Unofficial Notes

The Dentons, ManSat and SatNews 5th Annual Space and Satellite Regulatory Colloquium

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Executive Summary

Dentons, ManSat and SatNews Annual Space and Satellite Regulatory Colloquium, now in it's fifth year has grown to about 100 attendees and included 14 panels and keynotes (including the NSR breakfast briefing). It was a long day that ran from 7:00am to 5:45pm, followed by a rooftop cocktail reception. But the effort was worthwhile. As far as we know, this is the only gathering of its kind in the satellite sector.

Sessions were filled with an acknowledgement that recent technical developments in the sector will lead to more rapid change – from pricing, to new ways of using technology, to entirely new applications. It may also increase the number of satellites and launches. These changes making some of the industry's traditional concerns such as in-orbit debris, collision avoidance, traffic management and frequency interference even more important.

Presenters also seem to acknowledge that the demand of terrestrial wireless spectrum users mean that spectrum sharing will be required in the the future. The satellite industry needs to work with terrestrial users for better defining spectrum sharing approaches to ensure it works for everyone. In particular, many presenters emphasized the need for the satellite industry to work together on unified positions to maintain fair access to spectrum in light of strong push from terrestrial wireless operators, who are often more politically powerful, to take-over spectrum the satellite sector believes it needs.

Future issues, such as asteroid mining, still lack a comprehensive regulatory framework and will remain a project for space law attorneys to complete in the future. Other pressing issues, such as cybersecurity, might ultimately be beyond the powers of the legal system to control. They may require constant defensive technical vigilance to manage – particularly if they emanate from a "bad actor" country. Finally, while there is a lot of speculation about where the next major successes will be, the industry remains highly dynamic and hard to predict.
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Summary Notes

A. Breakfast Briefing

Christopher Baugh, President, NSR

- Supply/demand OK until 2010
  - Commodity price declines
  - Erosion of video in N. America
  - Foreign exchange problems
- Pricing is coming down even faster now than a few years ago
  - In last 10 months data pricing is down at least 10%
  - Broadcasting down 3%-5%
  - Pricing per GB down $1.35 by 2020
    - Now about $6 via LTE
  - See NSR's pricing index (goes back to 2008-2010
- Big-4 have seen revenue's drop-off – no end in sight
- Regionals were going better, but have started to drop-off over last 24 months
  - Trends are now getting to them
- Satellite operators are spending more on managed services
  - Need to spend more to get the same revenue
  - Likely to see EBITDA margins decline
- Trend to consolidations
  - Buyers are getting larger via consolidation and increasing their power

(Armand's comment – this is consistent with other information we've heard)

Brad Grady, NSR Senior Analyst

- See 4x increase in capacity
  - 2,000 Gbps in 2015 to 14 Gbps
    - Includes LEO
  - Will be lots of growth in broadband access, commercial mobility etc.
- Demand Side
  - See about $1b in applications that take declines in revenue
    - video contribution etc.
  - Frequencies
    - GEO HTS will grow
    - C-band $1.5B in losses due to price points
    - Ku-band slightly negative
    - Ka-band positive
  - Traditional FSS will be down $1.3B over next 10 years
- Macro level
  - Move to HTS from traditional FSS which will decline due to migration
- Growth
  - Aero, Backhaul and Consumer Broadband
  - 23x increase in HTS demand
    - But only small increase in revenues

- Positive
  - Price to get to orbit and making satellite is going down so cost of delivering capacity is going down
- Looking forward
  - We are now SatCom v1.5
    - Between FSS model and HTS model
  - Service providers need to generate Megabits AND value
    - Digging deeper into value chain, but this is harder
    - Trying to reduce friction to consumer
      - Flat panel antennas etc.
      - Build satellite ecosystems so roaming stays within fleet
  - Infrastructure is marginalized
    - Only the best and cheapest will survive
  - Customers have less concern about where connectivity is coming from
- Is video still a good market?
  - Yes, but
  - UHD is still has a way to go due to costs etc.
  - Regional operators are becoming more competitive in developing world
- CheapSat is new buzzword
- Aero
  - Growing rapidly – 2016 to 2025 – add 51 Gbps
    - Lots generated by widebody jets
    - *(Armand's comment: this is about 40% of ViaSat-1 over next 10 years!)*
- Backhaul
  - 27% growth rate annually until 2025
  - Lots of technical issues to monetize 3g, 4g growth in developing countries
- Consumer Broadband
  - Huge growth opportunities
  - 2x the growth of the rest of the market combined
- Elasticity of demand – does more capacity get more revenue
  - It depends on the market
    - Enterprise markets will buy more at lower price, but not clear if revenue will increase
    - Ground segment markets
      - No revolutionary developments – need flat panel antennas etc to get ready
- What does ideal satellite fleet look like?
  - Legacy FSS capacity over large land mass with DTH contracts
  - Want 20%-40% of fleet to be ending life so they can be replaced with new cheaper ones
  - 90% would be video DTH
  - Less HTS data
  - Global solution
- ROI on FSS vs. HTS
  - Different business models compete for different markets
  - Satellite payloads are getting more and more customized
- Keys to success

