Writing a Personal Statement or Statement of Purpose

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First Draft: October 14, 2011

OVERVIEW

Most of you will one day apply for a scholarship, a fellowship, or graduate school. Doing so generally requires that you write some "Personal Statement" or "Statement of Purpose."

A Statement of Purpose (say for graduate/professional school – engineering, medical, law, business, etc.) is supposed to answer the following questions:

(1) What are your main goals? What is it that you want to do short- and lon-term?

(2) Why have you set these goals?

(3) What critical experiences have steered you toward these goals?

(4) What have you done to prepare?

(5) What do you plan to do in order to meet your goals?

In short, your Statement of Purpose should present your case to the evaluator – clearly answering why you should be selected!

The following is a general outline for a statement of purpose.

For our purposes, let us assume that it is for graduate/professional school admission.

GENERAL OUTLINE FOR STATEMENT OF PURPOSE

The statement can be thought of consisting of three critical sections:

SECTION I is the first paragraph…it addresses GOALS

SECTION 2 explains WHY

SECTION 3 addresses FUTURE PLANS

SECTION 4 is the last paragraph…it provides a SUMMARY

NOTE 1:
Several professionals (typically faculty) will be reviewing your statement.

The reviewers of your statement want to see you present a coherent case that is logically organized and that has been well thought out.

The main impression that you want to convey is that you have a concrete plan – one that you have been working on over several years (not over a few days or hours!).

NOTE 2:
As a rule-of-thumb, a Statement of Purpose is generally two pages long.

Please make sure, however, that you follow the instructions very carefully.

You may be limited to one page.

In such a case, you must be particularly careful.

Writing a short Statement of Purpose can be very challenging!

SECTION I: GOALS

GOALS. The first paragraph should clearly and concisely answer:

> What are your main goals? What is it that you want to do?

Think hard about this paragraph. It should capture the interest of the evaluator. Keep in mind that the evaluator may be reading many of these.

The goals might include your:

> degree objective (e.g. PhD in Aerospace Engineering)
>
> research topic (e.g. application of new materials in the area of regenerative medicine)
>
> career choice (e.g. professor of Aerospace engineering at a Research I university)

Some explanation of the latter would be helpful; e.g.

> This would allow me to teach, conduct world-class research, mentor students, supervise their work, and contribute significantly to the technological development of the nation.

A sentence such as the following might help you link this opening paragraph to the next section of the statement:

> These goals have been fueled by my collective experiences.

You would like smooth transitions from paragraph to paragraph.

SECTION 2: WHY?

WHY THESE GOALS, CRITICAL EXPERIENCES, PREPARATION. The next section of the statement should answer:

Why have you set these goals?

What critical experiences have steered you toward these goals?

What have you done to prepare?

Toward this end, you may have paragraphs addressing some of the following – explaining how each of these experiences have steered you toward your goals/career choice.

MENTORS/ADVISORS
What mentors/advisors have influenced your goals? How did they influence your goals? These mentors/advisors may include professors, other professionals, or family members.

FAMILY EXPERIENCES
What family experiences have influenced your goals? e.g. deaths, divorces, wars, violence, poverty, successes, failures; How did they influence your goals?

TECHNICAL SEMINARS
What technical seminars have influenced your goals? How did they influence your goals?

PROFESSIONAL CONFERENCES
What professional conferences (e.g. ASME, IEEE, ASEE, SWE, SHPE, etc.) have influenced your goals? How did they influence your goals?

PROFESSIONAL ORGANIZATIONS
What professional organization activities have influenced your goals? How did they influence your goals?

CAREER PLANNING SEMINARS
What career planning seminars have influenced your goals? How did they influence your goals?

COURSEWORK
What coursework has influenced your goals? How did they influence your goals?

RESEARCH PROJECTS
What research projects have influenced your goals? How did they influence your goals?

PUBLICATIONS
Do you have any publications (e.g. conference papers, articles, reports) that have influenced your goals? How did they influence your goals?

BOOKS, PAPERS, ARTICLES, THESES, REPORTS
What works in the literature has influenced your goals? How did they influence your goals?

WORK EXPERIENCE/INTERNSHIPS
What work experiences/internships have influenced your goals? How did they influence your goals?

TUTORING/GRADING
What tutoring/grading experiences have influenced your goals? How did they influence your goals?

COMMUNITY SERVICE
What community service experiences have influenced your goals? How did they influence your goals?

SECTION 3: FUTURE PLANS

FUTURE PLANS. The next section of the statement should answer:

What do you plan to do in order to meet your goals?

Toward this end, you may have paragraphs addressing some (not necessarily all!!) of the following – explaining how each will move you forward toward accomplishing your stated goals.

AREA OF RESEARCH

You would be great if you could describe your planned area of research. What problem(s) do you wish to address? Try to give some technical specifics here. Show that you have some technical muscle. It is important to show that you have given thought about the problem(s) you wish to address. Explain why your problem(s) is (are) important. Explain what are some of the critical open issues. Try to explain (if you can) what your approach will be and why it is worthwhile. Keep in mind that multidisciplinary research is highly regarded these days because innovation often occurs at the boundaries of disciplines.

