public opinion, using fewer statistics to back up scientific and medical claims than national news.

On the other hand, some media researchers, such as Crawley (2007) claim local news has a stronger effect on social discourse, is more credible, more varied in perspective, and is more thorough in journalistic investigations. Crawley (2007) compared local versus national coverage frames and sources in biotechnology news. She found that local news affects social discourse and social reality and "have more tolerance for error and a certain degree of openness that allows for consideration of a variety of news topics and a range of voices," whereas national coverage does not stimulate a "national conversation" (Crawley, 2007, p. 342). She also states that local media take more risks and offer a wider range of topic coverage and more opposing viewpoints and present news in a more diverse way. She also noted that local media tend to include more varied sources than national elite media. Furthermore, Crawley's media framing studies suggest that many researchers have concluded that national mainstream biotechnology news is framed in a "rather similar, uniform way, leading one to believe that perhaps U.S. public opinion also reflects this monolithic view" (Crawley, 2007, p. 340).

Similarly, analysis by Priest (2001) and Crawley (2007) suggests that local media outlets capture community issues that may not always make the national news agenda. For example, an agriculture story that does not receive attention from the elite national newspapers could be highly relevant for local newspapers in places where resident farmers object to the economic concerns that a particular crop would provide advantages to farms (Priest, 2001).

Neveu, Crawley, and Priest highlighted why local and national news in science issues should be studied. Particularly, local and national coverage of the shuttle program is important. The shuttle program's launch site, Kennedy Space Center in Brevard County, Florida, is made up of engineers, scientists, and managers of the shuttle program. Perhaps the shuttle program and its resulting media affects this community differently than it does national policymakers and congressmen who make decisions about the shuttle's budget and missions.

Current Study

This content analysis will investigate the similarities and differences in post-Columbia shuttle coverage in the local Space Coast newspaper, *Florida Today*, versus the national *New York Times* to determine whether whether Neveu's (2002) and Crawley's (2007) claims are true for shuttle coverage. Coverage will include news articles, features, columns and editorials so that the full range of content about the shuttle program can be analyzed.

The focus of the stories were analyzed to see how they related to Borchelt's (2001) previously discussed findings on the focus of science communication. Those were not specifically inclusive of all of the focus in an analysis of the media's communication of post-Columbia shuttle program. Still, the three focus that Borchelt (2001) offers encompass the many other focus of shuttle communication. For this study, his focus will be modified and referred to as the "focus" to fit this particular topic.

There is little literature on this topic describing the focus of shuttle program communication in the media. Therefore, in order to fully assess what focus is communicated in shuttle program coverage, the focus coded in this study were derived by the author after a pilot test coding session of 30 articles chosen at random from the sample used for this study. Those foci and their definitions follow.

The first focus, “to help readers understand and formulate shuttle program policy or funding opinions or explain the state of the shuttle program,” is defined as articles dealing with a budget, law, Congressional, or other official political or economic document, idea, or policy change or description necessary for the reader to understand the policies of the NASA shuttle program. This type of article could also explain the state of current management, funding, policy, scheduling, and project situations. The focus, “to report a mission status update,” is defined as dealing with articles that *strictly* provide information on launches, landings, accident updates, scheduling, and scrubbed launches as the *primary* focus of the article, although most stories will contain information about shuttle missions as a secondary focus. The focus, “to explain a technical or scientific idea related to the shuttle,” means the article reported about why a foam piece fell off of the shuttle, why a launch was scrubbed due to technical reasons, and other similar ideas dealing with scientific explanations and engineering of shuttle components, excluding those dealing with the Columbia disaster. The focus, “to explain the details or investigations of Columbia disaster” refers to articles describing results of the CAIB investigation, debris findings, shuttle disaster details, or any other information related to the Columbia or its aftermath.

In the pilot study, mission coverage articles were discarded (Shkolyar, 2007). However, the author felt that in this more thorough analysis articles with the focus of providing shuttle

mission coverage should be included. It would be useful to see how much of the coverage deals with funding and policy changes or implications of the shuttle program versus reporting just launch and landing events.

Along with studying the focus in this coverage, studying the frames would be valuable to contribute to such a content analysis of a science communication topic. This study determined which dominant frames are prevalent in this coverage based on those found in the previously discussed framing pilot study. For that study, however, the sample size was too small to make valid conclusions (Shkolyar, 2007). The current study used a larger sample size of articles about post-Columbia shuttle program than the pilot study did.

There were three other frames not found in the pilot study that were added to this study's code sheet. The "progress" frame refers to articles about the "celebration of new development" or a breakthrough in the article (Nisbet and Lewenstein, 2002, p. 372) or about optimistic statements about the future and achievements of the shuttle program or specific flights. Also, the "astronaut hero" frame was added because (Nelkin, 1995) and Boot (1986) found it to be prominent in their analyses of NASA coverage. Lastly, the "lessons from history" was added after the author performed a preliminary test coding run of 30 randomly picked articles in the sample used for this study. The "lessons from history" frame refers to articles making references to the Apollo, Columbia, or Challenger accidents, the moon landings, or other NASA historical events in an effort to explain how NASA has learned from or changed its policies and procedures since those past events, or comparing the current shuttle program to past NASA events.

The following source definitions were borrowed from Sumpter & Garner (2007) and slightly altered for this study. They are: News workers, including any media, production, and editing personnel; Educational sources, including University professors or public school

educators who are not affiliated with NASA; Government experts, including any elected or appointed government leaders, advisers, *excluding* NASA employees, but including law enforcement, emergency workers; CAIB members, including any representatives of the Columbia Accident Investigation Board; Other Government investigators, including nongovernmental accident investigators (current or retired); Citizens, including “ordinary” people.

The author added the following source definitions derived from the pilot study (Shkolyar, 2007). NASA Technical source refers to a shuttle specialist, scientist, engineer, researcher, or contractor affiliated with NASA. These exclude non-NASA technical sources and sources with managerial authority. NASA sources with managerial authority are considered “NASA Official Sources;” Non-NASA Technical source refers to a shuttle specialist, scientist, engineer, member of a NASA committee advisory board member, or researcher NOT affiliated with NASA. NASA Official source refers to a NASA administrator (current or past) for a NASA source with leadership and administrative authority. NASA Spokesperson: refers to a spokesperson of any NASA department or organization, whether technical or non-technical. Non-NASA Spokesperson: refers to a spokesperson of any Non-NASA department or organization, whether technical or non-technical. Anonymous sources are those whose credentials are not given in the article. For instance, these can be listed only as “NASA employee Bob Doe.” Furthermore, in this study, the frequency of direct versus indirect sources cited in post-Columbia shuttle program coverage will be examined (Codebook in Appendix D).

It is useful to see whether the official sources indeed dominated the coverage, as Soloski (1989) and Brown, et. al. (1987) claim and whether such government officials versus NASA are associated with certain frames, such as the policy frame. This could be useful because such

sources may have the power to influence frames and thus readers’ perceptions of the shuttle program’s policy or funding matters.

Research Questions

Through a content analysis that will study the framing, sourcing, and focus, this study aims to develop an understanding of the focus and frames used in shuttle program coverage. It also aims to explore the sources used in shuttle program coverage and to investigate their frequency and range and to determine the degree of their diversity and dominance. Thus, the following research questions will be examined:

- **RQ1:** Does the coverage of the shuttle program differ between *Florida Today* and *New York Times* in terms of focus?
- **RQ2:** Does the coverage of the shuttle program differ between *Florida Today* and *New York Times* in terms of frames?
- **RQ3:** Does the frequency and type of source cited differ in *Florida Today* and *New York Times* shuttle program coverage?
- **RQ4:** Are any of the sources more frequently associated with a certain focus in *Florida Today* shuttle program coverage versus the *New York Times* coverage?
- **RQ5:** Are any of the frames more frequently associated with a certain focus in *Florida Today* shuttle program coverage versus the *New York Times* coverage?
- **RQ6:** Are any of the sources more frequently associated with certain frames in *Florida Today* shuttle program coverage versus the *New York Times* coverage?

Table 1-1. Comparison of the pilot study Florida Today and New York Times frames

	FT	(%)	NYT	(%)
Technical/scientific aspects	5	(22.7)	6	(33.3)
Program policy	6	(27.3)	3	(16.7)
Internal changes	0	(0.0)	3	(16.7)
Return to flight	2	(9.1)	3	(16.7)
Program industry	0	(0.0)	2	(11.1)
NASA in the public eye	5	(22.7)	1	(5.6)
Funding/economic future	4	(18.2)	0	(0.0)
Total	22	(100.0)	18	(100.0)

CHAPTER 3 METHODOLOGY

This study will use a quantitative content analysis. Content analysis was the chosen method because it facilitates the “objective, systematic, and quantitative description of the manifest content of communication” (Berelson, 1952, p. 18), and the primary goal of this study is to provide a comprehensive and objective analysis of newspaper coverage of the shuttle program. This can be accomplished in a number of ways as long as the analysis is valid and replicable (Krippendorff, 1980).

Although this study will use framing techniques, it should be noted that “framing” and “framing theory” mean different ideas here. In some studies, framing refers to a method for analyzing texts. In others, it refers to an ideology upon which to base a study (Hertog & McLeod, 2001). However, framing has not “settled on a core theory or even a basic set of propositions, nor has a widely accepted methodological approach emerged” (Hertog & McLeod, 2001, p. 139). Hertog & McLeod go on to outline their own approach to framing as a method to study social meanings. This study will also use their framing technique as a research tool in this content analysis study.

The content of science news is a topic that needs more up-to-date study. According to Clark and Illman (2003), “the full extent of public investment” in certain space-related activities is not yet adequately reflected in space affairs coverage. This study will contribute to the research of space coverage by highlighting the issues in NASA’s shuttle program coverage. Although many studies have examined the crisis communication of NASA’s two rare shuttle accidents (for example, Kauffman, 2005; Sumpter & Garner, 2007), little research had been done on NASA’s media coverage of a program that has launched 122 other launches successfully as of November 2008.

Newspaper Articles Chosen

Newspapers were chosen as the medium for this study for four reasons. First, Blum & Knudson (1997) state that newspapers are the most frequently relied upon source of science knowledge for the public. Also, Rensberger (1997) claims they are “the front lines of science communication” in which stories appear first before they are seen in other forms of media. Second, newspapers were selected as the medium for this analysis because they provide one of the most efficient ways to study a mass medium (Crawley, 2007). Third, Crawley (2007) states that they are also readily available and generally provide consistent data, as they are often archived and indexed in computer databases. The two newspapers chosen for this study, the Orlando newspaper *Florida Today* and the *New York Times*, are available in such databases. Last, according to *Florida Today* assistant Metro editor Dave Berman, the majority of online and print content for that newspaper is the same (personal communication, September, 2008).

Newspaper articles were chosen as the units of analysis over other forms of mass communication for additional reasons. Crawley (2007) states they are better to analyze because, although the Internet is gaining more dominance in science news dissemination, its “text continually changes and its archived matter is more incomplete than that of newspapers” and broadcast news is similarly “short-lived and difficult to explore systematically” (p. 323). Therefore, the author felt that using archived print newspaper articles was the optimal way to retrieve the sample for this study.

The local newspaper, *Florida Today*, was chosen because it is distributed throughout the city of Melbourne and Brevard County, Florida, which is the Space Coast region of NASA’s Kennedy Space Center. In fact, 90% of the 14,950 engineers, supervisors, contractors, control specialists, and other technical and management professionals employed at KSC are responsible for preparing, maintaining, and launching shuttles at the KSC launch site (the only NASA launch

site in the U.S.) live in Brevard County, Florida (National Aeronautics and Space Administration, 2004; National Aeronautics and Space Administration, 2007a). They make up a large portion of the readers of *Florida Today*. According to its Web site, *Florida Today* “[maintains] a presence throughout the Space Coast” (Florida, 2007, par. 1).

The daily circulation of the newspaper is 86,349 and Sunday circulation is 110,171 in Brevard County and the adjacent Indian River County (Florida, 2007). The newspaper has two journalists who specifically cover space issues and are stationed at the Kennedy Space Center, plus another reporter dedicated to space business news, and two additional editors overseeing this coverage, according to *Florida Today* assistant Metro editor Dave Berman (personal communication, September, 2008).

Another newspaper from a local community impacted by a NASA center’s shuttle operations could have been chosen, such as the *Huntsville Times* in Huntsville, Alabama, home of the Marshall Space Flight Center, or the *Houston Chronicle* in Houston, Texas, home to the Johnson Space Center. Brevard County’s Space Coast and its official newspaper were chosen for one main reason: the Kennedy Space Center has been NASA’s launch operations center for more than 45 years (National Aeronautics and Space Administration, 2007a). This makes the center’s impact on the shuttle program and the local stakeholders of that program very clear.

Time Frame

The coverage time frame was from February 1, 2003, the date of the Columbia disaster, until the present date when sample collection began, April 23, 2008. This was chosen to see what the shuttle coverage was like after this milestone for the program and what dominant frame prevailed. As Clark and Illman (2003) stated previously, the Columbia disaster 2003 brought issues of space coverage into clearer focus. Of interest is what percentage of shuttle program news coverage after the disaster dealt with issues about the program itself and funding,

management, safety, and policy changes made to it, versus what percent simply reported facts about shuttle missions, launches, and landings.

Search Criteria

The keyword search words were “NASA” and “shuttle program” for all document text in both newspapers from February 1, 2003, to April 23, 2008, the date when the sample collection began. The *New York Times* articles were located with the ProQuest National Newspapers search engine’s “*New York Times* (1857-Current file)” option. This search yielded 171 articles. The *Florida Today* articles were located by using the NewsBank America’s Newspapers online search engine courtesy of the University of North Florida Library. This search yielded 798 articles. It should be noted that these two databases produced only staff-generated coverage, due to copyright restrictions on wire stories.

The articles used included news, editorials, opinion pieces, and features. This represented an in-depth range of coverage on the shuttle program, not only by gatekeepers and news reporters, but also by columnists and guest writers who represent different voices of public opinion. Editorials were included in the search results because the author wanted to retrieve the full spectrum of stories relating to the shuttle program, even those that were written by guest columnists or other potentially subjective contributors. *New York Times* Book Review or *New York Times* Magazine articles were excluded from these results because only news articles were the unit of analysis of interest. Articles less than 250 words were excluded from the sample because the researcher felt these articles lacked thorough explanation and content. Also, duplicates, and unrelated articles were eliminated from both newspaper sets. Unrelated articles were discarded based on headline relevance and the frequency of the keywords “NASA” and “shuttle program” in the article text. If “shuttle program” was mentioned in the text but the article was not related to the program, the articles were discarded. Letters to the editor were also

excluded because reporters and editors do not write them and the opinions of those letters do not reflect those of the newspapers. This left 142 *New York Times* articles and 236 *Florida Today* articles, all of which were coded.

Pilot Study

As a prelude to the current study, a pilot was conducted analyzing frames and sources found in post-Columbia coverage. The pilot study analyzed the same search criteria but with a smaller sample size. The time frame was from February, 1, 2003, until the time that study ended, November 12, 2007 (Shkolyar, 2007). The articles were located by using the *New York Times* ProQuest academic online database and the Google News online search engine for the *Florida Today* articles. The Google News engine was used because at the time, the author did not have access to another database with a full selection of *Florida Today* articles and the newspaper's Web site did not have articles from past years archived. In that study, from the 72 *New York Times* articles and 60 *Florida Today* articles that matched the search criteria, duplicates, articles about individual launches, opinion features, and articles less than 400 words (to provide a complete enough story to adequately assess the frame) were excluded. This method resulted in 22 *Florida Today* articles and 38 *New York Times* articles. Thus, the earliest *New York Times* article and every other one thereafter was selected by systematic random sampling, so that a similar number of samples for each paper could be compared. Nineteen *New York Times* articles and 22 *Florida Today* articles were coded (Shkolyar, 2007).

The pilot study looked at the frames prevalent in shuttle coverage (Shkolyar, 2007). This study revealed the following frames, discussed in detail in the section "Framing Theory": program policy, NASA in the public eye, technical and scientific, funding/budget, return to flight, internal changes, and the industry frame (Shkolyar, 2007). Although the sample size of the pilot study was rather small, it still provided enough information to determine most of the frames

used in this shuttle program coverage study. That study, unlike this one, did not look at launch and landing articles, however, but that category has now been added to the code sheet and codebook. This was done to provide a more thorough sample to determine what the focuses of the articles were. The “progress,” “Astronaut hero,” and “lessons in history” frames, not found in the pilot study, were added to this analysis. The section, “Current Study” and the codebook in Appendix D provides details on those three frames. Also, some additional source categories not found in Sumpter & Garner (2007) were borrowed from the pilot study (“Current Study” section).

Coding and Data Collection Process

This study used quantitative methods to study the frames, focus, and sources used in post-Columbia shuttle program coverage. One dominant frame and focus were coded for each unit of analysis in this study, the individual newspaper article. If the story had more than one frame or focus, only the most dominant one was chosen. For each article, each source was also tallied separately for being cited directly, indirectly, and both ways in the same article.

This content analysis employed a standard coding sheet as a guide, but information was directly entered into a Microsoft Excel spreadsheet that replicated the categories on the coding sheet. Entering information directly into a database facilitated the quantitative analysis and also reduced the potential for error and increased efficiency by eliminating the need for extensive data entry after the coding process. All categories were designed to concisely answer the research questions. Each Excel cell data field (one separate cell for each frame, focus, direct source, and indirect source) was totaled and the percentage for how frequently each data field appeared in both newspapers was calculated on Excel.

The dominant frames were determined by analyzing key words, frequently appearing words, loaded words or phrases, themes, figures of speech, headlines, and sources to determine a

dominant frame. The overall “master narrative” (Hertog & Mcleod, 2001, p. 150), headlines, leads, concluding statements, and symbolic language of the text were qualitatively analyzed for dominant frames. The presence of key words and phrases were also noted and contributed to the overall frames. Illustrations or graphs of any kind, although helpful in framing studies, were not used in this study because they were not available in the archived articles. Although articles can have more than one frame, only the dominant one in each article was studied. After coding, dominant frames were quantitatively analyzed in terms of percentages of most frequently appearing frames.

Sources were also studied. Sources were counted and quantitatively analyzed in terms of percentages. Source affiliation categories in the code sheet were adapted and modified from the previously discussed study on Columbia story source selection by Sumpter and Garner (2007). They included the following previously defined categories: news workers, educational experts, government experts, CAIB members, other government investigators, NASA official sources, astronauts or their relatives, citizens, and “anonymous” categories. Others were added by the author. The codebook includes full definitions of sources. The frequency of times each source spoke was coded in this study to analyze the influences of sources. In terms of sourcing, this study will examine local versus national post-Columbia shuttle coverage to analyze the previously discussed trends that Einsiedel (1992), Crawley (2007), and Sumpter & Garner (2007) found.

Direct and indirect sources were counted. If a source was not directly quoted but his or her opinion was paraphrased, this was counted as an indirect quote. If sources were listed as anonymous, they were coded as such, even though their affiliation, if known, may have contributed to the results differently. If a source was quoted directly or indirectly more than

once, that source was tallied only once. If sources spoke both directly and indirectly in the same article, they were coded in the “both” category.