- Need to be early to market with HTS
- Pre-launch commitments are essential
- Need to buildout distribution chain to be a one-stop shop *(Armand's comment: note sure most operators are set-up to do this)*
- Invest in new ground equipment to get more bits/Hz etc.
- Have new things in development
- Need to reduce customer friction
- Satellite manufacturers need to get more flexible and lower cost

- Q&A
  - Contract lengths is are getting shorter
    - Combining fixed contracts for some capacity w/ spot market purchases
  - Some local storage models are taking over
  - Concerned about business opportunities for NGSO

B. Opening dialogue: The Framework for the Day

Welcome remarks: **Bruce Merlin Fried**, Managing Partner DC Office, Dentons
Del Smith, Senior Space Business Counsel, Dentons, Washington DC
Christopher Stott, Chairman & Chief Executive Office, ManSat
Silvano Payne, Founder & President, SatNews

Bruce Merlin Fried

- Dentons is growing
  - 143 offices in 53 countries
  - 8,000 employees
  - Looking into an office on the moon ☺

Chris Stott

- We are in an era of Moore's law
- More data and data points
- Satellite is the backbone of this network
- Change will create chaos and lead to opportunities and challenges for lawyers and regulators

Del Smith

- Satellite are becoming a "normal" part of the communications industry
- Jokingly indicated aspiration of a Dentons office on the moon!

C. Space Traffic Management

Facilitator: **Tom Stroup**, President, Satellite Industry Association
Panelists:
Henry R. Hertzfeld, Research Professor of Space Policy and International Affairs, George Washington University
George C. Nield, Associate Administrator for Commercial Space Transportation, Federal Aviation Administration
David Barnhart, Chief Executive Officer, Arkisys

Tom Stroup

- 1381 operational satellites as of two years ago (includes LEO)
- Now talking about 5,000 satellite constellations and more
    - This makes traffic management much more of an issue

(Armand's comment: Point well taken, but not clear how many of the large LEO constellations will actually be built)

Henry Hertzfield

- Not many satellite dispute resolution mechanisms for satellite issues related to safety, debris etc.
- Need more coordination with other countries etc
- Launching country has absolute liability for launch damage or damage from falling from space
    - Little rules on liability for damage to other satellites etc done in space
    - IADC mitigation rules are very vague and limited
        - Need more specific and realistic rules (add identification beacons, emergency avoidance maneuverability etc.)
- Not a real issue with emerging nations and complying with rules
    - So are – no real issues
- Launching state is technically still liable no matter how long

George Neild

- Can a civil agency run a collision avoidance/traffic management system?
    - Maybe
    - Looking for authority to process and release that data like the DoD have immunity from lawsuits etc.
    - No reason for not having a regulatory framework based on good judgement and responsible norms of behavior
- Not enough coordination between DoD and FAA etc
    - Disjointed in many ways within difference government agencies
    - Maybe need a lead federal agency for coordinating commercial space usage
    - Need to be careful about security issues

David Barnhart

- Orbits are like traffic lanes
- Commercial sector may be most efficient way to support self-management
    - Agreements between countries have not worked
    - Need system where money counts
- Space is different than normal traffic as an issue is space impacts orbits globally
- One small satellite can cause a lot of damage

D. Satellite Frequency Issues

Facilitator: **John Janka**, Partner, Latham & Watkins, Washington DC

Panelists:

Jim Kohlenberger, President, JK Strategies

Christopher Murphy, Associate General Counsel, Regulatory Affairs, ViaSat

John Janka

- FCC will be faced with new NGSO satellite proposals

Jim Kohlenberger

- Govt is looking to help certain areas
  - In the past, govt did not expect DBS to get to be as big as it is or for GPS to grow as much as it has
  - Challenges in broadband is bigger
    - Rural areas
    - Lack of DSL competition
  - Lots of gaps
- Increasing need for more spectrum, but spectrum is fixed
- Government is trying to look forward on zoning map
- Satellite industry is now changing not only at moore's law, but now a sensor revolution as well
  - Data doubling every few years
  - Launch cost falling
  - All adds to increasing opportunities
- Internet has done more to grow economy than industrial revolution has in 50 years
  - Only 1% of things that can be connected as can be connected
  - Can really help grow the economy
- 24 federal agencies involved in IOT
  - need to reduce red tape requirements

Chris Murphy

- Looking to redesign that was satellites are built
  - More specialized designs
    - OTT optimized satellites
    - Video broadcasting satellites are different
- Spectrum sharing needs to take everyone's needs into account
- Still distinction between fixed and mobile satellite that doesn't make a lot of sense

(Armand's Comment – seems an industry lack of recognition of/concern for the organizational hurdles to implementation of new IOT services and the like)

E. ITU & Satellite Spectrum Issues

Facilitator: **Christopher Stott**, Chairman & Chief Executive Officer, ManSat
Panelists:
Jennifer Manner, Vice President, Regulatory Affairs, EchoStar
Audrey Allison, Director of Frequency Management Services, Boeing
Phillip Spector, Of Counsel, Milbank, Tweed, Hadley & McCloy

Audrey Allison

- Now there is industry interest in using higher bands, such as the V-band, for satellite systems (NGSO and GSO)
  - Some of the regulatory issues are incomplete
  - Boeing expects to share V-band with 5G users

- *(Armand's comment: very focused on v-band – maybe Boeing is serious about that June 2016 V-band LEO filing?)*
- Satellite industry is getting better at engaging regulators and the like
  - Need to meet directly with regional groups and sub-groups
  - Doing a better and better job including GVF
- Lots of arcane regulatory definitions that restrict usage and impede progress
  - UAV's can now use FSS bands, but still lots of additional regulatory steps until it is really finished

Phil Spector

- There is a reason there is more interest in lower bands than higher bands
  - Higher frequencies are often harder to use and more limited
- Satellite industry has lots of experience with frequency re-use, but that can only go so far to increase supply
- Terrestrial [wireless] industry does not have a lot of incentives for sharing
  - Have an upper hand at the FCC
    - 2M US satellite broadband is small compared to mobile broadband
- Agrees that satellite is now doing a better and better job, esp. at WRC
  - But satellite industry got backlash from FCC chairman who chastised industry for winning
  - Spectrum Frontiers eroded into satellite as one tangible backlash example
- Broadcasters help satellite industry save the C-band
- Industry needs to develop and effective international coalition for WCR-19

Jennifer Manner

- Spectrum sharing issues can be revisited
- How can we get back to technology neutrality?
  - Gov't spectrum re-allocation mostly for terrestrial
  - Some gov't agency use of commercial satellite spectrum
  - Universal service favors fiber
  - Something to explore with new trade agreements
- Saying "no" to sharing won't be successful
  - Need to find a balance that works

(Armand's comment: nothing particularly controversial or surprising about most of the comments in this session. Increased satellite industry recognition of the need to work together better to coordinate spectrum with terrestrial wireless industry is significant)

F. 3rd Party Liability Insurance for LEO Sats: Regulatory Authority & Business Necessity

Facilitator: **Pamela Meredith**, Zuckert, Scoutt & Rasenberger, DC
Panelists:
Chris Kunstadter, Senior VP & Global Underwriting Manager – Space; XL Catlin
Stephen Duall, Chief, Policy Branch, Federal Communications Commission
T**om Johnson**, Analytical Graphics, Inc.

