The PocketQube Concept

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California State Polytechnic University
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Institutions

SSU (Sonoma State University)
MSU (Morehead State University)
LHR (Little H-Bar Ranch)
NA (Noqsi Aerospace)
PICO (Playful Invention Company)
DiSUS

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Overview

- Development objectives
- Launch of PocketQubes
- Summary of operational performance
- Future of PocketQubes
- Conclusion

Why PocketQube?

- We have the CubeSat and the CubeSat standard
- Internationally accepted space concept
- Many launch opportunities, even on the ISS
- Wide spectrum of vendors with proven components
- Rapid technology demonstrations
- Commercial applications
  - Planet Labs
  - Small satellite validation by Google's purchase of Skybox

- We have everything with Cubes
- Why introduce a new concept in small satellites?
- CubeSats were developed for education and university use

Now everyone else has accepted the concept, we got

SCREWED

Launch costs have risen to accommodate to meet demand

$40k to $120k for a 1U

Insignificant expense in the $1,000 0

Opportunity for independent e

We have ElaNa, but we trade $$

Enough to stop students from considering a career in space

Why PocketQube?

Launch cost

Launch cost

Launch cost

$$$$$$

Divide cost of a 1U launch with each small spacecraft

How small, how many = 1U CubeSat?

Make a spacecraft 1/2 size of CubeSat?
Already done – high cost

Make a spacecraft ¼ size of CubeSat?
Still cost $40k

Want to significantly lower cost

How to significantly lower cost?

