Skills Network

SpaceX Falcon 9 first stage Landing Prediction

Hands-on Lab: Complete the Data Collection API Lab

Estimated time needed: 45 minutes

In this capstone, we will predict if the Falcon 9 first stage will land successfully. SpaceX advertises Falcon 9 rocket launches on its website with a cost of 62 million dollars; other providers cost upward of 165 million dollars each, much of the savings is because SpaceX can reuse the first stage. Therefore if we can determine if the first stage will land, we can determine the cost of a launch. This information can be used if an alternate company wants to bid against SpaceX for a rocket launch. In this lab, you will collect and make sure the data is in the correct format from an API. The following is an example of a successful and launch.

Several examples of an unsuccessful landing are shown here:

SEPTEMBER 2013   HARD IMPACT ON OCEAN

Most unsuccessful landings are planned. Space X performs a controlled landing in the oceans.

Objectives

In this lab, you will make a get request to the SpaceX API. You will also do some basic data wrangling and formating.

- **Request to the SpaceX API**
- **Clean the requested data**

Install the below libraries

```
In [ ]:  !pip install requests
         !pip install pandas
         !pip install numpy
```

Import Libraries and Define Auxiliary Functions

We will import the following libraries into the lab

```
In [1]:  # Requests allows us to make HTTP requests which we will use to get da
         import requests
         # Pandas is a software library written for the Python programming lang
         import pandas as pd
         # NumPy is a library for the Python programming language, adding suppo
         import numpy as np
         # Datetime is a library that allows us to represent dates
```

```python
import datetime

# Setting this option will print all collumns of a dataframe
pd.set_option('display.max_columns', None)
# Setting this option will print all of the data in a feature
pd.set_option('display.max_colwidth', None)
```

Below we will define a series of helper functions that will help us use the API to extract information using identification numbers in the launch data.

From the `rocket` column we would like to learn the booster name.

In [3]:
```python
# Takes the dataset and uses the rocket column to call the API and app
def getBoosterVersion(data):
    for x in data['rocket']:
        if x:
            response = requests.get("https://api.spacexdata.com/v4/rockets
            BoosterVersion.append(response['name'])
```

In [ ]:

From the `launchpad` we would like to know the name of the launch site being used, the logitude, and the latitude.

In [4]:
```python
# Takes the dataset and uses the launchpad column to call the API and
def getLaunchSite(data):
    for x in data['launchpad']:
        if x:
            response = requests.get("https://api.spacexdata.com/v4/launch
            Longitude.append(response['longitude'])
            Latitude.append(response['latitude'])
            LaunchSite.append(response['name'])
```

From the `payload` we would like to learn the mass of the payload and the orbit that it is going to.

In [5]:
```python
# Takes the dataset and uses the payloads column to call the API and a
def getPayloadData(data):
    for load in data['payloads']:
        if load:
            response = requests.get("https://api.spacexdata.com/v4/payload
            PayloadMass.append(response['mass_kg'])
            Orbit.append(response['orbit'])
```

From `cores` we would like to learn the outcome of the landing, the type of the landing, number of flights with that core, whether gridfins were used, wheter the core is reused, wheter legs were used, the landing pad used, the

block of the core which is a number used to seperate version of cores, the number of times this specific core has been reused, and the serial of the core.

```python
# Takes the dataset and uses the cores column to call the API and appe
def getCoreData(data):
    for core in data['cores']:
            if core['core'] != None:
                response = requests.get("https://api.spacexdata.com/v4
                Block.append(response['block'])
                ReusedCount.append(response['reuse_count'])
                Serial.append(response['serial'])
            else:
                Block.append(None)
                ReusedCount.append(None)
                Serial.append(None)
            Outcome.append(str(core['landing_success'])+' '+str(core['
            Flights.append(core['flight'])
            GridFins.append(core['gridfins'])
            Reused.append(core['reused'])
            Legs.append(core['legs'])
            LandingPad.append(core['landpad'])
```

Now let's start requesting rocket launch data from SpaceX API with the following URL:

```python
spacex_url="https://api.spacexdata.com/v4/launches/past"
```

```python
response = requests.get(spacex_url)
```

Check the content of the response

```python
print(response.content)
```

b'[{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/94/f2/NN6Ph45r_o.png","large":"https://images2.imgbox.com/5b/02/QcxHUb5V_o.png"},"reddit":{"campaign":null,"launch":null,"media":null,"recovery":null},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://www.youtube.com/watch?v=0a_00nJ_Y88","youtube_id":"0a_00nJ_Y88","article":"https://www.space.com/2196-spacex-inaugural-falcon-1-rocket-lost-launch.html","wikipedia":"https://en.wikipedia.org/wiki/DemoSat"},"static_fire_date_utc":"2006-03-17T00:00:00.000Z","static_fire_date_unix":1142553600,"net":false,"window":0,"rocket":"5e9d0d95eda69955f709d1eb","success":false,"failures":[{"time":33,"altitude":null,"reason":"merlin engine failure"}],"details":"Engine failure at 33 seconds and loss of vehicle","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4b5b6c3bb0006eeb1e1"],"launchpad":"5e9e4502f5090995de566f86","flight_number":1,"name":"FalconSat","date_utc":"2006-03-24T22:30:00.000Z","date_unix":1143239400,"date_local":"2006-03-25T10:30:00+12:00","date_precis

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-1-rocket-fails-reach-orbit.html","wikipedia":"https://en.wikipedia.or
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llation leading to premature engine shutdown"}],"details":"Successful f
irst stage burn and transition to second stage, maximum altitude 289 k
m, Premature engine shutdown at T+7 min 30 s, Failed to reach orbit, Fa
iled to recover first stage","crew":[],"ships":[],"capsules":[],"payloa
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013/02/11/falcon-1-flight-3-mission-summary","wikipedia":"https://en.wi
kipedia.org/wiki/Trailblazer_(satellite)"},"static_fire_date_utc":nul
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payload was inserted into abnormally low orbit and lost due to Falcon 9
boost stage engine failure, ISS visiting vehicle safety rules, and the
primary payload owner\'s contractual right to decline a second ignition
of the second stage under some conditions.","crew":[],"ships":["5ea6ed2
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13/09/29/falcon-9-launch-payloads-orbit-vandenberg/","wikipedia":"http
s://en.wikipedia.org/wiki/CASSIOPE"},"static_fire_date_utc":"2013-09-19
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ved 13-tonne to LEO capacity. Following second-stage separation from th
e first stage, an attempt was made to perform an ocean touchdown test o
f the discarded booster vehicle. The test provided good test data on th
e experiment-its primary objective-but as the booster neared the ocean,
aerodynamic forces caused an uncontrollable roll. The center engine, de
pleted of fuel by centrifugal force, shut down resulting in the impact
and destruction of the vehicle.","crew":[],"ships":["5ea6ed2d080df40006
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w.orbcomm.com/en/networks/satellite/orbcomm-og2","wikipedia":"https://e
n.wikipedia.org/wiki/Falcon_9_flight_10"},"static_fire_date_utc":"2015-
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weighing 172 kg each, plus two 142-kg mass simulators. This was the sec
ond Falcon 9 booster equipped with landing legs. Following second-stage
separation, SpaceX conducted a controlled-descent test of the first sta
ge, which successfully decelerated from\xc2\xa0hypersonic velocity in t
he upper atmosphere, made reentry and landing burns, deployed its legs
and touched down on the ocean surface. As with the previous mission, th
e first stage then tipped over as expected and was not recovered.","cre
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f-two-satellites-for-asiasat/","wikipedia":"https://en.wikipedia.org/wi
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asa-cargo-launches-to-space-station-aboard-spacex-resupply-mission-0","
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w.com/2015/04/14/falcon-9-successfully-launches-descends-to-off-balance
-landing/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-6"},"s
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first stage contacted the ship, but soon tipped over due to excess late
ral velocity caused by a stuck throttle valve resulting in a later-than
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tes/spacex/files/spacexthalesfactsheet_final.pdf","webcast":"https://www.youtube.com/watch?v=nBwAYT_ogj4","youtube_id":"nBwAYT_ogj4","article":"https://spaceflightnow.com/2015/04/28/falcon-9-rocket-powers-into-space-with-satellite-for-turkmenistan/","wikipedia":"https://en.wikipedia.org/wiki/T%C3%BCrkmen%C3%84lem_52%C2%B0E_/_MonacoSAT"},"static_fire_date_utc":"2015-04-22T11:11:00.000Z","static_fire_date_unix":1429701060,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":null,"crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4beb6c3bb0006eeb1fb"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":23,"name":"T\xc3\xbcrkmen\xc3\x84lem 52\xc2\xb0E / MonacoSAT","date_utc":"2015-04-27T23:03:00.000Z","date_unix":1430175780,"date_local":"2015-04-27T19:03:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f35918233f3b2639","flight":1,"gridfins":false,"legs":false,"reused":false,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cedffd86e000604b340"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/53/12/gFtcOQuX_o.png","large":"https://images2.imgbox.com/7a/51/NfgiMpar_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/3b27hk","media":"https://www.reddit.com/r/spacex/comments/3berj3","recovery":null},"flickr":{"small":[],"original":["https://farm1.staticflickr.com/344/19045370790_f20f29cd8d_o.jpg","https://farm1.staticflickr.com/287/18999110808_6e153fed64_o.jpg"]},"presskit":"https://www.nasa.gov/sites/default/files/atoms/files/spacex_nasa_crs-7_presskit.pdf","webcast":"https://www.youtube.com/watch?v=PuNymhcTtSQ","youtube_id":"PuNymhcTtSQ","article":"https://spaceflightnow.com/2015/06/28/falcon-9-rocket-destroyed-in-launch-mishap/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-7"},"static_fire_date_utc":"2015-06-26T05:00:00.000Z","static_fire_date_unix":1435294800,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":false,"failures":[{"time":139,"altitude":40,"reason":"helium tank overpressure lead to the second stage LOX tank explosion"}],"details":"Launch performance was nominal until an overpressure incident in the second-stage LOX tank, leading to vehicle breakup at T+150 seconds. The Dragon capsule survived the explosion but was lost upon splashdown because its software did not contain provisions for parachute deployment on launch vehicle failure.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c"],"capsules":["5e9e2c5cf35918407d3b266c"],"payloads":["5eb0e4beb6c3bb0006eeb1fc"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":24,"name":"CRS-7","date_utc":"2015-06-28T14:21:00.000Z","date_unix":1435501260,"date_local":"2015-06-28T10:21:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f35918683c3b263a","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":null,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87ceeffd86e000604b341"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/6a/7e/J7IQfBqg_o.png","large":"https://images2.imgbox.com/99/d4/0aIlpFpw_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/3xgxh5","media":"https://www.reddit.com/r/spacex/comments/3xm83h/","recove

ry":null},"flickr":{"small":[],"original":["https://farm2.staticflickr.com/1648/23827554109_837b21739e_o.jpg","https://farm1.staticflickr.com/597/23802553412_d41e4dcc64_o.jpg","https://farm6.staticflickr.com/5806/23802550622_9ff8c90098_o.jpg","https://farm1.staticflickr.com/571/23604164970_2a1a2366e4_o.jpg","https://farm6.staticflickr.com/5773/23271687254_5e64d726ba_o.jpg","https://farm6.staticflickr.com/5766/23526044959_5bfe74bc88_o.jpg","https://farm6.staticflickr.com/5723/23785609832_83038751d1_o.jpg","https://farm1.staticflickr.com/715/23833499336_d3fde6a25a_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacex_orbcomm_press_kit_final2.pdf","webcast":"https://www.youtube.com/watch?v=O5bTbVbe4e4","youtube_id":"O5bTbVbe4e4","article":"https://spaceflightnow.com/2015/12/22/round-trip-rocket-flight-gives-spacex-a-trifecta-of-successes/","wikipedia":"https://en.wikipedia.org/wiki/Falcon_9_flight_20"},"static_fire_date_utc":"2015-12-19T00:09:00.000Z","static_fire_date_unix":1450483740,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Total payload mass was 2,034 kg (4,484 lb) : 11 satellites weighing 172 kg each, plus a 142-kg mass simulator. This was the first launch of the upgraded v1.1 variant (later called Falcon 9 Full Thrust), with a 30 percent power increase. Orbcomm had originally agreed to be the third flight of the enhanced-thrust rocket, but the change to the maiden flight position was announced in October 2015. SpaceX received a permit from the FAA to land the booster on solid ground at Cape Canaveral, and succeeded.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4beb6c3bb0006eeb1fd"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":25,"name":"OG-2 Mission 2","date_utc":"2015-12-22T01:29:00.000Z","date_unix":1450747740,"date_local":"2015-12-22T21:29:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f3591867753b263b","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cefffd86e000604b342"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/8a/44/PSksEBjD_o.png","large":"https://images2.imgbox.com/d9/c9/57ioWDgW_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/417weg","media":"https://www.reddit.com/r/spacex/comments/41cvdm","recovery":null},"flickr":{"small":[],"original":["https://farm2.staticflickr.com/1460/24382360351_9b1f2fcabc_o.jpg","https://farm2.staticflickr.com/1669/24423604506_27d3c4548b_o.jpg","https://farm2.staticflickr.com/1618/24151425850_1cb6040569_o.jpg","https://farm2.staticflickr.com/1622/24127012370_07edc62046_o.jpg","https://farm2.staticflickr.com/1508/24127011190_92ef932c96_o.jpg","https://farm2.staticflickr.com/1591/23778325594_08231286fc_o.jpg","https://farm2.staticflickr.com/1542/24038722499_34c10216a3_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacex_jason3_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=ivdKRJzl6y0","youtube_id":"ivdKRJzl6y0","article":"https://spaceflightnow.com/2016/01/18/satellite-launched-to-measure-motions-of-the-oceans/","wikipedia":"https://en.wikipedia.org/wiki/Jason-3"},"static_fire_date_utc":"2016-01-11T18:42:00.000Z","static_fire_date_unix":1452537720,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First laun

