

IAC-07-A2.6.01

Summary Of The Science Performed Onboard The International Space Station During Increments 12 and 13

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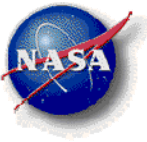
58th International Astronautical Congress (IAC)

Hyderabad, India --- September 24-28, 2007

09/28/2007

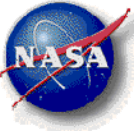
NASA Johnson Space Flight Center

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- ▶ Increment 13 Science Planning
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- ▶ A Quick Look At The Upcoming Increments (Increments 16 and 17)
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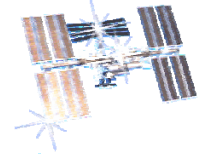
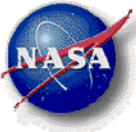


OBJECTIVE

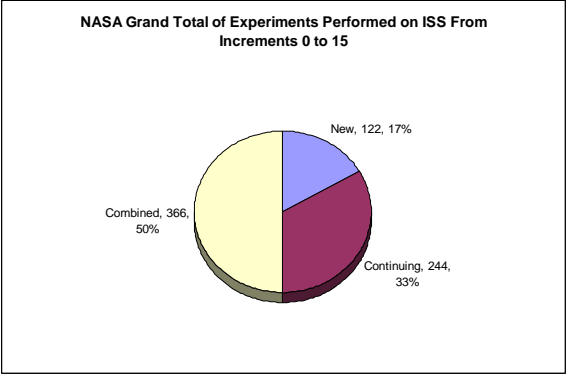
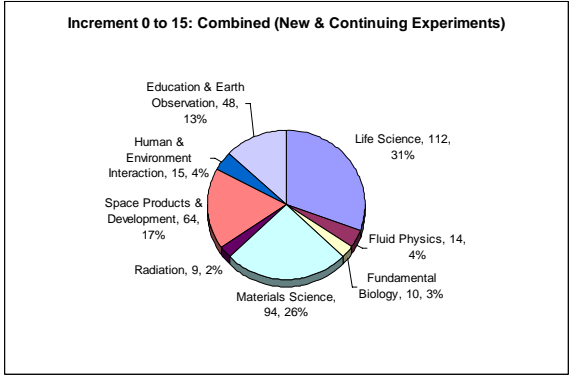
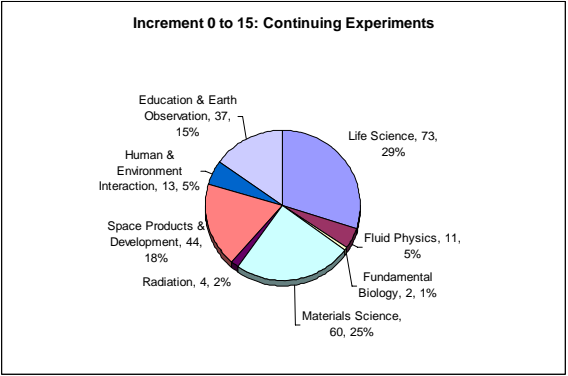
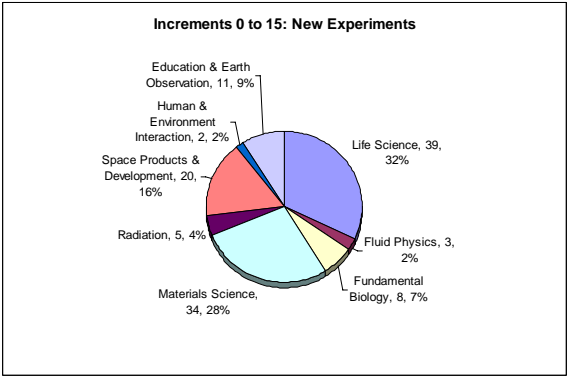
Often, it is thought by many in the scientific community that only the construction task is taken place on the International Space Station. This presentation hopes to shed some lights on the amount of science that has been performed on the ISS during the construction phase of the ISS

The objectives of this presentation are four-fold:

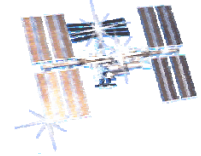
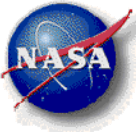
- ▣ To briefly review the science performed on the ISS during the previous fifteen Increments (Increments 0 to 15)
- ▣ To compare the original science complement plan for increments 12 and 13 with the on-orbit science accomplishment to illustrate the challenges of performing daily science activity on a space platform that is being built and staffed continuously
- ▣ To discuss the investigations that were conducted on ISS during Increments 12 and 13 (the discussion will focus mainly on the primary objectives of each investigation)
- ▣ To briefly discuss the science research complements that are being planned for Increments 16 and 17



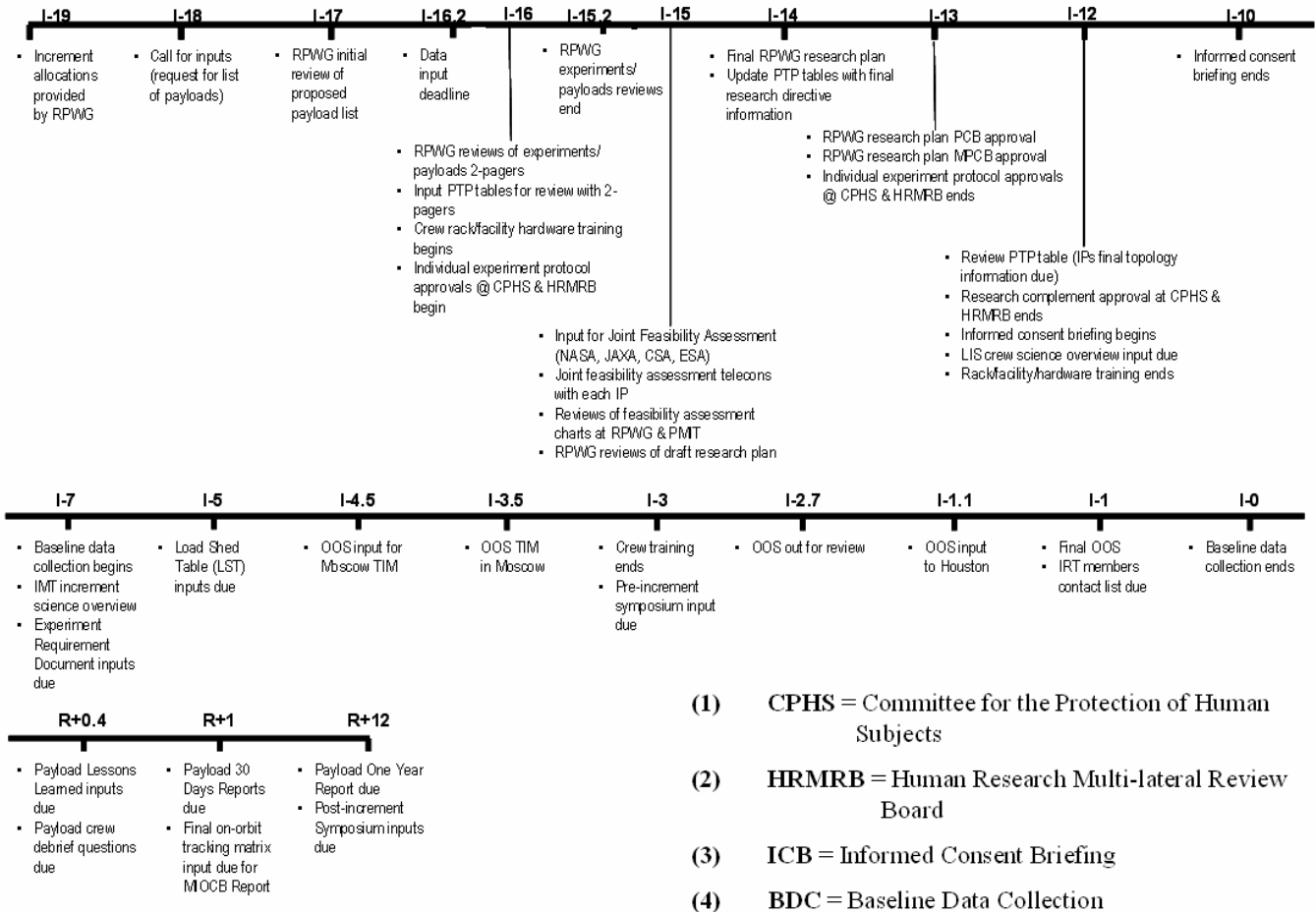
Science Performed on the ISS over the last Seven Years