For cost less than or equal to $20,000

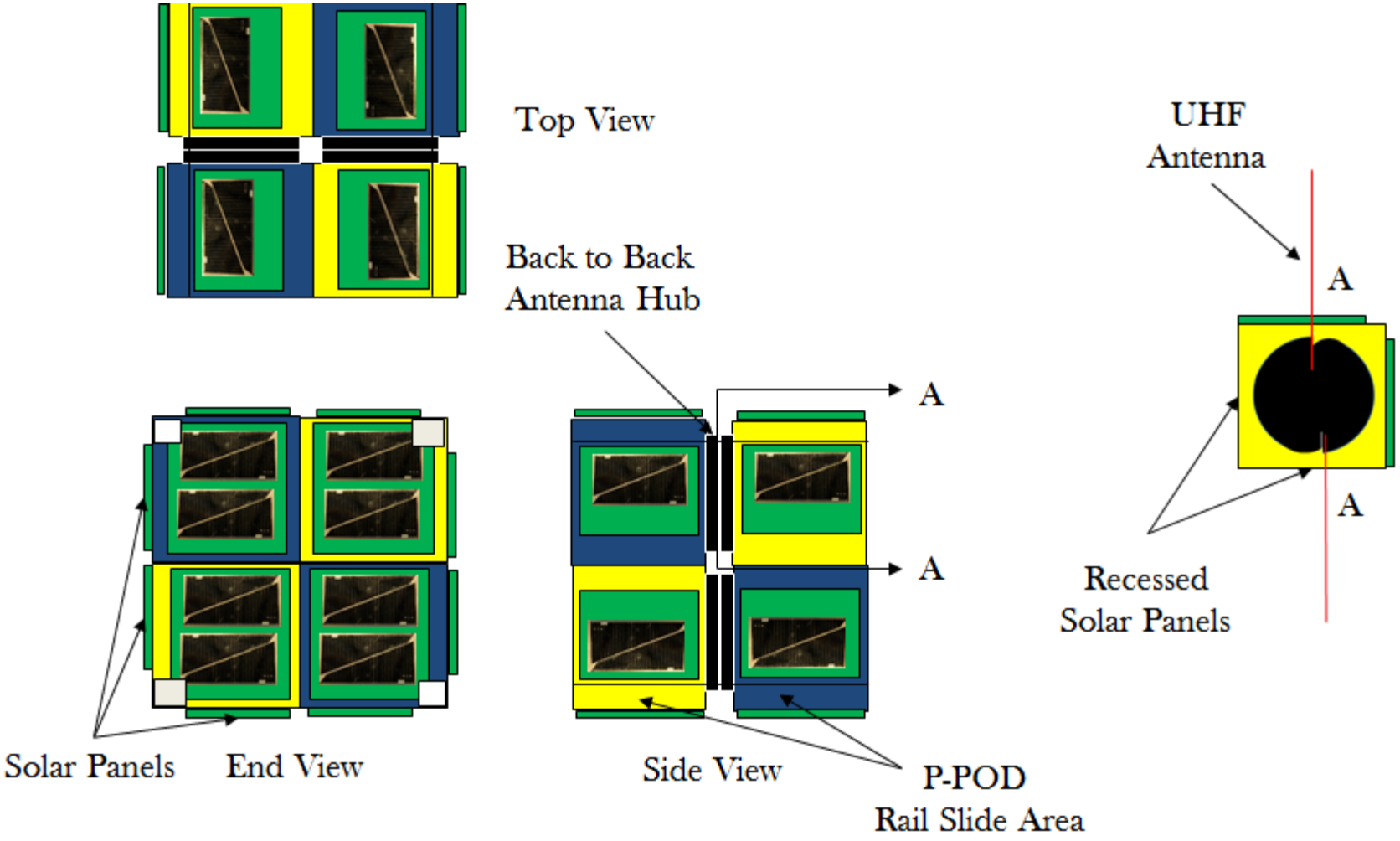
Need to divide $120k/6 or $120k/8

Try eight Femto sats in place of 1U CubeSat

= 5 cm cube

Get eight for 1U format

