SpaceX Falcon 9 first stage Landing Prediction

Lab 1: Collecting the data

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:

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

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 data from an AP
import requests
# Pandas is a software library written for the Python programming language for data
import pandas as pd
# NumPy is a library for the Python programming language, adding support for large,
import numpy as np
# Datetime is a library that allows us to represent dates
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 [2]:
```
# Takes the dataset and uses the rocket column to call the API and append the data
def getBoosterVersion(data):
    for x in data['rocket']:
       if x:
        response = requests.get("https://api.spacexdata.com/v4/rockets/"+str(x)).js
        BoosterVersion.append(response['name'])
```

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

In [3]:
```
# Takes the dataset and uses the launchpad column to call the API and append the da
def getLaunchSite(data):
    for x in data['launchpad']:
       if x:
         response = requests.get("https://api.spacexdata.com/v4/launchpads/"+str(x)
         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 [4]:
```
# Takes the dataset and uses the payloads column to call the API and append the dat
def getPayloadData(data):
    for load in data['payloads']:
       if load:
        response = requests.get("https://api.spacexdata.com/v4/payloads/"+load).jso
        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.

In [5]:
```
# Takes the dataset and uses the cores column to call the API and append the data t
def getCoreData(data):
    for core in data['cores']:
            if core['core'] != None:
                response = requests.get("https://api.spacexdata.com/v4/cores/"+core
                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['landing_type'
            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:

In [6]:
```
spacex_url="https://api.spacexdata.com/v4/launches/past"
```

In [7]:
```
response = requests.get(spacex_url)
```

Check the content of the response

In [8]:
```
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","lar
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s-reach-orbit.html","wikipedia":"https://en.wikipedia.org/wiki/DemoSat"},"static_fir
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n":"harmonic oscillation leading to premature engine shutdown"}],"details":"Successf
ul first stage burn and transition to second stage, maximum altitude 289 km, Prematu
re engine shutdown at T+7 min 30 s, Failed to reach orbit, Failed to recover first s
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tp://www.spacex.com/news/2013/02/11/falcon-1-flight-3-mission-summary","wikipedi
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ul, but the secondary payload was inserted into abnormally low orbit and lost due to
Falcon 9 boost stage engine failure, ISS visiting vehicle safety rules, and the prim
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age under some conditions.","crew":[],"ships":["5ea6ed2d080df4000697c902"],"capsule
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13-tonne to LEO capacity. Following second-stage separation from the first stage, an
attempt was made to perform an ocean touchdown test of the discarded booster vehicl
e. The test provided good test data on the experiment-its primary objective-but as t
he booster neared the ocean, aerodynamic forces caused an uncontrollable roll. The c
enter engine, depleted of fuel by centrifugal force, shut down resulting in the impa
ct and destruction of the vehicle.","crew":[],"ships":["5ea6ed2d080df4000697c90
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one-ses-8-launch/","wikipedia":"https://en.wikipedia.org/wiki/SES-8"},"static_fire_d
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8e1_o.jpg","https://farm9.staticflickr.com/8569/16169086873_4d8829832e_o.png"]},"pre

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en.wikipedia.org/wiki/Falcon_9_flight_10"},"static_fire_date_utc":"2015-12-19T04:57:
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5eda69973a809d1ec","success":true,"failures":[],"details":"Total payload mass was 1,
316 kg (2,901 lb) : 6 satellites weighing 172 kg each, plus two 142-kg mass simulato
rs. This was the second Falcon 9 booster equipped with landing legs. Following secon
d-stage separation, SpaceX conducted a controlled-descent test of the first stage, w
hich successfully decelerated from\xc2\xa0hypersonic velocity in the upper atmospher
e, made reentry and landing burns, deployed its legs and touched down on the ocean s
urface. As with the previous mission, the first stage then tipped over as expected a
nd was not recovered.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4bcb6c3b
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lw5s","article":"http://spacenews.com/41497spacex-launches-first-of-two-satellites-f
or-asiasat/","wikipedia":"https://en.wikipedia.org/wiki/AsiaSat_8"},"static_fire_dat
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chpad":"5e9e4501f509094ba4566f84","flight_number":16,"name":"AsiaSat 8","date_ut
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s":false,"landing_type":"ASDS","landpad":"5e9e3032383ecb761634e7cb"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87ce8ffd86e000604b33c"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/bc/a6/uDYvXvql_o.png","large":"https://images2.imgbox.com/30/47/WmtGcjW8_o.png"},"reddit":{"campaign":null,"launch":"http://www.reddit.com/r/spacex/comments/2vjm9e","media":null,"recovery":null},"flickr":{"small":[],"original":["https://farm9.staticflickr.com/8619/16511407538_9a25c5d8c6_o.jpg","https://farm9.staticflickr.com/8665/16697946612_1284e952b0_o.jpg","https://farm9.staticflickr.com/8570/16698990475_16524a93de_o.jpg","https://farm9.staticflickr.com/8681/16512864259_e849e496b1_o.jpg","https://farm9.staticflickr.com/8637/16079045013_1f0fab9b54_o.jpg","https://farm9.staticflickr.com/8601/16512864369_2bb896c344_o.jpg","https://farm9.staticflickr.com/8646/16697693861_a038331e0a_o.jpg","https://farm9.staticflickr.com/8680/16511407248_093635a243_o.jpg","https://farm9.staticflickr.com/8654/16511594820_451f194d53_o.jpg","https://farm9.staticflickr.com/8603/16673054016_472fb42a20_o.jpg"]},"presskit":"http://www.spacex.com/press/2015/02/11/dscovr-launch-update","webcast":"https://www.youtube.com/watch?v=OvHJSIKP0Hg","youtube_id":"OvHJSIKP0Hg","article":"https://spaceflightnow.com/2015/02/12/space-weather-observatory-blasts-off-after-17-year-wait/","wikipedia":"https://en.wikipedia.org/wiki/Deep_Space_Climate_Observatory"},"static_fire_date_utc":"2015-01-31T00:00:00.000Z","static_fire_date_unix":1422662400,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First launch under USAF\'s OSP 3 launch contract. First SpaceX launch to put a satellite to an orbit with an orbital altitude many times the distance to the Moon: Sun-Earth libration point L1. The first stage made a test flight descent to an over-ocean landing within 10 m (33 ft) of its intended target.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c"],"capsules":[],"payloads":["5eb0e4bdb6c3bb0006eeb1f7"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":20,"name":"DSCOVR","date_utc":"2015-02-11T23:03:00.000Z","date_unix":1423695780,"date_local":"2015-02-11T19:03:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a0f3591885be3b2636","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"Ocean","landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87ceaffd86e000604b33d"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/2b/65/8Hd65fHz_o.png","large":"https://images2.imgbox.com/3f/c9/ZczpJ97M_o.png"},"reddit":{"campaign":null,"launch":"http://www.reddit.com/r/spacex/comments/2x81fc","media":"https://www.reddit.com/r/spacex/comments/2xmumx","recovery":null},"flickr":{"small":[],"original":["https://farm9.staticflickr.com/8749/16788442562_ed460c2d9e_o.jpg","https://farm9.staticflickr.com/8586/16510243060_48d6a9b1f6_o.jpg","https://farm9.staticflickr.com/8641/16490359747_c043b8c61a_o.jpg","https://farm9.staticflickr.com/8636/16510241270_ca83157509_o.jpg","https://farm8.staticflickr.com/7618/16601658850_13b826e705_o.jpg","https://farm9.staticflickr.com/8617/16510041628_883af57512_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/abs-eutelsatfactsheet.pdf","webcast":"https://www.youtube.com/watch?v=mN7lyaCBzT8","youtube_id":"mN7lyaCBzT8","article":"https://www.space.com/28702-spacex-rocket-launches-satellites-video.html","wikipedia":"https://en.wikipedia.org/wiki/ABS-3A"},"static_fire_date_utc":"2015-02-25T19:10:00.000Z","static_fire_date_unix":1424891400,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"The launch was Boeing\'s first-ever conjoined launch of a lighter-weight dual-commsat stack that was specifically designed to take advantage of the lower-cost SpaceX Falcon 9 launch vehicle. Per satellite, launch costs were less than $30 million. The ABS satellite reached its final destination ahead of schedule and started operations on September 10.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4bdb6c3bb0006eeb1f8","5eb0e4bdb6c3bb0006eeb1f9"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":21,"name":"ABS-3A / Eutelsat 115W B","date_utc":"2015-03-02T03:50:00.000Z","date_unix":1425268200,"date_local":"2015-03-02T23:50:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"c

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m/7611/17171659711_42597fefed_o.jpg","https://farm9.staticflickr.com/8774/1717062441
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ceX_NASA_CRS-6_PressKit.pdf","webcast":"https://www.youtube.com/watch?v=csVpa25iqH
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n-9-successfully-launches-descends-to-off-balance-landing/","wikipedia":"https://en.
wikipedia.org/wiki/SpaceX_CRS-6"},"static_fire_date_utc":"2015-04-11T00:00:00.000
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t, SpaceX attempted a controlled-descent test of the first stage. The first stage co
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uck throttle valve resulting in a later-than-intended downthrottle.","crew":[],"ship
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ex/files/spacexthalesfactsheet_final.pdf","webcast":"https://www.youtube.com/watch?v
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04/28/falcon-9-rocket-powers-into-space-with-satellite-for-turkmenistan/","wikipedi
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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/","recovery":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/c9/57io

