Benefits Awareness: Educating Industry, Finance, and the Public About Space Commercialization

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Abstract

For space to be truly commercialized, businesses of all sizes and types must be involved, from foundries to agricultural research initiatives. Achieving this goal, however, requires three separate but integrated educational efforts to support it. The first is to educate industry leaders about the possibilities available through such research, while dispelling some of the myths and misinformation educate the financial community about the economic benefits that result both from the research and the leveraging of private research dollars through the use of space and microgravity research. The third is to educate the public about the tangible benefits that come directly to them from such efforts, the economic benefits to national economies from same, and the other less tangible benefits that will cascade from commercial operations. Together, these steps will educate and provide the framework necessary to help advance space commercialization.

1. History

The Space Product Development Program has been in existence for more than 5 years and is an outgrowth of commercialization efforts that formally began in 1984 with the establishment of the Office of Commercial Programs and 16 Centers for the Commercial Development of Space (CCDSs). This effort paved the way for current commercialization activities by exploring opportunities, involving industry, and otherwise taking on the difficult task of converting the hypotheses of space commercialization into reality.

As with all hypotheses, there were variances between theory and reality, and this program obtained the data and experience that has allowed a more mature approach to space commercialization to take place. Over the course of several reorganizations at NASA Headquarters, the Space Product Development Program (SPD) was established to build on this work and to take on the purely commercial aspects of such operations, as opposed to trying to do both NASA development and commercial activities. Several of the CCDSs made the transition to the new program and became Commercial Space Centers (CSCs).

Currently, there are 15 CSCs under the Space Product Development Program. Each Center is focused on a particular research area of interest to industry, not necessarily to NASA. While it is nice when research can be of benefit to both parties, the emphasis under SPD is on research that is industry-driven, industry-directed, and industry-funded. NASA does not directly fund any research through SPD, though there are no prohibitions against the CSCs or their Industry Partners seeking funding through Small Business Innovative Research (SBIR) grants or other mechanisms.

The CSCs are primarily located at institutions of higher learning that have a historic background in the area of research being performed. In this manner, the depth of knowledge from academia is combined with the real-world experience and knowledge of industry, and then multiplied by the resources that NASA can bring to bear, including low-cost and no-cost access to space and microgravity. The resulting synergy allows industry to leverage their research funding, often significantly, and obtain results that might otherwise not be possible in a timely and cost effective manner; it allows academia to benefit by having students and faculty take part in real-world, cutting-edge research while having the cash, in-kind, and other contributions from industry come into the CSCs and the host institutions; and, it allows NASA to achieve its goals of commercializing space to the fullest extent possible by obtaining the participation of a large number of non-aerospace companies, advancing U.S. educational efforts, benefiting the U.S. economy, and providing tangible benefits from space to the general public.

While full metrics are available in the SPD Annual Report[1], it is worth noting that the number of Industry Partners has remained above 130 for each of the last five years; that non-NASA funding to the CSCs has been more than $43 million for each of the last five years; that the ratio of non-NASA to NASA funding has remained at or above 3.3:1 for the last five years; and, that up to 30 percent of the payloads of the International Space Station – the current commercial set-aside – is being provided through the program for a cost of $15 million per year for hardware development, and with a staff of less than seven civil servants.

Despite its considerable successes, the program was not well known inside or outside of NASA. At the start of 1998, there were only sporadic attempts at industry, public, or internal outreach and education. It was clear that a coordinated plan was needed, and the decision was made to obtain the necessary personnel and resources to implement same.

2. Methodology

Given that outreach was, in effect, a tabula rasa situation, a strategic outreach plan, encompassing five years, was developed and initiated. The decisions behind the plan were made based on the following:

Assumptions

In its most basic terms, communications is often envisioned as a one-way process with information flowing from a source to a receiver, in much the same way that radio signal flow from a transmitter to the radio in your car. This rather simplistic model is not valid in either a mechanical sense or in terms of interpersonal communications. The information being put out by any source is not something flowing out to an eager receiver. Instead, there are a host of interference factors, feedback, and other impediments and enhancers in operation for any single communications channel that must be considered.

The prime model for consideration is the Westley-McLean Model[2], which documents how communications flow from a source through an intervening step and then to the recipient. This allows a more realistic flow to be charted, as well as allowing the interactions and feedback between all parties to be charted. While the classic model only addresses three steps, it is very much a multi-step model that can be, and has been, expanded.