The PocketQube Concept

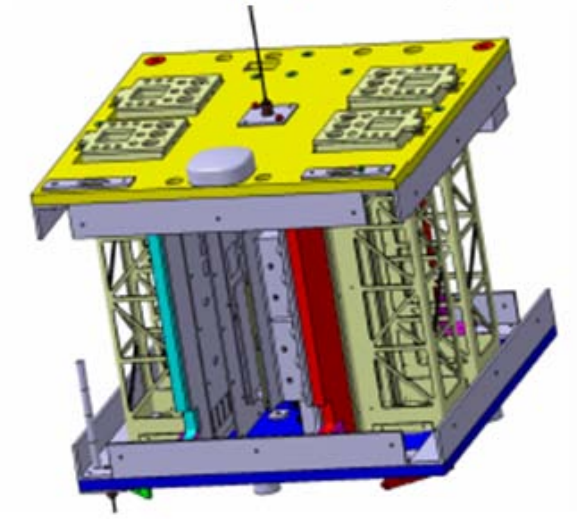


What happened in reality?

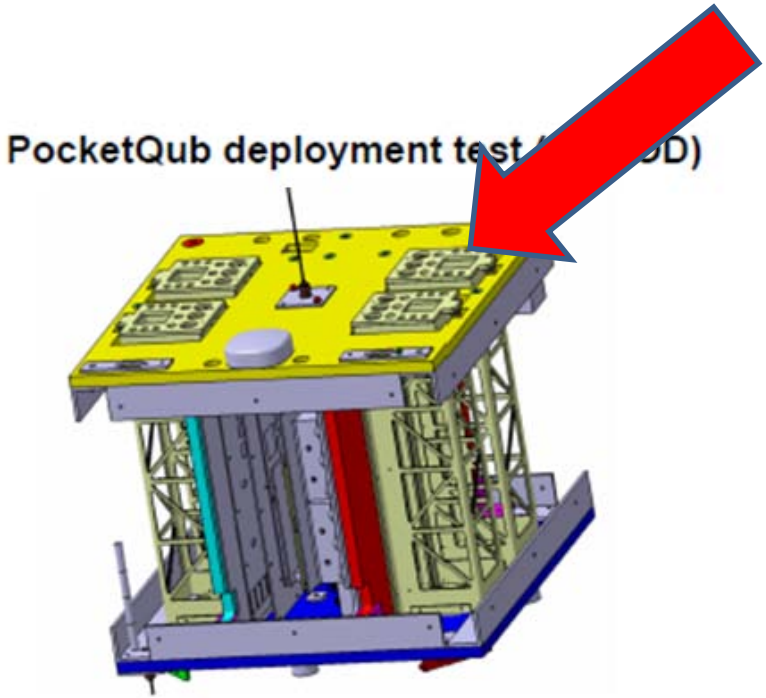
First design driven by launch opportunity