Before coding the articles, the author held a preliminary test run coding session of 30 articles chosen at random using a random number generator from the sample used for this study. From this session, the exact focus used in the code sheet and codebook were derived and thoroughly defined. Also from this test run, an extra frame, “lessons from history,” was found and added to the code sheet and codebook.

Articles were quantitatively coded for four descriptive categories (article number, date, newspaper, word count) and three content analysis categories (focus, frame, and source reference, which were separated by direct, indirect, and both citations, frames, and focus). Appendix C includes code sheet and Appendix D includes the codebook.

The focus of each story was qualitatively determined by the researcher and adapted from the definitions previously discussed by Borchelt (2001) in the section “Focus of Science Communication.” The focus was also chosen based on headlines and key words and phrases, such as concluding statements, just as the frames were chosen.

The categorical data for this content analysis was entered electronically into a Microsoft Excel spreadsheet. This Excel file was given to the co-coder and explained during the training session. The codebook in Appendix D provides specific data entry details. Keywords and phrases used to determine frames and focus for each article coded were noted in the appropriate cells of the Excel spreadsheet to aid in the process of citing examples in the Results section.

Reliability and Validity

Reliability applies to the “consistency of observation” of data (Lindlof and Taylor, 2002, p. 238). In this study, reliability applies to the same results being generated each time the coding sheet is applied to the same article. Intercoder reliability was established in this study by having

another mass communications graduate student code 10% of the articles. The co-coder completed course work in mass communication and had a good understanding of quantitative research methods, coding, and framing. Before coding, the co-coder was familiarized with the code sheet, codebook, and Microsoft Excel spreadsheet used to tabulate the data prior to coding. The sample of 10% of the articles was selected from a random number generator. Both coders analyzed the 10% sample independently, and after coding, they compared results. The coders agreed on the dominant frames and focus.

The Software PRAM (Program for Reliability Assessment with Multiple Coders) developed by Skymeg Software was used to analyze the Microsoft Excel file and to determine Holsti's Coefficient of Reliability as well as the percentage of agreement between the two coder common samples. Holsti's Coefficient of Reliability was 88.4% and the percentage of agreement was 91.9%. This is an acceptable result. While there is no standard for determining an acceptable level of agreement in intercoder reliability, a reliability of greater than 85% is considered satisfactory (Kassarjian, 1977). It is also important to note the inter-coder reliability check for categories judged to have the highest and lowest percentage of agreement. The directly quoted sourcing categories overall had the highest intercoder reliability. The Holsti's Coefficient of Reliability was 100% for news workers; 87.8% for educational sources; 81.8% for government sources; 87.2% for CAIB members, other government investigator sources, and non-NASA spokespeople; 85.7% for NASA official sources; 87.5% for astronauts or their relatives; 87.2% for NASA technical sources as well as anonymous sources; 88.1% for NASA spokespeople; and 87.2% for citizen sources. Conversely, the focus categories were found to have the lowest intercoder reliability. The Holsti's Coefficient of Reliability was 88.9% for the

policy and funding focus, 89.1% for mission focus articles as well as Columbia details focus articles, and 87.5% for technical and scientific focus articles as well as the “other” focus articles.

CHAPTER 4 RESULTS

Using the newspapers specified and the terms defined in Chapter 3, a total of 378 articles were examined: 236 from *Florida Today* (FT) and 142 from the *New York Times* (NYT). These articles were examined for quotes by sources, and frequently occurring keywords, headlines, leads, concluding statements, and phrases to determine frames and focus.

The bulk of the sample shuttle program coverage occurred in 2003. Coverage spiked during that year due to the Columbia disaster. In February 2003 alone, there were 58 articles, which made up 15.3% of the entire sample (Table 4-1). Although there were nine shuttle launches between the first “Return to Flight” launch in 2005 and the present, November 2008, coverage dropped in 2004, steadily rose in 2005, and then dropped again in 2008 (Appendix B for shuttle launch dates).

The *New York Times* coverage was longer than the *Florida Today* coverage. Most of the *New York Times* articles averaged between approximately 600 and 900 words, while most *Florida Today* stories averaged between approximately 400 to 500 words in length.

RQ1: Does The Coverage of the Shuttle Program Differ Between *Florida Today* and *New York Times* in Terms of Focus?

A total of five foci were coded for: Columbia details focus, policy and funding focus, mission status focus, technical and scientific focus, and “other” (Table 4-2).

Columbia Details Focus

The focus found most often in the coverage (31.5%, N = 119) involved providing details and information about the investigations of the Columbia disaster. A higher percentage of articles fitting this focus appeared in the *Florida Today* coverage (55.5%, N = 66) versus *New York Times* coverage (44.5%, N = 53) (Table 4-2).

These articles were written primarily to inform readers about the problems before, failures during, and investigations and changes after the Columbia disaster. This focus included articles about budget changes as a result of the Columbia accident, recommendation and disaster details¹ of the Columbia Accident Investigation Board (CAIB), Columbia debris findings, and Columbia shuttle or safety changes² as a result of the accident. The articles fitting this purpose were strictly about the Columbia event and its aftermath.

An example of a post-Columbia budget change addressed how “some lawmakers will use the Columbia accident as justification to boost NASA’s long-stagnant budget.” This article discussed several Congressmen’s opinions on increasing the budget for the remaining three shuttles after the \$2 billion Columbia shuttle was gone (Wheeler, 2003, August 27).

One example of an article discussing Columbia debris findings came from the *New York Times* sample. This article discussed the search near Fort Worth and Central Texas for “a ‘significant’ section of one of the space shuttle’s wings, including the hardened leading-edge material and heat resistant tiles that are among the leading suspects in the accident that killed the crew of the Columbia” (Broder, J. M., 2003, Feb. 8). The article also discussed how investigators were piecing together clues about the causes of the accident from the debris findings and from satellite photographs of the shuttle taken before its explosion. It stated that uncertainty remained about the exact causes at that time, less than a week after the accident.

¹ The CAIB, composed of 13 Air Force, safety, NASA, Federal Aviation Federation, space policy, and other experts, made over 30 recommendations for NASA’s return to flight effort after six months of conducting thorough post-Columbia safety, management, organizational, and procedural investigations. Causes of the accident, according to them, included physical ones, such as a breach in the thermal protection system that was initiated by a piece of foam hitting the fuel tank, and organizational causes, such as failure to assess anomalies and accepting risks without support (“Excerpts,” 2003, Aug. 27).

² The CAIB’s recommendations for changes included obtaining satellite images of shuttles to monitor the debris hitting them, submitting annual reports to Congress, maintaining consistent flight schedules, improving launch pad maintenance, and reorganizing the Space Shuttle Integration Office, among other technical, organizational, and procedural changes.

One account of the Columbia disaster in the *New York Times* described how technical warnings were communicated by several engineers and officials on duty the day of the disaster. An email to officials on the morning of the disaster from NASA engineer Robert H. Doherty warned them about the pressure and heating issues that might occur if a tire failure was not addressed that February morning on Columbia during its reentry:

Mr. Daugherty then discussed the problems that would remain “even if you could survive the heating,” [of the shuttle during reentry] which included the detonation of explosive door bolts, loss of hydraulic fluids, landing gear that would not deploy, and severe tire damage. (Schwartz and Broder, 2003, Feb. 13)

One *Florida Today* article describing post-Columbia safety changes discussed by the CAIB read:

NASA is making slow progress in implementing a key safety recommendation made last year by the Columbia Accident Investigation Board, an advisory panel concluded Thursday.

The Columbia board directed NASA to create a special department to take over responsibility setting and enforcing safety standards for the remaining space shuttles. (Wheeler, 2004, April 9)

Policy and Funding Focus

The next focus found most frequently, policy and funding, appeared in 28.8% (N = 109) of the total coverage. This was found more frequently in *Florida Today* coverage (69.7%, N = 76) (Table 4-2).

Articles with this focus were written to help readers understand and formulate policy or funding opinions about the shuttle program, excluding the Columbia disaster. These articles dealt with some financial or political aspect necessary for the reader to understand the functions and procedures of the NASA shuttle program.

Many of them discussed the funding and policy issues surrounding the retirement of the shuttle program. One example of a financial aspect from *Florida Today* explained the necessity

to approve future budgets for the program and the possible dire outcomes of not getting the funding. It began,

Several lawmakers have warned President Bush in a letter that if NASA doesn't get the budget it seeks for 2007 to 2010, it would have to retire shuttle Atlantis immediately, cutting jobs and gutting the vision for space exploration. (Kridler, 2005, Dec. 16)

The article went on to discuss various representatives' and space policy analysts' controversies surrounding the proposal. One was that the "OMB [Office of Management and Budget] lacks knowledge of the ramifications when they make a proposal like this,' [KSC area Rep. Tom] Feeney said" (Kridler, 2005, Dec. 16). Another was that if the shuttle was retired, international partnerships and projects such as the International Space Station would be ruined because the shuttles are the main transport systems to the Station.

Another example from the *New York Times* echoed this idea of job cuts during the shuttle retirement due to lack of funding and advocated an increased budget for NASA:

Last week [referring to early December 2005], Representative Tom DeLay of Texas sent a letter cosigned by 29 fellow Republicans and 6 Democrats to the White House Office of Management and Budget asking for full NASA financing.

Mr. DeLay, the former House majority leader, whose district includes the Johnson Space Center, suggested that NASA might have to retire one of its three shuttles early and lay off workers if more money was not found for the program. (Leary, 2005, Dec. 16)

One example of this focus highlighting President Bush's policies for the NASA's future, what he called the "vision for space exploration," was discussed in a *New York Times* article.

The article began:

Back to the moon? Push on to Mars? Visit an asteroid?

At Stanford University on Tuesday, 50 space experts and advocates from the National and Aeronautics Space Administration, industry, academia, and advocacy groups are gathering to ask whether the United States is on the right track in its plans to reach the Moon by 2020, build a long-term lunar base there, and eventually send humans to Mars.

Lois Friedman, a founder of the Planetary Society, a space exploration advocacy group, said,...“there are new political forces coming in that are not wedded to the vision for space exploration” put forth in 2004 by President Bush. (Schwartz and Leary, 2008, Feb. 12)

This article expanded on differing opinions about this vision from others, including director of the Space Policy Institute at George Washington University, John Logsdon, and NASA administrator, Michael Griffin. Both of them were in favor of Bush’s plan.

Mission Status Focus

The mission status focus was the next most common found in the articles. These articles were found almost as frequently as funding and policy focus articles. They appeared in 25.6% (N = 109) of the total sample, more frequently in *Florida Today* coverage (73.2%, N = 71) (Table 4-2).

These articles primarily provided information on specific shuttle launch schedules, launch updates, scrubbed launches, and landings. Although many stories mentioned information about certain shuttle missions as secondary focus. Articles in this focus category were predominantly about specific missions. This category excludes articles about the Columbia mission.

One *Florida Today* article giving an update on the 2005 Discovery mission and launch schedule began:

Breakaway ice and foam insulation from an external fuel tank still could cause lethal damage, but NASA shuttle program managers deem the risk acceptable and intend to launch Discovery in mid-July, officials say. (Halvorson, 2005, June 25)

The article went on to address the daylong debris analysis and the “wide range of possibilities... for almost any given scenario” of problems that exist before a launch, according to two shuttle program heads, Bill Parsons and John Muratore (Halvorson, 2005, June 25).

Another *Florida Today* article gave a status update on the February 2008 Atlantis mission. It began:

Shuttle Atlantis and its astronauts are scheduled to pull into the International Space Station today with a special delivery: the \$1.3 billion European Columbus science laboratory. (Halvorson, 2008, Feb. 9)

This article expanded on the mission to the Station, debris dangers it faced during its flight there, and its planned return, scheduled for Feb. 18, 2005. Many other articles in this focus category discussed details about mission landings and scrubbed missions, such as the 2005 Discovery Return to Flight mission in July that was postponed due to sensor malfunctions.

Technical and Scientific Focus

Articles explaining a technical or scientific idea about the shuttle appeared only in the *New York Times* sample (4.2%, N = 16). Such articles provided scientific explanations about some aspect of a shuttle component, malfunction, or this effect on flight phenomena. These articles also excluded technical details about Columbia. Those were considered part of the “Columbia details” focus.

One article from the *New York Times* discussed how impact analysis of the 2005 Discovery mission determined that “the shuttle’s skin is turning out to be more fragile than NASA engineers thought” (Schwartz, 2005, Jan. 20). This article went into detail about reentry heating, the damage this causes, and how engineers do not fully understand the impact of these phenomena on shuttles. Another *New York Times* article discussed the tail rudder problems many shuttles have experienced, procedures for their replacements and safety evaluations, and their effects on the shuttle while in flight and during reentry (Leary, 2004, Mar. 23).

Many articles in this focus category discussed the debris hitting shuttles during launches and landings. For example, one discussed the difficult hunt for external fuel tank debris damage on the Discovery during its 2005 mission. The article detailed how cameras on the launch pad and planes monitoring the shuttle’s ascent tracked the debris hitting it during its flight (Schwartz, 2005, Jul. 27).

“Other” Focus

The remaining sample (8.7%, N = 33) dealt with articles that could not be classified into any other focus category. Such articles discussed various topics including Space Coast shuttle art contests as NASA 50th anniversary fundraisers (Balancia, 2008, April 1), the Hall of Fame induction of astronauts, and articles highlighting management changes, such as the appointments and removals of personnel not as a result of Columbia.

RQ2: Does the Coverage of the Shuttle Program Differ Between *Florida Today* and *New York Times* in Terms of Frames?

Although it could have been argued that some articles had multiple frames, each had one key phrase, keyword, lead, or concluding statement that pushed it into one dominant frame. The next discussion provides a summary of frame statistics and descriptions for these frames: safety frame, technical and scientific³, industry, return to flight, funding and budget, policy, internal changes, lessons from history, astronaut hero, progress, NASA in the public eye, and some notable frames found in the “other” category that were not specified on the coding sheet (Table 4-3).

Safety Frame

Overall, the safety frame was found the most frequently (21.9%, N = 83). This frame was found predominantly in *Florida Today* coverage (72.3%, N = 60). Safety frame articles dealt with topics that primarily emphasized the safety issues and concerns behind a variety of shuttle program topics. These topics included launch conditions for missions, decisions on shuttle policy, and Columbia disaster investigations, among other topics.

³ It should be noted that technically and scientifically framed articles should not be confused with those that had a technical and scientific focus. Articles with that focus were primarily written to explain phenomenon, malfunctions, or procedures related to the shuttles. On the other hand, technically framed articles could have had *any* of the previously discussed purposes. They were about topics such as mission updates, scrubbed launches, details about the Columbia disaster, and policy decisions that were framed technically.

Safety frame articles were full of keywords such as “risk,” “hazard,” and discussions about NASA’s “safety culture.” These articles were also characterized by discussions on the CAIB’s safety investigations, mission launch details explaining the safety of launches, and the safety of the program. CAIB experts were frequently cited in these articles.

These articles framed safety issues in a variety of ways. Some discussed better-understood safety procedures that were implemented during launches after the Columbia (for example, Halvorson, 2007, October 12) while others criticized the safety of the shuttle program, claiming that few shuttle safety experts have advanced degrees in safety engineering or safety management (Wendt, 2003, March 19).

One *Florida Today* article discussed the planned launch of Atlantis on September 6, 2006, and the safety of the weather conditions for that mission. Wayne Hale, the shuttle program manager, said:

“[I]t does not make sense to fool with Mother Nature. You want to do what is safe. And when the forecast persisted in bringing the storm to the Kennedy Space Center area, we decided it would be most prudent to go back to the barn and wait it out there.” (Halvorson, 2006, Aug. 30)

An editorial framed this way from the *New York Times* was written by a NASA guest columnist who was a safety consultant encouraging NASA, Congress, and the White House to “work together, first to allocate more money, then to use it wisely” to make shuttles safer. He said:

I testified before Congress about the safety of the space shuttle program. My remarks contained both praise and concern, and I closed with a warning: No danger was imminent but the risk for future missions would almost certainly increase if NASA was unable to pursue its long-term safety strategy. (Blomberg, 2003, Feb. 7)

One *Florida Today* article that was previously discussed in the Columbia details focus fit the safety frame. It criticized the progress of NASA as being too slow in making safety changes according to the CAIB’s recommendations:

NASA is making slow progress in implementing a key safety recommendation made last year by the Columbia Accident Investigation Board, an advisory panel concluded Thursday.

The Columbia board directed NASA to create a special department to take over responsibility setting and enforcing safety standards for the remaining space shuttles. (Wheeler, 2004, April 9)

The article also criticized the safety panel as not being as “intimately involved in tracking and scrutinizing personnel, hardware and organizational problems at NASA” as in the past (Wheeler, 2004, April 9).

Technical and Scientific Frame

The second most frequently found frame was the technical and scientific frame (18.5%, N = 70). It appeared more frequently in the *New York Times* coverage (65.7%, N = 46).

Technically framed articles were full of keywords such as “fuel tank,” “heat,” “wing,” “sensors,” and “airflow,” all referring to parts, descriptions, or processes of the shuttle. These articles were also characterized by the inclusion of mathematical, statistical, and scientific details. Many technical experts were cited in these articles, including mostly university professors who consulted for NASA or other researchers.

For example, some articles in this frame discussed mission details. One discussed details of the sensor repairs that were causing scrubs of a 2005 Atlantis mission (Peterson, 2008, Jan. 23). Another *Florida Today* article explained the science behind an Atlantis mission’s payload:

The payload goes aboard Monday. On its flight to the International Space Station, Atlantis will carry a 17.5-ton truss, with a solar wing that can generate 14 kilowatts of electricity. (Peterson, 2007, Mar. 2)

One *New York Times* article framed this way cited a physicist and CAIB member, G. Scott Hubbard, as its main source. This article described a CAIB hearing where Hubbard discussed foam hitting the Columbia during its flight that could have caused the accident (Schwartz, 2003, Jul. 8).

Another *New York Times* technically framed article explained the policies about space debris which were being discussed by an international panel:

On Monday in Vienna, a panel of scientists from space agencies around the world will submit to the United Nations Office for Outer Space Affairs recommendations for designing and flying space vehicles to reduce the amount of debris they produce and cut their chances of colliding with one another.

The article went on to describe the technical details behind the damage that space debris can cause to spacecraft:

Even a one-centimeter pellet, the width of a fingertip, can destroy a spacecraft at a typical orbital speed of 20,000 miles per hour or more, experts say. (Revkin, 2003, Feb. 18)

One *New York Times* article discussed the “higher than normal heating on one side, and similar abnormal drag on one wing” which many shuttles experience upon flight reentry. It also discussed examples of flights that experienced this “very complex problem of fluid dynamics affecting any vehicle entering the atmosphere at several times the speed of sound” (Cushman, 2003, Feb. 6).

