

## P-3 Orion - WFF 04/19/19

**Aircraft:**

[P-3 Orion - WFF](#) (See full schedule)

**Flight Number:**

#2091: 2019 OIB Science Flight #12

**Payload Configuration:**

Operation IceBridge

**Nav Data Collected:**

No

**Total Flight Time:**

7.6 hours

**Submitted by:**

Kelly Griffin on 04/22/19

**Flight Segments:**

|                           |  |                |                  |
|---------------------------|--|----------------|------------------|
| <b>From:</b>              | BGTL   | <b>To:</b>     | BGTL             |
| <b>Start:</b>             | 04/19/19 10:50 Z                                       | <b>Finish:</b> | 04/19/19 18:28 Z |
| <b>Flight Time:</b>       | 7.6 hours  |                |                  |
| <b>Log Number:</b>        | <a href="#">19P017</a>                                 | <b>PI:</b>     | Joseph MacGregor |
| <b>Funding Source:</b>    | Bruce Tagg - NASA - SMD - ESD Airborne Science Program |                |                  |
| <b>Purpose of Flight:</b> | Science  |                |                  |
| <b>Miles Flown:</b>       | 2104 miles   |                |                  |

**Flight Hour Summary:**

|                                       | 19P017 |
|---------------------------------------|--------|
| <b>Flight Hours Approved in SOFRS</b> | 250    |
| <b>Total Used</b>                     | 216.3  |
| <b>Total Remaining</b>                | 33.7   |

**19P017 Flight Reports**

| Date                     | Flt #                                   | Purpose of Flight | Duration | Running Total | Hours Remaining | Miles Flown |
|--------------------------|---|-------------------|----------|---------------|-----------------|-------------|
| <a href="#">03/26/19</a> | #2053: 2019 OIB ATF                     | Check             | 0.9      | 0.9           | 249.1           | 0           |
| <a href="#">03/27/19</a> | #2059: 2019 OIB PTF-Laser               | Check             | 2.3      | 3.2           | 246.8           | 0           |
| <a href="#">03/28/19</a> | #2061: 2019 OIB PTF-Radar               | Check             | 3.2      | 6.4           | 243.6           | 0           |
| <a href="#">04/01/19</a> | #2068: 2019 OIB WFF-BGTL Transit Flight | Transit           | 6.9      | 13.3          | 236.7           | 2458        |
| <a href="#">04/03/19</a> | #2070: 2019 OIB Science Flight #1       | Science           | 7.6      | 20.9          | 229.1           | 1938        |
| <a href="#">04/05/19</a> | #2072: 2019 OIB Science Flight #2       | Science           | 7.7      | 28.6          | 221.4           | 1910        |
| <a href="#">04/06/19</a> | #2073: 2019 OIB Science Flight #3       | Science           | 7.2      | 35.8          | 214.2           | 2000        |
| <a href="#">04/08/19</a> | #2075: 2019 OIB Science Flight #4       | Science           | 6.9      | 42.7          | 207.3           | 1780        |
| <a href="#">04/09/19</a> | #2076: 2019 OIB Science Flight #5       | Science           | 7.8      | 50.5          | 199.5           | 2045        |
| <a href="#">04/10/19</a> | #2081: 2019 OIB Science Flight #6       | Science           | 10.1     | 60.6          | 189.4           | 2702        |
| <a href="#">04/11/19</a> | #2082: BGSF-BGTL Transit                | Transit           | 2.2      | 62.8          | 187.2           | 696         |
| <a href="#">04/12/19</a> | #2083: 2019 OIB Science Flight #7       | Science           | 7.2      | 70            | 180             | 2109        |

