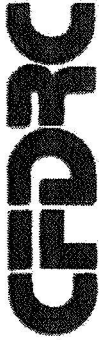


*Presented 10/20
2002 018 950*

CFD Research Corporation



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LASER IGNITION TECHNOLOGY FOR BI-PROPELLANT ROCKET ENGINE APPLICATIONS

By

M. Thomas¹, J. Bossard¹, J. Early², H. Trinh³, and J. Dennis³

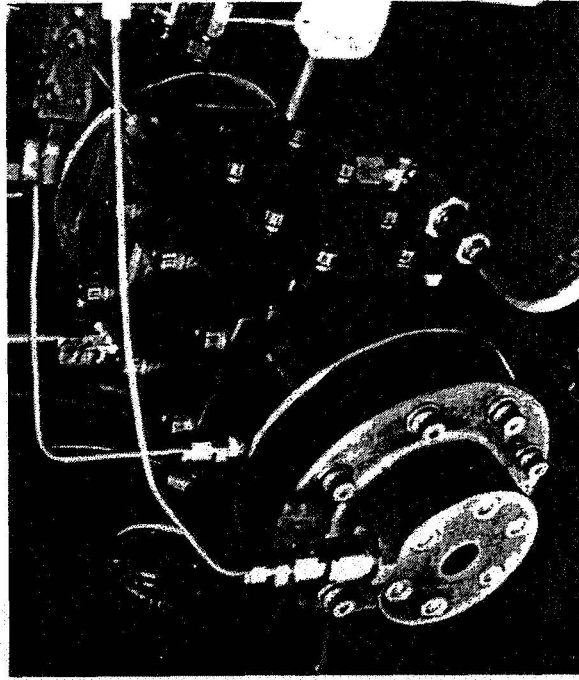
**13th Annual PERC Symposium
Huntsville, AL
October 22, 2001**