Industry Frame

The industry frame appeared in 12.2% (N = 46) of the entire sample. However, 95.7% (N = 44) of the articles with that frame were from *Florida Today*. Industry frame articles discussed how the shuttle program impacted NASA center communities, Florida’s aerospace industry, or other NASA-related industries such as contractor companies that provide outsourced support to NASA. Industry frame articles were characterized mainly by discussions of the retiring shuttle program in 2011 and its effect on NASA jobs and local industry, other countries’ space programs in comparison to that of the U.S, and Florida’s competition in the aeronautics industry. Many KSC area Representatives and NASA technical employees were cited in these articles.

For example, one very recent *Florida Today* article from April 2, 2008 discussed how job cuts might affect the Kennedy Space Center community:

NASA announced Tuesday that Kennedy Space Center could lose more than one-third of its work force as the shuttle program winds down. Economic analyses indicate that at least as many KSC-dependent non-space jobs – up to 6,400 – could also be lost in the communities around the space center. (Peterson, 2008, Apr. 2)

One article discussed the state’s aerospace industry:

Gov. Jeb Bush Tuesday signed into law a series of five economic development measures, including one to bolster the state’s aerospace industry. (Flemming, 2006, May 31)

Another *New York Times* article discussed an investigation about Columbia shuttle parts manufactured by two NASA contractor companies, Boeing and Lockheed Martin. It discussed how these “private companies that build and repair the nation’s space shuttle fleet and operate the shuttle program in tandem with NASA” participated in a Columbia disaster investigation about the causes of that accident which may have a significant effect on the future operation of these companies (Wong and Wayne, 2003, Feb. 3).

Return to Flight Frame

This frame appeared in 8.5% (N = 32) of the total coverage, mostly in *Florida Today* (71.9%, N = 23). It concentrated on the return to flight efforts of the shuttle program. This was during the time period right after the Columbia shuttle tragedy occurred and for the two years afterwards when all remaining scheduled shuttle launches were cancelled for safety investigations and inspections. The next shuttle was launched in 2005. This frame captured the excitement, skepticism, and caution about NASA’s efforts to return the shuttle to the sky over the two years when it was grounded.

Articles in this frame were characterized by uncertainties about the CAIB’s safety and Columbia accident investigations, optimistic statements about the shuttle’s readiness to go back to space after two years of preparations, nationalistic statements about the shuttle program, and

statements made by astronauts on the importance and necessity of space flight. Many astronauts, CAIB investigators, and NASA officials were cited in these articles.

For example, a *Florida Today* article framed this way discussed NASA's plans to launch Discovery two years after Columbia happened. Discovery's commander, Eileen Collins, said in the concluding statement of the article, "It's time for us to go fly" even though repairs and safety modifications still needed to be made to the shuttle (Halvorson and Kelly, 2005, Feb. 1). One skeptical *New York Times* article framed this way discussed NASA officials' plans to launch in late 2004 or early 2005 and the safety and administrative issues needing to be resolved for the return to flight to occur (Leary, 2004, Feb. 20).

Frequently found key words and phrases in this frame included avoiding "launch fever" after the Columbia accident in the Return to Flight time period and practicing "caution" during the subsequent flights. One article with these key phrases discussed the position of Wayne Hale, the shuttle program manager, on flying the shuttle safely:

With so much at stake, NASA must proceed with extreme caution and avoid catching 'launch fever.' ("NASA's", 2006, Mar. 2)

Funding/Budget Frame

This frame appeared in 5.3% (N = 20) of the entire sample but it dominated in *Florida Today* (95.0%, N = 19). This frame was characterized by the inclusion of financial discussions and the opinions or actions of lawmakers and NASA officials. It included information about the shuttle budget or funding policy related to the shuttle program. Funding and budget frame articles frequently referenced Congressional bills on budget policies, discussions of costs for safety and other post-Columbia changes, and proposed budgets for upcoming fiscal years. Many government experts were cited in these articles. One *Florida Today* funding frame article

discussed how the “shuttle program has seen little cost savings even though the remaining three orbiters have been idle since the Feb. 1 Columbia disaster” (Wheeler, 2003, July 12).

Many of these articles discussed the past, present, and future of the shuttle program budget and implications of this on the surrounding economy. One *New York Times* article discussed how the 2004 planned shuttle program budget suffered after Columbia and how President Bush requested for Congress to increase spending from \$3.2 billion in 2003 to \$3.97 billion in 2004 (Stolberg, 2003, Feb. 4). Another discussed the cost overruns on the shuttle program in its time of retirement and using long-term investments to boost economic development (“Action,” 2008, April 16). Many others discussed shuttle program budget increase requests for 2005, the year of the Return to Flight mission, and budget cut plans for 2010, the year of the shuttle’s retirement.

Policy Frame

This frame appeared in 5.0% (N = 19) of the coverage, spread about equally between the two newspapers. Articles in this frame discussed Congressional decisions on shuttle policies, including policies dealing with the retiring shuttle program, post-Columbia policy changes, and 2008 presidential candidate plans for the shuttle program if elected. Policy frame articles were full of keywords such as “proposal,” “agenda,” “Capitol Hill,” and other references to presidential commissions and Congressional hearings, decisions, and documents that gave information about shuttle policies. House, Senate, and Representative members were cited frequently in these articles, especially those of the House Science Committee.

One example of an article that dealt with policies about the retiring shuttle program was from *Florida Today*. It discussed how Brevard County Commissioner Chuck Nelson was supposed to meet with Congress about “leadership on space issues” and discuss narrowing the five-year gap in launching spacecraft between the retirement of the shuttle program and the beginning of the Constellation Program (Dean, 2008, Jan. 23).

An example of a policy frame article discussing post-Columbia issues was addressed in another piece from *Florida Today*. This article discussed Congress' opinions on the future of the shuttle program. In it, the chairman of one of Congress' subcommittees summarized the post-Columbia issues that define the policy frame:

There are a lot of questions that have to be asked and thoroughly vetted," said U.S. Rep. Sherwood Boehlert, R-N.Y., House Science Committee Chairman.

"Do we go forward with humans in space? Do we invest in a heavy upgrade program for the shuttle? Do we focus all our attention on a replacement vehicle? We've got some very important policy decisions to make," he said. (Wheeler, 2003, August 27).

This frame also included articles about the policies of several 2008 presidential candidates. These articles focused on their policies for the space industry if they were elected. For example, a *Florida Today* editorial discussed Senator Hillary Clinton's policies on space exploration. Hillary Clinton said in this editorial that her top scientific priorities would be "enhancing American leadership in space through investments in exploration, earth sciences, and aeronautics research" ("Hillary," 2007, Oct. 10). Another *Florida Today* editorial in this frame discussed the space policies of former New York City mayor and Republican candidate for president in that election, Rudy Giuliani. His editorial discussed his plans for making America a global space exploration leader in an effort to gain support from the Space Coast community for his presidential campaign (Giuliani, 2008, Jan. 26).

Internal Changes Frame

This frame appeared also in 5.0% of the total coverage (N = 19) and dominated in the *New York Times* coverage (63.2%, N = 12). This frame focused on management changes made by the CAIB after the Columbia disaster as well as managerial changes within NASA not related to the disaster. This frame also discussed changes within the agency as a result of the Columbia accident. Such articles were characterized by discussions of CAIB recommendations and

changes dealing with NASA's "culture" or organizational procedures. Many CAIB experts were cited in these articles.

One *Florida Today* article framed this way discussed former shuttle program manager Ralph Roe's reassignment to lead the NASA Engineering and Safety Center at Langley Research Center in Hampton, Virginia despite Congress' criticisms that he should not have been qualified after his performance during the Columbia events (Halvorson, 2003, Nov. 15).

One *New York Times* article discussed an administrative change not related to the Columbia accident. It reported President Bush's nomination of Dr. Michael Griffin, physicist at Johns Hopkins University's Applied Physics Laboratory, for administrator of NASA (Leary, 2005, Mar. 12). Such internal changes discussed in this frame also included articles reporting about the promotion of William Parsons as the shuttle program manager at Johnson Space Center in Houston in 2003.

One *Florida Today* article discussed post-Columbia agency procedural changes:

The [Columbia Accident Investigation B]oard has made it clear that serious problems in the agency's culture caused a management and communications breakdown that contributed to the accident, and that sweeping changes will be required.

Those will likely include revamping a flawed problem reporting system, creating a better trend-analysis system to help engineers spot potentially deadly hazards, and strengthening independent safety oversight of engineering decisions about shuttle flight risks. ("Facing," 2003, May 15)

Lessons from History Frame

This frame was found in 5.0% (N = 19) of the total coverage, mostly in the *Florida Today* sample (63.2%, N = 12). These articles emphasized the past advancements, mistakes, and lessons of events in NASA's history. These events included the Apollo program, which put man on the moon, and the Challenger accident, the first shuttle disaster.

Articles having this frame were full of keywords referencing the historical importance of space exploration, such as “legacy,” “lessons,” “era,” and “human history,” and references to past flights, programs, and the people made famous by those programs, such as Neil Armstrong, the first astronaut to walk on the moon during the Apollo program, President John F. Kennedy, who set the policies for that program, and Sally Ride, the teacher-astronaut who perished in the Challenger accident. Many other astronauts were cited in these articles.

One *Florida Today* article said “[n]early 35 years after Neil Armstrong’s earthshaking moon walk, president Bush is vowing to send America back there by 2015.” This article also discussed how Apollo’s launch operations manager, Paul Donnelly, believes his generation “did the right things for the space program” and wants to see it happen again in the future (Breen, 2004, Jan. 29).

In one article from *New York Times*, the leader of the CAIB, Admiral Harold W. Gehman, Jr., expressed a fiscal mistake from history that he hoped the agency would not repeat:

After the Apollo Program, Admiral Gehman said: “NASA has had to overstate its capabilities and understate the cost of doing business. I hope that the Congress and the While House don’t put them in that position again.” (Glanz, 2004, Jan. 27)

Another article with this frame from the *New York Times* discussed the problems and “echoes of the bitter Challenger experience” as they were apparent in the Columbia accident investigation (Sanger, 2033, Feb. 7).

Astronaut Hero Frame

The Astronaut Hero frame appeared in 2.9% of the total coverage (N = 11). It was found more frequently in *Florida Today* (70.0%, N = 8). These articles glorified astronauts as heroes in society for their accomplishments and martyrdom, in the case of the Columbia astronauts. Astronaut Hero frame articles were full of keywords such as “honor” and “fame,” whether it referred to the fame the astronauts experienced or Hall of Fame exhibits into which they were

inducted. Astronauts, their families, and other people who lived in their hometowns were cited in these articles.

One *Florida Today* article discussed the achievements and talents of Discovery mission specialist Robert Curbeam and his successful mission to the International Space Station to retract a solar panel:

Two dozen NASA astronauts have chalked up three spacewalks during 18 different missions, but no one ever has gone into the void four times during a shuttle flight. Curbeam now has tallied 45 hours and 34 minutes working outside the spacecraft – a total that ranks him on top 10 lists that track spacewalking records. (Halvorson, 2006, Dec. 19)

Some articles acknowledged the Columbia astronauts for their martyrdom. Two *New York Times* hero frame article described the loss of astronauts due to Columbia. One reported interviews with several Houston locals about the loss of Columbia pilot Cmdr. William C. McCool (Bragg and Yardley, 2003, Feb. 2). Another article reported a similar account of another lost Columbia astronaut, Lt. Col. Michael P. Anderson, told by the residents who knew him in his hometown, Spokane, Washington (LeDuff, 2003, Feb. 3).

Progress Frame

The progress frame appeared in 1.6% of the sample, or six articles, equally in each paper. It included articles that made optimistic statements about the advancement or improvement of the shuttle program or more generally, the space program. Progress frame articles were full of optimistic key phrases such as “good news” and “vast progress,” about the achievements that were being made by the shuttle program. Most articles in this frame included the keyword “progress” in the article text. Astronauts and spokespeople were cited most frequently in such articles.

Several articles that discussed successful shuttle missions characterized this frame. One from *New York Times* discussed the July 2005 mission of that shuttle. The article said, “[w]hile

the Discovery mission must wait the turn of a few more pages of history, its progress is encouraging,” referring to the mission’s successful assembly of part of the International Space Station (Wilford, 2005, Jul. 27).

One from *Florida Today* discussed the progress of human spaceflight:

The past 50 years saw the beginning of the space race and vast progress in human spaceflight, much of that launching from Brevard County. During the next 50 years, NASA plans to send humans farther than it ever has beyond the moon and to Mars. (Lowe, 2007, Nov. 11)

“NASA in the Public Eye” Frame

The least frequently found frame was “NASA in the public eye.” That frame appeared in 0.5% of the entire sample, with one such article appearing in each paper. These two articles focused on the way the public views the shuttle program and cited news worker sources frequently.

The two “NASA in the Public Eye” frame articles in the sample were very dissimilar in their content with no overlapping keywords or phrases found. One article discussed the findings of a Gallup poll reported in *Florida Today* about U.S. residents’ opinions on space exploration. The poll found that 74% of the participants believed the shuttle program should continue and that 53% believed NASA’s performance today is “good” or “excellent” (Reed, 2005, July 11). The other, from the *New York Times*, discussed NASA management openness and interaction with the media in the days following the Columbia failure. It stated:

“It’s easier to have what seems like a strong publicity operation if everything you’re doing is the stuff of high drama, which was the case earlier in the program,” Mr. Wolfe [a NASA space program author] said. (Broder, 2003, Feb. 10)

Other Frames

The articles not fitting any predetermined frames on the coding list made up 13.5% (N = 51) of the total coverage, spread about equally between the two newspapers. Some frames that

were not predetermined on the coding sheet were added to provide a full understanding of the frames used in the shuttle program and are described below. These frames included the blame frame and articles that gave mission summaries.

Blame frame. One of the most frequently found frames in the coverage that was not on the predetermined coding list was the blame frame. This frame dealt with stories that faulted different parties or actions for the failure of the Columbia. These articles blamed mainly the faulty debris and risk analysis and the program's "culture" and managerial communication for the disaster. One article said the disaster was the result of a combination of physical, organizational, and historical causes, claiming that:

Too often, accident investigators blame a failure only on the last step in a complex process, when a more comprehensive understanding of that process could reveal that earlier steps might be equally or even more culpable. ("Excerpts," 2003, Aug. 27)

Some articles framed this way included the keyword "fault tree," referring to a document that NASA engineers were constructing as part of the accident investigation analysis. A quote from one *Florida Today* article illustrates this:

Today, however he [Ron Dittmore, shuttle program manager] backtracked again, saying that he had not ruled out the debris strike as a possible factor [for the accident]. He said NASA engineers were constructing a "fault tree" with every conceivable reason for the massive and fatal failure. (Broder, 2003, Feb. 7)

Another article from the *New York Times* that illustrates this frame faulted the leader of the shuttle program.

Some lawmakers have even begun to ponder whether O'Keefe [NASA administrator] himself might deserve a share of whatever blame there is to be assigned in the aftermath of the Columbia tragedy. (Wheeler, 2003, Mar. 3)

Many articles found did not fit the frames previously discussed because they were neutral mission summary reports. For example, one, compiled by *Florida Today* staff, simply gave a brief synopsis of the shuttle program's focus, mission launch and landing locations, and cost. It

went on to list each flight since 1981 in chronological order and a brief description of what each achieved. Another from the *New York Times* was a summary of one particular mission. It discussed the Atlantis mission of 2006, listing its expected time of launch, mission duration, and focus. One from *Florida Today* reported some “fun facts” and statistics about shuttles in general (Breen, 2006, Jul. 1).

RQ3: Does the Frequency and Type of Source Cited Differ in *Florida Today* and *New York Times* Shuttle Program Coverage?

Types of Sources

The sources will be discussed in descending order of frequency found in the sample coverage. They included NASA officials, government officials, educational experts, NASA technical experts, NASA spokespeople, CAIB members, astronauts or their relatives, non-NASA technical experts, non-NASA spokespeople, citizens, anonymous sources, news worker sources, and other government investigators (Tables 4-4, 4-5, 4-6 and 4-7).

NASA officials. The most frequently cited sources in the total sample were NASA officials. This category made up 32.9% (N = 383) of the total number of cited sources in the overall coverage. They were cited as 34.8% (N = 204) of the total *Florida Today* sample sources and as 31.0% (N = 179) of the total *New York Times* sample sources. They were cited most often directly in both newspapers (*FT*: 20.8%, N = 122; *NYT*: 12.1%, N = 70).

This group included NASA administrators or contractors with managerial authority. Commonly cited NASA officials included NASA Administrator Michael Griffin, shuttle project manager Wayne Hale, and shuttle operations associate administrator William Gerstenmaier. Others in this category included any NASA or NASA contractor source with the title “manager,” “chief,” “official,” or related terms. Also, retired NASA officials such as Apollo flight director Eugene Kantz were considered part of this category.

Government officials. The next most frequently cited sources in the total sample were government officials (12.0%, N = 140), cited about half as frequently as NASA officials. They appeared more in *Florida Today* coverage (15.5%, N = 91) than in the total *New York Times* sample coverage (8.5%, N = 49). They were cited most often directly in the total *Florida Today* sample (8.5%, N = 50) and in the *New York Times* sample (5.2%, N = 30).

This category included any elected or appointed government leaders or advisers, excluding NASA employees. These also included Congressional and funding officials and House Science Subcommittee members. Examples of government sources that were frequently cited included Senator Sam Brownback, Kansas Republican, and Senator John McCain, Arizona Republican, both of whom lead the senate subcommittee that oversees NASA. Also, one very heavily cited government source was Representative Sherwood Boehlert, Republican of New York and the chairman of the House Science Committee. President Bush was also cited in many Congressional hearings in many articles.

Educational experts. The next most frequently cited sources in the total sample were educational experts (8.7%, N = 101). They appeared more than twice as often in the *New York Times* sample, cited as 12.1% (N = 70) of the total *New York Times* sample sources and as 5.3% (N = 31) of the total *Florida Today* sample sources. They were cited most often directly in the total *Florida Today* sample (3.1%, N = 18) and in the *New York Times* sample (6.2%, N = 36).

These were sources affiliated with a university who had administration, space policy, or technical expertise. Some were directly involved with research studies or investigations while others only commented on various NASA policies and technical phenomena.

Educational experts included Paul A. Czysz, professor emeritus at Parks College of Engineering and Aviation at St. Louis University, who was a consultant on the details of the

shuttle's break up. Others, such as John M. Logsdon, director of the Space Policy Institute at George Washington University, provided a great deal of information in the newspaper sample on NASA's changing policies after Columbia. Similarly, Alex Roland, history professor at Duke University, was frequently cited as a former NASA historian and critic of the shuttle program.

NASA technical experts. Technical experts were cited about as frequently in the total sample as government officials (8.0%, N = 93). This source category appeared about equally in the two newspapers, cited as 7.5% (N = 44) of the total *Florida Today* sample sources and as 8.5% (N = 49) of the total *New York Times* sample sources. They were cited most often directly in both *Florida Today* sample (5.1%, N = 30) and in the *New York Times* sample (4.2%, N = 25).