Pamela Meredith

- Launch insurance only covers launch + 30 days and reentry (if any)
- Some satellite manufacturers get liability insurance, but many don't

Tom Johnson

- *(Armand's comment: Tom showed a nice video about space debris by size and altitude – I'd suggest that anyone looking for such a video contact Tom)*
- About 200,000 debris object more than 2cm
  - 2cm is the critical size where debris gets dangerous for spacecraft
  - 1mm object can put hole in solar panel
- Accumulated risk to constellation over 10-year period
  - Get 10 million warnings for each expected collision (false positive problem)
  - More likely to have a hardware failure than a collision failure
- Some stuff will reenter
  - Accuracy of reentry is hard to figure out as things break-up on reentry
    - Some pieces reenter and others don't
  - A few hundred object re-enter each year
- Harder to maneuver around debris warning, than an actual satellite that might get in the way
- JSPOT doesn't catalogue unless it can track it back to a specific country/launch
  - This is obviously a problem for those wanting full data to take defensive action

Steven Duall

- Need to have a plan to deal with orbital debris when filing FCC applications
- Have not had to deal with issue of an operator not being able to control a satellite and get it to junk orbit or otherwise de-orbit
  - Would need to address it with state department if it came up
- Having an earth station in the US means an operator is brought into the US regime

Chris Kunstadter

- Need to get 3rd party insurance policy to launch from the US
- Not many operators buy in orbit liability insurance
  - Most just "hope"
- Satellite manufacturing contacts are quite tight
  - Satellite operator takes liability at point of launch
  - Satellite manufacturer usually has no liability absent gross negligent and/or willful misconduct
- Not many exclusions on insurance policies other than acts of war and related issues

G. NASA's Role in Emerging Space

Facilitator: **Alex Macdonald**, Emerging Space Program Executive and Senior Economic Adviser, NASA

Panelists:

Michael Gold, Space Systems/Loral

Sam Scimemi, Director, International Space Station, NASA
Chris Cummins, Chief Commerce Officer, NanoRacks

Alex Macdonald

- NASA is doing a lot with commercial partners
    - All areas of NASA
- Economic viability can be shown with fundraising

Michael Gold

- Days of NASA and DoD ignoring private sector needs are over
- Need to ask with each mission – how will this impact US space sector?
    - Jobs, capabilities, competitiveness of US industry etc.
- Gov't can encourage developments
- Need to commercialize LEO as GEO was commercialized
    - Maybe assemble GEO satellite in LEO
- Lots of changes in space will drive demand for legal services
    - Need to overcome regulatory issues
    - In many cases technology is ahead of regulatory structure
        - Other countries may be ahead
            - China has a space station and is welcoming foreign involvement

Chris Cummings

- NASA reached-out to private sector for Space Station construction
    - More commercial
- Have launched over 100 cubesats
    - More going up over the next few months
- Try to have scientific, educational merit with payloads

Sam Scimemi

- NASA has a challenge of being open enough to private activities and balancing risks to its mission
    - Want to help US industry but lots of risk allocation needs to be figured out if private industry can't deliver
- Need to get launch costs down to get regular access to the moon or Mars
- Need to have economic growth in LEO based on having some capabilities located there
    - Market is now catching-up to this
- NASA uses every mechanism the can to open-up the Space Station to companies for their use
    - Sometimes even on a no-cost basis
    - All things that allow human spaceflight in LEO will eventually need to be transitioned to private sector
    - May have a private module in the ISS and allow private astronaut's access it
- Two paths for ISS payloads
    - NASA – no economic analysis for its purposes – only its requirements and capabilities

- National Lab Side – CASIS – do a technical and economic assessment, does gov't benefit

(Armand's comment: Explicit gov't emphasis on private sector involvement was interesting, but probably not surprising given the strategic importance of space and various subsidies many governments are putting into the sector)

H. Luncheon Keynote Speech

Jennifer A. Warren, Vice President, Technology Policy & Regulation, Government and Regulatory Affairs, Lockheed Martin Washington Operations

