

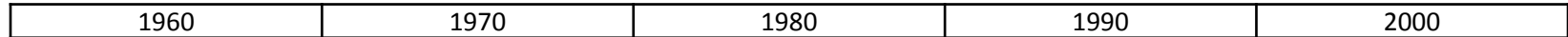
# Continuity of Investment from Satellites to Other Space Sectors

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# Space Communications Satellites

## Summary



Cold War →

NASA SYNCOM 1962 COMSAT Act    NASA ATS 3 Intersputnik    NASA ATS 6    NASA ACTS    .com Bubble    Credit Crisis

### Fixed

#### COMSAT



- SYNCOM**
- Spinner
  - 2 Xponders
  - 29 W Bol
  - 35 kg Bol
  - 1 year life

Fixed Telephony/Data

#### INTELSAT

RCA Americom

Weststar  
Telstar  
Galaxy  
ACS  
Palapa

#### Anik

PanAmSat

#### Eutelsat

SES

Arabsat

New Skies

Asiasat



Spaceways

#### I-14

- 3-axis
- 20 kW+ Bol
- 5663 kg Bol
- 66 Xponders
- Router
- 15 year life

### Funding

#### Governments

- Procurements
- User
- "Leases"

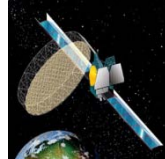
#### Large Companies

- Debt
- Equity

### Mobile

- Operators  
Debt  
Equity

INMARSAT



AMSC

Thuraya

#### Iridium

Globalstar

Orbcomm



SkyTerra

Mobile Telephony/Data

### Broadcast

- Operators  
Debt  
Equity

DirecTV

XM

Echostar

SIRIUS



Broadcast Video & Audio

# Case Study – COMSAT

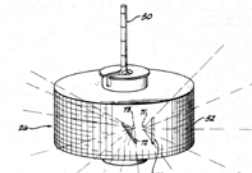


## A Series of Firsts

- Communications Satellite Act of 1962, 8/62
- COMSAT incorporated, 2/63
- Financing
  - 2/63: \$5m LOC Commercial Banks
  - 6/64: \$196m IPO (CQ), \$20/share – 1964 high of \$66 & low of \$36
- Early Bird/Intelsat I
  - ~ NASA SYNCOM 1, 2 & 3: 8/61, launches 4/63 (failed), 7/65 & 8/64
  - HAC Contract: 4/64, launch 4/65
  - HAC Williams Patent: US 3,758,051, *Velocity Control and Orientation of a Spin Stabilized Body*
- FCC approves sole earth station licenses, 5/65
- INTELSAT founded, 8/64 with COMSAT the majority Owner
- COMSAT Labs, 9/69
- INTERSPUTNIK founded 11/71



CQ

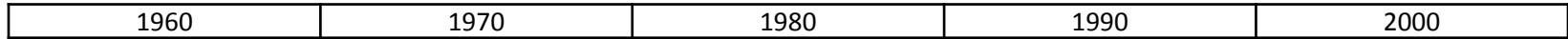


Spin Stabilized Satellite



Early Bird/Intelsat I

# Civil Programs Satellites Summary



Cold War →

NASA ATS 1 - 5 →

Landsat GOES

1992 Land Remote Sensing Policy Act

Transit

Navistar (GPS) GLONASS

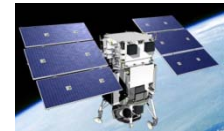
Beidou GIOVE

## Remote Sensing

SPOT 1 (Fr)



EarlyBird



Quickbird

(DigitalGlobe)

IKONOS  
(GeoEyes)



## Funding

Venture

Large Companies

Governments

as Users

Debt

Equity

## Position/Navigation

Large Companies ?

Private/Public (EU) ? Galileo(EU) ?

