NEXT GENERATION SUBORBITAL **ACTIVITIES:**

COMMERCIAL STEPPING STONE ASSESSMENT OF A

DAVID I. LACKNER FEB 18TH, 2010 #NSRC Opportunity to become expert







Ecosystem developing

suborbital research is wrong Conventional wisdom about

Conventional wisdom

- Suborbital tourism will be buoyed by a µgravity research market
- Suborbital research is new, and will create new products
- Anything "NewSpace" has commercial potential and will receive investment

Commercial reality

There is no "research market", there is an opportunity to create an ecosystem

- Not all suborbital research is new. Emerging **next-gen** suborbital research is developing against a backdrop of established work
- Most will remain in the research domain of thesis papers

NASTAR Overview.images.ASMA.pdf - Adube Acrobat Pro File Edit View Document Comments Forms Tools Advanced Window Help

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Background

NASK!

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Equipmen

- Grand Opening 2007. Philadelphia, PA USA.
- 30,000 sq.ft. AeroMedical Facility.
- Major Markets: Space, Military, Civilian, Research Entertainment, Education.
- <u>Created Because</u>: National BRAC (Base Realignment & Closures) & growing pilot training needs. Used also as showcase for manufactured equipment.
- Error and the provided subsidiary of Error (1969) with 40 years of motion system technology.
- Executives recognized in 67 communes
 BSI Certified to: ISO 9001 : 2000, ISO 9000-3, ISO
 13485 & MDD, EU PED.

tional AeroSpace Research and Training Center

www.NASTARcenter.com

'Phoenix' Centrifuge

Protection

High Fidelity, Multi-Axes, Sustained G Force Motion Platform



- World's most High Performan "Flyable" Human Centrifuge.
 ARN: 25 foot; 11 ton MAXIMUM G: +15Gz
 ONSET/OFFSET: 10 G/SEC
 MAX PAYLOAD: 1200 lbs. (544kg)
- MAX PAYLOAD: 1200 lbs.
 (544kg)
 Dual gimbaled axis, "G-Pointing
 Interchangeable Cockpits
 Interchangeable Cockpits
- Interchangeable Cockpus Integrate Customer Aero-Model

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High-fidelity, interchangeable research, snace & tactical cocknits with wide field of

nple New Shepard CC Trajectories

SUBORBITAL EX







X







Synthecon Houston, TX

Astrogenetix Austin, TX

Key people

Tom Pickens

San Francisco, CA Ventions, Inc.

Bill Anderson <u>Key people</u>

What they do research for stem cell **3-D** bioreactors

valuable Spinoffs are stil <u>Why they're</u> <u>important</u>

Substantially cheaper

plumbing. Silicon valley

Why they're important

propulsion

discovery

through biomarker

Therapeutic agents

What they do

turbomachinery,

What they do Microfluidics,

Adam London

Key people

Private <u>nvestment</u>

> umedy lechno E

San Diego, CA Technologies Lumedyne

Brad Chisum Key people

accelerometers Highly sensitive What they do

power MEMS with energy Why they're important harvesting means low

Angel Investment

<u>Investment</u>

costs

supporter and used to

long R&D cycles with high

microgravity research

Biotech is an original Why they're important

Bootstrapped

<u>nvestment</u>

local

Private



http://link.brightcove.com/services/player/bcpic

Investability below par





PricewaterhouseCoopers/National Venture Capital Association MoneyTree[™] Repo

"Short" timeline

Milestone	Duration
Project Start	
Science/Mission Definition	45 Days
Technology/Instrument Definition	180 Days
SRR	2 Months from Start
Flight Prototype Development	180 Days
PDR	4.5 Months from Start
Spacecraft/Hardware/Software Development	100 Days
CDR	7 Months from Start
Spaceflight Systems Integration and Test	50 Days
FRR	13 Months from Start
Mission Integration	14 Days
MRR	14 Months from Start
Launch	15 Months from Start
Mission Operations / Data Acquisition	45 Days
Post Mission Operations	30 Days
Mission Final Report	1 Year from Mission Complete

Source: MicroSatellite Free Flyer Proposal Section Templates (http://microsatellitefreeflyer.arc.nasa.gov/pst.html)





A CP train going for ough Bloomer Cut, just beyond Newcastk, California. It was 63 feet deep and 800 feet long. Every foot on the way had to be blasted with gampowder, and the CP used five hundred kegs of powder a day to do it. It was completed in the spring of 1865 and still stands to day, although the line now runs through two turnels to the north. Courtesy of the Union Pacific Maseum.







DAVID LACKNER DLACKNER@ALPS-VENTURES.COM 415.577.6659