|                          |  |         |     |       |       |      |
|--------------------------|--|---------|-----|-------|-------|------|
| <a href="#">04/15/19</a> | #2086: 2019 OIB Science Flight #8        | Science | 4.8 | 74.8  | 175.2 | 1243 |
| <a href="#">04/16/19</a> | #2087: 2019 OIB Science Flight #9        | Science | 7.6 | 82.4  | 167.6 | 2036 |
| <a href="#">04/17/19</a> | #2088: 2019 OIB Science Flight #10       | Science | 7.7 | 90.1  | 159.9 | 1937 |
| <a href="#">04/18/19</a> | #2090: 2019 OIB Science Flight #11       | Science | 7.8 | 97.9  | 152.1 | 2008 |
| <a href="#">04/19/19</a> | #2091: 2019 OIB Science Flight #12       | Science | 7.6 | 105.5 | 144.5 | 2104 |
| <a href="#">04/20/19</a> | #2092: 2019 OIB Science Flight #13       | Science | 6.9 | 112.4 | 137.6 | 0    |
| <a href="#">04/22/19</a> | #2094: 2019 OIB Science Flight #14       | Science | 6.6 | 119   | 131   | 1867 |
| <a href="#">04/23/19</a> | #2099: 2019 OIB Science Flight #15       | Science | 7.7 | 126.7 | 123.3 | 1979 |
| <a href="#">04/25/19</a> | #2102: 2019 OIB BGTL-KBGR Transit Flight | Transit | 6.2 | 132.9 | 117.1 | 0    |
| <a href="#">04/26/19</a> | KBGR to BGSF Transit                     | Transit | 5.7 | 138.6 | 111.4 | 0    |
| <a href="#">05/05/19</a> | 2019 OIB Science Flight #16              | Science | 7.8 | 146.4 | 103.6 | 0    |
| <a href="#">05/06/19</a> | 2019 OIB Science Flight #17              | Science | 8.4 | 154.8 | 95.2  | 0    |
| <a href="#">05/07/19</a> | 2019 OIB Science Flight #18              | Science | 8.5 | 163.3 | 86.7  | 0    |
| <a href="#">05/08/19</a> | 2019 OIB Science Flight #19              | Science | 8   | 171.3 | 78.7  | 0    |
| <a href="#">05/12/19</a> | 2019 OIB Science Flight #20              | Science | 9   | 180.3 | 69.7  | 0    |
| <a href="#">05/13/19</a> | 2019 OIB Science Flight #21              | Science | 7   | 187.3 | 62.7  | 0    |
| <a href="#">05/14/19</a> | 2019 OIB Science Flight #22              | Science | 7.9 | 195.2 | 54.8  | 0    |
| <a href="#">05/15/19</a> | 2019 OIB Science Flight #23              | Science | 8.3 | 203.5 | 46.5  | 0    |
| <a href="#">05/16/19</a> | 2019 OIB Science Flight #24              | Science | 6.3 | 209.8 | 40.2  | 0    |
| <a href="#">05/17/19</a> | 2019 OIB Transit                         | Transit | 6.2 | 216   | 34    | 0    |
| <a href="#">05/17/19</a> | 2019 OIB Transit                         | Transit | 0.3 | 216.3 | 33.7  | 0    |

Flight Reports began being entered into this system as of 2012 flights. If there were flights flown under an earlier log number the flight reports are not available online.

#### Related Science Report:

### OIB - P-3 Orion - WFF 04/18/19 Science Report

**Mission:**

OIB

**Mission Summary:**

Mission: Northeast Glaciers 02  
Priority: Medium

This mission reoccupies the centerlines of the Storstrømmen and L Bistrup Bræ glaciers, as well as an extension of the Northeast Greenland Ice Stream from Zachariæ Isstrøm and 79N Glaciers into the main ice sheet. This southward extension along the ice stream reflies the 2 May 2007 lines, and extends them 60 km farther up the trunk of the ice stream. We transit to and from the northeast region along a historical ATM line dating back to 1994, and along a Danish ground traverse route

connecting NEEM and EGRIP core sites. Measurements collected during the ground traverse may permit enhanced interpretation of shallow radar data from OIB. For 2018, we conduct crossing passes over a subglacial site of interest, at the request of Jon Bamber.