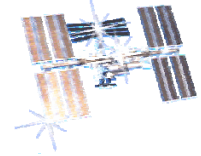
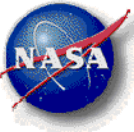


Science Performed In Different Disciplines on the International Space Station From Increments 0 to 15

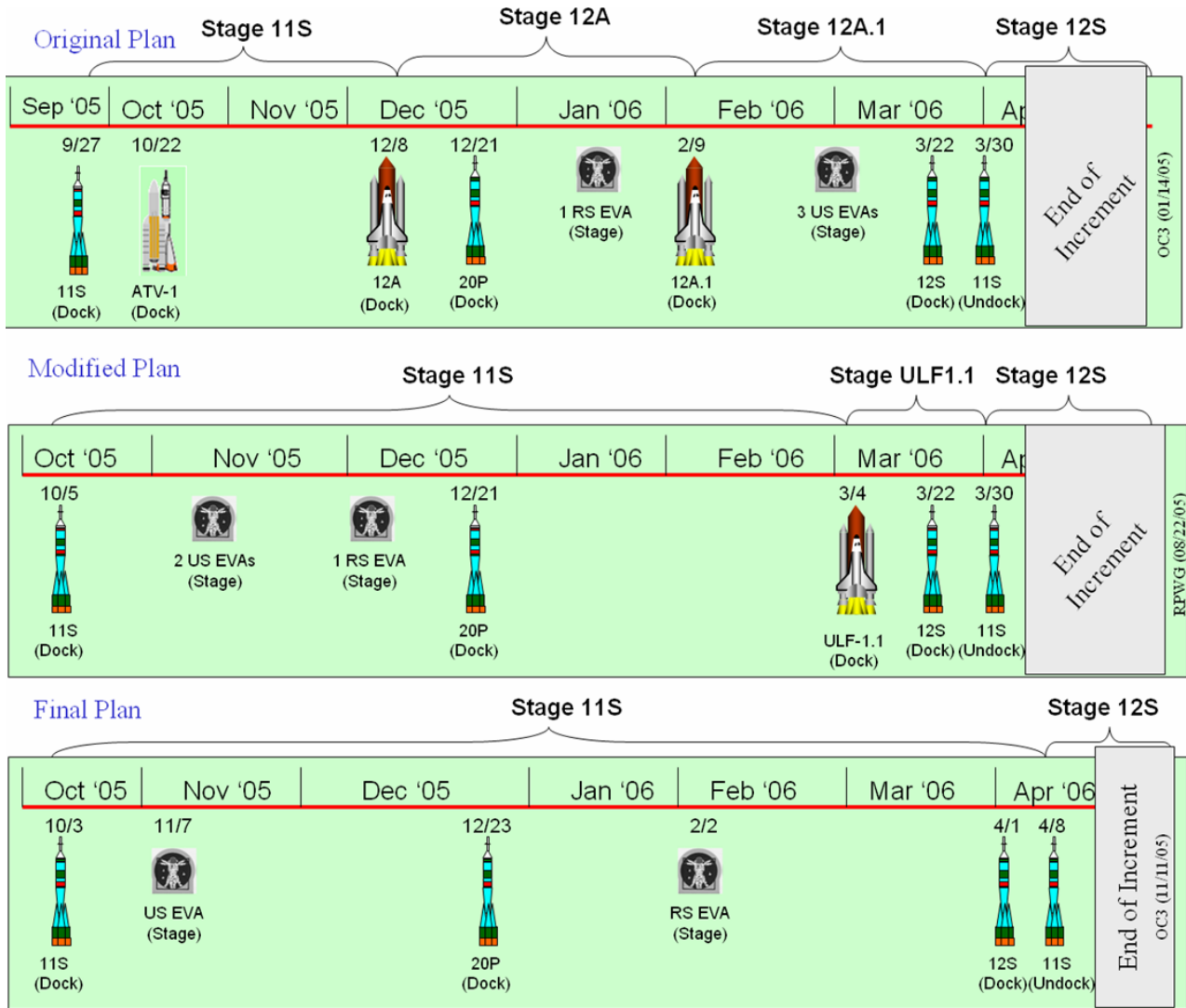


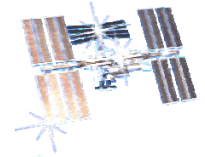
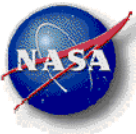
Science Planning Generic Milestones Template