These sources were any engineering or other technical experts who worked for NASA or one of its three major contractors, Boeing, Lockheed Martin, or the United Space Alliance. These were shuttle specialists, scientists, engineers, or NASA affiliated researchers excluding university-affiliated researchers.

They included, for example, Greg Katnik, a Kennedy Space Center engineer who performed a shuttle tile damage assessment in an investigation of shuttle safety. This group also included NASA scientists such as Donald Kessler, former NASA senior scientist for orbital debris research. These sources were referred to as "analysts," "engineers," "technical experts," and related titles.

NASA spokespeople. This group made up 7.0% (N = 82) of the overall sample's cited sources. They were cited as 9.7% (N = 56) of the total *New York Times* sample sources and as 4.4% (N = 26) of the total *Florida Today* sample sources. They were cited most often directly in the overall *Florida Today* sample (2.7%, N = 16) but most often cited indirectly in the overall *New York Times* sample (5.4%, N = 31).

This category included spokespeople of any NASA department or organization. Frequently cited NASA spokespeople included Allard Beutel. These also included spokespeople of companies who contract for NASA. One such source was Michael Curie, spokesperson for United Space Alliance, a company that supports NASA shuttle operations.

CAIB members. The next most frequently cited sources in the total sample were members of the Columbia Accident Investigation Board (6.5%, N = 76). They appeared slightly more frequently in *New York Times* coverage (7.6%, N = 44) than in *Florida Today* coverage (5.5%, N = 32). They were cited most often directly in both newspapers (*FT*: 4.3%, N = 25; *NYT*: 2.8%, N = 16).

These were members of the Columbia Accident Investigation Board, which was assembled by NASA to investigate the Columbia disaster and make recommendations for future shuttle flights and NASA management and procedures. The most frequently cited members of the CAIB were Adm. Harold W. Gehman, the chairman and a retired Navy officer; G. Scott Hubbard, NASA Ames Research Center director; and Steven B. Wallace, Federal Aviation Administration director.

It should be noted that these members all have expertise and titles that could qualify them in other source categories. However, they are primarily CAIB investigators in the context of the articles in which they were found and were only coded as such. These were labeled as “CAIB investigator,” “NASA investigator involved with debris analysis,” and other related titles that implied their CAIB status.

Astronauts or their relatives. Astronauts and their relatives were cited as frequently as CAIB members in the total sample (6.5%, N = 76). They appeared about equally in both samples, cited as 6.8% (N = 40) of the total *Florida Today* sample sources and as 6.2% (N = 36)

of the total *New York Times* sample sources. They were cited most often directly in both newspaper samples (*FT* 4.4, N = 26; *NYT*: 4.0%, N = 23).

Astronaut sources included those who had flown recently, such as Col. Steven W. Lindsey, the 2006 Discovery shuttle flight commander, and veterans such as Captain Frederick H. Hauck, who flew his first mission 20 years ago.

Astronauts' relatives included, for example, the father of Columbia astronaut Michael P. Anderson. He was cited in an article mourning the loss of his son who was killed in the Columbia disaster.

Non-NASA technical experts. Non-NASA affiliated technical experts made up 6.1% (N = 71) of the total number of cited sources in the overall coverage. They appeared about equally in the two newspapers, cited as 6.0% (N = 35) of the total *Florida Today* sample sources and as 6.2% (N = 36) of the total *New York Times* sample sources. They were cited most often directly in both samples (*FT*: 4.4%, N = 26; *NYT*: 4.2%, N = 24).

Non-NASA technical sources included those who held technical positions for organizations that do not contract or consult for NASA, including Boeing, Lockheed Martin, or the United Space Alliance. For instance, they included such individuals as Bob Holkan of MTS Global, a management and technical services company. Another example included Richard Blomberg, an independent aerospace safety expert from the Aerospace Safety Advisory Panel.

Non-NASA spokespeople. This group made up 5.0% (N = 58) of the total sample coverage's cited sources. This source category appeared about equally in the total *Florida Today* sample (5.1%, N = 30) and in the total *New York Times* sample (4.9%, N = 28). They were cited most often directly in both newspapers (*FT*: 3.1%, N = 18; *NYT*: 3.5%, N = 20).

Examples of non-NASA spokespeople included Peg Hashem from Hamilton Sunstrand Space Systems, which manufactures systems for the shuttles, and Richard Garcia from the Air Force Research Laboratory Starfire Optical Range at Kirtland Air Force Base, which provides images of shuttle flights for safety focuses.

Citizens. They made up 3.4% (N = 40) of the total sample's cited sources. This source category appeared more frequently in *Florida Today* sample (3.7%, N = 22) than in the *New York Times* sample (3.1%, N = 18). They were cited most often directly in both newspapers (*FT*: 3.1%, N = 18; *NYT*: 2.4%, N = 14).

Citizens included locals from the hometowns of the Columbia victims who commented on their loss and “casual observers” of launches who “expressed a strong interest in the space program and [Columbia] investigation,” such as Robert Maini, who attended a CAIB hearing (Kridler, 2003, Mar. 30). Other examples included restaurant owners who threw astronaut benefits, parents of Space Coast public school students, and relatives of Kennedy Space Center employees.

Anonymous sources. They made up 2.9% (N = 34) of the total sample's cited sources. This source category also appeared more frequently in the *Florida Today* sample (4.9%, N = 28) than in the *New York Times* sample (0.9%, N = 5). They were cited most often directly in both newspapers (*FT*: 2.9%, N = 17; *NYT*: 0.7%, N = 4).

Anonymous sources were those whose positions were ambiguous or not given for some reason. For example, one anonymous *New York Times* source “was given anonymity because he said disclosure of his name would jeopardize his career” (Schwartz, 2005, Jul. 31). Another expert who discussed the insulation issues on Columbia in an article about the CAIB

investigation was cited in the *New York Times* as “an expert close to the investigation” (Sanger, 2003, Feb. 12).

News worker sources. These were the second least frequently cited sources (0.5%, N = 6). This source category also appeared more frequently in the *New York Times* sample, cited as 0.9% (N = 5) of the total *New York Times* sample sources and as 0.2% (N = 1) of the total *Florida Today* sample sources. Two news workers were cited equally directly (0.3%, N = 2) and both ways (0.3%, N = 2) in the *New York Times* sample.

News worker sources were affiliated with news organizations. Two sources in this category cited in the same article included CBS anchor Walter Cronkite and retired editor of Aviation and Space Technology, Robert Hotz. Cronkite commented on the Apollo program and Hotz was part of an independent Challenger investigation and commented on NASA’s use of officials in media interviews (Broder, 2003, Feb. 10).

Other government investigators. This category of sources was the least frequently cited in the overall sample (0.3%, N = 4). This group appeared twice in each newspaper and made up 0.3% (*FT*: N = 2; *NYT*: 2) of the total sources for both newspapers. They were cited directly once and both ways once in the *Florida Today* sample, making up 0.2% (N = 1) of the total *Florida Today* sample sources in each of those categories; similarly, in the *New York Times* sample, one was cited directly and one was cited both ways. Each made up 0.3% (N = 1) of the total cited *New York Times* sample sources in those categories.

This category included nongovernmental accident investigators and other internal study boards. One example included the Stafford-Covey Return to Flight Task Group who investigated the launch requirements for the July 26, 2005 “Return to Flight” launch of Discovery (Kelly, 2005, June 28).

Comparison of sources cited directly, indirectly, and both ways

Overall, more directly cited sources appeared in the *Florida Today* sample. In that paper, 62.6% (N = 367) of the total *Florida Today* sources cited were directly quoted, versus 49.1% (N = 283) in the *New York Times*. Only 10.7% (N = 63) of the total sources in that paper were indirectly quoted. The percentage of sources that spoke both directly and indirectly in the same article was 26.7% (N = 157) in *Florida Today* (Table 4-4).

For the *New York Times* sample, sources were also most frequently cited directly. From the total number of sources appearing in that newspaper, directly cited ones made up 49.1% (N = 283) of the total percentage of cited sources. Indirectly cited sources made up 19.2% (N = 111) of the total percentage of cited sources cited in the entire *New York Times*, while those cited both ways appeared as 31.7% (N = 183) of the total percentage of cited sources for that paper (Table 4-5).

Directly quoted sources appeared more than the twice as much as the percentage of indirectly quoted sources and sources that were quoted both ways combined. From all sources who spoke in the total coverage sample, direct sources made up 52.1% (N = 560). Indirectly cited sources made up 16.2% (N = 174) and sources cited both ways made up 31.7% (N = 340) (Table 4-7).

RQ4: Are Any of the Sources More Frequently Associated with Certain Focuses in the *Florida Today* Shuttle Program Coverage Versus the *New York Times* Coverage?

Florida Today

For coverage in the *Florida Today* sample, NASA officials were the most frequently cited source category in each purpose category. They were cited the most in the articles with a purpose to provide information about the missions, appearing in a total of 57.6% (N = 87) of the *Florida Today* sample sources cited for that purpose. Similarly, they appeared as 29.3% (N =

51) of all of the *Florida Today* sources cited in the policy and funding purpose category, and as 34.1% (N = 57) of all of the *Florida Today* sample sources cited in the Columbia details explanation category. NASA technical sources also appeared frequently in the Columbia details focus category, and as 10.8% (N = 18) of the total *Florida Today* sample sources found in that category. Other frequently found sources were government officials, appearing mostly in the policy and funding focus articles. These officials were found in 39.1% (N = 68) of the total *Florida Today* policy and funding focus articles. Government officials were also found frequently in Columbia mission detail articles in *Florida Today* (10.8%, N = 18).

Two other source categories appeared to be associated with a certain focus. Astronauts or their relatives were cited as 15.2% (N = 23) of the total *Florida Today* sample sources in the mission focus articles. CAIB members were cited as 15.0% (N = 25) of the total *Florida Today* sample sources in the articles explaining Columbia accident details (Table 4-8).

New York Times

For the *New York Times* sample, NASA officials were also the most frequently cited source category in each focus category. They were cited most frequently in the articles that had a focus to provide information about the missions, appearing a total of 52.6% (N = 41) of the sources cited for that purpose. They also appeared as 23.8% (N = 34) of all of the sources cited in the *New York Times* sample policy and funding category, as 28.1% (N = 72) of all of the sources cited in the Columbia details explanation category, and as 25.0% (N = 15) of all of the sources cited in the *New York Times* sample technical and scientific category.

Several other source categories were associated with certain focus. Government sources were also frequently found in the policy and funding articles. They were cited as 16.8% (N = 24) of all of the *New York Times* sample policy and funding articles. Astronauts or their relatives were cited as 17.9% (N = 14) of the total *New York Times* sample sources in mission articles.

Educational experts were cited as 16.7% (N = 10) of the total *New York Times* sample sources in the technical and scientific articles (Table 4-9).

RQ5: Are Any of the Frames more Frequently Associated with a Certain Focus in the *Florida Today* Shuttle Program Coverage Versus the *New York Times* Coverage?

Florida Today

The *Florida Today* sample's frame category that was associated most frequently with a focus was the industry frame. Of the total number of policy and funding focus articles in *Florida Today* with that frame, 44.3% (N = 35) had this frame. This frame was not frequently associated with any other focus.

Several other frames were most frequently associated with a certain focus. About 22% (N = 16) of all *Florida Today* technically and scientifically framed articles fit the mission details focus category. About 12% (N = 7) of all the *Florida Today* articles framed that way fit the Columbia details focus category.

The safety frame was most frequently associated with the mission details focus category, as well. That category was associated with 51.4% (N = 38) of all of the *Florida Today* articles with the safety frame. The Columbia details focus was frequently associated with the safety frame, too. Nineteen-point-nine-percent (N = 11) of all of the *Florida Today* articles with the safety frame fit that focus.

The "Return to Flight" frame was associated frequently with the Columbia details category purpose. Of the total number of articles framed that way in the *Florida Today* sample, 21.1% (N = 12) fit this purpose.

The funding frame was associated frequently with the policy and funding details focus. Of the total number of articles framed that way in the *Florida Today* sample, 20.3% (N = 16) fit this focus (Table 4-10).

New York Times

The *New York Times* sample's focus category that was associated most frequently with two frames was the mission category. Of the total number of safety frame articles in the *New York Times* sample, 30.2% (N = 13) detailed specifics about missions. Of the total number of technical and scientific frame articles in *New York Times* sample, 39.5% (N = 17) fit the mission category.

Another frame frequently associated with different foci was the technical and scientific frame. Of the total number of technical and scientific frame articles in *New York Times* sample, 75.0% (N = 12) described the scientific and technical details. Similarly, of the total number of technical and scientific frame articles in *New York Times* sample, 16.7% (N = 8) fit the Columbia details focus (Table 4-11).

RQ6: Are Any of the Sources More Frequently Associated with Certain Frames in the Florida Today Shuttle Program Coverage Versus the New York Times Coverage?

Florida Today

In the *Florida Today* sample, four source categories, educational experts, government experts, non-NASA technical experts, and citizens, were most frequently associated with the industry frame. Twenty-nine percent (N = 9) of all of the educational experts, 39.6% (N = 36) of all of the government experts, and 37.1% (N = 13) of the non-NASA technical experts appeared in that frame. Also, 36.1% (N = 8) of all of the citizen sources were cited in that frame.

Four other source categories were frequently associated with certain frames in the local coverage. Educational sources were found frequently (38.7%, N = 12) in the funding and budget frame. NASA officials appeared frequently (40.2%, N = 82) in the safety frame. CAIB (Columbia Accident Investigation Board) members (31.3%, N = 10) and astronauts (35.0%, N = 14) were found often in the return to flight frame (Table 4-12).

New York Times

In the national coverage sample, four source categories were frequently associated with the technical and scientific frame. Approximately 39% (N = 27) of the total educational sources appeared in that frame. Of all the NASA official sources, 36% (N = 65) were cited in the scientific and technical frame. About 36% (N= 13) of all of the non-NASA technical sources and 44.9% (N = 22) of all of the NASA technical sources were cited in the technical and scientific frame.

Two other frames had frequently cited sources. Astronauts and their relatives were cited frequently (36.1%, N = 13) in the safety frame. Also, of all of the citizens cited, 50.0% (N = 9) were cited frequently in astronaut hero frame (Table 4-13).

Table 4-1. Frequencies of shuttle program stories in *Florida Today* and *New York Times* by year

Year	Total Coverage	(%)
2003	135	(35.7)
2004	23	(6.1)
2005	49	(13.0)
2006	72	(19.0)
2007	62	(16.4)
2008	37	(9.9)
Total	378	(100.0)

Table 4-2. Focus of *Florida Today* and *New York Times* coverage

	FT	(%)	NYT	(%)	Total	(%)
Policy/ funding	76	(69.7)	33	(30.3)	109	(28.8)
Mission	71	(73.2)	26	(26.8)	97	(25.6)
Columbia details	66	(55.5)	53	(44.5)	119	(31.5)
Tech./ science	0	(0.0)	16	(100.0)	16	(4.2)
Other	23	(70.0)	14	(42.4)	33	(8.7)
Total	236	--	142	--	378	(100.0)

Table 4-3. Frames of *Florida Today* and *New York Times* coverage

	FT	(%)	NYT	(%)	Total	(%)
Policy	10	(52.6)	9	(47.4)	19	(5.0)
NASA in the public eye	1	(50.0)	1	(50.0)	2	(0.5)
Technical and scientific	24	(34.3)	46	(65.7)	70	(18.5)
Funding/ budget	19	(95.0)	1	(5.0)	20	(5.3)
Return to flight	23	(71.9)	9	(28.1)	32	(8.5)
Internal changes	7	(36.8)	12	(63.2)	19	(5.0)
Industry	44	(95.7)	2	(4.3)	46	(12.2)
Safety	60	(72.3)	23	(27.7)	83	(21.9)
Progress	3	(50.0)	3	(50.0)	6	(1.6)
Astronaut hero	8	(70.0)	3	(30.0)	11	(2.9)
Lessons from history	12	(63.2)	7	(36.8)	19	(5.0)
Other	25	(48.1)	26	(51.9)	51	(13.5)
Total	236	--	142	--	378	(100.0)

Table 4-4. Sources in *Florida Today* coverage. N = 587

	Direct	(% of N)	Indirect	(% of N)	Both	(% of N)
News worker	0	(0.0)	1	(0.2)	0	(0.0)
Educational expert	18	(3.1)	10	(1.7)	3	(0.5)
Government	50	(8.5)	0	(0.0)	41	(7.0)
CAIB member	25	(4.3)	0	(0.0)	7	(1.2)
Other Gov. investigator	1	(0.2)	0	(0.0)	1	(0.2)
NASA official	122	(20.8)	19	(3.2)	63	(10.7)
Astronaut or relative	26	(4.4)	6	(1.0)	8	(1.4)
NASA technical	30	(5.1)	4	(0.7)	10	(1.7)
Non-NASA technical	26	(4.4)	2	(0.3)	7	(1.2)
NASA spokesperson	16	(2.7)	8	(1.4)	2	(0.3)
Non-NASA spokesperson	18	(3.1)	4	(0.7)	8	(1.4)
Anonymous	17	(2.9)	8	(1.4)	4	(0.7)
Citizens	18	(3.1)	1	(0.2)	3	(0.5)
Total	367	--	63	--	157	--

Table 4-5. Sources in *New York Times* coverage. N = 577

	Direct	(% of N)	Indirect	(% of N)	Both	(% of N)
News worker	2	(0.3)	1	(0.2)	2	(0.3)
Educational expert	36	(6.2)	8	(1.4)	26	(4.5)
Government	30	(5.2)	5	(0.9)	14	(2.4)
CAIB member	16	(2.8)	5	(0.9)	23	(4.0)
Other gov. investigator	1	(0.2)	0	(0.0)	1	(0.2)
NASA official	70	(12.1)	38	(6.6)	71	(12.3)
Astronaut or relative	23	(4.0)	5	(0.9)	8	(1.4)
NASA technical	25	(4.3)	12	(2.1)	12	(2.1)
Non-NASA technical	24	(4.2)	3	(0.5)	9	(1.6)
NASA spokesperson	18	(3.1)	31	(5.4)	7	(1.2)
Non-NASA spokesperson	20	(3.5)	0	(0.0)	8	(1.4)
Anonymous	4	(0.7)	1	(0.2)	0	(0.0)
Citizens	14	(2.4)	2	(0.3)	2	(0.3)
Total	283	--	111	--	183	--

Table 4-6. Total sources in *Florida Today* and *New York Times*

	FT	(%)	NYT	(%)	Total	(%)
News worker	1	(0.2)	5	(0.9)	6	(0.5)
Educational expert	31	(5.3)	70	(12.1)	101	(8.7)
Government	91	(15.5)	49	(8.5)	140	(12.0)
CAIB member	32	(5.5)	44	(7.6)	76	(6.5)
Other gov. investigator	2	(0.3)	2	(0.3)	4	(0.3)
NASA official	204	(34.8)	179	(31.0)	383	(32.9)
Astronaut or relative	40	(6.8)	36	(6.2)	76	(6.5)
NASA technical	44	(7.5)	49	(8.5)	93	(8.0)
Non-NASA technical	35	(6.0)	36	(6.2)	71	(6.1)
NASA spokesperson	26	(4.4)	56	(9.7)	82	(7.0)
Non-NASA spokesperson	30	(5.1)	28	(4.9)	58	(5.0)
Anonymous	29	(4.9)	5	(0.9)	34	(2.9)
Citizens	22	(3.7)	18	(3.1)	40	(3.4)
Total	587	(100.0)	577	(100.0)	1164	(100.0)