ch of NASA and NOAA joint science mission under the NLS II launch contract (not related to NASA CRS or USAF OSP3 contracts). Last launch of the original Falcon 9 v1.1 launch vehicle. The Jason-3 satellite was successfully deployed to target orbit. SpaceX again attempted a recovery of the first stage booster by landing on an autonomous drone ship; this time located in the Pacific Ocean. The first stage did achieve a soft-landing on the ship, but a lockout on one of the landing legs failed to latch, so that the booster fell over and exploded.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed30080df4000697c912","5ea6ed30080df4000697c914"],"capsules":[],"payloads":["5eb0e4beb6c3bb0006eeb1fe"],"launchpad":"5e9e4502f509092b78566f87","flight_number":26,"name":"Jason 3","date_utc":"2016-01-17T15:42:00.000Z","date_unix":1453045320,"date_local":"2016-01-17T08:42:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f3591842fa3b263c","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":false,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cf0ffd86e000604b343"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/7f/15/rjv54Es5_o.png","large":"https://images2.imgbox.com/c9/7f/EQ1g4Iv2_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/48u4yq","media":"https://www.reddit.com/r/spacex/comments/472k8c","recovery":null},"flickr":{"small":[],"original":["https://farm2.staticflickr.com/1623/25395662282_942fd68ba3_o.jpg","https://farm2.staticflickr.com/1458/25395661442_bfd783f18a_o.jpg","https://farm2.staticflickr.com/1641/25421381351_38390bcb8e_o.jpg","https://farm2.staticflickr.com/1616/25514167315_b19b0a4365_o.jpg","https://farm2.staticflickr.com/1482/24883160354_b03cefd416_o.jpg","https://farm2.staticflickr.com/1653/25420915781_8fc648b4a4_o.jpg","https://farm2.staticflickr.com/1610/25486858116_9c06dfea59_o.jpg","https://farm2.staticflickr.com/1617/25168697841_00dfff89bb_o.jpg","https://farm2.staticflickr.com/1533/24631230904_83b1624807_o.jpg","https://farm2.staticflickr.com/1627/25145624551_1b8743116f_o.jpg","https://farm2.staticflickr.com/1622/25120540712_7fc1a5ed72_o.jpg","https://farm2.staticflickr.com/1550/24585667074_aa712b13a8_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacex_ses9_press_kit_final.pdf","webcast":"https://www.youtube.com/watch?v=muDPSy07-A0","youtube_id":"muDPSy07-A0","article":"https://spaceflightnow.com/2016/03/05/tv-broadcasting-satellite-finally-launched-on-falcon-9/","wikipedia":"https://en.wikipedia.org/wiki/SES-9"},"static_fire_date_utc":"2016-10-02T14:11:00.000Z","static_fire_date_unix":1475417460,"net":false,"window":5400,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Second launch of the enhanced Falcon 9 Full Thrust launch vehicle. Following the launch, SpaceX attempted an experimental landing test to a drone ship, although a successful landing was not expected because launch mass exceeded previously indicated limit for a GTO there was little fuel left. As predicted, booster recovery failed: the spent first stage \\"landed hard\\", but the controlled-descent, atmospheric re-entry and navigation to the drone ship were successful and returned significant test data on bringing back high-energy Falcon 9s.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697

c913"],"capsules":[],"payloads":["5eb0e4beb6c3bb0006eeb1ff"],"launchpa
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6-03-04T19:35:00-04:00","date_precision":"hour","upcoming":false,"core
s":[{"core":"5e9e28a1f359188def3b263d","flight":1,"gridfins":true,"leg
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landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_updat
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b344"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgb
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RyPKsTpC_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddi
t.com/r/spacex/comments/4dtoly","media":"https://www.reddit.com/r/space
x/comments/4dtpxn/","recovery":"https://www.reddit.com/r/spacex/comment
s/4ee2zy"},"flickr":{"small":[],"original":["https://farm2.staticflick
r.com/1633/25788014884_6a3f9ae183_o.jpg","https://farm2.staticflickr.co
m/1650/26300505022_8b8b9035e8_o.jpg","https://farm2.staticflickr.com/14
86/25787998624_3ca213be1e_o.jpg","https://farm2.staticflickr.com/1450/2
6326628031_e1b08ec0b3_o.jpg","https://farm2.staticflickr.com/1670/26239
020092_05e5e4c538_o.jpg","https://farm2.staticflickr.com/1709/263054792
66_76b4d01caf_o.jpg","https://farm2.staticflickr.com/1645/26239017922_2
8c7ac50e0_o.jpg","https://farm2.staticflickr.com/1559/26288402056_6c599
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g","https://farm2.staticflickr.com/1508/26217345472_118767c608_o.jpg","
https://farm2.staticflickr.com/1495/25916886442_821a152917_o.jpg"]},"pr
esskit":"http://www.spacex.com/sites/spacex/files/spacex_crs8_press_ki
t.pdf","webcast":"https://www.youtube.com/watch?v=7pUAydjne5M","youtube
_id":"7pUAydjne5M","article":"https://spaceflightnow.com/2016/04/08/spa
cex-lands-rocket-on-floating-platform-after-station-resupply-launch/","
wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-8"},"static_fire_d
ate_utc":"2016-04-05T00:00:00.000Z","static_fire_date_unix":145981440
0,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":
true,"failures":[],"details":"Dragon carried over 1500 kg of supplies a
nd delivered (stowed in its trunk) the inflatable Bigelow Expandable Ac
tivity Module (BEAM) to the ISS for two years of in-orbit tests. The ro
cket\'s first stage landed smoothly on SpaceX\'s autonomous spaceport d
rone ship 9 minutes after liftoff, making this the first ever successfu
l landing of a rocket booster on a ship at sea as part of an orbital la
unch. The first stage B1021 was later also the first orbital booster to
be used again, when launching SES-10 on March 30, 2017.","crew":[],"shi
ps":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080
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eb200"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":28,"nam
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idfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing
_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7c
a"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb8

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s://farm8.staticflickr.com/7698/27294261525_82c4b7e604_o.jpg","https://farm8.staticflickr.com/7045/27259828166_9e32061cc9_o.jpg","https://farm8.staticflickr.com/7013/27259827316_c2f7507b3d_o.jpg","https://farm8.staticflickr.com/7211/27182485331_ed2414a947_o.jpg","https://farm8.staticflickr.com/7740/27182481921_0d7a759736_o.jpg","https://farm8.staticflickr.com/7315/26645036414_39736db559_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacex_thaicom_8_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=zBYC4f79iXc","youtube_id":"zBYC4f79iXc","article":"https://spaceflightnow.com/2016/05/27/spacex-logs-successful-late-afternoon-launch-for-thaicom/","wikipedia":"https://en.wikipedia.org/wiki/Thaicom_8"},"static_fire_date_utc":"2016-05-25T00:00:00.000Z","static_fire_date_unix":1464134400,"net":false,"window":7200,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Manufactured by Orbital ATK, the 3,100-kilogram (6,800 lb) Thaicom 8 communications satellite will serve Thailand, India and Africa from the 78.5\xc2\xb0 East geostationary location. It is equipped with 24 active Ku-band transponders.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4bfb6c3bb0006eeb202"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":30,"name":"Thaicom 8","date_utc":"2016-05-27T21:39:00.000Z","date_unix":1464385140,"date_local":"2016-05-27T17:39:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a2f3591845c73b2640","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cf6ffd86e000604b347"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/36/a4/J5gJWxuC_o.png","large":"https://images2.imgbox.com/c6/d2/MIC8sIE4_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/4ksdy3","launch":"https://www.reddit.com/r/spacex/comments/4o5u6r","media":"https://www.reddit.com/r/spacex/comments/4o5j6o","recovery":"https://www.reddit.com/r/spacex/comments/4on75l"},"flickr":{"small":[],"original":["https://farm8.staticflickr.com/7088/27661326426_ce3c3f320d_o.jpg","https://farm8.staticflickr.com/7698/27661325446_affb08be24_o.jpg","https://farm8.staticflickr.com/7733/27661322976_073466e80c_o.jpg","https://farm8.staticflickr.com/7218/27661320706_4c16f3b76b_o.jpg","https://farm8.staticflickr.com/7340/27661315686_6dcb2ce6f9_o.jpg","https://farm8.staticflickr.com/7656/27661313956_e1ac9650b9_o.jpg","https://farm8.staticflickr.com/7616/27661312516_640764f8fd_o.jpg","https://farm8.staticflickr.com/7413/27078893234_0142dd80f0_o.jpg","https://farm8.staticflickr.com/7334/27078889924_8819fd55ea_o.jpg"]},"presskit":"https://drive.google.com/open?id=0BwA3a65ef1OvMGpJSlpDNHhjelU","webcast":"https://www.youtube.com/watch?v=gLNmtUEvI5A","youtube_id":"gLNmtUEvI5A","article":"https://spaceflightnow.com/2016/06/15/spacex-successfully-fires-satellites-into-orbit-but-loses-booster-on-landing/","wikipedia":"https://en.wikipedia.org/wiki/ABS_(satellite_operator)"},"static_fire_date_utc":"2016-06-13T15:03:00.000Z","static_fire_date_unix":1465830180,"net":false,"window":2700,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"One year after pioneering this technique on flight 16, Falcon again launched two Boeing 702SP gridded ion t

hruster satellites in a dual-stack configuration, with the two customers sharing the rocket and mission costs. First stage landing attempt on drone ship failed on landing due to low thrust on one of the three landing engines.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4bfb6c3bb0006eeb203","5eb0e4bfb6c3bb0006eeb204"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":31,"name":"ABS-2A / Eutelsat 117W B","date_utc":"2016-06-15T14:29:00.000Z","date_unix":1466000940,"date_local":"2016-06-15T10:29:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a2f359184f403b2641","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":false,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cf8ffd86e000604b348"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/bb/0d/aLsm9QDC_o.png","large":"https://images2.imgbox.com/56/af/b7fNzZGo_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/4ksedl","launch":"https://www.reddit.com/r/spacex/comments/4t2umd/","media":"https://www.reddit.com/r/spacex/comments/4tayth","recovery":"https://www.reddit.com/r/spacex/comments/4znsvo"},"flickr":{"small":[],"original":["https://farm9.staticflickr.com/8819/27776240293_fcbf8c4a0a_o.jpg","https://farm8.staticflickr.com/7720/27776237513_038971797c_o.jpg","https://farm8.staticflickr.com/7594/27776235133_d794ce01f4_o.jpg","https://farm8.staticflickr.com/7759/27776229243_a0674e590f_o.jpg","https://farm8.staticflickr.com/7512/27776228443_6652c6baea_o.jpg","https://farm9.staticflickr.com/8038/27776218453_34112abbc1_o.jpg","https://farm8.staticflickr.com/7636/27776215913_3f9f1b05df_o.jpg","https://farm8.staticflickr.com/7740/28358960896_9785456101_o.jpg","https://farm8.staticflickr.com/7488/27776206663_262526ba5f_o.jpg","https://farm8.staticflickr.com/7656/28358955546_ce55d65e16_o.jpg","https://farm8.staticflickr.com/7467/27776204693_68b4ed82c9_o.jpg","https://farm8.staticflickr.com/7693/28348649546_0a54b1aa44_o.jpg","https://farm8.staticflickr.com/7540/28291786662_5e2e874576_o.jpg"]},"presskit":"https://drive.google.com/open?id=0BwA3a65ef1oVM0JpSXdDUUJMRVk","webcast":"https://www.youtube.com/watch?v=ThIdCuSsJh8","youtube_id":"ThIdCuSsJh8","article":"https://spaceflightnow.com/2016/07/18/spacex-sends-supplies-to-space-station-lands-another-falcon-rocket/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-9"},"static_fire_date_utc":"2016-07-16T02:31:47.000Z","static_fire_date_unix":1468636307,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Among other cargo, an International Docking Adapter (IDA-2) was carried to the ISS. This mission had a successful first-stage landing at Cape Canaveral.*Including the reusable Dragon Capsule, total payload to orbit was 6457 kg.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c912"],"capsules":["5e9e2c5cf359183bb73b266e"],"payloads":["5eb0e4c0b6c3bb0006eeb205"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":32,"name":"CRS-9","date_utc":"2016-07-18T04:45:00.000Z","date_unix":1468817100,"date_local":"2016-07-18T00:45:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a2f359187f273b2642","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"