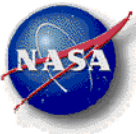
Increment 12 Flights/Stages Planning Overview



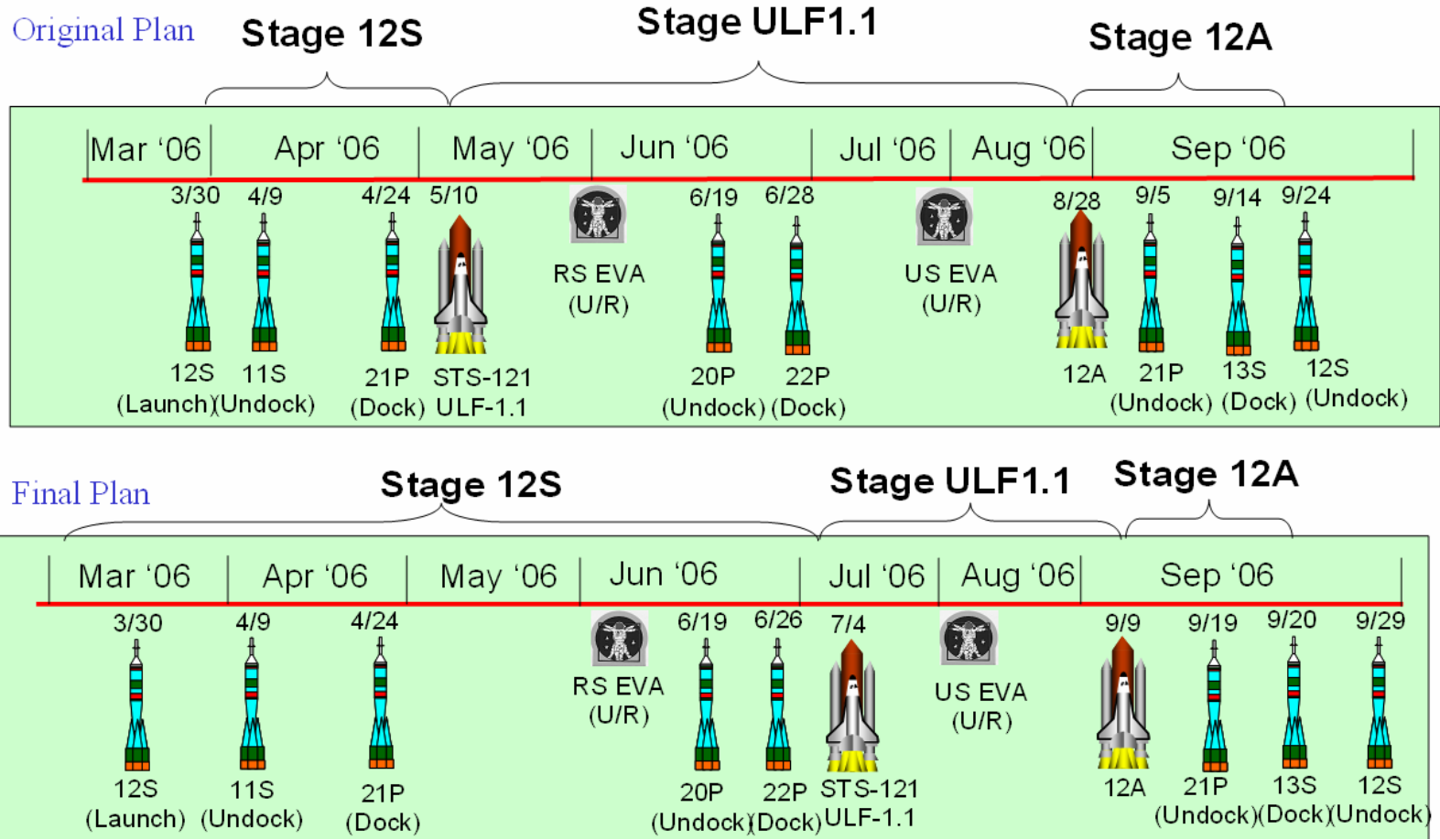


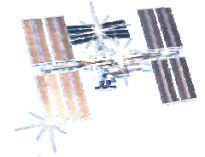
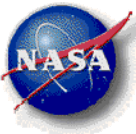
Investigations Performed in Different Disciplines during Increment 12