WDgW_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/com
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pg","https://farm2.staticflickr.com/1618/24151425850_1cb6040569_o.jpg","https://farm
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tions-of-the-oceans/","wikipedia":"https://en.wikipedia.org/wiki/Jason-3"},"static_f
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ails":"First launch of NASA and NOAA joint science mission under the NLS II launch c
ontract (not related to NASA CRS or USAF OSP3 contracts). Last launch of the origina
l Falcon 9 v1.1 launch vehicle. The Jason-3 satellite was successfully deployed to t
arget 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 fai
led to latch, so that the booster fell over and exploded.","crew":[],"ships":["5ea6e
d2f080df4000697c910","5ea6ed30080df4000697c912","5ea6ed30080df4000697c914"],"capsule
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7","flight_number":26,"name":"Jason 3","date_utc":"2016-01-17T15:42:00.000Z","date_u
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e,"legs":true,"reused":false,"landing_attempt":true,"landing_success":false,"landing
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e,"launch_library_id":null,"id":"5eb87cf0ffd86e000604b343"},{"fairings":{"reused":fa
lse,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"smal
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s9_press_kit_final.pdf","webcast":"https://www.youtube.com/watch?v=muDPSyO7-A0","you
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ing-satellite-finally-launched-on-falcon-9/","wikipedia":"https://en.wikipedia.org/w
iki/SES-9"},"static_fire_date_utc":"2016-10-02T14:11:00.000Z","static_fire_date_uni
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s":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 predict
ed, booster recovery failed: the spent first stage \\"landed hard\\", but the contro
lled-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","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4beb6c3bb0006eeb1ff"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":27,"name":"SES-9","date_utc":"2016-03-04T23:35:00.000Z","date_unix":1457134500,"date_local":"2016-03-04T19:35:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f359188def3b263d","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":"5eb87cf2ffd86e000604b344"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/72/1e/mA23xHqe_o.png","large":"https://images2.imgbox.com/36/d8/RyPKsTpC_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/4dtoly","media":"https://www.reddit.com/r/spacex/comments/4dtpxn/","recovery":"https://www.reddit.com/r/spacex/comments/4ee2zy"},"flickr":{"small":[],"original":["https://farm2.staticflickr.com/1633/25788014884_6a3f9ae183_o.jpg","https://farm2.staticflickr.com/1650/26300505022_8b8b9035e8_o.jpg","https://farm2.staticflickr.com/1486/25787998624_3ca213be1e_o.jpg","https://farm2.staticflickr.com/1450/26326628031_e1b08ec0b3_o.jpg","https://farm2.staticflickr.com/1670/26239020092_05e5e4c538_o.jpg","https://farm2.staticflickr.com/1709/26305479266_76b4d01caf_o.jpg","https://farm2.staticflickr.com/1645/26239017922_28c7ac50e0_o.jpg","https://farm2.staticflickr.com/1559/26288402056_6c5997ce66_o.jpg","https://farm2.staticflickr.com/1449/25709481274_60f8c77358_o.jpg","https://farm2.staticflickr.com/1671/26217360302_b66c3e384e_o.jpg","https://farm2.staticflickr.com/1704/26283822056_838c1103b9_o.jpg","https://farm2.staticflickr.com/1508/26217345472_118767c608_o.jpg","https://farm2.staticflickr.com/1495/25916886442_821a152917_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacex_crs8_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=7pUAydjne5M","youtube_id":"7pUAydjne5M","article":"https://spaceflightnow.com/2016/04/08/spacex-lands-rocket-on-floating-platform-after-station-resupply-launch/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-8"},"static_fire_date_utc":"2016-04-05T00:00:00.000Z","static_fire_date_unix":1459814400,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Dragon carried over 1500 kg of supplies and delivered (stowed in its trunk) the inflatable Bigelow Expandable Activity Module (BEAM) to the ISS for two years of in-orbit tests. The rocket\'s first stage landed smoothly on SpaceX\'s autonomous spaceport drone ship 9 minutes after liftoff, making this the first ever successful landing of a rocket booster on a ship at sea as part of an orbital launch. The first stage B1021 was later also the first orbital booster to be used again, when launching SES-10 on March 30, 2017.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c912","5ea6ed30080df4000697c913"],"capsules":["5e9e2c5cf3591885d43b266d"],"payloads":["5eb0e4bfb6c3bb0006eeb200"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":28,"name":"CRS-8","date_utc":"2016-04-08T20:43:00.000Z","date_unix":1460148180,"date_local":"2016-04-08T16:43:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a2f359182d0b3b263e","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":"5eb87cf3ffd86e000604b345"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/7a/90/Zdo2mijx_o.png","large":"https://images2.imgbox.com/2a/47/az2sxGIB_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/4gyh8z","launch":"https://www.reddit.com/r/spacex/comments/4htenu","media":"https://www.reddit.com/r/spacex/comments/4htg2g","recovery":"https://www.reddit.com/r/spacex/comments/4ihp1p"},"flickr":{"small":[],"original":["https://farm8.staticflickr.com/7340/27044931232_7b755276ec_o.jpg","https://farm8.staticflickr.com/7444/27028105566_1d3413daa7_o.jpg","https://farm8.staticflickr.com/7597/26778141961_e3bd237942_o.jpg","https://farm8.staticflickr.com/7079/26778141661_559b48ac80_o.jpg","https://farm8.staticflickr.com/7682/26778141401_c437b04b74_o.jpg","https://farm8.staticflickr.com/7706/26751237322_ceb6d56235_o.jpg","https://farm8.staticflickr.c

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4000697c90c","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":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cf9ffd86e000604b349"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/22/cc/DjPcsMhb_o.png","large":"https://images2.imgbox.com/0b/3e/aQpLZQHt_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/4pv6ws","launch":"https://www.reddit.com/r/spacex/comments/4xi7uq","media":"https://www.reddit.com/r/spacex/comments/4xkdfj","recovery":"https://www.reddit.com/r/spacex/comments/4y5xd1"},"flickr":{"small":[],"original":["https://farm9.staticflickr.com/8699/28965678292_17533229f3_o.jpg","https://farm9.staticflickr.com/8173/28453337463_b9d11eeb4c_o.jpg","https://farm8.staticflickr.com/7793/28453335533_3f5a0a5760_o.jpg","https://farm9.staticflickr.com/8784/28938085496_74b3fd0527_o.jpg","https://farm9.staticflickr.com/8337/28969742675_15f78369a1_o.jpg","https://farm9.staticflickr.com/8691/28353012603_ab83b6f5aa_o.jpg","https://farm9.staticflickr.com/8078/28351782813_58ca783e51_o.jpg"]},"presskit":"https://drive.google.com/open?id=0BwA3a65ef1Ovb0FkYnE5dElZRlU","webcast":"https://www.youtube.com/watch?v=QZTCEO0gvLo","youtube_id":"QZTCEO0gvLo","article":"https://spaceflightnow.com/2016/08/14/falcon-9-rocket-launches-japanese-satellite-then-nails-bullseye-landing/","wikipedia":"https://en.wikipedia.org/wiki/JCSAT-16"},"static_fire_date_utc":"2016-08-11T04:01:00.000Z","static_fire_date_unix":1470888060,"net":false,"window":7200,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First attempt to touch down from a ballistic trajectory using a single-engine landing burn. All previous landings from a ballistic trajectory had fired three engines on the landing-burn, which provided more braking force, but subjected the vehicle to greater structural stresses. The single-engine landing burn takes more time and fuel, but puts less stress on the vehicle.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c1b6c3bb0006eeb206"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":33,"name":"JCSAT-16","date_utc":"2016-08-14T05:26:00.000Z","date_unix":1471152360,"date_local":"2016-08-14T01:26:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a2f35918b8243b2643","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":"5eb87cfaffd86e000604b34a"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/0d/5b/8X01C3ov_o.png","large":"https://images2.imgbox.com/ff/19/KCI4DVla_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/4pv7jl","launch":null,"media":null,"recovery":null},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://www.youtube.com/watch?v=_BgJEXQkjNQ","youtube_id":"_BgJEXQkjNQ","article":"https://spaceflightnow.com/2016/09/01/spacex-rocket-and-israeli-satellite-destroyed-in-launch-pad-explosion/","wikipedia":"https://en.wikipedia.org/wiki/Amos-6"},"static_fire_date_utc":"2016-09-01T13:07:00.000Z","static_fire_date_unix":1472735220,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":false,"failures":[{"time":-165180,"altitude":0,"reason":"buckled liner in several of the COPV tanks, causing perforations 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 of personnel and there were no injuries.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4c1b6c3bb0006eeb207"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":34,"name":"Amos-6","date_utc":"2016-09-01T13:07:00.000Z","date_unix":1472735220,"date_local":"2016-09-01T09:07:00-04:0

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4/spacex-resumes-flights-with-on-target-launch-for-iridium/","wikipedia":"https://e
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5200,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"fail
ures":[],"details":"Return-to-flight mission after the loss of Amos-6 in September 2
016. Iridium NEXT will replace the original Iridium constellation, launched in the l
ate 1990s. Each 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 Ir
idium qualification units were supposed to ride a Dnepr rocket in April 2016 but wer
e delayed, so Iridium decided to qualify the first batch of 10 satellites instea
d.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed30080df4000697c912","5ea6ed
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d":"5e9e4502f509092b78566f87","flight_number":35,"name":"Iridium NEXT Mission 1","da
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0:54:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f3
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aq4"},"flickr":{"small":[],"original":["https://farm3.staticflickr.com/2815/32761844
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1.staticflickr.com/327/32153432924_09dd1482d8_o.jpg","https://farm3.staticflickr.com/2881/32183025803_36bf976b9e_o.jpg","https://farm3.staticflickr.com/2362/32183025493_2a37b4e22c_o.jpg","https://farm1.staticflickr.com/504/32178458813_ff47f61bb9_o.jpg","https://farm1.staticflickr.com/265/32176806823_879ccc5da0_o.jpg","https://farm1.staticflickr.com/401/32866357531_69c6d289ed_o.jpg","https://farm3.staticflickr.com/2105/32945170805_553d45ca56_o.jpg","https://farm4.staticflickr.com/3865/32945170225_58129f00dc_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/crs10presskitfinal.pdf","webcast":"https://www.youtube.com/watch?v=giNhaEzv_PI","youtube_id":"giNhaEzv_PI","article":"https://spaceflightnow.com/2017/02/19/historic-launch-pad-back-in-service-with-thundering-blastoff-by-spacex/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-10"},"static_fire_date_utc":"2017-02-12T21:30:00.000Z","static_fire_date_unix":1486935000,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First Falcon 9 flight from the historic LC-39A launchpad at Kennedy Space Center, carrying supplies and materials to support dozens of science and research investigations scheduled during ISS Expeditions 50 and 51. The first stage returned to launch site and landed at LZ-1.","crew":[],"ships":["5ea6ed30080df4000697c912"],"capsules":["5e9e2c5cf359185d753b266f"],"payloads":["5eb0e4c3b6c3bb0006eeb209"],"launchpad":"5e9e4502f509094188566f88","flight_number":36,"name":"CRS-10","date_utc":"2017-02-19T14:39:00.000Z","date_unix":1487515140,"date_local":"2017-02-19T10:39:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f3591829dc3b2646","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":"5eb87cfeffd86e000604b34d"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/56/9d/gvzAqLFg_o.png","large":"https://images2.imgbox.com/52/a0/z8Dwflcz_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/5n2e10/echostar_23_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/5z8dkm/welcome_to_the_rspacex_echostar23_official_launch/","media":"https://www.reddit.com/r/spacex/comments/5z8if6/rspacex_echostar_23_media_thread_videos_images/","recovery":null},"flickr":{"small":[],"original":["https://farm4.staticflickr.com/3819/33094074350_ae56bd5c73_o.jpg","https://farm3.staticflickr.com/2935/33094073720_92234ddaee_o.jpg","https://farm1.staticflickr.com/768/33094072690_31a85e82ba_o.jpg","https://farm3.staticflickr.com/2876/33094072100_546090a4f3_o.jpg","https://farm3.staticflickr.com/2860/32626053254_d702922d87_o.jpg","https://farm3.staticflickr.com/2904/32654666113_ba833971e0_o.jpg","https://farm1.staticflickr.com/677/32654665263_751d29ded1_o.jpg","https://farm3.staticflickr.com/2936/33299697331_09313ac49d_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/echostarxxiiifinal.pdf","webcast":"https://www.youtube.com/watch?v=lZmqbL-hz7U","youtube_id":"lZmqbL-hz7U","article":"http://spacenews.com/spacex-launches-echostar-23/","wikipedia":"https://en.wikipedia.org/wiki/EchoStar#Satellite_fleet"},"static_fire_date_utc":"2017-03-09T23:00:00.000Z","static_fire_date_unix":1489100400,"net":false,"window":9000,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Communications satellite for EchoStar Corp. EchoStar XXIII, based on a spare platform from the cancelled CMBStar 1 satellite program, will provide direct-to-home television broadcast services over Brazil. There was no attempt at a first-stage recovery so this rocket did not have landing legs or grid fins.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4c3b6c3bb0006eeb20a"],"launchpad":"5e9e4502f509094188566f88","flight_number":37,"name":"EchoStar 23","date_utc":"2017-03-16T06:00:00.000Z","date_unix":1489644000,"date_local":"2017-03-16T02:00:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f3591878473b2647","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":"5eb87cfeffd86e000604b34e"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/d0/c4/DFQ5TdPz_o.png","large":"https://images2.imgbox.com/9c/cf/tRe9z6t8_o.png"},"reddit":{"campaig

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d/","launch":"https://www.reddit.com/r/spacex/comments/62aqi7/rspacex_ses10_official
_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/62aqa
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s://www.youtube.com/watch?v=xsZSXav4wI8","youtube_id":"xsZSXav4wI8","article":"http
s://spaceflightnow.com/2017/03/31/spacex-flies-rocket-for-second-time-in-historic-te
st-of-cost-cutting-technology/","wikipedia":"https://en.wikipedia.org/wiki/SES-1
0"},"static_fire_date_utc":"2017-03-27T18:00:00.000Z","static_fire_date_unix":149063
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ly launched with CRS-8, which also landed a second time. In what is also a first, th
e payload fairing remained intact after a successful splashdown achieved with thrust
ers and a steerable parachute.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6e
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5/01/spacex-successfully-launches-nrol-76-u-s-military-satellite/","wikipedia":"http
s://en.wikipedia.org/wiki/List_of_NRO_launches"},"static_fire_date_utc":"2017-04-25T

