

## SMITH Status Report April 2012

We are working on finding a non-constant power solenoid that's 3/8th" inch FNPT (Female Nation Piping Thread) and the appropriate stainless steel plumbing to run a new test on that. Also after the initial testing we will have the machine shop bore out the new stainless steel filter housing to 3/8th so we can compare the new resistance of flow rate to that of the 2011 system. I also hope to get an estimate for doing this tomorrow.

Two methods of optimization for the pump system are being investigated:

### Oil Pumps:

- According to previous research, VW oil pumps have been used with success in stratospheric flights
- Advantages of these include decreased weight, possible decrease in power required for pump
- Disadvantages of these include low flow rates, previously provided about 30 LPM
- Two oil pumps were acquired from a Ford 302 engine, cleaned and dichronited
- Testing on these will begin when the testing described below is finished

### New Super Tigre Engine/Old Super Tigre Engine Testing system

- A testing system has been built for the previous pump used to accurately measure characteristics of its operation
- This testing system will be modified and rebuilt for the new super tigre engine
- All components of this system for the old pump are working and ready and testing has begun for this according to the SMITH Testing Procedure Document created by Michael Stewart
- Build of this test system for the new super tigre engine (larger) is still in progress and should be finished next week

## Biology

Limits of detection for multiple assays for SMITH 2012 have been calculated (Table 1). With a minimum cell concentration of  $250 \text{ cells m}^{-3}$ , we will achieve a statistically significant signal above the control. An analysis schedule is being created to establish protocols for sample processing. We will soon begin training undergraduates in their various assays to be completed in an effort to improve our recovery of organisms from the stratosphere.

<b>Measurement</b>	<b>Technique</b>	<b>Minimum number of cells to reach detection threshold</b>
Total cells	SYBR gold	$1.5 \times 10^3$
Total cells	ATP	$1.0 \times 10^4$
Viability	Live/Dead	$6.0 \times 10^3$
Culturing†	Spread plating	$1.0 \times 10^4$
Metabolic activity	XTT	$1.0 \times 10^1$

† Assuming 0.1% culturability using standard enrichment media techniques

**Table 1** Minimum requirements for SMITH 2012 to achieve the level of detection