University of Rome
EduSat launch on Dnepr

PocketQub deployment test (MRFOD)



Funded by Italian Space Agency (ASI)



Funded by Italian Space Agency (ASI)

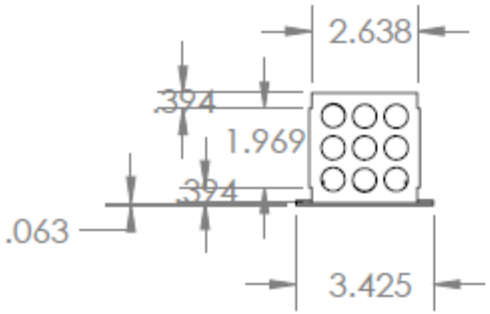
Launched 2011

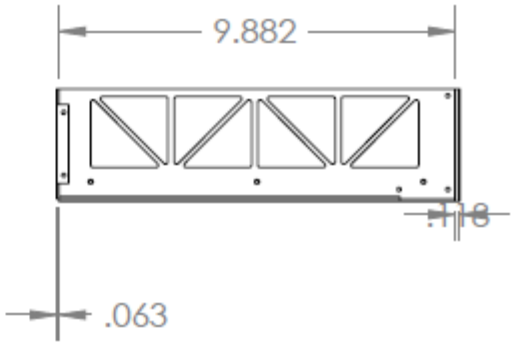
Flew MR-FOD

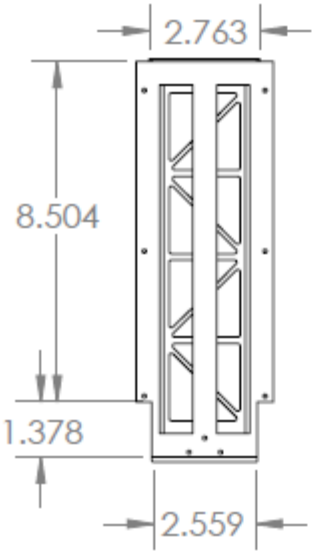
Not 1U CubeSat format

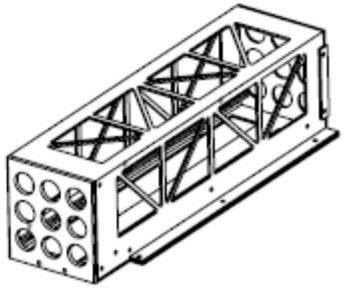
No PocketQubes

