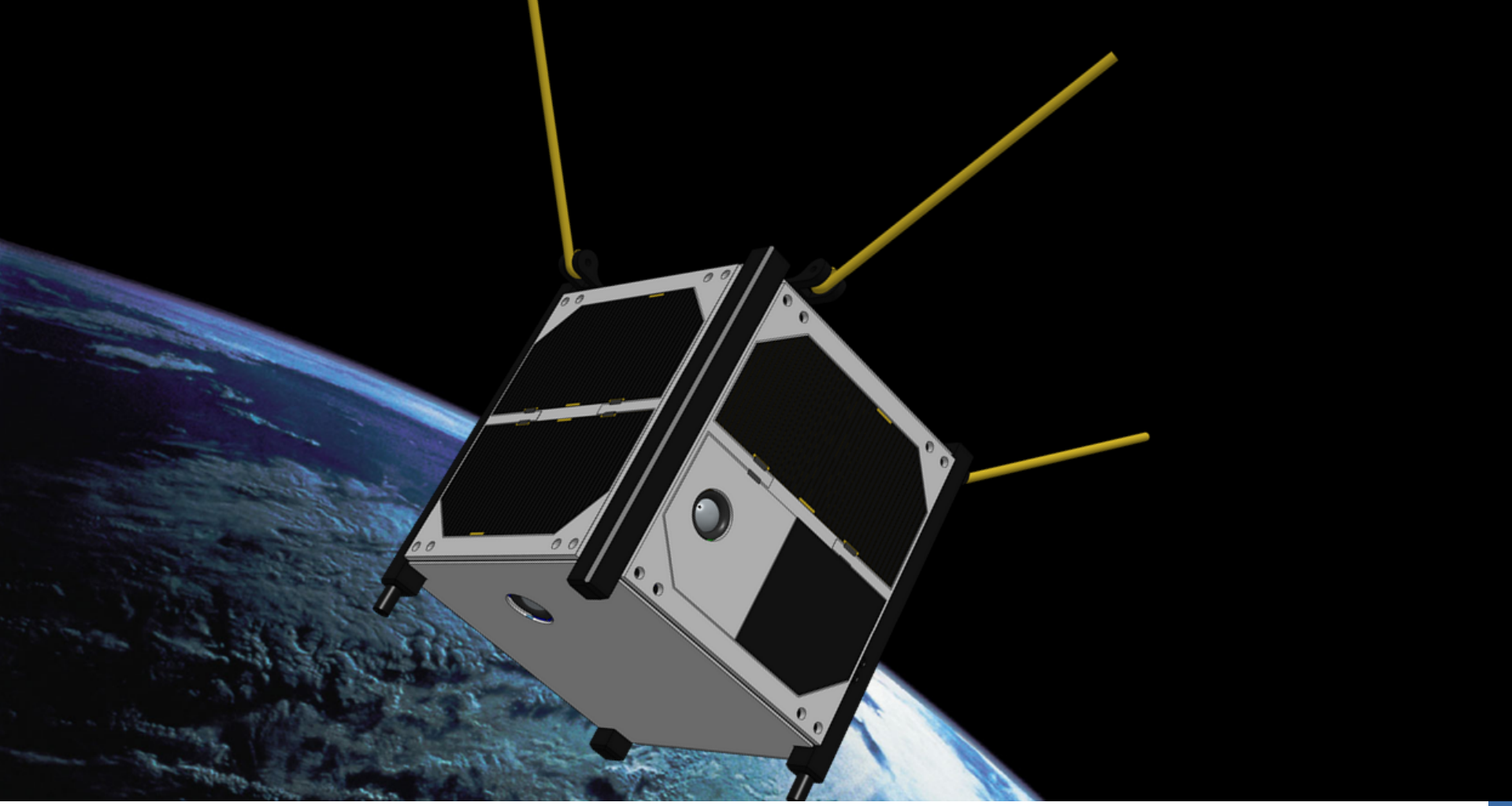

ARDUSAT ■ YOUR ARDUINO EXPERIMENT IN SPACE

Peter Platzer and Jeroen Cappaert
peter@nanosatisfi.com / jeroen@nanosatisfi.com
August 22, 2012 – Summer CubeSat Developer's workshop

NanoSatisfi

EXECUTIVE SUMMARY

1. ArduSat overview
2. Technical Details
3. Business model
4. Get involved!
5. Q & A

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KICKSTARTER CAMPAIGN

AFFORDABLE ACCESS TO SPACE

- **Rent a satellite for under $350**
- **Crowdsourcing space applications**
- **Driving STEM education**