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https://spaceflightnow.com/2016/08/14/falcon-9-rocket-launches-japanese
-satellite-then-nails-bullseye-landing/","wikipedia":"https://en.wikipe
dia.org/wiki/JCSAT-16"},"static_fire_date_utc":"2016-08-11T04:01:00.000
Z","static_fire_date_unix":1470888060,"net":false,"window":7200,"rocke
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irst attempt to touch down from a ballistic trajectory using a single-e
ngine landing burn. All previous landings from a ballistic trajectory h
ad fired three engines on the landing-burn, which provided more braking
force, but subjected the vehicle to greater structural stresses. The si
ngle-engine landing burn takes more time and fuel, but puts less stress
on the vehicle.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2
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paceflightnow.com/2016/09/01/spacex-rocket-and-israeli-satellite-destro
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i/Amos-6"},"static_fire_date_utc":"2016-09-01T13:07:00.000Z","static_fi
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a69973a809d1ec","success":false,"failures":[{"time":-165180,"altitude":
0,"reason":"buckled liner in several of the COPV tanks, causing perfora

tions that allowed liquid and/or solid oxygen to accumulate underneath the lining, which was ignited by friction."}],"details":"The rocket and Amos-6 payload were lost in a launch pad explosion on September 1, 2016 during propellant fill prior to a static fire test. The pad was clear o f personnel and there were no injuries.","crew":[],"ships":[],"capsule s":[],"payloads":["5eb0e4c1b6c3bb0006eeb207"],"launchpad":"5e9e4501f509 094ba4566f84","flight_number":34,"name":"Amos-6","date_utc":"2016-09-01 T13:07:00.000Z","date_unix":1472735220,"date_local":"2016-09-01T09:07:0 0-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9 e28a2f359187ee83b2644","flight":1,"gridfins":true,"legs":true,"reused": false,"landing_attempt":true,"landing_success":null,"landing_type":"ASD S","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":fals e,"launch_library_id":null,"id":"5eb87cfbffd86e000604b34b"},{"fairing s":{"reused":false,"recovery_attempt":false,"recovered":false,"ships": []},"links":{"patch":{"small":"https://images2.imgbox.com/89/2a/bkI6LN0 R_o.png","large":"https://images2.imgbox.com/24/c3/9MKjvOdD_o.png"},"re ddit":{"campaign":"https://www.reddit.com/r/spacex/comments/5dii6z","la unch":"https://www.reddit.com/r/spacex/comments/5nsaqm","media":"http s://www.reddit.com/r/spacex/comments/5nsico","recovery":"https://www.re ddit.com/r/spacex/comments/5oe9kk"},"flickr":{"small":[],"original":["h ttps://farm1.staticflickr.com/658/32394688795_55a9873ea7_o.jpg","http s://farm1.staticflickr.com/506/32394688095_a3339f3c6d_o.jpg","https://f arm1.staticflickr.com/745/32394687645_63ae2b4740_o.jpg","https://farm1. staticflickr.com/318/31548291014_e3a30abca8_o.jpg","https://farm1.stati cflickr.com/670/32351549066_e9cffe8d2b_o.jpg","https://farm6.staticflic kr.com/5518/31579784413_83aeac560a_o.jpg","https://farm6.staticflickr.c om/5556/32312421135_22c197c156_o.jpg","https://farm1.staticflickr.com/5 29/32312420015_5d2403a847_o.jpg","https://farm1.staticflickr.com/435/32 312417695_19c0e50c4b_o.jpg","https://farm1.staticflickr.com/735/3231241 6415_b90892af0a_o.jpg","https://farm1.staticflickr.com/293/32312415025_ cae16d1994_o.jpg","https://farm1.staticflickr.com/738/31467130724_92e02 c9524_o.jpg","https://farm1.staticflickr.com/464/31467130374_9f7a7d380e _o.jpg","https://farm1.staticflickr.com/581/31467129424_bac77d594a_o.jp g","https://farm1.staticflickr.com/380/32308163845_c1731a4b1f_o.jpg","h ttps://farm1.staticflickr.com/447/31450835954_72ed10a19e_o.jpg","http s://farm1.staticflickr.com/507/31450834974_b8a3f4aca5_o.jpg"]},"presski t":"https://drive.google.com/open?id=0BwA3a65ef1OvZC1aU3FuMlQzalE","web cast":"https://www.youtube.com/watch?v=7WimRhydggo","youtube_id":"7WimR hydggo","article":"https://spaceflightnow.com/2017/01/14/spacex-resumes -flights-with-on-target-launch-for-iridium/","wikipedia":"https://en.wi kipedia.org/wiki/Iridium_satellite_constellation#Next-generation_conste llation"},"static_fire_date_utc":"2017-01-05T19:40:00.000Z","static_fir e_date_unix":1483645200,"net":false,"window":0,"rocket":"5e9d0d95eda699 73a809d1ec","success":true,"failures":[],"details":"Return-to-flight mi ssion after the loss of Amos-6 in September 2016. Iridium NEXT will rep lace the original Iridium constellation, launched in the late 1990s. Ea ch Falcon mission will carry 10 satellites, with a goal to complete dep loyment of the 66 plus 9 spare satellite constellation by mid 2018. The first two Iridium qualification units were supposed to ride a Dnepr roc ket in April 2016 but were delayed, so Iridium decided to qualify the f irst batch of 10 satellites instead.","crew":[],"ships":["5ea6ed2f080df

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l":"2017-01-14T10:54:00-07:00","date_precision":"hour","upcoming":fals
e,"cores":[{"core":"5e9e28a3f359189e3a3b2645","flight":1,"gridfins":tru
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rue,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_
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pacex/comments/5n2eqx","launch":"https://www.reddit.com/r/spacex/commen
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ttps://farm1.staticflickr.com/574/32874779241_9f463de901_o.jpg","http
s://farm4.staticflickr.com/3710/32153433074_96337a54db_o.jpg","https://
farm1.staticflickr.com/327/32153432924_09dd1482d8_o.jpg","https://farm
3.staticflickr.com/2881/32183025803_36bf976b9e_o.jpg","https://farm3.st
aticflickr.com/2362/32183025493_2a37b4e22c_o.jpg","https://farm1.static
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r.com/265/32176806823_879ccc5da0_o.jpg","https://farm1.staticflickr.co
m/401/32866357531_69c6d289ed_o.jpg","https://farm3.staticflickr.com/210
5/32945170805_553d45ca56_o.jpg","https://farm4.staticflickr.com/3865/32
945170225_58129f00dc_o.jpg"]},"presskit":"http://www.spacex.com/sites/s
pacex/files/crs10presskitfinal.pdf","webcast":"https://www.youtube.com/
watch?v=giNhaEzv_PI","youtube_id":"giNhaEzv_PI","article":"https://spac
eflightnow.com/2017/02/19/historic-launch-pad-back-in-service-with-thun
dering-blastoff-by-spacex/","wikipedia":"https://en.wikipedia.org/wiki/
SpaceX_CRS-10"},"static_fire_date_utc":"2017-02-12T21:30:00.000Z","stat
ic_fire_date_unix":1486935000,"net":false,"window":0,"rocket":"5e9d0d95
eda69973a809d1ec","success":true,"failures":[],"details":"First Falcon
9 flight from the historic LC-39A launchpad at Kennedy Space Center, ca
rrying supplies and materials to support dozens of science and research
investigations scheduled during ISS Expeditions 50 and 51. The first st
age returned to launch site and landed at LZ-1.","crew":[],"ships":["5e
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8","flight_number":36,"name":"CRS-10","date_utc":"2017-02-19T14:39:00.0
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farm4.staticflickr.com/3771/32915198904_2df85aed05_o.jpg","https://farm4.staticflickr.com/3668/32915198334_d2fa2f16ab_o.jpg","https://farm4.staticflickr.com/3955/32915197674_24d6e27cf5_o.jpg","https://farm4.staticflickr.com/3830/33616913981_f04b6e2351_o.jpg","https://farm4.staticflickr.com/3819/33616913111_e699b48d66_o.jpg","https://farm4.staticflickr.com/3835/33361035860_c57ed61239_o.jpg","https://farm4.staticflickr.com/3783/33361035200_bfb797d38f_o.jpg","https://farm4.staticflickr.com/3698/33611796351_54d5a6d65a_o.jpg","https://farm3.staticflickr.com/2857/33611795531_82cc2d8789_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/finalses10presskit.pdf","webcast":"https://www.youtube.com/watch?v=xsZSXav4wI8","youtube_id":"xsZSXav4wI8","article":"https://spaceflightnow.com/2017/03/31/spacex-flies-rocket-for-second-time-in-historic-test-of-cost-cutting-technology/","wikipedia":"https://en.wikipedia.org/wiki/SES-10"},"static_fire_date_utc":"2017-03-27T18:00:00.000Z","static_fire_date_unix":1490637600,"net":false,"window":9000,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First payload to fly on a reused first stage, B1021, previously launched with CRS-8, which also landed a second time. In what is also a first, the payload fairing remained intact after a successful splashdown achieved with thrusters and a steerable parachute.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c3b6c3bb0006eeb20b"],"launchpad":"5e9e4502f509094188566f88","flight_number":38,"name":"SES-10","date_utc":"2017-03-30T22:27:00.000Z","date_unix":1490912820,"date_local":"2017-03-30T18:27:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a2f359182d0b3b263e","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d00ffd86e000604b34f"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/e5/2d/IZB4g6Ra_o.png","large":"https://images2.imgbox.com/9d/76/kMetaHqz_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/601ykx","launch":"https://www.reddit.com/r/spacex/comments/68bn8y/","media":"https://www.reddit.com/r/spacex/comments/68bpii","recovery":null},"flickr":{"small":[],"original":["https://farm3.staticflickr.com/2922/33578359423_4169ac8f98_o.jpg","https://farm3.staticflickr.com/2900/33578357343_85c247ebce_o.jpg","https://farm5.staticflickr.com/4166/34006001860_8c45f28e69_o.jpg","https://farm5.staticflickr.com/4166/34005999880_77684dba4b_o.jpg","https://farm3.staticflickr.com/2934/34005998140_c77076b6fb_o.jpg","https://farm5.staticflickr.com/4191/34005996220_fe9e4342d3_o.jpg","https://farm3.staticflickr.com/2883/33575654563_699c544776_o.jpg","https://farm3.staticflickr.com/2902/33575652913_0dece34db4_o.jpg","https://farm5.staticflickr.com/4163/33575651063_24e05826c5_o.jpg","https://farm3.staticflickr.com/2876/33994851620_fabd14770f_o.jpg","https://farm3.staticflickr.com/2832/33973172140_b370b79c51_o.jpg","https://farm3.staticflickr.com/2874/34357262105_11b417bea2_o.jpg","https://farm5.staticflickr.com/4158/34357260545_16870a94ba_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/nrol76presskit.pdf","webcast":"https://www.youtube.com/watch?v=EzQpkQ1etdA","youtube_id":"EzQpkQ1etdA","article":"https://techcrunch.com/2017/05/01/spacex

-successfully-launches-nrol-76-u-s-military-satellite/","wikipedia":"https://en.wikipedia.org/wiki/List_of_NRO_launches"},"static_fire_date_utc":"2017-04-25T19:02:00.000Z","static_fire_date_unix":1493146920,"net":false,"window":7200,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First launch under SpaceX\'s certification for national security space missions, which allows SpaceX to contract launch services for classified payloads. Second-stage speed and altitude telemetry were omitted from the launch webcast, which displayed first-stage telemetry instead, with continuous tracking of the booster from liftoff to landing for the first time.","crew":[],"ships":["5ea6ed2f080df4000697c90c"],"capsules":[],"payloads":["5eb0e4c3b6c3bb0006eeb20c"],"launchpad":"5e9e4502f509094188566f88","flight_number":39,"name":"NROL-76","date_utc":"2017-05-01T11:15:00.000Z","date_unix":1493637300,"date_local":"2017-05-01T07:15:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f3591811f83b2648","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d01ffd86e000604b350"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/ab/8d/fUpriAbI_o.png","large":"https://images2.imgbox.com/5b/f7/30l0xVXG_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/64kguj/","launch":"https://www.reddit.com/r/spacex/comments/6b88hz/","media":"https://www.reddit.com/r/spacex/comments/6bcf8j/","recovery":null},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4174/33859521334_d75fa367d5_o.jpg","https://farm5.staticflickr.com/4158/33859520764_5bb7a7daf6_o.jpg","https://farm5.staticflickr.com/4182/33859520404_a9c78c971d_o.jpg","https://farm5.staticflickr.com/4157/34556140711_f404943340_o.jpg","https://farm5.staticflickr.com/4179/34556139821_b2d6255e07_o.jpg","https://farm5.staticflickr.com/4187/34684981395_2f93965492_o.jpg","https://farm5.staticflickr.com/4155/34684980875_77b745158a_o.jpg","https://farm5.staticflickr.com/4183/34296430820_8d3a42c0d7_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/inmarsat5f4presskit_final.pdf","webcast":"https://www.youtube.com/watch?v=ynMYE64IEKs","youtube_id":"ynMYE64IEKs","article":"https://www.space.com/36852-spacex-launches-inmarsat-5-f4-satellite.html","wikipedia":"https://en.wikipedia.org/wiki/Inmarsat#Satellites"},"static_fire_date_utc":"2017-05-11T16:45:00.000Z","static_fire_date_unix":1494521100,"net":false,"window":2940,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"At 6,070 kg this was the heaviest payload launched to GTO by a Falcon 9 rocket. The launch was originally scheduled for the Falcon Heavy, but performance improvements allowed the mission to be carried out by an expendable Falcon 9 instead.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4c3b6c3bb0006eeb20d"],"launchpad":"5e9e4502f509094188566f88","flight_number":40,"name":"Inmarsat-5 F4","date_utc":"2017-05-15T23:21:00.000Z","date_unix":1494890460,"date_local":"2017-05-15T19:21:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f359186f3f3b2649","flight":1,"gridfins":false,"legs":false,"reused":false,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d01ffd86e000604b351"},{"