Table 4-7. Sources cited directly, indirectly, and both ways in *FT* and *NYT*

	FT	(%)	NYT	(%)	Total	(%)
Direct	367	(62.6)	283	(49.1)	650	(52.1)
Indirect	63	(10.7)	111	(19.2)	174	(16.2)
Both	157	(26.7)	183	(31.7)	340	(31.7)
Total	587	(100.0)	577	(100.0)	1164	(100.0)

Table 4-8. *Florida Today* source frequency per article focus

	Policy/ Funding	(%)	Mission	(%)	Columbia	(%)	Tech/ Science	(%)	Other	(%)
News worker	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(1.1)
Educational expert	10	(5.7)	1	(0.7)	7	(4.2)	0	(0.0)	13	(13.7)
Government	68	(39.1)	4	(2.6)	18	(10.8)	0	(0.0)	1	(1.1)
CAIB member	6	(3.4)	0	(0.0)	25	(15.0)	0	(0.0)	1	(1.1)
Other gov. investigator	0	(0.0)	0	(0.0)	2	(1.2)	0	(0.0)	0	(0.0)
NASA official	51	(29.3)	87	(57.6)	57	(34.1)	0	(0.0)	9	(9.5)
Astronaut or relative	0	(0.0)	23	(15.2)	10	(6.0)	0	(0.0)	7	(7.4)
NASA technical	5	(2.9)	13	(8.6)	18	(10.8)	0	(0.0)	8	(8.4)
Non-NASA tech.	20	(11.5)	4	(2.6)	8	(4.8)	0	(0.0)	3	(3.2)
NASA spokesperson	0	(0.0)	0	(0.0)	1	(0.6)	0	(0.0)	25	(26.3)
Non-NASA spokesperson	7	(4.0)	12	(7.9)	11	(6.6)	0	(0.0)	0	(0.0)
Anonymous	5	(2.9)	2	(1.3)	4	(2.4)	0	(0.0)	18	(18.9)
Citizens	2	(1.1)	5	(3.3)	6	(3.6)	0	(0.0)	9	(9.5)
Total	174	(100.0)	151	(100.0)	167	(100.0)	0	(0.0)	95	(100.0)

Table 4-9. *New York Times* source frequency per article focus

	Policy/ Funding	(%)	Mission	(%)	Columbia	(%)	Tech/ Science	(%)	Other	(%)
News worker	0	(0.0)	0	(0.0)	1	(0.4)	0	(0.0)	4	(9.1)
Educational expert	23	(16.1)	5	(6.4)	25	(9.8)	10	(16.7)	7	(15.9)
Government	24	(16.8)	2	(2.6)	21	(8.2)	0	(0.0)	2	(4.5)
CAIB member	5	(3.5)	0	(0.0)	36	(14.1)	3	(3.3)	0	(0.0)
Other gov. investigator	1	(0.7)	0	(0.0)	0	(0.0)	0	(0.0)	1	(2.3)
NASA official	34	(23.8)	41	(52.6)	72	(28.1)	15	(25.0)	17	(36.8)
Astronaut or relative	9	(6.3)	14	(17.9)	4	(1.6)	3	(5.0)	6	(13.6)
NASA technical	13	(9.1)	5	(6.4)	21	(8.2)	10	(16.7)	0	(0.0)
Non-NASA tech.	10	(7.0)	2	(2.6)	15	(5.9)	4	(6.7)	5	(11.4)
NASA spokesperson	15	(10.5)	5	(6.4)	26	(10.2)	10	(16.7)	0	(0.0)
Non-NASA spokesperson	6	(4.2)	4	(5.1)	24	(9.4)	5	(8.3)	2	(4.5)
Anonymous	0	(0.0)	0	(0.0)	2	(0.8)	2	(3.3)	1	(2.3)
Citizens	3	(2.1)	0	(0.0)	9	(3.5)	0	(0.0)	6	(13.6)
Total	143	(100.0)	78	(100.0)	256	(100.0)	60	(100.0)	44	(100.0)

Table 4-10. *Florida Today* coverage frame frequency per article focus

	Policy/ Funding	(%)	Mission	(%)	Columbia	(%)	Tech/ Science	(%)	Other	(%)
Policy	5	(6.3)	1	(1.4)	4	(7.0)	0	(0.0)	0	(0.0)
NASA in the pub. eye	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(3.6)
Tech. and scientific	1	(1.3)	16	(21.9)	7	(12.3)	0	(0.0)	0	(0.0)
Funding/ budget	16	(20.3)	0	(0.0)	2	(3.5)	0	(0.0)	1	(3.6)
Return to flight	3	(3.8)	5	(6.8)	12	(21.1)	0	(0.0)	3	(10.7)
Internal changes	0	(0.0)	0	(0.0)	4	(7.0)	0	(0.0)	3	(10.7)
Industry	35	(44.3)	1	(1.4)	3	(5.3)	0	(0.0)	5	(17.9)
Safety	10	(12.7)	38	(51.4)	11	(19.3)	0	(0.0)	1	(3.6)
Progress	0	(0.0)	2	(2.7)	0	(0.0)	0	(0.0)	0	(0.0)
Astronaut hero	0	(0.0)	2	(2.7)	0	(0.0)	0	(0.0)	6	(21.4)
Lessons from history	2	(2.5)	2	(2.7)	7	(12.3)	0	(0.0)	3	(10.7)
Other	7	(8.9)	6	(8.1)	7	(12.3)	0	(0.0)	5	(10.7)
Total	79	(100.0)	73	(100.0)	57	(100.0)	0	(100.0)	28	(100.0)

Table 4-11. *New York Times* coverage frame frequency per article focus

	Policy/ Funding	(%)	Mission	(%)	Columbia	(%)	Tech/ Science	(%)	Other	(%)
Policy	5	(20.0)	1	(2.3)	3	(6.3)	0	(0.0)	0	(0.0)
NASA in the pub. eye	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(9.1)
Tech. and scientific	5	(20.0)	17	(39.5)	8	(16.7)	12	(75.0)	4	(36.4)
Funding/ budget	0	(0.0)	0	(0.0)	1	(2.1)	0	(0.0)	0	(0.0)
Return to flight	1	(4.0)	1	(2.3)	7	(14.6)	0	(0.0)	0	(0.0)
Internal changes	6	(24.0)	0	(0.0)	4	(8.3)	1	(6.3)	1	(9.1)
Industry	1	(4.0)	0	(0.0)	1	(2.1)	1	(6.3)	0	(0.0)
Safety	0	(0.0)	13	(30.2)	10	(20.8)	0	(0.0)	0	(0.0)
Progress	1	(4.0)	2	(4.7)	0	(0.0)	0	(0.0)	0	(0.0)
Astronaut hero	0	(0.0)	2	(4.7)	0	(0.0)	0	(0.0)	1	(9.1)
Lessons from history	3	(12.0)	1	(2.3)	3	(6.3)	0	(0.0)	0	(0.0)
Other	3	(12.0)	6	(14.0)	11	(22.9)	2	(12.5)	4	(36.4)
Total	25	(100.0)	43	(100.0)	48	(100.0)	16	(100.0)	11	100.0)

Table 4-12. *Florida Today* coverage total source frequencies per frame

	News worker	(%)	Educational Expert	(%)	Gov. Expert	(%)	CAIB	(%)	Other Gov. investigator	(%)	NASA Official	(%)	Astronaut or Relative	(%)	NASA Technical	(%)
Policy	0	(0.0)	4	(12.9)	14	(15.4)	2	(6.3)	1	(50.0)	8	(3.9)	0	(0.0)	0	(0.0)
NASA in the public eye	0	(0.0)	0	(0.0)	3	(3.3)	0	(0.0)	0	(0.0)	1	(0.5)	0	(0.0)	0	(0.0)
Technical/ scientific	0	(0.0)	0	(0.0)	0	(0.0)	3	(9.4)	0	(0.0)	22	(10.8)	10	(25.0)	8	(18.2)
Funding/ budget	1	(100)	12	(38.7)	17	(18.7)	3	(9.4)	0	(0.0)	2	(1.0)	0	(0.0)	1	(2.3)
Return to flight	0	(0.0)	1	(3.2)	5	(5.5)	10	(31.3)	1	(50.0)	26	(12.7)	14	(35.0)	7	(15.9)
Internal changes	0	(0.0)	0	(0.0)	3	(3.3)	2	(6.3)	0	(0.0)	5	(2.5)	1	(2.5)	0	(0.0)
Industry	0	(0.0)	9	(29.0)	36	(39.6)	0	(0.0)	0	(0.0)	26	(12.7)	0	(0.0)	11	(25.0)
Safety	0	(0.0)	2	(6.5)	3	(3.3)	5	(15.6)	0	(0.0)	82	(40.2)	7	(17.5)	11	(25.0)
Progress	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	2	(1.0)	1	(2.5)	1	(2.3)
Astronaut hero	0	(0.0)	1	(3.2)	0	(0.0)	0	(0.0)	0	(0.0)	2	(1.0)	1	(2.5)	2	(4.5)
Lessons history	0	(0.0)	1	(3.2)	2	(2.2)	2	(6.3)	0	(0.0)	11	(5.4)	5	(12.5)	2	(4.5)
Other	0	(0.0)	1	(3.2)	8	(8.8)	5	(15.6)	0	(0.0)	17	(8.3)	1	(2.5)	1	(2.3)
Total	1	(100.0)	31	(100.0)	91	(100.0)	32	(100.0)	2	(100.0)	204	(100.0)	40	(100.0)	44	(100.0)

Table 4-12. Continued

	Non-NASA Technical	(%)	Anonymous	(%)	NASA Spokesperson	(%)	Non-NASA Spokesperson	(%)	Citizen	(%)
Policy	1	(2.9)	2	(6.9)	0	(0.0)	2	(6.7)	0	(0.0)
NASA in the public eye	0	(0.0)	4	(13.8)	0	(0.0)	3	(10.0)	0	(0.0)
Technical/ scientific	0	(0.0)	2	(6.9)	8	(30.8)	3	(10.0)	0	(0.0)
Funding/ budget	7	(20.0)	6	(20.7)	0	(0.0)	4	(13.3)	1	(4.5)
Return to flight	2	(5.7)	7	(24.1)	2	(7.7)	0	(0.0)	0	(0.0)
Internal changes	0	(0.0)	0	(0.0)	2	(7.7)	0	(0.0)	0	(0.0)
Industry	13	(37.1)	0	(0.0)	5	(19.2)	3	(10.0)	8	(36.4)
Safety	4	(11.4)	0	(0.0)	7	(26.9)	2	(6.7)	4	(18.2)
Progress	0	(0.0)	0	(0.0)	0	(0.0)	5	(16.7)	0	(0.0)
Astronaut hero	0	(0.0)	0	(0.0)	0	(0.0)	1	(3.3)	1	(4.5)
Lessons history	1	(2.9)	1	(3.4)	1	(3.8)	2	(6.7)	2	(9.1)
Other	7	(20.0)	7	(24.1)	1	(3.8)	5	(16.7)	6	(27.3)
Total	35	(100.0)	29	(100.0)	26	(100.0)	30	(100.0)	22	(100.0)

Table 4-13. *New York Times* coverage total source frequencies per frame

	News worker	(%)	Educational Expert	(%)	Gov. Expert	(%)	CAIB	(%)	Other Gov. investigator	(%)	NASA Official	(%)	Astronaut or Relative	(%)	NASA Technical	(%)
Policy	0	(0.0)	9	(12.9)	7	(14.3)	0	(0.0)	0	(0.0)	8	(4.5)	3	(8.3)	0	(0.0)
NASA in the pub. eye	4	(80.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(50.0)	2	(1.1)	0	(0.0)	0	(0.0)
Tech./ Scientific	1	(20.0)	27	(38.6)	2	(4.1)	9	(20.5)	0	(0.0)	65	(36.3)	9	(25.0)	22	(44.9)
Funding/ budget	0	(0.0)	0	(0.0)	3	(6.1)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Return to flight	0	(0.0)	2	(2.9)	1	(2.0)	4	(9.1)	0	(0.0)	18	(10.1)	1	(2.8)	0	(0.0)
Internal changes	0	(0.0)	11	(15.7)	13	(26.5)	2	(4.5)	0	(0.0)	23	(12.8)	0	(0.0)	0	(0.0)
Industry	0	(0.0)	2	(2.9)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	3	(6.1)
Safety	0	(0.0)	7	(10.0)	2	(4.1)	6	(13.6)	0	(0.0)	31	(17.3)	13	(36.1)	5	(10.2)
Progress	0	(0.0)	2	(2.9)	2	(4.1)	0	(0.0)	0	(0.0)	4	(2.2)	4	(11.1)	0	(0.0)
Astronaut hero	0	(0.0)	5	(7.1)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.6)	0	(0.0)	1	(2.0)
Lessons	0	(0.0)	3	(4.3)	7	(14.3)	1	(2.3)	1	(50.0)	8	(4.5)	1	(2.8)	1	(2.0)
Other	0	(0.0)	2	(2.9)	12	(24.5)	22	(50.0)	0	(0.0)	19	(10.6)	5	(13.9)	17	(34.7)
Total	5	(100.0)	70	(100.0)	49	(100.0)	44	(100.0)	2	(100.0)	179	(100.0)	36	(100.0)	49	(100.0)

Table 4-13 Continued

	Non-NASA Technical	(%)	Anonymous	(%)	NASA Spokesperson	(%)	Non-NASA Spokesperson	(%)	Citizen	(%)
Policy	2	(5.6)	2	(40.0)	2	(3.6)	0	(0.0)	0	(0.0)
NASA in the pub. eye	0	(0.0)	1	(20.0)	0	(0.0)	0	(0.0)	0	(0.0)
Tech./ Scientific	13	(36.1)	1	(20.0)	13	(23.2)	4	(14.3)	3	(16.7)
Funding/ budget	0	(0.0)	0	(0.0)	0	(0.0)	2	(7.1)	0	(0.0)
Return to flight	2	(5.6)	0	(0.0)	3	(5.4)	2	(7.1)	0	(0.0)
Internal changes	0	(0.0)	0	(0.0)	5	(8.9)	0	(0.0)	0	(0.0)
Industry	3	(8.3)	0	(0.0)	5	(8.9)	3	(10.7)	0	(0.0)
Safety	3	(8.3)	0	(0.0)	7	(12.5)	0	(0.0)	0	(0.0)
Progress	3	(8.3)	0	(0.0)	2	(3.6)	1	(3.6)	0	(0.0)
Astronaut hero	0	(0.0)	0	(0.0)	1	(1.8)	2	(7.1)	9	(50.0)
Lessons	4	(11.1)	1	(20.0)	0	(0.0)	3	(10.7)	0	(0.0)
Other	6	(16.7)	0	(0.0)	18	(32.1)	11	(39.3)	6	(33.3)
Total	36	(100.0)	5	(100.0)	56	(100.0)	28	(100.0)	18	(100.0)

CHAPTER 5 DISCUSSION AND CONCLUSION

This research investigated how a local versus national newspaper framed the coverage of the shuttle program. Coverage included news, feature, columns and editorial stories to gain a full spectrum of reporting. Studying the range of coverage of the shuttle program in a local versus national newspaper highlights the importance of media's role as an information provider and probable agenda-setter for the general public on the shuttle program's policies and developments.

The first question in the study asked how the focus of the coverage in the two newspapers differed. The Columbia details focus coverage dominated in both newspapers. This parallels the fact that in February 2003 alone, there were 58 articles, which made up 15.3% of the entire sample (Table 4-1). This is not surprising. Purdum (2003) offered one explanation for this. After the Columbia accident, the nation was disgruntled with NASA and preoccupied with the impending crisis in Iraq, so the public only took interest in the shuttle program when failures occurred (Purdum, 2003).

Another reason why this topic dominated the coverage deals with its newsworthiness level. Perhaps this is a result of the media setting the agenda for reporting NASA's events as sensationalistic, rather than concentrating on the full spectrum of stories about the shuttle program's developments and policies. The Columbia accident had elements of the human interest factor, the conflict, and the unusual circumstance, which, according to Shoemaker and Reese (1996), are some of the main elements of a story that determine its overall news value. These newsworthiness factors could be why the disaster received more media coverage than any other shuttle program topic in the sample studied. This may also be why a large percentage of the program's coverage was in 2003. After the disaster was old news, coverage of it and the

shuttle program fell, perhaps because newspapers' gatekeepers felt the public no longer would be interested in coverage about the program since there was no longer a disaster with which to link it.

Another interesting finding is that the *New York Times* covered technical topics much more frequently than *Florida Today*. Perhaps this is because the Space Coast community readers are already familiar with the technical aspects of the shuttle program, since many of them work at the Kennedy Space Center or for its surrounding area contractor companies, while readers of a national paper are likely to have much broader backgrounds and education and be less familiar with these aspects. Thus, focusing more on explaining technical shuttle program functions and phenomena would be appropriate for the national paper. Another possible reason for the dominance of the technical and scientific focus in the *New York Times* sample is that *Florida Today* editors may have taken out the technical details in the coverage. Perhaps another possibility is that *Florida Today* journalists may have been less skilled in science journalism than the *New York Times* staff. The training of science journalists would make an interesting supplementary investigation.

The second question sought to find differences and similarities in the frames found in the local and national coverage. It is neither surprising that the safety frame was found most frequently in the overall sample nor that it dominated in the *Florida Today* coverage. Perhaps this is a result of the post-Columbia media surge to report the urgency of NASA to make sure future flights would be safer, and the tragedy of the Columbia disaster, a newsworthy human interest topic. If Crawley's (2007) claim is true, that local news has a stronger effect on social discourse, perhaps journalists highlighted safety issue more in local coverage to promote discourse, and as a result, safety changes.

It is also not surprising that the industry and return to flight frames dominated local coverage. These were topics of interest to the Kennedy Space Center employees, many of whom were involved with work that depended on the well-being of the aerospace industry and a safe return to flight of the shuttle.

It seems that the *Florida Today* staff successfully put these issues of safety, industry, and the return to flight at the top of their agendas. Elements of drama and uncertainty in the coverage topics, such as the CAIB's safety investigations, how the shuttle program would affect local industry, and return to flight developments, could have been powerful tools employed by *Florida Today* journalists. They may have used these safety, industry, and return to flight frames to keep KSC readers in suspense about how their careers would be impacted by these issues. Or, it just may be that this newspaper was reflecting the dominant headlines of the topic at the time. Perhaps a future study of the positive, negative, or neutral valence found in this coverage would shed more light onto the post-Columbia sentiments portrayed by the media, local KSC employees, and national policy and funding decision makers.