Geo-caching in space Social media games Competitions … **ENTERTAINMENT**	Meteor hunter 3D imaging of magnetosphere Spot rivers/mountains on images … **EDUCATION**
ENGINEERING Web/fileserver in space Model analysis validation Technology demonstration …	**SCIENCE** Measure the SAA Basic radio astronomy Solar activity Random numbers …

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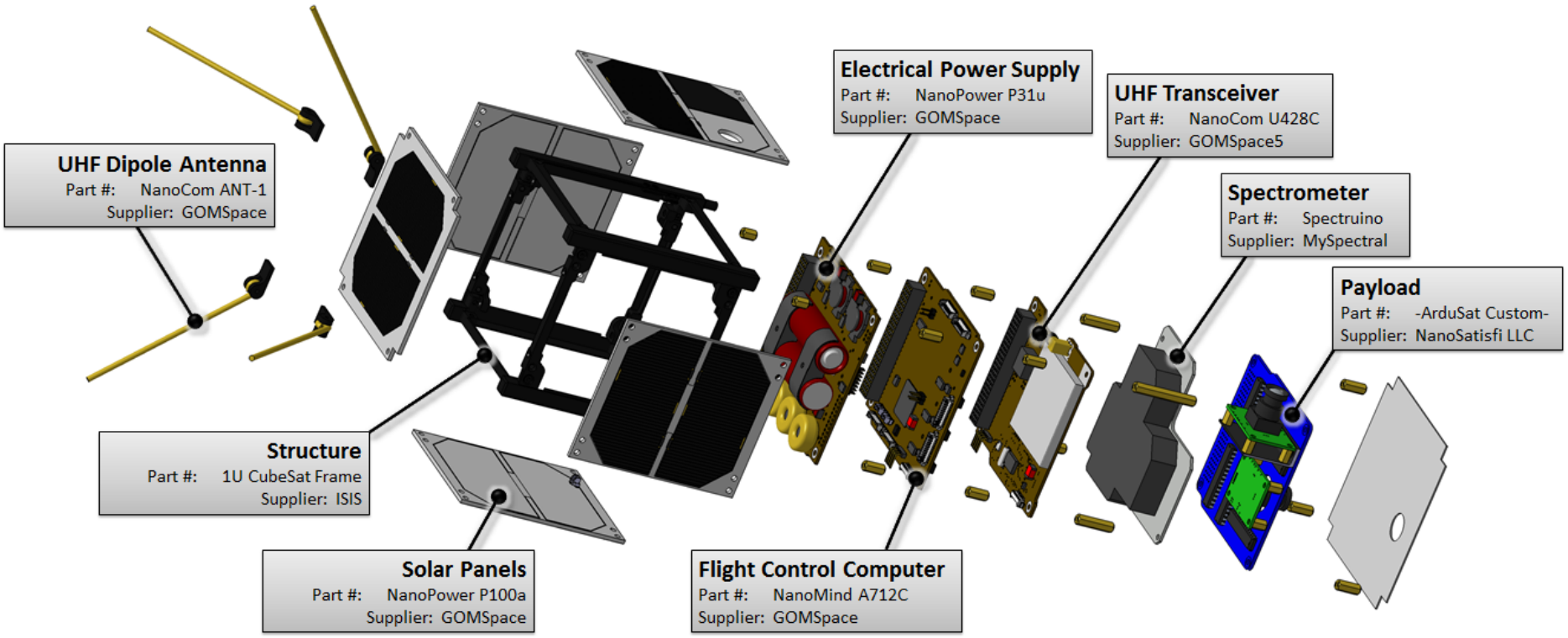
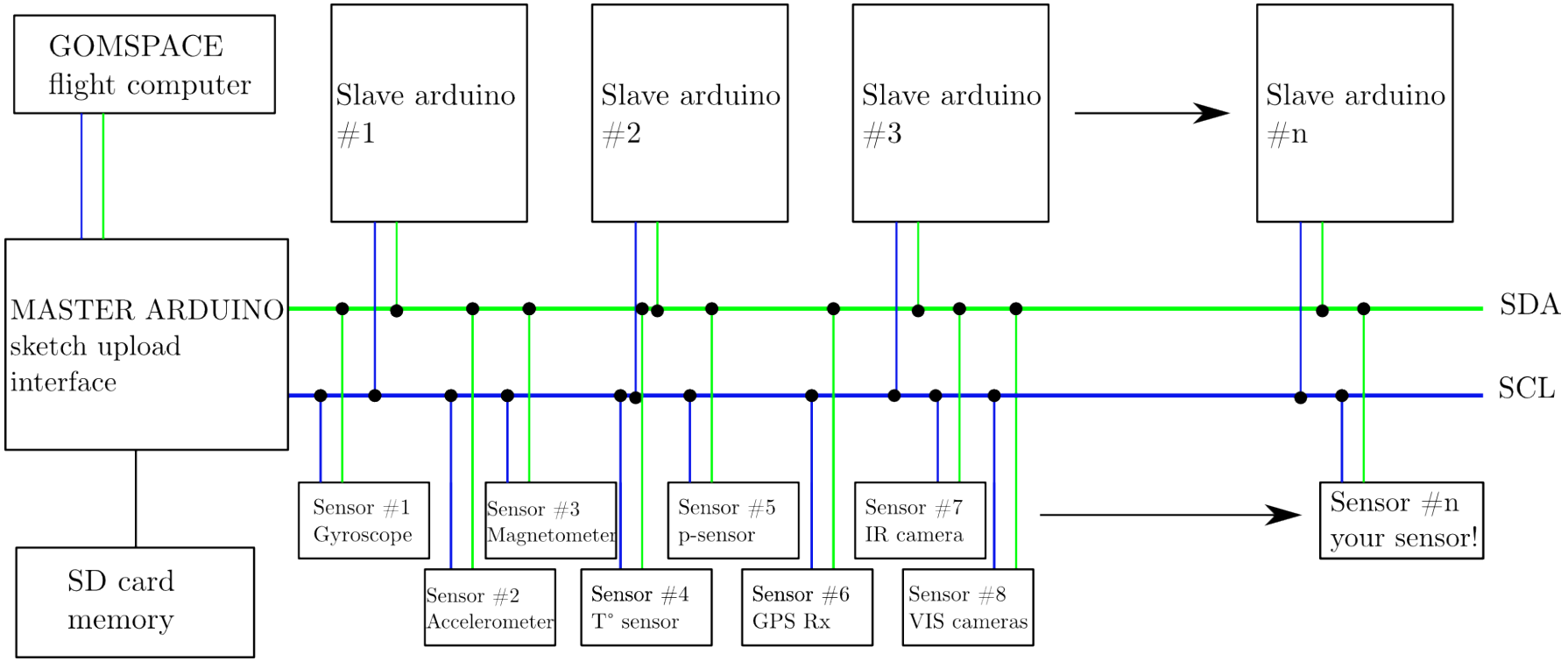
SATELLITE ARCHITECTURE

