

Program Update

Michael Toberman

SOFIA Deputy Program Manager (acting)

3rd SOFIA Users Group (SUG) Meeting
April 26, 2013



SOFIA
STRATOSPHERIC OBSERVATORY
FOR INFRARED ASTRONOMY

The image shows the side of the SOFIA aircraft fuselage. The word "SOFIA" is written in large, bold, black letters. Below it, the words "STRATOSPHERIC OBSERVATORY" and "FOR INFRARED ASTRONOMY" are written in smaller, bold, black letters. To the right of the text, there are two flags: the United States flag and the German flag. The aircraft is white with blue and yellow accents. The background of the slide is a colorful nebula or galaxy.



Program Manager's Outlook



- We are making good progress on the tremendous work ahead of us in 2013!
- We are in the midst of a key transition period for SOFIA, transitioning from a development-driven schedule to one focused on science.
- In the process, we will continually improve science-critical systems and program operations will demonstrate full flight rate capability by the end of the calendar year.
- Over the next few years, annual science hours will increase and reach sustained full operational levels by the end of 2014. At that time, SOFIA will transition to the operations phase.
- NASA sequestration budget impacts to SOFIA are manageable at this time. Agency guidance is to prioritize budget to support all mission-critical activities.



Program Status



- Program has made excellent progress since the September 2012 SUG!
- In December 2012, SOFIA conducted 3 Avionics Check Flights (ACFs) to evaluate aircraft system performance. Some issues were found that required additional time to resolve. Final ACF was completed on January 14, 2013.
- Due to the avionics upgrade schedule slip, Cycle 1 Science flights that were planned for November – December, 2012 were cancelled.
- The Science Mission Operations (SMO) and the Platform Project completed the baseline scheduling effort, based on program goals & priorities, to restore all Cycle 1 science observing flights.



Program Status



- Preliminary results from completed Engineering / V&V flights have confirmed improvements of the Observatory
 - Improved pointing and tracking
 - Upgraded FPI Functionality and Performance
- HIPO Science Instrument commission flights were completed on February 14, 2013.
- FORCAST commissioning part 1 was completed on April 3, 2013, including the first in-flight acquisition of spectroscopy/grism data.
- **Officially started Cycle 1 science with science flights on April 11-12, 2013!**
- Completed the GREAT instrument commissioning on April 16, 2013.
- SOFIA is ready for its first Southern Hemisphere deployment this July!



Program Status



- Preparing for FLITECAM / HIPO (FLIPO) commissioning flights next week.
- 2014 Cycle 2 proposal call will go out next week.



SOFIA 2013 Goals



- **Complete Cycle 1 Science this calendar year with 43 flights, 306 Research Hours, 186 CfP Hours**
- Conduct the first Southern Hemisphere Deployment this Summer
- Complete Cycle 1 Science Instrument Commissioning for HIPO, FORCAST, GREAT, and FLITECAM
- Complete science-critical improvements and V&V flights which include the ACFs, FPI installation, and Phase 2 improvements
- Satisfy the criteria associated with the Full Operational Capability (FOC) milestone
- By the end of the year, demonstrate full flight rate capacity with full operations staff and the supporting systems / processes in place
- Complete planning efforts in support of Cycle 2, continual observatory improvement, and transition to operations phase.



SOFIA 2013 Priorities – Cycle 1

1. Cycle 1 Science Schedule shall be maintained to achieve the full content/objectives.
2. Baseline Observatory systems for Cycle 1 Science shall be established.
 - A. MCCS (all subsystems)
 - B. Telescope assembly
 - C. CECS
 - D. CDDS
 - E. KOSMA Translator
3. Complete the Avionics upgrade.
4. Commissioning of Cycle 1 Science Instruments shall be performed to meet Cycle 1 Science objectives and satisfy the FOC milestone with the following priority:
 - A. FORCAST
 - B. GREAT
 - C. HIPO
 - D. FLITECAM
 - E. FLIPO
5. Phase 2 Observatory improvements shall address science-critical capabilities only and shall not impact Cycle 1 Science.



