Jun 4th, 3:30 PM

Cape Canaveral Air Force Station Support to Commercial Space Launch

Thomas Ste. Marie
Vice Commander, 45th Space Wing

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Cape Canaveral Air Force Station
Support to Commercial Space Launch

Colonel Thomas Ste. Marie
Vice Commander, 45th Space Wing
CCAFS Launch Customers: 2013

- Complex 46: Space Florida, Navy*
- Complex 41: ULA Atlas V (CST-100)
- Complex 40: SpaceX Falcon 9
- Complex 37: ULA Delta IV; Delta IV Heavy
- Skid Strip: NGIS Pegasus
- Atlantic Ocean: Navy Trident II*

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2013

- Complex 39B: NASA SLS
- Complex 41: ULA Atlas V (CST-100)
- Complex 40: SpaceX Falcon 9
- Complex 37: ULA Delta IV; Delta IV Heavy
- Complex 46: Space Florida, Navy*
- Atlantic Ocean: Navy Trident II*
- Skid Strip: NGIS Pegasus

Black text – current programs; Blue text – in work; * – sub-orbital

NASA Space Launch System Launch Complex 39B February 4, 2013

DRIVE TO 48
CCAFLS Launch Customers: 2014

Complex 46: Space Florida, Navy*

Complex 37: ULA Delta IV; Delta IV Heavy

Complex 40: SpaceX Falcon 9

Complex 39B: NASA SLS

Complex 41: ULA Atlas V (CST-100)

Landing Zone 1: SpaceX landing

Complex 46: Space Florida, Navy*

Skid Strip: NGIS Pegasus

Atlantic Ocean: SpaceX Landings; Navy Trident II*

May 6, 2014

SpaceX Landing
Launch Complex 13/BOA

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2014

Complex 39B: NASA SLS
Complex 41: ULA Atlas V (CST-100)
Complex 40: SpaceX Falcon 9
Complex 37: ULA Delta IV; Delta IV Heavy
Landing Zone 1: SpaceX landing
Complex 36: Moon Express
Complex 46: Space Florida, Navy*
Skid Strip: NGIS Pegasus
Atlantic Ocean: SpaceX Landings; Navy Trident II*

Moon Express
Launch Complex 36
August 11, 2014

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2015

- Complex 46: Space Florida, Navy*
- Complex 37: ULA Delta IV; Delta IV Heavy
- Complex 40: SpaceX Falcon 9
- Complex 36/11: Blue Origin New Glenn
- Complex 41: ULA Atlas V (CST-100)
- Complex 39B: NASA SLS
- Landing Zone 1: SpaceX landing
- Complex 36/11: Blue Origin New Glenn
- Skid Strip: NGIS Pegasus
- Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2015

- Complex 40: SpaceX Falcon 9
- Complex 41: ULA Atlas V (*CST-100*)
- Complex 37: ULA Delta IV; Delta IV Heavy
- Complex 46: Space Florida, Navy*
- Complex 36/11: Blue Origin New Glenn
- Complex 39B: NASA SLS
- Landing Zone 1: SpaceX landing
- SLF: X-37 Landings
- Air Force X-37/OTV
- Skid Strip: NGIS Pegasus
- Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Air Force X-37/OTV
Shuttle Landing Facility
May 20, 2015

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2015

Complex 46: NASA AA-2*, Navy*

Complex 39B: NASA SLS

Complex 40: SpaceX Falcon 9

Complex 37: ULA Delta IV; Delta IV Heavy

Landing Zone 1: SpaceX landing

Complex 41: ULA Atlas V (CST-100)

Complex 36/11: Blue Origin New Glenn

Skid Strip: NGIS Pegasus

SLF: X-37 Landings

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Navy Trident II*

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2016

Complex 37: ULA Delta IV; Delta IV Heavy
Complex 40: SpaceX Falcon 9
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 41: ULA Atlas V (CST-100)
Complex 40: SpaceX Falcon 9
Complex 37: ULA Delta IV; Delta IV Heavy
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*