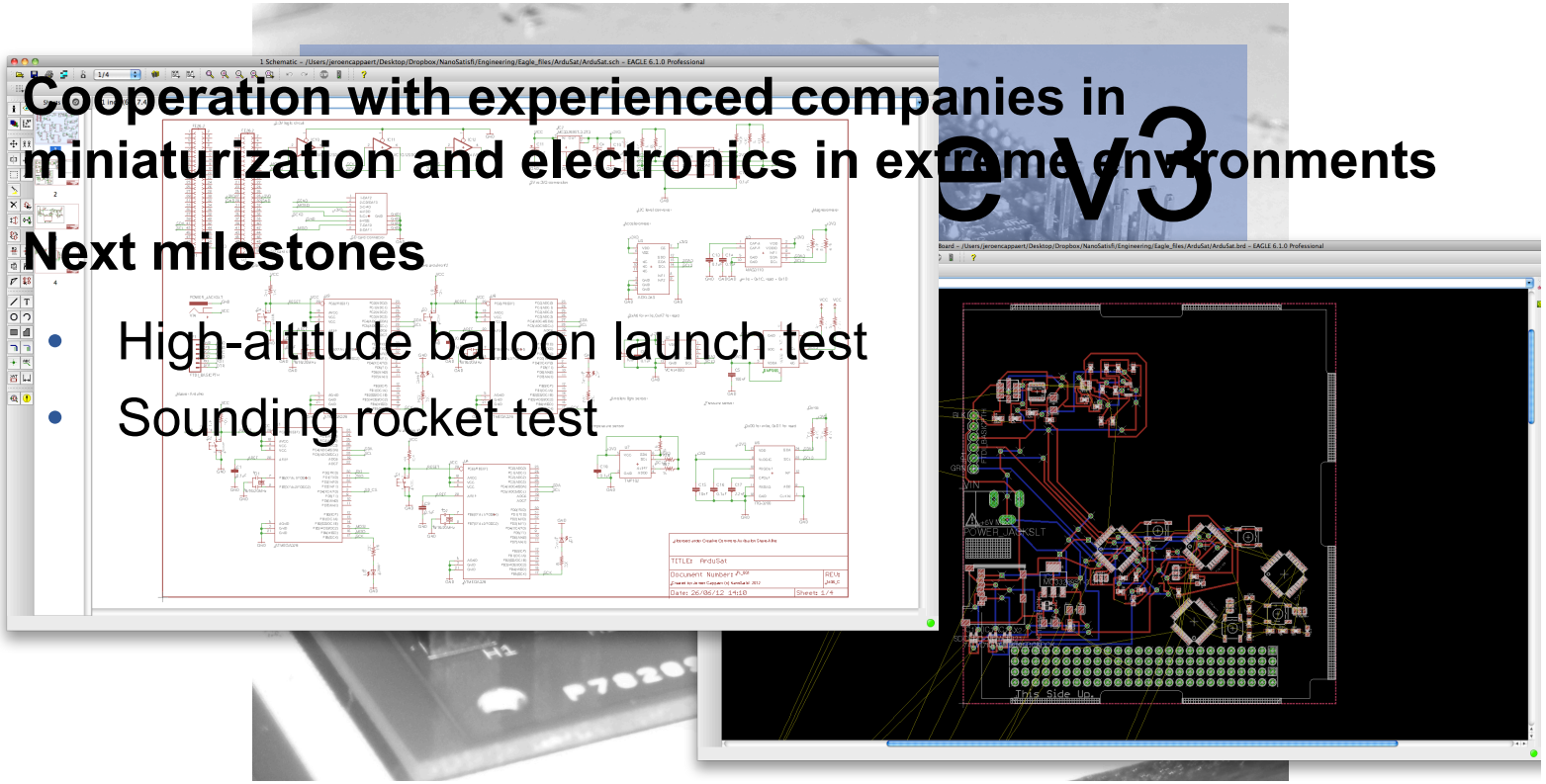


PAYLOAD ARCHITECTURE



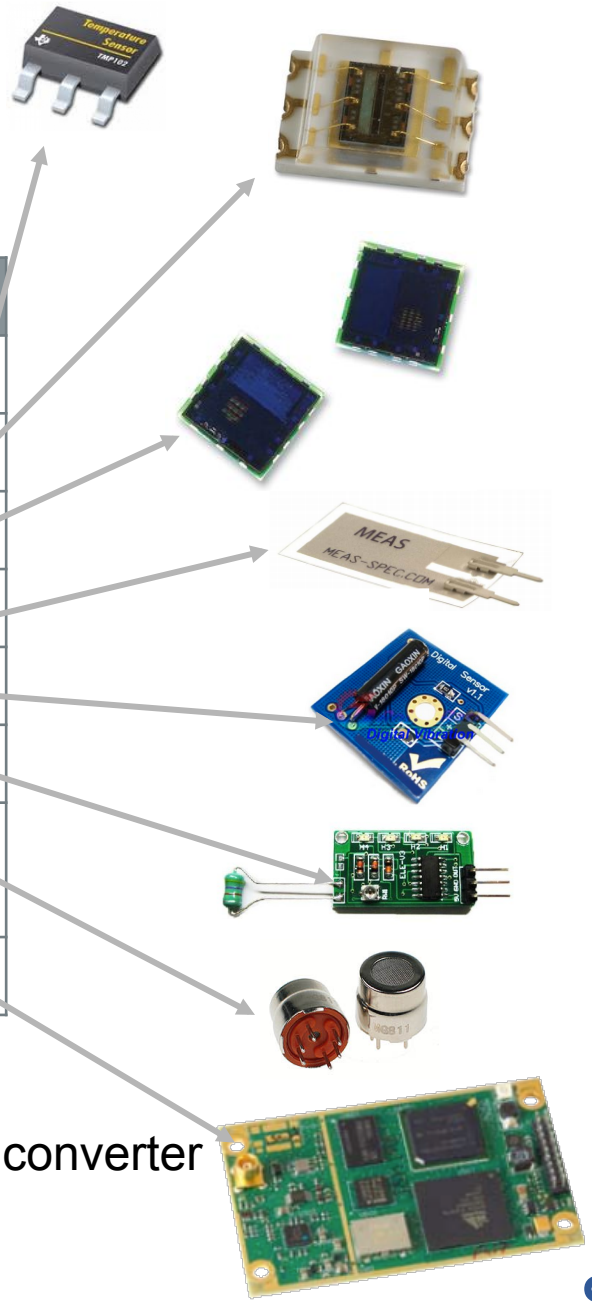
PAYLOAD DEVELOPMENT

- **Cooperation with experienced companies in miniaturization and electronics in extreme environments**
- **Next milestones**
  - High-altitude balloon launch test
  - Sounding rocket test