Science Disciplines	Increment 12 Experiments		Comment
	<i>New</i>	<i>Continuing</i>	
Life Science		RENAL STONE EPSTEIN-BARR MOBILITY FOOT	
Fluid Physics		CBOSS-FDI CFE-CL	
Materials Science		BCAT-3 MISSE-5 PromISS INSPACE	
Space Products & Developments		MAMS SAMS	
Human/Environment Interaction		Journals	
Education and Earth Observation		CEO EarthKAM EPO	



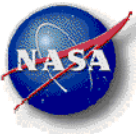
Increment 13 Flights/Stages Planning Overview





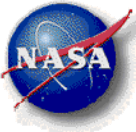
Investigations Performed in Different Disciplines during Increment 13

Science Disciplines	Increment 13 Experiments		Comment
	<i>New</i>	<i>Continuing</i>	
Life Science	ALTEA FIT SWAB	Latent Virus RENAL STONE EPSTEIN-BARR Yeast GAP SLEEP	
Fluid Physics		CBOSS-FDI CFE-CL	
Fundamental Biology	POEMS		
Materials Science	MISSE 3 /4	PFMI INSPACE-1 BCAT-3 MISSE-5	
Radiation Physics	STABILITY		
Space Products & Developments	MAUI SPHERES RAMBO	MAMS SAMS DAFT	
Human/Environment Interaction		Journals	
Education and Earth Observation		CEO EarthKAM SEM-1	



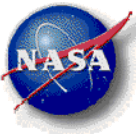
Investigations Performed in Different Disciplines during Increment 14

Science Disciplines	Increment 14 Experiments		Comment
	<i>New</i>	<i>Continuing</i>	
Life Science	NUTRITION PMDIS SLEEP LONG TRAC	Latent Virus RENAL STONE EPSTEIN-BARR MIDODRINE SLEEP ALTEA SWAB	
Fluid Physics		CFE-CL	
Fundamental Biology	GRAVI TROPI ORZS		
Materials Science		MISSE 3 /4	
Radiation Physics		STABILITY	
Space Products & Developments	STP-H2-ANDE STP-H2-MEDSI STP-H2-RAFT LOCAD-PTS	MAMS SAMS MAUI SPHERES RAMBO	
Human/Environment Interaction		Journals	
Education and Earth Observation	CEO-IPY CSI-01	CEO EarthKAM SEM-1 EPO	



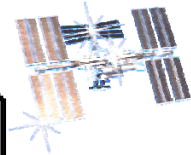
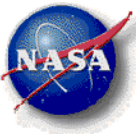
Investigations Currently Being Performed in Different Disciplines for Increment 15

Science Disciplines	Increment 15 Experiments		Comment
	<i>New</i>	<i>Continuing</i>	
Life Science	CBTM CCISS SPEGIS CCM	NUTRITION PMDIS PMZ ALTEA EPSTEIN-BARR MIDODRINE Latent Virus SLEEP LONG SLEEP SHORT SWAB TRAC	
Fluid Physics		CFE	
Materials Science		MISSE 3 /4 BCAT-3	
Space Products & Developments	ANITA SAME EMCH	MAMS SAMS LOCAD-PTS MAUI SPHERES RAMBO	
Human/Environment Interaction		Journals	
Education and Earth Observation	CSI-02 EPO-Educator EPO Kit C	CEO EarthKAM CSI-01 EPO	



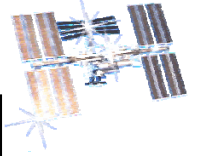
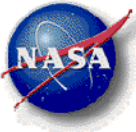
Investigations Currently Being Performed in Different Disciplines for Increment 16

Science Disciplines	Increment 16 Experiments		Comment
	<i>New</i>	<i>Continuing</i>	
Life Science	Integrated Immune	NUTRITION PMZ EPSTEIN-BARR MIDODRINE CCISS Latent Virus SLEEP LONG SLEEP SHORT SWAB	
Fluid Physics		CFE	
Fundamental Biology		ORZS	
Materials Science	BCAT-4 MISSE-6 (A &B) INSPACE-2 CSLM-2	BCAT-3	
Radiation Physics		STABILITY	
Space Products & Developments	RIGEX	MAMS SAMS LOCAD-PTS MAUI SPHERES SAME ANITA	
Human/Environment Interaction		Journals	
Education and Earth Observation		CEO EarthKAM EPO-Educator EPO	