FINANCING: FELLOWSHIPS, RESEARCH ASSISTANTSHIP, TEACHING ASSISTANTSHIP

How do you plan on financing your graduate education? Are you applying for fellowships? If so which?

Do you want a research assistantship? If you have some research experience that could help with this.

Do you want a teaching assistantship? If you have some teaching experience that could help you with this.

TARGETED PAPERS, THESES

Describe (if possible) what specific papers or theses you will be (or are already) examining? Survey papers that explain the state-of-the-art in a field can be particularly useful when starting out. Such papers can give you a keen sense of the "BIG PICTURE" – how the field has evolved and what the current challenges are.

RESEARCH ADVISOR(S)

Who would you like to work with? Why? Have you spoken with them? A yes here could prove helpful, particularly if there was useful advice and a follow up discussion.

THESIS COMMITTEE
Who would you like to be on you thesis committee? Why?

SPECIAL INTERNSHIPS
Are you planning to pursue special internships? e.g. at a national laboratory (DOE, with a surgeon, etc.)

COURSEWORK
Is there any specific coursework that will be particularly useful to you in achieving your goals? Can you get the books, notes, lectures?

PROFESSIONAL CONFERENCES
Do you plan on attending any specific professional conferences? You can meet some of the world leading authorities in your area of research.

PUBLICATIONS
Do you plan to publish some of your work? Where? Why? When?

PROFESSIONAL SERVICE
Do you plan on reviewing papers for professional conferences.

CONTRIBUTIONS TO SOCIETY
What are your plans for giving back to society? This one is important. They want to see leadership

SECTION 4: SUMMARY

SUMMARY. The final section of the statement is the last paragraph. It should summarize why you should be the one selected. In short, you need to convey that your past collective experiences have prepared you well to execute your future plans.

CONCLUSION. I understand that some of the above may have created more questions for you than I have answered. If this is the case, please feel free to speak with me or with some of your other mentors.

SAMPLE

FULTON RESEARCH INITIATIVE (FURI)

PROPOSAL

TIMELINE

PERSONAL STATEMENT

FURI Project for Spring 2012

Control-Relevant Design of Scramjet-Powered Hypersonic Vehicles

Student: Mark W. Meister, ASU Undergraduate, Aerospace Engineering

Advisor: Professor Armando A. Rodriguez, ASU, Electrical Engineering

PROPOSAL

GOAL. The goal of the proposed research is to gain insight into the design of sramjet-powered air-breathing hypersonic vehicles (ABHVs) using control-relevant models. Here, "hypersonic" refers to flight speeds in the range Mach 5-15; i.e. 5-15 times the speed-of-sound.

MOTIVATION. Such ABHVs are expected to play a key role in achieving NASA's airplane-based two-stage-to-orbit (TSTO) vision. As such, they represent the next critical stage toward attaining rapid, affordable, reliable space access and global reach capabilities.

The ABHVs under consideration are characterized by an aerodynamic-wedge-shape (side view), low aspect ratio geometry (top view), lower-forebody compression-ramps, a rearward-shifted scramjet engine, and a large external nozzle.

The scramjet (supersonic combustion) engine is the centerpiece of the ABHV. In contrast to conventional jet engines, the scramjet has no moving parts. High compression ratios are achieved by virtue of the significant pressure rise across the oblique bow shock wave – a consequence of supersonic operation.

In contrast to rocket-based vehicles which must carry their own oxygen supply (e.g. space shuttle external tank provided liquid oxygen), ABHVs exploit atmospheric oxygen thus opening the possibility for a larger payload.

The airplane-like operation of the targeted ABHVs also offer a significantly enlarged landing footprint as well as increased reliability over rocket-based alternatives.

HISTORIC FLIGHTS. The historic 2004 Mach 7, 10 flights of the NASA X-43A demonstrated scramjet propulsion – monumental milestones only 100+ years after the Wright brothers' 1903 flight. In 2010, Boeing demonstrated its scramjet-powered-hydrocarbon-fueled X-51 waverider at Mach 6. Two recent DARPA FALCON flights examined Mach 20+ glider operation during re-entry.

CONTROL-RELAVANT ISSUES. The ABHVs under consideration are characterized by (1) unstable nonlinear dynamics associated with a forward center-of-pressure and rearward center-

of-gravity, (2) undesirable inverse-altitude-response attributed to a transient loss-of-altitude for an upward elevator deflection, (3) limited elevator control authority, (4) low thrust/acceleration margins, (5) a hostile thermal environment - requiring a carefully designed thermal protection system (TPS) and that fundamentally governs the vehicle design, and (6) significant aero-thermo-elastic-propulsive dynamic coupling and uncertainty. These characteristics present a great challenge to control engineers – engineers charged with designing a flight control system to maximally exploit sensor readings (e.g. gyroscopes, GPS, FADS, etc.), control-relevant models, and control algorithms in order to coordinate (in real-time) vehicle controls (elevators, ailerons, rudders, fuel flow) to ensure acceptable and predictable performance without the assistance of a pilot.