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t/","media":"https://www.reddit.com/r/spacex/comments/6emlzr/","recover
y":null},"flickr":{"small":[],"original":["https://farm5.staticflickr.c
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ebcast":"https://www.youtube.com/watch?v=JuZBOUMsYws","youtube_id":"JuZ
BOUMsYws","article":"https://spaceflightnow.com/2017/06/03/reused-drago
n-cargo-capsule-launched-on-journey-to-space-station/","wikipedia":"htt
ps://en.wikipedia.org/wiki/SpaceX_CRS-11"},"static_fire_date_utc":"2017
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indow":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":
[],"details":"This mission delivered the Neutron Star Interior Composit
ion Explorer (NICER) to the ISS, along with the MUSES Earth imaging pla
tform and ROSA solar array. For the first time, this mission launched a
refurbished Dragon capsule, serial number C106 which first flew in Sept
ember 2014 on the CRS-4 mission. Originally scheduled to launch on June
1, but was scrubbed due to inclement weather.","crew":[],"ships":["5ea6
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ate_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f35918
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dia_thread_videos_images/","recovery":"https://www.reddit.com/r/spacex/
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ipedia.org/wiki/Intelsat_35e"},"static_fire_date_utc":"2017-06-29T00:3
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h-adds-another-10-satellites-to-iridium-next-fleet/","wikipedia":"http
s://en.wikipedia.org/wiki/Iridium_satellite_constellation#Next-generati
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paceflightnow.com/2017/10/12/video-falcon-9-rocket-lifts-off-with-joint
-satellite-for-ses-echostar/","wikipedia":"https://en.wikipedia.org/wik
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0/spacex-launches-and-lands-third-rocket-in-three-weeks/","wikipedia":"
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pacex-launch-dazzles-delivering-10-more-satellites-for-iridium/","wikip
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https://spaceflightnow.com/2018/01/08/spacex-kicks-off-ambitious-2018-s
chedule-with-launch-for-u-s-government/","wikipedia":"https://en.wikipe
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18/02/07/spacex-debuts-worlds-most-powerful-rocket-sends-tesla-toward-t
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ps://spaceflightnow.com/2018/02/22/recycled-spacex-rocket-boosts-paz-ra
dar-satellite-first-starlink-testbeds-into-orbit/","wikipedia":"http
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-hispasat-satellite-rides-spacex-rocket-into-orbit/","wikipedia":"http
s://en.wikipedia.org/wiki/Hispasat_30W-6"},"static_fire_date_utc":"2018
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not attempt a landing due to \'unfavorable weather conditions in the re
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ttps://farm1.staticflickr.com/809/41121608541_cdfec6a849_o.jpg","https://farm1.staticflickr.com/822/40227112875_ec3c5df585_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/iridium-5_press_kit_2018.pdf","webcast":"https://www.youtube.com/watch?v=mp0TW8vkCLg","youtube_id":"mp0TW8vkCLg","article":"https://spaceflightnow.com/2018/03/30/iridium-messaging-network-gets-another-boost-from-spacex/","wikipedia":"https://en.wikipedia.org/wiki/Iridium_satellite_constellation#Next-generation_constellation"},"static_fire_date_utc":"2018-03-25T12:23:00.000Z","static_fire_date_unix":1521980580,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Fifth Iridium NEXT mission to deploy ten Iridium NEXT satellites. Reused booster from third Iridium flight, and although controlled descent was performed, the booster was expended into the ocean. SpaceX planned a second recovery attempt of one half of the fairing using the specially modified boat Mr. Steven. However, the fairing\'s parafoil twisted during the recovery, which led to water impact at high speed","crew":[],"ships":["5ea6ed2e080df4000697c908"],"capsules":[],"payloads":["5eb0e4c7b6c3bb0006eeb220"],"launchpad":"5e9e4502f509092b78566f87","flight_number":58,"name":"Iridium NEXT Mission 5","date_utc":"2018-03-30T14:13:51.000Z","date_unix":1522419231,"date_local":"2018-03-30T07:13:51-08:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a4f3591843103b2650","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d16ffd86e000604b363"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/49/e8/6Tmdhwlq_o.png","large":"https://images2.imgbox.com/28/c4/dc3rQbGy_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/82op7a/crs14_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/88s8a7/rspacex_crs14_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/88l52i/rspacex_crs14_media_thread_videos_images_gifs/","recovery":null},"flickr":{"small":[],"original":["https://farm1.staticflickr.com/819/26326005987_c3aec29db5_o.jpg","https://farm1.staticflickr.com/791/40303273215_4926c917c4_o.jpg","https://farm1.staticflickr.com/867/26326007227_39e71e6775_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/crs-14presskit2018.pdf","webcast":"https://www.youtube.com/watch?v=BPQHG-LevZM","youtube_id":"BPQHG-LevZM","article":"https://spaceflightnow.com/2018/04/02/spacex-supply-ship-departs-cape-canaveral-for-space-station/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-14"},"static_fire_date_utc":"2018-03-28T15:52:00.000Z","static_fire_date_unix":1522252320,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"The launch used a refurbished booster (from CRS-12) for the 11th time, and a refurbished capsule (C110 from CRS-8) for the third time. External payloads include a materials research platform MISSE-FF phase 3 of the Robotic Refueling Mission TSIS, heliophysics sensor several crystallization experiments, and the RemoveDebris spacecraft aimed at space junk removal. The booster was expended in order to test a new landing profile.","crew":[],"ships":["5ea6ed30080df4000697c912"],"capsules":["5e9e2c5cf3591885d43b266d"],"payloads":["5eb0e4c7b6c3bb0006eeb221"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":59,"name":"CRS-14","date_utc":"2018-04-02T20:30:41.0

00Z","date_unix":1522701041,"date_local":"2018-04-02T16:30:41-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a4f3591884ee3b264d","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d16ffd86e000604b364"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/4d/55/TQjhUrc7_o.png","large":"https://images2.imgbox.com/22/84/wfppRwXb_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/88l46q/tess_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/8cm61o/rspacex_tess_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/8cmzop/rspacex_tess_media_thread_videos_images_gifs/","recovery":null},"flickr":{"small":[],"original":["https://farm1.staticflickr.com/799/27684194488_0d9a703c1c_o.jpg","https://farm1.staticflickr.com/854/41512967372_0c37360126_o.jpg","https://farm1.staticflickr.com/832/41512968122_20c2e31de3_o.jpg","https://farm1.staticflickr.com/803/27684194678_c1ccd0680b_o.jpg","https://farm1.staticflickr.com/902/41512967962_74913ef5b0_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/tesspresskitfinal417.pdf","webcast":"https://www.youtube.com/watch?v=aY-0uBIYYKk","youtube_id":"aY-0uBIYYKk","article":"https://spaceflightnow.com/2018/04/19/all-sky-surveyor-launched-from-cape-canaveral-on-the-hunt-for-exoplanets/","wikipedia":"https://en.wikipedia.org/wiki/Transiting_Exoplanet_Survey_Satellite"},"static_fire_date_utc":"2018-04-11T18:30:00.000Z","static_fire_date_unix":1523471400,"net":false,"window":30,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Part of the Explorers program, this space telescope is intended for wide-field search of exoplanets transiting nearby stars. It is the first NASA high priority science mission launched by SpaceX. It was the first time SpaceX launched a scientific satellite not primarily intended for Earth observations. The second stage placed it into a high-Earth elliptical orbit, after which the satellite\'s own booster will perform complex maneuvers including a lunar flyby, and over the course of two months, reach a stable, 2:1 resonant orbit with the Moon. In January 2018, SpaceX received NASA\'s Launch Services Program Category 2 certification of its Falcon 9 \'Full Thrust\', certification which is required for launching medium risk missions like TESS. It was the last launch of a new Block 4 booster, and marked the 24th successful recovery of the booster. An experimental water landing was performed in order to attempt fairing recovery.","crew":[],"ships":["5ea6ed2e080df4000697c90a","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c7b6c3bb0006eeb222"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":60,"name":"TESS","date_utc":"2018-04-18T22:51:00.000Z","date_unix":1524091860,"date_local":"2018-04-18T18:51:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f35918863d3b2655","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d18ffd86e000604b365"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgb

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w.com/2018/05/11/spacex-debuts-an-improved-human-rated-model-of-the-fal
con-9-rocket/","wikipedia":"https://en.wikipedia.org/wiki/Bangabandhu-
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m/sites/spacex/files/iridium6presskit2018521.pdf","webcast":"https://ww
w.youtube.com/watch?v=I_0GgKfwCSk","youtube_id":"I_0GgKfwCSk","articl
e":"https://spaceflightnow.com/2018/05/22/rideshare-launch-by-spacex-se

rves-commercial-and-scientific-customers/","wikipedia":"https://en.wiki
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Falcon 9 with Iridium following the cancellation of their Dnepr launch
contract in 2015. Iridium CEO Matt Desch disclosed in September 2017 th
at GRACE-FO would be launched on the sixth Iridium NEXT mission. The bo
oster reuse turnaround was a record 4.5 months between flights.","cre
w":[],"ships":["5ea6ed2e080df4000697c908"],"capsules":[],"payloads":["5
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multi-mission-telecom-craft-launched-by-spacex-for-ses/","wikipedia":"h
ttps://en.wikipedia.org/wiki/SES-12"},"static_fire_date_utc":"2018-05-2
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w":7200,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":
[],"details":"SES-12, the replacement satellite for NSS-6, was successf
ully launched and deployed on June 4th, completing SpaceX\'s eleventh f
light of 2018. According to SES Luxembourg, The SES-12 satellite will e
xpand SES\xe2\x80\x99s capabilities to provide direct-to-home (DTH) bro
adcasting, VSAT, Mobility and High Throughput Satellite (HTS) data conn
ectivity services in the Middle East and the Asia-Pacific region, inclu
ding rapidly growing markets such as India and Indonesia. [SES-12] will
be co-located with SES-8","crew":[],"ships":["5ea6ed2e080df4000697c90
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ate_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f35918
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v2IY","article":"https://spaceflightnow.com/2018/08/07/indonesian-commu
nications-satellite-deployed-in-orbit-by-spacex/","wikipedia":"https://
en.wikipedia.org/wiki/Telkom_Indonesia"},"static_fire_date_utc":"2018-0
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s":[],"details":"SpaceX\'s fifteenth flight of 2018 launched the Merah
Putih (also known as Telkom-4) geostationary communications satellite f
or Telkom Indonesia. It marked the first reuse of any Block 5 first sta
ge; the booster B1046 had previously launched Bangabandhu-1. The stage
was recovered and is expected to become the first Falcon 9 booster to f
ly three missions.","crew":[],"ships":["5ea6ed2f080df4000697c90d","5ea6
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-4W, very close to the launch pad.","crew":[],"ships":[],"capsules":
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0-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9
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df","webcast":"https://www.youtube.com/watch?v=PhTbzc-BqKs&feature=yout
u.be","youtube_id":"PhTbzc-BqKs","article":"https://spaceflightnow.com/
2018/11/15/spacex-launches-qatars-eshail-2-communications-satellite/","
wikipedia":"https://en.wikipedia.org/wiki/Es%27hailSat"},"static_fire_d
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s":true,"failures":[],"details":"SpaceX\'s eighteenth flight of 2018 wa
s its first for Es\'hailSat. Es\'hail-2 is a communications satellite d
elivering television and internet to Qatar and the surrounding region.
It was launched into a geostationary transfer orbit from LC-39A at Kenn
edy Space Center. The booster landed on OCISLY.","crew":[],"ships":["5e
a6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payl
oads":["5eb0e4c9b6c3bb0006eeb22d"],"launchpad":"5e9e4502f509094188566f8
8","flight_number":70,"name":"Es\xe2\x80\x99hail 2","date_utc":"2018-11
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6UoOrQ","article":"https://spaceflightnow.com/2018/12/03/spacex-launche
s-swarm-of-satellites-re-flies-rocket-for-third-time/","wikipedia":"htt
ps://en.wikipedia.org/wiki/Spaceflight_Industries"},"static_fire_date_u
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t":false,"window":1680,"rocket":"5e9d0d95eda69973a809d1ec","success":tr
ue,"failures":[],"details":"SpaceX\'s nineteenth flight of 2018 will fl
y SSO-A: SmallSat Express out of Vandenberg SLC-4E for Spaceflight. SSO
-A is a rideshare to sun synchronus low earth orbit consisting of 64 in
dividual microsatellites and cubesats. It is also likely to be the thir
d flight of core B1046 which previously flew Bangabandhu-1 and Merah Pu
tih. If this happens it will be the first time a Falcon 9 has flown mor
e than two missions. ","crew":[],"ships":["5ea6ed2f080df4000697c910","5
ea6ed30080df4000697c912","5ea6ed30080df4000697c914","5ea6ed2e080df40006
97c908"],"capsules":[],"payloads":["5eb0e4c9b6c3bb0006eeb22e"],"launchp
ad":"5e9e4502f509092b78566f87","flight_number":71,"name":"SSO-A","date_
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18-12-03T10:34:00-08:00","date_precision":"hour","upcoming":false,"core
s":[{"core":"5e9e28a5f359182b023b2656","flight":3,"gridfins":true,"leg
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=Esh1jHT9oTA","youtube_id":"Esh1jHT9oTA","article":"https://spaceflight
now.com/2018/12/05/spacex-falcon-9-boosts-dragon-cargo-ship-to-orbit-fi
rst-stage-misses-landing-target/","wikipedia":"https://en.wikipedia.or
g/wiki/SpaceX_CRS-16"},"static_fire_date_utc":"2018-11-30T19:57:00.000
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X\'s 16th Crew Resupply Mission on behalf of NASA, with a total of 20 c
ontracted flights. This will bring essential supplies to the Internatio
nal Space Station using SpaceX\'s reusable Dragon spacecraft. The Falco
n 9 will launch from SLC-40 at Cape Canaveral Air Force Station. During
the landing of the first stage, a grid fin hydraulic pump stalled, caus
ing the core to enter an uncontrolled roll, and resulting in a (succesf
ul) water landing.","crew":[],"ships":["5ea6ed2f080df4000697c90b"],"cap
sules":["5e9e2c5cf359185d753b266f"],"payloads":["5eb0e4cab6c3bb0006eeb2
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g":false,"cores":[{"core":"5e9e28a6f359185c603b265a","flight":1,"gridfi
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8/12/23/spacex-closes-out-year-with-successful-gps-satellite-launch/","
wikipedia":"https://en.wikipedia.org/wiki/GPS_Block_IIIA"},"static_fire
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s":true,"failures":[],"details":"SpaceX\'s twenty-first flight of 2018
launched the first of the new GPS III satellites (Block IIIA) for the U
nited States Air Force and was SpaceX\'s first EELV mission. The spacec
raft was delivered to a MEO transfer orbit from SLC-40 at Cape Canavera
l Air Force Station. This mission was the first to fly with the redesig
ned COPV on the first stage (B1054) as well as the second. The booster
was expended.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4ca
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r":73,"name":"GPS III SV01","date_utc":"2018-12-23T13:51:00.000Z","date_unix":1545573060,"date_local":"2018-12-23T08:51:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918513b3b265b","flight":1,"gridfins":false,"legs":false,"reused":false,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d27ffd86e000604b372"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/75/cb/DMVc5j8b_o.png","large":"https://images2.imgbox.com/d7/f9/861bfh4Q_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/a699fh/iridium_next_constellation_mission_8_launch/","launch":"https://www.reddit.com/r/spacex/comments/aemq2i/rspacex_iridium_next_8_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/aeoxve/rspacex_iridium_next_8_media_thread_videos_images/","recovery":"https://www.reddit.com/r/spacex/comments/aewp4r/iridium_8_recovery_thread/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4866/39745612523_14270b4b9d_o.jpg","https://farm8.staticflickr.com/7833/39745612923_21aa442350_o.jpg","https://farm5.staticflickr.com/4881/39745613173_e99b09c000_o.jpg","https://farm8.staticflickr.com/7882/39745613513_6cdd4581af_o.jpg","https://farm8.staticflickr.com/7807/39745613733_1a7b70e54a_o.jpg","https://farm5.staticflickr.com/4891/39745614053_43855205bc_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/iridium8presskit.pdf","webcast":"https://youtu.be/VshdafZvwrg","youtube_id":"VshdafZvwrg","article":"https://spaceflightnow.com/2019/01/11/spacex-begins-2019-with-eighth-and-final-for-upgraded-iridium-network/","wikipedia":"https://en.wikipedia.org/wiki/Iridium_satellite_constellation#Next-generation_constellation"},"static_fire_date_utc":"2019-01-06T13:51:00.000Z","static_fire_date_unix":1546782660,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s first flight of 2019 will be the eighth and final launch of its planned Iridium flights. Delivering 10 satellites to low earth orbit, this brings the total up to 75 and completes the Iridium NEXT constellation. This mission launches from SLC-4E at Vandenberg AFB. The booster is expected to land on JRTI.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed30080df4000697c912","5ea6ed30080df4000697c914"],"capsules":[],"payloads":["5eb0e4cab6c3bb0006eeb231"],"launchpad":"5e9e4502f509092b78566f87","flight_number":74,"name":"Iridium NEXT Mission 8","date_utc":"2019-01-11T15:31:00.000Z","date_unix":1547220660,"date_local":"2019-01-11T07:31:00-08:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591833b13b2659","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d28ffd86e000604b373"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/06/bc/5KvLN0mH_o.png","large":"https://images2.imgbox.com/4d/63/oBLNSPkL_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/afxyrd/nusantara_satu_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/assxjz/rspacex_psnvi_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/at5mu8/rspacex_psn6_media_thread_videos

