

PREFACE

The purpose of this publication is to enhance the ability of small businesses to compete effectively in Small Business Innovation Research (SBIR) programs. In order to participate in these programs, firms submit SBIR proposals to federal agencies in direct response to specific solicitations. Accordingly, the primary emphasis of this publication is on proposal preparation. As proposal submission is the culmination of a planning process, prudent firms devote attention to planning their proposal prior to the actual writing. This publication contains three chapters corresponding to a process through which your firm determines the suitability of SBIR participation, selects projects, and finally prepares proposals.

Chapter I describes the SBIR program and how it can relate to other aspects of your business.

Chapter II presents suggestions for gathering information necessary to determine the suitability of any project for an SBIR program. Such information includes information on federal agencies (who solicit research and development efforts), technology, and commercial markets.

Chapter III discusses specific items you should consider in preparing your proposal. The content of this chapter is based on information provided by technical evaluators within various agencies who reviewed SBIR proposals and on a sample of written evaluator comments.

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I. USING THE SBIR PROGRAM TO FURTHER BUSINESS DEVELOPMENT

A. What Is SBIR

Small Business Innovation Research (SBIR) programs fund research and development efforts of a high risk nature that may have excellent commercial potential.

The Small Business Innovation Development Act of 1982 (P.L. 102-567), and 1992 (P.L. 102-564), presents an exceptional opportunity for any innovator who is capable of conducting high-quality research and development (R&D). The purposes of the Act are to 1) stimulate technological innovation; 2) use small business to meet federal R&D needs; 3) encourage the participation by disadvantaged and minority persons in technological innovation; and 4) increase private sector commercialization derived from federal R&D.

Under the Small Business Innovation Development Act, each agency with an extramural R&D budget in excess of \$100 million must establish an SBIR program. The following agencies are currently participating in the SBIR Program:

- * Department of Agriculture
- * Department of Commerce
- * Department of Defense
- * Department of Education
- * Department of Energy
- * Department of Health and Human Services
(including the National Institutes of Health)
- * Department of Transportation
- * Environmental Protection Agency
- * National Aeronautics and Space Administration
- * National Science Foundation
- * Nuclear Regulatory Commission

Through its SBIR program, each agency will develop topics and release solicitations describing those topics. Proposals are submitted to the agency where they are reviewed and evaluated on a competitive basis. Each agency makes its own awards using contracts, grants, or cooperative agreements.

Under the law the SBIR program is a three-phase process.

Phase I is based on proposals solicited by participating agencies. These solicitations contain topics on which small firms are invited to submit proposals. The proposals describe the results the firm intends to attain, the approach the firm will take, and how it will prove the feasibility of its approach.

Phase I awards can be made upto \$100,000 for approximately a six-month effort. The purpose of Phase I is to show: 1) that the proposing firm can do high quality R&D; 2) that the proposed effort is technically feasible; and 3) that sufficient progress had been made to justify a much larger agency investment in Phase II. Phase I enables the agency to address these questions with relatively small agency investment, thereby increasing the efficiency with which federal R&D dollars in Phase II are utilized.

Those projects which complete Phase I can compete for Phase II funding to further develop the proposed idea. Phase II is the principal R&D effort, with a duration which normally does not exceed two years. Awards for Phase II are for \$750,000 or less.

Awards for Phase II are based upon the results of Phase I and the scientific and technical merit of the Phase II proposal. The object is to continue the R&D initiated under Phase I. However, the government is not obligated to fund any specific Phase II proposal. In order to fairly handle the problem of choosing between proposals of approximately equal merit, where the funds available to agencies do not permit funding all proposals, the Small Business Innovation Development Act mandates that commitments for follow-on funding from non-federal sources be given special consideration.

Formally, SBIR programs have a third phase. Where appropriate, Phase III is conducted by the small business (including joint ventures or R&D partnerships) to pursue commercial applications

of the R&D conducted in Phases I and II. Non-federal funds, including those obtained through exercising the follow-on funding commitment, support Phase III. Phase III may also be supported by non-SBIR funded R&D or production contracts with a federal agency for products or processes intended for use by the United States Government.

Small U.S. businesses are eligible to participate in the SBIR program if they are for profit and have 500 or fewer employees. This includes sole proprietorships, partnerships, joint ventures, associations or cooperatives. Nonprofit organizations are not eligible.

The primary employment of the principal investigator must be with the small business. He or she must spend more than one-half of his or her time employed by the small business at the time of award and during the conduct of the effort.

During Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing firm. The rest may be used for consultants or subcontractors. During Phase II, at least one-half must be performed by the proposing firm.

B. Integrating SBIR-related Efforts Into Your Overall Business Strategy

Good business strategy is guided by a simple maxim: Know your own business. Small firms may waste time and money chasing after federal R&D funds which are outside of their business plans and strategy or capability. Submitting an R&D proposal can be a costly exercise for a small firm. You must know what it is you want to accomplish. You must have the R&D staff and capabilities to do the work.

If you are willing to commit time and funds to R&D, and you know your market well enough to know what kinds of innovations will mean growth and profits, SBIR programs are an excellent way to get the seed money to do the advanced R&D often necessary to enter into new projects.

We recommend that firms interested in the SBIR program start by drawing up a business plan. Not only can such a plan help you decide what SBIR program you want to compete in, it also provides you with a document you can show venture capitalists and other potential investors. A good business plan can take a variety of forms, and should include at a minimum the following topics:

- * summary of what your company's objectives are and what business you are in;
- * description of the specific products and/or services that you are or will be providing;
- * description of the markets you are in or plan to com-

pete in;

- * description of your competition and your advantages vis-a-vis the competition;

- * biographical information on the principals and key personnel;

- * purpose(s) for which you are seeking funds and an estimate of the funds you will receive;

- * financial statement which includes both the past few years (if any) and projections for the next three to seven years;

There are numerous sources of information on business plans. For example, many large accounting firms publish free brochures or pamphlets on how to write a business plan. Many universities and associated Small Business Development Centers include business planning assistance as part of their efforts to assist small high-technology firms. Developing a business plan will enable you to clarify your business strategy and focus on your strengths. Within this context, you can decide if SBIR monies or other R&D or private sector monies for that matter - are worth pursuing.

C. Using SBIR To Establish Scientific/Technical Leadership

By viewing the SBIR program as one part of your overall business strategy, you can use the program to build scientific and technical leadership in your area. In an increasingly competitive marketplace, such leadership is a key to continual innovation and the sales that innovation brings to small firms.

Modern science and technology is frequently described as comprised of a series of specialties. Small firms can establish technical leadership in one of these specialties through a systematic sustained R&D effort. Success in winning SBIR awards provides vital funding and recognition for your company.

View the beginning stages of your SBIR proposal planning process as an opportunity to talk with various representatives from federal, state, and local government, from companies, from universities and non-profit institutions and with independent consultants. The people you meet and talk with in even the first stages of proposal preparation can prove to be valuable contacts in the future.

The SBIR proposal process provides an opportunity to establish ties with experts in your field. By approaching these experts in the context of your SBIR project, you are likely to find that they have valuable insights to offer your company. Working closely with eminent scientists and engineers provides opportunities for your staff to benefit

from the knowledge and experiences of others, thereby shortening the learning curve in moving to the frontiers of your field.