2013 Cycle 1 Ops Summary



Potential Flight and Line Ops Activities

- ü 1 ACFs / 1 Observatory V&V-HIPO Commissioning Flight / 3 Line Ops
- ü 2 FPI Engineering – HIPO Commissioning flights / 3 Line Ops
- ü 1 Engineering V&V flight / 8 Line Ops
- ü 2 FORCAST Part 1 Commissioning flights / 4 Line Ops
- ü 3 GREAT Flights (2 Engineering/Commissioning, 1 Science Flight) / 1 Line Ops
- Ø 3 FLIPO Commissioning–Observing flights / 3 Line Ops
 - 2 FLITECAM Part 1 Commissioning flights
 - 4 FORCAST Part 2 Commissioning flights / 6 Line Ops
 - 6 OC1–B Science Flights
 - 1 Pre–deployment checkout flight / Observing flight/ 1 Line Ops
 - 4 Ferry flights to/from NZ (2 each way with layover at Hickam)
 - 9 OC1–C Science Flights
 - 4 MCCS Phase 2 Line Ops
 - 7 OC1–D Science Flights
 - 4 FLITECAM Part 2 Commissioning Flights / 1 Line Ops <= **FOC Milestone Complete**
 - 19 Cycle 1 Science Fights (4 OC1–E, 7 OC1–F, 8 OC1–G)

69 potential flights / 34 potential Line Ops (Completed to date: 10 Flights / 20 Line Ops)



Cycle 1 Detailed Planning Overview



Cycle 1 Started

Observatory Prototyping													Cycle 1 Validation										GREAT Commissioning											
Trouble Shooting			Line Ops										Install	Issues	LO	EMI/LO	Prep	flight				LO	Remove	Install	Prep	EMI/LO	Prep	Eng.						
F	S	S	M	T	SD	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T
8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11
March -- 2013													April -- 2013																					

TODAY

IO#2

Remove

Potential Exoplanet

Observatory Systems Baselined

GREAT Commissioning										FLIPO/FLITECAM Comm. Part 1										Cycle 1 Validation & Training			Engine Inspection											
L1/L2	Channel Swap			M/L2	Install		EMI		Line Ops			Prep	flights				flight	Remove	Install															
F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T							
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
April -- 2013										May -- 2013																								

IO#4

Call for Cycle 2 Proposals

IO#5

Engine Inspection										FORCAST Comm. Part 2										Observ. Cycle #1-B - FORCAST														
Install		Line Ops - Half Nights								Prep	4 flts				Observ. Cycle #1-B - FORCAST																			
F	S	S	M	T	W	T	F	S	S	H	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T							
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
May -- 2013										June -- 2013																								

Cycle 2 Proposals Due

Deployments

Observ. Cycle #1-B - FORCAST										Observ. Cycle #1-C GREAT																								
Remove		Install								LO	Eng/Obs	Prep.	Ferry - 2 flts		Prep.	flights L1/L2				C. S.														
F	S	S	M	T	W	T	F	S	S	M	T	W	H	F	S	S	M	T	W	T	F	S	S	M	T	W	T							
21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
June -- 2013										July -- 2013																								

△ **Observer**

□ **y**

Bold Outline: Actual Flight / Line Ops

Red Outline: Platform Integration

Opportunity

Holiday SD Safety Day

- observing flights
- instrument commissioning
- platform flights
- aircraft maintenance/observatory upgrade
- deployed observing flights



Cycle 1 Detailed Planning Overview

Channel Swap		flights M/L2			Prep.		Ferry		Maintenance																	MCCS Phase 2 Test / Line Ops									
F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T								
26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
July - 2013							August - 2013																												

IO#6

Install FORCAST	Cycle 2 Proposals selected																	FLITECAM Com Part 2																
F	S	S	H	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T							
30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3
August - 2013	September - 2013																	October - 2013																

FOC 10/4/13		Observ. Cycle #1-E FLITECAM					Observ. Cycle #1-F FORCAST								Observ. Cycle #1-G GREAT																			
F	S	S	M	T	W	T	F	S	S	H	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T							
4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7
October - 2013												November - 2013																						

Cycle 1 End		Maintenance / Phase 2 Integration																																
F	S	S	H	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	H	F	S	S	M	T	W	T	F	S	S	M	T	W	T
8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12
November - 2013												December - 2013																						

IO#7

△ Observator
y
□ Project

Bold Outline: Actual Flight / Line Ops
Red Outline: Platform Integration Opportunity
H: Holiday SD: Safety Day

observing flights
instrument commissioning
platform flights
aircraft maintenance/observatory upgrade
deployed observing flights

OC	Flights	R. Hrs	CfP
1	43	306.2	186.0

Science hour estimates were calculated based on maximum possible flights at 89% reliability.



