Bioengineering Design

Mission Accelerator #1

Annotated Mission Statements

The mission statements included here represent varying degrees of quality. None of them are perfect, though some do a better job than others. Mouseover the comments to view feedback on each mission statement. The annotations will help you understand how these statements could be improved while also giving you an idea of the type of feedback you should expect to receive on your statement.

Note that only the first example contains a cover letter for the advisor. You should include this with your assignment and use it to send the mission statement to your advisors.

September 24, 2008

Dear \_\_\_Specific mentor here\_\_\_,

We are Team **Heat the Babies**, the bioengineering senior design team from Rice that has chosen to work on optimizing existing ‘hot cot’ incubators for our senior design project. Specifically, the team is contacting you to confirm our understanding of the goals you have for the project.

Attached is our Team Mission Statement, which we submit to you for revisions, suggestions and general outpourings of wisdom. We’d also like to meet you and hear your input for the upcoming year’s design. Please e-mail us at [heatthebabies@gmail.com](mailto:heatthebabies@gmail.com) the times you’d like to meet next week (9/29-10/3). As we all have class in the mornings, we’d prefer an afternoon time on Monday, Wednesday or Friday.

Thank you so much for offering your assistance. We are very excited about the project and its possible impacts on the developing world.

## Team Heat the Babies

Name 1 listed here

Name 2 listed here

Name 3 listed here

The mortality rates of premature babies can be easily decreased with simple accessibility to warmth in early development. In developing countries however, access to Western-style incubators is limited. Queen Elizabeth Central Hospital in Blantyre, Malawi has implemented a low-cost two-chambered ‘hot cot’ crib made from plywood. Ventilation gaps direct heat from light bulbs in the lower chamber upwards, thereby warming neonates.

We are senior bioengineering design students at Rice University studying the existing ‘hot cots’ in order to design and build an efficient incubator specifically for heating premature babies in the developing world. This project will allow those without access to traditional NICU incubators to construct an inexpensive and easily repairable device for warming babies.

Our overall goal is to create a standardized and optimized incubator that can be constructed from cheap and locally available materials in the developing world. We will then disseminate the technology to areas currently lacking sufficient incubators. While the current ‘hot cot’ addresses the issue of providing heat, the design lacks:

* Formal engineering analyses of thermodynamic concepts (may be inefficient)
* Consistent design and dimensions
* Temperature or humidity monitoring devices
* Construction and repair instructions

Over the course of 9 months (Sept. 08-May 09), with a budget of $2,500, our team will address:

* Optimizing heat flow—
  + Location/type of heat source
  + Presence/arrangement/size of metal flashing
  + Configuration and size of ventilation
* Availability of resources in developing countries
* Lowering construction costs
* Minimization of power requirements
* Overnight operation in the absence of power
* Possible additional humidifier & temperature and humidity monitoring
* Standardization with instructions for construction and repair—creation of exact plans in different languages

### Project Timeline

|  |  |
| --- | --- |
| Build current ‘hot cot’ and analyze thermodynamics | November 2008 |
| Optimize heat source/location & ventilation scheme | February 2009 |
| Add a humidifier and monitoring devices (if possible) | March 2009 |
| Find appropriate power source & power storage unit | March 2009 |
| Write instructions for assembly and translate | April 2009 |
| Teach Beyond Traditional Borders interns to build hot cots | April 2009 |
| Final presentations | April 2009 |
| Test optimized incubator in developing countries | May 2009 |

**Overall comments**: This team nicely summarizes the incentive for their project and takes an initial stab at identifying criteria that will constrain the design. The deadlines are specific and not tied solely to course deadlines. The document could be improved by more specifically defining some of the criteria. Certainly the team is not expected to begin setting quantitative criteria at this stage, but a mission that starts defining some of these terms would be more impressive and demonstrate a better, up-front understanding of the scope of the problem.

Team Name:

**I**nexpensive Cooling **E**quipment

Team Members [list omitted]

Team Mentors [list omitted]

Statement of Purpose:

A major barrier to the treatment of pediatric AIDS in Africa is that most AIDS medications must be kept cool in order to remain effective. Because power supplies are limited in the developing world, conventional refrigeration is not available to many patients and thus an alternative means of keeping medications cold is needed.