Award and successful completion of Phases I and/or II provides a federal government stamp of approval for your experience. Don't be shy - let people know about your success. Your firm should actively promote any award that you receive. Publicity should be directed towards the professional, trade, business, and mass media; towards relevant trade and professional associations and their members; and towards downstream users of your products or services.

As SBIR awards give you or your scientists and/or engineers a substantive project to talk about, encourage them to publish in professional literature. As it makes you a member of the "user community" for federal programs, seek to participate on federal agency advisory boards and peer review committees.

D. SBIR As a Potential Source Of Funding

An SBIR award is a powerful leveraging tool to attract other possible sources of funding. Your SBIR award is a sign of your company's credibility and creativity.

SBIR brings you into direct contact with federal agency SBIR and R&D program managers. These people are experts in their fields and have extensive networks which can benefit your firm. For example, some SBIR program managers send abstracts of Phase I awardees to large companies and venture capitalists who have shown interest in funding Phase III endeavors or working with your company in other capacities.

Mention your SBIR award when competing for other federal R&D. It is a sign of your competence to other program managers. After all, a number of their colleagues thought well of your firm.

The US Small Business Administration has developed a computerized matching system which will bring together potential capitalization sources with SBIR winners. This system will match Phase I and II winners with capital sources in light of technical interests, dollar amounts, geographical locations and time frames. Additional information on this system maybe obtained from the Office of Technology, U.S. Small Business Administration, 409 Third St., SW, Washington, DC 20416.

II. GETTING STARTED

The key to project selection is to make the best use of your firm's resources. For most small firms, developing projects in areas where they are weak will only waste time and money.

Some type of evaluation and comparison procedure is needed to prioritize projects so you will select only those with the greatest chance of success.

In selecting projects for SBIR participation, we recommend that you attempt to maximize the following criteria:

- * Your ability to respond to agency needs, problems, or mission area.
- * Your ability to conduct the quality technical effort required to make a significant impact.
- * Your ability to market and sell a technological innovation resulting from the research and development effort.

In this chapter we will present considerations bearing on each of the above criteria and suggest actions you can take to enhance your capabilities. Then we will discuss a process for putting these and other criteria together for final project selection.

A. Understanding What The Federal Agencies Want

In the SBIR program, agencies solicit proposals to meet their own R&D needs. You can only submit a proposal in response to a topic presented in an agency SBIR solicitation. Your chances of obtaining federal R&D funding are greater if you submit your proposal to those agencies whose R&D needs are most compatible with your particular project and the expertise and experience of your R&D team.

1. Agency R&D Interests

SBIR solicitations involve a tremendous variety of technical areas. Many agencies also have an interest in the same technology.

Because SBIR programs cover such a large range of technologies, we recommend that companies look first to their own expertise and business plans (as described in Chapter I). That is, first decide what type of technical effort will produce results which contribute to the growth of your business. Then find an agency solicitation topic which is consistent with the technology you want to develop.

Some agencies focus on solving specific, targeted problems (which may include product development) and their R&D is conducted with direct practical applications in mind. Other agencies focus on advancing generic scientific and engineering disciplines. As a rule of thumb, agencies with distinct

missions (defense, transportation, education, etc.) will predominantly offer solutions to problems or ways of exploiting opportunities; agencies with missions to support generic science and technology (e.g. the National Science Foundation, National Institutes of Health, etc.) will predominately offer solicitation topics focused towards solving problems which will enhance knowledge in that area.

This distinction is important for understanding the way in which the agencies look for originality and innovativeness in SBIR proposals. The problem-solving R&D agencies tend to emphasize originality and innovativeness in the approach to solving a problem; the more research oriented agencies tend to emphasize originality and innovativeness in the contribution to the scientific/technical discipline.

Nearly all solicitation topics can be divided into one of the following three categories:

- * produce a product with performance characteristics described in the topic statement;
- * solve or contribute to the solution of a particular problem important to the agency's mission;
- * perform research in a technical area, the advancement of which would have implications for the agency's future needs.

Note that in the latter two categories, it is up to the proposing firm to suggest what form the product of the R&D effort will take. There have been nearly an equal number of both topics and awards in each of these three categories.

Whatever the character of the solicitation topic, it is important to remember that agency R&D programs focus on agency needs. You should provide the agency with information on how your proposal will meet its needs as well as simultaneously lay the groundwork for a commercially viable innovation.

The important point is to learn as much as possible about agency expectations in your area of interest. The solicitation is the obvious starting point.

2. Obtaining Information

The most important document you will receive from an SBIR participating federal agency is the solicitation. It outlines the rules for submission in each agency. Among the features you should focus on are the topics on which proposals may be submit-

ted, eligibility criteria for awards, information to be included in proposals, evaluation criteria, procedural criteria (such as length limits on proposals, schedules for submission, evaluation, awards), and budgetary guidelines (such as total funding, limits, number of proposals funded, and whether profit is allowed). These solicitations also contain general information about the agency's program. Generally, you obtain solicitations by contacting the SBIR program office at each agency.

The Small Business Administration updates quarterly the Pre-Solicitation Announcement (PSA) which provides summary information on solicitation topics by agency. The PSA is displayed on the SBA ONLINE Bulletin Board prior to the release date of agency solicitations and provide brief statements of each agency's research topics, opening and closing dates of agency solicitations, who to contact for a copy of specific solicitations, and estimates of the number of awards to be made under each solicitation. The Pre-Solicitation Announcement alleviates the need for small firms to track the specific activities of all agencies by presenting relevant summary information on all agencies in one concise location. After reading through the PSA, you will have an idea of which agencies are offering topics in your area. You can then review the solicitation announcements from the relevant agencies and pinpoint the exact topics that most closely pertain to your dominant fields of expertise. The SBA SBIR Pre-Solicitation Announcement can only be accessed electronically. To access the SBA ONLINE Bulletin Board, dial: (800) 697-4636. To access this information via INTERNET, the INTERNET address is: Telnet SBAONLINE.SBA.GOV

Once connected to the bulletin board, the SBIR/STTR program areas can be accessed from the main menu by selecting "(5) Quick Search". From the Quick Search menu, the user selects item "(1) Search by Topic Menu". The user then selects item "Government Contracting Opportunities", then select "SBIR" or "STTR". There are many other sources of information about federal R&D, the agencies, and the SBIR program:

The NSF Small Business Guide to Federal R&D Funding Opportunities is an excellent starting place for assessing agency R&D interests. In addition to SBIR programs, this catalogue includes information on all major federal R&D programs, including the names, addresses, and phone numbers of contact people. Copies of the Guide may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. (202) 402-9325.

Every participating federal agency has an Office of Small and Disadvantaged Business Utilization which has material and information available for distribution. These offices can also direct you to the appropriate R&D program manager. Promoting a substantive body of R&D is a primary objective of an R&D agency. Agency R&D program managers, generally scientists and engineers, are the best sources of information about an agency's interest in particular technical areas. Because of the competitive nature of the SBIR program, they cannot answer questions about how to respond to specific SBIR solicitation topics. They can, however, describe general R&D needs of the agency and perhaps suggest other funding programs where your expertise might be applicable. As discussed in Chapter I, it is in your interest to identify these contacts within the agencies and make them a part of your information network.

