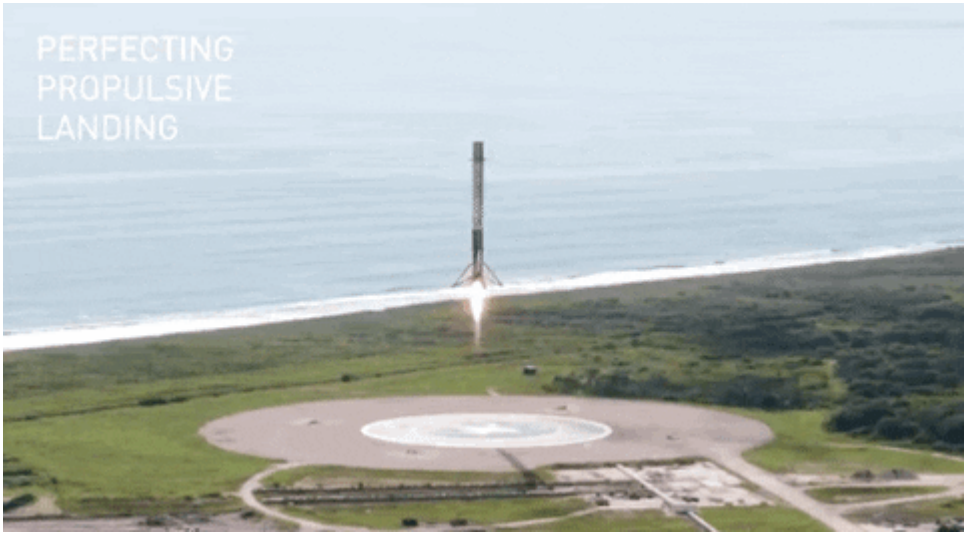
SpaceX Falcon 9 first stage Landing Prediction

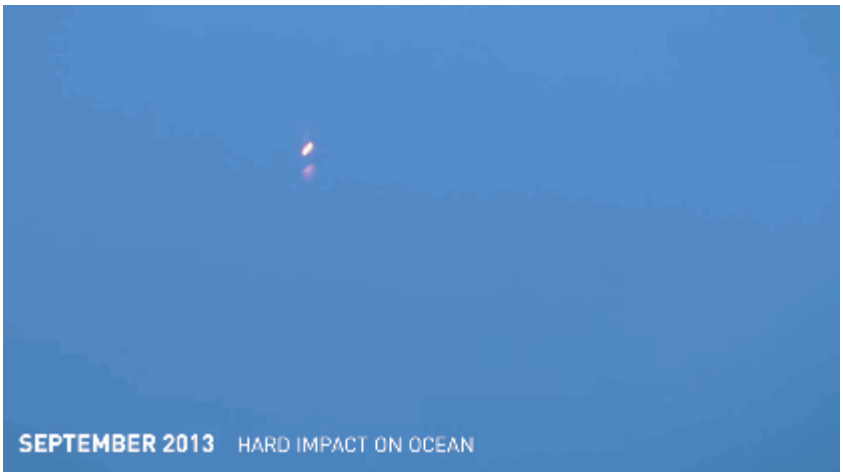
Lab 1: Collecting the data

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
import requests
# Pandas is a software library written for the Python programming languag
import pandas as pd
# NumPy is a library for the Python programming language, adding support
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
def getBoosterVersion(data):
```

```
    for x in data['rocket']:
       if x:
        response = requests.get("https://api.spacexdata.com/v4/rockets/"+
        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 app
def getLaunchSite(data):
    for x in data['launchpad']:
       if x:
         response = requests.get("https://api.spacexdata.com/v4/launchpad
         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 appe
def getPayloadData(data):
    for load in data['payloads']:
       if load:
        response = requests.get("https://api.spacexdata.com/v4/payloads/"
        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
def getCoreData(data):
    for core in data['cores']:
            if core['core'] != None:
                response = requests.get("https://api.spacexdata.com/v4/co
                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['lan
            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":fals
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data from this flight as part of a separate certification program for Spac
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ps://newatlas.com/crs-3-launch-spacex/31671/","wikipedia":"https://en.wiki
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owing second-stage separation, SpaceX conducted a second controlled-descen
t test of the discarded booster vehicle and achieved the first successful
controlled ocean touchdown of a liquid-rocket-engine orbital booster. Foll
owing touchdown the first stage tipped over as expected and was destroyed.
This was the first Falcon 9 booster to fly with extensible landing legs an
d the first Dragon mission with the Falcon 9 v1.1 launch vehicle.","crew":
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668"],"payloads":["5eb0e4bbb6c3bb0006eeb1f1"],"launchpad":"5e9e4501f509094
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weighing 172 kg each, plus two 142-kg mass simulators. This was the second
Falcon 9 booster equipped with landing legs. Following second-stage separa
tion, SpaceX conducted a controlled-descent test of the first stage, which
successfully decelerated from\xc2\xa0hypersonic velocity in the upper atmo
sphere, made reentry and landing burns, deployed its legs and touched down
on the ocean surface. As with the previous mission, the first stage then t
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ticle":"https://www.nasa.gov/press/2014/september/nasa-cargo-launches-to-s
pace-station-aboard-spacex-resupply-mission-0","wikipedia":"https://en.wik
ipedia.org/wiki/SpaceX_CRS-4"},"static_fire_date_utc":"2014-09-17T00:00:0
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ps://farm8.staticflickr.com/7635/16848159582_40c0f9d25f_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacex_nasa_crs-5_presskit.pdf","webcast":"https://www.youtube.com/watch?v=p7x-SumbynI","youtube_id":"p7x-SumbynI","article":"https://spaceflightnow.com/2015/01/10/dragon-successfully-launched-rocket-recovery-demo-crash-lands/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-5"},"static_fire_date_utc":"2014-12-19T00:00:00.000Z","static_fire_date_unix":1418947200,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Following second stage separation, SpaceX performed a test flight which attempted to return the first stage of the Falcon 9 through the atmosphere and land it on an approximately 90-by-50-meter (300 ft x 160 ft) floating platform-called the autonomous spaceport drone ship. Many of the test objectives were achieved, including precision control of the rocket\'s descent to land on the platform at a specific point in the Atlantic ocean, and a large amount of test data was obtained from the first use of grid fin control surfaces used for more precise reentry positioning. The grid fin control system ran out of hydraulic fluid a minute before landing and the landing itself resulted in a crash.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed2f080df4000697c90f","5ea6ed30080df4000697c912"],"capsules":["5e9e2c5bf35918165f3b266a"],"payloads":["5eb0e4bdb6c3bb0006eeb1f6"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":19,"name":"CRS-5","date_utc":"2015-01-10T09:47:00.000Z","date_unix":1420883220,"date_local":"2015-01-10T05:47:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a0f359187a3c3b2635","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":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":tru

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ches-satellites-video.html","wikipedia":"https://en.wikipedia.org/wiki/ABS
-3A"},"static_fire_date_utc":"2015-02-25T19:10:00.000Z","static_fire_date_
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c","success":true,"failures":[],"details":"The launch was Boeing\'s first-
ever conjoined launch of a lighter-weight dual-commsat stack that was spec
ifically designed to take advantage of the lower-cost SpaceX Falcon 9 laun
ch vehicle. Per satellite, launch costs were less than $30 million. The AB
S satellite reached its final destination ahead of schedule and started op
erations on September 10.","crew":[],"ships":[],"capsules":[],"payloads":
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alcon-9-successfully-launches-descends-to-off-balance-landing/","wikipedi
a":"https://en.wikipedia.org/wiki/SpaceX_CRS-6"},"static_fire_date_utc":"2
015-04-11T00:00:00.000Z","static_fire_date_unix":1428710400,"net":false,"w
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ed-descent test of the first stage. The first stage contacted the ship, bu
t soon tipped over due to excess lateral velocity caused by a stuck thrott
le valve resulting in a later-than-intended downthrottle.","crew":[],"ship
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s":["5e9e2c5cf359188bfb3b266b"],"payloads":["5eb0e4bdb6c3bb0006eeb1fa"],"l
aunchpad":"5e9e4501f509094ba4566f84","flight_number":22,"name":"CRS-6","da
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e,"reused":false,"landing_attempt":true,"landing_success":false,"landing_type":"ASDS","landpad":"5e9e3032383ecb761634e7cb"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cecffd86e000604b33f"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/a6/9b/IzWT1pYC_o.png","large":"https://images2.imgbox.com/a1/dc/grsyEfA5_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/33xqcj","media":"https://www.reddit.com/r/spacex/comments/3439s3","recovery":null},"flickr":{"small":[],"original":["https://farm8.staticflickr.com/7695/17138865668_18dcce7072_o.jpg","https://farm8.staticflickr.com/7677/16706406093_61a8f9c2f8_o.jpg","https://farm8.staticflickr.com/7691/17324793792_2dd13ea3f3_o.jpg","https://farm8.staticflickr.com/7691/17139094400_b94ce1ff56_o.jpg","https://farm9.staticflickr.com/8739/17140415959_38b5ee8bc6_o.jpg","https://farm8.staticflickr.com/7735/16704192574_e3a0a6fac2_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/spacexthalesfactsheet_final.pdf","webcast":"https://www.youtube.com/watch?v=nBwAYT_ogj4","youtube_id":"nBwAYT_ogj4","article":"https://spaceflightnow.com/2015/04/28/falcon-9-rocket-powers-into-space-with-satellite-for-turkmenistan/","wikipedia":"https://en.wikipedia.org/wiki/T%C3%BCrkmen%C3%84lem_52%C2%B0E_/_MonacoSAT"},"static_fire_date_utc":"2015-04-22T11:11:00.000Z","static_fire_date_unix":1429701060,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":null,"crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4beb6c3bb0006eeb1fb"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":23,"name":"T\xc3\xbcrkmen\xc3\x84lem 52\xc2\xb0E / MonacoSAT","date_utc":"2015-04-27T23:03:00.000Z","date_unix":1430175780,"date_local":"2015-04-27T19:03:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f35918233f3b2639","flight":1,"gridfins":false,"legs":false,"reused":false,"landing_attempt":false,"landing_success":null,"landing_type":null,"landpad":null}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87cedffd86e000604b340"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/53/12/gFtcOQuX_o.png","large":"https://images2.imgbox.com/7a/51/NfgiMpar_o.png"},"reddit":{"campaign":null,"launch":"https://www.reddit.com/r/spacex/comments/3b27hk","media":"https://www.reddit.com/r/spacex/comments/3berj3","recovery":null},"flickr":{"small":[],"original":["https://farm1.staticflickr.com/344/19045370790_f20f29cd8d_o.jpg","https://farm1.staticflickr.com/287/18999110808_6e153fed64_o.jpg"]},"presskit":"https://www.nasa.gov/sites/default/files/atoms/files/spacex_nasa_crs-7_presskit.pdf","webcast":"https://www.youtube.com/watch?v=PuNymhcTtSQ","youtube_id":"PuNymhcTtSQ","article":"https://spaceflightnow.com/2015/06/28/falcon-9-rocket-destroyed-in-launch-mishap/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-7"},"static_fire_date_utc":"2015-06-26T05:00:00.000Z","static_fire_date_unix":1435294800,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":false,"failures":[{"time":139,"altitude":40,"reason":"helium tank overpressure lead to the second stage LOX tank explosion"}],"details":"Launch performance was nominal until an overpressure incident in the second-stage LOX tank, leading to vehicle breakup at T+150 seconds. The Dragon capsule survived the explosion but was lost upon splashdown because its software did not contain provisions for parachute deployment on launch vehicle failure.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c"],"capsules":["5e9e2c5cf35918407d3b266c"],"payloads":["5eb0e4beb6c3bb0006eeb1fc"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":24,"name":"CRS-7","date_utc":"2015-06-28T14:21:00.000Z","date_unix":1435501260,"date_local":"2015-06-28T10:21:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a1f35918683c3b263a","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":null,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87ceeffd86e000604b341"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":

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www.reddit.com/r/spacex/comments/3xm83h/","recovery":null},"flickr":{"smal
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w.youtube.com/watch?v=O5bTbVbe4e4","youtube_id":"O5bTbVbe4e4","article":"h
ttps://spaceflightnow.com/2015/12/22/round-trip-rocket-flight-gives-spacex
-a-trifecta-of-successes/","wikipedia":"https://en.wikipedia.org/wiki/Falc
on_9_flight_20"},"static_fire_date_utc":"2015-12-19T00:09:00.000Z","static
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s 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 (la
ter called Falcon 9 Full Thrust), with a 30 percent power increase. Orbcom
m had originally agreed to be the third flight of the enhanced-thrust rock
et, 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 g
round at Cape Canaveral, and succeeded.","crew":[],"ships":[],"capsules":
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arm2.staticflickr.com/1508/24127011190_92ef932c96_o.jpg","https://farm2.st
aticflickr.com/1591/23778325594_08231286fc_o.jpg","https://farm2.staticfli
ckr.com/1542/24038722499_34c10216a3_o.jpg"]},"presskit":"http://www.space
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ww.youtube.com/watch?v=ivdKRJzl6y0","youtube_id":"ivdKRJzl6y0","articl
e":"https://spaceflightnow.com/2016/01/18/satellite-launched-to-measure-mo
tions-of-the-oceans/","wikipedia":"https://en.wikipedia.org/wiki/Jason-
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c","success":true,"failures":[],"details":"First launch of NASA and NOAA j
oint science mission under the NLS II launch contract (not related to NASA
CRS or USAF OSP3 contracts). Last launch of the original Falcon 9 v1.1 lau
nch vehicle. The Jason-3 satellite was successfully deployed to target orb
it. SpaceX again attempted a recovery of the first stage booster by landin
g 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 o
f the landing legs failed to latch, so that the booster fell over and expl

