



Space Industry's Impact on the California Economy

Executive Summary

July 2009

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ATKEARNEY

Executive summary

■ Extensive study

- 18 interviews (state & federal government, military, NASA, suppliers—primes through tier 2s, systems & testing, other service providers)
- 20+ data sources

■ Space industry contributes significantly to the California economy

- \$31 billion in revenues
- 71,000 direct jobs; 300,000 induced jobs; \$19 billion in wages
- Captures ~45% of US military and civil space program spend
- Fosters innovation and new commercial products and small businesses
- Well positioned to capture share of commercial sector growth
 - Spacecraft
 - Launch
 - Satellite services and new end-customer applications (e.g., DTH, GPS, Internet)

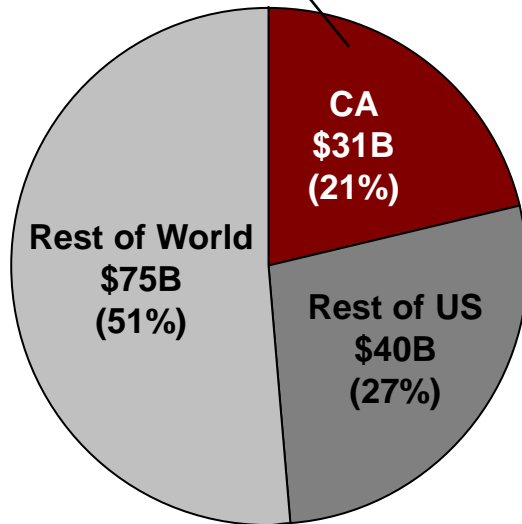
Executive summary (continued)

- California space industry has competitive strengths and challenges
 - Key strengths center around ecosystem in California
 - Strong customer and manufacturer/supplier bases
 - Academic/R&D assets
 - Highly skilled/experienced workforce
 - Key challenges are cost and regulatory climate
 - Cost of doing business (e.g., labor costs, cost of living, taxes)
 - Environmental costs of establishing facilities, permitting and process qualification
 - Other states are aggressively pursuing space industry development

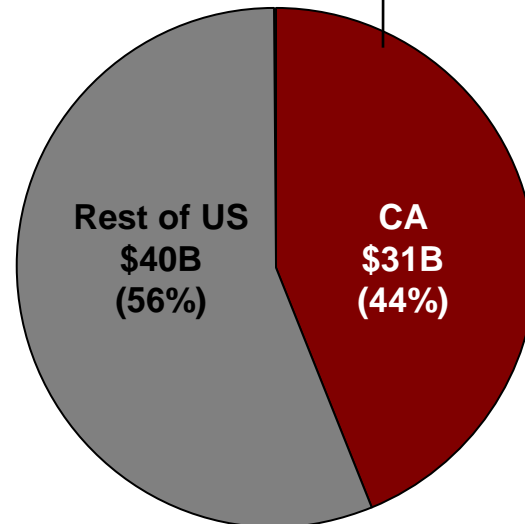
- How can government help the California space industry build on its strengths and mitigate challenges?

California space industry has a 21% share of the global space market and 44% of the US space market

California represents \$31B or 21% of the \$146B global space market...

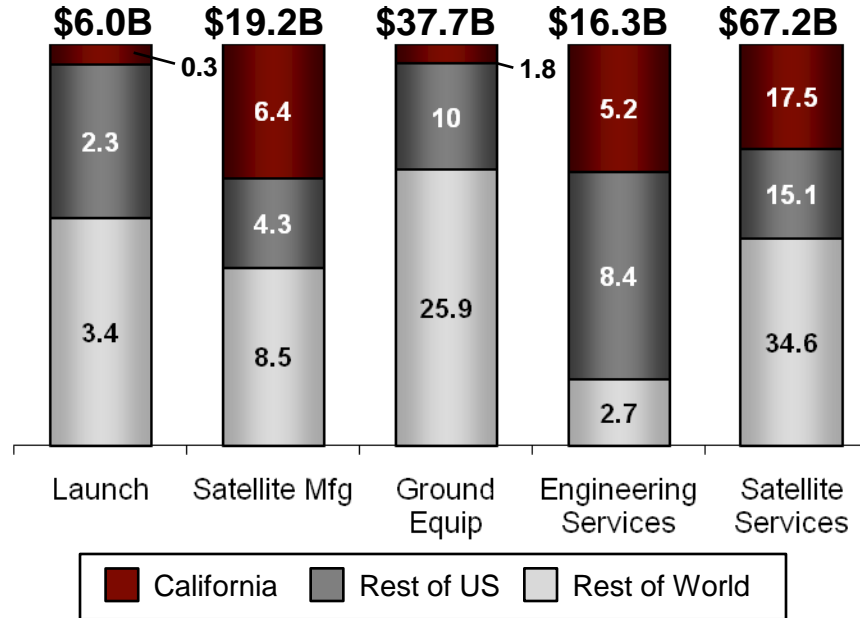


... and 44% of the \$71B US space market



California space industry covers all sectors and has a dominant global share (34%) in satellite manufacturing