Every participating federal agency has established an SBIR office which coordinates and oversees the SBIR program. The SBIR program managers are always willing to talk to firms about the program and will answer any general questions. SBIR program managers try to provide as much information as possible without telling you what to do or giving one firm more information than another. In general, it is a good idea to read through the agency's solicitation carefully before contacting the SBIR program manager with questions; more often than not your answer will be found there. Some agency SBIR offices also publish SBIR winners lists and provide titles and abstracts for winning projects.

SBIR abstracts are also available through an on-line service of the National Technical Information Service: the federal Research in Progress (FEDRIP) Database. This database is accessible through DIALOG, a large, private information service. To obtain a free copy of the FEDRIP Search Guide, call (703) 487-4650 and request PR 847. For information on DIALOG, or to set up an account, call (800) 334-2564.

B. Determining Whether There Are Potential Markets

Receiving an SBIR award is a wonderful marketing opportunity for a small firm. SBIR funding provides legitimacy to both you and your company, gets your name circulating in both the public and private sectors, and can be a basis for the development of new products and processes.

1. SBIR as a Marketing Opportunity

The first step in determining your potential markets is to determine just what will result from your research downstream. This may seem like an odd problem at first; yet, it is useful to determine all the points at which you could end your participation in the project and sell or license the results you have obtained. Depending on the stage at which you end your participation, the results of your effort may be technical knowhow, patents, a prototype, production techniques, a fully produced commodity, or a joint venture or spin-off company.

One way to determine which of these types of products you should market is to write down the salient features of what you anticipate obtaining at each point. Include features people might find objectionable as well as those they might find beneficial. Examine the features to determine who would be the likely customer or "client type" for the product or service at each decision point. Would it be a manufacturer? A consumer? Or some other type? And are they domestic, foreign, or multinational?

Once you have linked your potential products with a customer type, examine the buying patterns common within that type. Among the questions you should be asking are:

- * Do they use products or services like yours?
- * Do they buy them or produce them in-house?
- * From whom do they buy them - firms like yours or different types of profit or non-profit entities?
- * What do they pay for such products or services and how much do they buy?
- * Are substitutes for your products or services highly standardized, highly individual, or somewhere else on the continuum?

In doing market research always remember that your technology, your staff, and your firm's ability to work as a team are what you are selling. However, technology, personnel, and organization must translate into sales in product or service markets. If you cannot demonstrate that sales are likely, no-one will provide you with either debt or equity in capital markets.

2. Identifying Phase III Investors

A major objective of SBIR programs is to assist small firms in moving new scientific and technical ideas from concept to commercialization. Federally funded work frequently helps winning companies develop the underlying generic technology for commercial innovations.

We recommend identifying potential Phase III investors as early as possible. Your marketing strategy should enable you to better target your efforts in seeking Phase III commitments.

Two tactics will greatly facilitate your effort to identify potential investors:

- * Start at the top, with the president of the company you are targeting.
- * Do not try to sell anything.

What you should seek, and what many companies are willing to provide, is information on what specific product, service, or technology traits would enhance their interest in your project if you are successful in Phases I and II.

During your initial phone contacts note that you are interested in soliciting input from potential users of the innovations you anticipate will result from your project. Point out that you are aware that commercially successful innovations are "user or market driven."

Do not ruin your contact by indicating you are primarily interested in a sale. Prior to submission of your Phase I proposal, few large companies or venture capitalists are likely to be interested in making legally binding commitments to provide Phase III funding. These companies are familiar with the fact that R&D is highly risky, and that the risk is exceptionally great prior to a demonstration of technical feasibility (which is, of course, precisely what Phase I is designed to do).

Ask if you can visit their technical people to discuss your project. There is a remarkable amount of expertise in most large firms. Their comments can help you refine your project in a manner which will increase its chances of winning a federal award as well as attracting downstream funding from their company.

While you are with their technical people, explore possible relations. Would they be interested in serving as a subcontractor on Phases I and II? Do they think that if you hit speci-

fic performance targets in the government funded Phases I and II, their firm would be willing to provide Phase III money? Do they think their firm would sign a commitment to provide such funding contingent upon hitting those targets? Who has to sign off on such a commitment? In short, while you are seeking advice, also explore the dimensions of the relation you can establish.

Remember that the law requires that where Phase II proposals are judged to be of approximately equal technical merit, extra consideration in the evaluation process is to be given to those proposals accompanied by a non-federal follow-on funding commitment. This happens more often than you would think. Many agencies have many more proposals recommended for award than funds available, and it is difficult to judge whether one Phase II proposal is better than another when they are in different technical areas. Of course, follow-on funding commitments from recognized sources (or those otherwise judged to be credible) will carry more weight.

C. Gathering Technical Information and Identifying Consultants

All aspects of the proposal must be of high scientific and technical merit. The plausibility of your technical assumptions and proposed methodology will be completely examined in the light of current scientific evidence and techniques. As we shall discuss in Chapter III, the primary reason that proposals are rejected is because reviewers disagree with technical claims, dispute the uniqueness of the effort compared to others they are aware of, or downgrade the proposal for leaving out important technical considerations.

You must demonstrate in the proposal that you are knowledgeable of the state of research or R&D in the specific project area. If you are not certain that your company is at the forefront of awareness of technical developments in the area in which you intend to submit an SBIR proposal, you should seek additional information and/or advice. The purpose of this section is to identify sources of technical information and to provide guidance in obtaining advice.

1. Technical Information Sources

If you are not up-to-date on the literature relevant to your topic, there are numerous sources you can turn to for help. In addition to local research libraries, there are governmental research

and information facilities and commercially operated data bases. Also, in the solicitation, most agencies identify technical information sources which are applicable to the research areas they support.

The National Technical Information Service (NTIS) is the central source for the public sale of U.S. government-sponsored research, development, and engineering reports, as well as foreign technical reports and other analyses prepared by national and local government agencies, their contractors, or grantees. It is also the source of federally generated machine-processible data files and software and licensing arrangements for government-owned patents.

The NTIS information collection consists of numerous subject titles. In addition to its centralized bibliographic data base, there is a variety of announcement and dissemination products and services. For more information, contact NTIS, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4650.

The Department of Energy's (DOE's) Office of Scientific and Technical Information (OSTI) collects and disseminates DOE-originated and worldwide scientific and technical literature in subjects of interest to DOE researchers. For additional information, contact:

U.S. DOE, OSTI, P.O. Box 62, Oak Ridge, TN 37831, (615) 576-8401.

The National Aeronautics and Space Administration (NASA) acquires and organizes worldwide scientific and technical information on aerospace. Selected documents are available from public information sources including the NASA Industrial Applications Centers, NTIS, and in many instances university technical libraries and larger public libraries. NASA's Center for Aerospace Information (CASI) maintains RECON, an on-line bibliographic search system, which provides retrieval and current awareness products and services. For more information, contact CASI, P.O. Box 8757, Baltimore/Washington International Airport, MD 21240, (301) 621-0390.