oded.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed30080df4000697
c912","5ea6ed30080df4000697c914"],"capsules":[],"payloads":["5eb0e4beb6c3b
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s":true,"legs":true,"reused":false,"landing_attempt":true,"landing_succes
s":false,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"aut
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0","article":"https://spaceflightnow.com/2016/03/05/tv-broadcasting-satell
ite-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_unix":1475417460,"net":false,"window":5400,"rocket":"5e9d0d95eda6997
3a809d1ec","success":true,"failures":[],"details":"Second launch of the en
hanced Falcon 9 Full Thrust launch vehicle. Following the launch, SpaceX a
ttempted an experimental landing test to a drone ship, although a successf
ul landing was not expected because launch mass exceeded previously indica
ted limit for a GTO there was little fuel left. As predicted, booster reco
very failed: the spent first stage \\"landed hard\\", but the controlled-d
escent, atmospheric re-entry and navigation to the drone ship were success
ful and returned significant test data on bringing back high-energy Falcon
9s.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c9
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r/spacex/comments/4ee2zy"},"flickr":{"small":[],"original":["https://farm
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s://www.youtube.com/watch?v=7pUAydjne5M","youtube_id":"7pUAydjne5M","artic
le":"https://spaceflightnow.com/2016/04/08/spacex-lands-rocket-on-floating
-platform-after-station-resupply-launch/","wikipedia":"https://en.wikipedi
a.org/wiki/SpaceX_CRS-8"},"static_fire_date_utc":"2016-04-05T00:00:00.000
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ied over 1500 kg of supplies and delivered (stowed in its trunk) the infla
table Bigelow Expandable Activity Module (BEAM) to the ISS for two years o
f in-orbit tests. The rocket\'s first stage landed smoothly on SpaceX\'s a
utonomous spaceport drone ship 9 minutes after liftoff, making this the fi
rst ever successful landing of a rocket booster on a ship at sea as part o
f an orbital launch. The first stage B1021 was later also the first orbita
l booster to be used again, when launching SES-10 on March 30, 2017.","cre
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05/06/falcon-9-succeeds-in-middle-of-the-night-launch/","wikipedia":"http
s://en.wikipedia.org/wiki/JCSAT-2B"},"static_fire_date_utc":"2016-05-01T2
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s":"Launched the JCSAT 14 communications satellite for Tokyo-based SKY Per
fect JSAT Corp. JCSAT 14 will support data networks, television broadcaste
rs and mobile communications users in Japan, East Asia, Russia, Oceania, H
awaii and other Pacific islands. This was the first time a booster success
fully landed after a GTO mission.","crew":[],"ships":["5ea6ed2e080df400069
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s":"Return-to-flight mission after the loss of Amos-6 in September 2016. I
ridium NEXT will replace the original Iridium constellation, launched in t
he late 1990s. Each Falcon mission will carry 10 satellites, with a goal t
o complete deployment of the 66 plus 9 spare satellite constellation by mi
d 2018. The first two Iridium qualification units were supposed to ride a
Dnepr rocket in April 2016 but were delayed, so Iridium decided to qualify
the first batch of 10 satellites instead.","crew":[],"ships":["5ea6ed2f080
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_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comm
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it.pdf","webcast":"https://www.youtube.com/watch?v=xsZSXav4wI8","youtube_i
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lies-rocket-for-second-time-in-historic-test-of-cost-cutting-technolog
y/","wikipedia":"https://en.wikipedia.org/wiki/SES-10"},"static_fire_date_
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lures":[],"details":"First payload to fly on a reused first stage, B1021,
previously launched with CRS-8, which also landed a second time. In what i
s also a first, the payload fairing remained intact after a successful spl
ashdown achieved with thrusters and a steerable parachute.","crew":[],"shi
ps":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4
000697c90c","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c
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y/","media":"https://www.reddit.com/r/spacex/comments/68bpii","recovery":n
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357343_85c247ebce_o.jpg","https://farm5.staticflickr.com/4166/34006001860_
8c45f28e69_o.jpg","https://farm5.staticflickr.com/4166/34005999880_77684db
a4b_o.jpg","https://farm3.staticflickr.com/2934/34005998140_c77076b6fb_o.j
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a_o.jpg","https://farm5.staticflickr.com/4223/34272083563_f52e5bfffe_o.jpg","https://farm5.staticflickr.com/4219/34918571502_7cf66854f7_o.jpg","https://farm5.staticflickr.com/4252/34918568732_4efe0885de_o.jpg","https://farm5.staticflickr.com/4264/34272065153_cfd8899f3e_o.jpg","https://farm5.staticflickr.com/4284/34948230531_e76b7560c9_o.jpg","https://farm5.staticflickr.com/4280/35078830875_afbd41c675_o.jpg","https://farm5.staticflickr.com/4280/34268361083_71fc70ff1a_o.jpg","https://farm5.staticflickr.com/4199/35038651646_93d0339269_o.jpg","https://farm5.staticflickr.com/4227/34223076793_4abe7e74d6_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/crs11presskit.pdf","webcast":"https://www.youtube.com/watch?v=JuZBOUMsYws","youtube_id":"JuZBOUMsYws","article":"https://spaceflightnow.com/2017/06/03/reused-dragon-cargo-capsule-launched-on-journey-to-space-station/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-11"},"static_fire_date_utc":"2017-05-28T16:00:00.000Z","static_fire_date_unix":1495987200,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission delivered the 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 launched a refurbished Dragon capsule, serial number C106 which first flew in September 2014 on the CRS-4 mission. Originally scheduled to launch on June 1, but was scrubbed due to inclement weather.","crew":[],"ships":["5ea6ed30080df4000697c912"],"capsules":["5e9e2c5bf3591880643b2669"],"payloads":["5eb0e4c4b6c3bb0006eeb20e"],"launchpad":"5e9e4502f509094188566f88","flight_number":41,"name":"CRS-11","date_utc":"2017-06-03T21:07:00.000Z","date_unix":1496524020,"date_local":"2017-06-03T17:07:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f3591856803b264a","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":"5eb87d03ffd86e000604b352"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/fa/1b/3vvXwAf9_o.png","large":"https://images2.imgbox.com/e2/f3/RZJ7ET73_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/69hhkm/bulgariasat1_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/6isph2/welcome_to_the_rspacex_bulgariasat1_official/","media":"https://www.reddit.com/r/spacex/comments/6iuj1z/rspacex_bulgariasat1_media_thread_videos_images/","recovery":"https://www.reddit.com/r/spacex/comments/6k3kop/b10292_bulgariasat_1_recovery_thread/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4216/35496028185_ac5456195f_o.jpg","https://farm5.staticflickr.com/4278/35496027525_9ab9d90417_o.jpg","https://farm5.staticflickr.com/4277/35496026875_fd25c46934_o.jpg","https://farm5.staticflickr.com/4257/35496026065_02fe65754b_o.jpg","https://farm5.staticflickr.com/4289/35491530485_5a4d0f39ae_o.jpg","https://farm5.staticflickr.com/4279/35491529875_1e35ee0a1e_o.jpg","https://farm5.staticflickr.com/4230/34681559323_53f05581ca_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/bulgariasat1presskit.pdf","webcast":"https://www.youtube.com/watch?v=Y8mLi-rRTh8","youtube_id":"Y8mLi-rRTh8","article":"https://en.wikipedia.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":1497565500,"net":false,"window":7200,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"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 commercial Bulgarian-owned communications satellite and it will provide television broadcasts and other communications services over southeast Europe.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c4b6c3bb0006eeb20f"],"launchpad":"5e9e4502f509094188566f88","flight_number":42,"name":"BulgariaSat-1","date_utc":"2017-06-23T19:10:00.000Z","date_unix":1498245000,"date_local":"2017-06-23T15:10:00-04:00","date_p

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ikipedia":"https://en.wikipedia.org/wiki/Formosat-5"},"static_fire_date_utc":"2017-08-24T18:50:00.000Z","static_fire_date_unix":1503600600,"net":false,"window":2520,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Formosat-5 is an Earth observation satellite of the Taiwanese space agency. The SHERPA space tug by Spaceflight Industries was removed from the cargo manifest of this mission. The satellite has a mass of only 475 kg.","crew":[],"ships":["5ea6ed2e080df4000697c905","5ea6ed2f080df4000697c910"],"capsules":[],"payloads":["5eb0e4c4b6c3bb0006eeb213"],"launchpad":"5e9e4502f509092b78566f87","flight_number":46,"name":"FormoSat-5","date_utc":"2017-08-24T18:50:00.000Z","date_unix":1503600600,"date_local":"2017-08-24T11:50:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a4f359182d843b264e","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d08ffd86e000604b357"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/12/7c/p8btH0CD_o.png","large":"https://images2.imgbox.com/32/61/cX8ZlEJQ_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/6u6q1t/x37b_otv5_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/6ygmf1/rspacex_x37b_otv5_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/6yih4g/rspacex_x37b_otv5_media_thread_videos_images_gifs/","recovery":null},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4411/37087809715_08a6d9904d_o.jpg","https://farm5.staticflickr.com/4384/37087808315_4dc9575d1b_o.jpg","https://farm5.staticflickr.com/4363/36251815974_8b996dbbfb_o.jpg","https://farm5.staticflickr.com/4374/36251814644_1a469f63ee_o.jpg","https://farm5.staticflickr.com/4388/36251812554_006501315f_o.jpg","https://farm5.staticflickr.com/4355/36250895284_8c24cb4232_o.jpg","https://farm5.staticflickr.com/4342/36689886890_99709e6934_o.jpg","https://farm5.staticflickr.com/4364/36689885100_c3c427c6bf_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/otv5_presskit.pdf","webcast":"https://www.youtube.com/watch?v=9M6Zvi-fFv4","youtube_id":"9M6Zvi-fFv4","article":"https://spaceflightnow.com/2017/09/07/spacex-beats-hurricane-with-smooth-launch-of-militarys-x-37b-spaceplane/","wikipedia":"https://en.wikipedia.org/wiki/Boeing_X-37"},"static_fire_date_utc":"2017-08-31T20:30:00.000Z","static_fire_date_unix":1504211400,"net":false,"window":18300,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Notable because Boeing is the primary contractor of the X-37B, which has until now been launched by ULA, a SpaceX competitor and Boeing partnership. Second flight of the Falcon 9 Block 4 upgrade.","crew":[],"ships":["5ea6ed2e080df4000697c906","5ea6ed2f080df4000697c90b"],"capsules":[],"payloads":["5eb0e4c5b6c3bb0006eeb214"],"launchpad":"5e9e4502f509094188566f88","flight_number":47,"name":"Boeing X-37B OTV-5","date_utc":"2017-09-07T13:50:00.000Z","date_unix":1504792200,"date_local":"2017-09-07T09:50:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a4f3591845123b264f","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":"5eb87d09ffd86e000604b358"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/fb/5b/LNVLRITr_o.png","large":"https://images2.imgbox.com/48/d4/MKsibD8N_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/6ygwxw/iridium_next_constellation_mission_3_launch/","launch":"https://www.reddit.com/r/spacex/comments/753e0m/iridium_next_mission_3_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/755m2z/rspacex_iridium3_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/75z823/b10411_recovery_thread/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4509/37610550066_b56bc5d743_o.jpg","https://farm5.staticflickr.com/4487/37610548356_1b7d30001e_o.jpg","https://far

m5.staticflickr.com/4514/37610547696_9114038d60_o.jpg","https://farm5.staticflickr.com/4483/37610547226_01d19395a3_o.jpg","https://farm5.staticflickr.com/4504/36984625383_d7707548ec_o.jpg","https://farm5.staticflickr.com/4505/36984623903_7bb6643649_o.jpg","https://farm5.staticflickr.com/4445/36984622463_6f9b21929c_o.jpg","https://farm5.staticflickr.com/4471/369448842344_92ddc7fb39_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/iridium3presskit.pdf","webcast":"https://www.youtube.com/watch?v=SB4N4xF2B2w&feature=youtu.be","youtube_id":"SB4N4xF2B2w","article":"https://spaceflightnow.com/2017/10/09/spacex-launch-adds-another-10-satellites-to-iridium-next-fleet/","wikipedia":"https://en.wikipedia.org/wiki/Iridium_satellite_constellation#Next-generation_constellation"},"static_fire_date_utc":"2017-10-05T13:31:00.000Z","static_fire_date_unix":1507210260,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Third of eight missions to launch Iridium\'s second generation constellation from VAFB","crew":[],"ships":["5ea6ed2e080df4000697c905","5ea6ed2f080df4000697c910"],"capsules":[],"payloads":["5eb0e4c5b6c3bb0006eeb215"],"launchpad":"5e9e4502f509092b78566f87","flight_number":48,"name":"Iridium NEXT Mission 3","date_utc":"2017-10-09T12:37:00.000Z","date_unix":1507552620,"date_local":"2017-10-09T05:37:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a4f3591843103b2650","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d0affd86e000604b359"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/bc/d3/Yd5qpPd9_o.png","large":"https://images2.imgbox.com/dd/c6/Qns2WYDQ_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/6yvn64/ses11echostar_105_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/75bw7p/ses11echostar105_official_launch_discussions/","media":"https://www.reddit.com/r/spacex/comments/75pgu5/rspacex_ses11_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/76fqz1/b10312_recovery_thread/"},"flickr":{"small":[],"original":["https://farm5.staticflickr.com/4471/37388002420_b86680c3af_o.jpg","https://farm5.staticflickr.com/4497/37388002170_a267280534_o.jpg","https://farm5.staticflickr.com/4455/37388001730_0869279a8d_o.jpg","https://farm5.staticflickr.com/4465/36975195443_b98ed0fb24_o.jpg","https://farm5.staticflickr.com/4499/36975194993_8548a53c60_o.jpg","https://farm5.staticflickr.com/4482/36975194613_15bb109059_o.jpg","https://farm5.staticflickr.com/4453/36975194233_5f8f45c686_o.jpg"]},"presskit":"http://www.spacex.com/sites/spacex/files/echostar105ses11presskit.pdf","webcast":"https://www.youtube.com/watch?v=iv1zeGSvhIw","youtube_id":"iv1zeGSvhIw","article":"https://spaceflightnow.com/2017/10/12/video-falcon-9-rocket-lifts-off-with-joint-satellite-for-ses-echostar/","wikipedia":"https://en.wikipedia.org/wiki/List_of_SES_satellites"},"static_fire_date_utc":"2017-10-02T20:30:00.000Z","static_fire_date_unix":1506976200,"net":false,"window":7200,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Nineteenth comsat to GTO, also the fourth satellite launched for SES and second for Echostar. Third time a first stage booster will be reused.","crew":[],"ships":["5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4c5b6c3bb0006eeb216"],"launchpad":"5e9e4502f509094188566f88","flight_number":49,"name":"SES-11 / Echostar 105","date_utc":"2017-10-11T22:53:00.000Z","date_unix":1507762380,"date_local":"2017-10-11T18:53:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a3f3591829dc3b2646","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":"5eb87d0cffd86e000604b35a"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":false,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/bb/fa/vNIBtlSn_o.png","larg

