



The Adventure Continues!

An Update on Spaceborne Remote Sensing



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From 1966...



...to Today



EO Launches Since Last JACIE

- Sentinel-2A (ESA)
- Kompsat-3A (S.Korea)
- Resurs-P N3 (Russia)
- Diwata-1 (Philippines)
- LAPAN-A2 (Indonesia)
- TeLEOS 1 & Kent Ridge 1 (Singapore)
- 3ea. DMC-3 (21AT)
- At least ten diff. EO satellites (China)
- Flock 2b (14), 2e (12), 2e' (20) (Planet Labs)

Planet Labs

- **Bought BlackBridge/RapidEye**
- **Over 130 Doves launched to date**
- **Doves constantly evolving**
 - **Including Major improvements in imagery!**
 - **Totally different development philosophy**
- **Image in third major generation**
 - **NIR to come soon**
- **“Mission One”: 150+ Doves in orbit 2016-17**
- **Developing extensive user interfaces**

- **Urthecast – Imaging and Video from the ISS**
 - *Iris* UHD video, 1m GSD
 - *Theia* – 5m VNIR data, 100km swath
 - **Bought Deimos Imaging**
 - Deimos-1 (22m) & Deimos-2 (0.75m) satellites in orbit
 - **UrtheDaily**
 - Eight sats giving 5m daily whole-earth coverage
 - **OptiSAR™**
 - 16 Satellites: 8 tandem pairs, 2 orbital planes
 - 1m X-band and 5m L-band
 - Plus atmospheric data

Black Sky Global

BLACK(SKY)

YOUR WORLD NOW

- **Formed in 2013, announced June 2015**
 - **Seattle-based, Spaceflight Industries**
 - **Imager from Harris' Exelis division**
- **First six satellites to Launch in 2016**
- **Full constellation of 60 sats in orbit by 2019**
- **Will offer customers direct tasking of satellites**



Hera Systems



- **1HOPSat: 9 satellites, 12 μ form factor, 22kg**
 - Launches start end of 2016, done by end 2017
 - To expand to 48 satellites as market demand grows
- **8 band multispectral framing sensor**
 - 1m claimed resolution
 - 5km \times 5km image
 - Priced \$1-3/km²
- **Good communication planned:**
 - Last-minute tasking: 15 minutes before overpass
 - Can even communicate short burst to customers
- **Will have some degree of on-board analytics**

And more.....



- **Microcosm, Inc.**
 - NanoEye satellite platform
- **Scorpius Launch Systems**
 - Both of El Segundo, CA
- **Close ties to Univ. of Southern California**



Commercial Weather from Space?

- At least 5 firms vying to provide R.O. data
 - Some with very well-known names and backers
 - Congressional pressure mounting
- NOAA Commercial Weather Data Pilot
- Potential global precedents?
 - WMO agreements to share all data: What about proprietary data?



Comm. Weather – It's Real



- Spire, Inc. orbits first 8 weather satellites in two launches

Government: Some Thoughts

- **“New Space” is fast & very entrepreneurial**
- **Gov’t has provided “enablers”**
 - **Base imagery, maps, GPS, etc. for geopositioning**
 - **Space monitoring, launch assistance, etc.**
- **Gov’t is often an “anchor tenant”**
- **What can/should Gov’t do to continue enabling robust industry?**
 - **Advise & assist? Directed Research? Standards? Methodologies? Test ranges?**

Major Trends in 2016

- **Consolidation & New Starts**
 - Will new start announcements slow down?
- **First Operational Launches!**
 - Or will they slip?
 - Will we see new imagery sources by next JACIE?
- **Focus expanding from Space to Ground**
 - Focusing on direct customer interaction, control
 - “Operationally Responsive”
 - Will this area determine the “winner”?

Major Trends (cont.)

- **Government gets pushed**
 - Does Gov't push back?
 - More Congressional questions.....and help?
 - More policy announcements
- **Results of first “New” applications?**
- **More “New Space” people at JACIE?**

Conclusion

- **The Remote Sensing is booming!**
- **The Community Needs:**
 - **Introductions to the new players and possibilities**
 - **Assessments of the quality and utility of new data**
 - **Shared methods, assets, resources**
 - **Communication between all parties!**
- **Simply put, the Community Needs.....**

JACIE