The Defense Technical Center (DTIC) is the central source of scientific and technical information resulting from and describing R&D projects funded by the Department of Defense (DOD). DTIC searches this information for registered requesters. Reasonable quantities of paper or microfiche copies of requested documents are available for SBIR proposal preparation. DTIC also provides referrals

to DOD sponsored Information Analysis Centers (IACS) where specialists in mission areas assigned to these IACs perform informational and consultive services. For more information, contact DTIC, Attn: DTIC-SBIR, Defense Technical Information Center, 8725 John J Kingman Rd - Suite 0944, Ft. Belvoir, VA 22060-6218, (800) 363-7247, (703) 767-8269, e-mail sbir@dtic.mil .

Health science research literature is available at academic and health science libraries throughout the United States. Information retrieval services are available at these libraries and Regional Medical Libraries through a network supported by the National Library of Medicine (NLM). The latter is the world's largest medical library with over 4 million items. For additional information, contact Public Information Office, NLM, Bethesda, MD 20894, (301) 496-6308.

Commercial sources of technical information have developed significantly in the last decade. These include large information vendors which offer access to multiple data bases, provide direct on-line searching access, and offer rapid turn-around time on print-outs of abstracts and data records. In addition, there is a growing number of small independent information consultants/ brokers. Many universities and states provide similar information and literature search services.

2. Technical Expertise and Consultants

The information that you need or desire may reside with consultants or subcontractors, i.e., other individuals and organizations. There are various levels at which such advice may be useful in your SBIR participation:

- * Providing preliminary technical advice for planning the project;
- * Reviewing and critiquing the proposal before submittal;
- * Serving as an advisor or research performer after an award

Before you contact people or organizations in order to enhance your capacity, be clear in your own mind what you will want them to do and what you are willing to pay.

Three procedures are helpful for choosing consultants or subcontractors: literature searches, citation searches and expert panels.

Literature searches were discussed in the pre-

ceding section. Consider contacting the authors of publications closest to the research area in which you are planning to submit a proposal.

A citation search consists of consulting a data base in order to discover how many times particular authors are cited on a topic of interest to you. Those authors with the most cites are likely to be leading experts. To conduct a citation search contact your local university library, a major urban library, or a commercial data base service.

An expert panel is conducted by selecting leading individuals in a field and asking them who they believe to be the leading U.S. expert. To conduct an expert panel take the most frequently published authors in the area of your project and phone them. Another source of expert panels are the Advisory Committees used by federal R&D Agencies.

These committees commonly contain leading experts from the agency's user constituency. Sometimes it is possible to have experts review your proposal for free, with the understanding that they would be retained as a paid consultant or subcontractor if you win an award. You should emphasize your openness to constructive criticism.

If you are interested in working with a person or company, request that they send you a copy of their resume (or a company brochure and resumes of people who will be working on your project) and provide references of companies for whom they have conducted work similar to that you are requesting. Also ask them to sign a confidentiality agreement. Do not discuss proprietary details until you have received the signed confidentiality agreement. Prior to signing a contract, check the references.

You might also contact a relevant professional or trade association to determine the consultant's or subcontractor's reputation. You do not want any surprises downstream.

Hiring a consultant or subcontractor should be no different than any other business purchase. Using sound business judgment means you will be sure you are clear about what you are purchasing and what it will cost you. Make sure there is a legally binding contract, although such a contract can be very simple and avoid lawyer's jargon. The most important aspect of this contract is to tie payment to performance whenever possible. Also, any obligations you have under the contract

should be contingent upon prior award of an SBIR Phase I grant, contract, or cooperative agreement.

D. Strategies for Project Selection

All potential SBIR projects should be evaluated along three dimensions: Agency Importance, Commercial Importance, and Technology Leadership.

Agency Importance provides a measure of your firm's ability to meet federal research and development needs through the project under consideration. The following factors should be considered:

- * the extent to which a project can be considered responsive to an SBIR solicitation topic or subtopic;
- * the degree to which your project contributes to the agency's mission and the national need that it serves;

Commercial Importance provides a measure of your firm's potential ability to transform R&D into projects on a specific project. In determining the Commercial Importance of a project you should consider the following factors:

- * the extent to which your estimate of return-on-investment (ROI) for the project exceeds the ROI of the most preferable alternative investment;
- * your ability to specify the steps necessary to carry the project through R&D to full production;
- * the extent to which input from potential customers was part of the project design process.

Technology Leadership is a measure of the scientific and technical capacity of your firm in a particular technology base. It indicates your firm's ability to play a leading role in developing that base. Among the factors you should consider are:

- * the qualifications of all R&D personnel (both in-house and consultants), including their education, expertise, and areas of major R&D interest;
- * your managers' experience in the particular technology base;
- * your ownership of, or access to, relevant lab,

testing, and production equipment.

Projects should then be ranked on the basis of the evaluations of these three factors together. Various mathematical or heuristic techniques can be used to quantify the procedure. Such publications as *Research Management*, *IEEE Transactions on Engineering Management*, and *Spectrum* often feature articles directly relating to project selection as well as other R&D management concerns.

Once you have established a ranking, the next step is to think of reasons for dropping your preferred projects. Are the products or services derived from your first choice likely to stand up in operation as well as they do in tests? Can they be easily serviced or replaced if need be? Will they lead to an excessive risk of product liability suits? Is your technological leadership dependent upon retaining a single key employee or consultant?

If your present access to specific equipment ends, can you find substitute equipment in a reasonable period of time? In short: What can go wrong and how likely is it to go wrong?

Make an honest assessment. If the approach is poor, you can change it. If you do not have the capacity to conduct the project at present, it is always possible to hire staff, consultants, or para-professionals and technicians and to lease equipment or facilities. However, if you feel your project is not sufficiently attractive to win an SBIR award, it is a sign of sound business judgment to devote your resources to other efforts where your chances of success are better. It is preferable to address your weaknesses yourself prior to the submission of the proposal and avoid the investment in a proposal where there is little chance of success. SBIR is highly competitive.

When done correctly, the SBIR planning process should be viewed as an important component in your business planning. If your proposed SBIR project will contribute to your business growth then it should be considered a valid endeavor for your company whether or not you actually receive an SBIR award. If you have followed the steps outlined in this chapter you should have developed an honest assessment of your technical capability to produce a worthwhile result and the likelihood of the product's or service's eventual marketability. You should have identified related interests both within federal agencies and private companies. In short, you should be well on track for finding

alternative sources of funding.

It is now time to prepare the proposal.

III. PREPARING THE PROPOSAL

It cannot be overemphasized that SBIR is a competitive research or R&D program. Successful Phase I proposals describe technical efforts sufficient to establish the feasibility of a concept. Therefore, the most important content in the proposal is the scientific/technical expertise (including originality, innovativeness, scientific/technical merit) that you bring to bear on an agency problem, need, or mission area.

Like it or not, the burden is on you to convince reviewers that your proposal is worth funding. Further, while reviewers are technically qualified, you cannot expect that their expertise will be sufficiently close to your area that they will "recognize a good idea when they see one."

You will need to develop and present technical arguments to support the originality and expected benefits of your proposed efforts. The reviewers will have enough technical background to follow your arguments. But that doesn't mean they will agree with them. You must take great care to verify the accuracy or plausibility of all claims, assumptions, and approaches.

