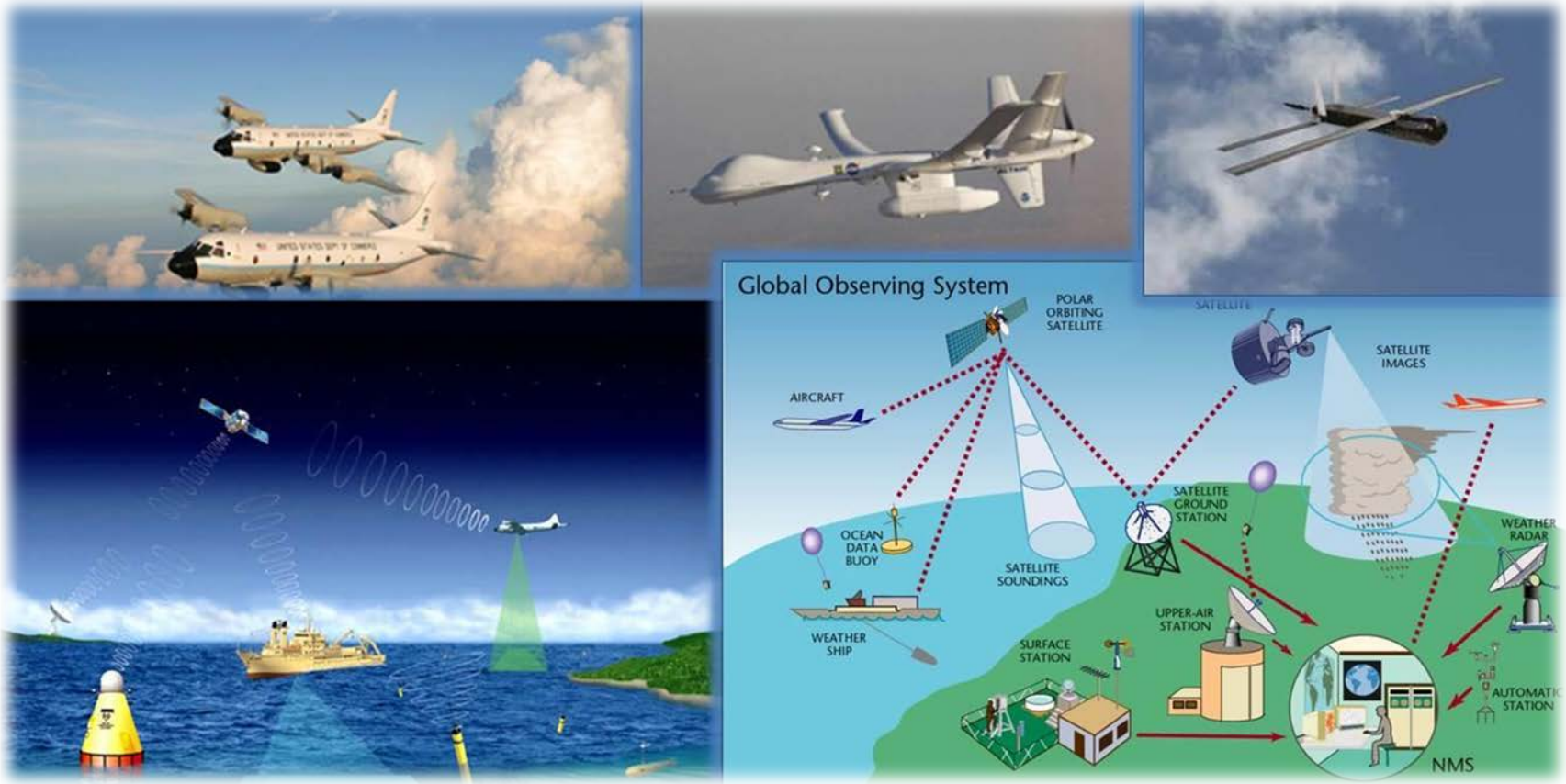






# Observing Systems: *Research* and Operational Airborne Fleet in 2030



# NOAA Aircraft EOSL and Capital Investment and Asset Planning

		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032		
Technology Infusion-Manned and Unmanned technology, integration and operations		P-3/G4 Upgrades AOA <sup>1</sup>			WP-3D/G4 Upgrades																
		UAS AOA <sup>2</sup>	UAS R2O <sup>3</sup>	UAS Procurement/Integration <sup>4</sup>			UAS R2O	UAS Procurement/Integration			UAS R2O	UAS Procurement/Integration			UAS R2O						
		Sensor Refresh <sup>5</sup>	Survey methods and Improvements -				Sensor Refresh <sup>5</sup>					Sensor Refresh <sup>5</sup>				Sensor Refresh <sup>5</sup>					
Business Process Improvement-Training, Staffing		Personnel Systems-Strategic Staffing <sup>7</sup>																			
		Corporate Processes <sup>8</sup> PAS/PASS, Performance Measures, cost modeling					Quantitative Observing System Assessments (QOSAP) Annually														
		SEE OPT <sup>9</sup> and NOSIA II <sup>10</sup>			Re-validate Observing Requirements every 3 years <sup>11</sup>																
		Technology and Capabilities Assessments and Prioritization -Annually review <sup>12</sup>																			
		Asset and Data Mgt Improvement <sup>13</sup>																			
Partnerships		Federal Sensor Inventory/Capabilities Assessment <sup>14</sup>																			
NOAA Aircraft	WP-3D - N42RF	W&T/SSI							PDM						P-3 Phase Out		EOSL	XXXXXXXXXXXXXXXXXX			
	WP-3D - N43RF	Engines	W&T/SSI							PDM						P-3 Phase Out		EOSL	XXXXXX		
	G-IV - N49RF	Useful Life and EOSL Assessment <sup>15</sup>					KDP EOSL <sup>16</sup>														
	JetProp - N45RF	Useful Life and EOSL Assessment				KDP EOSL <sup>16</sup>		SLE													
	Twin Otter - N46RF	Twin Otter Standardization																			
	Twin Otter - N48RF	Twin Otter	Wings	Standardization																	
	Twin Otter - N56F	Twin Otter Standardization																			