IMS Overview



				<input type="checkbox"/> Cycle 1 Started							<input type="checkbox"/> Potential Exoplanet							<input type="checkbox"/> Cycle 2 Proposals Due							
Maint./u	ACF	V&V	Observ. Test of FPI	V&V LO	UPS Install	V&V flt	Trouble Shoot	FORCAST Com 1	GREAT Com.	FLIPO / FLITECAM Com 1	FORCAST Com P2	Observing Cycle #1-1	FORCAST												
7	14	21	28	4	1	18	25	4	11	18	25	2	8	15	22	24	6	13	20	27	3	10	17	24	1
January -- 2013				February -- 2013				March -- 2013				April -- 2013				May -- 2013				June -- 2013					

<input type="checkbox"/> Call for Cycle 2 Proposals																								
Observing Cycle #1-C GREAT	Maint./up.#3 - 4wks	MCCS P2 Test/LO	OC#1-D FORCAST	FLITECAM C2	OC#1-E	OC#1-F FORCA	OC#1-G GREAT	Maintenance / Phase 2 Integration and Testing																
15	22	29	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30
July -- 2013			August -- 2013				September -- 2013				October -- 2013				November -- 2013				December -- 2013					

<input type="checkbox"/> Cycle 2 Starts		<input type="checkbox"/> Cycle 2 Proposals selected							★ FOC 10/4/13			<input type="checkbox"/> Cycle 1 Ends													
V&V	OC#2-A	FIFI-LS Com P1	EXES Com P1	OC#2-B	FIFI-LS Com P2	Observing Cycle #2-C			Aircraft & TA Heavy Maint. - 21 wks																
6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30
January -- 2014		February -- 2014				March -- 2014				April -- 2014				May -- 2014				June -- 2014							

<input type="checkbox"/> Cycle 3 Proposals Due											<input type="checkbox"/> Call for Cycle 3 Proposals											<input type="checkbox"/> Cycle 2 Ends						
Aircraft & TA Heavy Maint. - 21 wks											V&V	EXES Com P2	Observing Cycle #2-D						Maint./up.#6 - 5 w									
7	14	21	28	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29			
July -- 2014				August -- 2014				September -- 2014				October -- 2014				November -- 2014				December -- 2014								

● MCCS Phase 3		★ RSSO			<input type="checkbox"/> Cycle 3 Proposals selected											<input type="checkbox"/> Call for Cycle 4 Proposals									
Maint./up.#6 - 5 wks	upGREAT	Observing Cycle #3-A						Maint./up.#7 - 4 wks	HAWC+ Com 1			Observing Cycle #3-B				HAWC+ C2									
5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29
January -- 2015		February -- 2015				March -- 2015				April -- 2015				May -- 2015				June -- 2015							

<input type="checkbox"/> Cycle 4 Proposals Due				<input type="checkbox"/> Cycle 3 Starts				<input type="checkbox"/> Cycle 4 Proposals selected											<input type="checkbox"/> Cycle 3 Ends						
Observing Cycle #3				Maint./up.#8 - 4wks				Observing Cycle #3-D											Maint./up.#9 - 5w						
6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
July -- 2015				August -- 2015				September -- 2015				October -- 2015				November -- 2015				December -- 2015					