In the first section of this chapter we shall discuss three essential components of a proposal. We will also identify a fourth and even more important component: scientific and technical quality, which is communicated to the reviewer through its incorporation in the other components. We shall discuss the relative importance of each component and how they relate to formal proposal structure and to space allocation.

The second section presents details on what should be considered in preparing each component (and sub-component). Often the perspective taken is that of the reviewers. SBA has discussed the review of SBIR proposals with technical evaluators and has also reviewed written comments made by evaluators. We shall attempt to communicate what the technical reviewers look for in each proposal component and with regard to scientific/technical quality. In some instances verbatim reviewer comments on particular proposals are repeated to emphasize a point we are making.

Finally, in the third section, we will suggest tips

on writing and presentation in order to enhance the readability, logic, and appearance of your project. This section will close with some general guidance.

A. Proposal Components

A quality proposal has three generic components each targeted towards addressing one of the following questions:

1) What is the significance of the problem? What problem are you going to solve (or what are you going to produce) and what difference will your efforts make?

2) How you are going to go about resolving the issue identified in component 1? What are your specific technical objectives and what are their roles in proving of feasibility? What are the details the work plan for accomplishing the objectives?

3) Why you are the right firm to perform the work? What evidence can you provide to establish your firm's credibility, including your awareness of the state-of-art, your firm's previous experience in the conduct of related R&D, and the qualifications of key personnel, of consultants, and of your facilities.

In evaluating SBIR proposals, agency reviewers assign points to criteria which generally parallel these components. In order to determine the precise weights of the criteria for a given agency, you should carefully read each agency solicitation for specific statements on the weighing of criteria. For most agencies, each of the above components accounts for about 20% of the total score.

What about the remaining 40%? It is assigned to a fourth criterion:

4) The scientific/technical quality, innovativeness, and originality of the proposed project. This criterion is not addressed in a distinct part of the proposal. Rather you must keep your attention on this criterion as you prepare the above three components, especially the first two.

Each of the above components plus the fourth criterion will be discussed in more detail in section III B. Although the discussion of scientific/technical quality comes last, do not underestimate its importance.

It is important to understand that each agency pre-

scribes in its solicitation its own format for structuring the proposal. This format should be strictly adhered to. Agency reviewers who must compare and evaluate many proposals expect to find similar sections in all of the proposals they review. While the section headings may not correspond directly with the above three generic components, notice that the same flow of information is being sought.

SBIR proposals are presently restricted in length to 25 pages. Accordingly the judicious use of space is very important. For example, the sections which comprise component 3, credibility enhancers, only count for about 20% of the score (30% in one agency). Therefore do not give this component an excessive amount of attention in the proposal. Many losing proposals wasted valuable space by including detailed resumes of anyone related to the effort, long lists of the firm's clients, previous work and products, etc.

There is no formula for determining how to allocate space among the other sections of the proposal. The important thing is to ensure that your proposal is sensitive to the criteria that the reviewers are using to evaluate your proposal. Simultaneously, allocation of space to particular sections should reflect your own style and task. Tailor the precise number of pages devoted to components in your proposal in a manner which will make the most persuasive presentation.

B. Understanding What Counts

1. Significance of the Problem; What Difference Your Effort Will Make

Problems or opportunities always exist in a context which enables us to identify them as problems or opportunities. In this section you should focus on demonstrating how your project addresses a vital problem or opportunity in light of two key contexts: scientific/technical and socioeconomic. This component must clarify why your project is significant in each of these contexts.

Essentially, you must answer four related questions:

1) What is the significance of the problem? (Why is it worth working on? What is the national need? Why is it important to the agency?)

Never forget your objective in discussing significance is primarily to demonstrate that there is in fact a widely recognized problem or opportunity.

If you have been active in the appropriate scientific/technical specialty, this can be used to establish the fact that you have first hand awareness of the significance of the problem or opportunity. You must also demonstrate an awareness of how the problem or opportunity found in the solicitation ties in with the agency's and federal government's objectives.

The following comments, relating to the significance of the effort, were made about proposals which were recommended for funding:

"Existing data base management systems can effectively handle only formatted alphanumeric data. The aim of this research is to find ways to incorporate other types of information such as text, maps, diagrams, photographs, images, and signals in an advanced data base management system and to include facilities for declaring and manipulating general knowledge."

"There is a need for modular deck replacement units which can be rapidly put into place. Steel grid decks have been used in the past to accomplish this. A number of technical issues raised, regarding past failures of such decks, are accurate. If the investigators can overcome some of these problems at a reasonable expense, they may have a marketable item.

2) What is the technical challenge? (What barriers exist to its solution? Why is it important from a scientific or technical point of view?)

Scientific/technical significance is determined by the state of substantive and methodological/technique knowledge in the scientific discipline or technical field with which your proposal falls. You should clearly and concisely state the manner in which your project is based on a awareness of the larger scientific/technical problem or opportunity implicit in the agency's brief SBIR solicitation topic.

Use references where appropriate to support the claims you are making. If you or your key people have been active in the appropriate specialty, your response to this item should also describe how your activity provides firsthand awareness of significance. (Make sure to refer to any directly relevant publications you or key people may have.)

The above two questions reflect the distinction between the application and the scientific/technical barriers to developing the application. While

both questions should be addressed, it is quite appropriate to emphasize one over the other. The particular emphasis should give depends on the nature of the agency and the solicitation topic. Basic research agencies tend to prefer emphasis on the second question.

3) What will you do to meet this challenge that has not been done before? (What specific part of the problem are you taking on? What makes your problem definition and/or approach unique? What makes it better than prior efforts? How can you build on previous research and knowledge?)

The primary objectives in answering this question are to establish the merit of your general approach to the project, and to show that this approach will lead to benefits commensurate with the significance of the problem.

Your discussion should consist of a summary statement. The details can be provided in the next component.

The same scientific/technical context which you presented in establishing significance of the problem or opportunity contains vital information on how best to approach the topic. Where appropriate, refer to relevant methodological discussions in the scientific/technical literature.

4) What difference will your efforts make? (What will be available that is not present now? What will the products of your efforts be? What are the social and economic benefits?)

Indicate the types of benefits you anticipate will result if your project is funded. In discussing benefits, assume that the project will be carried through to Phase III. State clearly how Phase I work will lay the foundation for Phases II and III--with their corresponding costs and benefits. Be sure to include "spin-off" benefits for other federal agencies, for the private sector, and for the general quality of life of the American people if any exist.

Two proposals which failed to convince reviewers of potential benefits received the following comments:

"Proposal does not clearly demonstrate understanding of potential user requirements for proposed system. Discussion of advantages/benefits of the system are sketchy."

"The study presupposes that fleet operators should

be receptive to incorporating data base management into their existing management process. There is no evidence in the proposal to indicate this.

It most likely will not be enough to merely state the answers to these four questions; rather, you may need to present an argument to convince a reviewer of the accuracy of your answers. While the reviewers may not be thoroughly versed in your particular specialty, they will have enough background to judge whether your argument is convincing or plausible.