Revenues by Sector⁽¹⁾

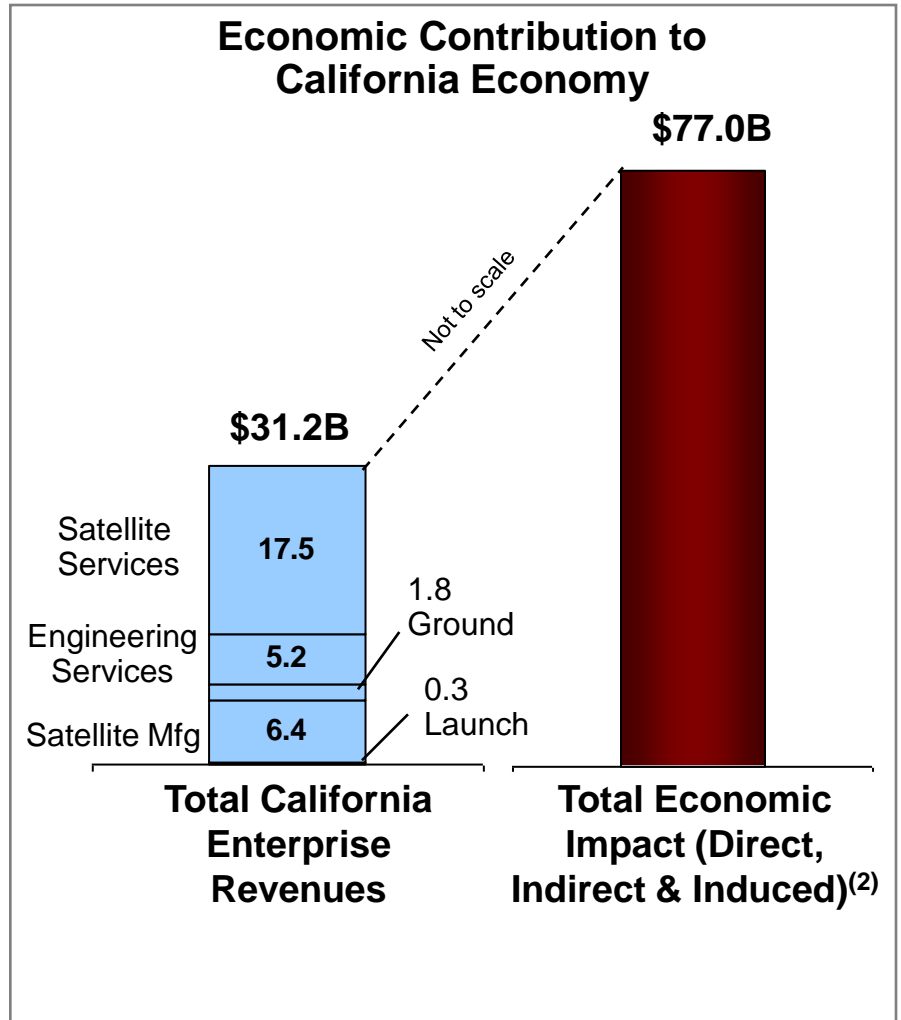
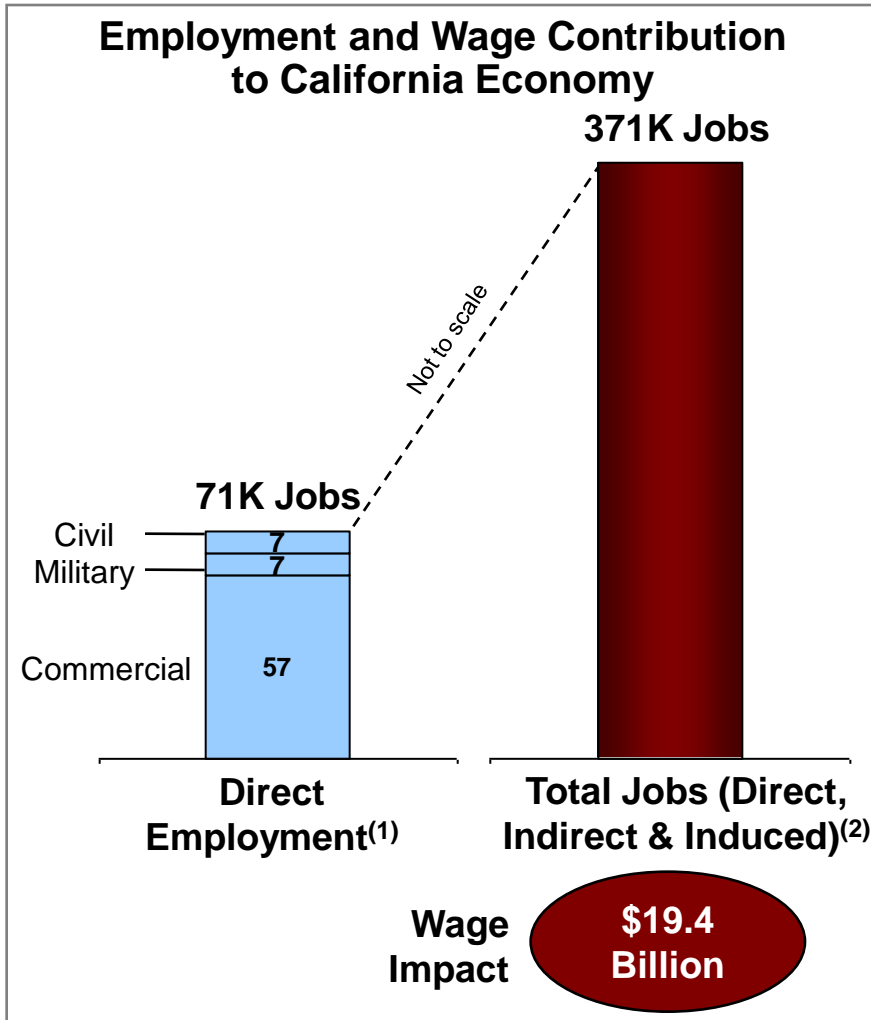


Market Share by Sector

	Launch	Satellite Mfg	Ground Equip	Engineering Services	Satellite Services
California	5%	34%	5%	32%	26%
Rest of US	38%	22%	27%	51%	22%
Rest of World	57%	44%	69%	17%	52%
Total	100%	100%	100%	100%	100%

Source: (1) DoD and NASA FY08 budget request, Satellite Industry Association, Forecast International, Air Force Magazine, SEC 10-Ks and 10-Qs; Company and industry interviews; A.T. Kearney analysis

California space enterprises employ 71,000 people and induce an additional 300,000 jobs across other industries



Notes: (1) Military employment includes SMC; Civil includes employment at NASA centers including contractors. Average revenue per commercial employee is \$303K, excluding DirecTV.

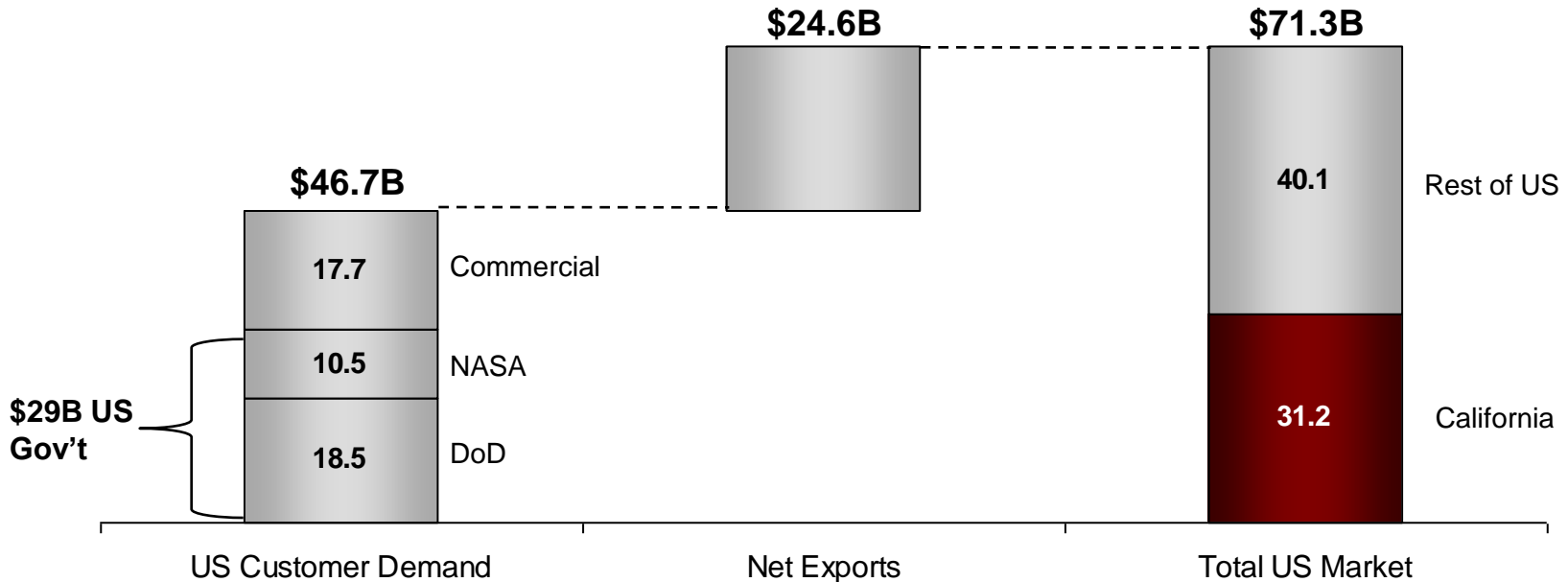
(2) Indirect and induced employment and dollars based on US Bureau of Economic Analysis employment multipliers