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d":"XS0E35aYJcU","article":"https://spaceflightnow.com/2019/02/22/israe
li-moon-lander-hitches-ride-on-spacex-launch-with-indonesian-comsat/","
wikipedia":"https://en.wikipedia.org/wiki/PT_Pasifik_Satelit_Nusantar
a"},"static_fire_date_utc":"2019-02-18T17:03:00.000Z","static_fire_date
_unix":1550509380,"net":false,"window":1920,"rocket":"5e9d0d95eda69973a
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s rideshare to GTO for Space Systems Loral (SSL). The primary payload f
or this mission is Nusantara Satu, a communications satellite built by
SSL for the private Indonesian company PT Pasifik Satelit Nusantara (PS
N). Spaceflight Industries\' GTO-1 mission consists of two secondary pa
yloads. One of those is Beresheet, the lunar lander built by the Israel
i non-profit organization, SpaceIL. Beresheet will make its own way to
the moon from GTO. The other secondary is Air Force Research Lab\'s (Sp
ace Situational Awareness) S5 mission, which hitches a ride to GEO aboa
rd Nusantara Satu. This mission launches from SLC-40 at Cape Canaveral
AFS. The booster is expected to land on OCISLY.","crew":[],"ships":["5e
a6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4cab6c3bb0006e
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8.staticflickr.com/7889/40294395933_f429c12e83_o.jpg","https://farm8.st
aticflickr.com/7914/40294395873_0a328f2d87_o.jpg","https://farm8.static
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com/sites/spacex/files/crew_demo-1_press_kit.pdf","webcast":"https://yo
utu.be/2ZL0tbOZYhE","youtube_id":"2ZL0tbOZYhE","article":"https://space
flightnow.com/2019/03/02/spacex-launches-first-crew-dragon-ferry-shi
p/","wikipedia":"https://en.wikipedia.org/wiki/SpX-DM1"},"static_fire_d
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0,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":
true,"failures":[],"details":"Demonstration Mission 1 (DM-1) will launc
h Dragon 2 as part of NASA\'s Commercial Crew Transportation Capability
program. This mission will demonstrate Dragon 2, and Falcon 9 in its co
nfiguration for crewed missions. DM-1 will launch from LC-39A at Kenned
y Space Center, likely carrying some cargo to the International Space S
tation. The booster is expected to land on OCISLY.","crew":[],"ships":
["5ea6ed30080df4000697c913"],"capsules":["5e9e2c5df35918b1063b2671"],"p
ayloads":["5eb0e4cbb6c3bb0006eeb235"],"launchpad":"5e9e4502f50909418856
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e":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tb
d":false,"launch_library_id":null,"id":"5eb87d2bffd86e000604b375"},{"fa
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spacexs-falcon-heavy-successful-in-commercial-debut/","wikipedia":"http
s://en.wikipedia.org/wiki/Arabsat-6A"},"static_fire_date_utc":"2019-04-
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w":7020,"rocket":"5e9d0d95eda69974db09d1ed","success":true,"failures":

[],"details":"SpaceX will launch Arabsat 6A to a geostationary transfer orbit from SLC–39A, KSC. The satellite is a geostationary telecommunications satellite built by Lockheed Martin for the Saudi Arabian company Arabsat. This will be the first operational flight of Falcon Heavy, and also the first Block 5 Falcon Heavy. All three cores will be new Block 5 cores. The side cores are expected to land at LZ–1 and LZ–2, and the center core is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2f080df4000697c90e","5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90c"],"capsules":[],"payloads":["5eb0e4cbb6c3bb0006eeb236"],"launchpad":"5e9e4502f509094188566f88","flight_number":77,"name":"ArabSat 6A","date_utc":"2019–04–11T22:35:00.000Z","date_unix":1555022100,"date_local":"2019–04–11T18:35:00–04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f3591897453b265f","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"},{"core":"5e9e28a6f359183c413b265d","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"},{"core":"5e9e28a6f359188fd53b265e","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb90a834e7c8"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d2dffd86e000604b376"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/97/8e/YbVKIUZB_o.png","large":"https://images2.imgbox.com/0d/05/zH7YqLRe_o.png"},"reddit":{"campaign":"https://new.reddit.com/r/spacex/comments/bd2l28/crs17_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/bjsn0v/rspacex_crs17_official_launch_discussion_updates","media":"https://www.reddit.com/r/spacex/comments/bkc4d5/rspacex_crs17_media_thread_videos_images_gifs","recovery":"https://www.reddit.com/r/spacex/comments/bjy7p5/rspacex_crs17_recovery_discussion_updates_thread"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/46856594435_206c773b5a_o.jpg","https://live.staticflickr.com/65535/47720639872_284e49381d_o.jpg","https://live.staticflickr.com/65535/46856594755_88f1b22e50_o.jpg","https://live.staticflickr.com/65535/47720639542_1b7c1a71b0_o.jpg","https://live.staticflickr.com/65535/47720639732_e04b2a9ed7_o.jpg","https://live.staticflickr.com/65535/32829382467_087d024428_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/crs-17_press_kit.pdf","webcast":"https://youtu.be/AQFhX5TvP0M","youtube_id":"AQFhX5TvP0M","article":"https://spaceflightnow.com/2019/05/04/spacex-launches-space-station-resupply-mission-lands-rocket-on-drone-ship/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS–17"},"static_fire_date_utc":"2019–04–27T07:23:00.000Z","static_fire_date_unix":1556349780,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s 17th Commercial Resupply Services mission for NASA out of a total of 20 contracted flights, this mission brings essential supplies to the International Space Station using SpaceX\'s reusable Dragon 1 spacecraft. The external payloads for this mission include Orbital Carbon Observatory 3 and Space Test Program–Houston 6. The Falcon 9 launches from SLC–40 at Cape Canaveral AFS. The booster was expected to land at LZ–1, however, due to the ongoing investigation and clean–up followi

ng the Crew Dragon testing incident, it is likely to land on OCISLY instead.\\n   ","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90e","5ea6ed2f080df4000697c90b"],"capsules":["5e9e2c5cf3591869b63b2670"],"payloads":["5eb0e4cbb6c3bb0006eeb237"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":78,"name":"CRS-17","date_utc":"2019-05-04T06:48:00.000Z","date_unix":1556952480,"date_local":"2019-05-04T02:48:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591809313b2660","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d2effd86e000604b377"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2f080df4000697c90c"]},"links":{"patch":{"small":"https://images2.imgbox.com/79/ec/TOE2PBJq_o.png","large":"https://images2.imgbox.com/39/aa/5of7buxK_o.png"},"reddit":{"campaign":"https://www.reddit.com/comments/bjybrl","launch":"https://www.reddit.com/r/spacex/comments/brfbic/rspacex_starlink_official_launch_discussion","media":"https://www.reddit.com/r/spacex/comments/bp0479/rspacex_starlink_media_thread_videos_images_gifs","recovery":"https://www.reddit.com/r/spacex/comments/bsaljm/rspacex_starlink_b10493_recovery_discussion_and"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/47926143711_4a0b2680bf_o.jpg","https://live.staticflickr.com/65535/47926136902_d8ce35223d_o.jpg","https://live.staticflickr.com/65535/47926144123_2a828b66d5_o.jpg","https://live.staticflickr.com/65535/47926137127_ef58152b6b_o.jpg","https://live.staticflickr.com/65535/47926137017_e6d86fa820_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/starlink_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=riBaVeDTEWI","youtube_id":"riBaVeDTEWI","article":"https://spaceflightnow.com/2019/05/24/spacexs-first-60-starlink-broadband-satellites-deployed-in-orbit","wikipedia":"https://en.wikipedia.org/wiki/Starlink_(satellite_constellation)"},"static_fire_date_utc":"2019-05-13T20:06:00.000Z","static_fire_date_unix":1557777960,"net":false,"window":9000,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch dozens of Starlink demonstration satellites from SLC-40, Cape Canaveral AFS. Starlink is a low Earth orbit broadband internet constellation developed and owned by SpaceX which will eventually consist of nearly 12 000 satellites and will provide low latency internet service to ground terminals around the world. Two prototype satellites, Microsats 2a and 2b, were launched from Vandenberg AFB in February 2018. The booster for this mission will land on OCISLY.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90c","5ea6ed2f080df4000697c90e","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909"],"capsules":[],"payloads":["5eb0e4cbb6c3bb0006eeb238"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":79,"name":"Starlink v0.9","date_utc":"2019-05-24T02:30:00.000Z","date_unix":1558665000,"date_local":"2019-05-23T22:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591833b13b2659","flight":3,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d30ffd86e000604b378"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":null,"ships":[]},"lin