The more obscure the problem, the more detail required. But do not overdo it. Reviewers are rarely interested in a tutorial of the subject matter.

References to the literature are only valuable where they support the argument you are making.

Note that the amount of space you devote to this component is not important. If the questions can be addressed in one or two pages, by all means do so.

2. Technical Approach; How You Will Do It.

Together the Technical Objectives and the Work Plan formulate your approach to solving the problem. They must be internally consistent and mutually supportive.

Technical Objectives

In the Technical Objectives you specify what it is you intend to accomplish. They should be regarded as a link between what you are ultimately trying to achieve (discussed in the significance part of the proposal) and the detailed technical work (work plan). It is preferable to state an objective as a result, not as a question that you intend to study. It is vital that your objectives be challenging but realistic.

The combination of Phase I objectives, if accomplished, should establish the scientific/technical feasibility of your basic approach to the problem or opportunity. Establishing feasibility should provide any substantive knowledge, methodological advances, or technical innovations necessary for successful Phase II work.

In preparing this section you should consider three types of objectives: substantive knowledge, methodological advancement, and technical innovation. Substantive knowledge refers to the infor-

mation you intend to obtain about the underlying natural or social phenomenon involved in your project. Basic or advanced applied research proposals frequently focus on attaining such knowledge. Methodological advancement refers to the information you intend to obtain about how to better do science or engineering as a result of your project. All scientific and technological advancement refines our understanding of what methods or techniques are appropriate for studying problems or approaching opportunities. Technical innovation refers to product (hardware or software) innovations. Developmental projects focus on such advances.

Needless to say, not all type of objectives will be of equal importance. Still, it is helpful to look at your project from a variety of perspectives and to provide program managers and reviewers with information about those objectives which you reasonably expect to be able to attain. Each objective that you list should represent a significant technical contribution.

Here are some considerations to keep in mind when developing your objectives:

- * Your objectives should flow logically from the discussion of the significance of the problem or opportunity. Reaching your objectives should mean you have proven the feasibility or solving the problem or realizing the opportunity.
- * Your objectives should be plausible, both in terms of your available resources and your budget.
- * Your objectives should be bounded by the resources your company can bring to bear on the problem - both staff and facilities.
- * In presenting your objectives, begin by specifying those objectives which are most clearly related to the solicitation topic and agency concerns. Next proceed to objectives relating to "spin-off" benefits. Make sure that "spin-off" related objectives are clearly secondary to topic related objectives.

As always, keep it as short as possible and to the point. (Most winning proposals that we sampled used one or two pages for the technical objectives).

Work Plan

The Work Plan describes your approach to the problem in detail. For your own protection, as well

as for effective marketing, the Phase I work plan must describe exactly what work you will conduct in order to accomplish your objectives. If you win an SBIR award, you will have to deliver (i.e., do) what you state in your work plan. You must not overpromise or you will lose in the competition, go broke in performing, or try to cut corners and ruin your firm's and your own reputations. Alternatively, if your plan is not challenging you will lose in the competition.

The Work Plan must demonstrate that you know what you are doing. Spell out your approach, methodology, options, reasons for choices, priorities and sequence of work in detail. You must clearly discuss both what you intend to do and how you will go about each task. For most proposals, this will be the longest section, probably 5-8 pages.

Elaborate on the techniques you will use to accomplish the objectives. Indicate why these techniques are appropriate. Demonstrate your expertise by highlighting any techniques which are state-of-the-art or which you have developed yourself. Indicate any past experience that you have in using these techniques. Refer to other studies that support the appropriateness of your methodology to accomplish the objectives.

Include a discussion of possible problems which might emerge or extraneous factors which might affect the outcome of your effort and how you intend to overcome those problems. People active in R&D know that it is risky; that the unexpected is often encountered. Clear attention to contingency planning is a sign of your professionalism and ability to deliver what you promise.

The Work Plan should be highly detailed without becoming bogged down in minutiae. Striking this delicate balance is not always easy - but it is essential. Scheduling and project staff activities charts may be useful in striking the appropriate balance. These charts depict who will do what work, when. The charts should guide the development of the supporting text.

Focusing on the project scheduling chart will ensure that your Work Plan starts at the beginning and proceeds chronologically to the end. The chart should include each task to be completed, how long it should take to complete the task, and on what date the task must be completed. Highlight any decision-points or targets which might exist along the way. Further, indicate which targets are key starting points for Phase II work. It does not hurt to indicate that you are aware that Phase I is the feasi-

bility study aspect of a larger project. The Phase I end is merely an interim decision-point on a project which does not end until Phase III.

The project staff chart specifies who is responsible for each task on the project scheduling chart and what support personnel, equipment, etc. they can utilize in completing the task.

If you will use consultants or subcontractors, your SBIR Work Plan must contain a discussion of how you will manage them in order to ensure a timely, high quality product.

Technical reviewers made the following comments about the Work Plan of Phase I SBIR proposals. The first two are from proposals recommended for funding:

"The Phase I tasks are based on many proven methodologies and therefore have high promise in providing information regarding the feasibility of the concept."

"The budget, estimated manhours and the schedule reflect the extensive C3 knowledge of the key personnel. This enables the firm to complete a study of the complex systems in a timely manner."

The next two are from proposals not recommended:

"The program plan, tasks, and schedules are not clearly stated. Milestones and end products are inadequate."

"No indication of how the results will be obtained, no indication of prospects for success or risks: a 'trust me' proposal."

3. Credibility Enhancers

Your project will be specifically evaluated on the "qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities." Most of these categories are identified in the solicitation directions as specific sections in the proposal format. Other areas which contribute to your firm's credibility include your awareness of related R&D, previous related experience, and a budget justified by the scope of the work proposed.

We will briefly discuss all of these categories. However, this credibility enhancing information should not be reserved only for the designated

sections in the proposal format. If this information contributes to your discussions of problem significance and technical approach, by all means put it up front in the earlier components of the proposal. This is especially true for references to publications or prior work that support assumptions or arguments you are making. Use these sections of the proposal format for summary and elaboration.

Awareness of Related R&D

You will need to establish beyond any doubt that you are aware of the state of the art in those scientific disciplines and technical fields directly relevant to your solicitation topic and your specific approach. This does not mean that you merely provide a list of references. Rather, references should be integrated within your discussions of significance and approach to support points you are making. After making this integration, a one-half to one page summary is appropriate. Be sure to include a discussion of relevant related R&D or publications by your firm or key project staff.

Most reviewers will be aware of some developments related to your proposed effort and will be looking to see if their view of the state-of-the-art squares with yours. The following are typical of remarks made by reviewers:

"proposers do not demonstrate an understanding of soil-structure interaction: they have no references of which there are a number of important ones."

"no substantial account is taken of the widespread research on knowledge bases and expert systems."

With few exceptions (where specifically required by the solicitation topic) it is particularly inappropriate to propose a Phase I effort to study the state-of-the-art. Of course, reviewers are not looking for a state-of-the-art tutorial in your proposal either. Use references to simultaneously demonstrate your awareness and support your arguments.