¹CFD Research Corp., ²Los Alamos, ³NASA MSFC

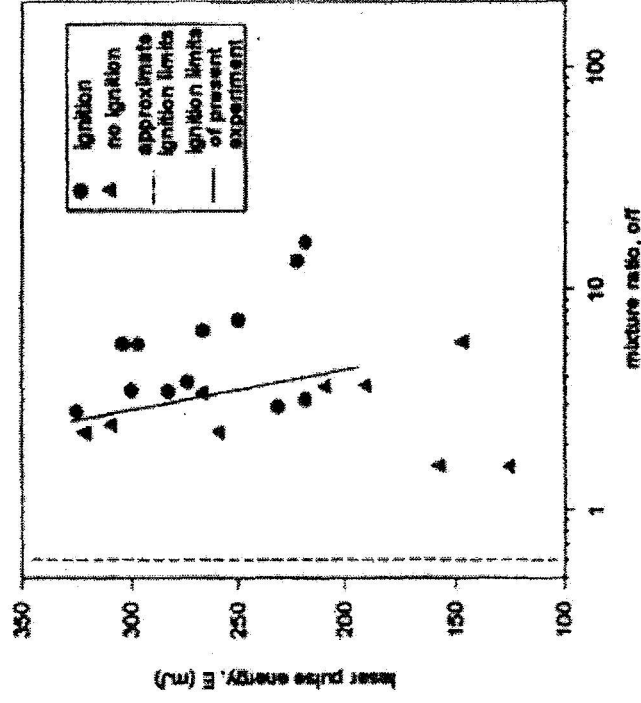
BACKGROUND



- Prior NASA Demonstration



Chamber



Selected Results

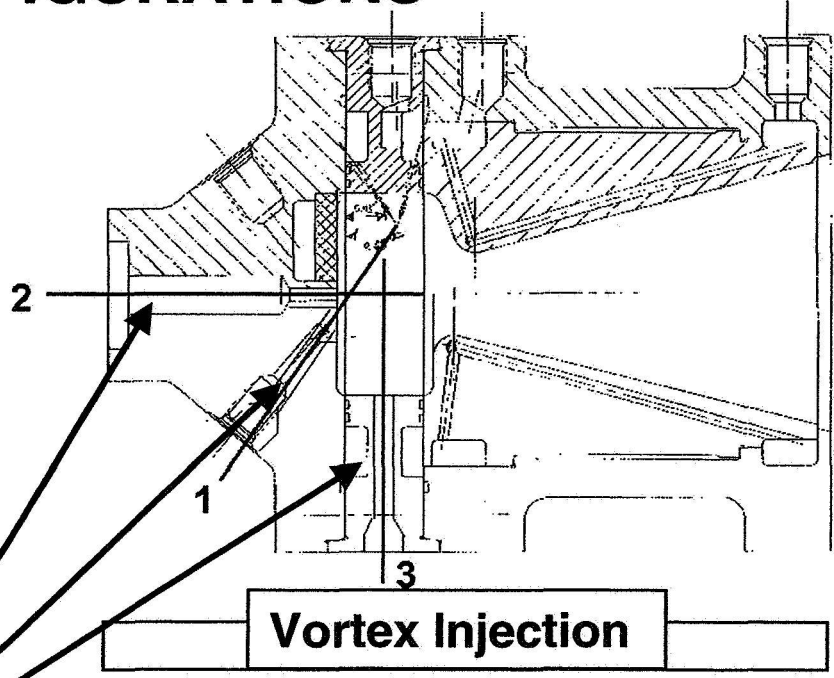
- Laser Technology Enhancement Required

OBJECTIVES



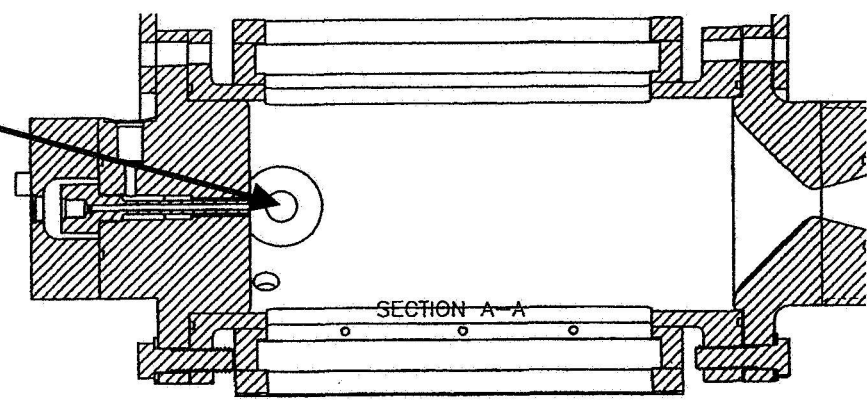
- **Select Test Chamber(s) and Flows**
- **Define Laser Ignition Setup**
- **Pulse Format Optimization**
- **Fiber Optic Coupled Laser Igniter System T&E**
- **Chamber Integration Issues**