## New Space

Government

Private Equity

Large Companies

Orbital  
Microcosm

MAV/TSC/Virgin

Bigelow Aero

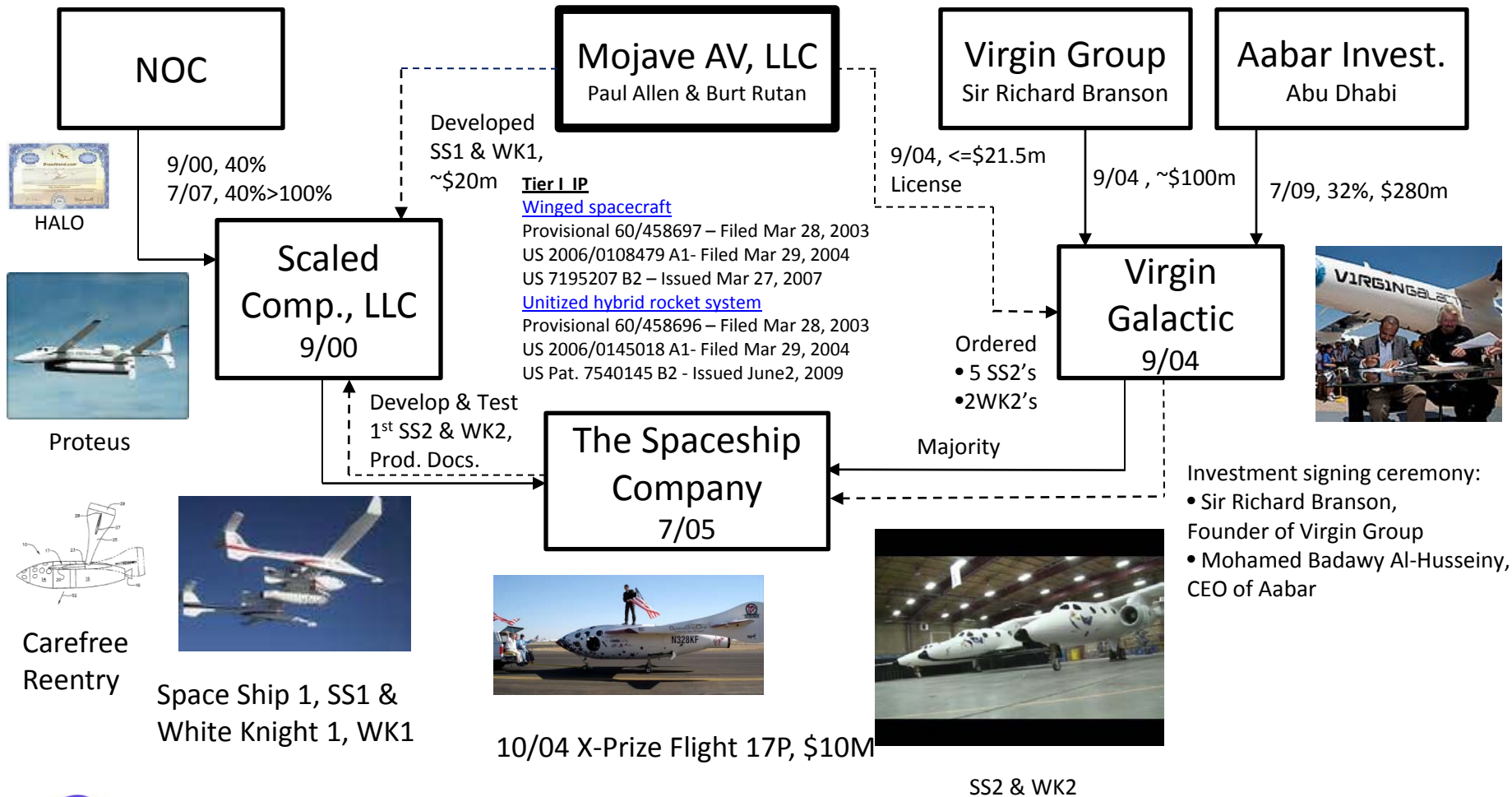
SpaceX

XCOR

Blue Origin Masten SS

Armadillo

# Case Study - Mojave Aerospace Ventures



# Case Study – Space X

- 6/02: Elon Musk founds, ~\$100m thru 3/06
- 1/04: Administration proposes STS retirement by 2010
- 1/05: Acquires 10% of SSTL
- 5/05: USAF Contract Responsive Small Spacelift (RSS) IDIQ, <=\$100m
- 11/05: NASA initiates Constellation
- 8/06: NASA Commercial Orbital Transportation Services (COTS), <=\$278m (not FAR per NASA's Authorization Act of 2005)
- 3/06: 1st Falcon 1 Launch, failure
- 8/08: Founders Fund Venture, \$20m
- 9/08: Falcon 1 Successful Launch, 4<sup>th</sup> attempt
- 12/08: NASA Commercial Resupply Services (CRS) Contract, <=\$1.6B
- 2/10: Administration proposes Constellation cancellation in FY2011
- 6/10: Falcon 9 Successful Launch



1 Merlin



9 Merlins

# Continuity of Investment from Satellites to Other Space Sectors

## Drivers & Innovations      Summary      Funding/Investment

- Technology, e.g., CubeSats
  - Economics , Value Proposition, Markets & Sustainability, e.g., SpaceX & XCOR
  - Risk Mitigation
  - IPR/IP
  - Geopolitics
    - Credit Crisis
    - Green
    - ITAR
    - Space Debris
    - Other
  - Governments
    - Policy
    - Regulation
- Government (US & Other)
    - R&D, e.g., CRAD, SBIR, Related Programs
    - User
  - Private/Market Sector
    - Early Stage
      - Angel
      - Venture
    - Debt
    - Equity
    - Partner
    - Operator
    - Supplier
    - Customer
    - Other
  - Prizes