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nder SpaceX\'s certification for national security space missions, which allows Spac
eX to contract launch services for classified payloads. Second-stage speed and altit
ude telemetry were omitted from the launch webcast, which displayed first-stage tele
metry instead, with continuous tracking of the booster from liftoff to landing for t
he first time.","crew":[],"ships":["5ea6ed2f080df4000697c90c"],"capsules":[],"payloa
ds":["5eb0e4c3b6c3bb0006eeb20c"],"launchpad":"5e9e4502f509094188566f88","flight_numb
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cex/files/inmarsat5f4presskit_final.pdf","webcast":"https://www.youtube.com/watch?v=
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x-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
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launched to GTO by a Falcon 9 rocket. The launch was originally scheduled for the Fa
lcon Heavy, but performance improvements allowed the mission to be carried out by an
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es/spacex/files/crs11presskit.pdf","webcast":"https://www.youtube.com/watch?v=JuZBOU
MsYws","youtube_id":"JuZBOUMsYws","article":"https://spaceflightnow.com/2017/06/03/r
eused-dragon-cargo-capsule-launched-on-journey-to-space-station/","wikipedia":"http
s://en.wikipedia.org/wiki/SpaceX_CRS-11"},"static_fire_date_utc":"2017-05-28T16:00:0
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Neutron Star Interior Composition Explorer (NICER) to the ISS, along with the MUSES
Earth imaging platform and ROSA solar array. For the first time, this mission launch
ed a refurbished Dragon capsule, serial number C106 which first flew in September 20
14 on the CRS-4 mission. Originally scheduled to launch on June 1, but was scrubbed
due to inclement weather.","crew":[],"ships":["5ea6ed30080df4000697c912"],"capsule
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e.com/watch?v=Y8mLi-rRTh8","youtube_id":"Y8mLi-rRTh8","article":"https://en.wikipedi
a.org/wiki/BulgariaSat-1","wikipedia":"https://en.wikipedia.org/wiki/BulgariaSat-
1"},"static_fire_date_utc":"2017-06-15T22:25:00.000Z","static_fire_date_unix":149756
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ailures":[],"details":"Second time a booster will be reused: Second flight of B1029
after the Iridium mission of January 2017. The satellite will be the first commercia
l Bulgarian-owned communications satellite and it will provide television broadcasts
and other communications services over southeast Europe.","crew":[],"ships":["5ea6ed
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2017/08/17/photos-falcon-9-rocket-soars-into-space-lands-back-at-cape-canaveral/","w
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xpected to carry 2,349 kg (5,179 lb) of pressurized mass and 961 kg (2,119 lb) unpre
ssurized. The external payload manifested for this flight is the CREAM cosmic-ray de
tector. First flight of the Falcon 9 Block 4 upgrade. Last flight of a newly-built D
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25/taiwanese-satellite-rides-spacex-rocket-into-orbit/","wikipedia":"https://en.wiki
pedia.org/wiki/Formosat-5"},"static_fire_date_utc":"2017-08-24T18:50:00.000Z","stati
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r/spacex/comments/6u6q1t/x37b_otv5_launch_campaign_thread/","launch":"https://www.re

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ube.com/watch?v=OPHbqY9LHCs","youtube_id":"OPHbqY9LHCs","article":"https://spaceflig
htnow.com/2017/12/15/spacexs-50th-falcon-rocket-launch-kicks-off-station-resupply-mi
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lightnow.com/2017/12/23/spacex-launch-dazzles-delivering-10-more-satellites-for-irid
ium/","wikipedia":"https://en.wikipedia.org/wiki/Iridium_satellite_constellation#Nex
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x-kicks-off-ambitious-2018-schedule-with-launch-for-u-s-government/","wikipedia":"ht
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s://spaceflightnow.com/2018/01/31/spacex-rocket-flies-on-60th-anniversary-of-first-u
-s-satellite-launch/","wikipedia":"https://en.wikipedia.org/wiki/List_of_SES_satelli
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n in May 2017. Following a successful experimental ocean landing that used three eng
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tnow.com/2018/02/07/spacex-debuts-worlds-most-powerful-rocket-sends-tesla-toward-the
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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":"2018-04-02T20:30:41.000Z","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.staticfl

ickr.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-survey or-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.imgbox.com/97/bf/G9sPBnrg_o.png","large":"https://images2.imgbox.com/8e/80/QIE1XB30_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/8624iq/bangabandhu1_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/8ia091/rspacex_bangabandhu1_official_launch_discussion","media":"https://www.reddit.com/r/spacex/comments/8ia5bu/rspacex_bangabandhu1_media_thread_videos_images/","recovery":"https://www.reddit.com/r/spacex/comments/8j6moa/bangabandhu1_block_5_recovery_thread/"},"flickr":{"small":[],"original":["https://farm1.staticflickr.com/903/28197547888_dd697d8147_o.jpg","https://farm1.staticflickr.com/823/42025498712_8ec531950f_o.jpg","https://farm1.staticflickr.com/975/28197546158_880e466fb6_o.jpg","https://farm1.staticflickr.com/823/27200014957_940f3720bb_o.jpg","https://farm1.staticflickr.com/945/42025498442_0b7b91d561_o.jpg","https://farm1.staticflickr.com/967/42025498972_8720104d8a_o.jpg","https://farm1.staticflickr.com/954/42025499162_8a0ef7feaa_o.jpg","https://farm1.staticflickr.com/911/42025499722_47d3433d65_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/bangabandhupresskit51118.pdf","webcast":"https://www.youtube.com/watch?v=rQEqKZ7CJlk","youtube_id":"rQEqKZ7CJlk","article":"https://spaceflightnow.com/2018/05/11/spacex-debuts-an-improved-human-rated-model-of-the-falcon-9-rocket/","wikipedia":"https://en.wikipedia.org/wiki/Bangabandhu-1"},"static_fire_date_utc":"2018-05-04T23:25:00.000Z","static_fire_date_unix":1525476300,"net":false,"window":7620,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"First launch of a Block V first stage.","crew":[],"ships":["5ea6ed2e080df4000697c90a","5ea6ed2f080df4000697c90b","5ea6ed30080df4000697c913","5ea6ed30080df4000697c916"],"capsules":[],"payloads":["5eb0e4c7b6c3bb0006eeb223"],"launchpad":"5e9e4502f509094188566f88","flight_number":61,"name":"Bangabandhu-1","date_utc":"2018-05-11T20:14:00.000Z","date_unix":1526069640,"date_local":"2018-05-11T16:14:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f359182b023b2656","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7c

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by-spacex-serves-commercial-and-scientific-customers/","wikipedia":"https://en.wikip
edia.org/wiki/Gravity_Recovery_and_Climate_Experiment"},"static_fire_date_utc":"2018
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a rideshare of GRACE-FO on a Falcon 9 with Iridium following the cancellation of the
ir Dnepr launch contract in 2015. Iridium CEO Matt Desch disclosed in September 2017
that GRACE-FO would be launched on the sixth Iridium NEXT mission. The booster reuse
turnaround was a record 4.5 months between flights.","crew":[],"ships":["5ea6ed2e080
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ion-telecom-craft-launched-by-spacex-for-ses/","wikipedia":"https://en.wikipedia.or
g/wiki/SES-12"},"static_fire_date_utc":"2018-05-25T01:48:00.000Z","static_fire_date_
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ess":true,"failures":[],"details":"SES-12, the replacement satellite for NSS-6, was
successfully launched and deployed on June 4th, completing SpaceX\'s eleventh flight
of 2018. According to SES Luxembourg, The SES-12 satellite will expand SES\xe2\x80\x
99s capabilities to provide direct-to-home (DTH) broadcasting, VSAT, Mobility and Hi
gh Throughput Satellite (HTS) data connectivity services in the Middle East and the
Asia-Pacific region, including rapidly growing markets such as India and Indonesia.
[SES-12] will be co-located with SES-8","crew":[],"ships":["5ea6ed2e080df4000697c90
a"],"capsules":[],"payloads":["5eb0e4c8b6c3bb0006eeb226"],"launchpad":"5e9e4501f5090

94ba4566f84","flight_number":63,"name":"SES-12","date_utc":"2018-06-04T04:45:00.000
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spacex/comments/8ugo3l/rspacex_crs15_official_launch_discussion_updates","media":"ht
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x-launches-ai-enabled-robot-companion-vegetation-monitor-to-space-station/","wikiped
ia":"https://en.wikipedia.org/wiki/SpaceX_CRS-15"},"static_fire_date_utc":"2018-06-2
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t":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Payload includ
ed MISSE-FF 2, ECOSTRESS, and a Latching End Effector. The refurbished booster featu
red a record 2.5 months period turnaround from its original launch of the TESS satel
lite \xe2\x80\x94 the fastest previous was 4.5 months. This was the last commercial
flight of a Block 4 booster, which was expended into the Atlantic without landing le
gs and grid fins.","crew":[],"ships":["5ea6ed30080df4000697c912"],"capsules":["5e9e2
c5cf359183bb73b266e"],"payloads":["5eb0e4c8b6c3bb0006eeb227"],"launchpad":"5e9e4501f
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s://farm1.staticflickr.com/914/29700004918_31ed7b73ef_o.jpg","https://farm1.staticfl
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star19vantagepresskit.pdf","webcast":"https://www.youtube.com/watch?v=xybp6zLaGx
4","youtube_id":"xybp6zLaGx4","article":"https://spaceflightnow.com/2018/07/22/space
x-delivers-for-telesat-with-successful-early-morning-launch/","wikipedia":"https://e
n.wikipedia.org/wiki/Telstar_19V"},"static_fire_date_utc":"2018-07-18T21:00:00.000
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ons satellite intended to be placed at 63\xc2\xb0 West over the Americas. At 7,075 k
g, it became the heaviest commercial communications satellite ever launched.","cre
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000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c8b6c3bb000
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ps://www.reddit.com/r/spacex/comments/91gx44/rspacex_iridium_next_constellation_miss
ion_7/","recovery":null},"flickr":{"small":[],"original":["https://farm1.staticflick
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pg","https://farm1.staticflickr.com/928/28787338507_3be74590d2_o.jpg"]},"presski
t":"http://www.spacex.com/sites/spacex/files/iridium7_press_kit_7_24.pdf","webcas
t":"https://www.youtube.com/watch?v=vsDknmK30C0","youtube_id":"vsDknmK30C0","articl
e":"https://spaceflightnow.com/2018/07/25/spacexs-second-launch-in-three-days-lofts-
10-more-iridium-satellites/","wikipedia":"https://en.wikipedia.org/wiki/Iridium_sate
llite_constellation#Next-generation_constellation"},"static_fire_date_utc":"2018-07-
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t":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s four
teenth flight of 2018 and seventh of eight launches in a half-a-billion-dollar contr
act with Iridium. Will use a Block 5 first stage, to be recovered in the Pacific Oce
an. Only one mission will be left for Iridium, with 10 more satellites. First attemp
t to recover a Fairing with the upgraded net. Fairing recovery was not successfu
l.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed2e080df4000697c908","5ea6ed
30080df4000697c912","5ea6ed30080df4000697c914"],"capsules":[],"payloads":["5eb0e4c9b
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e":"Iridium NEXT Mission 7","date_utc":"2018-07-25T11:39:26.000Z","date_unix":153251
8766,"date_local":"2018-07-25T04:39:26-07:00","date_precision":"hour","upcoming":fal
se,"cores":[{"core":"5e9e28a5f3591809c03b2658","flight":1,"gridfins":true,"legs":tru
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OYfZ_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/91gwfg/m
erah_putih_telkom4_launch_campaign_thread/","launch":"https://www.reddit.com/r/space
x/comments/9539nr/rspacex_merah_putih_telkom4_official_launch/","media":"https://ww
w.reddit.com/r/spacex/comments/94zr0b/rspacex_merah_putih_media_thread_videos_image
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g","https://farm2.staticflickr.com/1780/43006334045_fb7b4a8714_o.jpg","https://farm
1.staticflickr.com/929/28974335747_ffd87ff274_o.jpg","https://farm1.staticflickr.co
m/930/30041972208_f735b9690b_o.jpg"]},"presskit":"https://www.spacex.com/sites/space
x/files/merahputihpresskit.pdf","webcast":"https://www.youtube.com/watch?v=FjfQNBYv2
IY","youtube_id":"FjfQNBYv2IY","article":"https://spaceflightnow.com/2018/08/07/indo
nesian-communications-satellite-deployed-in-orbit-by-spacex/","wikipedia":"https://e
n.wikipedia.org/wiki/Telkom_Indonesia"},"static_fire_date_utc":"2018-08-02T15:53:00.
000Z","static_fire_date_unix":1533225180,"net":false,"window":7200,"rocket":"5e9d0d9
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t of 2018 launched the Merah Putih (also known as Telkom-4) geostationary communicat
ions satellite for Telkom Indonesia. It marked the first reuse of any Block 5 first
stage; the booster B1046 had previously launched Bangabandhu-1. The stage was recove
red and is expected to become the first Falcon 9 booster to fly three missions.","cr
ew":[],"ships":["5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":
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ype":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"l
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reddit.com/r/spacex/comments/9e7bmq/rspacex_telstar_18v_official_launch_discussio
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jpg","https://farm2.staticflickr.com/1869/43881193934_423eff8c86_o.jpg"]},"presski
t":"https://www.spacex.com/sites/spacex/files/telstar18vantagepresskit.pdf","webcas
t":"https://www.youtube.com/watch?v=Apw3xqwsG1U","youtube_id":"Apw3xqwsG1U","articl
e":"https://spaceflightnow.com/2018/09/10/spacex-telesat-achieve-repeat-success-with
-midnight-hour-launch/","wikipedia":"https://en.wikipedia.org/wiki/Telstar_18V"},"st
atic_fire_date_utc":"2018-09-05T07:21:00.000Z","static_fire_date_unix":1536132060,"n
et":false,"window":14400,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failure
s":[],"details":"SpaceX\'s sixteenth flight of 2018 launched the Telstar 18v GEO com
munication satellite for Telesat, the second launch for the canadian company in a fe
w months. The first stage was a new Falcon 9 V1.2 Block 5 which was successfully rec
overed on OCISLY.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df40006
97c90d","5ea6ed2f080df4000697c90b"],"capsules":[],"payloads":["5eb0e4c9b6c3bb0006eeb
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V","date_utc":"2018-09-10T04:45:00.000Z","date_unix":1536554700,"date_local":"2018-0
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_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ec
b6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d2
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thread/","launch":"https://www.reddit.com/r/spacex/comments/9lazvr/rspacex_saocom_1a
_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/9m3l
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2.staticflickr.com/1951/30234801997_b5a65426ca_o.jpg","https://farm2.staticflickr.co
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t":"https://www.spacex.com/sites/spacex/files/saocom1apresskit.pdf","webcast":"http
s://www.youtube.com/watch?v=vr_C6LQ7mHc","youtube_id":"vr_C6LQ7mHc","article":"http