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spacex_koreasat_5a_official_launch_discussion/","media":"https://www.reddi
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0/30/spacex-launches-and-lands-third-rocket-in-three-weeks/","wikipedi
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unication services from East Africa and Central Asia to southern India, So
utheast Asia, the Philippines, Guam, Korea, and Japan. The satellite will
be placed in GEO at 113\xc3\x82\xc2\xb0 East Longitude, and will provide s
ervices ranging from broadband internet to broadcasting services and marit
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ex-kicks-off-ambitious-2018-schedule-with-launch-for-u-s-government/","wik
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pacex-rocket-flies-on-60th-anniversary-of-first-u-s-satellite-launch/","wi
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Elon Musk stated in a tweet that SpaceX will attempt to tow the booster to
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ddit.com/r/spacex/comments/82op7a/crs14_launch_campaign_thread/","launc
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M","youtube_id":"BPQHG-LevZM","article":"https://spaceflightnow.com/2018/0
4/02/spacex-supply-ship-departs-cape-canaveral-for-space-station/","wikipe
dia":"https://en.wikipedia.org/wiki/SpaceX_CRS-14"},"static_fire_date_ut
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s":[],"details":"The launch used a refurbished booster (from CRS-12) for t
he 11th time, and a refurbished capsule (C110 from CRS-8) for the third ti
me. External payloads include a materials research platform MISSE-FF phase
3 of the Robotic Refueling Mission TSIS, heliophysics sensor several cryst
allization experiments, and the RemoveDebris spacecraft aimed at space jun
k removal. The booster was expended in order to test a new landing profil
e.","crew":[],"ships":["5ea6ed30080df4000697c912"],"capsules":["5e9e2c5cf3
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s://en.wikipedia.org/wiki/Transiting_Exoplanet_Survey_Satellite"},"static_
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00,"net":false,"window":30,"rocket":"5e9d0d95eda69973a809d1ec","success":t
rue,"failures":[],"details":"Part of the Explorers program, this space tel
escope is intended for wide-field search of exoplanets transiting nearby s
tars. It is the first NASA high priority science mission launched by Space
X. It was the first time SpaceX launched a scientific satellite not primar
ily intended for Earth observations. The second stage placed it into a hig
h-Earth elliptical orbit, after which the satellite\'s own booster will pe

rform complex maneuvers including a lunar flyby, and over the course of tw
o months, reach a stable, 2:1 resonant orbit with the Moon. In January 201
8, SpaceX received NASA\'s Launch Services Program Category 2 certificatio
n of its Falcon 9 \'Full Thrust\', certification which is required for lau
nching medium risk missions like TESS. It was the last launch of a new Blo
ck 4 booster, and marked the 24th successful recovery of the booster. An e
xperimental water landing was performed in order to attempt fairing recove
ry.","crew":[],"ships":["5ea6ed2e080df4000697c90a","5ea6ed2f080df4000697c9
0b","5ea6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":
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st":"https://www.youtube.com/watch?v=rQEqKZ7CJlk","youtube_id":"rQEqKZ7CJl
k","article":"https://spaceflightnow.com/2018/05/11/spacex-debuts-an-impro
ved-human-rated-model-of-the-falcon-9-rocket/","wikipedia":"https://en.wik
ipedia.org/wiki/Bangabandhu-1"},"static_fire_date_utc":"2018-05-04T23:25:0
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go3l/rspacex_crs15_official_launch_discussion_updates","media":"https://ww
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ages_gifs/","recovery":null},"flickr":{"small":[],"original":["https://far
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M","youtube_id":"ycMagB1s8XM","article":"https://spaceflightnow.com/2018/0
6/29/spacex-launches-ai-enabled-robot-companion-vegetation-monitor-to-spac
e-station/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-15"},"st
atic_fire_date_utc":"2018-06-23T21:30:00.000Z","static_fire_date_unix":152
9789400,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","succes
s":true,"failures":[],"details":"Payload included MISSE-FF 2, ECOSTRESS, a
nd a Latching End Effector. The refurbished booster featured a record 2.5
months period turnaround from its original launch of the TESS satellite \x
e2\x80\x94 the fastest previous was 4.5 months. This was the last commerci
al flight of a Block 4 booster, which was expended into the Atlantic witho
ut landing legs and grid fins.","crew":[],"ships":["5ea6ed30080df4000697c9
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m/2018/07/22/spacex-delivers-for-telesat-with-successful-early-morning-lau
nch/","wikipedia":"https://en.wikipedia.org/wiki/Telstar_19V"},"static_fir
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tended to be placed at 63\xc2\xb0 West over the Americas. At 7,075 kg, it
became the heaviest commercial communications satellite ever launched.","c
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a6ed2f080df4000697c90d","5ea6ed30080df4000697c913"],"capsules":[],"payload
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utih (also known as Telkom-4) geostationary communications satellite for T
elkom Indonesia. It marked the first reuse of any Block 5 first stage; the
booster B1046 had previously launched Bangabandhu-1. The stage was recover
ed and is expected to become the first Falcon 9 booster to fly three missi
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omments/9e7bmq/rspacex_telstar_18v_official_launch_discussion/","media":"h
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ticle":"https://spaceflightnow.com/2018/09/10/spacex-telesat-achieve-repea
t-success-with-midnight-hour-launch/","wikipedia":"https://en.wikipedia.or
g/wiki/Telstar_18V"},"static_fire_date_utc":"2018-09-05T07:21:00.000Z","st
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d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s six
teenth flight of 2018 launched the Telstar 18v GEO communication satellite
for Telesat, the second launch for the canadian company in a few months. T
he first stage was a new Falcon 9 V1.2 Block 5 which was successfully reco
vered on OCISLY.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f0
80df4000697c90d","5ea6ed2f080df4000697c90b"],"capsules":[],"payloads":["5e
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b234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"i
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ps://farm2.staticflickr.com/1914/44262170545_22fe55d4bb_o.jpg","https://fa

rm2.staticflickr.com/1934/44262166295_3f84597f09_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/saocom1apresskit.pdf","webcast":"https://www.youtube.com/watch?v=vr_C6LQ7mHc","youtube_id":"vr_C6LQ7mHc","article":"https://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":"http

s://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_thread/"},"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 Spa

ceX\'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,"landing_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://w

ww.spacex.com/sites/spacex/files/iridium8presskit.pdf","webcast":"https://youtu.be/VshdafZvwrg","youtube_id":"VshdafZvwrg","article":"https://spaceflightnow.com/2019/01/11/spacex-begins-2019-with-eighth-and-final-for-upgraded-iridium-network/","wikipedia":"https://en.wikipedia.org/wiki/Iridium_satellite_constellation#Next-generation_constellation"},"static_fire_date_utc":"2019-01-06T13:51:00.000Z","static_fire_date_unix":1546782660,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s first flight of 2019 will be the eighth and final launch of its planned Iridium flights. Delivering 10 satellites to low earth orbit, this brings the total up to 75 and completes the Iridium NEXT constellation. This mission launches from SLC-4E at Vandenberg AFB. The booster is expected to land on JRTI.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed30080df4000697c912","5ea6ed30080df4000697c914"],"capsules":[],"payloads":["5eb0e4cab6c3bb0006eeb231"],"launchpad":"5e9e4502f509092b78566f87","flight_number":74,"name":"Iridium NEXT Mission 8","date_utc":"2019-01-11T15:31:00.000Z","date_unix":1547220660,"date_local":"2019-01-11T07:31:00-08:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591833b13b2659","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d28ffd86e000604b373"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":false,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/06/bc/5KvLN0mH_o.png","large":"https://images2.imgbox.com/4d/63/oBLNSPkL_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/afxyrd/nusantara_satu_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/assxjz/rspacex_psnvi_official_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/at5mu8/rspacex_psn6_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/atbmp3/psnvi_recovery_discussion_updates_thread/"},"flickr":{"small":[],"original":["https://farm8.staticflickr.com/7800/47173936271_b8ddb5bc5b_o.jpg","https://farm8.staticflickr.com/7821/47121969172_37428a280e_o.jpg","https://farm8.staticflickr.com/7923/47173936181_c0bf7a22a6_o.jpg","https://farm8.staticflickr.com/7829/46259779115_8982c2c8c2_o.jpg","https://farm8.staticflickr.com/7889/46259778995_68130be69d_o.jpg","https://farm8.staticflickr.com/7895/47130341432_3772641a68_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/nusantara_satu_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=XS0E35aYJcU","youtube_id":"XS0E35aYJcU","article":"https://spaceflightnow.com/2019/02/22/israeli-moon-lander-hitches-ride-on-spacex-launch-with-indonesian-comsat/","wikipedia":"https://en.wikipedia.org/wiki/PT_Pasifik_Satelit_Nusantara"},"static_fire_date_utc":"2019-02-18T17:03:00.000Z","static_fire_date_unix":1550509380,"net":false,"window":1920,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch this rideshare to GTO for Space Systems Loral (SSL). The primary payload for this mission is Nusantara Satu, a communications satellite built by SSL for the private Indonesian company PT Pasifik Satelit Nusantara (PSN). Spaceflight Industries\' GTO-1 mission consists of two secondary payloads. One of those is Beresheet, the lunar lander built by the Israeli non-profit organization, SpaceIL. Beresheet will make its own way to the moon from GTO. The other secondary is Air Force Research Lab\'s (Space Situational Awareness) S5 mission, which hitches a ride to GEO aboard Nusantara Satu. This mission launches from SLC-40 at Cape Canaveral AFS. The booster is expected to land on OCISLY.","crew":[],"ships":["5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5eb0e4cab6c3bb0006eeb232","5eb0e4cab6c3bb0006eeb233","5eb0e4cab6c3bb0006eeb234"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":75,"name":"Nusantara Satu (PSN-6) / S5 / Beresheet","date_utc":"2019-02-22T01:45:00.000Z","date_unix":1550799900,"date_local":"2019-02-21T20:45:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591809c03b2658","flight":3,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":tru

e,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_updat
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nch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/a
v1asz/rspacex_cctcap_demo_mission_1_official_launch/","media":"https://ww
w.reddit.com/r/spacex/comments/aw6g7j/rspacex_cctcap_demo_mission_1_media_
thread_videos/","recovery":"https://www.reddit.com/r/spacex/comments/awo5l
f/cctcap_demo_mission_1_official_booster_recovery/"},"flickr":{"small":
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ps://farm5.staticflickr.com/4882/39684490143_7df3838d2c_o.jpg","https://fa
rm8.staticflickr.com/7851/46535572784_7eb295968e_o.jpg","https://farm8.sta
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kr.com/7889/40294395933_f429c12e83_o.jpg","https://farm8.staticflickr.com/
7914/40294395873_0a328f2d87_o.jpg","https://farm8.staticflickr.com/7866/46
535572294_22499c1223_o.jpg","https://farm8.staticflickr.com/7850/465355730
34_03da10f899_o.jpg","https://farm8.staticflickr.com/7848/46535572664_316c
466742_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/crew
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d":"2ZL0tbOZYhE","article":"https://spaceflightnow.com/2019/03/02/spacex-l
aunches-first-crew-dragon-ferry-ship/","wikipedia":"https://en.wikipedia.o
rg/wiki/SpX-DM1"},"static_fire_date_utc":"2019-01-24T19:03:00.000Z","stati
c_fire_date_unix":1548356580,"net":false,"window":0,"rocket":"5e9d0d95eda6
9973a809d1ec","success":true,"failures":[],"details":"Demonstration Missio
n 1 (DM-1) will launch Dragon 2 as part of NASA\'s Commercial Crew Transpo
rtation Capability program. This mission will demonstrate Dragon 2, and Fa
lcon 9 in its configuration for crewed missions. DM-1 will launch from LC-
39A at Kennedy Space Center, likely carrying some cargo to the Internation
al Space Station. The booster is expected to land on OCISLY.","crew":[],"s
hips":["5ea6ed30080df4000697c913"],"capsules":["5e9e2c5df35918b1063b267
1"],"payloads":["5eb0e4cbb6c3bb0006eeb235"],"launchpad":"5e9e4502f50909418
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les/arabsat-6a_press_kit.pdf","webcast":"https://youtu.be/TXMGu2d8c8g","youtube_id":"TXMGu2d8c8g","article":"https://spaceflightnow.com/2019/04/11/spacexs-falcon-heavy-successful-in-commercial-debut/","wikipedia":"https://en.wikipedia.org/wiki/Arabsat-6A"},"static_fire_date_utc":"2019-04-05T09:57:00.000Z","static_fire_date_unix":1554458220,"net":false,"window":7020,"rocket":"5e9d0d95eda69974db09d1ed","success":true,"failures":[],"details":"SpaceX will launch Arabsat 6A to a geostationary transfer orbit from SLC-39A, KSC. The satellite is a geostationary telecommunications satellite built by Lockheed Martin for the Saudi Arabian company Arabsat. This will be the first operational flight of Falcon Heavy, and also the first Block 5 Falcon Heavy. All three cores will be new Block 5 cores. The side cores are expected to land at LZ-1 and LZ-2, and the center core is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2f080df4000697c90e","5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90c"],"capsules":[],"payloads":["5eb0e4cbb6c3bb0006eeb236"],"launchpad":"5e9e4502f509094188566f88","flight_number":77,"name":"ArabSat 6A","date_utc":"2019-04-11T22:35:00.000Z","date_unix":1555022100,"date_local":"2019-04-11T18:35:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f3591897453b265f","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"},{"core":"5e9e28a6f359183c413b265d","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"},{"core":"5e9e28a6f359188fd53b265e","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb90a834e7c8"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d2dffd86e000604b376"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/97/8e/YbVKIUZB_o.png","large":"https://images2.imgbox.com/0d/05/zH7YqLRe_o.png"},"reddit":{"campaign":"https://new.reddit.com/r/spacex/comments/bd2l28/crs17_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/bjsn0v/rspacex_crs17_official_launch_discussion_updates","media":"https://www.reddit.com/r/spacex/comments/bkc4d5/rspacex_crs17_media_thread_videos_images_gifs","recovery":"https://www.reddit.com/r/spacex/comments/bjy7p5/rspacex_crs17_recovery_discussion_updates_thread"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/46856594435_206c773b5a_o.jpg","https://live.staticflickr.com/65535/47720639872_284e49381d_o.jpg","https://live.staticflickr.com/65535/46856594755_88f1b22e50_o.jpg","https://live.staticflickr.com/65535/47720639542_1b7c1a71b0_o.jpg","https://live.staticflickr.com/65535/47720639732_e04b2a9ed7_o.jpg","https://live.staticflickr.com/65535/32829382467_087d024428_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/crs-17_press_kit.pdf","webcast":"https://youtu.be/AQFhX5TvP0M","youtube_id":"AQFhX5TvP0M","article":"https://spaceflightnow.com/2019/05/04/spacex-launches-space-station-resupply-mission-lands-rocket-on-drone-ship/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-17"},"static_fire_date_utc":"2019-04-27T07:23:00.000Z","static_fire_date_unix":1556349780,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX\'s 17th Commercial Resupply Services mission for NASA out of a total of 20 contracted flights, this mission brings essential supplies to the International Space Station using SpaceX\'s reusable Dragon 1 spacecraft. The external payloads for this mission include Orbital Carbon Observatory 3 and Space Test Program-Houston 6. The Falcon 9 launches from SLC-40 at Cape Canaveral AFS. The booster was expected to land at LZ-1, however, due to the ongoing investigation and clean-up following the Crew Dragon testing incident, it is likely to land on OCISLY instead.\\n","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90e","5ea6ed2f080df4000697c90b"],"capsules":["5e9e2c5cf3591869b63b2670"],"payloads":["5eb0e4cbb6c3bb0006eeb237"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":78,"name":"CRS-17","date_utc":"2019-05-04T06:48:00.000