ks":{"patch":{"small":"https://images2.imgbox.com/39/af/ygmjLYhv_o.png","large":"https://images2.imgbox.com/03/18/xlkSHLy1_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/buq487/radarsat_constellation_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/byp69f/rspacex_radarsat_constellation_official_launch","media":null,"recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/48052269657_71764b0fb3_o.jpg","https://live.staticflickr.com/65535/48052269617_34447619f0_o.jpg","https://live.staticflickr.com/65535/48052224858_20ea2a411e_o.jpg","https://live.staticflickr.com/65535/48052269562_325c117b81_o.jpg","https://live.staticflickr.com/65535/48052182461_a419db6b84_o.jpg","https://live.staticflickr.com/65535/48052224733_f89f1dd046_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/radarsat_constellation_mission_press_kit.pdf","webcast":"https://youtu.be/8A2nJd9Urk8","youtube_id":"8A2nJd9Urk8","article":"https://spaceflightnow.com/2019/06/12/three-canadian-radar-surveillance-satellites-ride-spacex-rocket-into-orbit/","wikipedia":"https://en.wikipedia.org/wiki/RADARSAT_Constellation"},"static_fire_date_utc":"2019-06-08T08:39:00.000Z","static_fire_date_unix":1559983140,"net":false,"window":780,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX is launching the three satellite RADARSAT Constellation Mission into Sun Synchronous orbit from SLC-4E, VAFB. The RCM spacecraft are synthetic aperture radar (SAR) Earth observation satellites built by the Canadian space company, MDA, for the Canadian Space Agency. This mission was delayed when the originally slated booster failed to land after CRS-16. The booster is expected to return to LZ-4.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4ccb6c3bb0006eeb239"],"launchpad":"5e9e4502f509092b78566f87","flight_number":80,"name":"RADARSAT Constellation","date_utc":"2019-06-12T14:17:00.000Z","date_unix":1560349020,"date_local":"2019-06-12T07:17:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb554034e7c9"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d31ffd86e000604b379"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/b0/90/fA4QaCAi_o.png","large":"https://images2.imgbox.com/81/9e/p6AaiJwj_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/bw6aa8/stp2_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/c40a29/rspacex_stp2_official_launch_discussion_updates","media":"https://www.reddit.com/r/spacex/comments/c4ng3a/rspacex_stp2_media_thread_videos_images_gifs","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/48129211778_83c1769305_o.jpg","https://live.staticflickr.com/65535/48129211908_8390c775b0_o.jpg","https://live.staticflickr.com/65535/48129182836_fd53e5646b_o.jpg","https://live.staticflickr.com/65535/48129269897_22d854be5c_o.jpg","https://live.staticflickr.com/65535/48129182631_572051790c_o.jpg","https://live.staticflickr.com/65535/48129211693_d23b0287f1_o.jpg","https://live.staticflickr.com/65535/48129269942_eb9b5c25bc_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/stp-2_press_kit.pdf","webcast":"https://youtu.be/WxH4CAlhtiQ","youtube_id":"WxH4CAlhtiQ","article":"http

s://spaceflightnow.com/2019/06/25/falcon-heavy-launches-on-military-led-rideshare-mission-boat-catches-fairing","wikipedia":"https://en.wikipedia.org/wiki/Space_Test_Program"},"static_fire_date_utc":"2019-06-19T21:52:00.000Z","static_fire_date_unix":1560981120,"net":false,"window":14400,"rocket":"5e9d0d95eda69974db09d1ed","success":true,"failures":[],"details":"Space Test Program 2 is a rideshare managed by the U.S. Air Force Space and Missile Systems Center (SMC), launching from LC-39A, KSC. Most of the spacecraft will be delivered into low Earth orbit (LEO) in two deployment sequences separated by a second stage burn. These LEO payloads include the six Taiwan and United States owned COSMIC-2 microsatellites, the Planetary Society\'s LightSail-B demonstrator cubesat, and others. The third and final deployment will be the Air Force Research Lab\'s DSX spacecraft, which will be delivered to a medium Earth orbit (MEO). This mission will reuse the side cores from Arabsat 6A, which will return to LZ-1, and LZ-2. The new center core will boost back to land on OCISLY less than 40 km from the launch site.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909","5ea6ed2e080df4000697c908","5ea6ed2f080df4000697c90e"],"capsules":[],"payloads":["5eb0e4ccb6c3bb0006eeb23a","5eb0e4ccb6c3bb0006eeb23b","5eb0e4ccb6c3bb0006eeb23c","5eb0e4ccb6c3bb0006eeb23d","5eb0e4ccb6c3bb0006eeb23e","5eb0e4cdb6c3bb0006eeb23f","5eb0e4cdb6c3bb0006eeb240","5eb0e4cdb6c3bb0006eeb241","5eb0e4cdb6c3bb0006eeb242","5eb0e4cdb6c3bb0006eeb243","5eb0e4cdb6c3bb0006eeb244","5eb0e4cdb6c3bb0006eeb245","5eb0e4ceb6c3bb0006eeb246","5eb0e4ceb6c3bb0006eeb247","5eb0e4ceb6c3bb0006eeb248","5eb0e4ceb6c3bb0006eeb249"],"launchpad":"5e9e4502f509094188566f88","flight_number":81,"name":"STP-2","date_utc":"2019-06-25T03:30:00.000Z","date_unix":1561433400,"date_local":"2019-06-24T23:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591878063b2661","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":false,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"},{"core":"5e9e28a6f359183c413b265d","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"},{"core":"5e9e28a6f359188fd53b265e","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb90a834e7c8"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d35ffd86e000604b37a"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/f1/70/USGBp3Dy_o.png","large":"https://images2.imgbox.com/79/a5/ZdV48VwO_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/c8k6g5/crs18_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/ch2ml7/rspacex_crs18_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/chbr8i/rspacex_crs18_media_thread_videos_images_gifs/","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/48380511527_190682b573_o.jpg","https://live.staticflickr.com/65535/48380370691_7b0757a4d3_o.jpg","https://live.staticflickr.com/65535/48380511492_51db1bf984_o.jpg","https://live.staticflickr.com/65535/48380370626_a5d264c637_o.jpg","https://live.staticflickr.com/65535/48380511427_97db52a9e3_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/crs-18_press_kit.pdf","webcast":"https://youtu.be/SlgrxVuP5jk","youtu

be_id":"SlgrxVuP5jk","article":"https://spaceflightnow.com/2019/07/25/n
ew-docking-port-spacesuit-and-supplies-en-route-to-space-station/","wik
ipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-18"},"static_fire_dat
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et":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":tru
e,"failures":[],"details":"SpaceX\'s 18th Commercial Resupply Services
mission out of a total of 20 such contracted flights for NASA, this lau
nch will deliver essential supplies to the International Space Station
using the reusable Dragon 1 cargo spacecraft. The external payload for
this mission is International Docking Adapter 3, replacing IDA-1 lost i
n SpaceX\'s CRS-7 launch failure. This mission will launch from SLC-40
at Cape Canaveral AFS on a Falcon 9, and the first-stage booster is exp
ected to land back at CCAFS LZ-1.","crew":[],"ships":[],"capsules":["5e
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s://spaceflightnow.com/2019/08/07/spacex-launches-israeli-owned-telecom
-satellite/","wikipedia":"https://en.wikipedia.org/wiki/Spacecom"},"sta
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564617600,"net":false,"window":5280,"rocket":"5e9d0d95eda69973a809d1e
c","success":true,"failures":[],"details":"SpaceX will launch Boeing bu
ilt Amos-17, a geostationary communications satellite for Israeli compa
ny Spacecom. The satellite will be delivered to GTO from KSC LC-39A or
possibly CCAFS SLC-40, and will replace the defunct Amos-5 at 17\xc2\xb
0 E. Amos-17 carries multi-band high throughput and regional beams serv
icing Africa, Europe and the Middle East. The cost of this launch is co
vered for Spacecom by SpaceX credit following the Amos-6 incident. A re
covery of the booster for this mission is not expected.","crew":[],"shi
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YXp_4","article":"https://spaceflightnow.com/2019/12/05/dragon-soars-on
-research-and-resupply-flight-to-international-space-station","wikipedi
a":"https://en.wikipedia.org/wiki/SpaceX_CRS-19"},"static_fire_date_ut
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NASA with a total of 20 contracted flights, this mission brings essenti
al supplies to the International Space Station using SpaceX\'s reusable
Dragon spacecraft. The external payloads for this mission include the H
yperspectral Imager Suite and a lithium-ion battery. Falcon 9 and Drago
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cle":"https://spaceflightnow.com/2019/12/17/startup-launches-broadband-
satellite-on-spacex-rocket-to-connect-pacific-islands","wikipedia":"htt
ps://en.wikipedia.org/wiki/JSAT_(satellite_constellation)"},"static_fir

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ual payload satellite to geostationary transfer orbit from XXXX. JCSat
18 is a mobile broadband communications payload built for Sky Perfect J
SAT Corporation of Japan and will service Asia Pacific. Kacific 1 is a
high throughput broadband internet payload built for Kacific Broadband
Satellites and will service certain high demand areas of Southeast Asia
and the Pacific. Both payloads share a single chassis. The booster for
this mission is expected to land on OCISLY.","crew":[],"ships":["5ea6ed
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ightnow.com/2020/01/07/spacex-launches-more-starlink-satellites-tests-d
esign-change-for-astronomers","wikipedia":"https://en.wikipedia.org/wik
i/Starlink_(satellite_constellation)"},"static_fire_date_utc":"2020-01-
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details":"This mission will launch the second batch of Starlink version
1.0 satellites, from SLC-40, Cape Canaveral AFS. They are expected to c
ontribute to the 550 km x 53\xc2\xb0 shell. It is the third Starlink la
unch overall. Starlink is a low Earth orbit broadband internet constell
ation developed and owned by SpaceX which will eventually consist of ne
arly 12 000 satellites and will provide low latency internet service to
ground terminals around the world. The booster for this mission is expe
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uring the period of maximum dynamic pressure. As part of NASA\'a Commer
cial Crew Integrated Capability program (CCiCap) this test will contrib
ute valuable data to help validate Crew Dragon and its launch abort sys
tem. The Crew Dragon will be recovered by GO Searcher after splashdown
in the Atlantic Ocean. This flight does not go to orbit. The booster an
d upper stage are expected to break up following capsule separation and
there will be no landing attempt.","crew":[],"ships":["5ea6ed2f080df400
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w.com/2020/01/29/spacex-boosts-60-more-starlink-satellites-into-orbit-a
fter-weather-delays/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX
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Cape Canaveral AFS. It is the fourth Starlink launch overall. The satel
lites will be delivered to low Earth orbit and will spend a few weeks m
aneuvering to their operational altitude of 550 km. The booster for thi
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tes-to-orbit-booster-misses-drone-ship-landing/","wikipedia":"https://e
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s://spaceflightnow.com/2020/03/18/falcon-9-rocket-overcomes-engine-fail
ure-to-deploy-starlink-satellites/","wikipedia":"https://en.wikipedia.o
rg/wiki/Starlink"},"static_fire_date_utc":"2020-03-13T18:37:00.000Z","s
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Starlink launch overall and the fifth operational batch of Starlink sat
ellites will launch into orbit aboard a Falcon 9 rocket. This mission i
s expected to deploy all sixty satellites into an elliptical orbit abou
t fifteen minutes into flight. In the weeks following launch the satell
ites are expected to utilize their onboard ion thrusters to raise their
orbits to 550 km in three groups of 20, making use of precession rates
to separate themselves into three planes. The booster will land on a dr
one ship approximately 628 km downrange.","crew":[],"ships":["5ea6ed300
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wFI","article":"https://spaceflightnow.com/2020/04/22/spacexs-starlink-
network-surpasses-400-satellite-mark-after-successful-launch/","wikiped
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40, Cape Canaveral AFS. It is the seventh Starlink launch overall. The
satellites will be delivered to low Earth orbit and will spend a few we
eks maneuvering to their operational altitude of 550 km. The booster fo
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s-soil-for-first-time-in-nine-years/","wikipedia":"https://en.wikipedi
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ch the ninth batch of operational Starlink satellites, which are expect
ed to be version 1.0, from LC-39A, Kennedy Space Center. It is the tent
h Starlink launch overall. The satellites will be delivered to low Eart
h orbit and will spend a few weeks maneuvering to their operational alt
itude of 550 km. This mission is includes a rideshare of two BlackSky s
atellites on top of the Starlink stack. The booster for this mission is
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n 1.0, from LC-39A, Kennedy Space Center. It is the eleventh Starlink l
aunch overall. The satellites will be delivered to low Earth orbit and
will spend a few weeks maneuvering to their operational altitude of 550
km. This mission is includes rideshare payloads, SkySats 19-21, on top
of the Starlink stack. The booster for this mission is expected to land
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Falcon 9 will launch the second of the two satellite SAOCOM 1 satellite
s into a sun-synchronous polar orbit from SLC-40, Cape Canaveral AFS. S

AOCOM 1B is a synthetic aperture radar Earth observation satellite to s
upport disaster management. The SAOCOM spacecraft are operated by CONA
E, the Argentinian National Space Activities Commission, and are built
by INVAP. This mission is also expected to include rideshare payloads S
equoia, and GNOMES-1. This will be the first polar launch from the Spac
e Coast in 60 years. The launch azimuth will be southward and the boost
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twelfth Starlink launch overall. The satellites will be delivered to lo
w Earth orbit and will spend a few weeks maneuvering to their operation
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Cape Canaveral Air Force Station. It is the thirteenth Starlink launch
overall. The satellites will be delivered to low Earth orbit and will s
pend a few weeks maneuvering to their operational altitude of 550 km. T
he booster for this mission is expected to land on an ASDS.","crew":
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fourteenth Starlink launch overall. The satellites will be delivered to
low Earth orbit and will spend a few weeks maneuvering to their operati
onal altitude of 550 km. The booster for this mission is expected to la