MR-FOD PocketQube Launcher





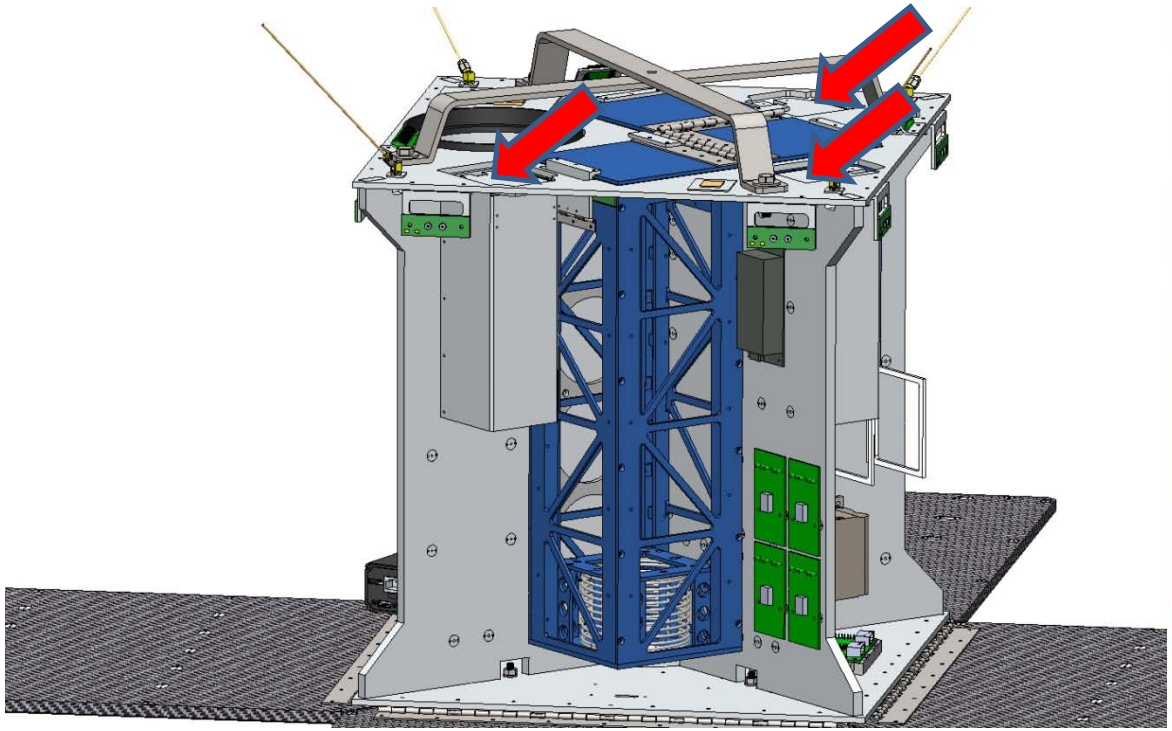




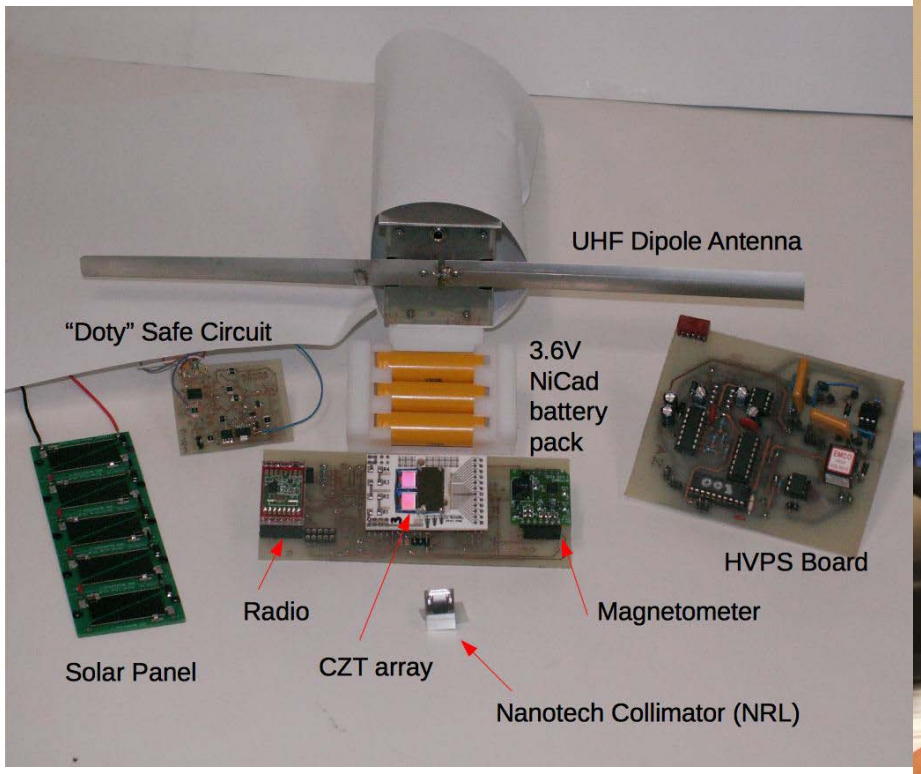
Second Chance 2011

UniSat-5 – another Dnepr launch -2013

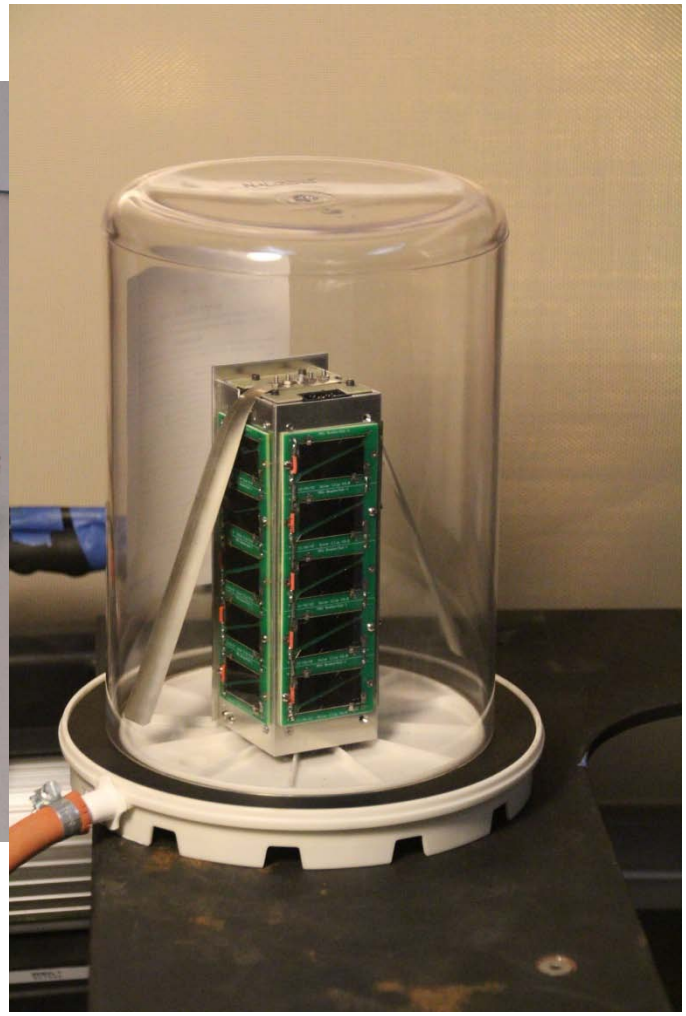
3- MR-FOD deployers



UniSat-5 – another Dnepr launch



2.5P T-LogoQube/Eagle-1



1.5P $50Sat/Eagle-2

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UniSat-5 –Dnepr launch Nov. 29, 2013

