Compiling Answers to Frequently Asked Questions about Space on Computer Networks

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Abstract

Widespread use of computer networks is creating new communities of people engaging in dialogue about common interests. In particular, a large public forum on spaceflight and related matters has emerged over the past decade. Members of the on-line space-interest community have recently prepared a new information resource, the "Frequently Asked Questions" list (FAQ), for the benefit of all users.

On the Usenet network, astronautics is discussed in the newsgroup "sci.space," which is read by an estimated 85,000 people worldwide. Its traffic is over 1200 messages, representing 2.7 megabytes, per month. To readers on the Internet and Bitnet networks, this traffic is duplicated in the "Internet SPACE Digest."

Since new correspondents join this community constantly, many messages concern topics which have often been discussed before. In addition, users vary widely in their knowledge of astronautics and its jargon. To minimize redundant queries, and to orient new readers of the newsgroup, an informal effort to compile Frequently Asked Questions was begun.

Volunteers scanned historical traffic in the newsgroup to identify the questions. Examples include: where to find on-line sources of orbital elements, planetary images, or NASA press releases; summaries of past planetary missions; and what happens to a human body exposed to vacuum. In many cases concise answers to the FAQs already existed, and they were included in the answer list. In other cases answers were formulated or updated by various contributors.

The FAQs and their answers, currently about 170 kilobytes in size, are revised and posted to the newsgroup on a regular basis. They appeared first in the summer of 1991. The project has involved at least 56 contributors to date. Many are professionals in astronautics and space science, but a majority are knowledgeable amateurs or students. The FAQ list serves as the collective memory of the networked spaceflight community and as a significant educational resource for its members.

Introduction

In recent years computer networks have seen explosive increases in extent, in capability, in the services they make available, and in the number of users they reach. "Computer-mediated communication" is helping to create new communities of far-flung people sharing similar interests. Newsgroups, digests, and mailing lists cover topics from dairy science to folk dancing to Chinese history to (naturally) computer hardware and software of every sort.

Astronautics is one such interest. For more than a decade discussion of astronautics has attracted a growing number of participants; like other computer-based communities, this group has problems, needs, and a social character. We will describe a cooperative effort within this community to create a network-wide space information resource, the "Frequently Asked Questions" (FAQ) posting, drawing on the talents of dozens of knowledgeable people. This project serves some needs of the network citizens, and may also be helpful outside the context of the networks. We will also explain how users of some networks can obtain the FAQ document and how they can become citizens of this on-line space interest community.

Space Forums on the Computer Networks

The forums we will discuss are available on Usenet, Internet, Bitnet/EARN, and other networks which can communicate with these by electronic mail. Nodes (computers) connected to these networks exist on every continent except Antarctica, and may be found in universities, corporations, government institutions, and a few private households. Commercial network services such as BIX and Compuserve also host discussions on astronautics, but in general their users comprise separate communities which do not yet mix with those on other networks.

The most widely read forum dealing with spaceflight and related matters is "sci.space," a Usenet newsgroup which was recently estimated to reach 85,000 readers [Reid 1992]. During March 1992, sci.space carried 1207 messages comprising 2.7 megabytes. A few other relevant Usenet newsgroups are listed below.

sci.space	General discussion of space
sci.astro	Astronomy topics
sci.space.shuttle	Shuttle missions, current events in space
sci.space.news	Postings of press releases, NASA mission status reports, solar and geomagnetic bulletins, etc.
talk.politics.space	Politics of spaceflight

Usenet's "netnews" is somewhat like a bulletin board operating on each system which is a part of the net. Contributors "post" submissions (called "articles" in netnews terminology) on their local machine, which sends it to other nearby machines. Similarly, articles sent from nearby machines are stored locally and may be forwarded to other systems, so that an article is posted locally and eventually reaches all the Usenet sites, and all readers, interested in receiving the newsgroup to which the article was posted.