One other interesting observation about the return to flight frame was that it was not as prevalent in the coverage as it could have been. This may be true because NASA may not have improved its policies and internal structure since its two previous accidents. In the section, "NASA's Shuttle Program Since Columbia," several reasons were presented for why NASA's ineffective Internal culture, including its management as well as funding structures, may have contributed to the two shuttle accidents. Some of these reasons included the ineffective hierarchical nature of NASA's management, ineffective internal communication between managers, and ineffective risk and safety assessment (Garner, 2006; Dombrowski 2006). Thus,

if the agency had improved its internal culture, and the media covered this improvement, perhaps there would have been a higher percentage of return to flight frame articles seen in the coverage.

Another finding is that several claims related to framing discussed previously by science communication researchers were not supported by this study. Nisbet and Lewenstein (2002) found that the progress frame is frequently found in science topics in the media. Nelkin (1995) and Boot (1986) both found that the astronaut hero frame is prominent in their analyses of NASA coverage. However, in the current study, the progress frame and the astronaut hero frame were the two least frequently found frames in the overall coverage.

Similarly, Miller & Reichert's (2001) claim that stakeholders try to frame issues to affect the attractiveness of policy and policymakers. Yet this also was not supported, as seen by the infrequency of total policy frame articles found in the total coverage. This result signifies that the shuttle program was not being covered like a science topic in the news, but more as a business issue, as seen by the total larger percentage of policy frame articles, funding frame articles, plus industry frame articles combined.

The third question investigated whether frequency and types of sources cited directly and indirectly differed between the local and national coverage sample. It was found that directly cited sources dominated both types of coverage, not surprisingly. In the total sample, directly quoted sources appeared more than the percentage of indirectly quoted sources and sources that were quoted both ways combined. This result seems to validate the analysis of Gibson and Zillman (1993) and (1998), whose studies about direct quotes being more influential were previously discussed in the section, "Sourcing."

The media used more directly quoted sources, especially sources of "power" such as NASA officials and government sources, to relay some of the major issues of the coverage such

as the safety and managerial changes after Columbia, budget uncertainties, and return to flight efforts. The most frequently cited sources in the total sample were NASA officials. This category made up a large percentage of the total number of cited sources in the overall coverage. They were cited most often directly in both newspapers. Government officials were the next most frequently cited sources, also most frequently directly quoted in both newspapers. These results supported the claims of Soloski (1989), Brown, et. al. (1987), and Miller and Reichert (2001) about elite sources dominating news as well as those of Gibson and Zillman (1993) and (1998) about direct quotes being more influential.

Frequently citing these sources directly had many implications. It may have increased journalists' credibility of the issues and portrayed the necessity to policymakers of continuing the shuttle program and increasing its budget. Journalists at both newspapers could have used these sources because of the "immense power" they have to influence issues in the media (Sumpter & Garner, 2007, p. 457). Citing NASA officials who discussed CAIB's post-Columbia safety, administrative, and policy changes within NASA implies these topics were on the agendas of NASA officials and policymakers. Citing this discourse in the media was a step forward toward making these changes. Possibly, these steps were initiated in response to the CAIB's recommendations. Citing these experts could imply that shuttle program improvements were on the agendas of policymakers, NASA officials, and the media. Perhaps citing these experts increased public support for these changes and the program. Citing them also supports the idea that the national paper may have provided strong policy coverage that in turn attracted the support from policymakers and Congress for the program since Congressional funding and policy leaders are likely to read the *New York Times*.

The results also support several previously discussed claims made by Sumpter & Garner (2007). First, management and government sources are dependable because they tend to be “affiliated with businesses, bureaucracies, or other social groups that subsidize the preparation of news” (p. 457). The results also confirm their finding that overall government- and NASA-affiliated sources are prominent in Columbia coverage. Both source categories were found in that focus category. A final conclusion made by Sumpter & Garner and confirmed by these findings was that the lack of source representation from the main builders of the shuttle, astronauts, and other investigators not affiliated with NASA or the CAIB led to an “incomplete account, account, one which deletes needed context from any explanation of how the Columbia was lost” (2007, p. 470). This is true because astronauts and non-government investigators were among the least frequently cited sources in the overall coverage. Few shuttle builders were represented among the NASA and non-NASA technical experts cited.

However, Sumpter and Garner’s (2007) claim that news sources tended to be spokespeople such as PIOs rather than scientists and government officials was not supported by these results. Taking into account the total number of sources cited, NASA spokespeople and non-NASA spokespeople were cited almost as frequently as NASA technical experts and non-NASA technical experts in this analysis.

It is interesting that some sources were cited more in the national coverage than in local coverage. For example, educational experts received twice as much coverage in the total *New York Times* sample than in the total *Florida Today* sample. NASA spokespeople were also cited about twice as much in the total *New York Times* sample than in the total *Florida Today* sample. One reason why these sources appeared to be cited more in the *New York Times* sample may be because the average word count was larger for articles in that newspaper. Other reasons for the

dominance of these two source groups are unclear. Further analysis into sourcing would be needed to make conclusions about the dominance of these and other source groups in the coverage. No matter what the reasons are for this, the larger percentage of both of these source groups in the national coverage seems to contradict Crawley's (2007) claim that local media tend to include more varied sources than national elite media. This is especially true since there were almost twice as many articles coded in the local sample but about twice as many educational and NASA spokesperson sources found in the national sample.

It is surprising, however, that sources of technical expertise, including educational and NASA and non-NASA technical experts, were cited infrequently. The frequencies of these source categories were a distant third place after NASA officials and government sources. It would have been fitting for reporters to rely more on these technical and educational sources, probably more so in the national coverage, to help the general public understand the technical nuances of the launches and science policies. Perhaps the lack of reliance on technical and educational sources in shuttle program coverage furthers the previously discussed idea that the shuttle program is not being covered like a science issue in the media, but more as a business topic.

The fourth question asked whether sources were associated more frequently with any particular focus. NASA officials were cited frequently in funding focus articles. Similarly, in both types of coverage, government officials appeared mostly in the policy and funding focus articles. This is logical since the media would have cited facts and opinions from policy and NASA experts in articles whose focus it was to explain policy and funding issues.

Also, this supports the previously mentioned claims that these powerful sources increased the newsworthiness of articles. Besides the previously discussed news value characteristics,

Shoemaker and Reese (1996) also claim that prominence/importance, timeliness, and proximity affect newsworthiness. In this case, the media cited sources of power that appeared in coverage relevant to both Space Coast KSC personnel and national policymakers. These articles were written at a time when budget and post-Columbia safety policies were being decided. Other policy articles advocated support for increased funding during the shuttle's retirement, another topic relevant at the time to KSC staff and their careers.

The fifth question investigated whether frames were associated more frequently with any particular focus. Of the total number of policy and funding focus articles in *Florida Today*, almost half fit the industry frame. This again supports the idea that the *Florida Today* staff successfully put these issues at the top of their agendas perhaps because job cuts and other local or state-wide industry topics were important to KSC shuttle program staff.

The mission details focus articles and the Columbia details focus articles in both the local and national coverage were predominantly framed in a technical way. Many technically and scientifically framed articles in *Florida Today* fit the mission details focus category. In the *New York Times*, a slightly larger percentage of the technical and scientific details frame was associated with that focus. Similarly, many *Florida Today* and *New York Times* articles that were framed technically and scientifically fit the Columbia details focus. These results are expected for a technical topic near the top of the agenda of a public still curious about the details of the first shocking shuttle accident since Challenger and how subsequent launches will proceed.

The sixth research question investigated which sources were cited more frequently in any of the frames. In the local coverage, it is not surprising that government sources were frequently cited in the industry frame. Government sources are considered by many communications

researchers (for example, Miller and Reichert 2001) to be elite sources that dominate and influence public and policy opinions. It is logical that journalists would seek the opinions of these sources to discuss the political and social implications of the aerospace industry on the Space Coast community.

Similarly, in the local coverage, it is logical that NASA official sources were cited frequently in the safety frame. NASA officials, also considered to be elite and influential sources of power, were probably sought out by journalists in safety frame stories to express the urgency, risks, and progress associated with making the shuttle safer after the Columbia accident. They were also in the best position to express these ideas because they are the ones implementing and overseeing the safety efforts. It is unclear, however, why CAIB members were not cited more in this frame, as they conducted many safety investigations and made many recommendations to NASA on improving its safety.

In the *Florida Today* coverage, citizens could have been cited frequently in the industry frame because they were in the best position to comment on how the aerospace industry affects the local Space Coast community. Citizens were probably cited in the industry frame to capture local sentiments about the shuttle's retirement and the impact of job losses on Space Coast businesses and Kennedy Space center workers.

Journalists most likely sought out the expert opinions of educational sources in the funding and budget frame because many of them were space policy or aerospace engineering professors who conducted academic research on such topics through their universities. They were in a good position to understand and communicate the issues associated with the budget cuts and funding requests during post-Columbia policy, safety, and agency changes and during the shuttle retirement.

Also in the local coverage, it is reasonable that astronauts and CAIB members were found often in the return to flight frame. No other sources than astronauts or their relatives could better comment on the benefits or the adventure of being in space than those who had been or had family members who had been to space. Likewise, CAIB members were the main investigators of the agency, safety, procedural, and technical problems that caused the Columbia accident. After an intense investigation period, they made many recommendations for NASA about the preparations necessary for the shuttle to return safely to flight. It is logical for national journalists to seek out firsthand information from the CAIB members when relaying information to the public about the return to flight efforts taking place within the agency.

The results for sources found frequently in certain frames in the national coverage were also not surprising. It is logical that both NASA and non-NASA technical sources would speak most often in the technical frame coverage. Also, educational sources appeared in that frame frequently because they were in a favorable position to provide technical expertise. As stated previously, many of them were aerospace engineering university professors and researchers. Some of the educational sources performed tests on shuttle systems in preparation for safety assessments and launches. Likewise, for the safety frame, it is reasonable that the opinions of astronauts and their relatives were heard often. Citing sources that had already experienced the dangers of being in space was a way to emphasize the necessity of making future flights safer. Last, *New York Times* journalists cited citizens often in the astronaut hero frame because many were locals from the astronauts' hometowns who knew them personally and thus were able to comment on their heroism.

Practical Implications of This Study

This analysis adds to the mass communication scholarly literature dealing with the significance of framing theory, sourcing, local versus national coverage, and how the mass media

shape public opinion, policy, and funding. This study attempted to show that mass media play an important part in conveying this information to national policymakers, financial decision makers, local shuttle program staff and officials, and public taxpayers and voters, all of whom contribute to the shuttle program's policies.

One important implication of the study is that it is clear that the media focused largely on coverage of the Columbia accident and its aftermath, even though the keywords searched for this coverage were simply "NASA" and "shuttle program." The disaster dominated both local and national coverage of this topic. This is evident by the fact that the Columbia details focus was the largest focus category. Few articles in the sample discussed the general implications of the other 122 *successful* NASA shuttle missions flown (as of November 2008). Furthermore, the media covered the Columbia disaster more than any other event in the sample's five-year time span, including the nine successful launches in that period¹.

Perhaps the media have yet to put the full spectrum of NASA's activities on its agenda at the time studied in this sample. There are several reasons for this. One *New York Times* article discussed the current state of affairs in the U.S. during the post-Columbia time period that may have been diverting America's attention away from the shuttle program:

Washington's attention is elsewhere, on Iraq, on Al Queda. President Bush's interests in space exploration seems well contained. In two years in office he has never spent much time on the question of America's mission in space. If that moment comes, it will happen only after Admiral Gehman [head of the Columbia Accident Investigation Board] has found probable cause [for the Columbia accident]. And that may not be anytime soon. (Sanger, 2003, Feb. 12)

¹ The exception to this is the 2005 return to flight Discovery mission, which received extensive coverage (for example, Halvorson, 2005, June 25; Schwartz, 2005, Jan. 20; Schwartz, 2005, Jul. 27), being the first launch in two years since a major disaster and disappointment to NASA. Still, it did not receive as much coverage as the Columbia mission and its aftermath (Appendix B for a table of the missions since Columbia).

However, there was another notable development in the shuttle program that received attention from the media since the Columbia accident. That event was NASA's announcement that it planned to retire the shuttles between 2010 and 2011 and to redesign a new crew and cargo vehicle planned for launch in 2015 as part of the new Constellation Program. "As NASA marks its 50th anniversary," wrote *USA Today* journalist Traci Watson, "...space experts say NASA is adrift, its future disturbingly murky" (2008, Sep. 28). She goes on to say, "At Bush's direction, NASA plans to retire the shuttle in mid-2010, but there's support in Congress to keep the shuttle flying. That could cost \$4 billion a year. NASA needs that money to build the new moon vehicle" (Watson, 2008, Sep. 28). However, it was beyond the scope of this study to make any conclusions about the shuttle's retirement. Perhaps a future study could investigate the coverage and implications of this transition from the shuttle to the Constellation Program.

In addition, under the leadership of a new president, it will be interesting to see what happens during the transition to the Constellation Program and how media cover it. As seen in some of the 2008 *Florida Today* coverage, several presidential candidates used the shuttle program to further their political campaigns among Space Coast area voters. Candidates Rudy Giuliani (Giuliani, 2008, Jan. 26) and Senator Hillary Clinton ("Hillary," 2007, Oct. 10) expressed their policies for space exploration if elected at least in the *Florida Today* sample studied. Probably, the space policies of president-elect, Barack Obama, would have also been expressed in a larger coverage sample for the year 2008. According to Watson (2008, Sep. 28), Obama expressed the goal of sending humans back to the moon and promised to increase NASA's budget.

In summary, the frames, sourcing, and focus in this shuttle program coverage may affect how the public and policymakers perceive it. It can be argued that the media have a vital

responsibility to frame and report these issues in a way that will increase understanding of the shuttle program in a non-sensationalistic, accurate, balanced way.

Conclusions

It is hoped that this study will prompt further analysis about how space exploration is communicated in the media and how this affects budget, policies, and public support for space exploration. This is especially true now, since the year 2008 marks the 50th anniversary of NASA. Additionally, with shuttle program's impending retirement in 2011, and the NASA Constellation Program's new generation spacecraft launch in 2015, media's coverage of space events is likely to rise in the coming years due to these events.

The full range of NASA's successes and scientific developments of the shuttle program has not yet been demonstrated in the coverage sample studied. This is evident by the fact that coverage of the Columbia disaster and its aftermath was the dominant focus found in the articles in this sample. Possibly, NASA employees and policymakers at both the local and national levels will soon start to be impacted by the program more than ever as its retirement and transition into the Constellation Program draw near. Perhaps with these developments, a broader scope of the issues involved, including the science and the progress of space exploration, will be reported as these topics will gain prominence in the media's agendas.

Furthermore, the growth of the private space industry is likely to usher in a new era of science communication in the near future. Media will likely play a significant role in the exploration of space. The newly developing private space industry is gaining popularity with such events as the Google XPrize competition, a privately funded spacecraft development competition, and with a growing number of private tourists expressing interest in taking vacation flights to space. According to Babidge, Cokley, Gordon, & Louw (2005), news, advertisements,

and editorial reports will provide the initial public motivation for private space travel and tourism.

Indeed, now is an exciting time for space exploration. The media's coverage of it in the midst of the shuttle program's upcoming retirement, transition to the Constellation Program, and emerging era of private sector space exploration may advance public discourse and influence funding, policy, and public support for these topics. This is an optimal time to be exploring space industry coverage.

Limitations of This Study

While this study attempted to provide a thorough analysis of the frames, story focus, and sources used in recent shuttle program coverage, it is not without its limitations. Some limitations were related to the way the sample was chosen. The databases in this study only archived staff-generated stories, not wire stories. Using both wire- and staff-generated stories would have been useful because it would have covered the full spectrum of shuttle program stories.

Another limitation of the sample was that articles with less than 250 words were discarded. Those shorter stories covered mostly launches and mission details. Since shorter stories provide information faster and more concisely, many people prefer to read those to receive their news. Not studying such stories may have altered the results and conclusions of this study.

Several limitations related to sourcing should also be noted. Sources such as quoted documents and Web site texts were not counted during the coding process. Perhaps taking into account official reports and Web sites, such as those from the American Institute of Aeronautics and Astronautics, which were found frequently in coverage, might have affected the sourcing results because these documents provided useful official information on policy and technical issues. Furthermore, source titles were inconsistently reported. For example, John Logsdon was

cited as an educational expert from the George Washington University's Space Policy Institute in some articles, a CAIB investigation board member in others, and cited under both titles in others still. In that instance, sources were coded according to the only title given in each particular article. If both titles were given, that source was counted under the dominant title in the context of the article.

There were also several limitations to the framing techniques used in this analysis. First, photos and graphics, illustrations, charts were not analyzed for frames due to copyright blockages in the sample. Perhaps those techniques would have impacted the frame analysis. Also, the author did not examine the placement of keywords, sources, or quotes within the articles, or their length or frequency. Perhaps studying these features would have impacted the judgments of the dominant frames during coding.

Furthermore, perhaps not providing a list of frames would have allowed a wider spectrum of frames and focuses to be found. This may have resulted in a wider or different range of topics to be revealed in the coverage.

Suggestions for Further Research

This topic lends itself to further investigation. The study was a snapshot of existing coverage, and lacked the ability to confirm any possible effects of media's coverage on shuttle program policy and funding. The methods of this study were to describe the trends and issues in the coverage, not to investigate how they directly influenced policy, funding, or the public's perceptions. Perhaps a survey on space or shuttle program attitudes among the public or policymakers may have provided more in-depth insight into these issues.

Different techniques could also be used in a future study to see whether those results would differ from the ones in this study. Another analysis could replicate the research questions asked

in this study using different frame categories, or maybe those found more commonly in risk, investigation, and science reporting.

Yet another study could examine different media coverage of the same topic. Engineering and technical magazines may have provided longer features and in-depth discussions with more graphics and technical details of the disaster. Also, they may have framed the Columbia disaster or the agency changes afterwards differently than newspapers. Still another useful study could compare magazine *and* newspaper coverage to see whether the focus, frames, and sources of shuttle coverage differ. Also, the shuttle program coverage in other major newspapers, such as *USA Today* and the *Los Angeles Times*, would likely have been read by a similar demographic as the *New York Times*. These are considered “first-tier” news sources in the United States, which are read by a large population. They not only have an average daily circulation of at least one million, but also have the highest average daily circulation per issue per capita (Boykoff, 2007). These newspapers might have framed shuttle program coverage more liberally, progressively, or conservatively.

Still other studies also could examine different features of the coverage. For example, coverage in other communities impacted by the shuttle program, such as the Marshall Space Flight Center community in Huntsville, Alabama or the Johnson Space Center community in Houston, Texas, would provide useful insight into the way other local NASA communities are affected by the media’s communication of NASA. Investigating whether coverage of the shuttle or the space program has a positive, negative, or neutral valence would be useful to see whether media have portrayed both NASA’s achievements and tragedies over its 50 years of activity in a balanced, informative way. Future research could also focus more in depth on issues surrounding each shuttle launch separately, rather than grouping all of the post –Columbia

launches into only four foci and 11 frames. A future study could also examine the differences in coverage before and after the Columbia disaster happened.