Orbital ATK Minotaur IV Launch Complex 46 January 11, 2016

SLF: X-37 Landings
Complex 39B: NASA SLS
Complex 41: ULA Atlas V (CST-100)
Complex 40: SpaceX Falcon 9
Complex 37: ULA Delta IV; Delta IV Heavy
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*

Skid Strip: NGIS Pegasus
Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

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CCAFS Launch Customers: 2016

Complex 37: ULA Delta IV; Delta IV Heavy
Complex 40: SpaceX Falcon 9
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*
Complex 17/18: Moon Express*
Slid Strip: NGIS Pegasus
Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

SLF: X-37 Landings
Complex 39B: NASA SLS
Complex 41: ULA Atlas V (CST-100)
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*
Complex 17/18: Moon Express*
Slid Strip: NGIS Pegasus
Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Moon Express
Launch Complex 17/18
April 7, 2016

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2016

Complex 37: ULA Delta IV; Delta IV Heavy
Complex 40: SpaceX Falcon 9
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*
Complex 17/18: Moon Express*
Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

ULA Vulcan Centaur
Launch Complex 41
August 2, 2016

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2016

- **Complex 37**: ULA Delta IV; Delta IV Heavy
- **Complex 40**: SpaceX Falcon 9
- **Landing Zone 1**: SpaceX landing
- **Complex 36/11**: Blue Origin New Glenn
- **Complex 46**: Minotaur IV, NASA AA-2*; Navy*
- **Complex 17/18**: Moon Express*

**SpaceX Falcon 9 / Heavy**
Launch Complex 39A
November 18, 2016

**SLF**: X-37 Landings
- **Complex 39B**: NASA SLS
- **Complex 39A**: SpaceX Falcon 9; Falcon Heavy
- **Complex 41**: ULA Atlas V (CST-100)
- **Complex 41**: ULA Vulcan (CST-100)
- **Complex 40**: SpaceX Falcon 9
- **Complex 37**: ULA Delta IV; Delta IV Heavy
- **Landing Zone 1**: SpaceX landing
- **Complex 36/11**: Blue Origin New Glenn

**Atlantic Ocean**: SpaceX/Blue Origin Landings; Navy Trident II*

**Skid Strip**: NGIS Pegasus

*Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2016

Complex 37: ULA Delta IV; Delta IV Heavy

Complex 40: SpaceX Falcon 9

Landing Zone 1: SpaceX landing

Complex 36/11: Blue Origin New Glenn

Complex 46: Minotaur IV, NASA AA-2*; Navy*

Complex 17/18: Moon Express*

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Skid Strip: NGIS Pegasus

SLF: X-37; SNC Dream Chaser Landings

Complex 39B: NASA SLS

Complex 39A: SpaceX Falcon 9; Falcon Heavy

Complex 41: ULA Atlas V (CST-100; Dream Chaser)

Complex 41: ULA Vulcan (CST-100; Dream Chaser)

Complex 37: ULA Delta IV; Delta IV Heavy

Complex 39B: NASA SLS

Complex 44: SpaceX Falcon 9

CST-100: Dream Chaser

Landing Zone 1: SpaceX landing

Complex 36/11: Blue Origin New Glenn

Complex 46: Minotaur IV, NASA AA-2*; Navy*

Complex 17/18: Moon Express*

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2016

Complex 37: ULA Delta IV; Delta IV Heavy
Complex 39A: SpaceX Falcon 9; Falcon Heavy (Dragon 2)
Complex 39B: NASA SLS
Complex 40: SpaceX Falcon 9
Complex 41: ULA Atlas V (CST-100; Dream Chaser)
Complex 41: ULA Vulcan (CST-100; Dream Chaser)
Complex 46: Minotaur IV, NASA AA-2*; Navy*
Complex 36/11: Blue Origin New Glenn
Complex 17/18: Moon Express*
Landing Zone 1: SpaceX landing
Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*
SLF: X-37; SNC Dream Chaser Landings
Skid Strip: NGIS Pegasus

SpaceX Dragon 2 Capsule
Launch Complex 39A
February 9, 2017

Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2017

Complex 37: ULA Delta IV; Delta IV Heavy

Complex 40: SpaceX Falcon 9

Landing Zone 1: SpaceX landing

Complex 36/11: Blue Origin New Glenn

Complex 46: Minotaur IV, NASA AA-2*; Navy*

Skid Strip: MDA MRBM Test*

Complex 17/18: Moon Express*

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

SLF: X-37; SNC Dream Chaser Landings

Complex 39B: NASA SLS

Complex 39A: SpaceX Falcon 9; Falcon Heavy (Dragon 2)