Users on some other networks, including Internet and Bitnet, can participate through the "Internet SPACE Digest." Readers send to an administrator electronic mail messages requesting a subscription, as they would to a magazine (though there is no fee involved). After they are added to a mailing list, they receive regular issues of the SPACE Digest.

(Until recently the Digest was administered by an editor at Carnegie-Mellon University. In the spring of 1992 preparations were underway to move it to the International Space University. After this transition, details such as the subscription address may change. However, we believe that the current address at CMU will continue to work for a considerable time to come, perhaps months or years. Most probably it will forward messages to the correct address.)

Todd Masco, former editor of SPACE Digest, recently estimated [Masco 1991] that 200 to 300 people receive the Digest on Internet, and a query of Bitnet servers showed over 400 subscribers there. A few of these "subscribers" are corporate or academic redistribution points which may be serving dozens or hundreds of readers apiece.

To contribute his own article in SPACE Digest, a reader sends it by electronic mail to an Internet address. It is then included with other articles in a collection—typically five to fifteen, depending upon size. The resulting file becomes an issue of the Digest, typically 15 to 20 kilobytes long, which is automatically shipped to subscribers.

The machine at Carnegie-Mellon which distributes the SPACE Digest is a member of both the Usenet and Internet networks, and acts as a gateway between them. Articles posted to Usenet's sci.space are included in the Digest issues sent to subscribers. Articles received from users on Internet and other networks are not only included in the Digest, but also posted to sci.space. In this way, users on both sides of the gateway can read, and participate in, discussions with the entire community. Essentially, we can treat users of the two forums as a single group.

The SPACE Digest/sci.space forum is the largest and most general for astronautical discussion. In addition, there are a number of more specialized mailing lists, dealing with such topics as space technology, space legislation, investment in commercial space efforts, and so forth. More information about these is included in the FAQ list.

The Nature of the Community

A computer network community, defined as the set of people reading and posting articles to a particular newsgroup or mailing list, develops a social structure all its own. The issues we review here are not unique to the space forums, but affect all on-line forums to some extent.

There is a wide variation in the knowledge and interest levels of sci.space readers. Postings have appeared from grade school students and from astronauts. There is some excellent commentary, news, explanation of technical issues, and debate to be found among these messages. But because it is an open forum, where any user is free to say anything, articles are not of uniformly high quality! New users, when they begin reading a newsgroup or posting to it, find misinformation, rumors, and heated opinions in abundance. Many find this discouraging—some drop out, never returning to the newsgroup.

In our opinion, the sci.space forum is quite a valuable one despite these drawbacks. A posting citing erroneous facts is frequently followed by a posting from another user who corrects the error. When discussions grow too acrimonious, other readers will often urge the principals to calm down or to continue their discussion in private (exchanging mail messages rather than posting for everyone to read). Similar "peer pressure" may be applied if postings are irrelevant to the newsgroup. By such means, the overall quality of the newsgroup is maintained, so that it remains interesting and useful to many thousands of users.

To understand the motivation for compiling the Frequently Asked Questions document, we consider the stream of postings appearing in sci.space, approximately 40 articles per day. On a typical day, many of the messages will appear from veteran participants discussing science, engineering, or policy at a sophisticated level.

A few other messages originate with newcomers to the list—perhaps university students discovering the newsgroup for the first time—who have a strong interest in the subject, but little background. These readers may have difficulty following the discussions of more advanced users. (As with all astronautical communication, the problem of acronym-slinging is particularly acute!)

Occasionally, there may be casual inquiries by users who don't usually read the sci.space forum. They know that there are experts who read it faithfully, and that they may be able to get a quick answer to space questions by posting to the newsgroup.

Why FAQs?

As one reads the postings to sci.space, certain elementary questions or questions which arouse high interest among readers recur. Examples include:

- Where can I get Voyager images in computer-readable form?
- I'm going to Florida next month. Will there be a Shuttle launch while I'm there?
- Why doesn't NASA use the Saturn V instead of designing a new heavy launch vehicle?
- How long can a human being live unprotected in a vacuum?