- There is new space, but it's all new space
  - Innovation is happening at all levels
- Talk is "off the record"
- Lots of new ideas – asteroid mining etc. from a variety of companies
- Congress does not care much about satellites/space – not consumer facing
- Not in our interest to have a divide between "New" and "Old" space
  - Hurts advocacy
  - Competing against others for resources including spectrum, government staffing etc.
  - Need to advocate internationally – can't be divided
- Regulatory environment does not reflection base policy documents
  - How do we energize interest?
- Pushing boundaries of current regulatory environment
  - Need to shape and direct policy for "light touch" regulations that support growth – want regulatory agility
  - Real investment (beyond exploratory funds) does not happen until there is more regulatory certainty
- Many analogies between deep seabed exploration and outer space
  - US has never ratified the law of the sea
  - Hard to attract large investment in sea mining rights can't be well guaranteed
- Never seen a challenge to US jurisdiction/regulatory process in space (Article 6 of Outer Space Treaty)
- Plugged CondoSat (Lockheed project led by Lon Levin)
  - Customers can have ownership but not full responsibilities
  - Can share risk
- Spectrum is an area for broader collaboration
  - FCC chair likening 5G as like the moonshot shows the power of the wireless sector
  - Don't have consumers advocating for satellite sector
  - Need to engage the wireless sector
    - Likely there won't be any unencumbered spectrum for satellite

(Armand's comments: This was broadly consistent with themes echoed on other panels throughout the day)

I. Legal Mechanisms for Facilitating Space Collaboration

Facilitator: **Brian Weimer**, Partner, Sheppard Mullin
Panelists:
Richard French, Staff Technologist, Space Technology Mission Directorate, NASA
David Harris, Deputy General Counsel, SpaceX
Joseph Cassady, Executive Director, Space, Aerojet Rocketdyne
Keith Szeliga, Partner, Sheppard Mullin

Brian Weimer

- Government contracts are critical to understand and are special animals

Keith Szeliga

- Procurement contracts
  - Most common type – required when government buys something it wants
    - Covered by FAR system
      - Possible buy difficult to have sole sourcing
      - Protest mechanism can delay process
  - Somewhat more relaxed for commercial items
    - More favorable IP treatment
- Grants and Cooperative Agreements
  - Transfers value to a private entity – not buying something
    - When done alone it is a grant
    - When done with gov't involvement – cooperative agreement
  - FAR, CAS and TINA don't apply
  - No protest process
  - Fee or profit generally not available
    - Gov't is doing this to get something done that helps both
      - Fee and profit is not an issue
- Space Act Agreements
  - Reimbursable
    - NASA makes underutilized resource available in exchange for reimbursement of costs
  - Non-reimbursable
  - Funded agreements
  - Can be very flexible
- Other contracts
- Risks are higher in government contracts
  - Perfect tender clause means product must be perfect
  - Gov't Changes clauses
    - Can change anything in the scope of the contact, but must compensate you – can't decline
- Clauses often need to be in the agreement as they are written into it if they are not in it
- Part of issue is how gov't treats commercial items – sometimes they don't treat commercial items as such
- Can't enforce state law and indemnification against the government
  - Deliver as little as possible (e.g. not software source code) to avoid IP issues

Richard French

- Space Act not used more because lots of things agencies want to do don't fit into it's requirement
- NASA is actively working to push more flexible manner of commercial partnerships
- Using FAR to do R&D – might stretch the vehicle, but they meet all of the requirements
    - Can take a long time to meet the requirements before they can even start negotiation
- Requirements for what constitutes a "US company"
    - Development with NASA usually needs to be a legitimate US company
    - More flexibility with procurement

Joseph Cassady

- Likes Space Act contracts
- Has worked on a few of them
- Often times there is confusion in what can and can't be done
    - No meeting of the minds on the suppliers' contact people and the gov't agency's intent and rational
- Sees contracts moving from OTA to FAR part-12

David Harris

- Most commercial satellite manufacturers or launch providers have done work with NASA
    - Sometimes to get access to equipment/expertise that would be hard for a small company to have access to otherwise
        - Sometimes even for free depending on the nature of the research
- FAR part-12 have about 50 clauses, regular FAR have hundreds of clauses
    - Traditional agreements 17-25 clauses
- Sometimes move from an OTA and then convert to a FAR part 12 for other parts of it
    - Gives contactor additional flexibility

(Armand's Comments: Panel did a good job of highlighting the complexity of this type of government contracting and why an attorney qualified in this area is necessary – ***please don't act on the basis of my potentially imperfect attempt to summarize some of the legal points above****!)*