Complex 41: ULA Atlas V (CST-100; Dream Chaser)

Complex 41: ULA Vulcan (CST-100; Dream Chaser)

Complex 37: ULA Delta IV; Delta IV Heavy

Landing Zone 1: SpaceX landing

Complex 36/11: Blue Origin New Glenn

Complex 46: Minotaur IV, NASA AA-2*; Navy*

Skid Strip: MDA MRBM Test*

Complex 17/18: Moon Express*

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Aerojet Rocketdyne MRBM
C CAFS Skid Strip
September 27, 2017

DRIVE TO 48
CCAFS Launch Customers: 2018

Complex 37: ULA Delta IV; Delta IV Heavy

Complex 40: SpaceX Falcon 9

Complex 36/11: Blue Origin New Glenn

Complex 46: Minotaur IV, NASA AA-2*; Navy*

Complex 17/18: Moon Express*

Landing Zone 1: SpaceX landing

Skid Strip: MDA MRBM Test*

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

SLF: X-37; SNC Dream Chaser Landings

Complex 39B: NASA SLS; NGIS OmegA

Complex 39A: SpaceX Falcon 9; Falcon Heavy (Dragon 2)

Complex 41: ULA Atlas V (CST-100; Dream Chaser)

Complex 41: ULA Vulcan (CST-100; Dream Chaser)

Complex 37: ULA Delta IV; Delta IV Heavy

Northrop Grumman OmegA Launch Complex 39B September 26, 2018

Black text – current programs; Blue text – in work; * – sub-orbital
Cape Canaveral Air Force Station (CCAFS) Launch Customers: 2019

- **Complex 37**: ULA Delta IV; Delta IV Heavy
- **Landing Zone 1**: SpaceX landing
- **Complex 36/11**: Blue Origin New Glenn
- **Complex 41**: ULA Atlas V (CST-100; Dream Chaser)
- **Complex 41**: ULA Vulcan (CST-100; Dream Chaser)
- **Complex 40**: SpaceX Falcon 9
- **Complex 39A**: SpaceX Falcon 9; Falcon Heavy (Dragon 2)
- **Complex 39B**: NASA SLS; NGIS OmegA
- **SLF**: X-37; SNC Dream Chaser Landings
- **Skid Strip**: MDA MRBM Test*
- **SLF**: X-37; SNC Dream Chaser Landings
- **Complex 39B**: NASA SLS; NGIS OmegA
- **Complex 39A**: SpaceX Falcon 9; Falcon Heavy (Dragon 2)
- **Complex 41**: ULA Atlas V (CST-100; Dream Chaser)
- **Complex 41**: ULA Vulcan (CST-100; Dream Chaser)
- **Complex 40**: SpaceX Falcon 9
- **Complex 37**: ULA Delta IV; Delta IV Heavy
- **Complex 16**: Relativity Terran
  - Landing Zone 1: SpaceX landing
  - Complex 36/11: Blue Origin New Glenn
  - Complex 46: Minotaur IV, NASA AA-2*; Navy*
  - Skid Strip: MDA MRBM Test*
  - Complex 17/18: Moon Express*
  - Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

*Black text – current programs; Blue text – in work; * – sub-orbital
CCAFS Launch Customers: 2019

Complex 37: ULA Delta IV; Delta IV Heavy
Complex 41: ULA Atlas V (CST-100; Dream Chaser)
Complex 41: ULA Vulcan (CST-100; Dream Chaser)
Complex 40: SpaceX Falcon 9
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*
Complex 16: Relativity Terran
Landing Zone 1: SpaceX landing
Complex 39B: NASA SLS; NGIS OmegA
Complex 39A: SpaceX Falcon 9; Falcon Heavy (Dragon 2)
Complex 20: Firefly Alpha
Complex 41: ULA Atlas V (CST-100; Dream Chaser)
Complex 41: ULA Vulcan (CST-100; Dream Chaser)
Complex 40: SpaceX Falcon 9
Complex 37: ULA Delta IV; Delta IV Heavy
Complex 20: Firefly Alpha
Complex 16: Relativity Terran
Landing Zone 1: SpaceX landing
Complex 36/11: Blue Origin New Glenn
Complex 46: Minotaur IV, NASA AA-2*; Navy*
Complex 17/18: Moon Express*
Skid Strip: MDA MRBM Test*
Skid Strip: NGIS Pegasus

