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9 June 2010

ENGLISH only

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Working Session 2
Exploring the next generation of Treaty implementation

TRANSITION TO THE DIGITAL FUTURE

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Transition to the Digital Future

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Excellencies, Ladies and Gentlemen: As I stated yesterday, the Sensor Working Group has completed all of the key decisions necessary to move the Treaty on Open Skies forward into the Digital Future. Next Generation Open Skies is "Digital". We are at a transition point in the history of this Treaty. As we heard in the previous briefing, the Russian path forward is the TU-214. Their path includes all of the sensors authorized by the Treaty and stands as an example of a fully integrated, digitally enabled, Open Skies platform. Other States Parties must also consider the global technology transition and craft their individual plans for the future.

In the next few minutes, I would like to address the future of Open Skies from a sensor perspective. First, let me talk about the digital sensors available in the Next Generation Open Skies program.

Section 1: The Sensors

Under the Open Skies Treaty, digital sensors come in three types, Electro-optical or Video, Infrared and Synthetic Aperture Radar.

Video

Revision One to Decision 14 describes the type of digital aerial camera systems envisioned and authorized for use within the bounds of the Treaty on Open Skies. This new decision was adopted last month and includes the specifications for color camera systems allowable for use within the bounds of the Treaty. The specifications generally match the type of digital aerial cameras available on the commercial market today and generally produce color imagery similar to the imagery that comes from commercial satellite providers. This is important for two reasons:

1) it provides an opportunity for States Parties to buy commercially available "off-the-shelf" camera systems and
2) it aligns Open Skies imagery products to be similar to the imagery products commonly used around the globe.

These two items keep our cost down because the hardware, the software and support architectures become simple and readily available to all States Parties. The timing of this new decision is important since Kodak has already announced that two or the three film types manufactured for Open Skies will no longer be available. Film is slowly moving toward retirement.

So what does the digital future look like after the transition to all digital? Much like your home use of digital cameras, there are no more film costs nor is there any requirement for wet-chemistry processing. Operating costs will plummet as film processing equipment and chemistry infrastructures are retired. Storage and distribution requirements also begin to look much like your personal photo album. Digital imagery is stored on hard-drives or DVDs. Some States Parties may opt to use only DVDs since the volume of their imagery may be small. Again, costs should be greatly reduced.

Infrared

Protocols for Infrared Sensors are listed in Revision One to Decision 15. As I mentioned yesterday, this is perhaps the sensor category where the Sensor Working Group incorporated the most changes in order to make data gathering and certifications "Faster-Better-Cheaper". But this is the sensor category where the commercial market is the thinnest. The commercial demand for infrared aerial remote sensing is not large and therefore manufacturers do not offer the wide variety of systems that they do in the color camera market.

However, aerial infrared systems offer many advantages and opportunities. Unlike color cameras, thermal infrared cameras function well at night. At this point, Open Skies flights have been day-time only. Infrared sensors open up the possibility to operate during times of the day when classic color imagery is marginal or impossible.

Additionally, infrared sensors open up various alternate uses, beyond those listed in the Treaty. As we have seen in the past, Open Skies sensors are valuable for national and international purposes, such as disaster relief. Infrared systems can map large flood plains during flooding conditions and are functional during twilight and nighttime conditions. Infrared provides new flexibility for disaster relief operations, and can even be used in very hazy conditions and during light fog conditions. Because infrared sensors see heat sources, disaster uses abound. Infrared sensors can be used to find individuals stranded on roof-tops during floods, to locate natural gas fires after earthquakes or to detect dangerous regions around a volcano during an eruption.

Synthetic Aperture Radar

Perhaps the most complex sensor category in the Open Skies Treaty is Synthetic Aperture Radar or SAR. SAR systems are described in Decision 7. Last month the Sensor Working Group began work on Revision One to Decision 7. As with the other sensor categories, this new revision will incorporate both technology upgrades and operational improvements based on experience gathered across the Open Skies community.

Like Infrared, SAR works well at night. Additionally, SAR can be used in all weather conditions and is the only sensor type that can be called "Day-Night, All-Weather". Since weather is often a factor for Open Skies observation missions, SAR offers the opportunity to obtain imagery of the ground even when the other sensors only see clouds.