Source: US Bureau of Economic Analysis, A.T. Kearney analysis

Partnership with the US military and civil space programs is the bedrock of the California space industry

US Market Space Systems Demand and Supply Equation

-Billion \$-



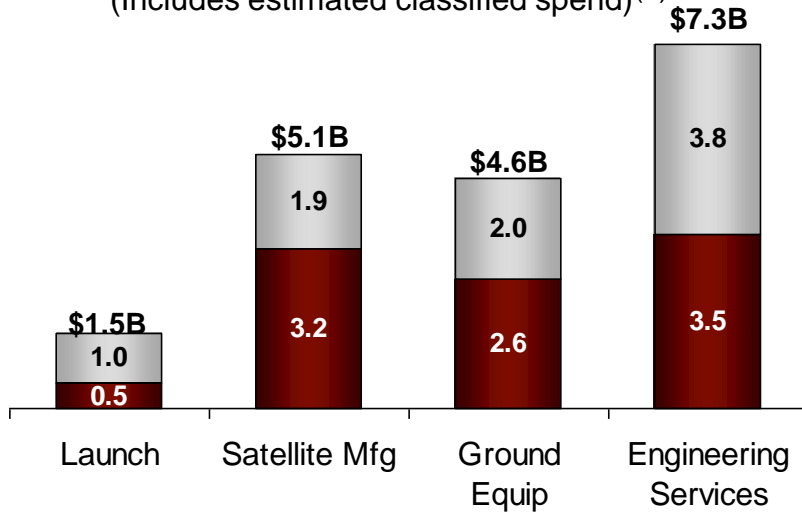
Nearly 45% of the US Military and Civil Space Program spend goes to the California Space Industry

Note: (1) Net exports calculated by estimating total US supply market minus net imports
 Source: DoD FY09 and NASA FY08 budget request; Satellite Industry Association, Forecast International, Air Force Magazine, Company reports, Interviews, A.T. Kearney analysis

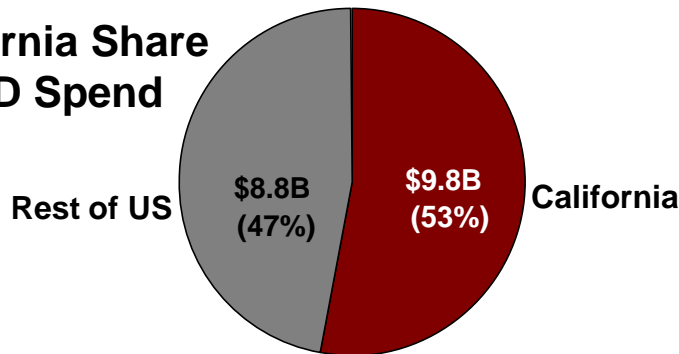
California gets a majority share of DoD spend

\$18.5B DoD Space External Spend

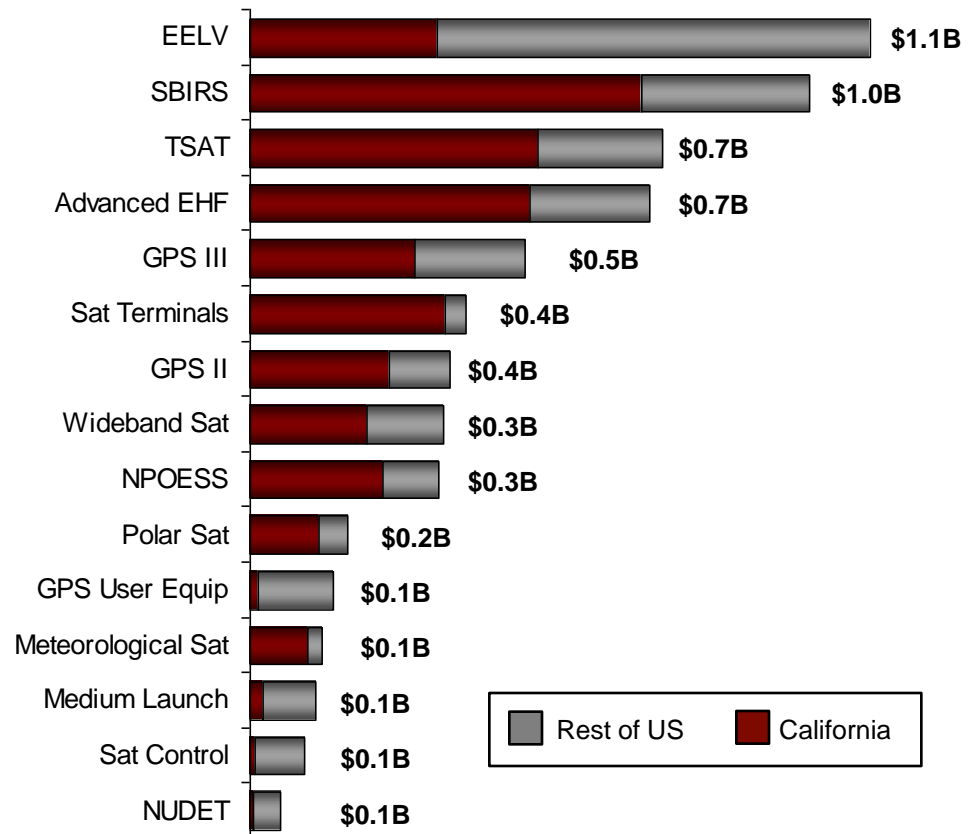
(Includes estimated classified spend)⁽¹⁾