SENSOR SUITE (1)

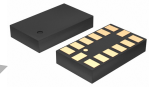
Sensor	Type	Protocol
Temperature	TMP102	I2C
Ambient light	TSL2561	I2C
RGB color	ADJD-S311	I2C
Vibration		analog*
Shock		analog*
EM wave		analog*
Gas sensors (CO_2, ozone, H)	MQ-8, MG811, MQ131	analog*
GPS	OEMV-1	UART



*analog sensors go through an MCP3424 A/D to I2C converter

SENSOR SUITE (2)

Sensor	Type	Protocol
3-ax magnetomer	MAG3110	I2C
3-ax Gyroscope	ITG-3200	I2C
3-ax accelerometer	ADXL-345	I2C
Geiger counter	LND712	UART/I2C
Spectrometer	Spectruino	UART/I2C
Camera	C3188A CMOS (OV7620)	I2C
IR sensor	VCNL4000	I2C
Photon flux density (optional)	LI190SB-L	analog
IR camera (optional)	MicroCAM 384	UART





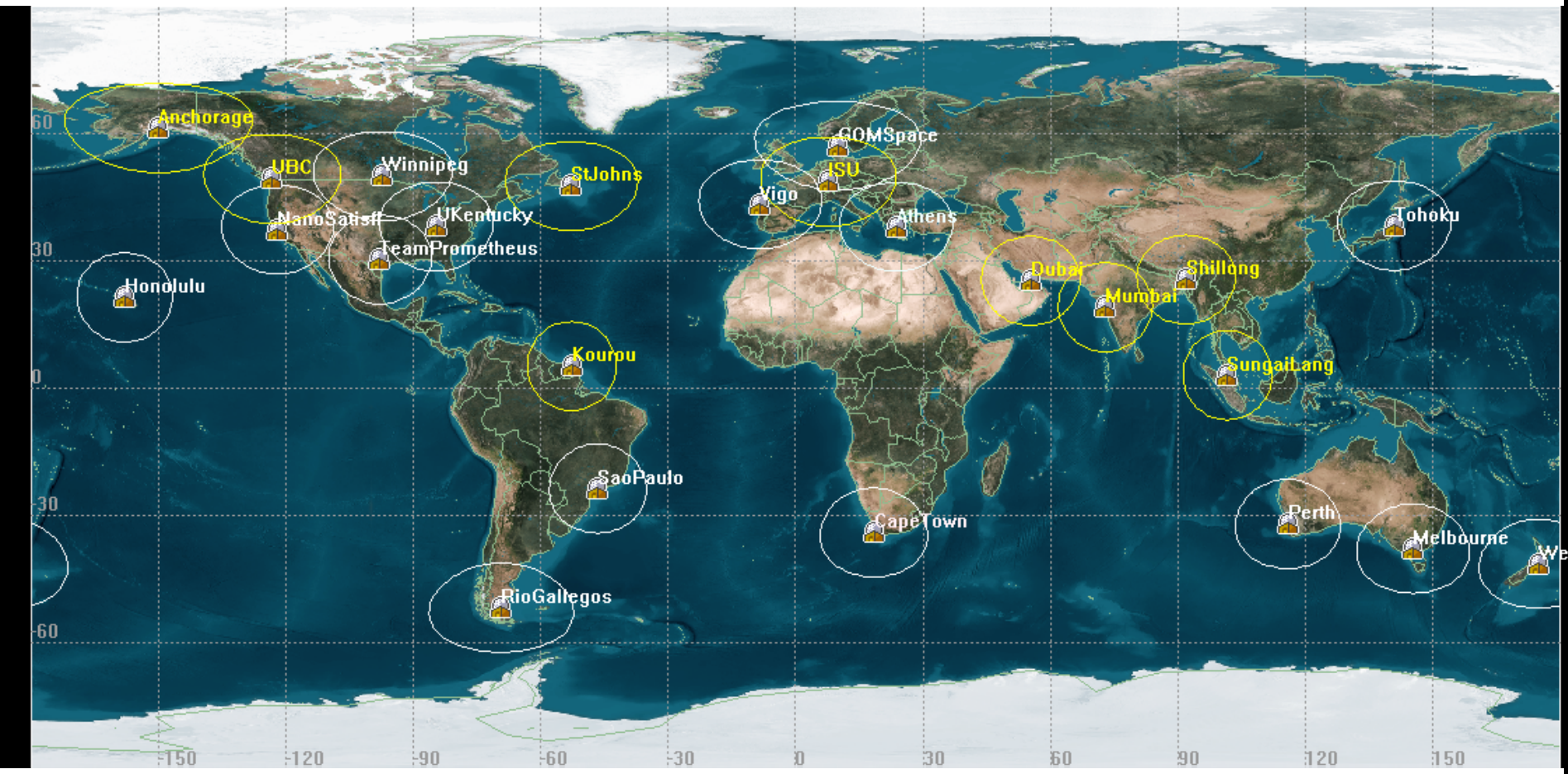

OPTICS

- OV7620 CMOS sensor
- 8/16 bit datastream @ 664x492 pixels (800m resolution/picture)
- Adjustable white balance, gamma, gain, color,…

myspectral

- Arduino-based spectrometer
- NIR/VIS wavelengths
- Open source visualization software

GROUND COMMUNICATION



FUTURE AVAILABLE LAUNCHES

Launch Vehicle	Demonstrated Capacity (CubeSat Units)	Upcoming launches	Potential Annual Slots
Rokot	8	3 scheduled 2013 LEO launches	24