Within hours after one of these questions appears on sci.space, it may be followed by dozens of responses as readers across the planet supply the well-known answers. If the question is controversial, partisans will rehash old arguments and trade shots with each other.

Reading this, the veteran user groans, "Not again!" as the computer screen becomes cluttered with redundant information. Articles which are "interesting" are buried somewhere in between the articles reiterating tiresome old discussions.

The Frequently Asked Questions list is an institution that has arisen in many Usenet newsgroups as a response to such situations. One or more of the newsgroup's experienced participants prepare a list of such questions and attempt to collect brief, but definitive, answers. The collection of FAQs and answers is posted to the newsgroup regularly, so that any user is likely to be able to find a fresh copy available on his node.

The FAQs benefit the network community in several ways. Most obviously, the list serves to prevent elementary questions from being posted—provided the questioner thinks to consult the FAQ list before posting! If not, veteran users can direct the questioner to the FAQ list or mail him an excerpt from it.

Readers who may be familiar with Usenet news, and with the FAQ convention, but not with the particular newsgroup—such as someone with a question about space who does not read sci.space regularly—will check for an FAQ list before posting their questions. This further cuts down on redundant queries.

As another benefit, the FAQ list can help bring a new reader into the society of the newsgroup by making him aware of facts and issues that are familiar to the majority of experienced readers. This shortens an education that might otherwise require weeks or months of reading the newsgroup to absorb. The FAQs may also provide references to books and articles which the motivated student can follow to probe the subject more deeply.

As participants in the sci.space newsgroup, we have recently been involved in preparing a large FAQ list to serve its readers.

Collecting the Frequently Asked Questions

Beginning in 1985, Eugene Miya of NASA Ames Research Center prepared responses to a short list of FAQs and arranged for software which posted them monthly. Miya also posted a monthly list of "netiquette" reminders to encourage smooth and orderly flow of discussion in the forums. Although Miya publicly urged his readers to improve upon his FAQ postings, his effort was not followed up by others for several years.

In late 1989 discussion began about preparing a more comprehensive list of FAQ answers. One method was to review several months of sci.space message traffic; a seasoned reader could recognized oft-covered ground and make a list of candidate FAQ topics. We posted such a list and other readers commented on it with suggestions of their own.

Many readers save individual postings that may be interesting or worth referring to in the future. A second method of gathering FAQs and answers is to review such a collection. We identified past postings that would be of interest to a wide readership, or which dealt with issues that came up repeatedly. Years of sci.space had provided a rich supply of text from which to choose. Related material from different authors was edited together (the various topic-specific bibliographies are the best example of this). These summaries were mailed back to the original authors for comment and changes. Few authors were asked to contribute anything new, as opposed to approving variations on something they had already contributed. Some, however, spontaneously supplied additional topics and material for the list during the editing process. We incorporated most of the text of Eugene Miya's earlier FAQ efforts into the new list.

The first draft of the FAQ list became available in February 1991, and regular postings began shortly thereafter. At present the FAQ files contain about 170 kilobytes of text. Their editor, Jonathan Leech, posts them to sci.space once a month. Roughly half the material overlaps the astronomical interests of sci.astro, so the relevant portions are "cross-posted" and appear in that newsgroup as well.

It is difficult to measure the effect that creation of this list has had on these newsgroups. Comments

FAQ Authors (Partial list)