TEST CHAMBER CONFIGURATIONS

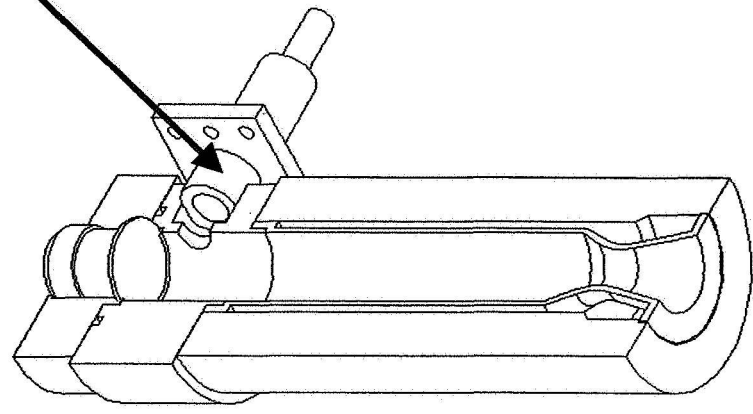


Vortex Injection

**Laser
Spark
Ports**



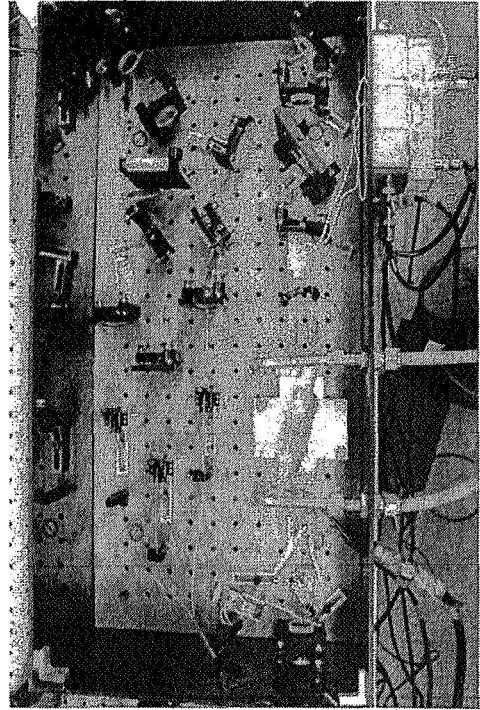
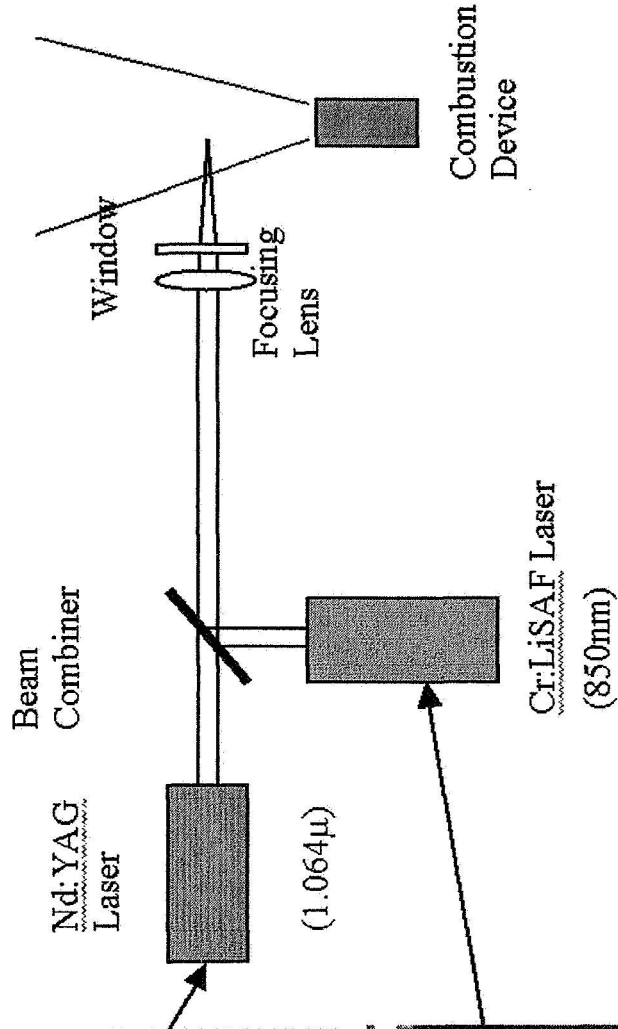
Coax Injection