California Share of DoD Spend

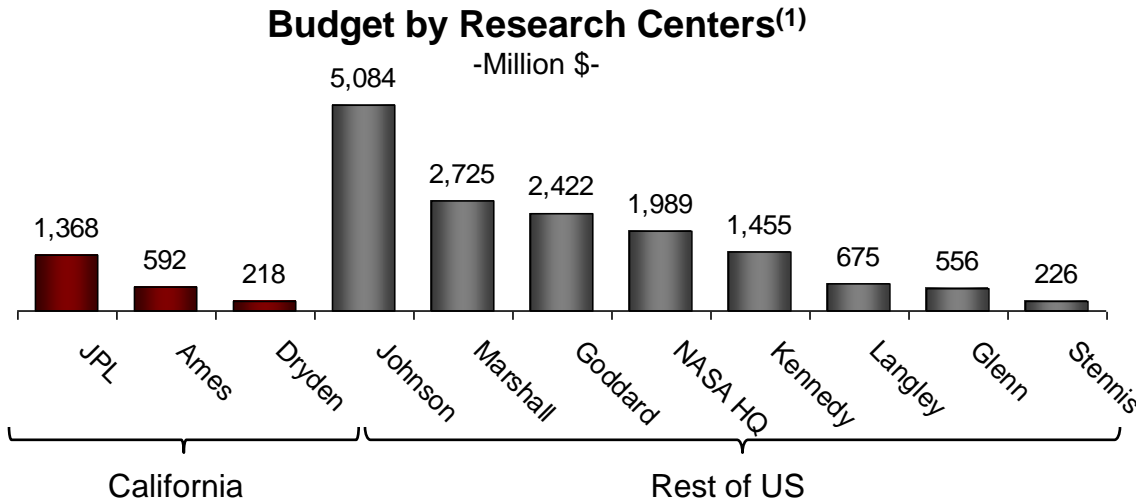


Top 15 DoD Space Projects (FY08 Budget)⁽²⁾

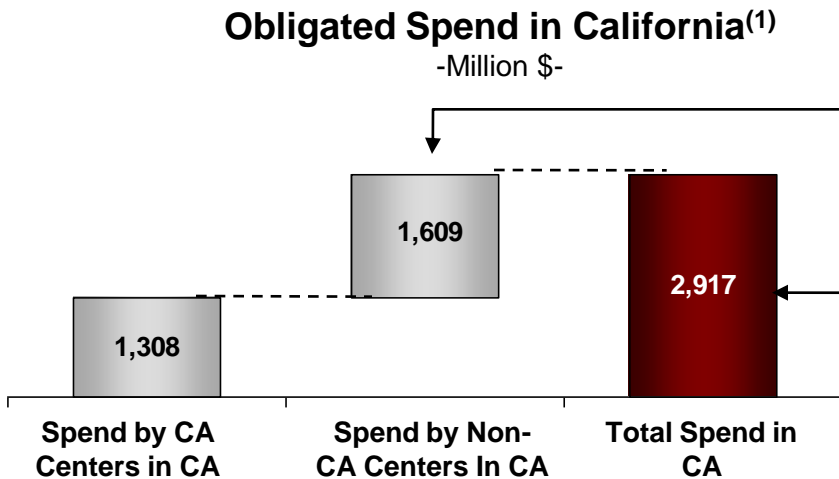


Note: (1) Includes estimate of classified spend. Engineering services include SE&I, Software, Testing & Verification, On-going Operational Support.
 (2) Includes Research, Development, Test & Evaluation (RDT&E) and procurement. California shading based on the location of the prime and tiered suppliers.

NASA allocates significant budget for its California centers



California Research Centers account for \$2.2B or 13% of the total \$17.3B NASA Budget

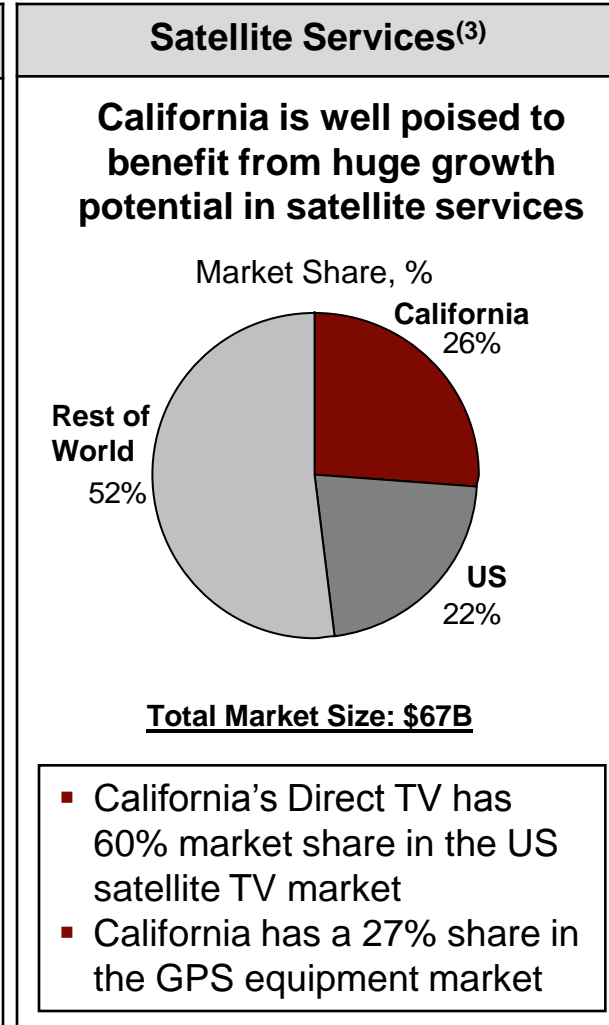
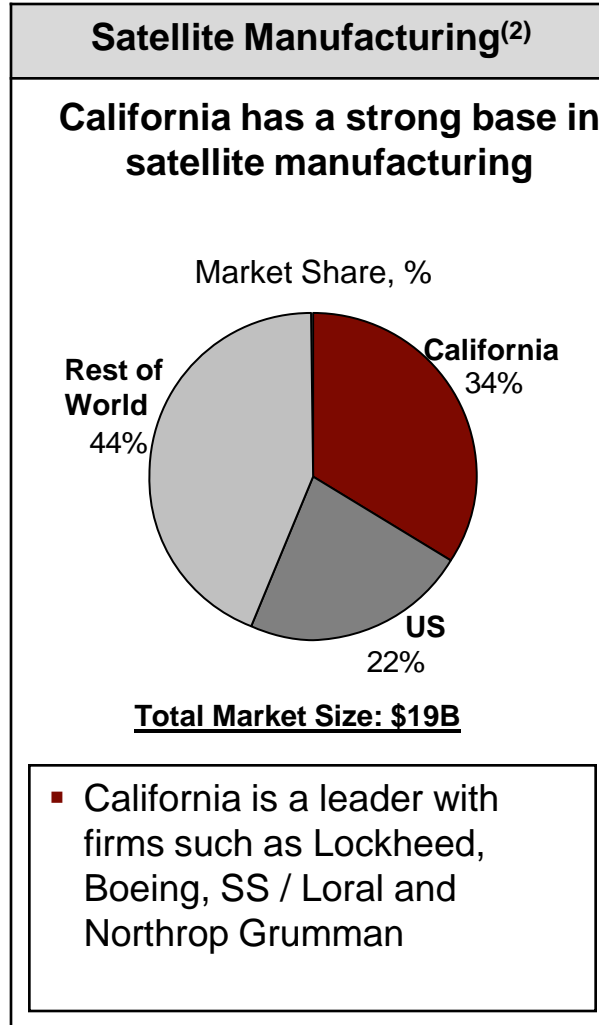
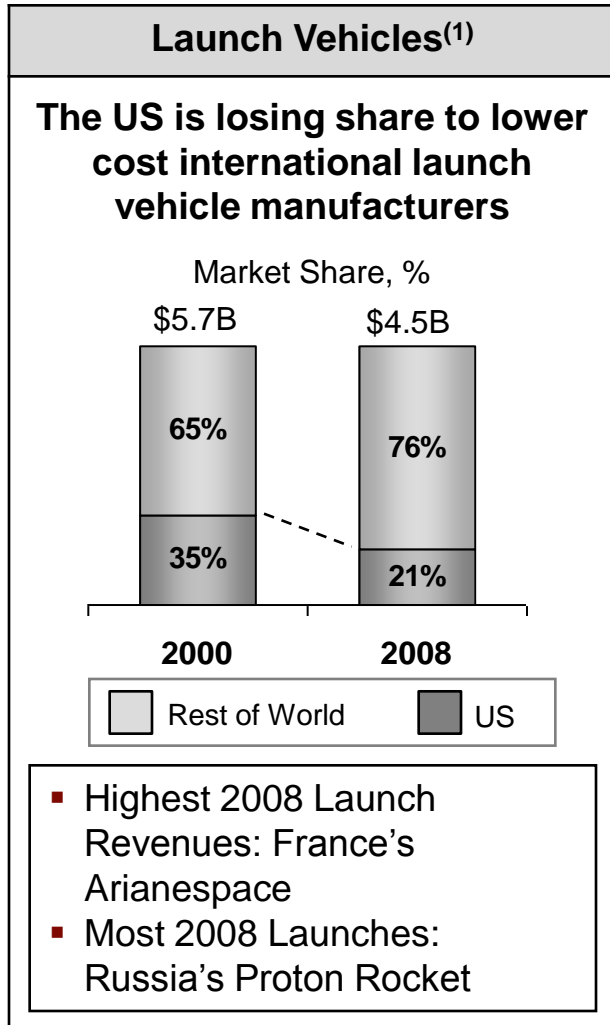