Name	*Topics*
Richard Akerman	crater diameters
Ted Anderson	propulsion
Ron Baalke	planetary probe schedules
Timothy Banks	map projections, variable star analysis archive
Srinivas Bettadpur	tides
Mark Brader	Mariner 1 info.
Kieran A. Carroll	references for spacecraft design
Tom Chapin	planetary positions
Anthony Datri	PDS/VICAR viewing software
Stephen Dixon	shuttle audio frequencies
Dani Eder	Saturn V plans
Phil Fraering	propulsion
Terry Gaetz	N-body calculations, orbital dynamics
Steve Grandi	planetary positions
Dale M. Greer	constants
Wayne Hayes	constants
William Higgins	RTGs, publishers, shuttle landings, spysats, propulsion, "Face on Mars"
Tom Horsley	references for algorithms
R. Michael Jungclas	models
Larry Klaes	planetary probe history
Jon Leech	crater diameters
Todd L. Masco	SPACE Digest
Marc W. McConley	space careers
Eugene N. Miya	introduction, NASA contact info, started FAQ postings
Hal Mueller	map projections, orbital dynamics
Alan Paeth	map projections
Francis Reddy	map projections
Dave Rickel	orbit formulae
Bernie Rosen	Space Camp
Paul W. Schleck	AMSAT, ARRL contact info
Barry Schlesinger	FITS format
Peter Scott	RTGs
David Seal	CRAF schedule
Allen W. Sherzer	"Great Exploration" proposals
Willie Smith	photos
Henry Spencer	survival in vacuum, astronaut how-to, publication references, DC-X
Ray Sterner	planetary positions
Phil Stooke	planetary maps
Bill Thorson	FITS info
Craig E. Ward	space group contact info
Annalisa L. Weigel	SEDS info
Matthew P Wiener	Voyager history
Peter Yee	Ames archive server, propulsion

have been positive, and many users have submitted changes to make the list more accurate or detailed. A few new questions have been added as it becameclear that they were "frequently asked." Our sense is that the sci.space community is eager to contribute to the continuing evolution of the list.

Below we give an incomplete list of the authors. (Electronic mail addresses of these contributors are given in the FAQ files.) Authors of the current set of FAQs represent Canada, Japan, New Zealand, the United Kingdom, and the United States. The majority of the contributors are knowledgeable amateurs who have gathered information or written lucid explanations of a topic. We estimate, however, that about 15 of the 56 authors are professionals or graduate students in space science, astronomy, or space engineering.

In addition to the FAQ list, other recurring postings appear in sci.space and other space and astronomy newsgroups. More detail on access to these is given in the FAQ files.

A listing of space-related acronyms, compiled by Garrett Wollman, is of particular interest to new readers who are trying to follow ongoing discussions. Other regular postings cover satellite orbital elements, solar activity bulletins, amateur-radio satellite information, launch reports, and recommendations for telescope buyers. Press releases, mission status reports, etc. are posted by several users at ESA in Europe, NASA in the U.S., and ISAS in Japan. At the end of 1991, the Usenet newsgroup sci.space.news was created for such postings.

Although the FAQ list was created for users of computer networks, others may benefit from it as well. Much of the information contained in it is helpful to anyone who is trying to learn about astronautics. As such, it is a homegrown resource for space education which reaches a fairly large public. In one case [Neufeld 92a], the *Toronto Star* published allegations that the NASA space shuttle was a serious source of ozone destruction. C. Neufeld used information and references available in the FAQ files in quickly composing a rebuttal letter. The *Star* published this as well as several letters responding to it [Neufeld 92b].

Topics Covered by the FAQ List

Below we include a table of contents for the FAQ list. (The list itself is too long to include in this paper.) In contrast to FAQ lists for many other newsgroups, the sci.space FAQ has a somewhat unusual content in that most of the "answers" are not simple questions followed by simple answers; rather, it's mostly collected information about a variety of specific areas. Where possible a brief summary answering a question is given, but in many cases the FAQ also directs the reader, through references, to books, articles, or computer archives.

How to Obtain the FAQ List (and Other Network Resources)

A user's access to the major space forums is dependent upon which of the networks he uses. Here are methods for reading, and posting to, these newsgroups from various networks. In the following discussion we assume a user has the ability to send electronic mail to addresses on one or more networks. One *caveat:* The networks are rapidly growing and changing. This information may become outdated; it is correct and, we hope, reasonably stable at this writing.

Quarterman gives extensive information on how to send mail from one network to another [Quarterman 1990]. This information may enable users who are not on Usenet, Internet, Bitnet, or EARN to access these resources nevertheless.