Dnepr	26	1 scheduled 2013 LEO launch, plus launches on-demand	26
Delta-II/Delta-IV	7	1 Delta-IV 2013 LEO launch	7
Atlas-V	16	5 scheduled 2013 LEO launches (maybe not additive to NPSCul…)	80
Atlast – V/Delta-IV	48	NPSCul 10 P-Pod, 6 schedule 2013 LEO launches	288
Falcon 1	6	1 scheduled 2013 LEO launch	6
Minotaur	4	No launches yet in manifest, averages 1-2 per year	8
Falcon 9	10	1 scheduled 2013 LEO launch	10
H-IIA	8	1 scheduled 2013 LEO Launch	8
Vega	10	2 scheduled 2013 LEO launches	20
PSLV	10	Average of 2-3 launches per year	30
Taurus-XL	3	1 scheduled 2013 LEO launch	3
		TOTAL POTENTIAL LEO LAUNCH SLOTS	**510**
ISS Resupply Missions			
H2B / HTV	7	1 scheduled 2013 mission	7
Antares / Cygnus	10	3 scheduled 2013 missions, 2 further purchased	30
Falcon 9 / Dragon	9	3 scheduled 2013 missions, 3 further purchased	27
Soyuz U / Progress	10	4 scheduled 2013 missions	40
		TOTAL POTENTIAL ISS RELEASE SLOTS	**104**

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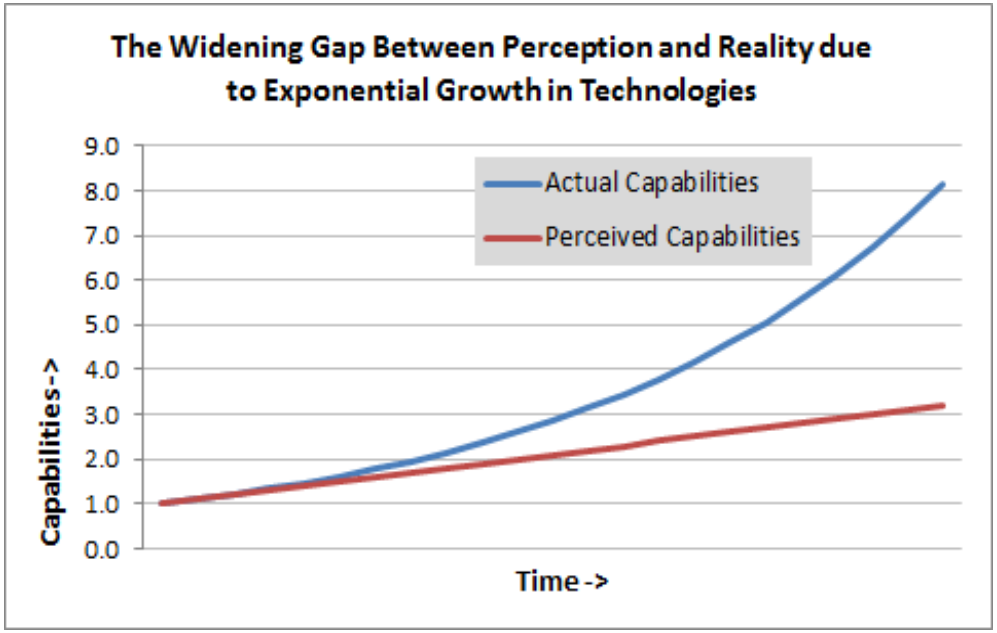
EXPONENTIAL VS. LINEAR THINKING

It is remarkable how thoughtful people, including leading scientists, think linearly.