Z","date_unix":1556952480,"date_local":"2019-05-04T02:48:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591809313b2660","flight":1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d2effd86e000604b377"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2f080df4000697c90c"]},"links":{"patch":{"small":"https://images2.imgbox.com/79/ec/TOE2PBJq_o.png","large":"https://images2.imgbox.com/39/aa/5of7buxK_o.png"},"reddit":{"campaign":"https://www.reddit.com/comments/bjybrl","launch":"https://www.reddit.com/r/spacex/comments/brfbic/rspacex_starlink_official_launch_discussion","media":"https://www.reddit.com/r/spacex/comments/bp0479/rspacex_starlink_media_thread_videos_images_gifs","recovery":"https://www.reddit.com/r/spacex/comments/bsaljm/rspacex_starlink_b10493_recovery_discussion_and"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/47926143711_4a0b2680bf_o.jpg","https://live.staticflickr.com/65535/47926136902_d8ce35223d_o.jpg","https://live.staticflickr.com/65535/47926144123_2a828b66d5_o.jpg","https://live.staticflickr.com/65535/47926137127_ef58152b6b_o.jpg","https://live.staticflickr.com/65535/47926137017_e6d86fa820_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/starlink_press_kit.pdf","webcast":"https://www.youtube.com/watch?v=riBaVeDTEWI","youtube_id":"riBaVeDTEWI","article":"https://spaceflightnow.com/2019/05/24/spacexs-first-60-starlink-broadband-satellites-deployed-in-orbit","wikipedia":"https://en.wikipedia.org/wiki/Starlink_(satellite_constellation)"},"static_fire_date_utc":"2019-05-13T20:06:00.000Z","static_fire_date_unix":1557777960,"net":false,"window":9000,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch dozens of Starlink demonstration satellites from SLC-40, Cape Canaveral AFS. Starlink is a low Earth orbit broadband internet constellation developed and owned by SpaceX which will eventually consist of nearly 12 000 satellites and will provide low latency internet service to ground terminals around the world. Two prototype satellites, Microsats 2a and 2b, were launched from Vandenberg AFB in February 2018. The booster for this mission will land on OCISLY.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90c","5ea6ed2f080df4000697c90e","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909"],"capsules":[],"payloads":["5eb0e4cbb6c3bb0006eeb238"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":79,"name":"Starlink v0.9","date_utc":"2019-05-24T02:30:00.000Z","date_unix":1558665000,"date_local":"2019-05-23T22:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f3591833b13b2659","flight":3,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d30ffd86e000604b378"},{"fairings":{"reused":false,"recovery_attempt":false,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/39/af/ygmjLYhv_o.png","large":"https://images2.imgbox.com/03/18/xlkSHLy1_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/buq487/radarsat_constellation_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/byp69f/rspacex_radarsat_constellation_official_launch","media":null,"recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/48052269657_71764b0fb3_o.jpg","https://live.staticflickr.com/65535/48052269617_34447619f0_o.jpg","https://live.staticflickr.com/65535/48052224858_20ea2a411e_o.jpg","https://live.staticflickr.com/65535/48052269562_325c117b81_o.jpg","https://live.staticflickr.com/65535/48052182461_a419db6b84_o.jpg","https://live.staticflickr.com/65535/48052224733_f89f1dd046_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/radarsat_constellation_mission_press_kit.pdf","webcast":"https://youtu.be/8A2nJd9Urk8","youtube_id":"8A2nJd9Urk8","article":"https://spaceflightnow.com/2019/06/12/three-canadian-radar-surveillance-satellites-ride-spacex-rocket-into-orbit/","wikipedia":"https://en.wikipedia.org/wiki/RADARSAT_Constellatio

n"},"static_fire_date_utc":"2019-06-08T08:39:00.000Z","static_fire_date_unix":1559983140,"net":false,"window":780,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX is launching the three satellite RADARSAT Constellation Mission into Sun Synchronous orbit from SLC-4E, VAFB. The RCM spacecraft are synthetic aperture radar (SAR) Earth observation satellites built by the Canadian space company, MDA, for the Canadian Space Agency. This mission was delayed when the originally slated booster failed to land after CRS-16. The booster is expected to return to LZ-4.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e4ccb6c3bb0006eeb239"],"launchpad":"5e9e4502f509092b78566f87","flight_number":80,"name":"RADARSAT Constellation","date_utc":"2019-06-12T14:17:00.000Z","date_unix":1560349020,"date_local":"2019-06-12T07:17:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb554034e7c9"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d31ffd86e000604b379"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/b0/90/fA4QaCAi_o.png","large":"https://images2.imgbox.com/81/9e/p6AaiJwj_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/bw6aa8/stp2_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/c40a29/rspacex_stp2_official_launch_discussion_updates","media":"https://www.reddit.com/r/spacex/comments/c4ng3a/rspacex_stp2_media_thread_videos_images_gifs","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/48129211778_83c1769305_o.jpg","https://live.staticflickr.com/65535/48129211908_8390c775b0_o.jpg","https://live.staticflickr.com/65535/48129182836_fd53e5646b_o.jpg","https://live.staticflickr.com/65535/48129269897_22d854be5c_o.jpg","https://live.staticflickr.com/65535/48129182631_572051790c_o.jpg","https://live.staticflickr.com/65535/48129211693_d23b0287f1_o.jpg","https://live.staticflickr.com/65535/48129269942_eb9b5c25bc_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/stp-2_press_kit.pdf","webcast":"https://youtu.be/WxH4CAlhtiQ","youtube_id":"WxH4CAlhtiQ","article":"https://spaceflightnow.com/2019/06/25/falcon-heavy-launches-on-military-led-rideshare-mission-boat-catches-fairing","wikipedia":"https://en.wikipedia.org/wiki/Space_Test_Program"},"static_fire_date_utc":"2019-06-19T21:52:00.000Z","static_fire_date_unix":1560981120,"net":false,"window":14400,"rocket":"5e9d0d95eda69974db09d1ed","success":true,"failures":[],"details":"Space Test Program 2 is a rideshare managed by the U.S. Air Force Space and Missile Systems Center (SMC), launching from LC-39A, KSC. Most of the spacecraft will be delivered into low Earth orbit (LEO) in two deployment sequences separated by a second stage burn. These LEO payloads include the six Taiwan and United States owned COSMIC-2 microsatellites, the Planetary Society\'s LightSail-B demonstrator cubesat, and others. The third and final deployment will be the Air Force Research Lab\'s DSX spacecraft, which will be delivered to a medium Earth orbit (MEO). This mission will reuse the side cores from Arabsat 6A, which will return to LZ-1, and LZ-2. The new center core will boost back to land on OCISLY less than 40 km from the launch site.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c909","5ea6ed2e080df4000697c908","5ea6ed2f080df4000697c90e"],"capsules":[],"payloads":["5eb0e4ccb6c3bb0006eeb23a","5eb0e4ccb6c3bb0006eeb23b","5eb0e4ccb6c3bb0006eeb23c","5eb0e4ccb6c3bb0006eeb23d","5eb0e4ccb6c3bb0006eeb23e","5eb0e4cdb6c3bb0006eeb23f","5eb0e4cdb6c3bb0006eeb240","5eb0e4cdb6c3bb0006eeb241","5eb0e4cdb6c3bb0006eeb242","5eb0e4cdb6c3bb0006eeb243","5eb0e4cdb6c3bb0006eeb244","5eb0e4cdb6c3bb0006eeb245","5eb0e4ceb6c3bb0006eeb246","5eb0e4ceb6c3bb0006eeb247","5eb0e4ceb6c3bb0006eeb248","5eb0e4ceb6c3bb0006eeb249"],"launchpad":"5e9e4502f509094188566f88","flight_number":81,"name":"STP-2","date_utc":"2019-06-25T03:30:00.000Z","date_unix":1561433400,"date_local":"2019-06-24T23:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591878063b2661","fl

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king-port-spacesuit-and-supplies-en-route-to-space-station/","wikipedi
a":"https://en.wikipedia.org/wiki/SpaceX_CRS-18"},"static_fire_date_ut
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s":[],"details":"SpaceX\'s 18th Commercial Resupply Services mission out o
f a total of 20 such contracted flights for NASA, this launch will deliver
essential supplies to the International Space Station using the reusable D
ragon 1 cargo spacecraft. The external payload for this mission is Interna
tional Docking Adapter 3, replacing IDA-1 lost in SpaceX\'s CRS-7 launch f
ailure. This mission will launch from SLC-40 at Cape Canaveral AFS on a Fa
lcon 9, and the first-stage booster is expected to land back at CCAFS LZ-
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8/07/spacex-launches-israeli-owned-telecom-satellite/","wikipedia":"http

s://en.wikipedia.org/wiki/Spacecom"},"static_fire_date_utc":"2019-08-01T0
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s":"SpaceX will launch Boeing built Amos-17, a geostationary communication
s 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 defu
nct 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 t
his launch is covered for Spacecom by SpaceX credit following the Amos-6 i
ncident. A recovery of the booster for this mission is not expected.","cre
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of Starlink version 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 sec
ond Starlink launch overall. Starlink is a low Earth orbit broadband inter
net constellation developed and owned by SpaceX which will eventually cons
ist of nearly 12 000 satellites and will provide low latency internet serv
ice to ground terminals around the world. The booster for this mission is
expected to land on OCISLY.","crew":[],"ships":["5ea6ed2e080df4000697c90
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5r8hj/rspacex_crs19_official_launch_discussion_updates","media":"https://www.reddit.com/r/spacex/comments/e6ln0m/rspacex_crs19_media_thread_videos_images_gifs","recovery":"https://www.reddit.com/r/spacex/comments/e6lbzy/rspacex_crs19_booster_recovery_discussion_updates"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/49178460143_e3ae2bd506_o.jpg","https://live.staticflickr.com/65535/49178954221_8544835325_o.jpg","https://live.staticflickr.com/65535/49179161792_9f1801a963_o.jpg","https://live.staticflickr.com/65535/49178460368_62eb945db8_o.jpg","https://live.staticflickr.com/65535/49184948561_ce20b38bc6_o.jpg","https://live.staticflickr.com/65535/49185149122_00a7fa573d_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/crs-19_mission_press_kit.pdf","webcast":"https://youtu.be/-aoAGdYXp_4","youtube_id":"-aoAGdYXp_4","article":"https://spaceflightnow.com/2019/12/05/dragon-soars-on-research-and-resupply-flight-to-international-space-station","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-19"},"static_fire_date_utc":"2019-11-26T17:04:00.000Z","static_fire_date_unix":1574787840,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":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 battery. 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.","crew":[],"ships":["5ea6ed2f080df4000697c90d"],"capsules":["5e9e2c5bf3591880643b2669"],"payloads":["5eb0e4cfb6c3bb0006eeb24d"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":85,"name":"CRS-19","date_utc":"2019-12-05T17:29:23.000Z","date_unix":1575566963,"date_local":"2019-12-05T12:29:23-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f359187afd3b2662","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":"5eb87d39ffd86e000604b37e"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":false,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/2c/03/fMLdgNQ4_o.png","large":"https://images2.imgbox.com/73/e2/4I3Os6n7_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/e5w6i8/jcsat18kacific1_launch_campaign_thread","launch":"https://www.reddit.com/r/spacex/comments/ebfr9t/rspacex_jcsat18kacific1_official_launch","media":"https://www.reddit.com/r/spacex/comments/ebn4g5/rspacex_jcsat18kacific1_media_thread_videos","recovery":"https://www.reddit.com/r/spacex/comments/ec48p3/jscat_18kacific1_recovery_discussion_and_updates"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/49235364922_e55ceb61be_o.jpg","https://live.staticflickr.com/65535/49235136806_e5a3774904_o.jpg","https://live.staticflickr.com/65535/49235137056_585dc050e7_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/jcsat18kacific1_mission_press_kit.pdf","webcast":"https://youtu.be/sbXgZg9JmkI","youtube_id":"sbXgZg9JmkI","article":"https://spaceflightnow.com/2019/12/17/startup-launches-broadband-satellite-on-spacex-rocket-to-connect-pacific-islands","wikipedia":"https://en.wikipedia.org/wiki/JSAT_(satellite_constellation)"},"static_fire_date_utc":"2019-12-13T12:34:00.000Z","static_fire_date_unix":1576240440,"net":false,"window":5280,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch the Boeing built dual payload satellite to geostationary transfer orbit from XXXX. JCSat 18 is a mobile broadband communications 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 and the Pacific. Both payloads share a single chassis. The booster for this mission is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c907","5ea6ed30080df4000697c913","5ea6ed2f080df4000697c9

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x/comments/efqnvg/starlink2_launch_campaign_thread","launch":"https://www.
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cussion","media":"https://www.reddit.com/r/spacex/comments/ekybzb/rspacex_
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1/07/spacex-launches-more-starlink-satellites-tests-design-change-for-astr
onomers","wikipedia":"https://en.wikipedia.org/wiki/Starlink_(satellite_co
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h the second batch of Starlink version 1.0 satellites, from SLC-40, Cape C
anaveral AFS. They are expected to contribute to the 550 km x 53\xc2\xb0 s
hell. It is the third Starlink launch overall. Starlink is a low Earth orb
it broadband internet constellation developed and owned by SpaceX which wi
ll eventually consist of nearly 12 000 satellites and will provide low lat
ency internet service to ground terminals around the world. The booster fo
r this mission is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2
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Hshb3E","article":"https://spaceflightnow.com/2020/01/19/spacex-aces-final-major-test-before-first-crew-mission","wikipedia":"https://en.wikipedia.org/wiki/Commercial_Crew_Development"},"static_fire_date_utc":"2020-01-11T09:42:00.000Z","static_fire_date_unix":1578735720,"net":false,"window":14400,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch a Crew Dragon capsule from LC-39A, KSC on a fully fueled Falcon 9 rocket and then trigger the launch escape system during the 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 Searcher 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 there will be no landing attempt.","crew":[],"ships":["5ea6ed2f080df4000697c90c"],"capsules":["5e9e2c5df359184c9a3b2672"],"payloads":["5eb0e4d0b6c3bb0006eeb250"],"launchpad":"5e9e4502f509094188566f88","flight_number":88,"name":"Crew Dragon In Flight Abort Test","date_utc":"2020-01-19T14:00:00.000Z","date_unix":1579442400,"date_local":"2020-01-19T09:00:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a5f359182b023b2656","flight":4,"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":"5eb87d3dffd86e000604b381"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/3a/c6/ueu9Acdh_o.png","large":"https://images2.imgbox.com/1c/55/xNcIOR8Z_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/eof5pr/starlink3_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/eudve3/rspacex_starlink_3_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/evjdws/rspacex_starlink3_media_thread_videos_images_gifs/","recovery":"https://www.reddit.com/r/spacex/comments/evnyij/rspacex_starlink3_recovery_discussion_updates/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/49461673512_f4e01c8b27_o.jpg","https://live.staticflickr.com/65535/49461673792_b1804c2a2b_o.jpg","https://live.staticflickr.com/65535/49461673707_cb7fc4a3a8_o.jpg","https://live.staticflickr.com/65535/49461673552_65cc294f82_o.jpg"]},"presskit":"https://www.spacex.com/sites/spacex/files/starlink_press_kit_jan272020.pdf","webcast":"https://youtu.be/1KmBDCiL7MU","youtube_id":"1KmBDCiL7MU","article":"https://spaceflightnow.com/2020/01/29/spacex-boosts-60-more-starlink-satellites-into-orbit-after-weather-delays/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_Starlink"},"static_fire_date_utc":"2020-01-20T13:17:00.000Z","static_fire_date_unix":1579526220,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission will launch the third batch of Starlink version 1.0 satellites, 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 maneuvering to their operational altitude of 550 km. The booster for this mission is expected to land on OCISLY.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c907","5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90d"],"capsules":[],"payloads":["5eb0e4d0b6c3bb0006eeb251"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":89,"name":"Starlink-3","date_utc":"2020-01-29T14:06:00.000Z","date_unix":1580306760,"date_local":"2020-01-29T09:06:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","flight":3,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d3fffd86e000604b382"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":false,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/4f/07/GJWgTmKM_o.png","large":"https://images2.imgbox.com/90/7c/MlD6s04z_o.png"},"reddi