California companies are able to attract \$1.6M in spend from NASA centers outside the state

California companies received \$2.9B or 21% of the total \$14.0B NASA Obligated Spend in FY08

Note: (1) The 50% of JPL's obligated spend to pay in-house staff is excluded
Source: NASA NAIS database, NASA FY08 Budget Request, A.T. Kearney analysis

California has a strong base and sustainable competitive advantages in certain segments



Source: (1) Satellite Industry Association, A.T. Kearney analysis
 (2) NASA and DoD FY08 Budget Requests, Space News, FAA, Satellite Industry Association, A.T. Kearney Analysis
 (3) Frost & Sullivan, FCC, SEC filings, A.T. Kearney analysis

California companies span across the space industry and lead important segments such as satellite manufacturing

Partial List

		California		US		Rest of World
Launch		<ul style="list-style-type: none"> Boeing / Sea Launch SpaceX 		<ul style="list-style-type: none"> United Launch Alliance 		<ul style="list-style-type: none"> Arianespace Khronichev Yuzhnoye TsSKB-Progress CNSA (China)
Satellite Mfg	Primes & Payload	<ul style="list-style-type: none"> Lockheed Martin (Sunnyvale) Boeing Northrop Grumman SS / Loral SAIC 		<ul style="list-style-type: none"> Lockheed Martin (Denver) Orbital General Dynamics Ball 		<ul style="list-style-type: none"> EADS Astrium Thales Alenia Space Mitsubishi MacDonald, Dettwiler OHB Technology
	Propulsion	<ul style="list-style-type: none"> Rocketdyne / Pratt & Whitney Aerojet 		<ul style="list-style-type: none"> ATK 		<ul style="list-style-type: none"> Safran (Snecma)
	Tier 2 / 3	<ul style="list-style-type: none"> L-3 		<ul style="list-style-type: none"> Honeywell United Technologies ITT 		<ul style="list-style-type: none"> Com Dev Thales Alenia Tesat FinMeccanica
Ground Equipment		<ul style="list-style-type: none"> ViaSat Trimble Magellan Mio 		<ul style="list-style-type: none"> Garmin HughesNet Sirius XM 		<ul style="list-style-type: none"> Various Chinese / Taiwanese suppliers
Engineering Services		<ul style="list-style-type: none"> The Aerospace Corp Raytheon Jacobs Technology SAIC 		<ul style="list-style-type: none"> United Space Alliance ATK CSC 		
Satellite Services	DTH	<ul style="list-style-type: none"> DirecTV 		<ul style="list-style-type: none"> Dish / Echostar 		<ul style="list-style-type: none"> British Sky Broadcasting Other regional / local DTH
	DARS			<ul style="list-style-type: none"> Sirius XM 		
	FSS	<ul style="list-style-type: none"> Loral Skynet / Telesat ViaSat 		<ul style="list-style-type: none"> Intelsat / PanAmSat 		<ul style="list-style-type: none"> SES / New Skies Eutelsat JSAT Shin Satellite Space Comm Corp
	MSS	<ul style="list-style-type: none"> Globalstar 		<ul style="list-style-type: none"> MSV Iridium ICO Terrestar Orbcomm 		<ul style="list-style-type: none"> Inmarsat Asia Cellualr Thuraya
	Remote Sensing			<ul style="list-style-type: none"> GeoEye Digital Globe 		<ul style="list-style-type: none"> RapidEye Spot Image

California Supplier Base Position

- Strong players / leadership in sector
- Some supplier base in sector
- Weak position in sector

New generation entrepreneurial California space companies are positioned for a game change in the launch segment