This is just wrong, and I make this case, showing dozens of examples.

But even though someone may be an expert regarding one aspect of technology or science, doesn't mean that they have studied technology forecasting.

Ray Kurzweil, 2012



I quickly realized that timing is the critical factor in the success of inventions.

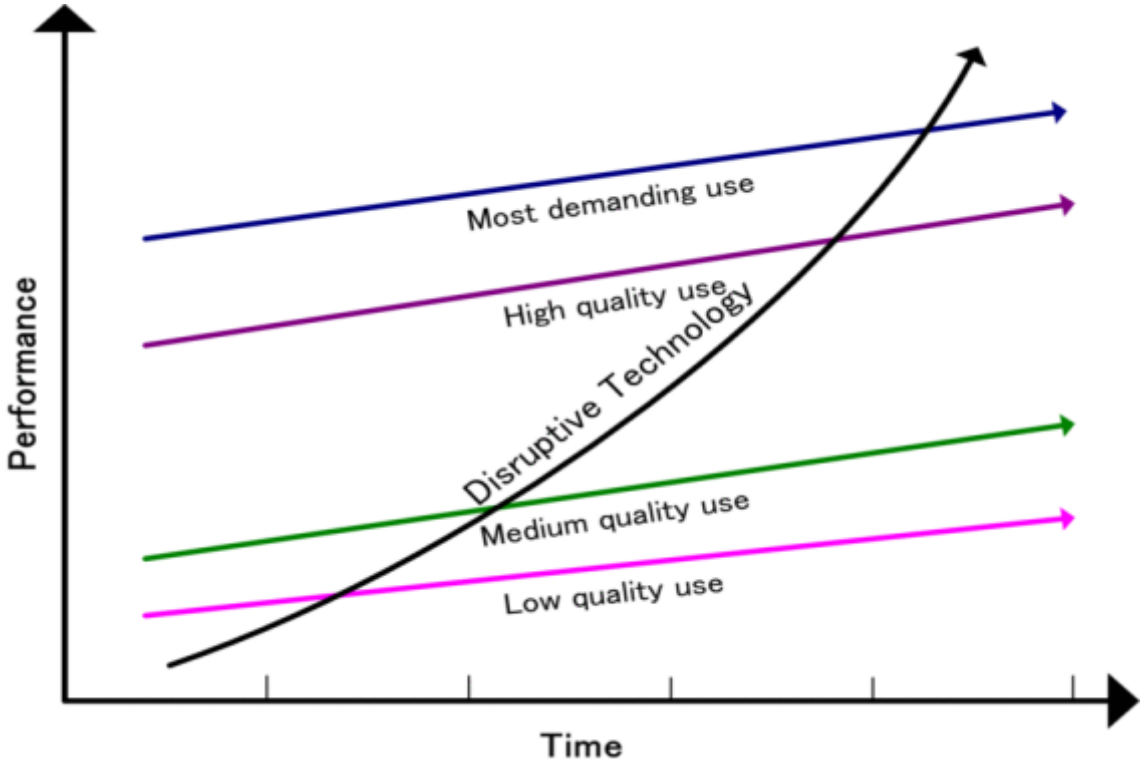
Ray Kurzweil, 2005

FIND MARKET DISRUPTING IDEAS

A disruptive innovation creates a new market disrupting (destroying) an existing market sometimes within years.

The term describes innovations that improve a product or service in ways that the market does not expect, typically first by designing for a different set of consumers for lower prices than in the existing market.

introduced by Clayton Christenson in 1995



DO MORE FASTER (© DAVID COHEN)

Do.

More.

Faster.

Start with your Passion.

Look for the pain.

Get Feedback early.

Forget the kitchen sink.

Find that one thing they love.

Don't plan. Prototype!

Get it out there.

Focus.

Iterate!