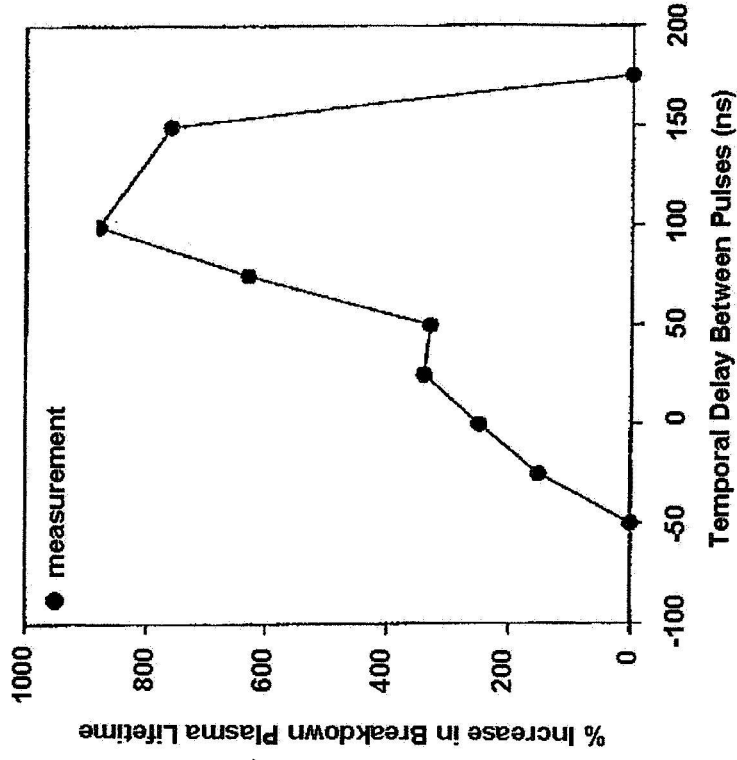
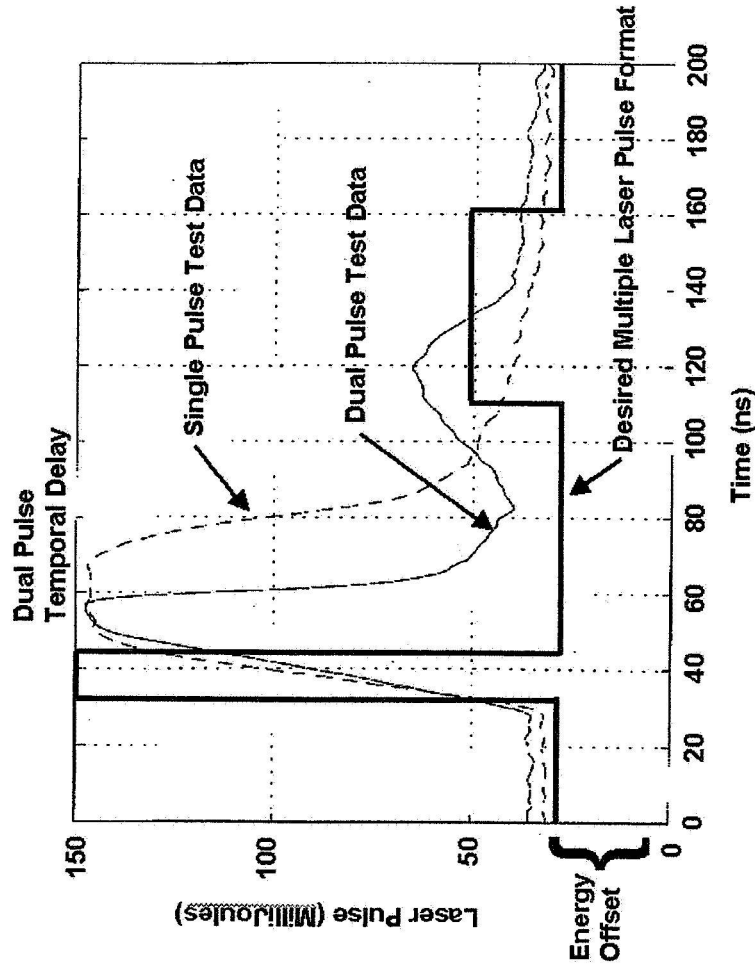
Triplet Injection