APPENDIX A
BRIEF CHRONOLOGY OF THE NASA SHUTTLE PROGRAM THROUGH THE
CHALLENGER ACCIDENT

- **1950s:** On October 1, 1958, NASA was created, largely in response to the Soviet Union's successful space program and launch of the first man-made satellite on October 4, 1957, and a second Sputnik one month later (Byrnes, 1994; Purdum, 2003).

In the late 1950s and early 1960s the agency began to send other satellites to the Moon. "The romance and intrigue of the moon, coupled with the mythology of the frontier, gave Kennedy a way of depicting a march to the moon that was both exciting and concrete," wrote Kaufmann (1994). This represented not only President Kennedy's but also America's motivations for establishing the Apollo program to land man on the moon. This goal was also a response to the security and technology threat of the Soviet Union's advancing technological capabilities (Purdum, 2003).
- **1960s:** During the Apollo program of the 1960s, NASA projected an image of romanticism, stressing the ideas of expansion and exploration into the unknown and the heroism of the astronauts (Byrnes, 1994). The Apollo Program landed its two missions successfully on the Moon but also had a few failures. Alan Shepard Jr. became the first American in space aboard the Mercury capsule for a 15-minute suborbital flight on May 5, 1961. Less than a year later, the successful Project Mercury sent John H. Glenn Jr. into orbit on February 20, 1962, making him the first American to orbit the Earth. Following the successful Mercury and Apollo projects, on January 27, 1967, a fire on the Apollo 1 command module located atop a rocket on the launch pad killed all three of its crewmembers (Martin & Boynton, 2005; Kauffman, 2005). On July 20, 1969, Neil Armstrong and Buzz Aldrin flew aboard Apollo 11 and became the first humans to land and walk on the Moon, a feat accomplished by only 12 people to date.
- **1970s:** Three years later, another accident occurred on Apollo 13, the third manned lunar-landing mission launched on April 11, 1970 when a faulty oxygen tank exploded. The three crewmembers successfully returned to Earth in the functioning lunar module (Martin & Boynton, 2005).

Despite the failures, America's and NASA's determination to continue exploring space was evident. "The continuing influence of the frontier mythology is perhaps nowhere more evident than in the decision to develop the shuttle program," wrote Kauffman (1994), capturing the sentiment of NASA and the country that justified the inception of NASA's shuttle program.

NASA's shuttle program was officially launched on January 5, 1972 with a main focus of transporting satellites to and from space with humans to help with repairs and the transportation process (Kauffman, 1993). A fleet of five reusable shuttles were built and flown: Columbia, Challenger, Discovery, Atlantis, and Endeavor.
- **1980s:** The first of these shuttles not to make it back to Earth was the Challenger. Just 73 seconds after takeoff of the Challenger on January 28, 1986, the space shuttle exploded and all seven of its astronauts were killed. The cause was erosion of the seals (O-rings) between segments of the solid rocket booster (Smith, 2003b). Winsor (1990) cites many experts who also agree that the Challenger accident happened because of management-

level miscommunication (for example, Goldzwig & Dionisopoulos, 1986).

The Challenger was also the first shuttle to launch the Teachers in Space program. This began as a government project on August 27, 1984. That day, President Ronald Reagan announced NASA's search for the "first citizen passenger in the history of our space program, one of America's finest—a teacher" (Teachers, 2008). Reagan stated, "All of America will be reminded of the crucial role that teachers and education play in the life of our nation. I can't think of a better lesson for our children and our country" (Teachers, n.d., par. 1).

- **1990s:** After the Challenger accident, throughout the 1990s, NASA was back to launching successful shuttle missions. The Hubble Space Telescope, the first general focus orbiting observatory, was launched on April 24, 1990 aboard space shuttle *Discovery*. In 1993, the United States and other countries began building the International Space Station. Both contributed greatly to scientific discoveries in astronomy and cosmology, as previously discussed.

APPENDIX B
SHUTTLE LAUNCHES THE SINCE COLUMBIA DISASTER

Table B-1. Shuttle launches after 2003 Columbia disaster until March 2008.

Year	Shuttle	Launch Date
2007	Endeavour	03.11.08
	Atlantis	02.07.08
	Discovery	10.23.07
	Endeavour	08.08.07
	Atlantis	06.08.07
2006	Discovery	12.09.06
	Atlantis	09.09.06
	Discovery	07.04.06
2005	Discovery	07.26.05

APPENDIX C
CODE SHEET

(1) Article number: _____

(2) Date: __ / __ / 200__

(3) Newspaper: *Florida Today* = 1 *New York Times* = 2

(4) Word count:

(5) Focus of article (Select only one dominant focus):

To help readers understand and formulate shuttle program policy or funding opinions or explain the state of the shuttle program

To report a mission status update

To explain the details/investigations of Columbia disaster

To explain a technical or scientific idea about the shuttle

Other (Specify.)

(5a) List key words, symbolic language, concluding statement, or other phrases implying focus:

(5b) List Headline:

(5c) List Lead (if available):

(6) Story frame (Select only one dominant frame):

Program policy

Industry

NASA in the public eye

Safety

Technical and scientific

Progress

Funding/ budget

Astronaut Hero

Return to flight

Lessons from history

Internal changes

Other (Specify.)

(6a) List key words, symbolic language, concluding statement, or other phrases implying frame:

(6b) List Headline:

(6c) List Lead (if available):

(7) Sources (List number found per article in each corresponding category and column).

Source	Directly Quoted	Indirectly Quoted	Both Quoted
News Worker			
Educational			
Experts			
Government Experts			
CAIB Members			
Other Gov. Investigator			
NASA Official Source			
Astronaut or Relative			
NASA Technical source			
Non-NASA technical source			
NASA Spokesperson			
Non-NASA			
Spokesperson			
Anonymous			
Citizens			

APPENDIX D CODEBOOK

1. For article number, refer to the reference number in the upper right hand corner written in blue for each FT article and in pink for each NYT article.
2. For date, use date on article in the format mm/dd/yy.
3. Input “1” for *Florida Today* and “2” for *New York Times*.
4. Enter the number of words. If none is specified, use the approximation: eight words per line multiplied by the number of lines of text. Do not count the abstract in the word count.
5. For this category on the Excel file, input “1” in the most relevant focus category and “0” in the others. There should only be one dominant focus specified for each article. For 5a-5c, type what specifically leads to the conclusion of the chosen focus. The following focus explanations should be applied:

To help readers understand and formulate shuttle program policy or funding opinions or explain the state of the shuttle program: an article dealing with some budget or Congressional idea, policy, bill, or change necessary for the reader to understand the functions and procedures of the NASA shuttle program. This type of article could also explain the state of current management, funding, policy, scheduling, and project situations.

To report a mission status update: an dealing with articles that strictly provide event information on specific shuttle launch updates, landings, launch schedules, and scrubbed launches as the primary focus of the article, although most stories will contain information about shuttle missions as secondary focuses. Mark this focus only if it is the PRIMARY focus.

To explain a technical or scientific idea related to the shuttle: an article reported about why a foam piece fell off of the shuttle, why a launch was scrubbed due to technical reasons, and other similar ideas dealing with scientific explanations of shuttle components, malfunctions, and disaster investigations. This focus excludes any articles dealing with the malfunctions and disaster investigations of the Columbia disaster.

To explain the details/investigations of Columbia disaster: an article explaining results of the CAIB investigation, debris findings, shuttle disaster details, or any other information related to the Columbia disaster aftermath. The focus of these articles is to emphasize the mistakes from Columbia and causes and prevention methods for future flights or to help the reader piece together different reasons for the Columbia accident. This also includes articles dealing with Columbia safety or management changes and accident investigations.

Other: the option to input if the article focus does not fit into any of the above categories. Specify the focus if it does not fit the above descriptions.

6. Input “1” for the dominant frame in each article and “0” for the other frames for that article. There should only be one dominant frame for each article even though many frames can be identified for an article in some cases. For this analysis, frames were determined by analyzing key words, frequently appearing words, loaded words or phrases, themes, figures of speech, headlines, and sources to determine a dominant frame. For 6a-6c, type what specifically leads to the conclusion of the chosen frame. The following definitions, as discussed in that research, apply:

The program policy frame: this frame discussed Congressional decisions on shuttle policies, post-Columbia disaster policy changes, the future of the shuttle program in terms of the policy changes, and what effects the Columbia failure or the retiring shuttle program had on Congressional or other federal decisions, or 2008 presidential candidate shuttle policies.

The “NASA in the public eye” frame: this frame refers to articles dealing with the public’s perceptions of NASA. It discussed the public’s reactions to the NASA shuttle program, how it is communicated by NASA’s press and managerial representatives, and how it is seen by the public in general.

Technical and scientific frame: this frame discussed any scientific or technical ideas. Examples include articles discussing Columbia debris findings or tank problems of the 2005 Discovery launch.

The funding and economic future frame: this discussed Congress’ decisions on funding changes for the shuttle program and the overall economic future of the program.

The return to flight frame: this frame concentrated on the return to flight efforts of the shuttle program. This was during the time period right after the Columbia shuttle tragedy occurred and for the two years afterwards when all remaining scheduled shuttle launches were cancelled for safety investigations and inspections. The next shuttle was launched in 2005. This frame captured the excitement and skepticism about the shuttle’s return to the sky over the two years when it was grounded.

The internal organizational changes frame: this frame included articles that addressed the post-Columbia recommendations of the CAIB to change the management structure of the shuttle program in an effort to return to flight more effectively. This also includes articles dealing with safely recommendations of the CAIB or other government, NASA, or investigations officials. This frame also refers to changes made not as a result of Columbia or CAIB events, such as general management changes in the agency.

The program industry frame: this frame is defined by discussions of the privatization of space flight and its effects on the shuttle program and other shuttle issues impacting the aerospace industry or NASA. This frame may also discuss how the local Space Coast community and its industries are affected by the shuttle program or how the shuttle program affects local jobs and job cuts, especially during the shuttle’s upcoming retirement.

Safety frame: this refers to any article focuses on event descriptions and report the status of mission launches, landings, and scrubs in terms of the safely landing and launching shuttles, weather conditions supporting landing and launching decisions, and other shuttle hardware or other reasons for landing and launching. It also includes any articles emphasizing any type of safety concerns, changes, or procedures of the shuttle program.

The progress frame: this refers to the “celebration of new development” or breakthrough in the article (Nisbet and Lewenstein, 2002, p. 372). This frame would include articles that make optimistic statements about the future and achievements of the shuttle program or specific flights.

Astronaut hero frame: this frame, prominent in studies by (Nelkin, 1995) and Boot (1986), was added. This frame refers to articles expressing the tragic loss of a Columbia shuttle astronaut or any other astronaut in the shuttle program’s history. It may also express the martyrdom or other heroic qualities of an astronaut.

Lessons from history: this frame refers to articles making references to the Apollo, Columbia, or Challenger accidents, the moon landings, or other NASA historical events in an effort to explain how NASA has learned from or changed its policies and procedures since those past events, or comparing the current shuttle program to past NASA events. It includes articles that discuss advancements, mistakes, and lessons from those historical events.

Other: select this if no others apply. Specify what frame applies if none of the given ones match.

7. Source reference: For each article, input number total number of direct or indirect quotes by sources in the appropriate cell. If a source is not directly quoted but his or her opinion or a statement was paraphrased, this is defined as “quoted indirectly.” If the same source speaks only directly or only indirectly more than once, count it only once. However, if a source speaks both directly and indirectly, count it in the “both” category. If a panel or team is cited, count this as only one in the corresponding category cell. Choose the title that more directly fits the discussion or focus of that source’s quote. For example, if an article on the causes of the Columbia accident cites a Columbia Accident Investigation Board member who is also a physics professor, only code this source as a CAIB member, not an educational expert. Spokespeople for categories are not considered to be members of those categories. If a feature is written by the source, cite that source in the appropriate category as well as anyone he or she cites. “White House assessment report” or any other document or Web site quoting text is not considered a source. For example, a “NASA report said . . .” or “showed” is not considered a source. Here, source definitions include:

News workers: any sources affiliated with a news organization, whether print, visual, or radio and include production and editing personnel.

Educational sources: any primary, secondary, or university level sources affiliated with an educational institution. They may be university professors, or public school educators. These are not affiliated with NASA but may advise NASA. They can be space history professors,

scientists, or other academia experts qualified to comment on the scientific, economic, policy, or managerial aspects of the shuttle program. They also include such sources as academic researchers who have researched aspects of NASA or principals or other authorities of Space Coast schools.

Government experts: any elected or appointed government leaders, or advisers, excluding NASA employees, but including law enforcement, emergency workers, etc., from local, state, and federal jurisdictions. These also include Congressional and funding officials and House science subcommittee members. They may include members from the Economic Development Commission of Florida's Space Coast or other local or federal funding agencies, as well. These can also be groups or people who work for the government such as Florida Tax Watch, a nonpartisan government watchdog group.

CAIB sources: representatives of the Columbia Accident Investigation Board.

Other Government investigators: are nongovernmental accident investigators (current or retired). Investigators mentioned after the time of the disaster are not considered part of this category. "Investigators said..." is NOT considered a source.

NASA official: a NASA administrator or a NASA contractor with managerial authority (current or past) for a NASA department with leadership and administrative authority. "Michael Wetmore, who manages shuttle efforts, said that..." is an example.

NASA technical source: a shuttle specialist, scientist, engineer, a member of a NASA committee advisory board member, or researcher affiliated with or contracting for NASA. These exclude NASA technical sources and sources with managerial authority. Sources with managerial authority are listed as "NASA Official Sources." An "engineer who worked on the thermal shields of the shuttle," for example, is considered part of this category. A contractor supporting shuttle program operations, such as a Boeing or Lockheed Martin employee, is considered a NASA technical source because he or she is employed by NASA. A flight director, for example, is coded as an official source, even if he or she has technical expertise.

Non-NASA technical source: a shuttle specialist, scientist, engineer, member of a NASA committee advisory board member, or researcher NOT affiliated with NASA. These exclude technical sources and sources with managerial authority. This could include an aerospace industry analyst, for example, too.

Anonymous sources: those whose credentials are not given in the article. However, "NASA said..." is not considered a source because it does not differentiate between technical or managerial experts.

NASA spokesperson: a spokesperson of any NASA department or organization, whether technical or non-technical. PAO and PIO personnel are spokespeople. A contractor spokesperson, such as one from a Boeing, United Space Alliance, or Lockheed Martin, is considered a NASA spokesperson because contractors support NASA operations.

Non-NASA spokesperson: a spokesperson of any Non-NASA department or organization, whether technical or non-technical.

Citizens: include “ordinary” people. They may have witnessed, in person or through the media, some portion of a shuttle mission or the search for debris, even if their relatives or close friends are NASA officials or technical experts. All other common people who did have a title that fit a category above would be part of this category.

LIST OF REFERENCES

- Action needed, now. (2008, April 16). *Florida Today*, p. 1.
- Andrew, B. (2007). Media-generated shortcuts: Do newspaper headlines present another roadblock for low-information rationality? *Harvard International Journal of Press/Politics*, 12(2), 24-43.
- Babidge, S., Cokley, J. D., Gordon, F., & Louw, P.E. (2005). Making media work in space: An interdisciplinary perspective on media and communication requirements for current and future space communities. *International Journal of Astrobiology*, 4(3-4), 259-268.
- Balancia, D. (2008, April 1). Shuttle Art Launches Scholars. *Florida Today*, p. C1.
- Bay Area Houston Economic Partnership. (2008). Economic impact NASA JSC. Retrieved Sep. 5, 2008 from <http://www.bayareahouston.com/Home/NASAJohnsonSpaceCente/EconomicImpact/>
- Barnhart, K. G. (2003). The makers of meaning: National Public Radio and the New Long Journalism. *Political Communication* 20(1), 1-22.
- BBC NEWS. (2006, December 19). NASA and Google's cosmic union. Retrieved October 26, 2007, from <http://news.bbc.co.uk/2/hi/technology/6192523.stm?ls>
- Berelson, B. (1952). *Content analysis in communication research*. New York: Hafner.
- Berkowitz, D., and J. V. TerKeurst. (1999). Community as interpretive community: Rethinking the journalist–source relationship. *Journal of Communication*, 49(3): 125-36.
- Blomberg, R. D. (2003, Feb. 7). What really worried me about the shuttle. *New York Times*, p. A25.
- Blum, D. and M. Knudson. (1997). *A Field Guide for Science Writers*. New York: Oxford University.
- Boot, W. (1986). NASA and the spellbound press. *Columbia Journalism Review*, July/August, 23-29.
- Borchelt, R. E. (2001). Communicating the future: Report of the research roadmap panel for public communication of science and technology in the twenty-first century. *Science Communication*, 23(2), 194.
- Boykoff, M. T. (2007). Flogging a dead norm? Newspaper coverage of anthropogenic climate change in the United States and United Kingdom from 2003 to 2006. *Area*, 39(2), 470-481.
- Bragg, R. and Yardley, J. Once again, spaceflight's hometown loses its hero. *New York Times*, p. 1.

Broad, W. J. (1986, March 16). NASA aide assails methods of investigators. *New York Times*, 40. Retrieved September 22, 2007, from <http://www.lexisnexis.com.lp.hscl.ufl.edu/us/Inacademic/search/urlapiRunSearch.do?csi=6742&date=1986&searchTerms=NASA+aide+assails+methods+of+investigators&shr=t&secondRedirectIndicator=true&rand=0.5768306393090992>

Broad, W. (2005, Jul. 29) Despite problems, politically popular shuttle program may be hard to kill. *New York Times*, p. A18.

Broder, J. M. (2003, Feb. 7). NASA relinquishes authority to lead Columbia inquiry. *New York Times*, p. A1.

Broder, J. M. (2003, Feb. 8). “Significant” piece of shuttle’s wing is found in Texas. *New York Times*, p. A1.

Broder, J. M. (2003, Feb. 10). At NASA, a retreat from initial openness. *New York Times*, p. A21.

Brown, Bybee, Wearden, and Straughan. (1987). Invisible power: Newspaper news sources and the limiu of diversity. *Joumalism Quarterly*, 64, 45-54.

Burrows, W. E. (1999). *The new ocean: The story of the first Space Age*. New York: Modern Library Paperback.

Byrnes, M. E. (1994). *Politics and space: Image making by NASA*. Greenwood: Praeger.

Christen, T. C. & K. E. Huberty. (2007). Media reach, media influence? The effects of local, national, and internet news on public opinion influences. *Journal of Mass Communication Quarterly*, (54)2, 315-334.

Cialdini, R. (1997). Professionally responsible communication with the public: Giving psychology a way. *Personality and Social Psychology Bulletin*, 23, p. 675-83.

Clark, F., & D. L. Illman. (2003). Content analysis of *New York Times* coverage of space issues for the year 2000. *Science Communication*, 25(1), 14-38.

Crawley, C. E. (2007). Localized debates of agricultural biotechnology in community newspapers: A quantitative content analysis of media frames and sources. *Science Communication*, 28(3), 314-346.