Emerging Players in Spacecraft & Launch Segments

State / Region	Company	Investors/Leadership
California	SpaceX	Elon Musk, PayPal Co-founder
	Interorbital	Randa Milliron, CEO
	Masten Space	David Masten, CEO
	Scaled Composites	Owned by Northrop Grumman
	SpaceDev	Mark Sirangelo, CEO
	XCOR Aerospace	Jeff Greason, CEO
Texas	Armadillo Aerospace	Millionaire video-game programmer John Carmack
	Blue Origin	Jeff Bezos
Virginia	Explorer	Ansari family
	t/Space	Charles Duelfer, CEO
Colorado	UP Aerospace	Partnered with Lockheed Martin
Illinois	PlanetSpace	Millionaire Chirinjeev Kathuria
Nevada	Bigelow Aerospace	Real-estate billionaire Robert Bigelow
New Mexico	Virgin Galactic	Richard Branson of Virgin Group
Oklahoma	Rocketplane Limited	George French, CEO/Chairman
Rest of World	Da Vinci Project	Team leader Brian Feeney
	Starchaser	Steve Bennett, CEO

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- SpaceX successful launch of Falcon 1 on Sept 28th cuts down the launch price by ~75%

Emerging and Potential New Applications

Cellular and Internet Backhaul

HD Video Content

Space Tourism

Geospatial Content & Mobile Video

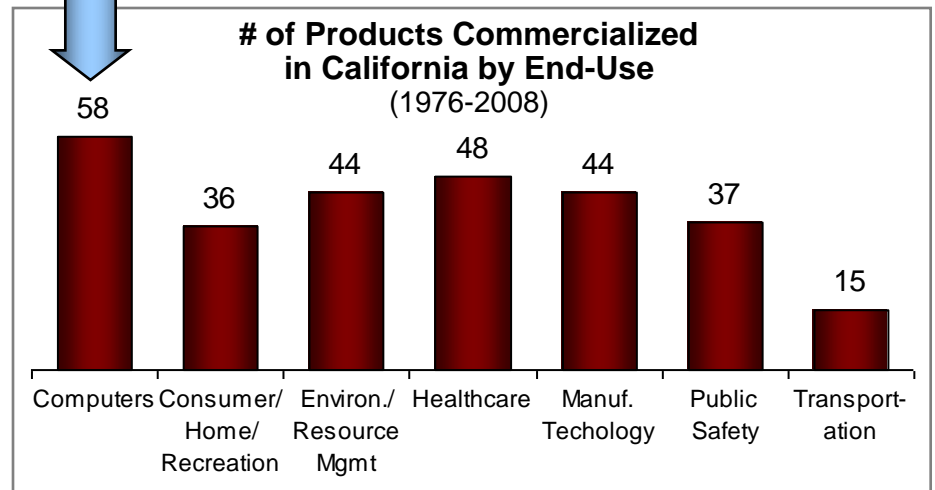
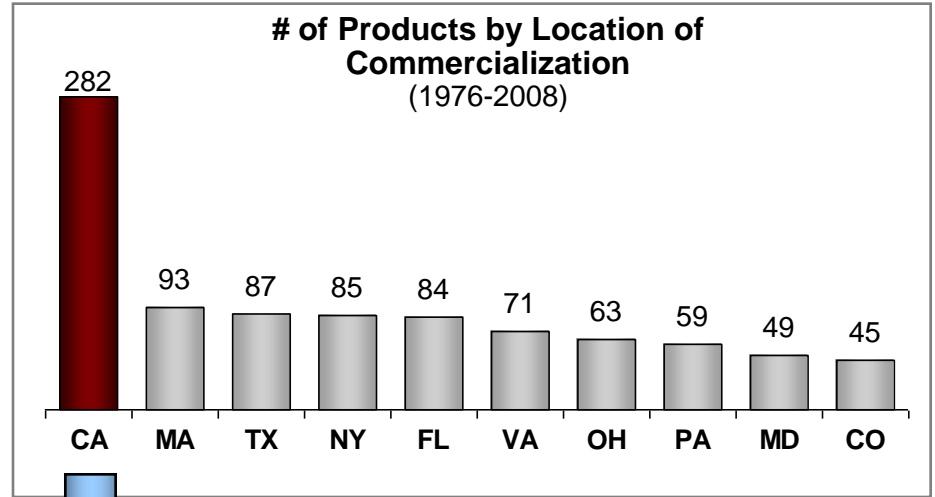
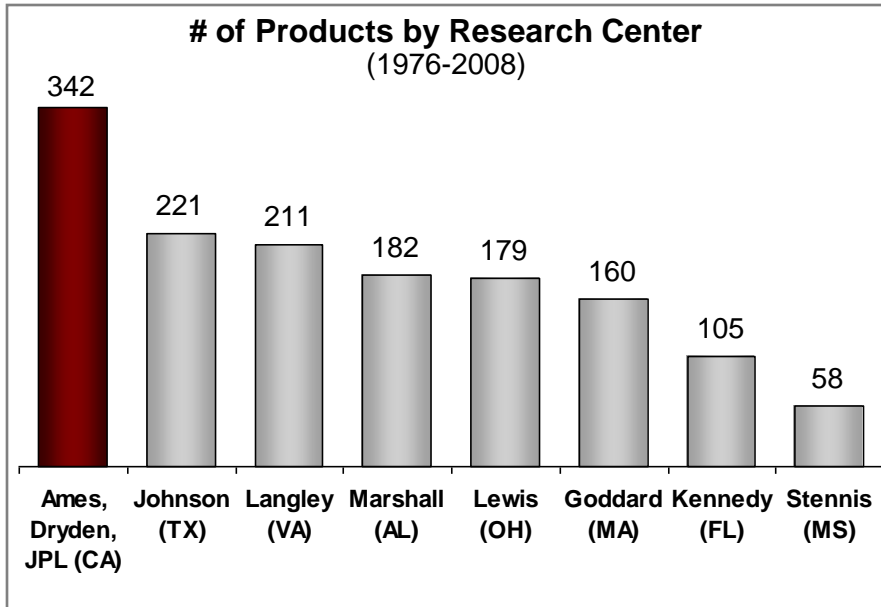
Micro-gravity R&D (Pharmaceutical Industry)

Mining?