Previous Experience and Key Personnel

In your discussion of the background of the problem or opportunity, you should present your information in a manner which indicates your firm's knowledge of the problem and experience in the solicitation topic area. This expertise and experience may be a result of directly relevant work previously conduct-

ed by the firm or by key personnel involved in the project. Alternatively, it may be the result of related work in another area which has enable your firm and personnel to build expertise and experience which can be transferred to the solicitation topic area.

The most important member of your project team is the Principal Investigator or PI. Our survey of agency SBIR program managers indicates that the principal investigator should have good R&D experience and technical expertise in the area of your project. If possible, related work experience should indicate that the PI has successfully managed projects similar to the one you are proposing.

Few projects can be conducted by a single individual. Accordingly, your discussion in this section should emphasize the existence of a complete R&D project team. A good team includes adequate support staff to carry the Phase I project through to completion on time and within budget.

Present specific background information only for key R&D personnel. In presenting information about key personnel, be brief. Extensive resumes will rapidly push your proposal over the page limitation. Remember that what you are demonstrating is the ability of your key personnel to perform the work proposed. Therefore, summarize relevant related works, education, and publications.

Present the uniqueness of your expertise and experience so the program manager and reviewer will conclude that it is unlikely that anyone else is more qualified to conduct your project. If you feel that your firm cannot establish its unique capabilities, consultants and subcontractors can help you enhance your firm's expertise and experience. But remember, the primary competence must be in-house.

The following comments are used to demonstrate the reviewers point of view on experience and personnel:

"The relevant experience would come mostly from an academic consultant who is involved for just 21 days."

"while the PI has experience in formulating polymeric materials, there is no experience listed in formulating bridge coatings."

"the PI is not fully qualified to conduct this study. He has a good background in the proposed applications for the proposed system, but he

lacks the electronics background for the system development in the video area."

Consultants and Subcontractors

It is important to keep the crucial work in-house. Consultants and subcontractors should be used for clearly defined, support functions such as project review, product testing, and specific experimental operations or data collection. If you are farming everything out, why should the agency hire you in the first place?

Consultants are helpful if you or your key people are not among the leading U.S. experts in the area of your project. It is a sign of professionalism, not weakness, to be willing to enhance your capabilities through exceptionally qualified consultants. Use consultants where your strengths will be complemented, not duplicated. Take particular care that the major thrust of your proposal is not distorted by a reviewing consultant. For example, it may not be appropriate to have a university point of view imposed on an SBIR proposal which is being submitted to a problem-solving oriented agency.

Subcontractors are helpful if your project requires special expertise or facilities you do not possess in-house. The same considerations apply to subcontractors as apply to consultants.

See also the discussion in section 11 C.

Facilities/Equipment

Briefly describe the key relevant facilities and equipment you will utilize. Include specifics on all laboratory or clinical, computing, and office facilities and equipment crucial for the project. If these facilities and equipment are not in-house, provide information which will satisfy any concerns the project manager or reviewers might have with respect to access.

If you do not have adequate in-house facilities or equipment, you often can buy access to what you need from universities, private firms, and non-profit institutes, or federal laboratories. Whenever possible, outside facilities or equipment should be located close to your own firm.

Future R&D, Potential Applications, and Follow-on Funding Commitment

Agencies like to fund work with a future. In this section, you should carefully synthesize material presented earlier in your proposal. Begin by summarizing (from Component 1) the precise results you intend to accomplish. Indicate how each anticipated result will facilitate your ability to conduct Phase II and Phase III R&D.

Summarize the commercial applications your project may have. You should consider both direct and indirect applications. For example, a project on oil seeds may have direct applications in the commercial petroleum market and Indirect applications in agricultural technology markets.

If you established ties with potential Phase III Investors, this is a good time to mention them. Indicate whether you intend to obtain a non-federal follow-up funding commitment. One caution: do not drop names unless you are sure you will not be embarrassed if the program manager phones your contact to see if there really is interest in your project!

Budget

There are two keys to preparing a good budget: be realistic, and follow the instructions.

The best way to prepare a realistic budget is to have your R&D team assist in preparing a draft budget at the time you prepare the outline for your proposal. You should show this draft budget to your accountant to ensure it is appropriate for your business. For example, you will want to have backup for your material and labor overhead rates should the agency demand these.

Unless expressly excluded by statute, agencies are directed by the SBA to provide for a reasonable fee or profit on SBIR work. Because the funds for Phase I work are limited, considerations of profit should be secondary in preparing your budget to complete cost-recovery. In preparing your budget, you do not have to offer to expend in-house funds on the proposed project. As a general policy, cost-sharing is not required in SBIR programs and is not a consideration factor in the evaluation of either Phase I or II proposals.

Most agencies provide budget sheets as part of their SBIR solicitations. Before filling in these sheets it is a good idea to make copies of them for use in preparing a draft budget.

4. Scientific/Technical Quality, Innovation, Originality

Throughout your proposal you must seek ways to convince reviewers that you and your firm are competent to conduct the highest quality work. You must also convince them that your project is innovative and original. The agencies do not identify a distinct part of the proposal for making this kind of argument. Nonetheless, it counts more than any other criterion.

In reading your proposal, reviewers will compare your objectives and approach with the totality of their experience in the technical field and their understanding of the problem. How your proposed effort stands up against their background will be a judgement call, involving some measure of subjectivity. Do not be willing to leave this judgement exclusively to the reviewers' intuition. You must make the case for your project through all components of your proposal, especially in discussing the project's significance and approach.

There are several reasons why reviewers may give poor scores for this criterion. For example, the proposed approach may not be distinctly different from others tried in the past:

"The proposal lists 3 ways of obtaining profiling data. These are the most obvious approaches which have worked in the past. Therefore I mark them down for originality.

"Offeror appears to be proposing a new/improved signal controller...no concepts, innovations or unique characteristics have been identified which would allow such improvement."

"doesn't indicate how what is proposed varies from currently existing production, keyword, printing systems used in China which deal with the complexity of characters in that language."

Reviewers will also note technical claims and assumptions which they consider unfounded:

"serious question whether a restricted natural language is better than a well designed query language.

"proposer thinks the problem with central control is reliability, It's not. It's communications cost."

"tests will be limited to forces on a station-

ary vehicle. Forces on a moving vehicle are likely to be even higher and the guidelines are likely not to be conservative."

Failure to consider important factors also will work against you:

"it is rather puzzling to note that the carrier gas flow rate and its effect on particle size and dispersity has not been discussed at all."

"no discussion of the capacity of people to handle and associate three different code inputs and another different code output in very close approximation."

"the offeror presents no reasons why polymethylmethacrylate will be effective in forming a barrier coat."

The key to demonstrating originality and innovativeness is to demonstrate familiarity with past work and how your project goes beyond it. Certain methods or techniques are likely to have been used in the past with greater or lesser success. Some approaches will have clearly turned out to be dead-ends, while others appear promising. Merely chronicling the past is not enough.

Take the opportunity to convince the reviewers that your objectives and approach have merit. Where possible use references to previously published work to support your assertions.

C. Additional Guidelines

1. Writing Tips

A proposal is a written document. Accordingly, all the considerations which go into writing any persuasive piece apply to proposal writing. You must consider what your audience wants to hear, how they like to hear it, and what criteria they use in evaluating what they hear.