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-rocket-overcomes-engine-failure-to-deploy-starlink-satellites/","wikipedi
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f Starlink satellites will launch into orbit aboard a Falcon 9 rocket. Thi
s mission is expected to deploy all sixty satellites into an elliptical or
bit about fifteen minutes into flight. In the weeks following launch the s
atellites are expected to utilize their onboard ion thrusters to raise the
ir 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
ship approximately 628 km downrange.","crew":[],"ships":["5ea6ed30080df400
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-satellite-mark-after-successful-launch/","wikipedia":"https://en.wikipedi

a.org/wiki/Starlink"},"static_fire_date_utc":"2020-04-17T11:48:00.000Z","static_fire_date_unix":1587687810,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission will launch the sixth batch of operational Starlink satellites, which are expected to be version 1.0, from SLC-40, Cape Canaveral AFS. It is the seventh Starlink launch overall. The satellites will be delivered to low Earth orbit and will spend a few weeks maneuvering to their operational altitude of 550 km. The booster for this mission is expected to land on OCISLY.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c907","5ee68c683c228f36bd5809b5"],"capsules":[],"payloads":["5eb0e4d1b6c3bb0006eeb255"],"launchpad":"5e9e4502f509094188566f88","flight_number":93,"name":"Starlink-6","date_utc":"2020-04-22T19:30:00.000Z","date_unix":1587583800,"date_local":"2020-04-22T15:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","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":"5eb87d44ffd86e000604b386"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/48/a8/LTqq8OrE_o.png","large":"https://images2.imgbox.com/e3/b7/DeT7QTkx_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/fjf6rr/dm2_launch_campaign_thread/","launch":"https://www.reddit.com/r/spacex/comments/glwz6n/rspacex_cctcap_demonstration_mission_2_general","media":"https://www.reddit.com/r/spacex/comments/gp1gf5/rspacex_dm2_media_thread_photographer_contest/","recovery":"https://www.reddit.com/r/spacex/comments/gu5gkd/cctcap_demonstration_mission_2_stage_1_recovery/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/49927519643_b43c6d4c44_o.jpg","https://live.staticflickr.com/65535/49927519588_8a39a3994f_o.jpg","https://live.staticflickr.com/65535/49928343022_6fb33cbd9c_o.jpg","https://live.staticflickr.com/65535/49934168858_cacb00d790_o.jpg","https://live.staticflickr.com/65535/49934682271_fd6a31becc_o.jpg","https://live.staticflickr.com/65535/49956109906_f88d815772_o.jpg","https://live.staticflickr.com/65535/49956109706_cffa847208_o.jpg","https://live.staticflickr.com/65535/49956109671_859b323ede_o.jpg","https://live.staticflickr.com/65535/49955609618_4cca01d581_o.jpg","https://live.staticflickr.com/65535/49956396622_975c116b71_o.jpg","https://live.staticflickr.com/65535/49955609378_9b77e5c771_o.jpg","https://live.staticflickr.com/65535/49956396262_ef41c1d9b0_o.jpg"]},"presskit":"https://www.nasa.gov/sites/default/files/atoms/files/commercialcrew_press_kit.pdf","webcast":"https://youtu.be/xY96v0OIcK4","youtube_id":"xY96v0OIcK4","article":"https://spaceflightnow.com/2020/05/30/nasa-astronauts-launch-from-us-soil-for-first-time-in-nine-years/","wikipedia":"https://en.wikipedia.org/wiki/Crew_Dragon_Demo-2"},"static_fire_date_utc":"2020-05-22T17:39:00.000Z","static_fire_date_unix":1590169140,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"SpaceX will launch the second demonstration mission of its Crew Dragon vehicle as part of NASA\'s Commercial Crew Transportation Capability Program (CCtCap), carrying two NASA astronauts to the International Space Station. Barring unexpected developments, this mission will be the first crewed flight to launch from the United States since the end of the Space Shuttle program in 2011. DM-2 demonstrates the Falcon 9 and Crew Dragon\'s ability to safely transport crew to the space station and back to Earth and it is the last major milestone for certification of Crew Dragon. Initially the mission duration was planned to be no longer than two weeks, however NASA has been considering an extension to as much as six weeks or three months. The astronauts have been undergoing additional training for the possible longer mission.","crew":["5ebf1a6e23a9a60006e03a7a","5ebf1b7323a9a60006e03a7b"],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c90c","5ea6ed2e080df4000697c909","5ea6ed2f080df4000697c90d"],"capsules":["5e9e2c5df359188aba3b2676"],"payloads":["5eb0e4d1b6c3bb0006eeb257"],"launchpad":"5e9e4502f509094188566f88","flight_number":94,"name":"CCtCap Demo Missi

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ets-new-mark-in-rocket-reuse-10-years-after-first-falcon-9-launch/","wikip
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ndow":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":
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arlink satellites, which are expected to be version 1.0, from SLC-40, Cape
Canaveral AFS. It is the eighth Starlink launch overall. The satellites wi
ll be delivered to low Earth orbit and will spend a few weeks maneuvering
to their operational altitude of 550 km. The booster for this mission is e
xpected to land on JRTI on its first mission since arriving at Port Canave
ral.","crew":[],"ships":["5ea6ed2e080df4000697c908","5ea6ed2e080df4000697c
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SLC-40, Cape Canaveral AFS. It is the ninth Starlink launch overall. The s
atellites will be delivered to low Earth orbit and will spend a few weeks
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des rideshare payloads, SkySats 16-18, on top of the Starlink stack. The b
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by the US Air Force and produced by Lockheed Martin. This is the third GPS
III satellite and the second launched by SpaceX. The satellite will be del
ivered into a MEO transfer orbit. The booster for this mission is expected
to land on an ASDS.","crew":[],"ships":[],"capsules":[],"payloads":["5eb0e
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st-military-satellite-into-on-target-orbit/","wikipedia":null},"static_fir

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e,"failures":[],"details":"SpaceX will launch ANASIS-II, a South Korean ge
ostationary military communication satellite from LC-39A, Kennedy Space Ce
nter. It will be South Korea\'s first dedicated military communications sa
tellite. Falcon 9 will deliver the satellite to a geostationary transfer o
rbit. The booster is expected to land downrange on an ASDS.","crew":[],"sh
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A, Kennedy Space Center. It is the tenth Starlink launch overall. The sate
llites will be delivered to low Earth orbit and will spend a few weeks man
euvering to their operational altitude of 550 km. This mission is includes
a rideshare of two BlackSky satellites on top of the Starlink stack. The b
ooster for this mission is expected to land an ASDS.","crew":[],"ships":
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e,"landing_success":true,"landing_type":"RTLS","landpad":"5e9e3032383ecb267a34e7c7"}],"auto_update":true,"tbd":false,"launch_library_id":null,"id":"5eb87d47ffd86e000604b38a"},{"fairings":{"reused":null,"recovery_attempt":true,"recovered":null,"ships":["5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/38/09/yStzn5Er_o.png","large":"https://images2.imgbox.com/83/11/smudwRMI_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/i63bst/starlink_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/iip8h3/rspacex_starlink11_launch_discussion_updates/","media":"https://www.reddit.com/r/spacex/comments/ij8mxf/rspacex_starlink11_saocom_1b_media_thread/","recovery":null},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://youtu.be/_j4xR7LMCGY","youtube_id":"_j4xR7LMCGY","article":null,"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 will launch the eleventh batch of operational Starlink satellites, which are 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 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":["5ea6ed2e080df4000697c908","5ea6ed2f080df4000697c90b","5ee68c683c228f36bd5809b5"],"capsules":[],"payloads":["5ef6a4600059c33cee4a829e"],"launchpad":"5e9e4502f509094188566f88","flight_number":102,"name":"Starlink-11 (v1.0)","date_utc":"2020-09-03T12:46:00.000Z","date_unix":1599137160,"date_local":"2020-09-03T08:46:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5ef670f10059c33cee4a826c","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":"5ef6a1e90059c33cee4a828a"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":true,"ships":["5ea6ed2e080df4000697c907","5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/3b/c3/kd7H9FTQ_o.png","large":"https://images2.imgbox.com/79/1f/hBdiixIW_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/i63bst/starlink_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/iu0vtg/rspacex_starlink12_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/iudifm/rspacex_starlink12_media_thread_photographer/","recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/50428228397_6151927733_o.jpg","https://live.staticflickr.com/65535/50427359318_67b3397892_o.jpg","https://live.staticflickr.com/65535/50428050591_36defbe958_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/UZkaE_9zwQQ","youtube_id":"UZkaE_9zwQQ","article":null,"wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission will launch the twelfth batch of operational Starlink satellites, which are expected to be version 1.0, from SLC-40, Cape Canaveral Air Force Station. It is the thirteenth 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":["5ea6ed2f080df4000697c90b","5ea6ed2f080df4000697c910","5ea6ed2e080df4000697c907","5ea6ed2e080df4000697c908","5ea6ed30080df4000697c913"],"capsules":[],"payloads":["5ef6a48e0059c33cee4a829f"],"launchpad":"5e9e4502f509094188566f88","flight_number":103,"name":"Starlink-12 (v1.0)","date_utc":"2020-10-06T11:29:00.000Z","date_unix":1601983740,"date_local":"2020-10-06T07:29:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a7f3591817f23b2663","flight":3,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_updat

e":true,"tbd":false,"launch_library_id":null,"id":"5ef6a2090059c33cee4a828b"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":null,"ships":["5ea6ed2e080df4000697c907","5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/1d/5c/Eg5XilXY_o.png","large":"https://images2.imgbox.com/42/26/UbDMepRy_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/i63bst/starlink_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/jctqq9/rspacex_starlink13_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/jdgsm2/rspacex_starlink13_media_thread_photographer/","recovery":"https://www.reddit.com/r/spacex/comments/jdgpgl/starlink13_recovery_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/50500804918_eb1187e1b2_o.jpg","https://live.staticflickr.com/65535/50501674637_f16f528728_o.jpg","https://live.staticflickr.com/65535/50501515611_2a3753bed1_o.jpg","https://live.staticflickr.com/65535/50501674632_0d5276b1b5_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/UM8CDDAmp98","youtube_id":"UM8CDDAmp98","article":"https://spaceflightnow.com/2020/10/18/spacex-launches-another-batch-of-starlink-satellites/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":"2020-10-17T05:23:00.000Z","static_fire_date_unix":1602912180,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission will launch the thirteenth batch of operational Starlink satellites, which are expected to be version 1.0, from 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 maneuvering to their operational altitude of 550 km. The booster for this mission is expected to land on an ASDS.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ee68c683c228f36bd5809b5","5ea6ed2e080df4000697c907","5ea6ed2e080df4000697c908"],"capsules":[],"payloads":["5ef6a4d50059c33cee4a82a1"],"launchpad":"5e9e4502f509094188566f88","flight_number":104,"name":"Starlink-13 (v1.0)","date_utc":"2020-10-18T12:25:00.000Z","date_unix":1603023900,"date_local":"2020-10-18T08:25:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e9e28a6f35918c0803b265c","flight":6,"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":"5ef6a2bf0059c33cee4a828c"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":null,"ships":["5ea6ed2e080df4000697c907","5ea6ed2e080df4000697c908"]},"links":{"patch":{"small":"https://images2.imgbox.com/65/e5/GS6w5gPI_o.png","large":"https://images2.imgbox.com/21/50/iOx9Tpuy_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/i63bst/starlink_general_discussion_and_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/jetth8/rspacex_starlink14_official_launch_discussion/","media":"https://www.reddit.com/r/spacex/comments/jhcwun/rspacex_starlink14_media_thread_photographer/","recovery":null},"flickr":{"small":[],"original":[]},"presskit":null,"webcast":"https://youtu.be/2gbVgTxLgN0","youtube_id":"2gbVgTxLgN0","article":"https://spaceflightnow.com/2020/10/24/spacex-adds-another-60-satellites-to-starlink-network/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":"2020-10-21T12:55:00.000Z","static_fire_date_unix":1603284900,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission will launch the fourteenth batch of operational Starlink satellites, which are expected to be version 1.0, from SLC-40, Kennedy Space Center. It is the fifteenth Starlink launch overall. The satellites will be delivered to low Earth orbit and will spend a few weeks maneuvering to their operational altitude of 550 km. The booster for this mission is expected to land on JRTI.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ea6ed2f080df4000697c90b","5ea6ed2e080df4000697c907","5ea6ed2e080df4000697c908"],"capsules":[],"payloads":["5ef6a4ea0059c33cee4a82a2"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":105,"name":"Starlink-14 (v1.0)","date_utc":"2020-10-24T