UniSat-5 – another Dnepr launch

Operational Results

T-LogoQube/ Eagle-1 ----- 2 months operation – now no contact

$50Sat/ Eagle-2 ----- still operating – all systems GO

CubScout ----- no contact

Wren ---- some recent contact

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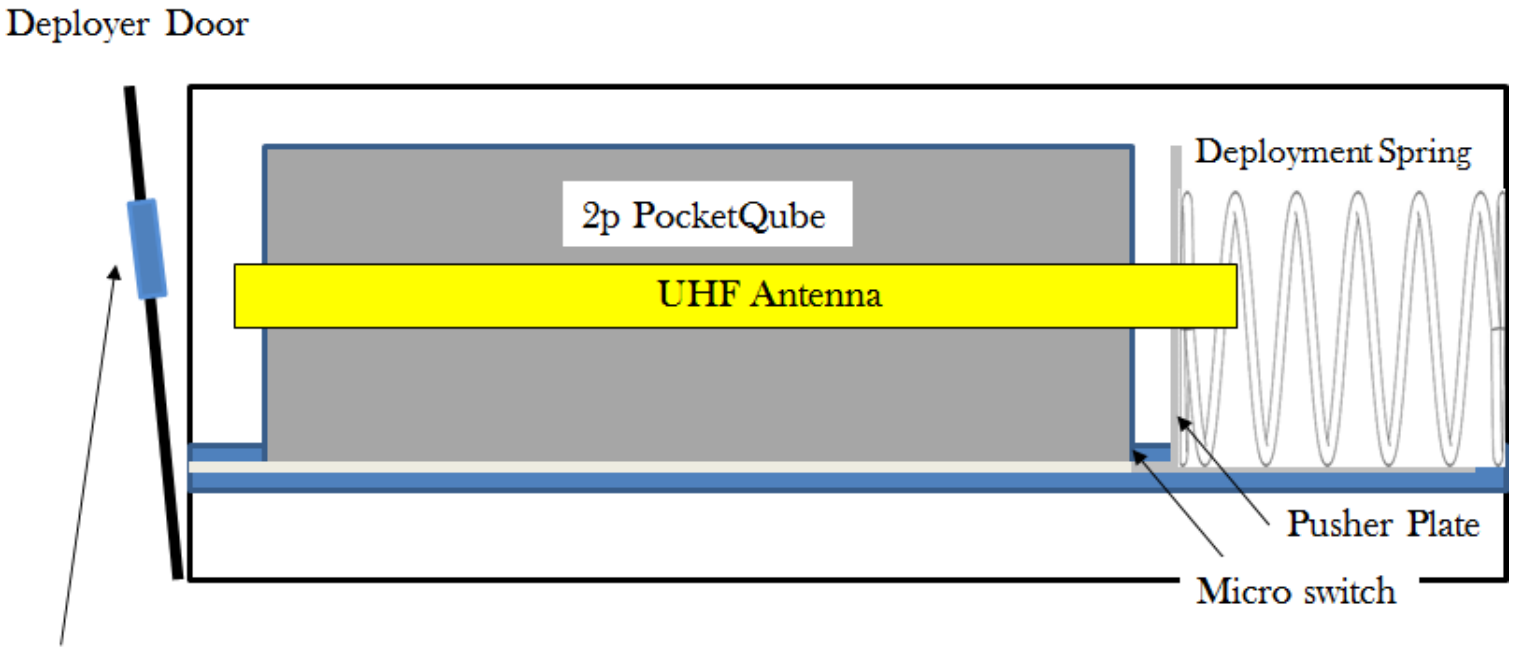
MR-FOD
PocketQube Deployer



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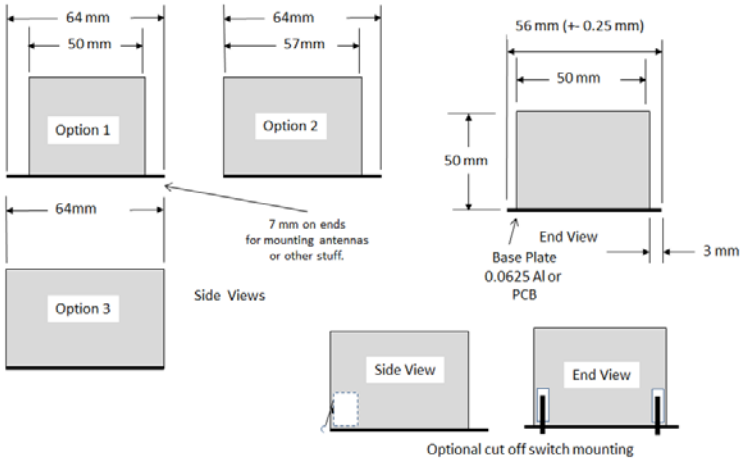
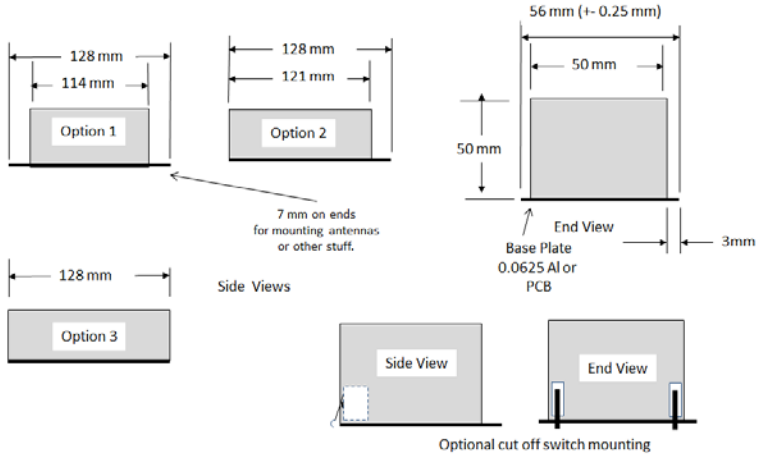
The PocketQube Standard

