# Space and Missile Systems Center



Defense Weather Systems Directorate (SMC/WM)

American Meteorology Society CONFERENCE

> Program Status of DoD Weather Satellites

> > 8 January 2013

Col Scott C. Larrimore,

Director

Defense Weather Systems Directorate (DWSD)

Building the Future of Military Space



requirements

### **DWSD** Mission Overview

#### Satellites TBD Develop, acquire, field and sustain affordable space and terrestrial weather Weather systems to meet Department of Defense Weather System DMSP Follow-on Space Weather **SSAEM** C/NOFS SWAFS Weapons Weather Air Force Weather Weapons Systems (AFWWS)

VISION: Be the provider of the most effective and affordable space and terrestrial weather systems

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## se Meteorological Satellite Program (DMSP)

- DMSP continues to meet mission requirements
  - F13 F18 continue to supply operational weather data to AFWA
- F19 launch date ~ CY 1Q 2014
- As a result of DWSS cancellation, AF will evolve to single plane constellation
  - F19 launch will bring DMSP to single-orbit configuration
  - Preserves DMSP capability into next decade
- Tech refresh for ground command and control system

Orbits	2011	2012 2013	2014 2015	2016 20	16 2017 2018 2019 202			2022 2023	2024 2025			
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Early												
Morning	DMS	SP F15 & F17		DMSP I	19		DMSP F20					
,												
Mid-Morning												
		DMSP F1	6 & F18									



## DMSP

### Sensors & Products

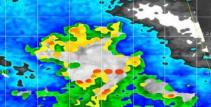
#### SPACE AND MISSILE SYSTEMS CENTER



Provides visible and infrared cloud data





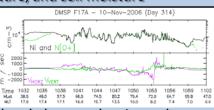


Detects precipitation, surface temperature, and soil moisture

SSI/ES-3

**SSM** 





Measures the spacecraft's electric field and electron density and scintillation in the upper atmosphere



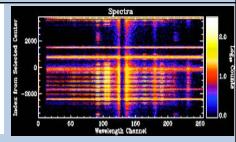
DMSP F16A - 25-Nov-2004 (Day 330)														
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Time	2006	2009	2012	2015	2018	2021	2024	2027	2030	2033	2036			
ML/dt MLT	-46.9 8.5	-57.4	-68.0	-78.4	-86.7	-80.0	-71.1	-63.2	-58.2	-49.6	-43.0 20.1			
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Measures disturbances in the earth's magnetic field

Analyzes electrons and ions entering the upper atmosphere which produce the auroral display

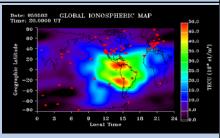


SSJ/5



Profiles of natural airglow from atoms, molecules, and ions in the upper atmosphere





Electron density profiles ,electron/ion density, neutral density, auroral imaging

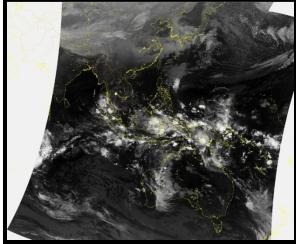
**DMSP Sensors Provide All Weather Terrestrial & Space Weather Capabilities** 



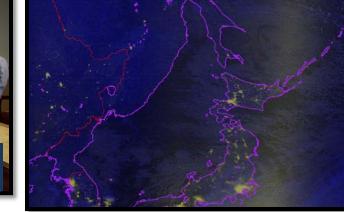
## DMSP at McMurdo Site

#### SPACE AND MISSILE SYSTEMS CENTER

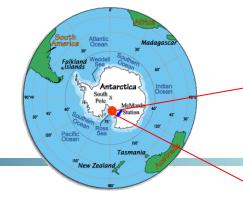
- DMSP satellites operated by NOAA from NSOF in Suitland, MD
- McMurdo site reduces DMSP stored mission data latency to ~25 minutes from ~55 minutes
- 2 Dual use antennas S and Ka bands (JPSS & DMSP)
- DMSP fine resolution OLS cloud imagery data increase from 35% /rev to ~100% /rev global
- Antarctica Treaty: collected data is posted near-real time to public website



ЮС – 28 Mar 12



Mercator gridded mosaic of F17's OLS visible and infrared data from Day 3 of McMurdo Ops -4 revs of data daily for JPSS SAT support



Second McMurdo Pass from F17 of Stored Data Smooth on 26 January 2012 Half Orbit over China, Korea and Japan



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## Weather System Follow-On Activities