	Twin Otter - N57RF	Twin Otter Standardization																			
	King Air - N68RF																				
	Acquisition -replace	AOA				R	Capital Asset Strategy for P-3 Replacement				F	D	P	I/ IOC		FOC					
	Acquisition -replace					R	Capital Asset Strategy for P-3 Replacement					F		P	I/ IOC		FOC				
	New Acquisition <sup>17</sup>		R /AOA-Business Case			F	P														
	Acquisition-replace <sup>18</sup>						R /AOA-Business Case		F/P												
Chartering																					
Partnerships																					



# P-3 Replacement AoA- Timeline

- Phase I-Prioritize mission and data requirements, review procedures, platforms and instruments; use of aircraft observations in hurricane forecasting
- Phase II-Assess current and future needs for Observations
- Phase III-Evaluate Sensor/Platform Technology, Expendables, Data collection trends
- Phase IV-Assess and optimize Instruments, sensors, systems, R&D
- Phase V-Life Cycle Cost Analysis, economic simulation



# AoA Workshop-Goal Oct 14-15 NCEP

## PRIMARY GOAL

Better understand the processes and variables relevant to improving TC forecasts

- Focus on requirements rather than capabilities/solutions
- Translate science of TC forecasts to future requirements~15 yrs
- Need for expert judgement on the relative importance of many requirements



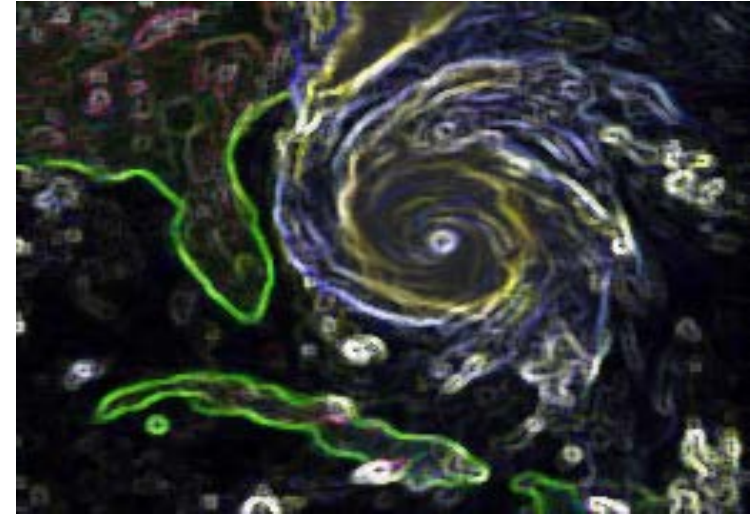
# Requirements- Observing Methods-Sensors- Platforms- Total Fleet composition

1. Will we need to measure something different in 2030 and beyond?
2. How will our observation strategies change if at all?
3. What does the future of sensors look like to collect the *changing* requirements and parameters?





# Assessment of Gaps in TC-related Physical Processes-NOAA AoA Workshop at NCEP Oct. 2015



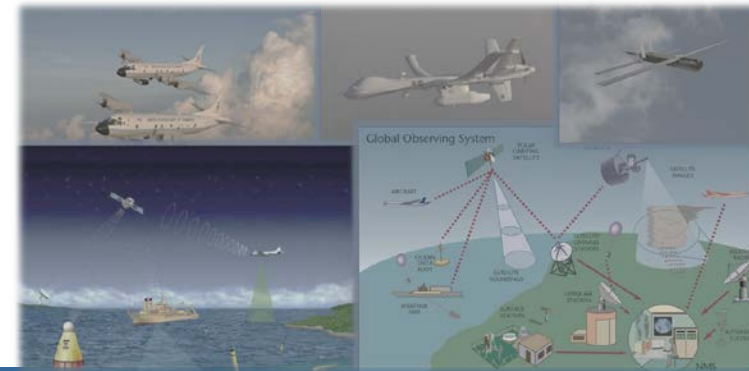
- Air-Sea Interactions-BL
- Cloud microphysics-Melting Layer
- Deep Convection -sheered environment
- Electrodynamic processes
- Ventilation in the outflow