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averal/","wikipedia":"https://en.wikipedia.org/wiki/GPS_Block_III"},"stati
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s":true,"failures":[],"details":"SpaceX will launch GPS Block III Space Ve
hicle 04 from SLC-40, Cape Canaveral AFS aboard a Falcon 9. GPS III is own
ed 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 Sp
aceX. The satellite will be delivered into a MEO transfer orbit. The boost
er for this mission will land on an ASDS.","crew":[],"ships":["5ea6ed30080
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rlink15_official_launch_discussion/","media":"https://www.reddit.com/r/spa
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w.com/2020/11/25/spacex-launches-60-more-starlink-satellites-on-100th-falc
on-9-flight/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"stati
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s":true,"failures":[],"details":"This mission will launch the fifteenth ba
tch of operational Starlink satellites, which are version 1.0, from SLC-4
0, Cape Canaveral Air Force Station. It will be the sixteenth Starlink lau
nch 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":[],"ship
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00697c90b","5ea6ed2f080df4000697c90d","5ea6ed2e080df4000697c907"],"capsule
s":[],"payloads":["5fb95c263a88ae63c9546044"],"launchpad":"5e9e4501f509094
ba4566f84","flight_number":109,"name":"Starlink-15 (v1.0)","date_utc":"202
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13:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5e
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ba6b08d142_o.jpg","https://live.staticflickr.com/65535/50689254552_1d9f91a
963_o.jpg"]},"presskit":"https://www.nasa.gov/sites/default/files/atoms/fi
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w.com/2020/12/06/spacex-launches-first-in-new-line-of-upgraded-space-stati
on-cargo-ships/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS-2
1"},"static_fire_date_utc":"2020-12-03T13:45:00.000Z","static_fire_date_un
ix":1607003100,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1e
c","success":true,"failures":[],"details":"SpaceX\'s 21st ISS resupply mis
sion on behalf of NASA and the first under the CRS-2 contract, this missio
n brings essential supplies to the International Space Station using the c
argo variant of SpaceX\'s Dragon 2 spacecraft. The external payload for th
is mission is the Nanoracks Bishop Airlock. Falcon 9 and Dragon launch fro
m LC-39A, Kennedy Space Center and the booster is expected to land on an A
SDS. The mission will be complete with return and recovery of the Dragon c
apsule and down cargo.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea
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m/2020/12/13/siriusxm-satellite-rides-spacex-rocket-into-orbit/","wikipedi
a":"https://en.wikipedia.org/wiki/Sirius_XM#Satellites"},"static_fire_date
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ilures":[],"details":"SpaceX will launch the first of two next generation
high power S-band broadcast satellites for SiriusXM. The spacecraft will b
e delivered into a geostationary transfer orbit and the booster will be re
covered 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 orbi
t.","crew":[],"ships":["5ea6ed2f080df4000697c910","5ee68c683c228f36bd5809b
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-record-year-of-launches-from-floridas-space-coast/","wikipedia":"https://
en.wikipedia.org/wiki/National_Reconnaissance_Office"},"static_fire_date_u
tc":null,"static_fire_date_unix":null,"net":false,"window":null,"rocke
t":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"Spac
eX will launch NROL-108 for the National Reconnaissance Office aboard a Fa
lcon 9 from SLC-40, Cape Canaveral Air Force Station. The booster for this

mission is expected to land at LZ-1.","crew":[],"ships":["5ea6ed2f080df400
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paceflightnow.com/2021/01/08/spacex-deploys-turkish-satellite-in-first-lau
nch-of-2021/","wikipedia":"https://en.wikipedia.org/wiki/T%C3%BCrksat_5
A"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":fals
e,"window":17820,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failu
res":[],"details":"SpaceX will launch the first of two next generation sat
ellites on contract for T\xc3\xbcrksat. T\xc3\xbcrksat 5A is a Ku-band bro
adcast satellite built by Airbus Defense and Space and based on the Electr
ic Orbit Raising version of the Eurostar E3000 platform. This spacecraft w
ill be delivered into a transfer orbit and will then raise itself to its o
perational 31\xc2\xb0 East geostationary orbit to serve Turkey, the Middle
East, Europe, North Africa and South Africa. The booster for this mission
will be recovered downrange via ASDS.","crew":[],"ships":["5ea6ed2f080df40
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ksat 5A","date_utc":"2021-01-08T02:15:00.000Z","date_unix":1610072100,"dat
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mments/kz969o/rspacex_starlink16_official_launch_discussion/","media":"htt
ps://www.reddit.com/r/spacex/comments/l1b5q8/starlink16_media_thread_photo
grapher_contest/","recovery":"https://www.reddit.com/r/spacex/comments/k2t
s1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"origi
nal":["https://live.staticflickr.com/65535/50855737853_4d290519b4_o.jp
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icle":"https://spaceflightnow.com/2021/01/20/spacex-sets-new-rocket-reuse-

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uccessfully-deploys-60-more-starlink-satellites-but-loses-booster-on-desce
nt/","wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_da
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nal altitude. The booster is expected to land on an ASDS.","crew":[],"ship
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de. The booster is expected to land on an ASDS.","crew":[],"ships":["5ea6e
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9973a809d1ec","success":true,"failures":[],"details":"SpaceX launches the
second operational mission of its Crew Dragon vehicle as part of NASA\'s C
ommercial Crew Program, carrying NASA astronauts Shane Kimbrough, Megan Mc
Arthur, Thomas Pesquet, and Akihiko Hoshide to the International Space Sta
tion. The Falcon 9 and Crew Dragon lift off from LC-39A, Kennedy Space Cen
ter. 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
astronauts to Earth.","crew":["5fe3ba5fb3467846b3242188","5fe3bb01b3467846

b3242189","5fe3bc3db3467846b324218b","5fe3bc8ab3467846b324218c"],"ships":["5ea6ed2e080df4000697c909","5ea6ed30080df4000697c913"],"capsules":["5e9e2c5df359188aba3b2676"],"payloads":["5fe3b3adb3467846b3242173"],"launchpad":"5e9e4502f509094188566f88","flight_number":123,"name":"Crew-2","date_utc":"2021-04-23T09:49:00.000Z","date_unix":1619171340,"date_local":"2021-04-23T05:49:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c53d0622a6330279009f","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":"32dcb5ad-7609-4fc0-8094-768ee5c2ebe0","id":"5fe3af58b3467846b324215f"},{"fairings":{"reused":false,"recovery_attempt":true,"recovered":true,"ships":["6059166413f40e27e8af34b6"]},"links":{"patch":{"small":"https://images2.imgbox.com/cd/30/UYfjAmuT_o.png","large":"https://images2.imgbox.com/2e/a8/bvzKCiwf_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/mzol0k/rspacex_starlink24_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/65535/51146838376_4667d78231_o.jpg","https://live.staticflickr.com/65535/51147622479_d027e09727_o.jpg","https://live.staticflickr.com/65535/51147949685_975bd6b4ee_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/RBxkRKZ34yo","youtube_id":"RBxkRKZ34yo","article":"https://spaceflightnow.com/2021/04/29/spacex-launches-60-more-starlink-spacecraft-fcc-clears-spacex-to-fly-satellites-at-lower-altitudes/","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 24th batch of operational Starlink satellites, which are version 1.0, from LC-39A or SLC-40. It is the 25th 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","5ea6ed2f080df4000697c90d","5ee68c683c228f36bd5809b5","6059166413f40e27e8af34b6"],"capsules":[],"payloads":["605b4be3aa5433645e37d046"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":124,"name":"Starlink-24 (v1.0)","date_utc":"2021-04-29T03:44:00.000Z","date_unix":1619667840,"date_local":"2021-04-28T23:44:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5ef670f10059c33cee4a826c","flight":7,"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":"fbd23c86-89d0-4d3f-b5fb-5d7165d05cca","id":"605b4b6aaa5433645e37d03f"},{"fairings":{"reused":true,"recovery_attempt":true,"recovered":true,"ships":["6059166413f40e27e8af34b6"]},"links":{"patch":{"small":"https://images2.imgbox.com/33/03/aHKx9cu1_o.png","large":"https://images2.imgbox.com/8e/e0/wOt6ZecV_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/n3z0aa/rspacex_starlink25_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/xpl_JnG7rcg","youtube_id":"xpl_JnG7rcg","article":null,"wikipedia":"https://en.wikipedia.org/wiki/Starlink"},"static_fire_date_utc":"2021-05-03T05:00:00.000Z","static_fire_date_unix":1620018000,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":"This mission launches the 25th batch of operational Starlink satellites, which are version 1.0, from LC-39A. It is the 26th 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 OCISLY.","crew":[],"ships":["608c1a06cf7f3d6152666ad4","5ea6ed30080df40006

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is the 27th Starlink launch overall. The satellites will be delivered to l
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altitude. The booster is expected to land on an ASDS.","crew":[],"ships":
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h batch of operational Starlink satellites, which are version 1.0, from LC
-39A or SLC-40. It is the 28th Starlink launch overall. The satellites wil
l be delivered to low Earth orbit and will spend a few weeks maneuvering t
o their operational altitude. The booster is expected to land on an ASD
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tps://spaceflightnow.com/2021/05/26/first-phase-of-spacexs-starlink-networ
k-nears-completion-with-falcon-9-launch/","wikipedia":"https://en.wikipedi
a.org/wiki/Starlink"},"static_fire_date_utc":null,"static_fire_date_unix":
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ational Starlink satellites, which were version 1.0, from SLC-40. It was t
he 29th Starlink launch overall. The satellites plan to be delivered to lo
w Earth orbit and will spend a few weeks maneuvering to their operational
altitude. The booster is expected to land on ASDS JRTI.","crew":[],"ship
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6/03/spacex-supply-ship-launches-on-mission-to-begin-upgrading-space-stati
on-electrical-grid/","wikipedia":"https://en.wikipedia.org/wiki/SpaceX_CRS
-22"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":fals

e,"window":0,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failure
s":[],"details":"SpaceX\'s 22nd ISS resupply mission on behalf of NASA, th
is mission sends essential supplies to the International Space Station usi
ng the cargo variant of SpaceX\'s Dragon 2 spacecraft. The external payloa
d 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 e
xpected to land on an ASDS. The mission will be complete with splashdown a
nd recovery of the capsule and down cargo.","crew":[],"ships":["5ea6ed2f08
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eX launches the second of two next generation satellites for SiriusXM from
SLC-40, Cape Canaveral Space Force Station. The spacecraft will be deliver
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-4 in geostationary orbit. The booster for this mission will land on an AS
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eddit.com/r/spacex/comments/o0gcnq/rspacex_gps_iii_sv05_launch_discussion_
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ix":1629946140,"net":false,"window":0,"rocket":"5e9d0d95eda69973a809d1e
c","success":true,"failures":[],"details":"SpaceX\'s 23rd ISS resupply mis
sion on behalf of NASA, this mission brings essential supplies to the Inte
rnational Space Station using the cargo variant of SpaceX\'s Dragon 2 spac
ecraft. Cargo includes several science experiments. The booster for this m
ission is expected to land on an ASDS. The mission will be complete with r
eturn and recovery of the Dragon capsule and down cargo.","crew":[],"ship
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6b3242193"],"launchpad":"5e9e4502f509094188566f88","flight_number":133,"na
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ghtnow.com/2021/09/14/spacex-launches-first-full-batch-of-laser-equipped-s
tarlink-satellites/","wikipedia":"https://en.wikipedia.org/wiki/Starlin
k"},"static_fire_date_utc":"2021-09-02T17:29:00.000Z","static_fire_date_un
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[],"details":"Inspiration4 is the world\xe2\x80\x99s first all-civilian mi
ssion to space. The mission will be commanded by Jared Isaacman, the 37-ye
ar-old founder and Chief Executive Officer of Shift4 Payments and an accom
plished pilot and adventurer. Inspiration4 will leave Earth from Kennedy S
pace Center\xe2\x80\x99s historic Launch Complex 39A, the embarkation poin
t for Apollo and Space Shuttle missions, and travel across a low earth orb
it on a multi-day journey that will continually eclipse more than 90% of t
he earth\xe2\x80\x99s population. Named in recognition of the four-person
crew that will raise awareness and funds for St. Jude Children\xe2\x80\x99
s Research Hospital, this milestone represents a new era for human spacefl
ight and exploration.","crew":["607a3a5f5a906a44023e0870","607a3ab45a906a4
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s":"SpaceX will launch the third operational mission of its Crew Dragon ve
hicle 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 wil
l land downrange on a drone ship. The Crew-2 mission returns from the spac
e station in November.","crew":["5fe3c587b3467846b3242198","5fe3c5beb34678
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53200,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","succe
ss":true,"failures":[],"details":"NASA\'s Double Asteroid Redirect Test (D
ART) will demonstrate the use of a kinetic impactor to alter an asteroid
\'s trajectory, an intervention that could be used in the future to preven
t devastating Earth impacts. The target system consists of Didymos, 780 me
ters in diameter, and its moonlet Dimorphos, 160 meters. The DART spacecra
ft will intercept the double asteroid, using autonomous guidance to crash
into the smaller one. Moving at about 6 km/s, the transferred momentum sho
uld alter Dimorphos\'s 12 hour orbital period around its companion by seve
ral minutes. The mission tests several technologies, including the Small-b
ody Maneuvering Autonomous Real-Time Navigation (SMART Nav) used to differ
entiate and steer toward the target body and Roll-Out Solar Arrays (ROSA)
with Transformational Solar Array concentrators. NASA\xe2\x80\x99s Evoluti
onary Xenon Thruster \xe2\x80\x94 Commercial (NEXT\xe2\x80\x93C) ion engin

e will also be demonstrated, although the spacecraft\'s primary propulsion is hydrazine thrusters. DART should arrive at Didymos in late September 2022, when it is about 11 million kilometers from Earth. Ten days before impact, the Italian Space Agency\'s cubesat LICIACube will be deployed to observe the collision and ejecta with its two cameras. Earth-based telescopes will be used to measure the altered orbit.","crew":[],"ships":["5ea6ed30080df4000697c913","5ea6ed2f080df4000697c90b","5ea6ed30080df4000697c912"],"capsules":[],"payloads":["5fe3c4a6b3467846b3242192"],"launchpad":"5e9e4502f509092b78566f87","flight_number":138,"name":"DART","date_utc":"2021-11-24T06:20:00.000Z","date_unix":1637734800,"date_local":"2021-11-23T22:20:00-08:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c54a0622a633027900a1","flight":2,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3032383ecb6bb234e7ca"}],"auto_update":true,"tbd":false,"launch_library_id":"c4b2f90e-3385-4cbe-a89f-fc5f57da1bfb","id":"5fe3b107b3467846b324216b"},{"fairings":{"reused":null,"recovery_attempt":true,"recovered":null,"ships":["618fad7e563d69573ed8caa9"]},"links":{"patch":{"small":"https://images2.imgbox.com/fc/e7/esvHlHwA_o.png","large":"https://images2.imgbox.com/91/15/2LRaHihk_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/r79osa/spacex_starlink_43_launch_discussion_and_updates/","media":null,"recovery":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51732172914_4efa7d5210_o.jpg","https://live.staticflickr.com/65535/51730706247_4b5bf2899f_o.jpg","https://live.staticflickr.com/65535/51732172879_4ce91546ed_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/594TbXriaAk","youtube_id":"594TbXriaAk","article":null,"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":null,"crew":[],"ships":["5ea6ed2d080df4000697c904","618fad7e563d69573ed8caa9","5ee68c683c228f36bd5809b5"],"capsules":[],"payloads":["6161d0f26db1a92bfba85355"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":139,"name":"Starlink 4-3 (v1.5)","date_utc":"2021-12-01T23:20:00.000Z","date_unix":1638400800,"date_local":"2021-12-01T18:20:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5ef670f10059c33cee4a826c","flight":9,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecb075134e7cd"}],"auto_update":true,"tbd":false,"launch_library_id":"56db9abd-41b8-41a3-9d6d-88e52460682b","id":"6161c94c6db1a92bfba85349"},{"fairings":{"reused":null,"recovery_attempt":null,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/75/ac/qogMzpf1_o.png","large":"https://images2.imgbox.com/29/60/zFjdRVpC_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/r7chh2/ixpe_launch_campaign_thread/","launch":null,"media":null,"recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/51736587581_c944959eaa_o.jpg","https://live.staticflickr.com/65535/51737479675_63a2074244_o.jpg","https://live.staticflickr.com/65535/51737234364_b43ca3ea26_o.jpg","https://live.staticflickr.com/65535/51735767097_6126fe3138_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/CpmHsN5GUn8","youtube_id":"CpmHsN5GUn8","article":null,"wikipedia":"https://en.wikipedia.org/wiki/IXPE"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":null,"crew":[],"ships":[],"capsules":[],"payloads":["61c1f395a4a2462678cbf46e"],"launchpad":"5e9e4502f509094188566f88","flight_number":140,"name":"IXPE","date_utc":"2021-12-09T06:00:00.000Z","date_unix":1639029600,"date_local":"2021-12-09T01:00:00-05:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c53d0622a6330279009f","flight":5,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e303338