This project will encompass the design and construction of an affordable, portable cooling device which can keep medications cool for 30 days with minimal power needs. It must remain low-cost, low energy consumption, and inconspicuous in size and design.

Time frame:

This project is to begin October and be completed by April the following year.

Funding:

Up to $4000 is available; however, the cost of the final device must be minimized because it must be affordable enough for distribution to patients in developing countries.

Significant Deadlines:

October 30: Written design proposal

December 8: Demonstration of device prototype, CAD drawings, etc.

February 9: Form business and marketing plan

March 16: Users manual, device summary, report and poster, cost analysis

April 20: Final report, summary, and device prototype

**Overall comments**: This team has developed a well organized narrative describing its project. The background supplied, however, is vague. While the first paragraph sets up a general need, the actual need is much more specific. Clearly, the types of diagnostic tests doctors need to do influence the design approach—as the team indicates when it ultimately says its focus will be developing a power source. The team should refocus the background to discuss the specific tests most relevant in a remote environment that can’t be performed because of a lack of power or portability. In addition, a definition of “remote” would be useful. What are the characteristics of the Honduran environment that will impact the design undertaken?

The reader also wonders whether there is a connection between the medical records device and the power source work. Why were these two factors chosen as focal points?

Team The South Face

Beyond Traditional Borders: “Diagnostic Lab in a Backpack”

*Team Members*: [List omitted]

*Team Mentors*: [List omitted]

*Mission Statement*:

Doctors in the developing world are faced with the challenge of diagnosing and treating diseases in remote areas with limited access to standard diagnostic assays and medicine. Physicians must travel to remote villages and treat patients too ill to travel to the clinics in larger towns. However, this is difficult because many diagnostic tests and clinical devices are not easily portable and many of the devices need a constant power source. Additionally, doctors in the developing world are faced with the problem of a lack of medical records. There are only primitive and unreliable means of keeping up with patients.

In order to better provide healthcare to patients in remote areas, a diagnostic backpack needs to be developed. This diagnostic backpack will provide a set of portable treatment and test equipment for physicians. Furthermore, the backpack ought to provide a power source to many of the devices. We intend to focus on developing a power source for the diagnostic devices in the backpack. Furthermore, we hope to develop a portable medical records device that would help physicians to keep track of their patients.

The product should be effective in addressing the specific medical needs of the target communities, and should furthermore be inexpensive, portable, straightforward, culturally acceptable, and easily replaceable. Initially, the diagnostic backpack would be modeled for use in Honduras. Eventually, the backpack would be adaptable for other audiences besides Honduras. Our target audience is physicians who must travel to rural areas.

We aim to complete this project within 8 months utilizing a development budget of $4000. A prototype is expected to be completed by the December. Testing and redesigning will occur in spring. A final model should be finished by April.

**Overall comments**: This team states its goal concisely under “Objective,” but the statement does not put the objective in context. As written here, the goal sounds much like how the original assignment might have been presented to the team. The team must determine why this problem is worth solving—beyond having been given the task by a superior. Why is this device needed? Is it only useful to one lab, or could the work have broader implications? Perhaps the work done to build this single device will lead to methodological or technological developments that could be applied in other contexts.

Additionally, the constraints defined are extremely vague. A better statement of the need might help the team define how the systems and functions it describes actually constrain the design.

**Mission Statement**

**Team Name:** Triple T

**Team Members:** [List omitted]

**Mentor:** [List omitted]

**Objective**: To develop a device or method that will allow for reproducible clean-up of contaminants of Gold / Gold Sulfide nanoshells formed during production. This method or device should be relatively cheap and amenable to mass producing large quantities of particles in addition to requiring minimal operator intervention.

**Customer**: Laboratory for Biofunctional Materials and Cardiovascular Tissue Engineering

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**Constraints:**

* Within the budget of a research lab
* High through put sorting system
* Highly automated interface
* Scaleable to mass sorting

**Budget:**

* $2000.00 for preliminary testing of nano particle properties including but not limited to
* Raw materials for producing nanoparticles
* Analytical testing equipment
* Raw materials for manufacturing the device

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**Time Frame:** Device is expected to be delivered as soon as possible not to exceed April 1.

**Deliverables:** A novel device or method capable of sorting nano scale particles.