OC	Flights	R. Hrs.	CfP
1	43	306.2	186.0
2	47	334.6	205.8
3	109	776.1	513.0

★ Program

△ Observer

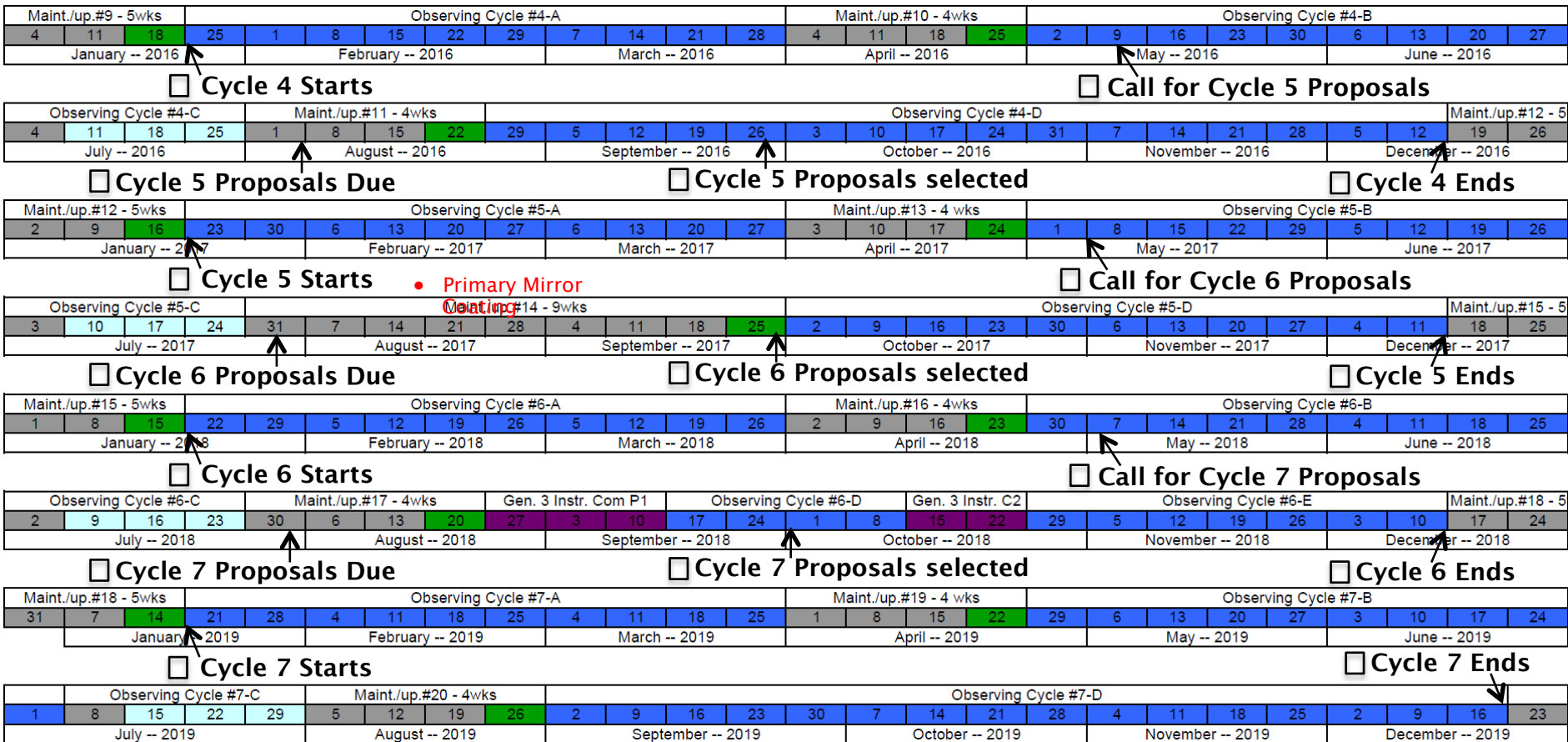
□ Project

- Observing Flights
- Instrument Commissioning
- Platform / Engineering Flights
- Aircraft Maintenance / Observatory Upgrade
- Deployment

Science hour estimates were calculated based on maximum possible flights at 89% reliability



IMS Overview



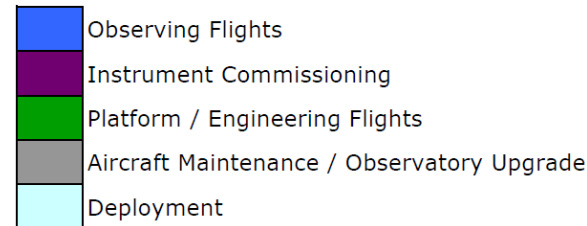
OC	Flights	R. Hrs.	CfP
4	142	1011.0	676.6
5	123	875.8	582.4
6	123	875.8	582.4
7	144	1025.3	686.5

☆ Program

△ Observer

□ y

Project



Science hour estimates were calculated based on maximum possible flights at 89% reliability



Program Summary



- Program is on track to complete cycle 1 instrument commissioning with improved observatory performance
- Have completed HIPO and GREAT commissioning flights and part one of FORCAST commissioning flights
- Still on track for achieving maximum flight rate late in Cycle 1
- Program priorities continuing to transition from a Development-driven schedule to a Science-driven schedule
- Cycle 2 proposal call will go out next week with 50 Science flights planned
- **The 100th flight of SOFIA occurred on Thursday April 11th and was the official start to Cycle 1 Science Observations!**