SAR also offers many capabilities that have value to nations that extend beyond the Treaty. SAR systems are the only sensors that could possibly be used to map disasters during the actual storms; creating real time maps of flooding during the actual storm period. SAR is also useful for mapping geomorphology features like those that occurred in Central America during Hurricane Mitch in 1998.

Section #2: The Transition

At this point, most States Parties have not established definitive plans to move from film to digital systems. Costs appear to be the dominating factor across the spectrum for those looking into the future at various alternatives.

As with many technology transition plans, each State Party must review their current situation, establish their long term vision and objectives (perhaps for the year 2015 or even 2020) and estimate the costs to make such a transition from film to digital.

Sensor replacement is not always a matter of removing one camera and installing another. Many factors must be examined to find cost-effective solutions; total costs are more than just the purchase price of a new camera. Costs that need to be considered include:

- initial purchase cost for the sensor
- auxiliary equipment costs (computers & software)
- recording media costs
- long term Operations & Maintenance (O&M) costs
- Integration Cost (to install the camera on the aircraft)
- Effects on aircraft operating parameters (flying the new camera at Hmin)
- Special needs (IR window or SAR antenna cover)

Collaboration with partners or collaborative equipment purchases are possible paths to reduce or minimize costs. Frequently, two or more States Parties can share costs in a manner which reduces their cost per mission when compared to individual plans or programs.

In this vein, the United States Air Force has recently completed a market survey of potential color camera systems available from commercial manufactures that could be used within the context of the Open Skies Treaty. In an effort to collaborate and find cost savings for multiple States Parties, the US Air Force has recently invited Open Skies members to a workshop on 15 and 16 July in Dayton Ohio. The US Air Force will share their database created from this research with hopes of making the transition to digital more cost-effective for all States Parties. This initial meeting is intended to be only the first step in a process to look for ways to jointly find collaboration models which are

beneficial to multiple States Parties. All States Parties received an invitation in document OSCC.SEN/11/10.

Section #3: Future Opportunities

Cost-effectiveness must be addressed by considering the multiple opportunities for auxiliary uses of these new sensors. Many of the commercial aerial cameras have been developed for specific applications such as municipal aerial surveys to make multi-level Geospatial products which are useful in a wide variety of emergency and disaster applications. Being digital, Open Skies sensor data can be used for routine updates to national geospatial baseline data sets. In other words, the Observed State Party may find the data gathered by the Observing State Party to be a valuable supplement to their own national data gathering effort.

It is important to point out at the end of this presentation, that the 34 members of the Treaty on Open Skies have created a very remarkable international model of cooperation. We have, in effect, established standards for inter-operability on an international level. With our new digital decisions, States Parties can operate Video, Infrared and SAR systems and produce Geospatial Products that are compatible in both recording standards and exchange media standards.

These efforts have made us quite flexible and interoperable as a body of nations. With the digital decisions, we are able to freely share data across all of the digitally enabled members. Our Treaty operations over the last 8 years has built a familiarity with each other's operating procedures, both flight operations and sensor operations which gives us potential to work together as a team. Our Treaty has created a very robust international structure for aerial remote sensing which has potential for various applications beyond the Treaty and into categories like disaster mitigation and environmental sciences.

Again, I would like to thank all of the men and women who have worked many hours since the last Review Conference in 2005 to get us to this historic point where we begin our transition into the Digital Future, into Next Generation Open Skies.

Next Generation Sensors

- **Three types of sensors**
  - Electro-optical (EO) or video
  - Infrared (IR)
  - Synthetic Aperture Radar (SAR)

EO or Video

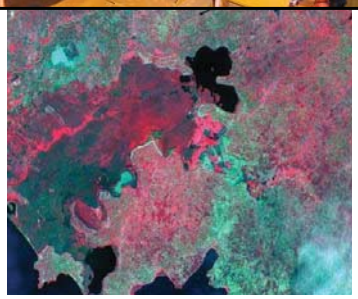
- Decision 14 Revision 1
- Provides opportunity for States Parties to buy commercially available camera systems
- Aligns Open Skies imagery products to be similar to Imagery products around the globe
- Keeps cost down