Cushman, J. (2003, Feb. 6). Columbia’s final flight was not its first to encounter problems during reentry. *New York Times*, p. F1.

David, L. (2005, Feb. 11). Total tally of shuttle fleet costs exceed initial estimates. *Space.com*. Retrieved July 2, 2008, from http://www.space.com/news/shuttle_cost_050211.html

David, L. (2007, October 22). Entrepreneurs envision a sea change in commercial space. *Space.com*. Retrieved June 10, 2007, from <http://www.space.com/aol/071022-busmon-entrepreneurs.html>

Dean, J. (2008, Jan. 23). Nelson pushes space in D.C. *Florida Today*, p. B01.

DiBella, S. M., Ferri, A. J., and Padderud, A. B. (1991). Scientist's reasons for consenting to mass media interviews: a national survey. *Journalism Quarterly*, 68, 740-749.

Dombrowski, P. M. (2006). The two shuttle accident reports: Context and culture in technical communication. *Journal of Technical Writing & Communication*, 36(3), 231-252.

Dowie, M. (1998). "What's wrong with the *New York Times* science reporting?" *The Nation*, July 6, p.13-19.

Einsiedel, E. (1992). Framing science and technology in the Canadian press. *Public Understanding of Science*, 1, 89-102.

Entman, R.M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, 43, 51-58.

Excerpts from News Conference by NASA Space Shuttle Administrator. (2003, Feb. 5). *New York Times*, p. A18.

Excerpts from Report of the Columbia Accident Investigation Board. (2003, Aug. 27). *New York Times*, p. A18.

Facing, not minimizing, Urgent Shuttle Changes. (2003, May 15) *Florida Today*, p. 12.

Fern-Banks, K. (1996). *Crisis communications: A casebook approach*. Mahwah, NJ: Lawrence Erlbaum.

Florida Today. (2007). Retrieved August 1, 2008 from <http://www.floridatoday.com/content/services/welcome/about.shtml>

Flemming, P. (2006, May 31). Bush signs bill boosting state's space industry. *Florida Today*, p. A6.

Forbes, S. (2005). Needed: Space-age approaches to space. *Forbes*, 176(4), 31-31.

Gamson, W. A. (1988). The 1987 distinguished lecture: A constructionist approach to mass media and public opinion. *Symbolic Interaction*, 11(2),161-74.

Garner, J. T. (2006). It's not what you know: A transactive memory analysis of knowledge networks at NASA. *Journal of Technical Writing & Communication*, 36(4), 329-351.

Gibson, R. and D. Zillman. (1993). The impact of quotation in news reports on issue perception. *Journalism Quarterly*. 70, 793-800.

- Gibson, R. and D. Zillman. (1998). Effects of citation in exemplifying testimony on issue perception. *Journalism and Mass Communication Quarterly*. 70, 793-800.
- Glanz, J. (2003, Feb. 8). Cryptic clues and new questions face NASA in Columbia inquiry. *New York Times*, p. A1.
- Glanz, J. (2004, Jan. 27). Has the shuttle become NASA's '76 dart? *New York Times*, p. F1.
- Goldman, N. C. (1992). *Space policy: An introduction*. Ames: Iowa State University Press.
- Goldzwig, Steve, and George N. Dionisopoulos. (1986). "Explaining it to ourselves: The phases of national mourning in space tragedy." *Central States Speech Journal* 37(3), 180-92.
- Greene, C. S., & P. Miesing. (1984). Public policy, technology, and ethics: Marketing decisions for NASA's space shuttle. *Journal of Marketing*, 48(3), 56-67.
- Greenberg, D. (2001). *Science, Money and Politics*. Chicago: University of Chicago Press.
- Gustin, C., & J. Sheehy. (2003). Avoiding the seven sins of crisis communication. *Electric Perspectives*, 28(4), 5-6.
- Halvorson, T. (2003, May 21). Daring rescue may have saved crew. *Florida Today*, p. 6.
- Halvorson, T. (2003, May 21). NASA promotes criticized manager. *Florida Today*, p. 1.
- Halvorson, T. (2005, June 25). NASA ready to fly in. *Florida Today*, p. A01.
- Halvorson, T. (2005, Dec. 3). May launch in doubt. *Florida Today*, p. A01.
- Halvorson, T. (2006, Dec. 19). Spacewalk succeeds at last. *Florida Today*, p. A01.
- Halvorson, T. (2006, Dec. 11). Shuttle's heat shield impact. *Florida Today*, p. A01.
- Halvorson, T. (2007, Oct. 12). Managers back flight on Oct 23. *Florida Today*, p. A01.
- Halvorson, T. (2008, Feb. 9). Ding-free Atlantis closes in on station. *Florida Today*, p. A01.
- Hand, Mark. (2005). NASA's press staff steps up in face of growing scrutiny. *PRweek*, 8(32), 3. Retrieved September 25, 2007, from ABI/INFORM Trade & Industry database. (Document ID: 888887501).
- Hertog, J. and D. McLeod. (2001). A multiperspectival approach to framing analysis: a field guide. In S.Reese, O. Grandy & A. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world* (p. 139-161). New Jersey: Erlbaum.
- Hillary goes cosmic (2007, Oct. 10). *Florida Today*, p. A8.

Historical *New York Times* Takes You Back to 1851. (2004). *Newsletter of the Melvin J. Zahnnow Library, Saginaw Valley State University*, (9)2. Retrieved October 22, 2007 from <http://www.svsu.edu/library/newsletterw04/newYorkTimes.htm>

Houston, F. (1999). Space coverage: The second stage. *Columbia Journalism Review*, 37(5), 17.

Ismach, A., and E. Dennis. (1978). A profile of newspaper and television reporters in a metropolitan setting. *Journalism Quarterly*, (55)741.

Jurkowitz, M. (2003). In contrast with 1986, media views NASA as responsive to inquiries. *Knight Ridder Tribune Business News*, 1. Retrieved September 26, 2007, from ABI/INFORM Dateline database. (Document ID: 283833311).

Kassarjian H. (1977). Content Analysis in Consumer Research, *Journal of Consumer Research*, 4(1), 8.

Kauffman, J. (1994). *Selling outer space: Kennedy, the media, and funding for Project Apollo, 1961-1963: Studies in Rhetoric and Communication*. Tuscaloosa: University of Alabama Press.

Kauffman, J. (1999). Adding fuel to the fire: NASA's crisis communications regarding Apollo 1. *Public Relations Review*, 25(4), 421.

Kauffman, J. (2005). Lost in space: A critique of NASA's crisis communications in the Columbia disaster. *Public Relations Review*, 31(2), 263-275.

Kelly, J. (2005, June 28). By John Kelly. *Florida Today*, p. A01.

Kennedy, D. (2005). NASA: Back to eating seed corn. *Science*, 310(5752), 1245.

Kridler, C. (2003, Mar. 30). What-if scenarios part of NASA's spaceflight legacy. *Florida Today*, p. 1.

Kridler, C. (2006, Mar. 26). Few spectators for Columbia board inquiry. *Florida Today*, 11.

Krippendorff, K. (1980). *Content analysis: An introduction to its methodology*. Beverly Hills, CA: Sage.

Kunkel, Thomas. (2003). Lost in space? *American Journalism Review*, 25(2), 4.

Leary, W. E. (2000, Jan. 25). Mapping the earth, swath by swath. *New York Times*, p. F1.

Leary, W. E. (2004, Mar. 23). Shuttle Flew for decades with potentially fatal flaw. *New York Times*, p. A20.

Leary, W. E. (2005, Mar. 12). Bush nominates physicist to lead space agency. *New York Times*, p. A10.

Leary, W. E. (2005, Dec. 16). NASA Plans to Remove some foam from shuttle. *New York Times*, p. A38.

- Leary, W. E. (2008, Apr. 2). Shuttle retirement may bring loss of 8,600 jobs, NASA says. *New York Times*, p. A24.
- Leary, W. E. (2006, Mar. 1). NASA Hopeful for May Shuttle Launching. *New York Times*, p. A17.
- Leary, W. E. and Schwartz, J. (2004, June 15). NASA Is urged to widen role for business. *New York Times*, p. A1.
- LeDuff, C. (2003, Feb. 3). Gathering to mourn the hero few knew they had produced. *New York Times*, p. A13.
- León, J. (1997). The effects of headlines and summaries on news comprehension and recall. *Reading and Writing: An Interdisciplinary Journal* 9(2), 85–106.
- Logan, R. (2001). Science mass communication: Its conceptual history. *Science Communication*, 23(2), 135-163.
- Lowe, D. (2007, Dec. 11). Space coast's past...and future. *Florida Today*, p. A13.
- Marshall, S. (1986). NASA after Challenger: The public affairs perspective. *The Public Relations Journal*, 42(8), 17–23.
- Martin, R. & L. Boynton. (2005). From liftoff to landing: NASA's crisis communications and resulting media coverage following the Challenger and Columbia tragedies. *Public Relations Review*, 31(2), 253- 261.
- McDougall, W. A. (1985). *The heavens and the earth: A political history of the Space Age*. New York: Basic Books Inc.
- McKie, R. (January 2006). A wrong turning in space. *New Statesman*, 31.
- Miller, M., & B. Reichert. (2001). The spiral of opportunity and frame resonance: Mapping the issue cycle in news and public discourse. In S. Reese, O. Grandy, & A. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world*, 139-161. New Jersey: Erlbaum.
- National Aeronautics and Space Administration. (2007a). *Economic impact of NASA in Florida FY 2007*. Retrieved June 30th, 2008 from http://www.nasa.gov/centers/kennedy/pdf/217899main_Economic_Impact_NASA_2007.pdf
- National Aeronautics and Space Administration. (2007b). *Fields of Research*. Retrieved June 30th, 2008 from <http://pdlprod3.hosc.msfc.nasa.gov/A-fieldsresearch/index.html>
- National Aeronautics and Space Administration. (2008a). *Shuttle History and Missions*. Retrieved June 30th, 2008 from <http://aerospacescholars.jsc.nasa.gov/HAS/cirr/ss/2/4.cfm>

- National Aeronautics and Space Administration. (2008b). *Marshall Space Flight Center: Economic Impact and Community Involvement*. Retrieved June 30th, 2008 from <http://www.nasa.gov/centers/marshall/about/impact.html>
- National Science Board. (2002). *Science and Engineering indicators – 2002* (NSB-02-1). Arlington, Va: National Science Foundation. Retrieved October 1, 2007 from <http://www.nsf.gov/statistics/seind02/pdfstart.htm>
- NASA's daisy chain. (2006, Mar. 2) *Florida Today*, p. A12.
- Nelkin, D. (1995). *Selling science: How the press covers science and technology*. Rev. ed. New York: Freedman.
- Neveu, E. (2002). The local press and farmers' protests in Brittany: Proximity and distance in the local newspaper coverage of a social movement. *Journalism Studies*, 3(1), 53-67.
- New York Times Company: (2008). Retrieved from August 1, 2008 from <http://www.nytc.com/investors-nyt-circulation.html>
- Nisbet, M. C., and B. V. Lewenstein. (2002). Biotechnology and the American media: The policy process and the elite press, 1970 to 1999. *Science Communication*, 23(4): 359-91.
- O'Keefe, S. (2003, October 28). *Remarks by Administrator O'Keefe at Public Relations Society of America International Conference*. Retrieved September 22, 2007 from <http://www.nasa.gov/audience/formedia/speeches>
- Oppel, R. A. (2003, Feb. 12). Hearings open at capitol today with vast range of queries for NASA. *New York Times*, p. A30.
- Peterson, P. (2008, Jan. 23). NASA is confident sensor troubles fixed. *Florida Today*, p. A03.
- Peterson, P. (2008, Apr. 2). Job loss impact will reach beyond KSC. *Florida Today*, p. A1.
- Pollack, A. (2003, Feb. 10). Columbia's final overhaul draws NASA's attention. *New York Times*, p. A19.
- Priest, S. H. (2001). *A grain of truth: The media, the public, and biotechnology*. Lanham, MD: Rowman and Littlefield.
- Purdum, T. S. (2003). Loss of the shuttle: The space agency; giant leap to the moon, then space lost allure. *New York Times*, sec.1, p. 35. Retrieved September 26, 2007 from <http://query.nytimes.com/gst/fullpage.html?res=9403E7DE103BF93AA35751C0A9659C8B63&sec=&spon=&pagewanted=all>
- Reed, M. (2005, July 11). Americans have faith in aging shuttle. *Florida Today*, p. A01.
- Rensberger, B. (1997). *Covering science for newspapers. A field guide for science writers*. D. Blum and M. Knudson. New York: Oxford University Press.

- Revkin, A. C. (2003, Feb. 18). As debris and satellites multiply, U.N. steps in. *New York Times*, p. F1.
- Roefs, W. (1998). From framing to frame theory: A research method turns theoretical concept. Conference proceedings of the Association for Education in Journalism and Mass Communication: Baltimore, MD.
- Rutenberg, J. (2003). This time, NASA gives access and instant answers. *New York Times* (Late Edition), A.23. Retrieved September 26, 2007, from *New York Times* database. (Document ID: 283001461).
- Sanger, D. E. (2003, Feb, 12). Painstaking work ahead for investigative panel. *New York Times*, p. A28.
- Sanger, D. E. (2003, Feb, 7). Learning lessons of the Challenger inquiry. *New York Times*, p. A20.
- Schwartz, J. and Broder, J. M. (2003, Feb. 13) Engineer warned about dire impact of liftoff damage. *New York Times*, p. A1.
- Schwartz, J. (2003, Jul. 8). Test shows foam was likely cause of shuttle's loss. *New York Times*, p. A1.
- Schwartz, J. (2005, Jul. 27). Intense hunt for signs of damage could raise problems of its own. *New York Times*, p. A1.
- Schwartz, J. (2005, Jul. 31). For NASA, misjudgments led to latest shuttle woes. *New York Times*, p. 1.
- Schwartz, J. and Leary, W. E. (2008, Feb. 12). Experts to discuss U.S. space plan. *New York Times*, p. F3.
- Shkolyar, S. (2007). *The NASA shuttle program: Local and national newspaper framing*. Unpublished master's thesis. Gainesville, FL: University of Florida.
- Shoemaker, P. J., & Reese, S. D. (1996). *Mediating the message: Theories of influences on mass media content*. White Plains, NY: Longman.
- Smith, D. (2003a). Shuttle disaster tests planning, resources. *American Editor*,(830), 16-17. Retrieved September 26, 2007, from ABI/INFORM Global database. (Document ID: 322417081).
- Smith, M. S. (2003b). NASA's space shuttle Columbia: Synopsis of the Report of the Columbia accident investigation board. *CRS Report for Congress*.
- Soloski, J. (1989). Sources and channels of local news. *Journalism Quarterly*, 66(4), 864–70.

Space Policy Project Military Space Programs (2000). *Defense Support Program*. Retrieved online July 2, 2008 from <http://www.fas.org/spp/military/program/warning/dsp.htm>

Space Telescope Science Institute. (n.d.). *What A View: Hubble's "Eye" on the Cosmos*. Retrieved August, 1, 2008, from http://hubblesite.org/hubble_discoveries/10th/telescope_and_science/telescope/overview.shtml

Stolberg, S. H. (2003, Feb. 4). Even before disaster, the plan was to increase NASA spending. *Florida Today*, p. A25.

Stolberg, S. G. (2003, Feb. 4). Several Chief Lawmakers Vow a Rapid Rush for Money to Improve Shuttle's Safety. *New York Times*, p. A19.

Sumpter, R. S., & J. T. Garner. (2007). Telling the Columbia story: source selection in news accounts. *Science Communication*, 28, 455-475.

Tankard, J. (2001). The empirical approach to the study of media framing. In S. Reese, O. Grandy, & A. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world* (p. 139-161). New Jersey: Erlbaum.

Teachers in Space. (2008, Oct. 3) *History of Teachers in Space*. Teachers in Space. Nyack, NY. Retrieved on July 9, 2008 from <http://www.teachersinspace.org/history/history.htm>

Ten Eyck, T. A., P. B. Thompson, and S. H. Priest. (2001). Biotechnology in the United States of America: Mad or moral science? In *Biotechnology 1996-2000: The years of controversy*, edited by G. Gaskell and M. W. Bauer, 307-18. London: Science Museum.

Treise, D., & M. F. Weigold. (2002). Advancing science communication: A survey of science communicators. *Science Communication*, 23(3), 310-322.

Watson, T. NASA hits 'crossroads' at 50. *USA Today*. Retrieved October, 15, 2008, from http://www.usatoday.com/tech/science/space/2008-09-28-NASA_N.htm

Weaver, D. H., and G.C. Wilhoit. (1996). *The American journalist in the 1990s: U.S. news people at the end of an era*. Manwah: Lawrence Erlbaum.

Weigold, M. (2001). Communicating science: A review of the literature. *Science Communication*, 23(2), 164-193.

Wendt, G. (2003, Mar. 19). NASA left out safety experts. *Florida Today*, p. 2.

Wheeler, L. (2003, Mar. 3). Investigation could reshape space agency. *Florida Today*, p. 3.

Wheeler, L. (2003, August 27). 'Do we go forward?' *Florida Today*, p. 15.

Wheeler, L. (2004, April 9). Panel chides NASA for slow progress on safety team. *Florida Today*, p. 11.

Wilkins, L. (1987). *Shared vulnerability: Media coverage and public perception of the Bhopal disaster*. Westport, CT: Greenwood.

Wilford, J. (2005, Jul. 27). Watching liftoff, with an eye on the future. *New York Times*, p. A17.

Winsor, D. A. (1990). The Construction of Knowledge in Organizations: Asking the right questions about the Challenger. *Journal of Business and Technical Communication*, 4, 7- 20.

Wong, E. and Wayne, L. (2003, Feb. 3). Boeing and Lockheed, prime builders, face questions in shuttle inquiry. *New York Times*, p. A22.

Zelizer, B. (2003). *Extraordinary events, ordinary coverage: When images of the past shape journalism*. Paper presented at the Brigrance Forum, Crawfordsville, Indiana

BIOGRAPHICAL SKETCH

Svetlana Shkolyar was born in Kichinev, Moldova, in 1986. She and her family moved to Jacksonville, Florida, in 1991. She graduated Paxon High School for Advanced Studies with summa cum laude distinction and an International Baccalaureate Diploma in May 2004.

She then attended the University of North Florida where she was in the Honors program and majored in physics. There, she was awarded the Hercules scholarship, a UNF physics scholarship, and a NASA Space Grant Consortium Undergraduate Research Grant. At UNF, she was also a research assistant in the PICM Sensor Laboratory, a staff science writer for the campus newspaper, and president of the Society of Physics Students.

After graduating with a Bachelor of Science in physics with interdisciplinary honors and cum laude distinction in May 2007, she attended the University of Florida in Gainesville, Florida, where she pursued a master's degree in science communication. She also participated in two NASA Kennedy Space Center internships and a 4Frontiers, Corporation communication and technical writing remote internship.

She is now a freelance contributor to the UK-based technology magazine for the Institution of Engineering and Technology. In her career, she hopes to work for NASA and to communicate and contribute to knowledge about the universe.