It is vital to remember that it is exceptionally difficult to produce a good proposal under time pressure. Leave yourself plenty of lead time.

We recommend writing your proposal in four major steps: 1) outline, 2) preliminary draft, 3) review, 4) and final draft. You should review the product at the end of each of these steps.

The outline should be extensive. A good outline contains the first sentence of each paragraph

in the proposal. The primary considerations in evaluating your outline are the completeness of the information you will be presenting (have you addressed all format items in the solicitation) and the organization of your arguments (is the argument logical and persuasive). After you have reviewed and approved your outline, it should be considered "fixed" and unchangeable. There must be exceptionally good reasons for subsequent major modifications to the outline or you will not be able to stay on schedule.

The preliminary draft fleshes out the outline. At this time you should prepare all appropriate graphics (see discussion below). You should treat this draft as if it were a final draft - good spelling, good grammar, etc. are a must.

The preliminary draft should be presented to a review team. If you have competent and qualified people in-house, use them. If not, seek help from outside. In doing so however, realize that highly qualified reviewers often expect, and deserve, remuneration. (See discussion in section 11 C.)

The next step is to prepare your final draft. You should consider all possibilities for improving it and integrate those that seem to have merit. It is at this time that you seek to catch any mistakes, errors, faulty arguments or logic which might have been missed at earlier stages - including mistakes your review team may have missed.

Like any written piece, a proposal should have a beginning, middle, and end. The beginning and end are where you highlight the most persuasive reasons for funding your proposal. The middle contains the back-up for those arguments, plus an analysis of why any of your firm's weaknesses will not adversely affect performance.

At the beginning of your proposal you must place a technical abstract of no more than two-hundred words highlighting what you propose to do and how you will do it. At the end you should state these same points in a very brief conclusion. The conclusion should also state why your firm is uniquely qualified for this project. Set yourself a one or two paragraph limit on the abstract and conclusion.

The order of presentation in the middle of your proposal should carefully adhere to the

order of items described in the proposal format presented in the solicitation. Reviewers are expecting it this way. Even if you have covered the substance of an item early, you should devote a section to that item. The section can be brief - "This item has been discussed under Subsection X."

Guide your reader by starting each major section or subsection with a heading. The heading should clearly identify the topic of the discussion to follow. Your headings should be distinguished from the text through underlining, doublestriking, or bold type.

Within each section, choose the placement of your arguments carefully in order to maximize persuasive presentation. In general, it is a good idea to present your strongest argument first, your next strongest argument immediately before your conclusion, and your weakest arguments in the middle. This structure enables you to create a good impression on the reader up front, while saving a good point for the end to overcome any concerns which might be raised by the weaker arguments.

It is also important to be honest with your reader. If your company is weak in one area, present the reader with your solution to that weakness. For example, if you lack in-house expertise for a specific part of your project, state the names of the consultants that you will hire to assist you with that part. In this manner your weaknesses are presented as strengths.

2. Presentation Tips

Careful formatting of the page assists the reader. Page after page of solid text with margins at the edge of the paper are difficult to read. Long paragraphs are difficult to read. White space on the page makes the proposal look less formidable.

Think about alternative ways of presenting information. If you are presenting a list of items, perhaps you should indent and number them. If you are making a minor point which is not central for the argument, but nonetheless important for demonstrating your familiarity with the scientific or technical area, perhaps you should put the point in a footnote.

In today's computerized world, you should consider using a word processor or computer with word pro-

cessing software in preparing your proposal. A good word processor (or software) enables you to quickly make corrections and to easily explore alternative formats. You can underline doublestrike, or bold passages or words, depending on the emphasis you want to place on items. However, you should not get carried away with the technological options. You are preparing a R&D proposal, not a newsletter.

Above all, be consistent. The same format should be used throughout. If you are bolding section headings and underlining subsection headings - do it everywhere. If you doublestrike for major emphasis and underline for minor emphasis - do it everywhere. If you skip two lines between paragraphs and three between text and headings - do it everywhere. Once you adopt a footnote or bibliographic format - use it everywhere. A consistent format enables your reader to easily grasp the significance you place on information.

Graphics and other proposal art can provide highly effective means for communicating complicated information in a minimal amount of space. Properly and sparingly used, they can give your proposal a polished, professional look.

A handy aid for determining where to use graphics is to ask yourself two questions:

- 1) "How would I best grasp this information - through graphics?"
- 2) "By using graphics will I cut down the length of my proposal?"

Some common types of graphics helpful in SBIR proposals are:

- * Project Scheduling Charts
(what tasks will be conducted when),
- * Project Staff Activities Charts
(who will spend what time on what tasks),
- * Diagrams and Flow Charts,
- * Data Tables, Graphs, and Photographs

In order to ensure that your graphics strengthen your proposal, make sure that they are tightly integrated into the proposal. After you prepare your outline, examine it to decide what information can most efficaciously be presented through graphics. Then determine precisely what type of graphic should be used.

Graphics must appeal to the eye. If you attempt to present too much information in a chart, table, or graph, you are likely to find that your reader's eyes will glaze over and your effort is wasted.

It is vital that the final draft look professional. The type should be clear and readable. The graphics should be clean and professional looking. Check to make sure that all the pages are included in the proposal and that they are correctly numbered.

3. Final Considerations

In summary, there are two "tricks" to alleviating common mistakes and preparing a winning proposal:

- 1) Follow the Instructions!
- 2) Remember The Evaluation Criteria!

A great number of small businesses do not follow the detailed instructions included in the solicitation. It is extremely important to read and re-read the solicitation and follow the instructions exactly as they are presented. Proposers who do not do this have little chance of success.

The SBIR program does NOT accept unsolicited proposals. Each proposal must respond to a specific topic outlined in the solicitation or it will not be considered for award.

Note that you are allowed to send similar proposals to more than one agency. This is a viable strategy for increasing your chances of being funded. However, make it clear to each agency that the proposed effort is responsive to their needs. (Proposal submission forms require you to identify all other agencies. Don't overlook this requirement. It is not difficult for the agency to determine when substantially similar work has been funded twice).

Your proposal should be either hand delivered and a receipt obtained or mailed "return receipt requested." It must be submitted on time.

If you do not win an award, it is worthwhile to write or visit the program manager for a debriefing.

In your communication, you should make it clear that your interest is in identifying how you might better compete in the future. Seek information on the strengths and weaknesses of your technical approach, on names of individuals or firms you might

work with on subsequent proposals, and on appropriate budget levels for the kind of work proposed. You also should request a copy of the evaluations on your proposal, if these are not provided at the debriefing. Many agencies will provide you with these comments.

Do not be discouraged if you do not win. Instead, view the proposal preparation process as a learning experience and draw as many lessons from it as possible. Use the knowledge you gain in preparing your next proposal. Many successful SBIR winners have found that they had to go through the "learning curve" of proposal submission, debriefing, and submission of a new SBIR proposal.

If you are a small technology-based firm (including manufacturing, and service), SBIR is your R&D program. It provides your firm with an opportunity to obtain funds for high risk ideas that can result in new products and processes. In the process, you can serve our country and be paid for your contribution. By submitting only the highest quality proposals in areas you honestly believe you are competent, you will increase your chance of receiving an award.

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