NanoSatisfi

From Napkin to KickStarter …
… In less than 4 months …
… While at grad school

- 8 Business Plan Competitions, finalist at NewSpace
- 2 startup accelerator offers
- Design Phase A/B completed
- 3 Payload prototype iterations
- 5+ Partnerships agreed and started
- High Altitude Balloon launch date (9/22)
- Sounding rocket launch date (10/31)
- 600+ customers
- $106k+ raised on KickStarter
- 150+ media coverage (Make, Endgadget, TEDglobal, DVICE, Guardian, China, Russia, Video, Radio,…)

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HOW CAN YOU GET INVOLVED

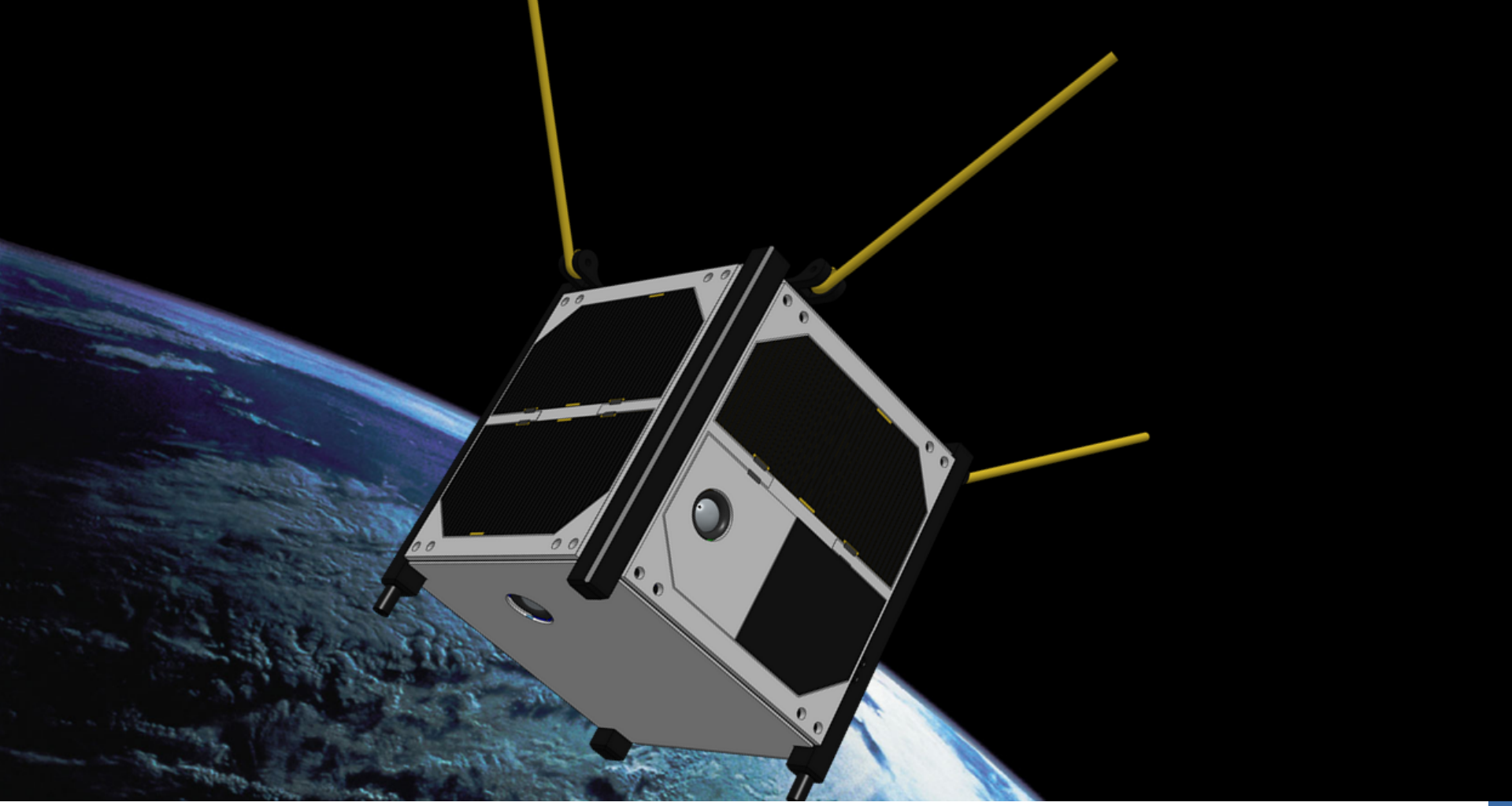
Join ArduSat and get your own space experiments or pictures!

Join companies like Freetronics, DIYSandbox and Scistarter and partner with us for design or distribution!

Join our groundstation Network!

Help us spread the word and share on Facebook, Twitter, LinkedIn,…

Come onboard as an Advisor, Board member or investor



THANK YOU! ■ ASK YOUR QUESTIONS OR SEND THEM TO

peter@nanosatisfi.com / jeroen@nanosatisfi.com

WWW.ARDUSAT.ORG / WWW.NANOSATISFI.COM

NanoSatisfi