# AoA Workshop-Results

## What currently measured variables need to be observed better?

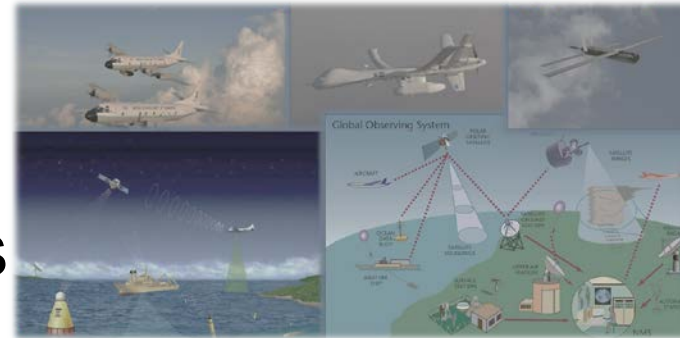
- Wind Speed
- Temp
- Humidity
- Hydrometeors
- Fluxes across air-sea interface
- SST
- Wave height and Wave Spectra
- Surface currents
- Salinity/Conductivity



# AoA Workshop-Results

## What new atmospheric and oceanic variables should be observed? Persisting Through 2030

- Turbulence
- Aerosols
- Cloud microphysics measurements
- Radiative flux at the sea surface
- Airborne dual-pol and dual-frequency radar
- Rain Rates
- Humidity measurements
- More frequent/better measurements for all variables



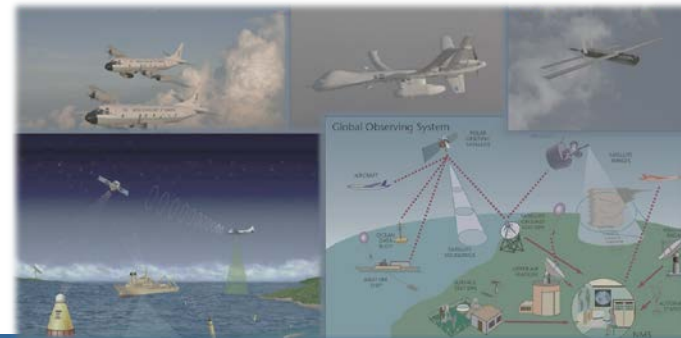


# AoA Workshop-Results

What current manned data collection efforts might transition to unmanned collection? Why and when?

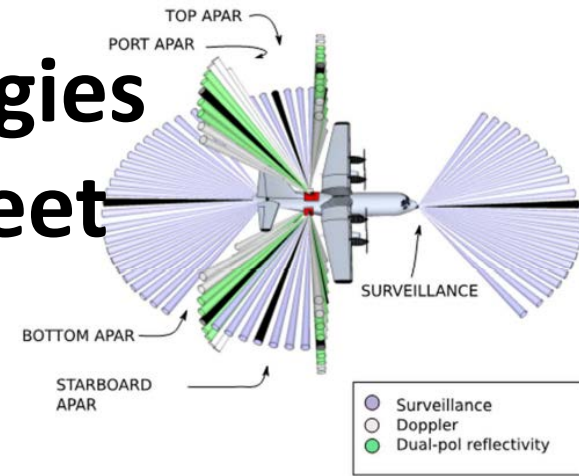
The gaps in capacity and capability between manned and unmanned systems are expected to remain large in the near future~15 years

- Platform Responsiveness • Availability
- Efficiency • Reliability
- Safety • Flexibility



# Major Players –Observing Strategies that will Define “our” Future Fleet

1. Dual Pol-Doppler Radars
2. Airborne launched UAS
3. Autonomous Systems airborne/ocean
4. High altitude observations
5. Results of OSSE/OSEs GH data
6. Still a need to penetrate severe weather
7. Surveillance/Research Modules



# **Future Platforms-need to accommodate rapidly changing sensor technology**

- Wing mounted pods and ports
- Fuselage mounted instruments
- Upward, Downward, Side looking
- Nose mounted
- Heavy Payloads
- Robust
- Move fast and slow
- Operate Low and high



# Requirements- Observing Methods-Sensors- Platforms- Total Fleet composition

1. Will we need to measure something different in 2030 and beyond?
2. How will our observation strategies change if at all?
3. What does the future of sensors look like to collect the *changing* requirements and parameters?





One Platform Does Not and Should Not Meet every Observational Need



Office of Marine and Aviation Operations