Reading sci.space on Usenet

The newsgroup sci.space is often available on systems carrying Usenet news. "Newsreader" software is usually employed for reading and posting news articles; consult your local documentation or computer administrators for information on the newsreader in use at your site.

How to subscribe to SPACE Digest (for Internet users)

Internet readers who wish to read SPACE Digest should send a request message to the address

```
space-request+@andrew.cmu.edu
```

where a human editor will process it. The same address is appropriate for requests to be dropped from the SPACE Digest mailing list. (In the summer of 1992, as we noted, this address is expected to change to `space-request@isu.isunet.edu` at ISU.)

How to subscribe to SPACE Digest (for Bitnet/EARN users)

Although most Bitnet and EARN users can send mail to Internet nodes, the above method is *not* recommended. To reduce the load on gateway nodes that move mail between Bitnet and Internet, Bitnet readers should deal with automated servers running the LISTSERV program. One copy of the Digest is sent through the gateway to the LISTSERV server, which then distributes it across Bitnet to many subscribers.

Send a mail message whose body reads:

```
SUBSCRIBE SPACE Your_Name_Here
```

to the Bitnet address `listserv@uga`.

To be dropped from the redistribution list, send a message reading:

```
SIGNOFF SPACE
```

(There are several LISTSERVs which distribute the SPACE Digest on Bitnet and EARN. The one at node UGA may not be the nearest one to you; however, UGA will route your request to the nearest appropriate sister LISTSERV.) Send a message with HELP as the body to receive information on further LISTSERV commands.

How to Obtain the FAQ List

Usenet users may usually find the most recent version of the FAQ list in the sci.space newsgroup.

The FAQ list is also maintained in an archive at NASA Ames Research Center. Internet users, and others who are capable of sending mail to Internet addresses, may obtain a copy by sending electronic mail to

```
archive-server@ames.arc.nasa.gov
```

with suitable commands in the body of the message. Send a message with the command "`HELP`" in the body, and the archive server will reply with a mail message containing further information on its use.

To obtain the first of the sixteen FAQ files, send a message whose body reads:

```
send pub/SPACE/FAQ/faq1
```

The requested file will then be mailed to your network address. (In this instance the distinction between upper- and lower-case letters is important!) Substituting "`faq2`" for "`faq1`" in the subject line will obtain the second FAQ file, and so forth. At this writing there are fifteen FAQ files, so the last file in the complete set is "`faq15`."

Copies may also be obtained by the "anonymous File Transfer Protocol" method on the Internet node `AMES.ARC.NASA.GOV`. We will not describe the use of FTP here; it is a common arrangement for requesting files from Internet nodes. Consult your system administrator or local documentation for more information.

Conclusion

Electronic mail network use has expanded beyond narrow technical and academic communities. In the years to come it will influence millions of lives as the reach of such services grows.

Our experience in compiling the Frequently Asked Questions for sci.space represents an example of voluntary cooperation in this new kind of community. A large number of authors contributed to this document; in a sense it represents the accumulated experience of the people who make up the forum.

As a social device, the FAQs should help raise the new user to a higher level of sophistication, more able to comprehend and discuss the material covered by the newsgroup. They also prevent repetition of material already familiar to most seasoned users, thereby reducing traffic volume and increasing "signal-to-noise ratio," the subjective (and never quantified) fraction of interesting and worthwhile articles among the total posted to the newsgroup [Raymond 1991].

Conceived and created outside the traditional framework of classrooms and teachers, the FAQ list represents a unique educational resource. It offers not merely specific answers, but references to wider information which the motivated person can seek out. It also helps unlock other space-related resources of the network world to neophyte users. We look forward to improving the information in the FAQ files, and to welcoming many new participants as they join our electronic village.

Acknowledgements

We acknowledge Eugene Miya for his efforts in preparing and maintaining early versions of the FAQ list, and for inspiring us and others to undertake the present effort. We thank the co-authors of the list for their invaluable contributions, and for the spirit of generous cooperation which all have exhibited.

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