s://spaceflightnow.com/2018/10/08/spacex-aces-first-rocket-landing-in-california-after-launching-argentine-satellite/","wikipedia":"https://en.wikipedia.org/wiki/SAOCOM"},"static_fire_date_utc":"2018-10-02T21:00:00.000Z","static_fire_date_unix":1538514000,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s seventeenth flight of 2018 was the first launch of the Saocom Earth observation satellite constellation of the Argentine Space Agency CONAE. The second launch of Saocom 1B will happen in 2019. This flight marked the first RTLS launch out of Vandenberg, with a landing on the concrete pad at SLC-4W, very close to the launch pad.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4c9b6c3bb0006eeb22c"],"launchpad":"5e9e4502f509092b78566f87","flight_number":69,"name":"SAOCOM 1A","date_utc":"2018-10-08T02:22:00.000Z","date_unix":1538965320,"date_local":"2018-10-07T19:22:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591809c03b2658","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":"5eb87d23ffd86e000604b36e"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/ad/40/oCtCFYfl_o.png","large":"https://images2.imgbox.com/7c/8a/j6Hu3TqR_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/9p82jt/eshail_2_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/9x9w9v/rspacex_eshail_2_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/9xaa76/rspacex_eshail_2_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/9xmpa7/eshail_2_recovery_thread/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4834/32040174268_b71d703417_o.jpg","https://farm5.staticflickr.com/4810/32040174058_a65fa64e85_o.jpg","https://farm5.staticflickr.com/4814/32040173268_0ab571e7bc_o.jpg","https://farm5.staticflickr.com/4899/32040173568_bb5c991565_o.jpg","https://farm5.staticflickr.com/4875/32040173278_b5578ba6be_o.jpg","https://farm5.staticflickr.com/4862/32040173928_afdfb09939_o.jpg","https://farm5.staticflickr.com/4888/32040173048_b2b29c020f_o.jpg","https://farm5.staticflickr.com/4808/32248947038_dd1cf9e8c3_o.jpg","https://farm5.staticflickr.com/4887/31180979107_da6a935c20_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/eshail-2_mission_press_kit_11_14_2018.pdf","webcast":"https://www.youtube.com/watch?v=PhTbzc-BqKs&feature=youtu.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_date_utc":"2018-11-12T18:13:00.000Z","static_fire_date_unix":1542046380,"net":false,"window":6180,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s eighteenth flight of 2018 was its first for Es\'hailSat. Es\'hail-2 is a communications satellite delivering television and internet to Qatar and the surrounding region. It was launched into a geostationary transfer orbit from LC-39A at Kennedy Space Center. The booster landed on OCISLY.","crew":[],"ships":["5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c9b6c3bb0006eeb22d"],"launchpad":"5e9e4502f509094188566f88","flight_number":70,"name":"Es\xe2\x80\x99hail 2","date_utc":"2018-11-15T20:46:00.000Z","date_unix":1542314760,"date_local":"2018-11-15T15:46:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f359181eed3b2657","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":"5eb87d24ffd86e000604b36f"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":false,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/48/3b/Lg1Qc4uX_o.png","large":"https://images2.imgbox.com/3e/87/xYszAJQc_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/9raysi/ssoa_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/a0vjff/rspacex_ssoa_official_launch_discussion_updates/","media":"https://old.reddit.com/r/spacex/comments/a0wylf/rspacex_ssoa_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/a2tjoe/ssoa_recovery_thr

ead/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4875/45257565145_d53757e0b2_o.jpg","https://farm5.staticflickr.com/4839/45257565835_4fd6f3e895_o.jpg","https://farm5.staticflickr.com/4822/45257566865_9c9d34a7ca_o.jpg","https://farm5.staticflickr.com/4821/45257568225_186c8431cf_o.jpg","https://farm5.staticflickr.com/4885/45257569445_1d74a601df_o.jpg","https://farm5.staticflickr.com/4869/45257570925_8eae9a0888_o.jpg","https://farm5.staticflickr.com/4842/31338804427_2e4dcda6e7_o.jpg","https://farm5.staticflickr.com/4894/46227271292_2eee9af3eb_o.jpg","https://farm5.staticflickr.com/4870/44460659210_de634098ac_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/ssoa_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=Wq8kS6UoOrQ","youtube_id":"Wq8kS6UoOrQ","article":"https://spaceflightnow.com/2018/12/03/spacex-launches-swarm-of-satellites-re-flies-rocket-for-third-time/","wikipedia":"https://en.wikipedia.org/wiki/Spaceflight_Industries"},"static_fire_date_utc":"2018-11-15T21:55:00.000Z","static_fire_date_unix":1542318900,"net":false,"window":1680,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s nineteenth flight of 2018 will fly 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 individual microsatellites and cubesats. It is also likely to be the third flight of core B1046 which previously flew Bangabandhu-1 and Merah Putih. If this happens it will be the first time a Falcon 9 has flown more than two missions. ","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed30080df4000697c912","5ea6ed30080df4000697c914","5ea6ed2e080df4000697c908"],"capsules":[],"payloads":["5eb0e4c9b6c3bb0006eeb22e"],"launchpad":"5e9e4502f509092b78566f87","flight_number":71,"name":"SSO-A","date_utc":"2018-12-03T18:34:00.000Z","date_unix":1543861920,"date_local":"2018-12-03T10:34:00-08:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f359182b023b2656","flight":3,"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":"5eb87d25ffd86e000604b370"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/f0/a6/oNKZP5Hu_o.png","large":"https://images2.imgbox.com/ee/c6/MkvXHhu1_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/9z7i4j/crs16_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/a2oubw/rspacex_crs16_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/a2uojp/rspacex_crs16_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/a3n3vm/crs16_emergency_recovery_thread/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4835/45473442624_69ee8bee45_o.jpg","https://farm5.staticflickr.com/4903/45473443604_0d668c31da_o.jpg","https://farm5.staticflickr.com/4858/45473444314_413a344dcb_o.jpg","https://farm5.staticflickr.com/4856/45473445134_d9384878f8_o.jpg","https://farm5.staticflickr.com/4840/45473446114_7d5e5d6fe2_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/crs16_press_kit_12_4.pdf","webcast":"https://www.youtube.com/watch?v=Esh1jHT9oTA","youtube_id":"Esh1jHT9oTA","article":"https://spaceflightnow.com/2018/12/05/spacex-falcon-9-boosts-dragon-cargo-ship-to-orbit-first-stage-misses-landing-target/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-16"},"static_fire_date_utc":"2018-11-30T19:57:00.000Z","static_fire_date_unix":1543607820,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s 16th Crew Resupply Mission on behalf of NASA, with a total of 20 contracted flights. This will bring essential supplies to the International Space Station using SpaceX\'s reusable Dragon spacecraft. The Falcon 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, causing the core to enter an uncontrolled roll, and resulting in a (succesful) water landing.","crew":[],"ships":["5ea6ed2f080df4000697c90b"],"capsules":["5e9e2c5cf359185d753b266f"],"payloads":["5eb0e4cab6c3bb0006eeb22f"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":72,"name":"CRS-16","date_utc":"2018-12-05T18:16:00.000Z","date_unix":1544033760,"date_local":"2018-12-05T13:16:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f359185c603b265a","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"la

nding_success":false,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d26ffd86e000604b371"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/3c/2f/tL7xDUD6_o.png","large":"https://images2.imgbox.com/f9/31/MGTnAfuR_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/a4516o/gps_iii2_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/a71wyn/rspacex_gps_iii2_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/a73kz5/rspacex_gps_iii2_media_thread_videos_images_gifs/","recovery":null},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4864/45715171884_f1dd88c058_o.jpg","https://farm8.staticflickr.com/7926/45525648155_32fdab17a5_o.jpg","https://farm8.staticflickr.com/7876/45525649035_ba60162fe0_o.jpg","https://farm8.staticflickr.com/7853/45525649825_e6d35415e1_o.jpg","https://farm5.staticflickr.com/4893/45525650685_02b408c385_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/gps_iii_press_kit.pdf","webcast":"https://youtu.be/yRiLPoy_Mzc","youtube_id":"yRiLPoy_Mzc","article":"https://spaceflightnow.com/2018/12/23/spacex-closes-out-year-with-successful-gps-satellite-launch/","wikipedia":"https://en.wikipedia.org/wiki/GPS_Block_IIIA"},"static_fire_date_utc":"2018-12-13T21:24:00.000Z","static_fire_date_unix":1544736240,"net":false,"window":1560,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s twenty-first flight of 2018 launched the first of the new GPS III satellites (Block IIIA) for the United States Air Force and was SpaceX\'s first EELV mission. The spacecraft was delivered to a MEO transfer orbit from SLC-40 at Cape Canaveral Air Force Station. This mission was the first to fly with the redesigned COPV on the first stage (B1054) as well as the second. The booster was expended.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4cab6c3bb0006eeb230"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":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"],"launch