J. Commercial Space Transportation

Facilitator: **Clay Mowry**, Sales, Marketing & Customer Experience, Blue Origin
Panelists:
Richard DalBello, Vice-President Business Development, Virgin Galactic
Sarah Graves, Legal Counsel, Sierra Nevada Corporation
Tom Tshudy, Vice President and General Counsel, United Launch Alliance
John Scott, Vice President and General Counsel, Orbital ATK Space Systems Group

Clay Mowry

- Very dynamic time in the satellite launch sector
    - New GEO launch providers have entered
    - 25 LEO launch providers in development

Richard Dabello

- Virgin is planning on doing both human and cargo launches
- FAA should continue to oversee launches – they have proven competency
- Legal protections for launching people/passengers
    - Last round of space act includes cross waivers for passengers who can accept their own risk
- FAA is working on merging airplane and space database so you know you won't hit anything when you launch
    - Space database by FAA not at level of plane database
    - Space Data Association for GEO is helpful to avoid problems
        - Example of private sector working out of its own self-interest

Sarah Graves

- Suggests a government clearing group to help manage the regulatory process when dealing with new issues that might overlap a variety of agencies
- Dream chaser has lots of capabilities and will have different risk profiles etc.
    - The longer the time in orbit, the more the risk
- Need regulatory boxes, but carve-outs can be catastrophic
- Interesting ramifications of an international landing on re-entry (export laws)

Thomas Tshudy

- FAA has served a key role in overseeing the launch process, and is doing fine
- Liability regimes for space operations will be a challenge
- It's impractical to have a regime where you are responsible for everything you might touch in space
    - Maritime law of the sea might be more applicable way to figure out space traffic issues

John Scott

- Don't care who regulates launch as long as it's done well
- Cross waivers to limit risk is a good thing and avoids lots of finger pointing
- Have help-up a launch for a single boat in the region

K. Commercial Extraction of Space Resources

Facilitator: **Joseph Pelton,** Executive Board, International Association for the Advancement of Space Safety

Panelists:

James Muncey, Principal, PoliSpace

Sagi Kfir, General Counsel, Deep Space Industries

Michele Gates, Program Director, NASA Asteroid Redirect Mission

Peter J. Marquez, Vice President, Global Engagement, Planetary Resources

Michele Gates

- NASA can provide all kinds of partnerships for commercial sector in space

Joseph Pelton

- Capturing an asteroid, mining it and keeping the rights to the recovery is a major legal challenge

Sagi Kfir

- Title 4 of the Commercial Space Competitiveness Act ("Space Act") allows people to keep what they mine from space, such as an asteroid
  - Huge first step
  - Gives investors some comfort about investing needed to build infrastructure needed for asteroid mining
- Luxembourg's legislations will likely spawn bilateral agreements, then multi-lateral agreements
  - International regulation may come in over time

James Muncey

- Need an agency review to launch to ensure compliance with Title 4 of the Space Act that requires the US Gov't to provide continuous supervision
- Title 4 is not consistent with the Moon Treaty, but the US is not a signatory
  - 16 of 194 nations have ratified it

Peter Marquez

- Title 4 [of the Space Act] is a big deal
  - Allows us to focus on technology and not potential litigation
  - Congress loves it
  - Other countries are looking at implementing similar laws
    - Some people have objections
      - Say it is a violation of article 2 that prohibits sovereignty
      - Some object that the US did not take time to socialized
      - Others see it as colonialism
- No legal definition of "celestial body", so it's not defined in Title 4 [of the Space Act]
  - US legislation is not complete
    - Need more processes in place for gov't to give a firm "yes" to asteroid mining missions
  - Luxembourg is likely to have more complete legislation on asteroid mining
- Need to get spectrum – can't use commercial or amateur spectrum for asteroid mining

(Armand's comments: seems there are still some issues to be worked out with commercial asteroid mining. Fortunately, we probably have some time before those issues become pressing)

L. Cyber Threats to Satellites

Facilitator: **David Hartshorn**, Secretary General, Global VSAT Forum

Panelists:

Vernon Mosley, Senior Cybersecurity Engineer, Cybersecurity and Communications Reliability Division, Public Safety and Homeland Security Bureau, Federal Communications Commission

Donna Bethea-Murphy, Senior Vice President Global Regulatory at Inmarsat
Andy Tomaszewski, Chief Information Officer & Chief Information Security Officer, iDirect
Michael Smith, Senior Vice President of Kratos Defense & Security Solutions

David Hartshorn

- Security incidents in 2015 grew 66% CAGR
- Attacks take minutes or less in 93% of cases
- At Satellite 2016, Harris CapRock sent out a press release that they added a new security element to their portfolio – is this a glass half full story where satellite can gain market share?

