SpaceX Metadata and Financials

* Launch Prediction Columns
  + FlightNumber: Flight Number, sequential, 1-90 incremental increase over time
  + Date: Launch date, sequential, 6/4/2010 to 11/5/2020
  + BoosterVersion: Launch vehicle type, Falcon 9
  + PayloadMass: Mass in Kg of payload attached to second stage within the fairings, most commonly StarLink satellites, ISS supplies, other customer satellites; other customers such as NASA, military, private companies, and governments of other countries
  + Orbit: Orbit destination of payload, GTO (geostationary transfer orbit), ISS (International Space Station), VLEO (Very low Earth orbit), PO (polar orbit), LEO (low Earth orbit), SSO (Sun-synchronous orbit), MEO (medium Earth orbit), ES-L1 (type of Lagrange point orbit where orbital period of the object becomes exactly equal to Earth's orbital period approximately 1.5 million km from Earth), HEO (highly elliptical orbit), SO (heliocentric orbit (HCO) an orbit around the Sun), GEO (geosynchronous equatorial orbit)
  + LaunchSite: Launch site locations CCAFS SLC-40 (Cape Canaveral Space Launch Complex 40), KSC LC-39A (Kennedy Space Center Launch Complex 39A), and VAFB SLC-4E (Vandenberg Space Launch Complex 4)
  + Outcome: Landing outcome type, True Ocean = controlled, successfully landed to a specific region of the ocean, False Ocean = uncontrolled, unsuccessfully landed to a specific region of the ocean, True RTLS = successfully landed to a ground pad, False RTLS = unsuccessfully landed to a ground pad, True ASDS = successfully landed on a drone ship, False ASDS = unsuccessfully landed on a drone ship
  + Flights: Launch number of core/booster, 1-6
  + GridFins: present (1) or absent (0) at launch, attached to first stage, deployed during re-entry to guide landing
  + ReusedCore: Using a reused first stage (1) or using a new first stage (0)
  + Legs: present (1) or not present (0) at launch, used in landing deploying shortly before touchdown
  + LandingPad: Landing pad used, ground pad, drone ship, in February 2015 LZ-1 and LZ-2 on Cape Canaveral Space Force Station on the site of the former Cape Canaveral Launch Complex 13
  + Block: booster version variant, or Falcon 9 launch vehicle variant, blocks 1-5, successively more modifications to prior block
  + ReusedCount: Total number flights - 1 = number of times core reused
  + Serial: Serial of core, B1XXX.Y, B = Booster, 1 = 1st stage, XXX incremental number starting at 001, .Y= mission information
  + Longitude: Coordinates of launch site
  + Latitude: Coordinates of launch site
  + Class: Landing outcome 0 = "unsuccessful", 1 = "successful", Class 0 = None None (No attempt), False ASDS, False Ocean (Uncontrolled), None ASDS, False RTLS, Class 1 = True ASDS, True RTLS, True Ocean (Controlled)
  + Year: Year extracted from launch date
  + ReusedFairings: if on the present flight’s fairings are reused (1), if new (0), two piece protective shell enclosing and protecting the payload during launch, they are shed after stage separation when the rocket is high enough such that aerodynamic stresses no longer present a danger to the payload; Recovery program: 2014 – June 2019 Mr. Steven 2014–2019, then Ms. Tree, first recovery for reuse April 2019, first reuse of refurbished fairings November 2019
  + Core data of SpaceX API: Outcome, Flights, GridFins, Reused, Legs, LandingPad, Block, ReusedCount, Serial
  + Sources of metadata
    - SpaceX Falcon 9 User Guide
    - <https://www.spacex.com/media/falcon-users-guide-2021-09.pdf>
    - Falcon 9 Wikipedia
    - <https://en.wikipedia.org/wiki/List_of_Falcon_9_and_Falcon_Heavy_launches#Booster_landings>
    - SpaceX API
    - <https://github.com/r-spacex/SpaceX-API>
    - SpaceX API Sources
    - <https://www.reddit.com/r/spacex/wiki/index/>
    - <https://www.reddit.com/r/SpaceX/wiki/spacex/development/fairing/>
    - <https://www.elonx.net/fairing-recovery-attempts/>
* Financial data (all multiply by 1 million)
  + CostCoreMil: if ReusedCore 1 = 250,000 (cost to refurbish a booster), if 0 = 30,000,000 (cost to build a new booster)
  + CostFairingsMil: if ReusedFairings 1 = 750,000 (cost to refurbish recovered fairings), if 0 = 6 (cost to build new fairings)
  + CostOtherMil: other costs = 10,000,000 + 4,000,000 (new second stage (10) + fuel/other; fuel/other (4 base cost) – such as operation of fairing recovery fleet
  + CostKgMil: 70% of payload revenue (.7\*10,000\*kg) is allocated to SpaceX cost vs allocation to profit, based on analysis of price to customer (from per launch charge of Falcon 9 contracts and respective payload masses) minus base price to customer for new or reused boosters
  + CostTotalMil: CostOtherMil + CostKgMil + CostCoreMil + CostFairingsMil
  + RevenueReuseMil: Base cost to customer, from Reused if 1 = 50,000,000 (customer charge if using a refurbished booster), if 0 = 62,000,000 (customer charge for new F9 flight)
  + RevenueKgMil: 10,000\*kg, per kg of payload, estimated based on payload mass by flight vs. contract cost per flight, based on analysis of price to customer (from per launch charge of Falcon 9 contracts and respective payload masses) minus base price to customer for new or reused boosters
  + RevenueTotalMil: RevenueReuseMil + RevenueKgMil
  + ProfitMil: RevenueTotalMil – CostTotalMil
  + Sources for Calculation and Estimation
    - See Notebook: Contracts and Financial Calculations EDA
    - Falcon 9 Wikipedia
    - <https://en.wikipedia.org/wiki/List_of_Falcon_9_and_Falcon_Heavy_launches#Booster_landings>
    - SpaceX API
    - <https://github.com/r-spacex/SpaceX-API>
    - SpaceX API Sources
    - <https://www.reddit.com/r/spacex/wiki/index/>
    - <https://www.reddit.com/r/SpaceX/wiki/spacex/development/fairing/>
    - <https://www.elonx.net/how-much-does-it-cost-to-launch-a-reused-falcon-9-elon-musk-explains-why-reusability-is-worth-it/>
    - <https://www.elonx.net/list-of-spacex-contracts/>