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e,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTL
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e":"https://spaceflightnow.com/2019/05/04/spacex-launches-space-station-resupply-mis
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CRS-17"},"static_fire_date_utc":"2019-04-27T07:23:00.000Z","static_fire_date_unix":1
556349780,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":tru
e,"failures":[],"details":"SpaceX\'s 17th Commercial Resupply Services mission for N
ASA 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 Te
st Program-Houston 6. The Falcon 9 launches from SLC-40 at Cape Canaveral AFS. The b
ooster was expected to land at LZ-1, however, due to the ongoing investigation and c
lean-up following the Crew Dragon testing incident, it is likely to land on OCISLY i
nstead.\\n   ","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c
90e","5ea6ed2f080df4000697c90b"],"capsules":["5e9e2c5cf3591869b63b2670"],"payloads":
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78,"name":"CRS-17","date_utc":"2019-05-04T06:48:00.000Z","date_unix":1556952480,"dat
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ive.staticflickr.com/65535/47926144123_2a828b66d5_o.jpg","https://live.staticflickr.
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ink_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.o
rg/wiki/Starlink_(satellite_constellation)"},"static_fire_date_utc":"2019-05-13T20:0

6:00.000Z","static_fire_date_unix":1557777960,"net":false,"window":9000,"rocket":"5e
9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch d
ozens 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 laten
cy 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":["5ea6ed30080df4000697c91
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9","date_utc":"2019-05-24T02:30:00.000Z","date_unix":1558665000,"date_local":"2019-0
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ssion_press_kit.pdf","webcast":"https://youtu.be/8A2nJd9Urk8","youtube_id":"8A2nJd9U
rk8","article":"https://spaceflightnow.com/2019/06/12/three-canadian-radar-surveilla
nce-satellites-ride-spacex-rocket-into-orbit/","wikipedia":"https://en.wikipedia.or
g/wiki/RADARSAT_Constellation"},"static_fire_date_utc":"2019-06-08T08:39:00.000Z","s
tatic_fire_date_unix":1559983140,"net":false,"window":780,"rocket":"5e9d0d95eda69973
a809d1ec","success":true,"failures":[],"details":"SpaceX is launching the three sate
llite RADARSAT Constellation Mission into Sun Synchronous orbit from SLC-4E, VAFB. T
he RCM spacecraft are synthetic aperture radar (SAR) Earth observation satellites bu
ilt 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 boos
ter is expected to return to LZ-4.","crew":[],"ships":[],"capsules":[],"payloads":
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ype":"RTLS","landpad":"5e9e3032383ecb554034e7c9"}],"auto_update":true,"tbd":false,"l
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cex/files/stp-2_press_kit.pdf","webcast":"https://youtu.be/WxH4CAlhtiQ","youtube_i
d":"WxH4CAlhtiQ","article":"https://spaceflightnow.com/2019/06/25/falcon-heavy-launc
hes-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.
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a rideshare managed by the U.S. Air Force Space and Missile Systems Center (SMC), la
unching from LC-39A, KSC. Most of the spacecraft will be delivered into low Earth or
bit (LEO) in two deployment sequences separated by a second stage burn. These LEO pa
yloads include the six Taiwan and United States owned COSMIC-2 microsatellites, the
Planetary Society\'s LightSail-B demonstrator cubesat, and others. The third and fin
al deployment will be the Air Force Research Lab\'s DSX spacecraft, which will be de
livered to a medium Earth orbit (MEO). This mission will reuse the side cores from A
rabsat 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":["5ea6ed3
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0:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591
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_updates/","media":"https://www.reddit.com/r/spacex/comments/chbr8i/rspacex_crs18_me
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spaceflightnow.com/2019/07/25/new-docking-port-spacesuit-and-supplies-en-route-to-sp
ace-station/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-18"},"static_fir
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e,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"detai
ls":"SpaceX\'s 18th Commercial Resupply Services mission out of a total of 20 such c
ontracted flights for NASA, this launch will deliver essential supplies to the Inter
national Space Station using the reusable Dragon 1 cargo spacecraft. The external pa
yload for this mission is International Docking Adapter 3, replacing IDA-1 lost in S

paceX\'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 expected to land back at CCAFS LZ-1.","crew":[],"ships":[],"capsules":["5e9e2c5cf359188bfb3b266b"],"payloads":["5eb0e4ceb6c3bb0006eeb24a"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":82,"name":"CRS-18","date_utc":"2019-07-25T22:01:00.000Z","date_unix":1564092060,"date_local":"2019-07-25T18:01:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591809313b2660","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d36ffd86e000604b37b"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/65/c2/MMGkhdcA_o.png","large":"https://images2.imgbox.com/9e/6f/oaYZfAoF_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/cjaawx/amos17_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/cmedgn/rspacex_amos17_official_launch_discussion_updates","media":"https://www.reddit.com/r/spacex/comments/cmppne/rspacex_amos17_media_thread_videos_images_gifs","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/48478269312_58dd3dc446_o.jpg","https://live.staticflickr.com/65535/48478269747_353dcb2e62_o.jpg","https://live.staticflickr.com/65535/48478119901_2de0441026_o.jpg","https://live.staticflickr.com/65535/48478120646_ab72c2c6c3_o.jpg","https://live.staticflickr.com/65535/48478120031_5aae1f6131_o.jpg","https://live.staticflickr.com/65535/48478269442_08479bed36_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/amos-17_mission_press_kit_8_6_2019.pdf","webcast":"https://youtu.be/fZh82-WcCuo","youtube_id":"fZh82-WcCuo","article":"https://spaceflightnow.com/2019/08/07/spacex-launches-israeli-owned-telecom-satellite/","wikipedia":"https://en.wikipedia.org/wiki/Spacecom"},"static_fire_date_utc":"2019-08-01T00:00:00.000Z","static_fire_date_unix":1564617600,"net":false,"window":5280,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch Boeing built Amos-17, a geostationary communications satellite for Israeli company 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\xb0 E. Amos-17 carries multi-band high throughput and regional beams servicing Africa, Europe and the Middle East. The cost of this launch is covered for Spacecom by SpaceX credit following the Amos-6 incident. A recovery of the booster for this mission is not expected.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c909"],"capsules":[],"payloads":["5eb0e4cfb6c3bb0006eeb24b"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":83,"name":"Amos-17","date_utc":"2019-08-06T22:52:00.000Z","date_unix":1565131920,"date_local":"2019-08-06T18:52:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f359181eed3b2657","flight":3,"gridfins":false,"legs":false,"reused":true,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d37ffd86e000604b37c"},{"fairings":{"reused":true,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/61/a6/1MnnbXIF_o.png","large":"https://images2.imgbox.com/3a/d1/R1MaGiiV_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/dgqcb6/2nd_starlink_mission_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/du07rt/rspacex_starlink1_official_launch_discussion","media":"https://www.reddit.com/r/spacex/comments/durx53/rspacex_starlink_1_media_thread_videos_images","recovery":"https://www.reddit.com/r/spacex/comments/du1duu/starlink1_booster_and_fairing_recovery_discussion"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/49051988851_0b422e1603_o.jpg","https://live.staticflickr.com/65535/49051988746_1a97e38ca8_o.jpg","https://live.staticflickr.com/65535/49052201452_c3b01e37f0_o.jpg","https://live.staticflickr.com/65535/49051988636_3714a78787_o.jpg","https://live.staticflickr.com/65535/49051477088_d86104481d_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/starlink_press_kit_nov2019.pdf","webcast":"https://youtu.be/pIDuv0Ta0XQ","youtube_id":"pIDuv0Ta0XQ","article":"https://spaceflightnow.com/2019/11/11/successful-launch-continues-depl

oyment-of-spacexs-starlink-network","wikipedia":"https://en.wikipedia.org/wiki/Starl
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atch of Starlink version 1.0 satellites, from SLC-40, Cape Canaveral AFS. They are e
xpected to contribute to the 550 km x 53\xc2\xb0 shell. It is the second Starlink la
unch overall. Starlink is a low Earth orbit broadband internet constellation develop
ed 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. The
booster for this mission is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2
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ticle":"https://spaceflightnow.com/2019/12/05/dragon-soars-on-research-and-resupply-
flight-to-international-space-station","wikipedia":"https://en.wikipedia.org/wiki/Sp
aceX_CRS-19"},"static_fire_date_utc":"2019-11-26T17:04:00.000Z","static_fire_date_un
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true,"failures":[],"details":"SpaceX\'s 19th Crew Resupply Mission on behalf of NASA
with a total of 20 contracted flights, this mission brings essential supplies to the
International Space Station using SpaceX\'s reusable Dragon spacecraft. The external
payloads for this mission include the Hyperspectral Imager Suite and a lithium-ion b
attery. Falcon 9 and Dragon will launch from SLC-40, Cape Canaveral AFS. The mission
will be complete with return and recovery of the Dragon capsule and down cargo.","cr
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u.be/sbXgZg9JmkI","youtube_id":"sbXgZg9JmkI","article":"https://spaceflightnow.com/2
019/12/17/startup-launches-broadband-satellite-on-spacex-rocket-to-connect-pacific-i
slands","wikipedia":"https://en.wikipedia.org/wiki/JSAT_(satellite_constellatio
n)"},"static_fire_date_utc":"2019-12-13T12:34:00.000Z","static_fire_date_unix":15762
40440,"net":false,"window":5280,"rocket":"5e9d0d95eda69973a809d1ec","success":tru
e,"failures":[],"details":"SpaceX will launch the Boeing built dual payload satellit
e to geostationary transfer orbit from XXXX. JCSat 18 is a mobile broadband communic
ations payload built for Sky Perfect JSAT 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 an
d the Pacific. Both payloads share a single chassis. The booster for this mission is
expected to land on OCISLY.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e
080df4000697c907","5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90d"],"capsules":
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light_number":86,"name":"JCSat 18 / Kacific 1","date_utc":"2019-12-17T00:10:00.000
Z","date_unix":1576541400,"date_local":"2019-12-16T19:10:00-05:00","date_precisio
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ridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":tru
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r/spacex/comments/elgp5k/rspacex_starlink_l2_recovery_discussion_updates"},"flickr":
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020/01/07/spacex-launches-more-starlink-satellites-tests-design-change-for-astronome
rs","wikipedia":"https://en.wikipedia.org/wiki/Starlink_(satellite_constellatio
n)"},"static_fire_date_utc":"2020-01-04T11:45:00.000Z","static_fire_date_unix":15781
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1.0 satellites, from SLC-40, Cape Canaveral AFS. They are expected to contribute to
the 550 km x 53\xc2\xb0 shell. It is the third Starlink launch overall. Starlink is
a low Earth orbit broadband internet constellation developed and owned by SpaceX whi
ch will eventually consist of nearly 12 000 satellites and will provide low latency
internet service to ground terminals around the world. The booster for this mission
is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6e
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cle":"https://spaceflightnow.com/2020/01/19/spacex-aces-final-major-test-before-firs
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on a fully fueled Falcon 9 rocket and then trigger the launch escape system during t
he period of maximum dynamic pressure. As part of NASA\'a Commercial Crew Integrated
Capability program (CCiCap) this test will contribute valuable data to help validate
Crew Dragon and its launch abort system. The Crew Dragon will be recovered by GO Sea
rcher after splashdown in the Atlantic Ocean. This flight does not go to orbit. The
booster and upper stage are expected to break up following capsule separation and th
ere will be no landing attempt.","crew":[],"ships":["5ea6ed2f080df4000697c90c"],"cap
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paceflightnow.com/2020/01/29/spacex-boosts-60-more-starlink-satellites-into-orbit-af
ter-weather-delays/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_Starlink"},"s
tatic_fire_date_utc":"2020-01-20T13:17:00.000Z","static_fire_date_unix":157952622
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tellites, from SLC-40, Cape Canaveral AFS. It is the fourth Starlink launch overall.
The satellites will be delivered to low Earth orbit and will spend a few weeks maneu