This expansion has allowed what has been called the "gatekeeper" effect to be charted. In simplest terms, there are people between an event or message that decide which messages get passed along, and how those messages are presented. Each person in the chain serves as a "gatekeeper" since they can either send a story along, or stop it from going out. Each person also has the ability to shape or change that message as it is passed along, such that what does go out may or may not bear a close resemblance to what was originally presented, as anyone who has played the game "Gossip" in school knows.

Another theory that deserves consideration is the "expert" theory of communications. In this theory, given the wealth of information, sometimes referred to as information overload, people tend to specialize in particular areas of knowledge. Messages coming from someone who specializes in the area concerning the subject of the message tend to be believed more often without supporting data or confirmation. By the same token, a person getting a message about a subject and desiring confirmation of the

content will check it with someone they know is an "expert" in that area. It needs to be noted that these "experts" are not necessarily scientists or other academic experts, but average people who are known to have a particular interest in a given subject.

When "the public" is referred to in this paper and in day-to-day operations, it should be considered as being the key target audiences and not truly "the public." As noted by Rick Borchelt, "The literature the panel reviewed and the best practices it observed in use make very clear that there is no such thing as a one-size-fits-all public communication message for a mythical lay public[3]."

There are other theories and models that need to be considered, but these models and theories provide a good basic understanding of the communications process. One of the best overviews of research pertaining to science communications is the latest issue of Science Communication[4], which features reports from the "Research Roadmap" sponsored by NASA's George C. Marshall Space Flight Center to examine the scholarly research in the public communication of science and technology.

3. Operations

Obviously, no activity should be planned or operated as a single channel operation. Instead, any communications activity needs to be multi-tiered, with a variety of outreach and feedback channels coming into play. The basic assumptions behind the strategic plan developed for the SPD program are as follows:

• That the prime goal of this effort was to increase industry involvement with the program, and with space commercialization. Secondary goals were to increase public understanding of the benefits, and opportunities, resulting from commercial space research; increase awareness of, and support for, space commercialization within NASA and the government; and, to increase awareness of commercial space research benefits to the science media.

• That the key audiences for outreach were business and industry leaders, financial leaders, and key governmental policy makers. The public is a necessary component of the equation, but given the budgetary, political, and other constraints facing space commercialization, it was decided to make the public a secondary audience along with the media and other specialized groups.

• That all activities would be targeted activities, rather than attempts to reach all audiences with all materials.

• That a "newsroom" style approach would be taken to all communications.

• That a multi-level effort was required to achieve significant market penetration in the shortest possible time.

A multi-tiered approach is crucial to meeting the advertising "Rule of Three" that is speculated to have a psychological component[5]. In its shortest form, this rule of thumb states that a person has to see or hear an advertisement or message at least three times to recognize, retain, and remember it (positively, it is to be hoped). Indeed, Murray Raphel notes that "A series of 3 produces a rhythm that causes a positive and pleasing sense of completion of fulfillment."[6]

Repetition is not limited to advertising, as anyone who remembers repetition exercises from grade school can attest. It can and does have a strong bearing on learning and thought. Studies have shown that the larger the number of connections a person can make between new information and existing knowledge, the greater the chance that the new information will be retained, recalled and elaborated upon[7] [8] [9].

A multi-tiered approach offers the opportunity to both avoid the "gatekeeper" syndrome and to make use of the "expert" theory of communications. By placing information out through multiple channels, in multiple "languages," it is possible to circumvent a number of "gatekeepers" and ensure that the information reaches as many targets as possible in as many ways and as accurately as possible. This also has the advantage of increasing the odds that the information will get to "experts" who are trusted by members of the target audiences.

Just as a person speaking Urdu and a person speaking Swahili are not going to be able to communicate effectively, a person speaking science and a person speaking business are going to talk past each other. For effective outreach, it is crucial to produce materials that are

written in the "language" of the target audience, so that time is not wasted, and opportunities lost.

In addition, this material must be presented in a familiar way, so it was decided that journalistic feature and news writing formats, including use of a modified Associated Press style guide, would be used. The Associated Press style guide is the most used guide in the news media, with most major media outlets using it or some variant of it. With this in mind, some changes were made and a style guide started.