MSFC LASER IGNITION SETUP

CFDRC



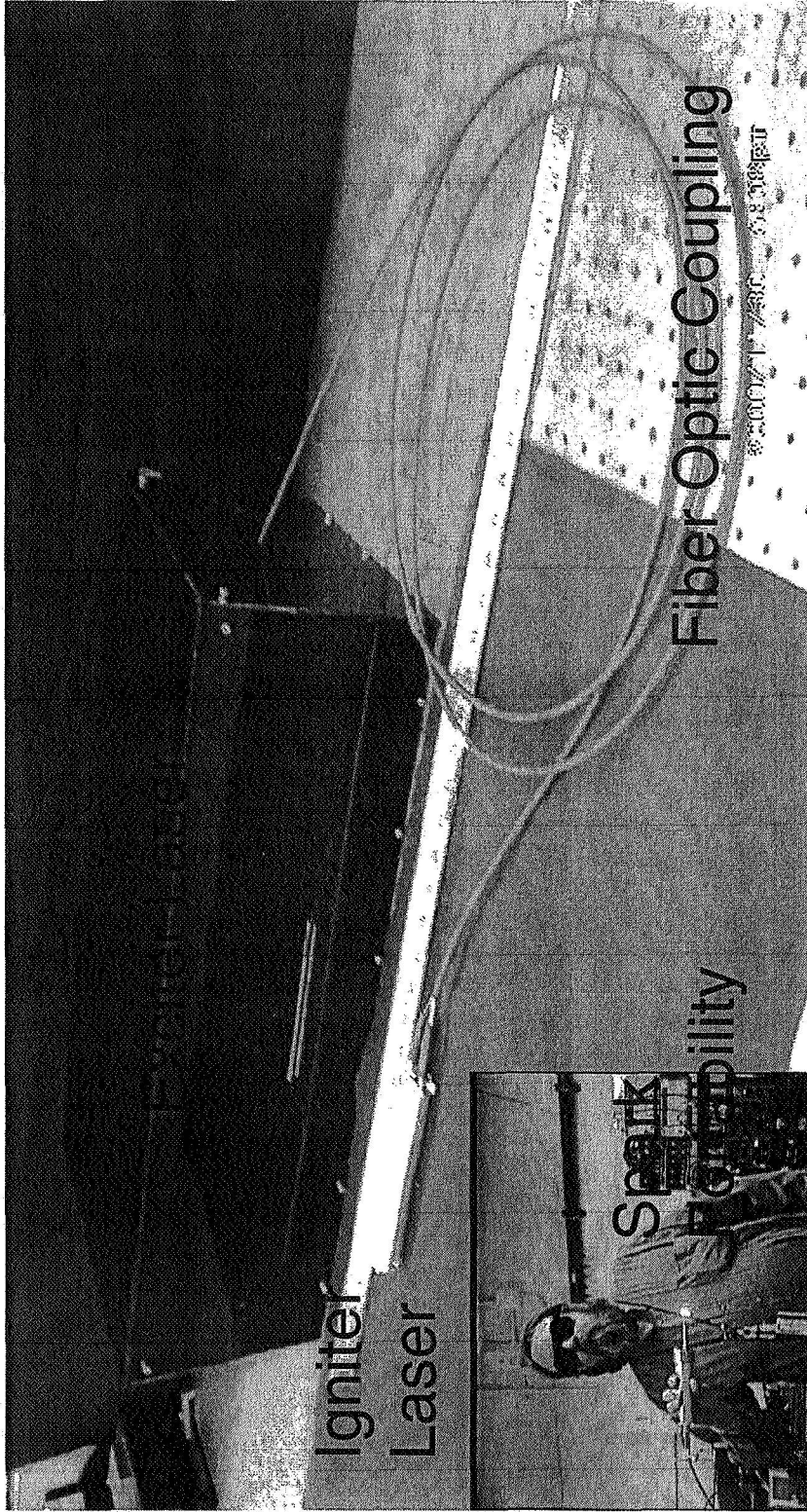
PULSE FORMAT OPTIMIZATION



Pulse Format Definition

Dual Pulse Advantage

FIBER OPTIC COUPLED LASER



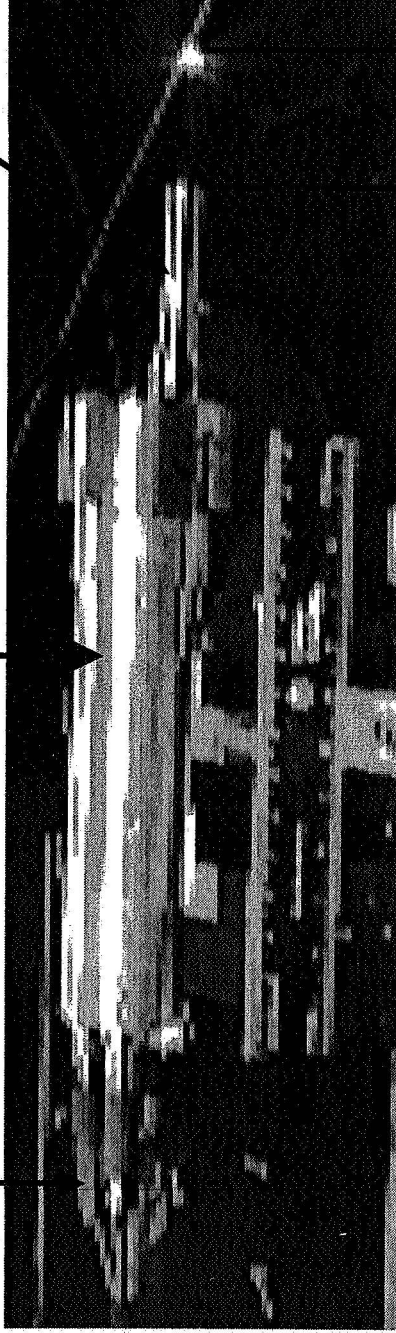
ADJUSTABLE SPARK LOCATION



Optic Couplers

Igniter Laser

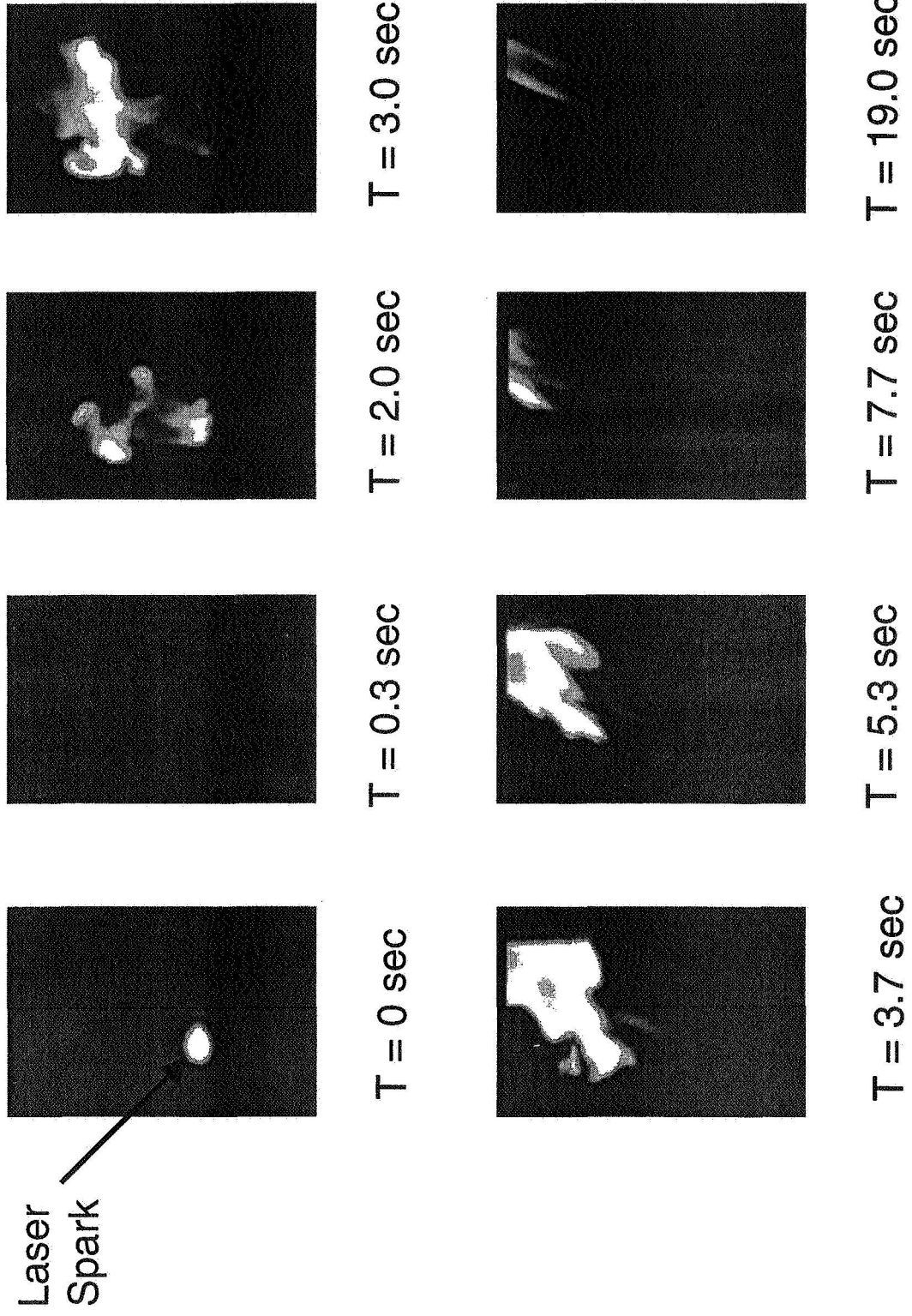
Focusing Optics



X