vering to their operational altitude of 550 km. The booster for this mission is expe
cted to land on OCISLY.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080d
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ex-delivers-more-starlink-satellites-to-orbit-booster-misses-drone-ship-landing/","w
ikipedia":"https://en.wikipedia.org/wiki/SpaceX_Starlink"},"static_fire_date_utc":"2
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Cape Canaveral AFS. It is the fifth 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 land on OCISL
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paceflightnow.com/2020/03/07/late-night-launch-of-spacex-cargo-ship-marks-end-of-an-
era/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-20"},"static_fire_date_u
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ceX\'s 20th and final Crew Resupply Mission under the original NASA CRS contract, th
is mission brings essential supplies to the International Space Station using SpaceX
\'s reusable Dragon spacecraft. It is the last scheduled flight of a Dragon 1 capsul
e. (CRS-21 and up under the new Commercial Resupply Services 2 contract will use Dra
gon 2.) The external payload for this mission is the Bartolomeo ISS external payload
hosting platform. Falcon 9 and Dragon will launch from SLC-40, Cape Canaveral Air Fo
rce Station and the booster will land at LZ-1. The mission will be complete with ret
urn and recovery of the Dragon capsule and down cargo.","crew":[],"ships":[],"capsul
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Starlink launch overall and the fifth operational batch of Starlink satellites will
launch into orbit aboard a Falcon 9 rocket. This mission is expected to deploy all s
ixty satellites into an elliptical orbit about fifteen minutes into flight. In the w
eeks following launch the satellites are expected to utilize their onboard ion thrus
ters 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 drone shi
p approximately 628 km downrange.","crew":[],"ships":["5ea6ed30080df4000697c913","5e
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ow.com/2020/06/04/spacex-sets-new-mark-in-rocket-reuse-10-years-after-first-falcon-9
-launch/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_ut
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s mission will launch the seventh batch of operational Starlink satellites, which ar
e expected to be version 1.0, from SLC-40, Cape Canaveral AFS. It is the eighth Star
link launch overall. The satellites will be delivered to low Earth orbit and will sp
end a few weeks maneuvering to their operational altitude of 550 km. The booster for
this mission is expected to land on JRTI on its first mission since arriving at Port
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link-satellite-deployments-continue-with-successful-falcon-9-launch/","wikipedia":"h
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ue,"failures":[],"details":"This mission will launch the eighth batch of operational
Starlink satellites, which are expected to be version 1.0, from SLC-40, Cape Canaver
al AFS. It is the ninth 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. This mission is includes rideshare payloads, SkySats 16-18, on top of the
Starlink stack. The booster for this mission is expected to land an ASDS.","crew":

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ry communication satellite from LC-39A, Kennedy Space Center. It will be South Korea \'s first dedicated military communications satellite. Falcon 9 will deliver the sat ellite to a geostationary transfer orbit. The booster is expected to land downrange on an ASDS.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c90 7","5ea6ed2f080df4000697c90b"],"capsules":[],"payloads":["5eb0e4d2b6c3bb0006eeb25 b"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":98,"name":"ANASIS-II","da te_utc":"2020-07-20T21:30:00.000Z","date_unix":1595280600,"date_local":"2020-07-20T1 7:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3 591817f23b2663","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attemp t":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534 e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d50ffd86e 000604b394"},{"fairings":{"reused":null,"recovery_attempt":true,"recovered":true,"sh ips":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c907"]},"links":{"patch":{"sma ll":"https://images2.imgbox.com/ac/ad/FhIfqkTq_o.png","large":"https://images2.imgbo x.com/2f/4f/Mk46ah9f_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/c omments/h8mold/starlink9_launch_campaign_thread/","launch":"https://www.reddit.com/ r/spacex/comments/i4ozw3/rspacex_starlink9_launch_discussion_updates/","media":"http s://www.reddit.com/r/spacex/comments/hg499n/rspacex_starlink9_media_thread_photograp her/","recovery":"https://www.reddit.com/r/spacex/comments/i5smhk/starlink_9blacksky _recovery_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/ 65535/50198901143_0bb53a499e_o.jpg","https://live.staticflickr.com/65535/50199448011 _35d0e9c8bf_o.jpg","https://live.staticflickr.com/65535/50199715777_eca6f41d25_o.jp g"]},"presskit":null,"webcast":"https://youtu.be/KU6KogxG5BE","youtube_id":"KU6KogxG 5BE","article":"https://spaceflightnow.com/2020/08/07/spacex-closes-out-busy-week-wi th-launch-of-more-starlink-satellites/","wikipedia":"https://en.wikipedia.org/wiki/S tarlink"},"static_fire_date_utc":"2020-06-24T18:18:00.000Z","static_fire_date_unix": 1593022680,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":tru e,"failures":[],"details":"This mission will launch the ninth batch of operational S tarlink satellites, which are expected to be version 1.0, from LC-39A, Kennedy Space Center. It is the tenth 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. This mission is includes a rideshare of two BlackSky satellites on top of the Starlink stack. The booster for this mission is expected to land an ASDS.","cre w":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c907","5ea6ed30080df4 000697c913","5ee68c683c228f36bd5809b5"],"capsules":[],"payloads":["5ed9858b1f3055403 0d45c3e","5ee522e32f1f3d474c758123"],"launchpad":"5e9e4502f509094188566f88","flight_ number":99,"name":"Starlink-9 (v1.0) & BlackSky Global 5-6","date_utc":"2020-08-07T0 5:12:00.000Z","date_unix":1596777120,"date_local":"2020-08-07T01:12:00-04:00","date_ precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","flig ht":5,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_succ ess":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_updat e":true,"tbd":false,"launch_library_id":null,"id":"5ed9819a1f30554030d45c29"},{"fair ings":{"reused":true,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080d f4000697c908","5ea6ed2e080df4000697c907"]},"links":{"patch":{"small":"https://images 2.imgbox.com/64/b3/CIqV9XMZ_o.png","large":"https://images2.imgbox.com/17/e3/ZxklwOk r_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/i63bst/star link_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/s pacex/comments/ibacxz/rspacex_starlink10_launch_discussion_updates/","media":"http s://www.reddit.com/r/spacex/comments/ic46fw/starlink10_recovery_updates_discussion_t hread/","recovery":"https://www.reddit.com/r/spacex/comments/ic46fw/starlink10_recov ery_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.stat icflickr.com/65535/50241845831_9a7412e81d_o.jpg","https://live.staticflickr.com/6553 5/50242057637_ea4f98d517_o.jpg","https://live.staticflickr.com/65535/50242057682_608 4977bf7_o.jpg","https://live.staticflickr.com/65535/50242057677_e96fbd46e6_o.jp g"]},"presskit":null,"webcast":"https://youtu.be/jTMJK7wb0rM","youtube_id":"jTMJK7wb 0rM","article":"https://spaceflightnow.com/2020/08/18/spacex-adds-more-satellites-to

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ures":[],"details":"This mission will launch the tenth batch of operational Starlink
satellites, which are expected to be version 1.0, from LC-39A, Kennedy Space Center.
It is the eleventh 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. This mission is includes rideshare payloads, SkySats 19-21, on top of the St
arlink stack. The booster for this mission is expected to land on an ASDS.","crew":
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rbit-mission-from-florida-in-decades/","wikipedia":"https://en.wikipedia.org/wiki/SA
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es into a sun-synchronous polar orbit from SLC-40, Cape Canaveral AFS. SAOCOM 1B is
a synthetic aperture radar Earth observation satellite to support disaster managemen
t. The SAOCOM spacecraft are operated by CONAE, the Argentinian National Space Activ
ities Commission, and are built by INVAP. This mission is also expected to include r
ideshare payloads Sequoia, and GNOMES-1. This will be the first polar launch from th
e Space Coast in 60 years. The launch azimuth will be southward and the booster will
land at LZ-1.","crew":[],"ships":["5ea6ed2e080df4000697c907"],"capsules":[],"payload
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s mission will launch the eleventh batch of operational Starlink satellites, which a
re expected to be version 1.0, from SLC-40, Cape Canaveral Air Force Station. It is
the twelfth Starlink launch overall. The satellites will be delivered to low Earth o
rbit 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":["5e
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ersion 1.0, from SLC-40, Cape Canaveral Air Force Station. It is the thirteenth Star
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end a few weeks maneuvering to their operational altitude of 550 km. The booster for
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18/spacex-launches-another-batch-of-starlink-satellites/","wikipedia":"https://en.wi
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th batch of operational Starlink satellites, which are expected to be version 1.0, f
rom LC-39A, Kennedy Space Center. It is the fourteenth Starlink launch overall. The
satellites will be delivered to low Earth orbit and will spend a few weeks maneuveri
ng to their operational altitude of 550 km. The booster for this mission is expected
to land on an ASDS.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df400
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ink-network/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_dat
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s, which are expected to be version 1.0, from SLC-40, Kennedy Space Center. It is th
e fifteenth Starlink launch overall. The satellites will be delivered to low Earth o
rbit and will spend a few weeks maneuvering to their operational altitude of 550 km.
The booster for this mission is expected to land on JRTI.","crew":[],"ships":["5ea6e
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spaceflightnow.com/2020/11/06/spacex-launches-gps-navigation-satellite-from-cape-can

averal/","wikipedia":"https://en.wikipedia.org/wiki/GPS_Block_III"},"static_fire_date_utc":"2020-09-25T05:42:00.000Z","static_fire_date_unix":1601012520,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch GPS Block III Space Vehicle 04 from SLC-40, Cape Canaveral AFS aboard a Falcon 9. GPS III is owned and operated by the US Air Force and produced by Lockheed Martin. This will be the fourth GPS III satellite launched and the third launched by SpaceX. The satellite will be delivered into a MEO transfer orbit. The booster for this mission will land on an ASDS.","crew":[],"ships":["5ea6ed30080df4000697c913","5ee68c683c228f36bd5809b5","5ea6ed2e080df4000697c907"],"capsules":[],"payloads":["5eb0e4d2b6c3bb0006eeb25e"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":106,"name":"GPS III SV04 (Sacagawea)","date_utc":"2020-11-05T23:24:00.000Z","date_unix":1604618640,"date_local":"2020-11-05T18:24:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c5440622a633027900a0","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":"5eb87d4cffd86e000604b38d"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/98/cc/UJd0SS73_o.png","large":"https://images2.imgbox.com/03/3d/LzQWXPfy_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/iwb8bl/crew1_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/ju7fxv/rspacex_crew1_official_launch_coast_docking/","media":"https://www.reddit.com/r/spacex/comments/judv0r/rspacex_crew1_media_thread_photographer_contest/","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/50618376646_8f52c31fc4_o.jpg","https://live.staticflickr.com/65535/50618376731_43ddaab1b8_o.jpg","https://live.staticflickr.com/65535/50618376671_ba4e60af7c_o.jpg","https://live.staticflickr.com/65535/50618376351_ecfdee4ab2_o.jpg","https://live.staticflickr.com/65535/50618727917_01e579c4d9_o.jpg","https://live.staticflickr.com/65535/50618355216_2872d1fe98_o.jpg","https://live.staticflickr.com/65535/50618354801_ff3e722884_o.jpg","https://live.staticflickr.com/65535/50618463487_41642939a4_o.jpg","https://live.staticflickr.com/65535/50617619613_5630422345_o.jpg","https://live.staticflickr.com/65535/50617619668_d680d7319c_o.jpg","https://live.staticflickr.com/65535/50617625523_a7484e0abf_o.jpg","https://live.staticflickr.com/65535/50618469202_fa86f88ab3_o.jpg","https://live.staticflickr.com/65535/50617625183_8554412cee_o.jpg","https://live.staticflickr.com/65535/50618470472_fb8e6507d7_o.jpg","https://live.staticflickr.com/65535/50617626838_c0c71de1f7_o.jpg","https://live.staticflickr.com/65535/50617626738_aa3997aaea_o.jpg","https://live.staticflickr.com/65535/50617626408_fb0bba0f89_o.jpg","https://live.staticflickr.com/65535/51158778650_9b8d555c1e_o.jpg","https://live.staticflickr.com/65535/51158458619_9b74f6a3d0_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/bnChQbxLkkI","youtube_id":"bnChQbxLkkI","article":"https://spaceflightnow.com/2020/11/16/astronauts-ride-spacex-crew-capsule-in-landmark-launch-for-commercial-spaceflight/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_Crew-1"},"static_fire_date_utc":"2020-11-11T16:17:00.000Z","static_fire_date_unix":1605111420,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch the first operational mission of its Crew Dragon vehicle as part of NASA\'s Commercial Crew Transportation Capability Program (CCtCap), carrying 3 NASA 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":["5f7f1543bf32c864a529b23e","5f7f158bbf32c864a529b23f","5f7f15d5bf32c864a529b240","5f7f1614bf32c864a529b241"],"ships":["5ea6ed2f080df4000697c910","5ee68c683c228f36bd5809b5","5ea6ed2f080df4000697c90c","5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90b"],"capsules":["5f6f99fddcfdf403df379709"],"payloads":["5eb0e4d2b6c3bb0006eeb25f"],"launchpad":"5e9e4502f509094188566f88","flight_number":107,"name":"Crew-1","date_utc":"2020-11-16T00:27:00.000Z","date_unix":1605486420,"date_local":"2020-11-15T19:27:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c53d0622a6330279009f","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383e

cbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d4dffd86e000604b38e"},{"fairings":{"reused":null,"recovery_attempt":null,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/96/40/667HXq7w_o.png","large":"https://images2.imgbox.com/26/73/pypHBlGD_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/jkk93v/sentinel6_michael_freilich_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/jxsche/rspacex_sentinel6_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/jyd67q/rspacex_sentinel6_media_thread_photographer/","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/50630802488_8cc373728e_o.jpg","https://live.staticflickr.com/65535/50631642722_3af8131c6f_o.jpg","https://live.staticflickr.com/65535/50631544171_66bd43eaa9_o.jpg","https://live.staticflickr.com/65535/50631543966_e8035d5cca_o.jpg","https://live.staticflickr.com/65535/50631643257_c214ceee7b_o.jpg","https://live.staticflickr.com/65535/50631643917_cb7db291d0_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/aVFPzTDCihQ","youtube_id":"aVFPzTDCihQ","article":"https://spaceflightnow.com/2020/11/21/international-satellite-launches-to-extend-measurements-of-sea-level-rise/","wikipedia":"https://en.wikipedia.org/wiki/Copernicus_Sentinel-6"},"static_fire_date_utc":"2020-11-17T13:17:00.000Z","static_fire_date_unix":1605619020,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch Sentinel-6 Michael Freilich into low Earth orbit for NASA, NOAA, ESA, and the European Organization for the Exploitation of Meteorological Satellites aboard a Falcon 9 from SLC-4E, Vandenberg Air Force Station. Sentinel-6(A) is an ocean observation satellite providing radar ocean surface altimetry data and also atmospheric temperature profiles as a secondary mission. The booster for this mission is will land at LZ-4.","crew":[],"ships":[],"capsules":[],"payloads":["5ed9867c1f30554030d45c40"],"launchpad":"5e9e4502f509092b78566f87","flight_number":108,"name":"Sentinel-6 Michael Freilich","date_utc":"2020-11-21T17:17:00.000Z","date_unix":1605979020,"date_local":"2020-11-21T09:17:00-08:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c54a0622a633027900a1","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb554034e7c9"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5ed983aa1f30554030d45c31"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":null,"ships":["5ea6ed2e080df4000697c907"]},"links":{"patch":{"small":"https://images2.imgbox.com/54/00/2OgoVFlS_o.png","large":"https://images2.imgbox.com/4a/e7/h403ivFa_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/jxyodz/rspacex_starlink15_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/k0mom0/starlink15_media_thread_photographer_contest/","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/50644831893_bb40b60827_o.jpg","https://live.staticflickr.com/65535/50645580736_44af27257f_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/J442-ti-Dhg","youtube_id":"J442-ti-Dhg","article":"https://spaceflightnow.com/2020/11/25/spacex-launches-60-more-starlink-satellites-on-100th-falcon-9-flight/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":"2020-11-21T16:31:00.000Z","static_fire_date_unix":1605976260,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission will launch the fifteenth batch of operational Starlink satellites, which are version 1.0, from SLC-40, Cape Canaveral Air Force Station. It will be the sixteenth 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","5ea6ed2f080df4000697c90c","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90d","5ea6ed2e080df4000697c907"],"capsules":[],"payloads":["5fb95c263a88ae63c9546044"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":109,"name":"Starlink-15 (v1.0)","date_utc":"2020-11-25T02:13:00.000Z","date_unix":1606270380,"date_local":"2020-11-24T21:13:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591833b13b2

659","flight":7,"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":"5fb95b3f3a88ae63c954603c"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/a2/a0/cHJWyFCo_o.png","large":"https://images2.imgbox.com/dd/53/W10Rog1y_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/jw8bfe/crs21_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/k6my16/rspacex_crs21_official_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/65535/50689254612_db8bc87d2c_o.jpg","https://live.staticflickr.com/65535/50689254712_98ef758c81_o.jpg","https://live.staticflickr.com/65535/50689254512_bb44826694_o.jpg","https://live.staticflickr.com/65535/50689254642_ba6b08d142_o.jpg","https://live.staticflickr.com/65535/50689254552_1d9f91a963_o.jpg"]},"presskit":"https://www.nasa.gov/sites/default/files/atoms/files/spacex_crs-21_mision_overview_high_res.pdf","webcast":"https://youtu.be/4xJAGFR_N-c","youtube_id":"4xJAGFR_N-c","article":"https://spaceflightnow.com/2020/12/06/spacex-launches-first-in-new-line-of-upgraded-space-station-cargo-ships/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-21"},"static_fire_date_utc":"2020-12-03T13:45:00.000Z","static_fire_date_unix":1607003100,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s 21st ISS resupply mission on behalf of NASA and the first under the CRS-2 contract, this mission brings 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 Nanoracks Bishop Airlock. 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 return and recovery of the Dragon capsule and down cargo.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90d"],"capsules":["5fbb0f8fec55b34eb9f35c14"],"payloads":["5eb0e4d3b6c3bb0006eeb262"],"launchpad":"5e9e4502f509094188566f88","flight_number":110,"name":"CRS-21","date_utc":"2020-12-06T16:17:00.000Z","date_unix":1607271420,"date_local":"2020-12-06T11:17:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591817f23b2663","flight":4,"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":"5eb87d4effd86e000604b391"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/a9/be/43FhrPoq_o.png","large":"https://images2.imgbox.com/17/34/WgRl7YFh_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/k51p7b/sxm7_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/kaizok/rspacex_sxm7_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/kcev8p/sxm7_media_thread_photographer_contest/","recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/50715254423_3cb2a8ff9c_o.jpg","https://live.staticflickr.com/65535/50715992426_bf43a8f872_o.jpg","https://live.staticflickr.com/65535/50716071077_5a5bc00af9_o.jpg","https://live.staticflickr.com/65535/50716071167_100d6f7092_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/COraGXFb1lo","youtube_id":"COraGXFb1lo","article":"https://spaceflightnow.com/2020/12/13/siriusxm-satellite-rides-spacex-rocket-into-orbit/","wikipedia":"https://en.wikipedia.org/wiki/Sirius_XM#Satellites"},"static_fire_date_utc":"2020-12-07T23:00:00.000Z","static_fire_date_unix":1607382000,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch the first of two next generation high power S-band broadcast satellites for SiriusXM. The spacecraft will be delivered into a geostationary transfer orbit and the booster will be recovered downrange. The spacecraft is built by Space Systems Loral (SSL) on the SSL 1300 platform and includes two solar arrays producing 20kW, and an unfurlable antenna dish. SXM-7 will replace XM-3 in geostationary orbit.","crew":[],"ships":["5ea6ed2f080df4000697c91

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1\xc2\xb0 East geostationary orbit to serve Turkey, the Middle East, Europe, North A
frica and South Africa. The booster for this mission will be recovered downrange via
ASDS.","crew":[],"ships":["5ea6ed2f080df4000697c90d","5ea6ed2f080df4000697c910","5ea
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nk16_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/
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ive.staticflickr.com/65535/50855737933_bcc65bdf8b_o.jpg","https://live.staticflickr.
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of operational Starlink satellites, which are version 1.0, from SLC-40 or LC-39A. It
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g-rideshare-mission-with-143-small-satellites/","wikipedia":null},"static_fire_date_
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mission launches the eighteenth batch of operational Starlink satellites, which are
version 1.0, from SLC-40. It is the nineteenth Starlink launch overall. The satellit
es will be delivered to low Earth orbit and will spend a few weeks maneuvering to th
eir operational altitude. The booster is expected to land on an ASDS.","crew":[],"sh
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booster-on-descent/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_f
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[],"details":"This mission launches the eighteenth batch of operational Starlink sat

ellites, which are version 1.0, from SLC-40. It is the nineteenth 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":["5ea6ed30080df4000697c913"],"capsules":[],"payloads":["600f9bc08f798e2a4d5f97a4"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":117,"name":"Starlink-19 (v1.0)","date_utc":"2021-02-16T03:59:00.000Z","date_unix":1613447940,"date_local":"2021-02-15T22:59:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f359187afd3b2662","flight":6,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":false,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":"985f1cc1-82c1-4a89-b2cc-e9dc91829a0e","id":"600f9a5e8f798e2a4d5f979c"},{"fairings":{"reused":null,"recovery_attempt":null,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/ba/a9/Q6APoE8C_o.png","large":"https://images2.imgbox.com/29/6c/mQwxR0KQ_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/l8qsz3/rspacex_starlink17_official_launch_discussion/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51004598206_9779f08338_o.jpg","https://live.staticflickr.com/65535/51004598196_b2059799f4_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/d5DzoKuhdNk","youtube_id":"d5DzoKuhdNk","article":"https://spaceflightnow.com/2021/03/04/spacex-sticks-75th-falcon-rocket-landing-after-launching-60-more-starlink-satellites/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":"2021-02-24T12:25:00.000Z","static_fire_date_unix":1614169500,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission launches the sixteenth batch of operational Starlink satellites, which are version 1.0, from LC-39A. It is the eighteenth 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":["5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5fbfedc654ceb10a5664c814"],"launchpad":"5e9e4502f509094188566f88","flight_number":118,"name":"Starlink-17 (v1.0)","date_utc":"2021-03-04T08:24:00.000Z","date_unix":1614846240,"date_local":"2021-03-04T03:24:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591833b13b2659","flight":8,"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":"dfd4f0e0-0ab4-494d-bd88-1b93b934b269","id":"5fbfecfe54ceb10a5664c80b"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90c"]},"links":{"patch":{"small":"https://images2.imgbox.com/df/ea/lre39tFr_o.png","large":"https://images2.imgbox.com/38/db/moPRrpCB_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/m0yww5/rspacex_starlink20_official_launch_discussion/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51027544097_799f5baccc_o.jpg","https://live.staticflickr.com/65535/51027443336_3e7486be6f_o.jpg","https://live.staticflickr.com/65535/51027443321_9a59458d39_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/U4sWbTfrzj8","youtube_id":"U4sWbTfrzj8","article":"https://spaceflightnow.com/2021/03/11/spacex-adds-more-satellites-to-starlink-internet-fleet/","wikipedia":"https://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":"600f9a8d8f798e2a4d5f979e"},{"fairings":{"reused":null,"recovery_attempt":true,"recovered":true,"ships":["6059166413f40e27e8af34b6","5ea6ed2f080df4000697c90b"]},"links":{"patch":{"small":"https://images2.imgbox.com/f3/0d/E2I1NJs2_o.png","large":"https://images2.imgbox.com/68/e1/XpScXejQ_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/maqmd0/rspacex_starlink22_launch_discussion_updates/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://youtu.be/a15czI9B91c","youtube_id":"a15czI9B91c","article":"https://spaceflightnow.com/2021/03/24/spacex-launches-25th-mission-to-build-out-starlink-internet-network/","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 22nd batch of operational Starlink satellites, which are version 1.0, from or SLC-40. It is the 23rd 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":["5ee68c683c228f36bd5809b5","5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","6059166413f40e27e8af34b6"],"capsules":[],"payloads":["60428afbc041c16716f73cdd"],"launchpad":"5e