A poor forecast for target regions in the Arctic Ocean and the northwest coast brought us again to northeast Greenland. We again conducted a ramp pass after take-off at 1,200 ft AGL. We encountered low clouds for the first 150 km or so, as expected, but then broke out into haze prior to reaching Camp Century. The survey continued through NEEM and EGRIP. We encountered ground fog in the lower reaches of L. Bistrup Bræ and Storstrømmen, which had not cleared out quite as much as we had expected. We could however faintly observe the odd rift that appears to lie near the collision between the two glaciers. After that, the skies cleared and the mission proceeded uneventfully. Clouds returned around Camp Century and we gained elevation to stay out of them, with intermittent returns to survey altitude. Headwall again required a restart. Otherwise, all instruments performed well and ATM estimates 95% altimetry recovery. We again performed two ramp passes at 1,600 and 1,200 ft AGL prior to landing at Thule AB.

Attached images:

1. Map of today's mission (John Sonntag / NASA)
2. CAMBOT image of EGRIP dome structure (Jeremy Harbeck / NASA)
3. Hazy view of the rift between floating ice at the downstream ends of L. Bistrup Bræ (left) and Storstrømmen (right) (Jeremy Harbeck/ NASA)
4. CAMBOT image of frozen supraglacial lake on Storstrømmen with a possible moulin on the right side (Jeremy Harbeck / NASA)
5. Large snow-filled crevasse field on Zachariæ Isstrøm with P-3 shadow (Jeremy Harbeck / NASA)
6. Drifted-over arcuate crevasses on Zachariæ Isstrøm (Joe MacGregor / NASA)

Images:

## Map of today's mission



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## CAMBOT image of EGRIP dome structure



[Read more](#)

## Hazy view of the rift between floating ice at the downstream ends of



[Read more](#)

## CAMBOT image of frozen supraglacial lake on Storstrømmen with a



[Read more](#)

## Large snow-filled crevasse field on Zachariae Isstrøm with P-3



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## Drifted-over arcuate crevasses on Zachariae Isstrøm



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**Submitted by:**

Joseph MacGregor on 04/18/19

## OIB - P-3 Orion - WFF 04/19/19 Science Report

**Mission:**

OIB

**Mission Summary:**

Mission: ICESat-2 Arctic Ocean #3 (long line)

Priority: Baseline

This new flight for 2019 flies out along a single ICESat-2 ground track, selected and timed so that our aircraft and the spacecraft fly the track as closely as possible in time, and also with the track drift-corrected according to winds measured from the aircraft. The particulars of the technique we will use to fly the track will depend on knowledge of ICESat-2's pointing accuracy just prior to the time of this flight. Options include out-and-back along the same or parallel and offset lines, varying the altitude of one or both lines, or even a four-segment line. The general idea is to obtain a composite swath wide enough to capture any likely pointing offset of the spacecraft. See Appendix D for more details on the design of these flights.

Yesterday's forecast matched the imagery and we opted for a much-needed sea ice mission, with a zero-latency underflight of RGT 0325 at 13:10:46 UTC. An uneventful transit over Ellesmere, Axel Heiberg and Ellef Ringnes Islands brought us to the start of the mission, which we flew at 3,500 ft AGL. To our pleasant surprise, the cloud conditions were scattered and better than forecast. Headwall SWIR was unable to be started at the beginning of the line, likely due to the cold high-altitude transit. Clear conditions lasted for a few minutes for we entered a layer that we dropped below somewhat by descending to 3,000 ft AGL prior to the time of ICESat-2 passing overhead. At that time, there was moderate haze above us and what appeared mostly ridged first-year sea ice below us, for which observations were challenged by the flat light conditions. About a third of the way through the mission and ~25 minutes after the ICESat-2 coincident pass, the skies began to clear and the light conditions improved and we returned to 3,500 ft AGL. About two thirds of the way through the mission, haze descended again and we lost the surface for about 10 minutes. ATM estimated 90% altimetry data collection. We didn't see many leads in the first third of the mission, but many appeared after that. We corrected our course for sea ice drift relative to the time since ICESat-2's passing multiple times during flight. Headwall SWIR

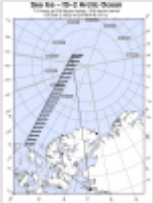
again froze occasionally once it warmed up sufficiently, losing about the first hour of the survey. Snow radar performed well. We conducted a ramp pass at 1,200 ft AGL.