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ital-launches-from-space-coast-in-a-year/","wikipedia":null},"static_fire_
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ential supplies to the International Space Station using the cargo variant
of SpaceX\'s Dragon 2 spacecraft. Cargo includes several science experimen
ts. The booster for this mission is expected to land on an ASDS. The missi
on will be complete with return and recovery of the Dragon capsule and dow
n cargo.","crew":[],"ships":["5ea6ed2f080df4000697c910","614251b711a64135d
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-starlink-satellites-in-first-launch-of-2022/","wikipedia":"https://en.wik
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S), operated by SpaceX on behalf of Axiom Space. The flight will launch no earlier than 31 March 2022 and send four people to the ISS for an eight-day stay","crew":["61eefc9c9eb1064137a1bd77","61eefcf89eb1064137a1bd79","61eefd5b9eb1064137a1bd7a","61eefdbf9eb1064137a1bd7b"],"ships":["5ea6ed2e080df4000697c909"],"capsules":["5e9e2c5df359188aba3b2676"],"payloads":["61eefb129eb1064137a1bd74"],"launchpad":"5e9e4502f509094188566f88","flight_number":156,"name":"Ax-1","date_utc":"2022-04-08T15:17:00.000Z","date_unix":1649431020,"date_local":"2022-04-08T11:17:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5f57c5440622a633027900a0","flight":5,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"landing_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecb075134e7cd"}],"auto_update":true,"tbd":false,"launch_library_id":"a3eeb03b-a209-4255-91b5-772dc0d2150e","id":"61eefaa89eb1064137a1bd73"},{"fairings":{"reused":null,"recovery_attempt":null,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/2b/af/npQ6NwKM_o.png","large":"https://images2.imgbox.com/aa/64/aThfTk9s_o.png"},"reddit":{"campaign":null,"launch":null,"media":null,"recovery":null},"flickr":{"small":[],"original":["https://live.staticflickr.com/65535/52013376989_395092fa4c_o.jpg","https://live.staticflickr.com/65535/52013130121_da63eecbec_o.jpg","https://live.staticflickr.com/65535/52013376694_cea1bb1c0b_o.jpg"]},"presskit":null,"webcast":"https://youtu.be/mMcmf1g4qSA","youtube_id":"mMcmf1g4qSA","article":"https://spaceflightnow.com/2022/04/17/spacex-launches-and-lands-rocket-on-mission-for-national-reconnaissance-office/","wikipedia":"https://en.wikipedia.org/wiki/National_Reconnaissance_Office"},"static_fire_date_utc":null,"static_fire_date_unix":null,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"details":null,"crew":[],"ships":[],"capsules":[],"payloads":["6243b036af52800c6e919262"],"launchpad":"5e9e4502f509092b78566f87","flight_number":157,"name":"NROL-85","date_utc":"2022-04-17T13:13:00.000Z","date_unix":1650201180,"date_local":"2022-04-17T06:13:00-07:00","date_precision":"hour","upcoming":false,"cores":[{"core":"61fae5947aa67176fe3e0e1e","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":"42932355-c450-4250-a885-2d2709fd7cfc","id":"6243adcaaf52800c6e919254"},{"fairings":{"reused":null,"recovery_attempt":null,"recovered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbox.com/60/36/ReA4NxNK_o.png","large":"https://images2.imgbox.com/77/16/dxET2a6z_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/u8hpux/rspacex_starlink_414_launch_discussion_and/","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/s6yBwQSrtFY","youtube_id":"s6yBwQSrtFY","article":null,"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":null,"crew":[],"ships":["618fad7e563d69573ed8caa9"],"capsules":[],"payloads":["6243af9faf52800c6e919261"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":158,"name":"Starlink 4-14 (v1.5)","date_utc":"2022-04-21T15:16:00.000Z","date_unix":1650554160,"date_local":"2022-04-21T11:16:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"core":"5ef670f10059c33cee4a826c","flight":12,"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":"2c5447d7-36c5-40fd-88de-47ed6b258bdb","id":"6243ada6af52800c6e919253"},{"fairings":null,"links":{"patch":{"small":"https://images2.imgbox.com/22/94/l0GVrzr2_o.png","large":"https://images2.imgbox.com/8f/ce/drbrg4Ky_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comments/u6d5na/rspacex_crew4_campaign_launch_discussion_updates/","launch":null,"media":null,"re

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sed":true,"landing_attempt":true,"landing_success":true,"landing_type":"AS
DS","landpad":"5e9e3033383ecb075134e7cd"}],"auto_update":true,"tbd":fals
e,"launch_library_id":"992823ad-f843-4a4a-beca-882b8ce8773a","id":"62a9f89
a20413d2695d8871a"},{"fairings":{"reused":null,"recovery_attempt":null,"re
covered":null,"ships":[]},"links":{"patch":{"small":"https://images2.imgbo
x.com/a9/9a/NXVkTZCE_o.png","large":"https://images2.imgbox.com/e3/cc/hN96
PmST_o.png"},"reddit":{"campaign":"https://www.reddit.com/r/spacex/comment
s/jhu37i/starlink_general_discussion_and_deployment_thread/","launch":"htt
ps://www.reddit.com/r/spacex/comments/xd8vhj/rspacex_starlink_434_launch_d
iscussion_and/","media":null,"recovery":"https://www.reddit.com/r/spacex/c
omments/k2ts1q/rspacex_fleet_updates_discussion_thread/"},"flickr":{"smal
l":[],"original":[]},"presskit":null,"webcast":"https://youtu.be/ZlQHF_yBk
MQ","youtube_id":"ZlQHF_yBkMQ","article":null,"wikipedia":null},"static_fi
re_date_utc":null,"static_fire_date_unix":null,"net":false,"window":nul
l,"rocket":"5e9d0d95eda69973a809d1ec","success":true,"failures":[],"detail
s":null,"crew":[],"ships":[],"capsules":[],"payloads":["63161699ffc78f3b85
670719"],"launchpad":"5e9e4501f509094ba4566f84","flight_number":185,"nam
e":"Starlink 4-34 (v1.5)","date_utc":"2022-09-17T01:05:00.000Z","date_uni
x":1663376700,"date_local":"2022-09-16T21:05:00-04:00","date_precision":"h
our","upcoming":false,"cores":[{"core":"60b800111f83cc1e59f16438","fligh
t":6,"gridfins":true,"legs":true,"reused":true,"landing_attempt":true,"lan
ding_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7
cc"}],"auto_update":true,"tbd":false,"launch_library_id":"9ba04064-c329-40
bf-b477-ff468d7d8058","id":"63161329ffc78f3b8567070b"},{"fairings":{"reuse
d":null,"recovery_attempt":null,"recovered":null,"ships":[]},"links":{"pat
ch":{"small":"https://images2.imgbox.com/a9/9a/NXVkTZCE_o.png","large":"ht
tps://images2.imgbox.com/e3/cc/hN96PmST_o.png"},"reddit":{"campaign":"http
s://www.reddit.com/r/spacex/comments/jhu37i/starlink_general_discussion_an
d_deployment_thread/","launch":"https://www.reddit.com/r/spacex/comments/x
n028t/rspacex_starlink_435_launch_discussion_and/","media":null,"recover
y":"https://www.reddit.com/r/spacex/comments/k2ts1q/rspacex_fleet_updates_
discussion_thread/"},"flickr":{"small":[],"original":[]},"presskit":nul
l,"webcast":"https://youtu.be/VVu2bSJJhgI","youtube_id":"VVu2bSJJhgI","art
icle":null,"wikipedia":null},"static_fire_date_utc":null,"static_fire_date
_unix":null,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1e
c","success":true,"failures":[],"details":null,"crew":[],"ships":[],"capsu
les":[],"payloads":["631616a7ffc78f3b8567071a"],"launchpad":"5e9e4501f5090
94ba4566f84","flight_number":186,"name":"Starlink 4-35 (v1.5)","date_ut
c":"2022-09-24T23:30:00.000Z","date_unix":1664062200,"date_local":"2022-09
-24T19:30:00-04:00","date_precision":"hour","upcoming":false,"cores":[{"co
re":"627843d657b51b752c5c5a53","flight":4,"gridfins":true,"legs":true,"reu

sed":true,"landing_attempt":true,"landing_success":true,"landing_type":"AS
DS","landpad":"5e9e3033383ecbb9e534e7cc"}],"auto_update":true,"tbd":fals
e,"launch_library_id":"1c903b65-6667-4fd5-944d-296c5f13e01f","id":"6316133
9ffc78f3b8567070c"},{"fairings":null,"links":{"patch":{"small":"https://im
ages2.imgbox.com/eb/d8/D1Ywp0w_o.png","large":"https://images2.imgbox.co
m/33/2e/k6VE4iYl_o.png"},"reddit":{"campaign":null,"launch":"https://www.r
eddit.com/r/spacex/comments/xvm76j/rspacex_crew5_launchcoast_docking_discu
ssion_and/","media":null,"recovery":null},"flickr":{"small":[],"original":
[]},"presskit":null,"webcast":"https://youtu.be/5EwW8ZkArL4","youtube_i
d":"5EwW8ZkArL4","article":null,"wikipedia":"https://en.wikipedia.org/wik
i/SpaceX_Crew-5"},"static_fire_date_utc":null,"static_fire_date_unix":nul
l,"net":false,"window":null,"rocket":"5e9d0d95eda69973a809d1ec","success":
true,"failures":[],"details":null,"crew":["62dd7196202306255024d13c","62dd
71c9202306255024d13d","62dd7210202306255024d13e","62dd7253202306255024d13
f"],"ships":[],"capsules":["617c05591bad2c661a6e2909"],"payloads":["62dd73
ed202306255024d145"],"launchpad":"5e9e4502f509094188566f88","flight_numbe
r":187,"name":"Crew-5","date_utc":"2022-10-05T16:00:00.000Z","date_unix":1
664985600,"date_local":"2022-10-05T12:00:00-04:00","date_precision":"hou
r","upcoming":false,"cores":[{"core":"633d9da635a71d1d9c66797b","flight":
1,"gridfins":true,"legs":true,"reused":false,"landing_attempt":true,"landi
ng_success":true,"landing_type":"ASDS","landpad":"5e9e3033383ecbb9e534e7c
c"}],"auto_update":true,"tbd":false,"launch_library_id":"f33d5ece-e825-4cd
8-809f-1d4c72a2e0d3","id":"62dd70d5202306255024d139"}]'

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.appdo
```

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 [12]:
```
# Use json_normalize meethod to convert the json result into a dataframe
import requests
import pandas as pd

# Static JSON URL
static_json_url = 'https://cf-courses-data.s3.us.cloud-object-storage.app

# Send GET request and decode response as JSON
response = requests.get(static_json_url)
data = response.json()
```

```
# Convert JSON data into a DataFrame
df = pd.json_normalize(data)

# Display first 5 rows
print(df.head())
```

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

                     rocket  success  \
0  5e9d0d95eda69955f709d1eb    False
1  5e9d0d95eda69955f709d1eb    False
2  5e9d0d95eda69955f709d1eb    False
3  5e9d0d95eda69955f709d1eb     True
4  5e9d0d95eda69955f709d1eb     True


details  \
0
Engine failure at 33 seconds and loss of vehicle
1  Successful first stage burn and transition to second stage, maximum alt
itude 289 km, Premature engine shutdown at T+7 min 30 s, Failed to reach o
rbit, Failed to recover first stage
2
Residual stage 1 thrust led to collision between stage 1 and stage 2
3                        Ratsat was carried to orbit on the first successf
ul orbital launch of any privately funded and developed, liquid-propelled
carrier rocket, the SpaceX Falcon 1
4
None

  crew ships capsules                                                  payload
s  \
0   []    []       []                             [5eb0e4b5b6c3bb0006eeb1e
1]
1   []    []       []                             [5eb0e4b6b6c3bb0006eeb1e
2]
2   []    []       []  [5eb0e4b6b6c3bb0006eeb1e3, 5eb0e4b6b6c3bb0006eeb1e
4]
3   []    []       []                             [5eb0e4b7b6c3bb0006eeb1e
5]
4   []    []       []                             [5eb0e4b7b6c3bb0006eeb1e
6]

                  launchpad  auto_update  \
0  5e9e4502f5090995de566f86         True
1  5e9e4502f5090995de566f86         True
2  5e9e4502f5090995de566f86         True
3  5e9e4502f5090995de566f86         True
4  5e9e4502f5090995de566f86         True


failures  \
0                                             [{'time': 33, 'altitude':
None, 'reason': 'merlin engine failure'}]
1            [{'time': 301, 'altitude': 289, 'reason': 'harmonic oscillati
on leading to premature engine shutdown'}]
2  [{'time': 140, 'altitude': 35, 'reason': 'residual stage-1 thrust led t
o collision between stage 1 and stage 2'}]
3
[]
```

```
4
[]

   flight_number         name                  date_utc   date_unix  \
0              1    FalconSat  2006-03-24T22:30:00.000Z  1143239400
1              2      DemoSat  2007-03-21T01:10:00.000Z  1174439400
2              3  Trailblazer  2008-08-03T03:34:00.000Z  1217734440
3              4       RatSat  2008-09-28T23:15:00.000Z  1222643700
4              5     RazakSat  2009-07-13T03:35:00.000Z  1247456100

                  date_local date_precision  upcoming  \
0  2006-03-25T10:30:00+12:00           hour     False
1  2007-03-21T13:10:00+12:00           hour     False
2  2008-08-03T15:34:00+12:00           hour     False
3  2008-09-28T11:15:00+12:00           hour     False
4  2009-07-13T15:35:00+12:00           hour     False


cores  \
0  [{'core': '5e9e289df35918033d3b2623', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
1  [{'core': '5e9e289ef35918416a3b2624', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
2  [{'core': '5e9e289ef3591814873b2625', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
3  [{'core': '5e9e289ef3591855dc3b2626', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
4  [{'core': '5e9e289ef359184f103b2627', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]

                        id fairings.reused fairings.recovery_attempt  \
0  5eb87cd9ffd86e000604b32a           False                     False
1  5eb87cdaffd86e000604b32b           False                     False
2  5eb87cdbffd86e000604b32c           False                     False
3  5eb87cdbffd86e000604b32d           False                     False
4  5eb87cdcffd86e000604b32e           False                     False

  fairings.recovered fairings.ships  \
0              False             []
1              False             []
2              False             []
3              False             []
4              False             []

                                links.patch.small  \
0  https://images2.imgbox.com/3c/0e/T8iJcSN3_o.png
1  https://images2.imgbox.com/4f/e3/I0lkuJ2e_o.png
2  https://images2.imgbox.com/3d/86/cnu0pan8_o.png
3  https://images2.imgbox.com/e9/c9/T8CfiSYb_o.png
4  https://images2.imgbox.com/a7/ba/NBZSw3Ho_o.png

                                links.patch.large links.reddit.campaign
\
0  https://images2.imgbox.com/40/e3/GypSkayF_o.png                  None
1  https://images2.imgbox.com/be/e7/iNqsqVYM_o.png                  None
```

```
2  https://images2.imgbox.com/4b/bd/d8UxLh4q_o.png                  None
3  https://images2.imgbox.com/e0/a7/FNjvKlXW_o.png                  None
4  https://images2.imgbox.com/8d/fc/0qdZMWWx_o.png                  None

  links.reddit.launch links.reddit.media links.reddit.recovery  \
0                None               None                  None
1                None               None                  None
2                None               None                  None
3                None               None                  None
4                None               None                  None

  links.flickr.small links.flickr.original  \
0                 []                     []
1                 []                     []
2                 []                     []
3                 []                     []
4                 []                     []


links.presskit  \
0
None
1
None
2
None
3
None
4  http://www.spacex.com/press/2012/12/19/spacexs-falcon-1-successfully-de
livers-razaksat-satellite-orbit

                                links.webcast links.youtube_id  \
0  https://www.youtube.com/watch?v=0a_00nJ_Y88      0a_00nJ_Y88
1  https://www.youtube.com/watch?v=Lk4zQ2wP-Nc      Lk4zQ2wP-Nc
2  https://www.youtube.com/watch?v=v0w9p3U8860      v0w9p3U8860
3  https://www.youtube.com/watch?v=dLQ2tZEH6G0      dLQ2tZEH6G0
4  https://www.youtube.com/watch?v=yTaIDooc8Og      yTaIDooc8Og

                                                                links.ar
ticle  \
0  https://www.space.com/2196-spacex-inaugural-falcon-1-rocket-lost-launc
h.html
1      https://www.space.com/3590-spacex-falcon-1-rocket-fails-reach-orbi
t.html
2       http://www.spacex.com/news/2013/02/11/falcon-1-flight-3-mission-su
mmary
3                                        https://en.wikipedia.org/wiki/R
atsat
4                      http://www.spacex.com/news/2013/02/12/falcon-1-fli
ght-5

                                       links.wikipedia  fairings
0                 https://en.wikipedia.org/wiki/DemoSat       NaN
1                 https://en.wikipedia.org/wiki/DemoSat       NaN
2  https://en.wikipedia.org/wiki/Trailblazer_(satellite)       NaN
3                  https://en.wikipedia.org/wiki/Ratsat       NaN
4               https://en.wikipedia.org/wiki/RazakSAT       NaN
```