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s mission launches the 23rd batch of operational Starlink satellites, which are vers
ion 1.0, from or SLC-40 or LC-39A. It is the 24th Starlink launch overall. The satel
lites 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":
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-refurbished-capsule-and-flight-proven-rocket/","wikipedia":"https://en.wikipedia.or
g/wiki/SpaceX_Crew-2"},"static_fire_date_utc":"2021-04-17T11:01:00.000Z","static_fir

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c","success":true,"failures":[],"details":"SpaceX launches the second operational mi
ssion of its Crew Dragon vehicle as part of NASA\'s Commercial Crew Program, carryin
g NASA astronauts Shane Kimbrough, Megan McArthur, Thomas Pesquet, and Akihiko Hoshi
de to the International Space Station. The Falcon 9 and Crew Dragon lift off from LC
-39A, Kennedy Space Center. Both the booster and the capsule have flown previously,
each a first for a commercial crew flight. The booster for this mission is expected
to land on an ASDS. The mission will be complete with the safe return of the astrona
uts to Earth.","crew":["5fe3ba5fb3467846b3242188","5fe3bb01b3467846b3242189","5fe3bc
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cex-to-fly-satellites-at-lower-altitudes/","wikipedia":"https://en.wikipedia.org/wik
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re version 1.0, from LC-39A or SLC-40. It is the 25th Starlink launch overall. The s
atellites will be delivered to low Earth orbit and will spend a few weeks maneuverin
g to their operational altitude. The booster is expected to land on an ASDS.","cre
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The satellites will be delivered to low Earth orbit and will spend a few weeks maneu
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pdates/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rs
pacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":[]},"pressk
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s the 27th Starlink launch overall. The satellites will be delivered to low Earth or
bit and will spend a few weeks maneuvering to their operational altitude. The booste
r is expected to land on an ASDS.","crew":[],"ships":["5ea6ed30080df4000697c913","5e
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and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/ncfexu/rs
pacex_starlink26_launch_discussion_updates/","media":null,"recovery":"https://www.re
ddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flick
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are version 1.0, from LC-39A or SLC-40. It is the 28th Starlink launch overall. The
satellites will be delivered to low Earth orbit and will spend a few weeks maneuveri
ng to their operational altitude. The booster is expected to land on an ASDS.","cre

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73a809d1ec","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":true,"ships":["5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909"]},"links":{"patch":{"small":"https://images2.imgbox.com/9a/f0/UVl6cZ6e_o.png","large":"https://images2.imgbox.com/98/c3/8McdwgVu_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/n9llxw/sxm8_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/nss9br/rspacex_sxm8_launch_discussion_and_updates_thread/","media":null,"recovery":null},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://youtu.be/bgtDRR2F2wA","youtube_id":"bgtDRR2F2wA","article":null,"wikipedia":"https://en.wikipedia.org/wiki/Sirius_XM#Satellites"},"static_fire_date_utc":"2021-06-03T06:32:00.000Z","static_fire_date_unix":1622701920,"net":false,"window":5940,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX launches the second of two next generation satellites for SiriusXM from SLC-40, Cape Canaveral Space Force Station. The spacecraft will be delivered into a sub-synchronous geostationary transfer orbit and will replace XM-4 in geostationary orbit. The booster for this mission will land on an ASDS.","crew":[],"ships":["5ee68c683c228f36bd5809b5","5ea6ed2f080df4000697c910","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909"],"capsules":[],"payloads":["5fe3b57db3467846b324217a"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":130,"name":"SXM-8","date_utc":"2021-06-06T04:26:00.000Z","date_unix":1622953560,"date_local":"2021-06-06T00:26:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c53d0622a6330279009f","flight":3,"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":"edaf9a8d-d67c-4e0e-8452-a37b111581d5","id":"5fe3af6db34678460b3242160"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["60c8c7a45d4819007ea69871"]},"links":{"patch":{"small":"https://images2.imgbox.com/d0/66/bCRsHNSZ_o.png","large":"https://images2.imgbox.com/2f/6f/ebFS9FDJ_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/nuud0l/gps_iii_sv05_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/o0gcnq/rspacex_gps_iii_sv05_launch_discussion_and/","media":null,"recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51254829184_e6e1d0d79c_o.jpg","https://live.staticflickr.com/65535/51253353892_de82b01e23_o.jpg","https://live.staticflickr.com/65535/51254285968_288383ce6e_o.jpg","https://live.staticflickr.com/65535/51254829154_3c5980c086_o.jpg","https://live.staticflickr.com/65535/51253353882_e59ea4df4f_o.jpg","https://live.staticflickr.com/65535/51254829139_ca68c19689_o.jpg","https://live.staticflickr.com/65535/51262926489_9fbce20e9c_o.jpg","https://live.staticflickr.com/65535/51262926469_974292477d_o.jpg","https://live.staticflickr.com/65535/51262179176_e4302db116_o.jpg","https://live.staticflickr.com/65535/51263224735_3210fb7499_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/QJXxVtp3KqI","youtube_id":"QJXxVtp3KqI","article":null,"wikipedia":"https://en.wikipedia.org/wiki/GPS_Block_III"},"static_fire_date_utc":"2021-06-13T19:30:00.000Z","static_fire_date_unix":1623612600,"net":false,"window":900,"rocket":"5e9d0d95eda69973a809d1ec","succes

s":true,"failures":[],"details":"SpaceX\'s fourth GPS III launch will use the first stage from the previous GPS mission. This will be the first time a National Security Space Launch has flown on a flight proven booster. Falcon 9 will launch from SLC-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/L2EqHznO_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/65535/51283604428_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,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":"5d248abe-17ef-43ce-9c04-aef33af40520","id":"600f9b6d8f798e2a4d5f979f"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/23/8a/eyj3lHJk_o.png","large":"https://images2.imgbox.com/fd/60/g7jacgTb_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/p67i27/crs23_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/pcj0ao/rspacex_crs23_launch_docking_discussion_updates/","media":null,"recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51411435986_82d7088b61_o.jpg","https://live.staticflickr.com/65535/51411702583_fe67991413_o.jp

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of the four-person crew that will raise awareness and funds for St. Jude Children\xe
2\x80\x99s Research Hospital, this milestone represents a new era for human spacefli
ght and exploration.","crew":["607a3a5f5a906a44023e0870","607a3ab45a906a44023e087
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national-space-station/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_Crew-
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gon vehicle as part of NASA\'s Commercial Crew Program, carrying four astronauts to
the International Space Station, including 1 international partner This mission will
fly on a new capsule and a once used booster. The booster will land downrange on a d
rone ship. The Crew-2 mission returns from the space station in November.","crew":
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tails":"NASA\'s Double Asteroid Redirect Test (DART) will demonstrate the use of a k
inetic impactor to alter an asteroid\'s trajectory, an intervention that could be us
ed in the future to prevent devastating Earth impacts. The target system consists of
Didymos, 780 meters in diameter, and its moonlet Dimorphos, 160 meters. The DART spa
cecraft 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 Dimor
phos\'s 12 hour orbital period around its companion by several minutes. The mission
tests several technologies, including the Small-body Maneuvering Autonomous Real-Tim
e Navigation (SMART Nav) used to differentiate and steer toward the target body and
Roll-Out Solar Arrays (ROSA) with Transformational Solar Array concentrators. NASA\x
e2\x80\x99s Evolutionary Xenon Thruster \xe2\x80\x94 Commercial (NEXT\xe2\x80\x93C)
ion engine will also be demonstrated, although the spacecraft\'s primary propulsion
is hydrazine thrusters. DART should arrive at Didymos in late September 2022, when i
t is about 11 million kilometers from Earth. Ten days before impact, the Italian Spa
ce 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 orb
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nch-of-2022/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_dat
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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 [9]:
```
static_json_url='https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud
```

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

In [10]:
```
response=requests.get(static_json_url)
```

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 [21]:
```
# Use json_normalize meethod to convert the json result into a dataframe
response = requests.get(static_json_url).json()
data = pd.json_normalize(response)
```

Using the dataframe `data` print the first 5 rows

In [22]:
```
# Get the head of the dataframe
data.head()
```

Out[22]:

	static_fire_date_utc	static_fire_date_unix	tbd	net	window	rocke
0	2006-03-17T00:00:00.000Z	1.142554e+09	False	False	0.0	5e9d0d95eda69955f709d1eb
1	None	NaN	False	False	0.0	5e9d0d95eda69955f709d1eb
2	None	NaN	False	False	0.0	5e9d0d95eda69955f709d1eb
3	2008-09-20T00:00:00.000Z	1.221869e+09	False	False	0.0	5e9d0d95eda69955f709d1eb

	static_fire_date_utc	static_fire_date_unix	tbd	net	window	rocke
4	None	NaN	False	False	0.0	5e9d0d95eda69955f709d1eb

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 [24]:
```
# Lets take a subset of our dataframe keeping only the features we want and the fli
data = data[['rocket', 'payloads', 'launchpad', 'cores', 'flight_number', 'date_utc

# We will remove rows with multiple cores because those are falcon rockets with 2 e
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 the single valu
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 extracting t
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 [25]:
```
#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 [26]:
```
BoosterVersion
```

Out[26]:
```
[]
```

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

In [27]:
```
# Call getBoosterVersion
getBoosterVersion(data)
```

the list has now been update

In [28]:
```
BoosterVersion[0:5]
```

Out[28]:
```
[]
```

we can apply the rest of the functions here:

In [30]:
```
# Call getLaunchSite
getLaunchSite(data)
```

In [31]:
```
# Call getPayloadData
getPayloadData(data)
```

In [32]:
```
# Call getCoreData
getCoreData(data)
```

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

In [33]:
```
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 [34]:
```
# Create a data from launch_dict
df = pd.DataFrame(launch_dict)
```

Show the summary of the dataframe

In [35]:
```
# Show the head of the dataframe
df.head()
```

Out[35]:

FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights

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 [36]:
```
# Hint data['BoosterVersion']!='Falcon 1'
data_falcon9 = df.loc[df['BoosterVersion'] != "Falcon 1"]
```

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

In [37]:
```
data_falcon9.loc[:,'FlightNumber'] = list(range(1, data_falcon9.shape[0]+1))
data_falcon9
```

Out[37]:

	FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcome	Flights

Data Wrangling

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

In [38]:
```
data_falcon9.isnull().sum()
```

Out[38]:
```
FlightNumber      0.0
Date              0.0
BoosterVersion    0.0
PayloadMass       0.0
Orbit             0.0
LaunchSite        0.0
Outcome           0.0
Flights           0.0
GridFins          0.0
Reused            0.0
Legs              0.0
LandingPad        0.0
Block             0.0
ReusedCount       0.0
Serial            0.0
Longitude         0.0
Latitude          0.0
dtype: float64
```

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 [40]:
```
# Calculate the mean value of PayloadMass column
payloadmass_mean = data_falcon9['PayloadMass'].mean()

# Replace the np.nan values with its mean value
data_falcon9['PayloadMass'] = data_falcon9['PayloadMass'].replace(np.nan, payloadma
```

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

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