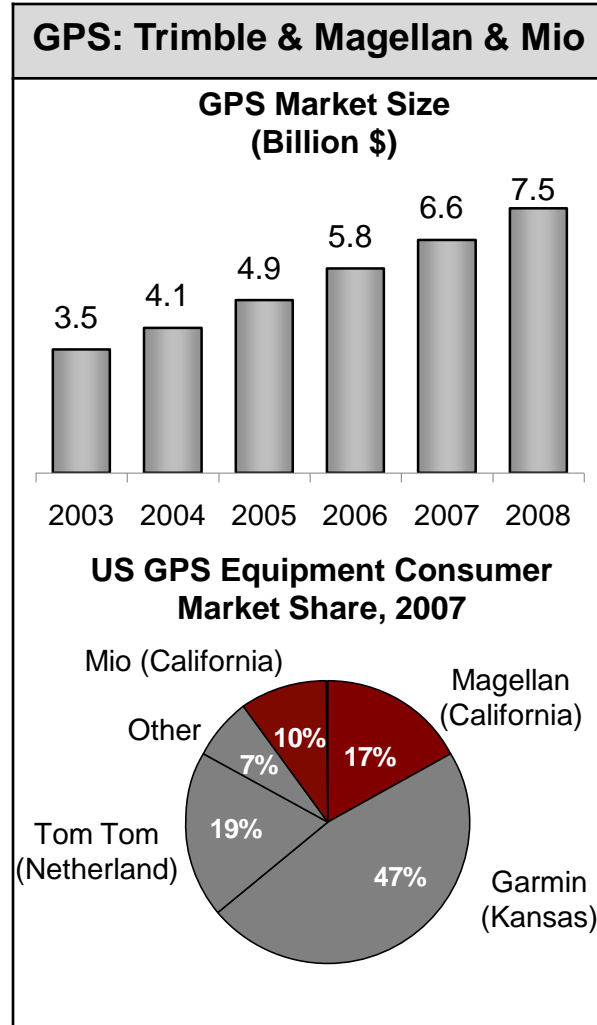
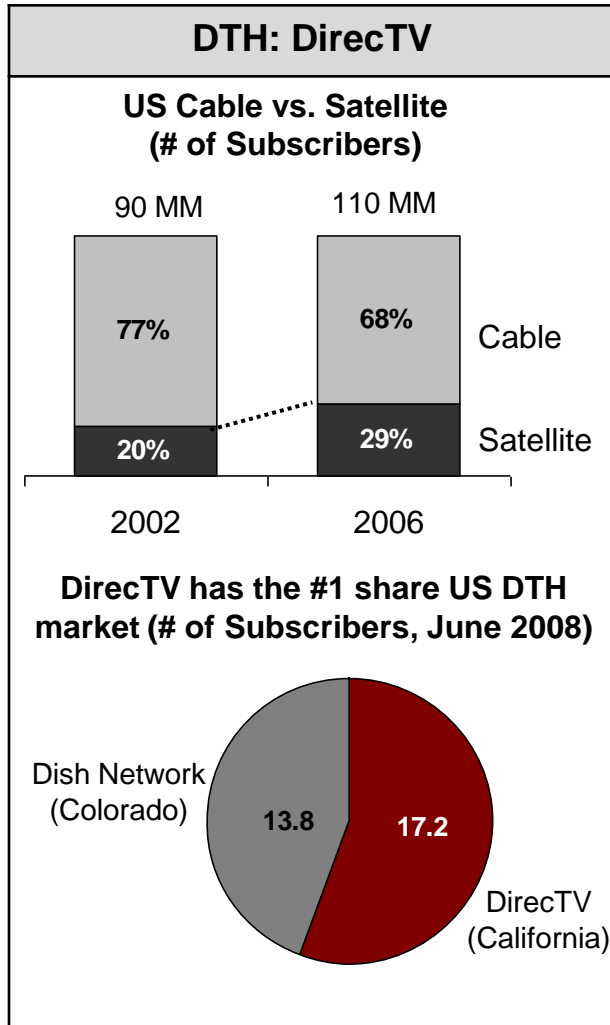


Space industry programs foster small businesses and innovation in various economic sectors in California

NASA Technology Transfer and Small Business Innovation Programs: Benefit to California



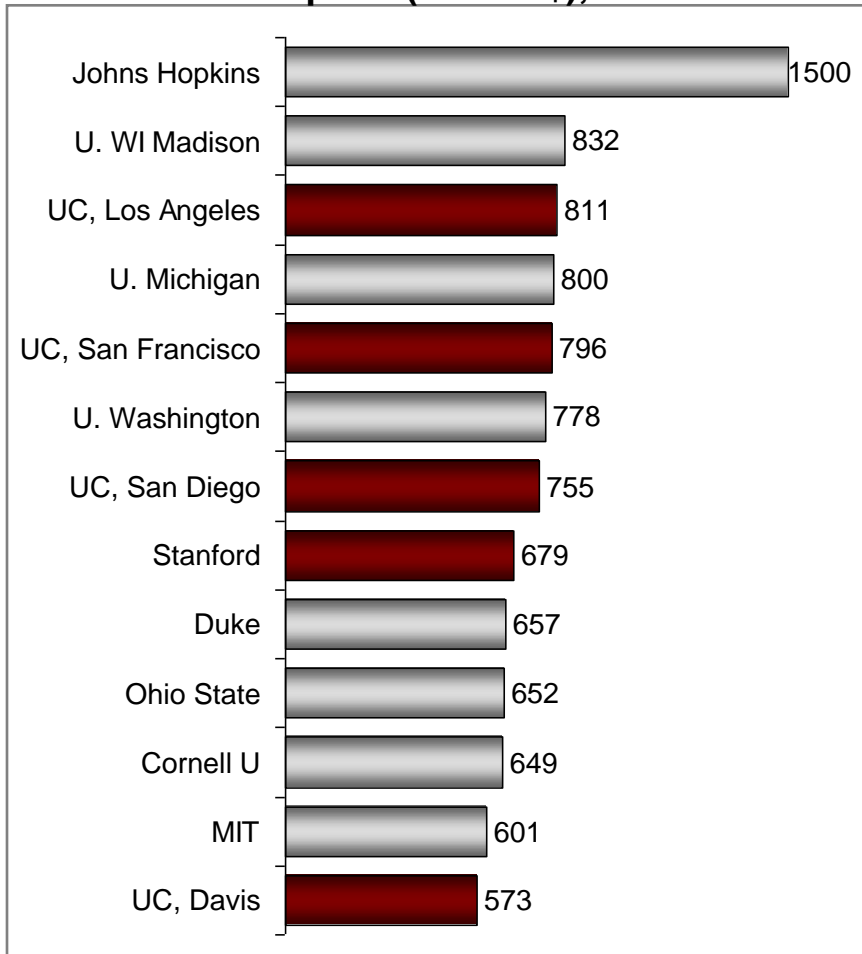
New end-customer applications from California's high tech and media sectors are expanding the industry value chain