Vernon Mosley

- Need strong cyber security to protect national communications system
- Put together a committee to look into cyber security across platforms
    - 400+ pages
    - Good policies
- Have lots of info relate to physical damage/outage
    - Cyber security problems can grow from a local event to an international one in a period of minutes
        - Can't just geo-fence it in and restore service as would be done with physical network damage
- Cyber security needs to move from IT level to board level
    - But need to find a common language around risk mitigation

Donna Bethea-Murphy

- Customers see cyber security as a key selling point
    - Of increasing importance
- Companies can't chase everything [that is a cyberthreat], but needs to find trends and stop the [major] threats
- Agrees that satellites can be more secure than terrestrial options
- Hard to get damages from a "bad actor" country

Andy Tomaszewski

- Ground equipment companies face similar threats to cyber security
    - Need to collaborative with other parts of the technical chain – all the way back to launch providers to deal with cyber security
- Satellite cyber-attacks are very sophisticated – often state actors
    - Need highly customized response and need to share data up and down the value chain
- Hard to get damages from a "bad actor" country – try to prevent them from getting access
- Can't see equipment lasting 15 years. Now building them so that they can be reconfigured
    - Unlikely ground equipment can remain static for 15 years as it has in the past

Michael Smith

- Non-threatening/non-intentional denial of service is an issue to spend more time on
- Satellite is not on the bleeding edge of security, but since it is a small market share hackers don't focus on it [satellite] as much

(Cyber treats look like they may be beyond a legal solution…expect perhaps to allocate blame after a breach)

M. SPACE 3.0: The Quest for Unicorn Start-ups in Space

Facilitator: **Elizabeth Evans**, Partner, Dentons
Panelists:
J. Armand Musey, President/Founder of Summit Ridge Group, LLC
Marshall Heard, Chairman, Florida Aviation Aerospace Alliance
Randy Segal, Partner, Hogan Lovells
Michael Mendelson, Mendelson Legal

Armand Musey

- Many VCs won't sign NDAs
  - Many want to see a management team that is smart and develop new IP as company may need to change
- PE shops generally want better internal processes in place so they can implement more advanced financial engineering
- Distinction between VC and PE is not sharp as investment firms often exist in grey areas between the distinctions
- Hard to predict unicorns

Marshal Heard

- Showed slide with 9 levels of product development
  - Move from seed capital to complex bank financing as you move up the chain
- Agrees that management team for an early stage company may not be suited for developed company
- Hard to predict unicorns
  - Lists of up and coming companies are different every year

Randy Segal

- VC firms are all about chaos, management and ideas
- PE firms are about order and complex financial engineering

Michael Mendelson

- Need to consider NDAs and when to use them
  - Registered IP
  - Unregistered IP including business processes that might not even be patentable
  - Apple won't sign NDAs, but if they did not have a reputation for respecting IP, people would not show ideas to them

(Armand's comment: Surprising amount of consensus on this panel)

N. Regulatory Framework: 21st and 22nd Century Challenges in Space

Facilitator: **Giovanna Cinelli,** Partner, Dentons
Panelist: **Gerry Oberst**, Sr. VP of Global Regulatory & Governmental Strategy, SES Global

Gerry Oberst

- Spectrum is the lifeblood of the satellite communications sector
    - Satellite communications sector needs to learn to share
- Need to work to accommodate the different needs of developed and developing countries
    - Satellites are particularly effective with emergency communications
- Need to make sure 5G definitions include satellite
- Hard to predict long-term in the satellite industry
- Smaller satellite companies may not have back-up etc.
- Goal for satellite industry is to avoid litigation as it is expensive and takes too long
    - Look more to arbitration etc. to resolve disputes

Giovanna Cinelli

- Technology impedes privacy
    - Privacy is a difficult thing to deal with
- International courts are getting more complex
- Maybe we will see litigation over rights to asteroids