MS Bing – Aerial View
Image source: 5 sources cited

Google – Aerial View
Image source: European Space Agency

Infrared

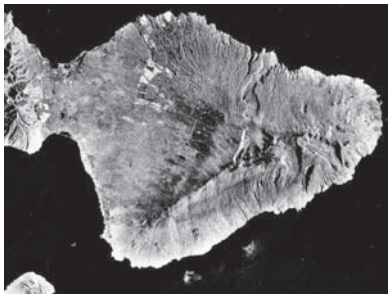
- Decision 15 Revision 1
- Faster-Better-Cheaper
- Limited variety of systems available
- Thermal infrared functions well at night which opens the possibility to operate when color imagery is impossible
- IR can be used in disaster relief
  - Map flood plains
  - See through hazy conditions
  - Find stranded individuals on roof-tops
  - Locate natural gas fires after earthquakes
  - Detect dangerous regions around volcanoes



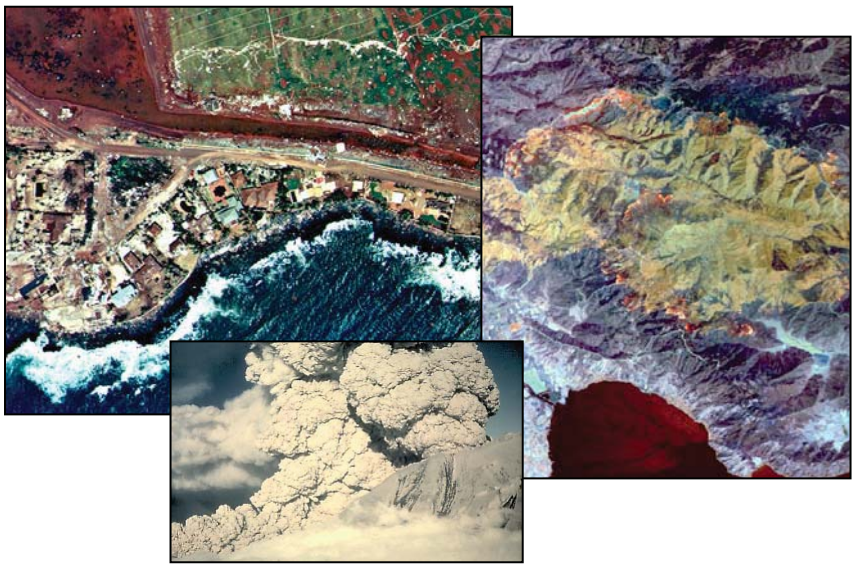
Flooding

SAR

- **Decision 7**
- **SAR works well at night**
- **Only sensor that can be called “Day- night, All-weather”**
- **Offers capabilities that have value to nations beyond the treaty**
- **Could be used to map disasters**
  - Create real-time maps of flooding during the storm
  - Useful in mapping geomorphology features during Hurricane Mitch in 1998



Natural Disasters



The Transition

<u>COST</u> is the dominant factor that most States Parties face when looking into the transition to digital sensors

The Digital Transition

Factors to consider:

- **Initial purchase cost of the sensor**
- **Auxiliary equipment costs (computers & software)**
- **Recording media costs**
- **Long term operations & maintenance costs**
- **Integration costs (installation of new cameras)**
- **Effects on aircraft operations**
  - sensor Hmin may not match best fuel performance altitude
- **Special needs**
  - Infrared windows or SAR antenna covers

Next Steps

Collaboration meeting in Dayton Ohio next month to discuss collaborative international ideas for sensor selection and acquisition

- 15-16 July 2010

- invitation in OSCC.SEN/11/10

Future Opportunities

Cost Effectiveness is enhanced when Open Skies aircraft, sensors and flight crews are shared with other national and/or international missions

Future Opportunities

- Our efforts to create digital standards have resulted in making us very “interoperable”
- Our routine flights together have built a strong rapport and robust familiarity among our flight teams

Future Opportunities

Result

As we transition into the digital age, we will create a unique international team able to work together with similar equipment for joint applications beyond the Treaty