Atlantic Ocean: SpaceX/Blue Origin Landings; Navy Trident II*

Black text – current programs; Blue text – in work; * – sub-orbital
Commercial Activity at CCAFS

- Commercial space operations thriving at CCAFS
  - 45 SW agreements with eight commercial companies
  - Nine launch complexes leased/licensed to commercial/non-federal entities
    - ULA – Complex 37 and 41
    - SpaceX – Complex 40 and 13
    - Blue Origin – Complex 11 and 36
    - Moon Express – Complex 17 and 18
    - Space Florida - Complex 46
  - Two more launch pads pending
    - Firefly (Complex 20) and Relativity (Complex 16)
  - In preliminary talks with five more companies
  - Leased/licensed 102 facilities with over 930,000 square feet of space worth over $491M
Drive to 48

• Launch cadence climbing at steady rate
• Commercial represents an ever increasing percentage of launches
  • 2008 – 14%; 2018 – 54%
• Autonomous Flight Safety Systems allow for faster launch cadence
• New vehicles and large satellite constellations will push launch rates even higher

![Eastern Range Launches](image)
Drive to 48

- Launch rate projected to continue climbing
  - 11 potential new launch vehicles in the next 5 years
  - Emerging satellite constellations from SpaceX, OneWeb, Kuiper (Amazon)
- Actual launch rates dependent on success of new companies
### Future Launch Vehicles

<table>
<thead>
<tr>
<th>Company</th>
<th>Future Launch Vehicles</th>
<th>45 SW Support:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firefly Aerospace</td>
<td>Alpha &amp; Beta</td>
<td>-</td>
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<tr>
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<td>CX-20, CY21 launch</td>
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<tr>
<td></td>
<td>Relativity</td>
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<tr>
<td></td>
<td>Terran 1 &amp; 2</td>
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<td>CX-16, CY20 launch</td>
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<td>Blue Origin</td>
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<td></td>
<td>New Glenn</td>
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<td></td>
<td>CX-36, CY21 launch</td>
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<td></td>
<td>NASA</td>
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<td>SLS</td>
<td>-</td>
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<td>CX-39B, CY20 launch</td>
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<td>OmegA</td>
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<td></td>
<td>CX-39B, CY21 launch</td>
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<td></td>
<td>Vulcan</td>
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<td></td>
<td>CX-41, CY21 launch</td>
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<td></td>
<td>Aerojet Rocketdyne</td>
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<td></td>
<td>MRBM</td>
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<tr>
<td></td>
<td>Skid Strip, CY19 test</td>
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<tr>
<td></td>
<td>Relativity</td>
<td>-</td>
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<tr>
<td></td>
<td>MTV &amp; MX-1</td>
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<td></td>
<td>CX 17/18; CY20 test</td>
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<tr>
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<td>Ascent Abort 2</td>
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<td>CX 46; 19 launch</td>
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<td>CST-100</td>
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<td>SpaceX</td>
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<td>Dragon-2</td>
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<td>SNC</td>
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<td></td>
<td>Dream Chaser</td>
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<td>CX-41, CY20 launch KSC SLF Landing</td>
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</tbody>
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### Future Sub-Orbital Test Vehicles

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<td>Ascent Abort 2</td>
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<td>Boeing</td>
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<td>SpaceX</td>
<td>Dragon-2</td>
<td>CX-39A, CY19 launch</td>
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<td>Dream Chaser</td>
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### Cargo/Crew Vehicles

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<tbody>
<tr>
<td>United Launch Alliance</td>
<td>Vulcan</td>
<td>CX-41, CY21 launch</td>
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</table>

**On the Way to 48**