Using the dataframe `data` print the first 5 rows

In [13]:
```
# Get the head of the dataframe
print(df.head())
```

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

                     rocket  success  \
0  5e9d0d95eda69955f709d1eb    False
1  5e9d0d95eda69955f709d1eb    False
2  5e9d0d95eda69955f709d1eb    False
3  5e9d0d95eda69955f709d1eb     True
4  5e9d0d95eda69955f709d1eb     True


details  \
0
Engine failure at 33 seconds and loss of vehicle
1  Successful first stage burn and transition to second stage, maximum alt
itude 289 km, Premature engine shutdown at T+7 min 30 s, Failed to reach o
rbit, Failed to recover first stage
2
Residual stage 1 thrust led to collision between stage 1 and stage 2
3                        Ratsat was carried to orbit on the first successf
ul orbital launch of any privately funded and developed, liquid-propelled
carrier rocket, the SpaceX Falcon 1
4
None

  crew ships capsules                                                  payload
s  \
0   []    []       []                             [5eb0e4b5b6c3bb0006eeb1e
1]
1   []    []       []                             [5eb0e4b6b6c3bb0006eeb1e
2]
2   []    []       []  [5eb0e4b6b6c3bb0006eeb1e3, 5eb0e4b6b6c3bb0006eeb1e
4]
3   []    []       []                             [5eb0e4b7b6c3bb0006eeb1e
5]
4   []    []       []                             [5eb0e4b7b6c3bb0006eeb1e
6]

                  launchpad  auto_update  \
0  5e9e4502f5090995de566f86         True
1  5e9e4502f5090995de566f86         True
2  5e9e4502f5090995de566f86         True
3  5e9e4502f5090995de566f86         True
4  5e9e4502f5090995de566f86         True


failures  \
0                                             [{'time': 33, 'altitude':
None, 'reason': 'merlin engine failure'}]
1            [{'time': 301, 'altitude': 289, 'reason': 'harmonic oscillati
on leading to premature engine shutdown'}]
2  [{'time': 140, 'altitude': 35, 'reason': 'residual stage-1 thrust led t
o collision between stage 1 and stage 2'}]
3
[]
```

```
4
[]

   flight_number         name                  date_utc   date_unix  \
0              1    FalconSat  2006-03-24T22:30:00.000Z  1143239400
1              2      DemoSat  2007-03-21T01:10:00.000Z  1174439400
2              3  Trailblazer  2008-08-03T03:34:00.000Z  1217734440
3              4       RatSat  2008-09-28T23:15:00.000Z  1222643700
4              5     RazakSat  2009-07-13T03:35:00.000Z  1247456100

                  date_local date_precision  upcoming  \
0  2006-03-25T10:30:00+12:00           hour     False
1  2007-03-21T13:10:00+12:00           hour     False
2  2008-08-03T15:34:00+12:00           hour     False
3  2008-09-28T11:15:00+12:00           hour     False
4  2009-07-13T15:35:00+12:00           hour     False


cores  \
0  [{'core': '5e9e289df35918033d3b2623', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
1  [{'core': '5e9e289ef35918416a3b2624', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
2  [{'core': '5e9e289ef3591814873b2625', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
3  [{'core': '5e9e289ef3591855dc3b2626', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]
4  [{'core': '5e9e289ef359184f103b2627', 'flight': 1, 'gridfins': False,
'legs': False, 'reused': False, 'landing_attempt': False, 'landing_succes
s': None, 'landing_type': None, 'landpad': None}]

                        id fairings.reused fairings.recovery_attempt  \
0  5eb87cd9ffd86e000604b32a           False                     False
1  5eb87cdaffd86e000604b32b           False                     False
2  5eb87cdbffd86e000604b32c           False                     False
3  5eb87cdbffd86e000604b32d           False                     False
4  5eb87cdcffd86e000604b32e           False                     False

  fairings.recovered fairings.ships  \
0              False             []
1              False             []
2              False             []
3              False             []
4              False             []

                                links.patch.small  \
0  https://images2.imgbox.com/3c/0e/T8iJcSN3_o.png
1  https://images2.imgbox.com/4f/e3/I0lkuJ2e_o.png
2  https://images2.imgbox.com/3d/86/cnu0pan8_o.png
3  https://images2.imgbox.com/e9/c9/T8CfiSYb_o.png
4  https://images2.imgbox.com/a7/ba/NBZSw3Ho_o.png

                                links.patch.large links.reddit.campaign
\
0  https://images2.imgbox.com/40/e3/GypSkayF_o.png                  None
1  https://images2.imgbox.com/be/e7/iNqsqVYM_o.png                  None
```

```
2  https://images2.imgbox.com/4b/bd/d8UxLh4q_o.png                  None
3  https://images2.imgbox.com/e0/a7/FNjvKlXW_o.png                  None
4  https://images2.imgbox.com/8d/fc/0qdZMWWx_o.png                  None

  links.reddit.launch links.reddit.media links.reddit.recovery  \
0                None               None                  None
1                None               None                  None
2                None               None                  None
3                None               None                  None
4                None               None                  None

  links.flickr.small links.flickr.original  \
0                 []                     []
1                 []                     []
2                 []                     []
3                 []                     []
4                 []                     []


links.presskit  \
0
None
1
None
2
None
3
None
4  http://www.spacex.com/press/2012/12/19/spacexs-falcon-1-successfully-de
livers-razaksat-satellite-orbit

                                links.webcast links.youtube_id  \
0  https://www.youtube.com/watch?v=0a_00nJ_Y88      0a_00nJ_Y88
1  https://www.youtube.com/watch?v=Lk4zQ2wP-Nc      Lk4zQ2wP-Nc
2  https://www.youtube.com/watch?v=v0w9p3U8860      v0w9p3U8860
3  https://www.youtube.com/watch?v=dLQ2tZEH6G0      dLQ2tZEH6G0
4  https://www.youtube.com/watch?v=yTaIDooc8Og      yTaIDooc8Og

                                                                links.ar
ticle  \
0  https://www.space.com/2196-spacex-inaugural-falcon-1-rocket-lost-launc
h.html
1      https://www.space.com/3590-spacex-falcon-1-rocket-fails-reach-orbi
t.html
2       http://www.spacex.com/news/2013/02/11/falcon-1-flight-3-mission-su
mmary
3                                        https://en.wikipedia.org/wiki/R
atsat
4                       http://www.spacex.com/news/2013/02/12/falcon-1-fli
ght-5

                                       links.wikipedia  fairings
0                  https://en.wikipedia.org/wiki/DemoSat       NaN
1                  https://en.wikipedia.org/wiki/DemoSat       NaN
2  https://en.wikipedia.org/wiki/Trailblazer_(satellite)       NaN
3                   https://en.wikipedia.org/wiki/Ratsat       NaN
4                 https://en.wikipedia.org/wiki/RazakSAT       NaN
```

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 [14]:
```
import datetime

# Keep only the required columns
df = df[['rocket', 'payloads', 'launchpad', 'cores', 'flight_number', 'da

# Remove rows with multiple cores or payloads
df = df[df['cores'].map(len) == 1]
df = df[df['payloads'].map(len) == 1]

# Extract the single value from the lists
df['cores'] = df['cores'].map(lambda x: x[0])
df['payloads'] = df['payloads'].map(lambda x: x[0])

# Convert date_utc to datetime and extract date
df['date'] = pd.to_datetime(df['date_utc']).dt.date

# Filter launches by date
df = df[df['date'] <= datetime.date(2020, 11, 13)]

# Check result
print(df.head())
```

```
                     rocket                   payloads  \
0  5e9d0d95eda69955f709d1eb  5eb0e4b5b6c3bb0006eeb1e1
1  5e9d0d95eda69955f709d1eb  5eb0e4b6b6c3bb0006eeb1e2
3  5e9d0d95eda69955f709d1eb  5eb0e4b7b6c3bb0006eeb1e5
4  5e9d0d95eda69955f709d1eb  5eb0e4b7b6c3bb0006eeb1e6
5  5e9d0d95eda69973a809d1ec  5eb0e4b7b6c3bb0006eeb1e7

                  launchpad  \
0  5e9e4502f5090995de566f86
1  5e9e4502f5090995de566f86
3  5e9e4502f5090995de566f86
4  5e9e4502f5090995de566f86
5  5e9e4501f509094ba4566f84


cores  \
0  {'core': '5e9e289df35918033d3b2623', 'flight': 1, 'gridfins': False, 'l
egs': False, 'reused': False, 'landing_attempt': False, 'landing_success':
None, 'landing_type': None, 'landpad': None}
1  {'core': '5e9e289ef35918416a3b2624', 'flight': 1, 'gridfins': False, 'l
egs': False, 'reused': False, 'landing_attempt': False, 'landing_success':
None, 'landing_type': None, 'landpad': None}
3  {'core': '5e9e289ef3591855dc3b2626', 'flight': 1, 'gridfins': False, 'l
egs': False, 'reused': False, 'landing_attempt': False, 'landing_success':
None, 'landing_type': None, 'landpad': None}
4  {'core': '5e9e289ef359184f103b2627', 'flight': 1, 'gridfins': False, 'l
egs': False, 'reused': False, 'landing_attempt': False, 'landing_success':
None, 'landing_type': None, 'landpad': None}
5  {'core': '5e9e289ef359185f2b3b2628', 'flight': 1, 'gridfins': False, 'l
egs': False, 'reused': False, 'landing_attempt': False, 'landing_success':
None, 'landing_type': None, 'landpad': None}

   flight_number                  date_utc        date
0              1  2006-03-24T22:30:00.000Z  2006-03-24
1              2  2007-03-21T01:10:00.000Z  2007-03-21
3              4  2008-09-28T23:15:00.000Z  2008-09-28
4              5  2009-07-13T03:35:00.000Z  2009-07-13
5              6  2010-06-04T18:45:00.000Z  2010-06-04
```

- 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 [15]:
```
#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 [16]:
```
BoosterVersion
```

Out[16]:
```
[]
```

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

In [17]:
```
# Call getBoosterVersion
getBoosterVersion(df)
```

the list has now been update

In [18]:
```
BoosterVersion[0:5]
```

Out[18]:
```
['Falcon 1', 'Falcon 1', 'Falcon 1', 'Falcon 1', 'Falcon 9']
```

we can apply the rest of the functions here:

In [19]:
```
# Call getLaunchSite
getLaunchSite(df)
```

In [20]:
```
# Call getPayloadData
getPayloadData(df)
```

In [21]:
```
# Call getCoreData
getCoreData(df)
```

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

In [22]:
```
launch_dict = {'FlightNumber': list(df['flight_number']),
'Date': list(df['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 [23]:
```
# Create a data from launch_dict
launch_df = pd.DataFrame(launch_dict)
```

Show the summary of the dataframe

In [24]:
```
# Show the head of the dataframe
launch_df.head()
```

Out[24]:

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

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 [25]:
```
# Hint data['BoosterVersion']!='Falcon 1'
data_falcon9 = launch_df[launch_df['BoosterVersion'].str.contains('Falcon
```

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

In [26]:
```
data_falcon9.loc[:,'FlightNumber'] = list(range(1, data_falcon9.shape[0]+
data_falcon9
```

Out[26]:

	FlightNumber	Date	BoosterVersion	PayloadMass	Orbit	LaunchSite	Outcor
0	1	2010-06-04	Falcon 9	NaN	LEO	CCSFS SLC 40	No No
1	2	2012-05-22	Falcon 9	525.0	LEO	CCSFS SLC 40	No No
2	3	2013-03-01	Falcon 9	677.0	ISS	CCSFS SLC 40	No No
3	4	2013-09-29	Falcon 9	500.0	PO	VAFB SLC 4E	Fal Oce
4	5	2013-12-03	Falcon 9	3170.0	GTO	CCSFS SLC 40	No No
...	...	...	...	...	...	...	
85	86	2020-09-03	Falcon 9	15600.0	VLEO	KSC LC 39A	Tr ASI
86	87	2020-10-06	Falcon 9	15600.0	VLEO	KSC LC 39A	Tr ASI
87	88	2020-10-18	Falcon 9	15600.0	VLEO	KSC LC 39A	Tr ASI
88	89	2020-10-24	Falcon 9	15600.0	VLEO	CCSFS SLC 40	Tr ASI
89	90	2020-11-05	Falcon 9	3681.0	MEO	CCSFS SLC 40	Tr ASI

90 rows × 17 columns

Data Wrangling

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

In [27]:
```
data_falcon9.isnull().sum()
```

Out[27]:
```
FlightNumber       0
Date               0
BoosterVersion     0
PayloadMass        5
Orbit              0
LaunchSite         0
Outcome            0
Flights            0
GridFins           0
Reused             0
Legs               0
LandingPad        26
Block              0
ReusedCount        0
Serial             0
Longitude          0
Latitude           0
dtype: int64
```

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

Task 3: Dealing with Missing Values

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

In [28]:
```
# Calculate the mean value of PayloadMass column
mean_payload_mass = data_falcon9['PayloadMass'].mean()
print("Mean Payload Mass:", mean_payload_mass)


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

```
Mean Payload Mass: 6123.547647058824
```

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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