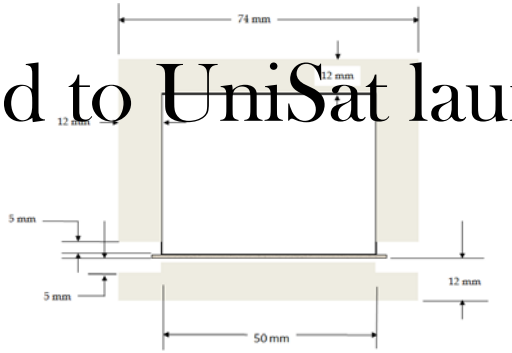


1 p 50 mm PocketQube



2 p 50 mm PocketQube

Presently Limited to ~~UniSat~~ launch on Dnepr



Allowable expansion
around the PocketQube for Deployer

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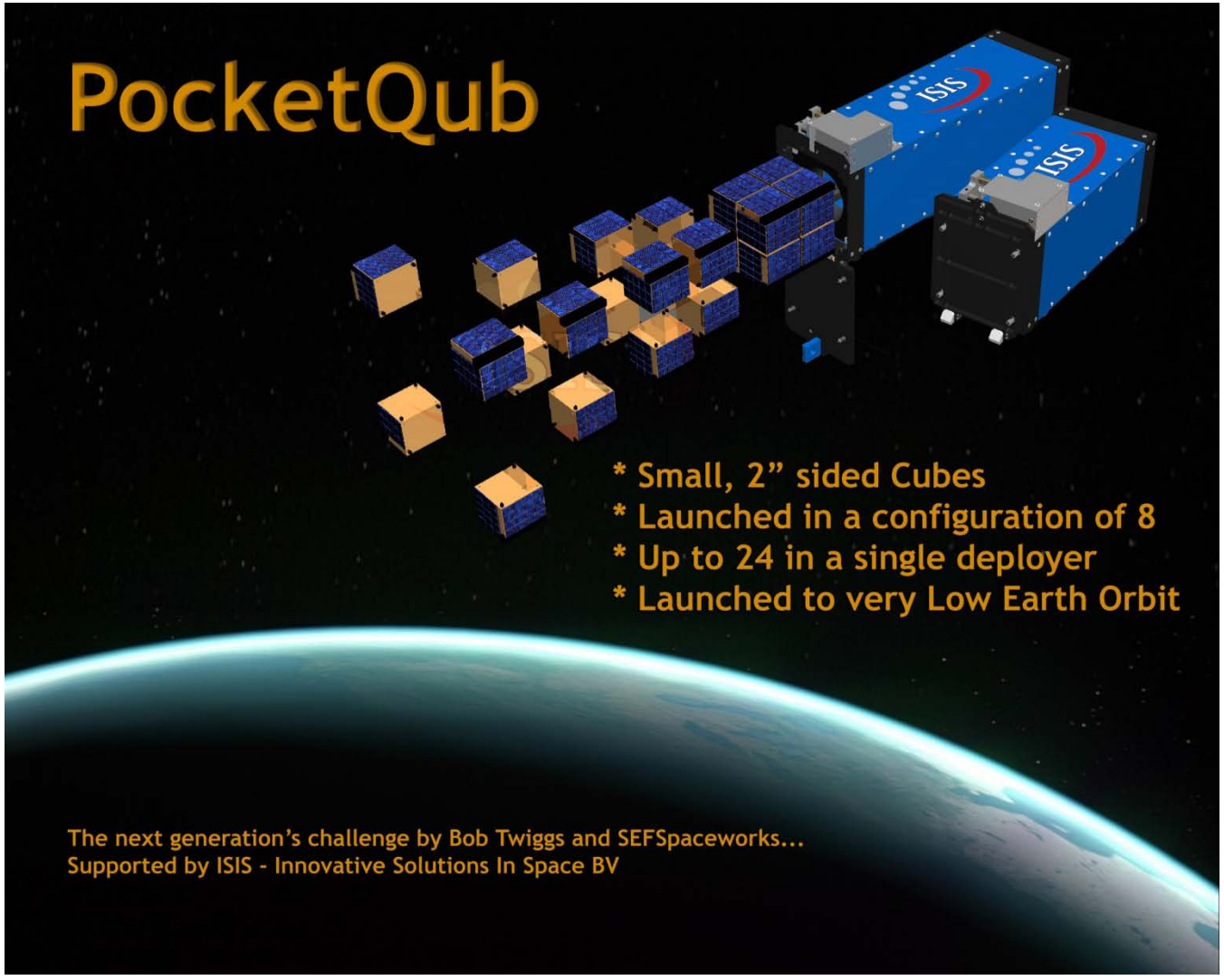