As with all such programs, there were a number of operational constraints. The prime constraint was that such a program was indeed new, and many of the people who have to approve such activities have little or no experience with industry practices, communications theory, or communications operations. Add to this a NASA budget that has shrunk significantly over the last ten years, resulting in an intense competition for funding, and the challenges facing development are readily apparent.

Based on these goals, operational restraints, theories, and research, an initial strategic effort was begun. Three key components were identified: print publications, a WWW site, and trade show representation.

Print

Print components are still a major component of any outreach operation. While considered by some to be "old fashioned," they do offer a number of important advantages.

First, research and anecdotal studies have shown that the generation that currently comprises the executive level of business, finance, and government leadership is less comfortable with the World Wide Web and related "new" media than are younger generations. Print products continue to be a prime means of reaching this level of management.

Secondly, print materials allow a targeted approach to be followed, so that publications can be written to specific audiences. While a targeted approach can and should be used on the WWW, print products allow both the product and the distribution to be refined.

Third, print materials enjoy a wide circulation well beyond the initial recipient, as these people often provide the materials to others that they feel will enjoy it or understand it more. Indeed, the Space Product Development program has seen evidence of such distributions well beyond secondary or even tertiary levels.

Fourth, in First World nations that are heavily "wired" there is a tendency to forget that a majority of the world is not this way, and that significant audience segments may be limited in terms of access for reasons of security, corporate policy, or technical resources. For all the advances in connectivity, the ability of the WWW to reach key targets at the decision making level of all industries is not guaranteed.

This said, it also must be noted that print materials require frequent updates, are expensive to produce, costly to distribute, and can offer perceptual drawbacks – such as an image of ecological or financial waste – if not handled correctly.

With these precepts in mind, a decision was made to produce an initial core of eight publications, each targeted to a specific audience, with a goal of also serving additional audiences on a more limited basis.

The initial core of the print materials consisted of a "public" brochure that provided a general overview of the program, its benefits, and why it was being done, and three "success" publications that covered the three research categories then used by the program. These were supplemented by a brochure that provided an executive summary of, and WWW site information for, each of the Commercial Space Centers then under the program; a contact sheet for the Commercial Space Centers that provides mail, voice, and other contact venues; and, an Industry Brochure that answers the questions most frequently asked by businesses.

While called the "public" brochure, the general document is written for a non-science executive. It provides key information about the program: why it is being done, the benefits that have come from it, a select list showing who is participating and the breadth of

participation, and the possibilities for the future. Since it is written for management, rather than for researchers, this executive summary is useful with a number of secondary audiences as well.

The "success" brochures are written for executive management and senior research managers in the given fields. While it is presumed that they are familiar with basic terms and conditions, and are scientifically literate in their area of responsibility, it is also understood that they are not scientists and may not be as familiar with research outside their immediate field. To help ensure that managers within a given area, such as biotechnology, understand the positive results in their particular specialization and that of other fields, strong efforts are made to ensure that the research is presented in general, rather than scientific, terms. This helps ensure that the material is both engaging and presented in the appropriate "language" for that group.

The Commercial Space Center brochure was developed in response to the need to provide a quick reference to each Center and the work being done by industry through them. Businesses often expressed an interest in more than one Center, and wanted a quick reference to each so that they could go through, read, research, and evaluate which Center, or Centers, they felt could benefit them. This brochure, though large in comparison with other print products, serves as a quick reference for the Centers.

In addition to the quick reference, it soon became clear that a smaller, inexpensive contact listing was needed. To that end, a black-and-white brochure was developed that was easy for a person to pocket, yet contained full contact information for each Center. This is less costly to produce than the larger brochure, easier to update, less expensive to ship, and eliminates the need to carry or ship business cards for each individual Center.

After this core was completed, additional materials were added based on feedback and observations at trade shows and other events. Bookmarks, one general and one each focusing on the prime research areas, were produced. A poster, with fact sheets on the back targeted to the general public and students, was also developed and has proven to be very popular. Once the WWW site was up and operational, a WWW card was developed and distributed to increase awareness of, and visits to, the site.

While these publications are effective and successful, an additional publication was needed. What was missing was a document that would provide a single source of information on the program, its accomplishments, and other information on a year-by-year basis. At the recommendation of NASA Headquarters, a corporate-style annual report was begun to provide this "one stop" publication. Pursuant to the goals and methodology discussed previously, it was decided to produce the report as if it were being done by a corporation so that it was familiar to business and financial leaders. This publication now serves as the driver for all the other publications, as the information in it is used to create all freestanding publications.