- Congress directed DWSS termination; AF & DoD executing decision
  - ✓ Issued contract termination to NGAS, April 2012
  - ✓ Existing hardware inventory being assessed for disposition or possible re-use
  - ✓ Transitioned DMSP operational control to Air Force
- Weather System Follow-On Capability Requirements (METOC ICD)
  - ✓ Capability requirements approved by Joint Requirements Oversight Council (JROC) on 15 Jun 12
- \$125M Congressional Add for Weather System Follow-on Activities
  - ✓ BAA released 8 Jun 12; significant number of responses across all focus areas
  - ✓ 67 white papers in house; 61 have been adjudicated, 18 accepted, 43 rejected
- Materiel Development Decision (MDD): Completed on 5 Oct 12
  - Acquisition Decision Memorandum (ADM) on 24 Oct 12
- Analysis of Alternatives (AoA) started on 10 Oct 12
  - Air Force will lead execution of the AoA with support and participation by the Joint community
  - Focus on military utility and affordability
  - AoA results expected to be brief by summer 2013





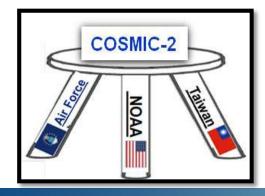
### WSF Anticipated Missions Chronological Order

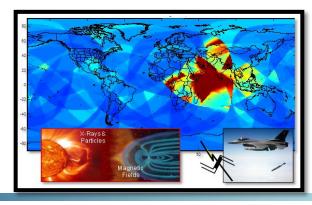
Capability																	
Ocean Surface Vector Winds					S	tays G	reen	as lon	g as W	'indSa	t Ope	ration	al				
Soil Moisture	If Wind Operation		1	G	COM	Opera	itional					(	сом	W-2	EOL		
Tropical Cyclone Intensity		-				1	1	1				(	сом	W-2	EOL		
LEO Energetic Charged Particle Characterization							POES	EOL					N	ETOP	EOL		
Equatorial lonospheric Scintillation				C/NOFS EOL	CC	DSMIC	C-2 Op	eratio	nal	COS	SMIC-2 EC EOL	2			<mark>/IC-2</mark> E	OL	
Ionospheric Density				C/NOFS EOL	cos	MIC-1 E		Sir	<mark>igle Dl</mark>	MSP C	<mark>rbit</mark>				1IC-2 E	OL	
Theater Weather Imagery					St	tays G	reen v	vith N	IET 7 f	ollow	-on				DN	/SP EC	)L
Cloud Characterization					St	tays <mark>G</mark>	reen v	vith N	IET 7 f	ollow	-on				DN	<mark>/ISP EC</mark>	)L
Snow Depth			1			1	1	1	1		1	1			DN	ISP EC	)L
Auroral Characterization			1			1		Sin	gle DI	MSP O	rbit	1				<mark>/ISP EC</mark>	JL
Electric Field				C/NOFS EOL	C	OSMIC	C-2 Op	eratio	nal		COSM	IC-2 E	Q EOL			<mark>/ISP EC</mark>	DL
Sea Ice Characterization			<del>_</del>			1									DN	ISP EC	)L
СҮ	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Need - Near-term Need – Mid-term Need – Long-term Programmed EOL, or Operational Start																	

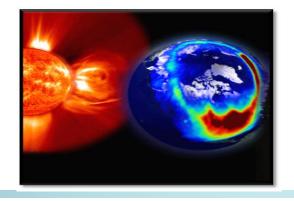


### Space Weather

- Meets three JROC approved CAT A requirements
- Space Situational Awareness and Environmental Monitoring (SSAEM)
  - Collects ionospheric and Space Weather data to forecast impact on communication, navigation and monitoring systems
  - Part of an interagency & international partnership for affordability and collaboration (COSMIC-II)
    - AF: sensors and launch
    - NOAA: ground system
    - Taiwan: spacecraft (FORMOSAT-7)
    - National Space Policy (28 Jun 10): "Strengthen Interagency Partnerships" and "Strengthen U.S. Space Leadership thru International Cooperation"
- Space Weather Hosted sensors opportunities
  - In addition to COSMIC-2 exploring Iridium NEXT hosted opportunities
- Technology development for weather CubeSat options
- C/NOFS is a pathfinder for SSAEM







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### Director's Summary

- DMSP primary satellites are operational, but with single orbit planned
  - Several secondary satellites available
  - F19 launch campaign on track
  - Developing storage and reconstitution plan for F20 Launch in FY20
- Implementing SSAEM on COSMIC-2
  - Investigating additional rideshare opportunities
- Weather follow-on system risk reduction activities ongoing
  - BAAs reduce technical and programmatic risk for follow-on
  - Supporting pre-acquisition planning and AoA analysis
- Looking to collaborate on data collection with civil & international partners