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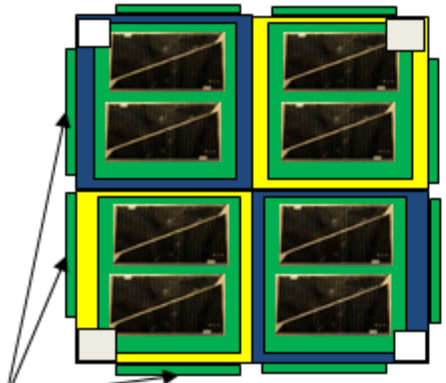
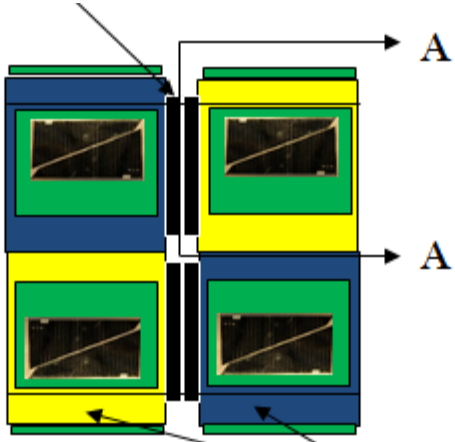
Top View

Any CubeSat Deployer

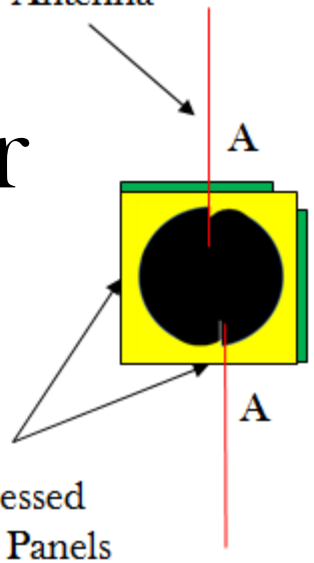


Solar Panels End View



Side View

P-POD
Rail Slide Area



Recessed
Solar Panels

Conclusion

First PocketQubes launched

Proven do work with really cheap parts

Expect launch costs to be ~ 25% or less from CubeSat

Two launch methods

- UniSat – Dnepr
- Any CubeSat launch

More to come on PocketQubes in following two presentations