World Wide Web

Even with the limitations discussed above, the World Wide Web is rapidly becoming the key component to any outreach activity. Indeed, it is perhaps the vital means of reaching the "science interested" and "science attentive" segments of the public. According to Weigold, the Web brings four major advantages for science and technology – and space commercialization – communications: direct communication with the audience; elimination of traditional media space and time constraints; combines the best of traditional print and broadcast media; and, allows for a variety of direct interactions[10].

Interaction is the key to any successful Web site. Studies, from Salomon[11] to Tremayne and Dunwoody[12], have shown that the more interaction that occurs on a given site the higher the cognition and recall. Yet, it takes time and effort to build a truly effective and interactive site.

Another key point to consider is that the majority of Web users do not have the "latest and greatest" equipment and software, and that sites which use the "latest and greatest" in everything can effectively eliminate the majority of potential users. WWW sites should be geared towards the low-end user, rather than the high-end user. In this way, thought the site can be made very dynamic, appealing, and user-friendly, the maximum number of potential visitors can be accommodated.

With this in mind, it was decided to start fairly simply by mirroring the print publications and building from there. The one deviation from this was to have a "news" site that posted stories about the program, the research, and other topics of interest. Adhering both to the interactivity and to the need operate in a familiar environment, this news site was based on a journalistic model in terms of posting and style of writing. By making the writing "fun" with the maximum number of relevant links and illustrations, readers are drawn in, engaged, and given the maximum number of opportunities for interaction with the story and/or the site.

Trade Show Operations

The Commercial Space Centers are tasked with finding and retaining Industry Partners, who provide both direction and the bulk of funding for research activities conducted through the program. Prior to the initiation of this effort, each CSC was tasked with doing outreach and business development by themselves. Given that each CSC is independent of NASA, they were not able to take advantage of the incredible branding present in the NASA name. In addition, other limitations included a base funding that remains unchanged from 1985, so that no additional funds for such activities was available.

The obvious solution was that NASA should take a more active role and assist the CSCs in these efforts. As a part of the strategic plan that was developed, the CSCs were asked to provide a list of trade shows that they would like to attend, where it was felt that there were maximum opportunities to recruit new partners. The program office would then secure space at those events, provide the opportunity to share that space with the requesting CSCs, and initiate a more aggressive effort at recruitment. This not only provided an increased opportunity for the CSCs, but also allowed information about the program and its benefits to be presented directly to a large number of decision makers. To do this, a standard pop-up would be used and appropriate artwork and standard trade show products were obtained.

4. Results

The original five year strategic outreach and education plan was met in approximately 3.5 years. This serves as a foundation for future growth and expansion, not merely of outreach activities, but of the program and space commercialization.

Print

As discussed above, the print publications have been updated and expanded based on audience feedback, audience interest, and suggestions from key decision makers in industry and government. A variety of designs have been tried and new ideas continue to be experimented with for improvement.

The original public and success brochures have, for now, evolved into single sheets (one-sheets) instead of brochures. These are produced on a color copier, allowing information to be updated more easily and in a more cost-effective manner. This also allows design elements to be changed so that feedback can be collected on the reaction of various target audiences. While the color copier does have a higher per-page cost, it also allows a smaller number of each to be produced, reducing or eliminating the possibility of having large numbers of out-of-date documents in storage when changes are made. The smaller number and size of the documents also has a positive affect on storage needs.

While proper statistical research has not been possible because of constraints, direct feedback from various target audiences has been both helpful and positive. While no citations are available, the authors believe that the publications have facilitated a number of new partnerships, and will continue to be an important part of future partner recruitment.

World Wide Web

The Web site continues to be our unrealized potential. The site itself has grown to more than 100 individual pages, and has been redesigned once to update the look and feel. Viewership and participation continues to grow, though not at the rate desired. There are several reasons for this, ranging from promotion to the lack of needed resources for posting new stories at the rate originally set. This is an area that will be discussed and addressed during the creation of

the new strategic outreach plan for space commercialization.

One new initiative is planned in this arena. While there are numerous excellent sites devoted to science education, there appear to be no corresponding sites related to the business of science. Accordingly, a new initiative is being prepared for submission to NASA Headquarters to start an interactive, K-Adult educational site that focuses on the business of space, science, and space commercialization. While this proposal is extremely ambitious, it is possible because it will follow the NASA space commercialization model and bring together industry, academia, business trade organizations, NASA, and educators for its development.