A DANGEROUS DESIGN PHILOSOPHY. Traditionally, aerospace vehicles have been designed with little/no consultation of control engineers. This philosophy has resulted in fundamental problems for high performance aircraft (e.g. X-29). This lack of consulting control engineers has also been seen in other arenas – the most flagrant example being the 1986 Chernobyl disaster – a disaster that could've been avoided had proper attention had been paid to control system fundamentals (Stein, Respect the Unstable, 1989); i.e. operating an unstable system in the presence of limited control authority (like the ABHVs under consideration) can be disastrous. This provides substantive and overwhelming motivation for the **control-relevant vehicle design approach** to be taken for the proposed project.

CRITICAL TRADEOFFS AND LIMITATIONS. The proposed work will specifically seek to reveal critical tradeoffs and fundamental performance limitations associated with vehicle geometry as well as propulsion system characteristics as they relate to critical metrics; i.e. instability, lift-to-drag-ratio/range, fuel use, structural flexibility, elevator/wing placement/sizing.

ADVISOR BACKGROUND. Dr. Rodriguez has been sponsored by NASA Ames to work on the above topic during the past 6 years. This work has resulted in 3 MS students and 2 PhD students. A former MS student is currently working at NASA Ames. I hope that the proposed project will put me in a good position to apply for a NASA graduate fellowship. One of Dr. Rodriguez' PhD students was supported by a NASA PhD fellowship.

TIMELINE FOR PROPOSED HYPERSONIC VEHCILE PROJECT

The following timeline will be followed to guide the proposed Spring 2012 FURI project on control-relevant hypersonic vehicle design:

Week 1 – 3 Comprehensive literature survey; i.e. journal and conference papers, books, theses, etc.

Week 2 – 10 Examination of nonlinear model – to be provided by my faculty advisor: Dr. Armando A. Rodriguez (Professor of Electrical Engineering)

Week 8 – 15 Generate relevant vehicle geometry and propulsion flow path trade studies to understand the impact on the vehicle's static and dynamic characteristics

Week 12 – 13 Prepare poster for presentation at FURI symposium (April 20, 2012)

Week 11 – 15 Document all results in a final comprehensive report

PERSONAL STATEMENT

MOTIVATION. My main motivation for pursuing the proposed hypersonic vehicle design project is to establish a foundation for a senior design project, an MS thesis, and a PhD thesis in the area of hypersonic vehicle design. My ultimate goal is to become a professor of Aerospace engineering at a Research I university. This would allow me to teach, conduct world-class research, mentor students, supervise their work, and contribute significantly to the technological development of the nation. These goals have been fueled by my collective experiences.

CAREER PLANNING ANS SEMINARS. I've had many career planning discussions with my advisor/mentor: Dr. Armando A. Rodriguez (Professor, Electrical Engineering). He has been supported by NASA to work in my area of interest during the past 6 years (see Proposal). These discussions and specific seminars have deeply influenced my career choice.

COURSEWORK. My math, physics, and engineering courses have steadily steered/guided my career path. More specifically, my courses in thermodynamics, heat and mass transfer, structural mechanics, aerodynamics, and sensors and controls have provided a very good foundation for my proposed work and career objectives. Through innovation, engineers continue to revolutionize the way we live. My coursework has given me a foundation to participate in this ongoing technological revolution; one day as a professor.

TUTORING AND GRADING. I've tutored mathematics since 2010. This has given me a wonderful glimpse into the world of teaching. It has (1) taught me the value of explaining technical material to others, (2) forced me to deeply think about what I have learned and how to best communicate it, and it has also (3) taught me the value of exploring and comparing alternative problem approaches. I've also served as a grader in Calculus I-II. This has further sharpened my problem solving skills as well as given me greater insight into student thinking. The latter should help me become a better tutor/teacher. I can see how fun it would be to introduce cutting-edge research ideas into the classroom – something I'd be able to do as a professor.

RESEARCH EXPERIENCE. Since the Summer of 2011, I've had the opportunity to work with Dr. Patrick Phelan (Professor, Mechanical Engineering) and his solar-nanofluids group on the development of a thermodynamic model that captures the use of solar cells to achieve supercritical conditions in order to efficiently convert methanol to a biofuel. This has given me a great foundation to understand/address many of the critical thermodynamic problems that govern the design of hypersonic vehicles (Anderson, Hypersonic and High-Temperature Gas Dynamics, 2006); see Proposal.

WORK EXPERIENCE. An internship at General Dynamics (February-August 2010) exposed me to issues associated with military satellite communications. Seeing PhDs working on the most cutting-edge issues/problems clearly reinforced the value of a engineering doctorate.

SUMMARY. In summary, I'm very eager to pursue the proposed project. It will (1) strengthen my analytical capabilities, (2) prepare me for advanced graduate work and my chosen career path, (3) give me the opportunity to publish and present my research, and (4) assist me financially.