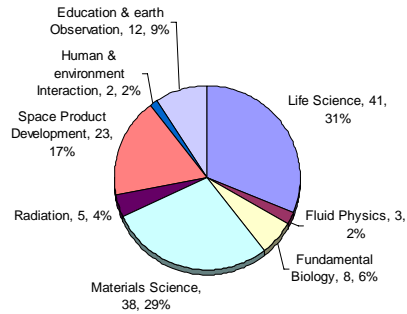
Investigations Currently Being Performed in Different Disciplines for Increment 17

Science Disciplines	Increment 17 Experiments		Comment
	<i>New</i>	<i>Continuing</i>	
Life Science	BISPHOSPHONATES	NUTRITION EPSTEIN-BARR MIDODRINE CCISS Integrated Immune SLEEP LONG SLEEP SHORT	
Fluid Physics		CFE	
Fundamental Biology		ORZS	
Materials Science		BCAT-4 MISSE-6 (A & B) INSPACE-2 CSLM-2	
Radiation Physics		STABILITY	
Space Products & Developments	ENOSE PSSC	MAMS SAMS LOCAD-PTS MAUI SPHERES ANITA RIGEX EMCH	
Human/Environment Interaction		Journals	
Education and Earth Observation	CSI-03	CEO CSI-02 EarthKAM EPO	

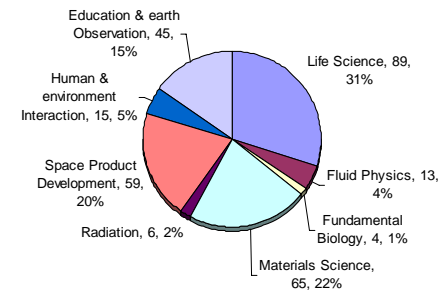


Science Performed (or will be) in Different Disciplines on ISS from Increments 0 to 17

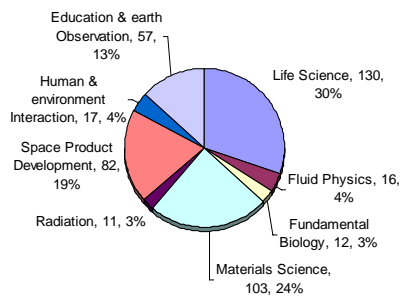
Increments 0 to 17: Projected New Experiments



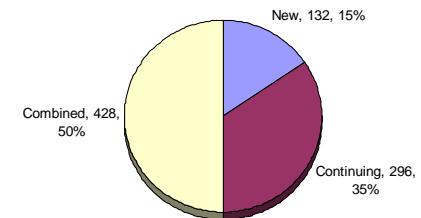
Increments 0 to 17: Projected Continuing Experiments