Trade Show Operations

Trade show operations have proven to be extremely successful for the program. While the first trade show attended was quite small, the attendees were the proper target audience and some 18 solid contacts were made and new Industry Partners were signed by the requesting CSC.

This radical success, compared to the industry norms, has been replicated more than once. While one should never expect to make any significant contacts, much less sign a partner, at such an event, there have been few events attended that did not result in at least one solid contact, and many have resulted in partnerships.

This is important because trade shows are the most expensive undertaking for any outreach program. This multiplies if the program is fortunate enough to get involved with event planning, requiring frequent travel to planning meetings. Yet, taking part in such opportunities creates a number of opportunities, ranging from meeting key people within a given industry to developing the possibility of increased participation in the event without increased costs.

Originally, the program went out with a standard pop-up and standard artwork. This rapidly evolved to a novel pop-up display that makes use of foamcore panels that allow a cleaner, glossier look to be employed, along with the use of 3-D standouts to give depth and texture to that display. This display is redesigned each year, so that the display is "fresh" each year to the audiences.

To augment this display, and to take advantage of larger spaces that are becoming available to the program, a backlit display has been developed. This display evolved out of a loan from Dan Woodard of the Microgravity Research Program Office of a backlit display developed for another use. This display was not in constant use and could be borrowed, so it was used on a trial basis to evaluate its effectiveness, as well as the effectiveness of the backlit components. As a result, the program was able to obtain a backlit display that incorporated these improvements, providing significant cost- and time-savings.

5. Conclusion

NASA space commercialization outreach and education efforts have gone from zero to a respectable effort in a very short period of time. This effort is targeted, multi-tiered, and designed to present consistent messages in a variety of effective formats. The overall plan, along with individual components, was predicated on both proven research and proven professional experience. The use of targeted communications has been proven, and the success of this effort may lead to the development of even more narrowly targeted communications efforts.

The outreach program has grown and improved based on feedback from a variety of sources. Future plans will be based on the knowledge gained in this process, and on new research in the communications field.

With this and a sustained effort by NASA, space commercialization and its challenges and potential, will be better understood by both governmental and industry decision makers. The public will have a better awareness of the results of the program, if not of the program itself, and the stage will be set for future activities.

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[1] *NASA Space Commercialization, Space Product Development: The sky is no longer the limit... 2001*, NP-2002-02-19-MSFC.

[2] Westley, B. and McLean, M., "A Conceptual Model For Communications Research," Journalism Quarterly, Vol. 34, pp. 31-38, 1957.

[3] Borchelt, R., "Communicating the Future: Report of the Research Roadmap Panel for Public Communication of Science and Technology in the Twenty-first Century," Science Communication: An Interdisciplinary Social Science Journal, Vol. 23, Number 2/December 2001, pp. 194-211.

[4] *Science Communication: An Interdisciplinary Social Science Journal*, Vol. 23, Number 2/December 2001, Sage Publications.

[5] Mitchell, A., Ed., *Advertising Exposure, Memory, and Choice*, Hillsdale: Lawrence Erlbaum Assocciates, 1993.

[6] Raphel, M., *Direct Marketing*; Garden City: Hoke Communications, July 1998.

[7] Anderson, J., Cognitive Psychology and Its Implications, San Francisco: Freeman, 1990.

[8] Anderson, J. and Reder, L., in *Levels of Processing in Human Memory*, Cermak L. and Craik, F. Editors, Hillsdale: Lawrence Erlbaum Associates, 1979.

[9] Eveland, W. and Dunwoody, S., "Examining Information Processing on the World Wide Web Using Think Aloud Protocols," Media Psychology, Vol. 2, pp. 219-244, 2000.

[10] Weigold, M., "Communicating Science: A Review of the Literature," Science Communication: An Interdisciplinary Social Science Journal, Vol. 23, Number 2/December 2001, pp. 164-193.

[11] Salomon, G., "Cognitive Effects With and Of Computer Technology," Communications Research, Vol. 17, No. 1, February 1990, pp. 26-44.

[12] Tremayne, M. and Dunwoody, S., "Interactivity, Information Processing, and Learning on the World Wide Web," Science Communication: An Interdisciplinary Social Science Journal, Vol. 23, Number 2/December 2001, pp. 111-134.

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