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on will launch the fourteenth batch of operational Starlink satellites,
which are expected to be version 1.0, from SLC-40, Kennedy Space Cente
r. It is the fifteenth Starlink launch overall. The satellites will be
delivered to low Earth orbit and will spend a few weeks maneuvering to
their operational altitude of 550 km. The booster for this mission is e
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rst operational mission of its Crew Dragon vehicle as part of NASA\'s C
ommercial Crew Transportation Capability Program (CCtCap), carrying 3 N
ASA astronauts and 1 JAXA astronaut to the International Space Station.
This mission will be the second crewed flight to launch from the United
States since the end of the Space Shuttle program in 2011.","crew":["5f
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international-satellite-launches-to-extend-measurements-of-sea-level-ri
se/","wikipedia":"https://en.wikipedia.org/wiki/Copernicus_Sentinel-
6"},"static_fire_date_utc":"2020-11-17T13:17:00.000Z","static_fire_date
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tinel-6 Michael Freilich into low Earth orbit for NASA, NOAA, ESA, and
the European Organization for the Exploitation of Meteorological Satell
ites aboard a Falcon 9 from SLC-4E, Vandenberg Air Force Station. Senti
nel-6(A) is an ocean observation satellite providing radar ocean surfac
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fifteenth batch of operational Starlink satellites, which are version
1.0, from SLC-40, Cape Canaveral Air Force Station. It will be the sixt
eenth Starlink launch overall. The satellites will be delivered to low
Earth orbit and will spend a few weeks maneuvering to their operational
altitude of 550 km. The booster for this mission is expected to land on
an ASDS.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4
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com/2020/12/19/spacex-closes-out-record-year-of-launches-from-floridas-
space-coast/","wikipedia":"https://en.wikipedia.org/wiki/National_Recon
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com/2021/03/04/spacex-sticks-75th-falcon-rocket-landing-after-launching
-60-more-starlink-satellites/","wikipedia":"https://en.wikipedia.org/wi
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launches the sixteenth batch of operational Starlink satellites, which
are version 1.0, from LC-39A. It is the eighteenth Starlink launch over
all. The satellites will be delivered to low Earth orbit and will spend
a few weeks maneuvering to their operational altitude. The booster is e
xpected to land on an ASDS.","crew":[],"ships":["5ea6ed2f080df4000697c9
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ex-adds-more-satellites-to-starlink-internet-fleet/","wikipedia":"http

s://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":"2021-03-09T23:00:00.000Z","static_fire_date_unix":1615330800,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission launches the 20th batch of operational Starlink satellites, which are version 1.0, from LC-39A or SLC-40. It is the 21st Starlink launch overall. The satellites will be delivered to low Earth orbit and will spend a few weeks maneuvering to their operational altitude. The booster is expected to land on an ASDS.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ee68c683c228f36bd5809b5","5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90c"],"capsules":[],"payloads":["600f9bcb8f798e2a4d5f97a5"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":119,"name":"Starlink-20 (v1.0)","date_utc":"2021-03-11T08:13:00.000Z","date_unix":1615450380,"date_local":"2021-03-11T03:13:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591817f23b2663","flight":6,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":"134eb787-244e-4131-8b03-c9fbd0a11efc","id":"600f9a718f798e2a4d5f979d"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90c"]},"links":{"patch":{"small":"https://images2.imgbox.com/a0/1a/BLRGLyNe_o.png","large":"https://images2.imgbox.com/a0/db/7LwA6xV9_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/jhu37i/starlink_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/m4e377/rspacex_starlink21_launch_discussion_updates/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51036945097_9fc94fa9a9_o.jpg","https://live.staticflickr.com/65535/51036945067_ce0d5b3c0b_o.jpg","https://live.staticflickr.com/65535/51036945027_47c96d71d1_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/JKf45ATgATc","youtube_id":"JKf45ATgATc","article":"https://spaceflightnow.com/2021/03/14/spacex-extends-its-own-rocket-reuse-record-on-starlink-launch/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission launches the 21st batch of operational Starlink satellites, which are version 1.0, from LC-39A or SLC-40. It is the 22nd Starlink launch overall. The satellites will be delivered to low Earth orbit and will spend a few weeks maneuvering to their operational altitude. The booster is expected to land on an ASDS.","crew":[],"ships":["5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90c","5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["600f9bd88f798e2a4d5f97a6"],"launchpad":"5e9e4502f509094188566f88","flight_number":120,"name":"Starlink-21 (v1.0)","date_utc":"2021-03-14T10:01:00.000Z","date_unix":1615716060,"date_local":"2021-03-14T06:01:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","flight":9,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":"896d876d-e834-4810-8a5e-44d6b6a42630","id":"600f9a8d8f798e2a4d5f979

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nal altitude. The booster is expected to land on an ASDS.","crew":[],"s
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l mission of its Crew Dragon vehicle as part of NASA\'s Commercial Crew
Program, carrying NASA astronauts Shane Kimbrough, Megan McArthur, Thom
as Pesquet, and Akihiko Hoshide to the International Space Station. The
Falcon 9 and Crew Dragon lift off from LC-39A, Kennedy Space Center. Bo
th the booster and the capsule have flown previously, each a first for
a commercial crew flight. The booster for this mission is expected to l
and on an ASDS. The mission will be complete with the safe return of th
e astronauts to Earth.","crew":["5fe3ba5fb3467846b3242188","5fe3bb01b34
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the 26th Starlink launch overall. The satellites will be delivered to l
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nal altitude. The booster is expected to land on OCISLY.","crew":[],"sh
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ill spend a few weeks maneuvering to their operational altitude. The bo
oster is expected to land on an ASDS.","crew":[],"ships":["5ea6ed30080d
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nd on ASDS JRTI.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90c","5ee68c683c228f36bd5809b5","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909"],"capsules":[],"payloads":["6079bd679a06446e8c61bf7d"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":128,"name":"Starlink-28 (v1.0)","date_utc":"2021-05-26T18:59:00.000Z","date_unix":1622055540,"date_local":"2021-05-26T14:59:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c54a0622a633027900a1","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":"fb25ecf0-fb51-4b5e-b678-105f6ba4c06e","id":"6079bd399a06446e8c61bf77"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/aa/a8/HhwYIXoB_o.png","large":"https://images2.imgbox.com/16/32/9Z7btrQF_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/nhztq5/crs22_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/nqqojc/rspacex_crs22_launch_docking_discussion_updates/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51225482033_086576f2cd_o.jpg","https://live.staticflickr.com/65535/51226340205_9c3ac87b8e_o.jpg","https://live.staticflickr.com/65535/51224563112_61d493b775_o.jpg","https://live.staticflickr.com/65535/51224563062_95bf029b80_o.jpg","https://live.staticflickr.com/65535/51225271661_49315dc688_o.jpg","https://live.staticflickr.com/65535/51226340225_27df994080_o.jpg","https://live.staticflickr.com/65535/51224563102_d07c630ef5_o.jpg","https://live.staticflickr.com/65535/51225482053_1fe7157f74_o.jpg","https://live.staticflickr.com/65535/51226038164_304c347347_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/QXf9mRWbXDM","youtube_id":"QXf9mRWbXDM","article":"https://spaceflightnow.com/2021/06/03/spacex-supply-ship-launches-on-mission-to-begin-upgrading-space-station-electrical-grid/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-22"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s 22nd ISS resupply mission on behalf of NASA, this mission sends essential supplies to the International Space Station using the cargo variant of SpaceX\'s Dragon 2 spacecraft. The external payload for this mission is the first pair of ISS Roll Out Solar Arrays. Falcon 9 and Dragon launch from LC-39A, Kennedy Space Center and the booster is expected to land on an ASDS. The mission will be complete with splashdown and recovery of the capsule and down cargo.","crew":[],"ships":["5ea6ed2f080df4000697c90b","608c1a06cf7f3d6152666ad4","5ea6ed30080df4000697c913"],"capsules":["60b803421f83cc1e59f1644d"],"payloads":["5fe3b642b3467846b324217b"],"launchpad":"5e9e4502f509094188566f88","flight_number":129,"name":"CRS-22 & IROSA","date_utc":"2021-06-03T17:29:00.000Z","date_unix":1622741340,"date_local":"2021-06-03T13:29:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"60b800111f83cc1e59f16438","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":"89a150ea-6e4b-489f-853c-3603ae684611","id":"5fe3af84b3467846b3242161"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":tru

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9973a809d1ec","success":true,"failures":[],"details":"SpaceX launches t
he second of two next generation satellites for SiriusXM from SLC-40, C
ape Canaveral Space Force Station. The spacecraft will be delivered int
o a sub-synchronous geostationary transfer orbit and will replace XM-4
in geostationary orbit. The booster for this mission will land on an AS
DS.","crew":[],"ships":["5ee68c683c228f36bd5809b5","5ea6ed2f080df400069
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094ba4566f84","flight_number":130,"name":"SXM-8","date_utc":"2021-06-06
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t":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"S
paceX\'s fourth GPS III launch will use the first stage from the previo
us GPS mission. This will be the first time a National Security Space L
aunch has flown on a flight proven booster. Falcon 9 will launch from S

LC-40, Cape Canaveral and the booster will land downrange on a drone ship. GPS III is the third generation of the U.S. Space Force\'s NAVSTAR Global Positioning System satellites, developed by Lockheed Martin. The GPS III constellation will feature a cross-linked command and control architecture, allowing the entire GPS constellation to be updated simultaneously from a single ground station. A new spot beam capability for enhanced military coverage and increased resistance to hostile jamming will be incorporated.","crew":[],"ships":["60c8c7a45d4819007ea69871","5ee68c683c228f36bd5809b5","5ea6ed2f080df4000697c910"],"capsules":[],"payloads":["5eb0e4d2b6c3bb0006eeb261"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":131,"name":"GPS III SV05","date_utc":"2021-06-17T16:09:00.000Z","date_unix":1623946140,"date_local":"2021-06-17T12:09:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c5440622a633027900a0","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":"110c808a-a091-47ab-8532-4fa058c1de7a","id":"5eb87d4effd86e000604b390"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":true,"ships":["60c8c7a45d4819007ea69871"]},"links":{"patch":{"small":"https://images2.imgbox.com/a9/3e/L2EqHzn0_o.png","large":"https://images2.imgbox.com/96/8c/4HOqLFoZ_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/nz7rai/transporter2_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/o9ki7u/rspacex_transporter2_launch_discussion_and/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51283430951_a9e5a41141_o.jpg","https://live.staticflickr.com/65535/51283430936_3852120bbe_o.jpg","https://live.staticflickr.com/65535/51283604493_d1a088b7c9_o.jpg","https://live.staticflickr.com/65535/51284454795_591717faee_o.jpg","https://live.staticflickr.com/65535/51284454810_9fdd0e8db4_o.jpg","https://live.staticflickr.com/65535/51283604443_6d92fe1231_o.jpg","https://live.staticflickr.com/65535/5128360_4428_b24ebf1b5f_o.jpg","https://live.staticflickr.com/65535/51283604438_7202e2a388_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/sSiuW1HcGjA","youtube_id":"sSiuW1HcGjA","article":null,"wikipedia":null},"static_fire_date_utc":"2021-06-22T15:24:00.000Z","static_fire_date_unix":1624375440,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Falcon 9 launches to sun-synchronous polar orbit from Florida as part of SpaceX\'s Rideshare program dedicated to smallsat customers. The mission lifts off from SLC-40, Cape Canaveral on a southward azimuth and performs a dogleg maneuver. The booster for this mission is expected to return to LZ-1 based on FCC communications filings. This rideshare takes approximately 90 satellites and hosted payloads into orbit on a variety of deployers including three free-flying spacecraft which dispense their customers\' satellites after separation from the SpaceX stack.","crew":[],"ships":["60c8c7a45d4819007ea69871"],"capsules":[],"payloads":["608ac397eb3e50044e3630e7"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":132,"name":"Transporter-2","date_utc":"2021-06-30T19:31:00.000Z","date_unix":1625081460,"date_local":"2021-06-30T15:31:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5ef670f10059c33cee4a826c","flight":8,"gridfin