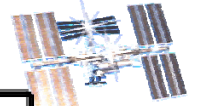


Increments 0 to 17: Projected Combined (New & Continuing) Experiments

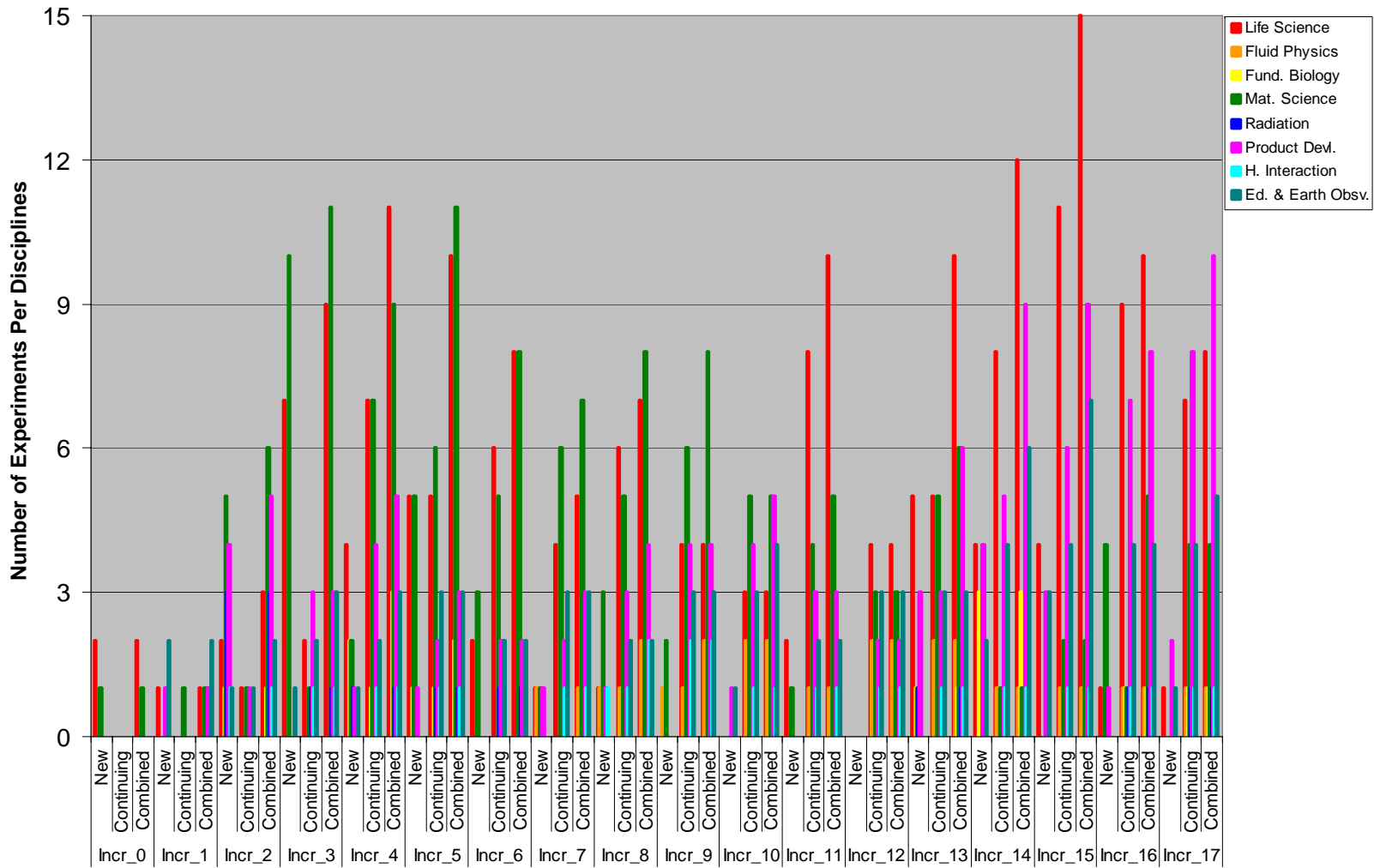


Increments 0 to 17: Projected Total Experiments That Will Be Performed on ISS

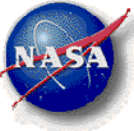




Science Performed in Different Disciplines on ISS for each Category (Increments 0 to 17)

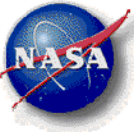


Distribution of Experiments per Increments



Summary

- **The main purpose of this presentation was to make the science community aware of the many investigations that have been conducted and continued to be performed on the ISS over the last seven years**
- **To show that science has been performed on ISS in a wide spectrum of science disciplines and yielded many interesting results that are changing or improving our understanding of some of the phenomena and theories in these fields**
- **It was shown that a total of 122 new investigations and 244 continuing ones will be performed by the end of Increment 15 (for a grand total of 366 investigations by the end of Increment 15)**
- **With the currently planned investigations for the next two increments (Increments 16 and 17), it was shown that a grand total of 428 investigations will be performed by this time, next year**
- **All this research is being accomplished while the station is still under the construction**
- **Based on these facts, the prospect for the station as a science research platform once the construction phase is over, is, indeed, quite bright.**



Acknowledgments

The author would like to thank Mr. Roger Weiss for providing information relating to crew time and ascent research upmass, including the on-orbit rack facilities information

Also, the author would like to thank all the Astronauts who spent time conducting science on ISS during the last seven years, and specially those who unselfishly gave their weekend and off duty days to perform additional science for the scientific community

Finally, the author would like to thank Astronauts William S. McArthur, Jr. and Jeffrey N. Williams, whom he worked with as their increments Lead Scientist (LIS) during Increments 12 and 13. Both of them gave up many hours during their weekends to perform much needed additional science during their ISS tour of duty.