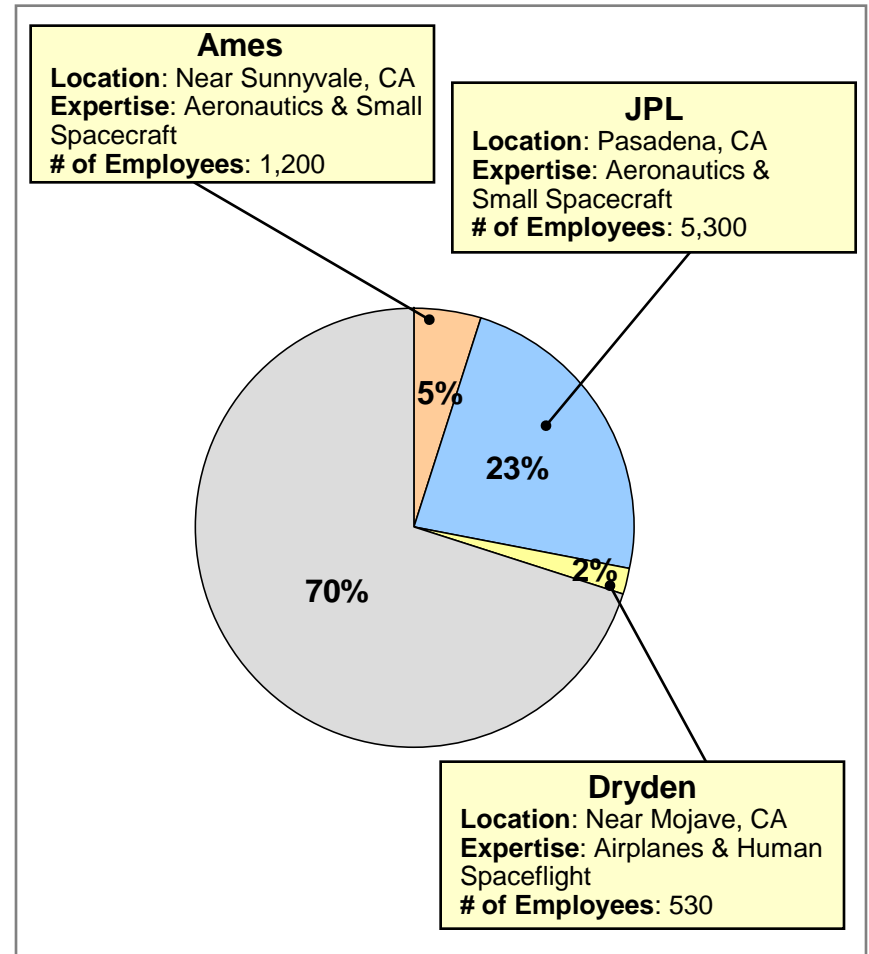
- ### Internet: Google
- NASA/Google Cooperation:** Plans for cooperation on large-scale data management, massively distributed computing, bio-info-nano convergence, and encouragement of the entrepreneurial space industry.
 - Google Content and Tools:**
 - Google Earth: bird's eye view of the planet
 - Google Sky: virtual space telescope
 - Google Moon: lunar exploration tool with content from NASA Ames
 - Google Mars: imagery maps of Mars (from collaboration with NASA and Arizona State)
 - Google Lunar X Prize:** 7-year X PRIZE, to be awarded to the first privately-funded robotic rovers to land on the Moon

Leading edge UC science & engineering programs and the NASA centers position California as the R&D powerhouse

Universities with Top Science & Engineering R&D Spend (Million \$), 2006

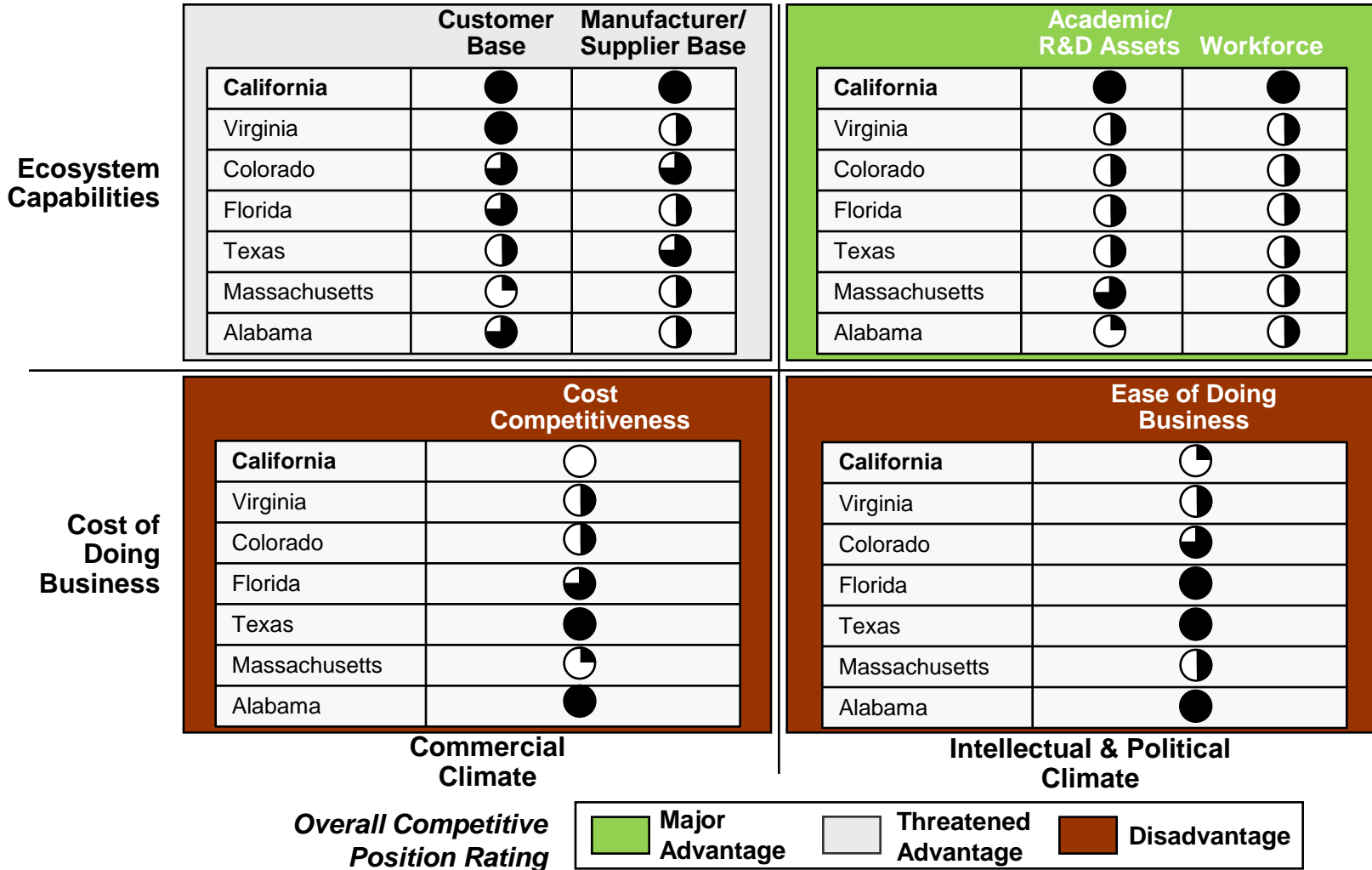


Workforce at NASA Centers in California as % of Total NASA Workforce



Cost of doing business is a challenge to California's competitiveness and space industry ecosystem capabilities

Space Industry Competitiveness Scorecard



● = Strong
○ = Weak



California's space industry faces new opportunities and challenges