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ss":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"
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s://youtu.be/x-KiDqxAMU0","youtube_id":"x-KiDqxAMU0","article":null,"wi
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e,"failures":[],"details":"SpaceX\'s 23rd ISS resupply mission on behal
f of NASA, this mission brings essential supplies to the International
Space Station using the cargo variant of SpaceX\'s Dragon 2 spacecraft.
Cargo includes several science experiments. The booster for this missio
n is expected to land on an ASDS. The mission will be complete with ret
urn and recovery of the Dragon capsule and down cargo.","crew":[],"ship
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tellites/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"stati
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b6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":"6b9f
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iki/Inspiration4"},"static_fire_date_utc":"2021-09-13T07:07:00.000Z","s
tatic_fire_date_unix":1631516820,"net":false,"window":18000,"rocket":"5
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ation4 is the world\xe2\x80\x99s first all-civilian mission to space. T
he mission will be commanded by Jared Isaacman, the 37-year-old founder
and Chief Executive Officer of Shift4 Payments and an accomplished pilo
t and adventurer. Inspiration4 will leave Earth from Kennedy Space Cent
er\xe2\x80\x99s historic Launch Complex 39A, the embarkation point for
Apollo and Space Shuttle missions, and travel across a low earth orbit
on a multi-day journey that will continually eclipse more than 90% of t
he earth\xe2\x80\x99s population. Named in recognition of the four-pers
on crew that will raise awareness and funds for St. Jude Children\xe2\x
80\x99s Research Hospital, this milestone represents a new era for huma
n spaceflight and exploration.","crew":["607a3a5f5a906a44023e0870","607
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es":[],"details":"NASA\'s Double Asteroid Redirect Test (DART) will dem
onstrate the use of a kinetic impactor to alter an asteroid\'s trajecto
ry, an intervention that could be used in the future to prevent devasta
ting Earth impacts. The target system consists of Didymos, 780 meters i
n diameter, and its moonlet Dimorphos, 160 meters. The DART spacecraft
will intercept the double asteroid, using autonomous guidance to crash
into the smaller one. Moving at about 6 km/s, the transferred momentum
should alter Dimorphos\'s 12 hour orbital period around its companion b
y several minutes. The mission tests several technologies, including th
e Small-body Maneuvering Autonomous Real-Time Navigation (SMART Nav) us
ed to differentiate and steer toward the target body and Roll-Out Solar
Arrays (ROSA) with Transformational Solar Array concentrators. NASA\xe2
\x80\x99s Evolutionary Xenon Thruster \xe2\x80\x94 Commercial (NEXT\xe2
\x80\x93C) ion engine will also be demonstrated, although the spacecraf
t\'s primary propulsion is hydrazine thrusters. DART should arrive at D
idymos in late September 2022, when it is about 11 million kilometers f
rom Earth. Ten days before impact, the Italian Space Agency\'s cubesat
LICIACube will be deployed to observe the collision and ejecta with its
two cameras. Earth-based telescopes will be used to measure the altered
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ompanys-first-falcon-9-launch-doubleheader/","wikipedia":"https://en.wi
kipedia.org/wiki/T%C3%BCrksat_5B"},"static_fire_date_utc":null,"static_
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5B communication satellite, which its construction work continues at Ai
rbus Defense and Space\'s facilities in Toulouse, France, will soon be
sent to the Cape Canaveral Space Launch Station located in Florida, Uni
ted States. The satellite will be launched into space onboard the Falco
n 9 rocket following pre-launch preparations. With an estimated in-orbi
t lifetime of 30 years and the aim of securing Turkey\xe2\x80\x99s orbi
tal and frequency rights, T\xc3\xbcrksat 5B will be launched into an or

bital slot at 42 degrees East. With 12 kW power, T\xc3\xbcrksat 5B will provide TV broadcasting and data communication services over a wide coverage area that reaches the entire Middle East, the Persian Gulf, the Red Sea, the Mediterranean, North Africa, East Africa, South Africa and Nigeria. Apart from that, the satellite will also provide customized services for airlines and commercial ship operators around the world thanks to the fact that it operates in Ka-Band.","crew":[],"ships":["618fad7e563d69573ed8caa9","5ee68c683c228f36bd5809b5"],"capsules":[],"payloads":["5fe3c080b3467846b3242190"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":142,"name":"T\xc3\xbcrksat 5B","date_utc":"2021-12-19T03:58:00.000Z","date_unix":1639886280,"date_local":"2021-12-18T22:58:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"60b800111f83cc1e59f16438","flight":3,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecb075134e7cd"}],"auto_update":false,"tbd":false,"launch_library_id":"16d0c02e-0bb1-45d5-a3f5-7c4ff6cf6de1","id":"5fe3afc1b3467846b3242164"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/fe/c3/yV1LnAUT_o.png","large":"https://images2.imgbox.com/37/fd/AiNV3ldU_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/rfisc2/crs24_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/rktygs/rspacex_crs24_launch_discussion_and_updates_thread/","media":null,"recovery":null},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://youtu.be/gEv6HLHYhWo","youtube_id":"gEv6HLHYhWo","article":"https://spaceflightnow.com/2021/12/21/spacex-cargo-flight-sets-record-for-most-orbital-launches-from-space-coast-in-a-year/","wikipedia":null},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s 24th ISS resupply mission on behalf of NASA, this mission brings essential supplies to the International Space Station using the cargo variant of SpaceX\'s Dragon 2 spacecraft. Cargo includes several science experiments. The booster for this mission is expected to land on an ASDS. The mission will be complete with return and recovery of the Dragon capsule and down cargo.","crew":[],"ships":["5ea6ed2f080df4000697c910","614251b711a64135defb3654"],"capsules":["60b803421f83cc1e59f1644d"],"payloads":["6161d22a6db1a92bfba85357"],"launchpad":"5e9e4502f509094188566f88","flight_number":143,"name":"CRS-24","date_utc":"2021-12-21T10:06:00.000Z","date_unix":1640081160,"date_local":"2021-12-21T05:06:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"61c1ef45a4a2462678cbf45d","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":"878ba32c-5e93-4d2b-95c3-24b60c8b05e7","id":"6161d2006db1a92bfba85356"},{"fairings":{"reused":null,"recovery_attempt":true,"recovered":null,"ships":["614251b711a64135defb3654"]},"links":{"patch":{"small":"https://images2.imgbox.com/8e/e9/MJG9yylu_o.png","large":"https://images2.imgbox.com/e3/1b/r7u0e6SM_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/jhu37i/starlink_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/rwukw5/rspacex_starlink_45_launch_discussion_and_updates/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k

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-on-pace-for-one-launch-per-week-this-year/","wikipedia":"https://en.wi
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You should see the response contains massive information about SpaceX launches. Next, let's try to discover some more relevant information for this project.

Task 1: Request and parse the SpaceX launch data using the GET request

To make the requested JSON results more consistent, we will use the following static response object for this project:

In [10]:
```
static_json_url='https://cf-courses-data.s3.us.cloud-object-storage.ap
```

We should see that the request was successfull with the 200 status response code

In [11]:
```
response.status_code
```

Out[11]: 200

Now we decode the response content as a Json using `.json()` and turn it into a Pandas dataframe using `.json_normalize()`

In [14]:
```
response = requests.get(static_json_url)
```

In [15]:
```
# Use json_normalize method to convert the json result into a datafram
data = pd.json_normalize(response.json())
```

Using the dataframe `data` print the first 5 rows

In [16]:
```
# Get the head of the dataframe
data.head(5)
```

	static_fire_date_utc	static_fire_date_unix	tbd	net	window	
0	2006-03-17T00:00:00.000Z	1.142554e+09	False	False	0.0	5e9d0d
1	None	NaN	False	False	0.0	5e9d0d
2	None	NaN	False	False	0.0	5e9d0d

3	2008-09-20T00:00:00.000Z	1.221869e+09	False	False	0.0	5e9d0d
4	None	NaN	False	False	0.0	5e9d0d

You will notice that a lot of the data are IDs. For example the rocket column has no information about the rocket just an identification number.

We will now use the API again to get information about the launches using the IDs given for each launch. Specifically we will be using columns `rocket`, `payloads`, `launchpad`, and `cores`.

```
In [17]:  # Lets take a subset of our dataframe keeping only the features we wan
          data = data[['rocket', 'payloads', 'launchpad', 'cores', 'flight_numbe

          # We will remove rows with multiple cores because those are falcon roc
          data = data[data['cores'].map(len)==1]
          data = data[data['payloads'].map(len)==1]

          # Since payloads and cores are lists of size 1 we will also extract th
          data['cores'] = data['cores'].map(lambda x : x[0])
          data['payloads'] = data['payloads'].map(lambda x : x[0])

          # We also want to convert the date_utc to a datetime datatype and then
          data['date'] = pd.to_datetime(data['date_utc']).dt.date

          # Using the date we will restrict the dates of the launches
          data = data[data['date'] <= datetime.date(2020, 11, 13)]
```

- From the `rocket` we would like to learn the booster name

- From the `payload` we would like to learn the mass of the payload and the orbit that it is going to

- From the `launchpad` we would like to know the name of the launch site being used, the longitude, and the latitude.

- **From `cores` we would like to learn the outcome of the landing, the type of the landing, number of flights with that core, whether gridfins were used, whether the core is reused, whether legs were used, the landing pad used, the block of the core which is a number used to seperate version of cores, the number of times this specific core has been reused, and the serial of the core.**

The data from these requests will be stored in lists and will be used to create a new dataframe.

In [18]:
```python
#Global variables
BoosterVersion = []
PayloadMass = []
Orbit = []
LaunchSite = []
Outcome = []
Flights = []
GridFins = []
Reused = []
Legs = []
LandingPad = []
Block = []
ReusedCount = []
Serial = []
Longitude = []
Latitude = []
```

These functions will apply the outputs globally to the above variables. Let's take a looks at `BoosterVersion` variable. Before we apply `getBoosterVersion` the list is empty:

In [19]:
```python
BoosterVersion
```

Out[19]: `[]`

Now, let's apply `getBoosterVersion` function method to get the booster version

In [20]:
```python
# Call getBoosterVersion
getBoosterVersion(data)
```

the list has now been update

```
In [21]:   BoosterVersion[0:5]
```

Out[21]:   ['Falcon 1', 'Falcon 1', 'Falcon 1', 'Falcon 1', 'Falcon 9']

we can apply the rest of the functions here:

```
In [22]:   # Call getLaunchSite
           getLaunchSite(data)
```

```
In [23]:   # Call getPayloadData
           getPayloadData(data)
```

```
In [24]:   # Call getCoreData
           getCoreData(data)
```

Finally lets construct our dataset using the data we have obtained. We we combine the columns into a dictionary.

```
In [25]:   launch_dict = {'FlightNumber': list(data['flight_number']),
           'Date': list(data['date']),
           'BoosterVersion':BoosterVersion,
           'PayloadMass':PayloadMass,
           'Orbit':Orbit,
           'LaunchSite':LaunchSite,
           'Outcome':Outcome,
           'Flights':Flights,
           'GridFins':GridFins,
           'Reused':Reused,
           'Legs':Legs,
           'LandingPad':LandingPad,
           'Block':Block,
           'ReusedCount':ReusedCount,
           'Serial':Serial,
           'Longitude': Longitude,
           'Latitude': Latitude}
```

Then, we need to create a Pandas data frame from the dictionary launch_dict.

```
In [28]:   # Create a data from launch_dict
           df = pd.DataFrame.from_dict(launch_dict)
```

Show the summary of the dataframe

```
In [29]:   # Show the head of the dataframe
           df.head()
```

	FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite
0	1	2006-03-24	Falcon 1	20.0	LEO	Kwajalein Atoll
1	2	2007-03-21	Falcon 1	NaN	LEO	Kwajalein Atoll
2	4	2008-09-28	Falcon 1	165.0	LEO	Kwajalein Atoll
3	5	2009-07-13	Falcon 1	200.0	LEO	Kwajalein Atoll
4	6	2010-06-04	Falcon 9	NaN	LEO	CCSFS SLC 40

Task 2: Filter the dataframe to only include `Falcon 9` launches

Finally we will remove the Falcon 1 launches keeping only the Falcon 9 launches. Filter the data dataframe using the `BoosterVersion` column to only keep the Falcon 9 launches. Save the filtered data to a new dataframe called `data_falcon9`.

In [30]:
```python
data_falcon9 = df[df['BoosterVersion']!='Falcon 1']
```

Now that we have removed some values we should reset the FlgihtNumber column

In [31]:
```python
data_falcon9.loc[:,'FlightNumber'] = list(range(1, data_falcon9.shape[
data_falcon9
```

	FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite
4	1	2010-06-04	Falcon 9	NaN	LEO	CCSFS SLC 40
5	2	2012-05-22	Falcon 9	525.0	LEO	CCSFS SLC 40
6	3	2013-03-01	Falcon 9	677.0	ISS	CCSFS SLC 40
7	4	2013-09-29	Falcon 9	500.0	PO	VAFB SLC 4E
8	5	2013-12-03	Falcon 9	3170.0	GTO	CCSFS SLC 40
...	...	...	...	...	...	...
89	86	2020-09-03	Falcon 9	15600.0	VLEO	KSC LC 39A
90	87	2020-10-06	Falcon 9	15600.0	VLEO	KSC LC 39A
91	88	2020-10-18	Falcon 9	15600.0	VLEO	KSC LC 39A
92	89	2020-10-24	Falcon 9	15600.0	VLEO	CCSFS SLC 40
93	90	2020-11-05	Falcon 9	3681.0	MEO	CCSFS SLC 40

90 rows × 17 columns

Data Wrangling

We can see below that some of the rows are missing values in our dataset.

In [32]:
```python
data_falcon9.isnull().sum()
```

```
Out[32]: FlightNumber        0
         Date                0
         BoosterVersion      0
         PayloadMass         5
         Orbit               0
         LaunchSite          0
         Outcome             0
         Flights             0
         GridFins            0
         Reused              0
         Legs                0
         LandingPad         26
         Block               0
         ReusedCount         0
         Serial              0
         Longitude           0
         Latitude            0
         dtype: int64
```

Before we can continue we must deal with these missing values. The `LandingPad` column will retain None values to represent when landing pads were not used.

Task 3: Dealing with Missing Values

Calculate below the mean for the `PayloadMass` using the `.mean()`. Then use the mean and the `.replace()` function to replace `np.nan` values in the data with the mean you calculated.

```
In [34]: # Calculate the mean value of PayloadMass column and Replace the np.na
         data_falcon9 = data_falcon9.fillna(value={'PayloadMass': data_falcon9[
```

```
In [35]: data_falcon9['PayloadMass'].isnull().sum()
```

```
Out[35]: np.int64(0)
```

You should see the number of missing values of the `PayLoadMass` change to zero.

Now we should have no missing values in our dataset except for in `LandingPad`.

We can now export it to a **CSV** for the next section,but to make the answers consistent, in the next lab we will provide data in a pre-selected date range.

```
data_falcon9.to_csv('dataset_part_1.csv', index=False)
```

Authors

Joseph Santarcangelo has a PhD in Electrical Engineering, his research focused on using machine learning, signal processing, and computer vision to determine how videos impact human cognition. Joseph has been working for IBM since he completed his PhD.