Attached images/files:

1. Map of today's mission (John Sonntag / NASA)
2. KML of today's mission (John Sonntag / NASA)
3. Land-terminating glacier terminus and snow-covered proglacial outwash on Ellef Ringnes Island (Joe MacGregor / NASA)
4. First-year and multi-year floes about a third of the way through the mission (Jeremy Harbeck / NASA)
5. CAMBOT image of leads slicing through pressure ridges (Jeremy Harbeck / NASA)

**Images:**

## Map of today's mission



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## Land-terminating glacier terminus and snow-covered proglacial



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## First-year and multi-year floes about a third of the way through the



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## CAMBOT image of leads slicing through pressure ridges



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**Submitted by:**

Joseph MacGregor on 04/21/19

## OIB - P-3 Orion - WFF 04/20/19 Science Report

**Mission:**

OIB

## Mission Summary:

Mission: Nansen Gap  
Priority: Medium

This is a modified version of the Fram Gateway missions flown in the earlier years of IceBridge. It differs from them in that it transits to and from the area of the Fram Strait at high-altitude, leaving more time to sample ice farther north and east than in prior years. In addition to Level 1 Requirements SI1 and SI2, this mission addresses sea ice level 1 baseline requirements SI3c and d by sampling sea ice north of Fram Strait.

In the interest of acquiring additional sea ice over a greater swath of the Arctic Ocean, we opted for this mission, which was shortened slightly to accommodate airfield opening hours. A thin layer northwest of Svalbard that we could partly see through in satellite imagery gave us confidence that this mission was viable. Following an uneventful transit, we descended into clear conditions for the survey at 1,500 ft AGL. Because of a significant (>50 kt) tailwind during the transit to the survey, we realized that we would not underfly Sentinel-3A at zero latency, so we decided to switch the return Sentinel underpass to Sentinel-3B (updated KML from notice this morning attached). We performed that zero latency Sentinel-3B underflight on the return crossing of the Fram Strait, underflying it in clear conditions at 15:00:34 UTC. We were successfully able to survey beneath the layer we had seen in imagery, and several beluga whales and seals were briefly spotted. We briefly descended to 1,000 ft AGL to avoid some thin layers. Headwall SWIR was frozen for about the first hour again and once warmed up had to be rebooted every now and then. Snow radar worked well and MCoRDS was again operated in imaging mode over land ice at high altitude during transit. We also recorded some short videos of our flight and a brief interview with Jeremy Harbeck for potential national broadcast this coming week. Because of time constraints associated with the airfield opening, we did not perform a ramp pass.

Attached images/files:

1. Map of today's mission (John Sonntag / NASA)
2. Updated KML of today's mission (John Sonntag / NASA)
3. The cockpit during the survey (Jeremy Harbeck / NASA)
4. Thin sea ice (nilas) finger rafting in a refreezing lead (Jeremy Harbeck / NASA)
5. Pressure ridge keel of sea ice floe (Jeremy Harbeck / NASA)
6. Cloud as evidence enhanced moisture flux over a lead (Jeremy Harbeck / NASA)

## Images:

### Map of today's mission



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### The cockpit during the survey



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### Thin sea ice (nilas) finger rafting in a refreezing lead



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## Pressure ridge keel of sea ice floe



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## Cloud as evidence enhanced moisture flux over a lead



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**Submitted by:**

Joseph MacGregor on 04/21/19

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