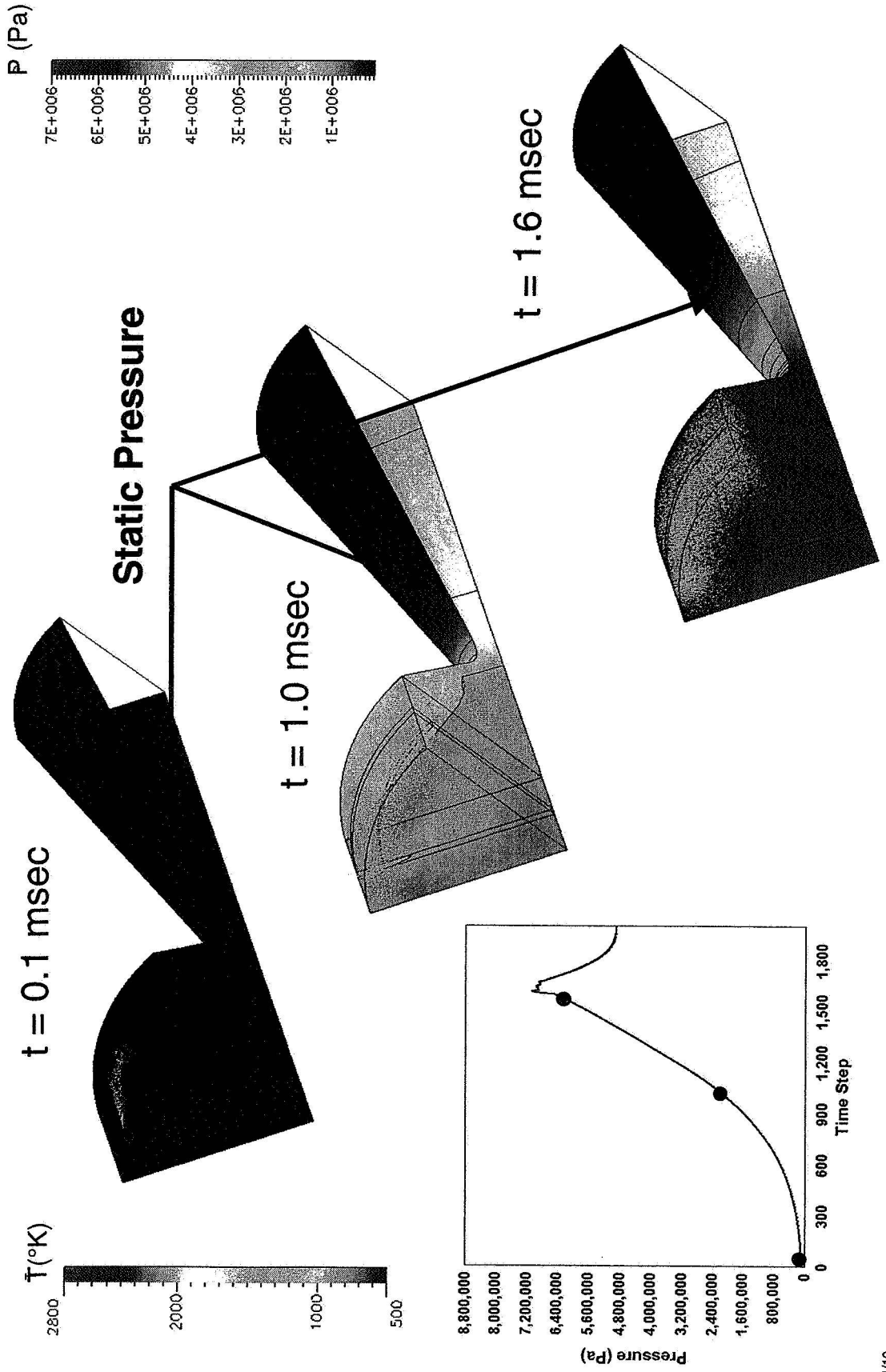
AMBIENT BIPROPELLANT IGNITION

Stoichiometric GOx/MAPP



TRANSIENT CFD SIMULATION

Vortex Injection

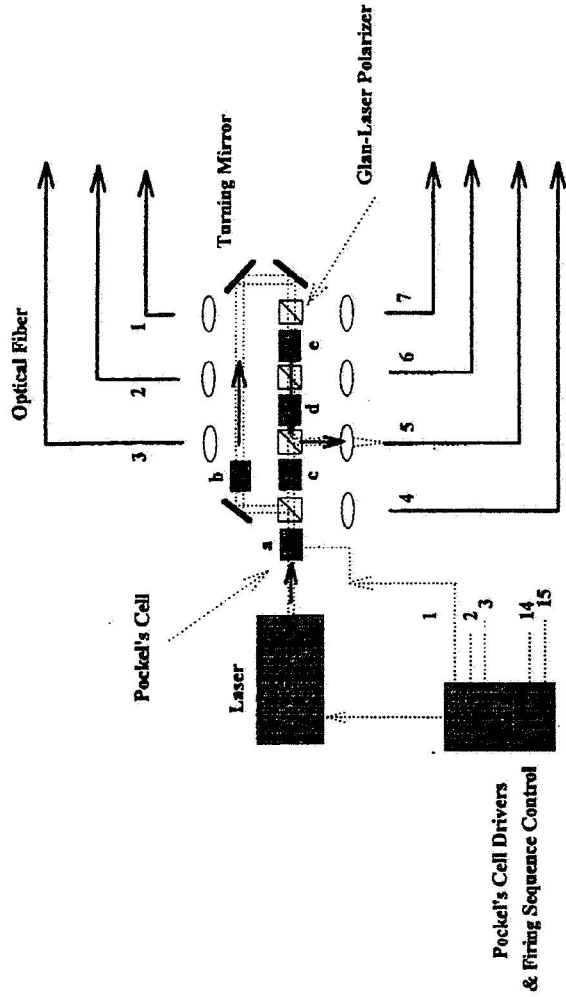


TEST SCHEDULE

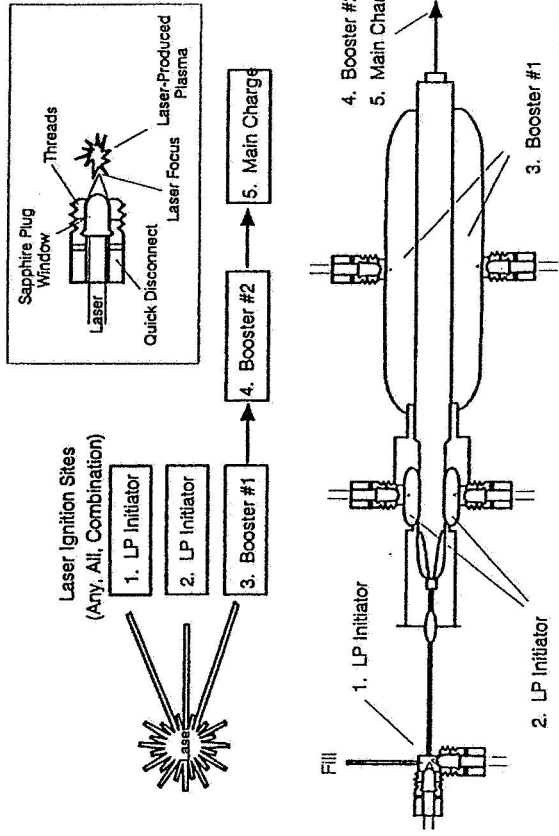


ID	Resp.	Task Name	June	July	August	September	October	November	December	January	February	March	April	May
			Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1														
2	J. Early	LASER IGNITION SYSTEM												
7	CFDR	COMBUSTOR CHAMBER												
16	J. WILLEY	DATA ACQUISITION SYSTEM												
29	J. PRICE	FACILITY BUILDUP												
73	J. Price	Combustor / Propellant Feed System Checkouts												
74	J. Price	Total System Checkout												
75	J. Price	System Documentation												

CHAMBER INTEGRATION ISSUES



Multiplexing



Window Durability

CONCLUSIONS



- **Rocket Combustion Chamber Laser Ignition Feasibility Demonstration Imminent**
- **Support Technologies (Multiplexing, Window Durability/Cleaning, Fiber Optic Durability) Feasible**
- **Technology Development on Schedule to Address Gen 3 Requirements**