SITUATION OVERVIEW

In October 2019, Virgin Galactic (VG) became public when it merged with the SPAC Social Capital Hedosophia Holdings ($IPOA). The company markets itself as a vertically integrated pure play space investment, well positioned to capture a large portion of the exponentially growing commercial space industry. The sell side and public market commentators believe VG is optional in nature, with huge upside to a major commercial space competitor if successful. In reality, VG's technology makes it more similar to a pre-revenue vertically integrated theme park that has a high probability of self-destruction either through cash burn or catastrophic loss of a flight vehicle and its passengers.

At $9.68 per share ($1893m mkt cap / $1505mn EV), we believe VG equity has 48% downside to $5 per share and that the speculative optionality in nature does not exist. Our view point is the combination of several theses. The current share price today substantially overestimates the demand for suborbital spaceflight, which has been studied in-depth. The core technology underlying their space vehicle limits themselves to suborbital altitudes, restraining VG from competing with more technologically advanced and better funded peers which plan to enter into the same market. The pro forma that VG management provided to investors contains unrealistic assumptions that do not reconcile with previous management comments and lacks credibility given the company's 15-year track record of misleading the public.

We believe the short thesis will pay out as the following occurs: VG will continue to miss their aggressive assumptions as formidable competitors come to market with similar offerings. Investors will see firsthand that neither the demand at certain prices VG is assuming, the synergies, nor scale that VG is assuming will exist for this type of product, and that the company is far from becoming the next SpaceX or Blue Origin. In 18-24 months, we expect VG's cash position to be insufficient to continue operations without additional funding. In our blue-sky scenario where VG meets all of their costs goals, operational and efficiency targets, and successfully realizes tickets prices of $250k by their terminal year, VG would make $106mn in EBITDA and $52mn in FCF. Today's valuation would then imply that the company already trades at 18x EBITDA / 45x FCF of VG's terminal year, which is 3.5 years away. Historical loss rates for similar class spaceflight vehicles virtually guarantee at least one catastrophic failure within this same time period making this optimistic scenario highly unlikely.

COMPANY BACKGROUND

Virgin Galactic plans to offer $250k suborbital trips to the edge of space. Over the last 15 years the company has invested more than a billion dollars to develop SpaceShipTwo (SST), its proprietary spaceflight system. The customers will pay $250k for 3 days of training at Spaceport America leading up to a 90-minute flight to the edge of space resulting in 3-4 minutes of weightlessness. The company has obtained $80mn in deposits from 603 pre-sale customers over the past decade.

The origins of VG trace back to 2004, when Paul Allen, Burt Rutan, and Scaled Composites won the Ansari X Prize with SpaceShipOne (SSO) on a $25mn investment by successfully sending the same vehicle to space twice in a two-week period. Seeing the potential for affordable spaceflight, Richard Branson approached the group to produce future vehicles. Together, Branson, Rutan, and Scaled Composites created The SpaceShip Company, which would develop and manufacture SST, for the sole use of VG. The SpaceShip Company has since been completely acquired by VG.

VG's space solution is to have a dual body cargo aircraft carrier (WhiteNightTwo) fly to an altitude of 15,000 meters and jettison a small fixed wing glider (SpaceShipTwo). After detachment, a rocket engine accelerates SST to Mach 3, pushing the flight vehicle to an altitude of 90,000 meters. After 3-4 minutes at the edge of space, SpaceShipTwo then glides back to Earth using a unique feathering reentry system.

INVESTMENT THESIS

1) VG's spacecraft design is technologically incapable of going beyond suborbital flights to the edge of space; limiting the full commercial space appeal and capping any future product roadmap.

a) SSO's solution, a carrier-launched glider, was designed specifically to win the Ansari X competition by getting an aircraft to skim the edge of space. By utilizing a carrier-launched glider design, the flight vehicle requires less propulsion to reach the edge of space relative to a traditional ground-launched rocket, since the flight vehicle propulsion system is initiated at an altitude of 15,000 meters, benefiting from both the carrier's forward velocity and the lower ambient pressure. SSO's intuitive feathering re-entry system enables the flight vehicle to slow

during re-entry, avoiding the need for weight-intensive heat shields. This solution varies significantly from other space vehicles, which are ground launched and use aerodynamic drag and heat shields for re-entry.

b) This design technologically limits VG to suborbital flights as increasing the maximum altitude of the glider requires more propulsion, which increases the amount of friction on descent. This is problematic for VG as their design utilizes the more complex feathering re-entry system instead of heat shields, in order to save time, money and weight. VG has not been able to pilot the SST past the Karman Line, one of the highest theoretical boundaries of space.

c) Beyond suborbital flights, the next opportunity for the space tourism industry is orbital flight. The advantage of reaching orbital velocity (which requires significantly more thrust than suborbital flights) is that vehicles can stay in space indefinitely, a significant advantage compared to 3-4 minutes of spaceflight experienced on suborbital flights. While Boeing, SpaceX, and Blue Origin are rushing to develop vehicles capable of sustaining orbital velocity, VG, the self-described leader in space tourism, does not even include orbital flights as a possibility in their roadmap. This is because their current technology is incapable of achieving orbital velocities (Mach 25 versus March 3) and successfully re-entering the earth's atmosphere.

d) VG believes there are four potential future use cases for its technology (listed below); however, these are not realistic. This highlights the fact that VG has no achievable roadmap and lacks the ability to reinvest capital.

a. Hypersonic Point to Point Travel: Well-funded competitors such as Boom Supersonic and Boeing are already developing hypersonic and supersonic vehicles, while VG is not.
b. Electric Air Mobility: VG has no experience here, and there are hundreds of viable competitors in this space.
c. Third Party WhiteKnightTwo (WKT) Sales: VG does not own the IP for this class of vehicle. Scaled Composites, a subsidiary of Northrop Grumman and the original manufacturer for WK1 and SS1 has developed similar class vehicles on request for companies like Stratolaunch.
d. High Altitude Persistent Platforms: VG has no experience here, and high-altitude drones have yet to become commercially viable.

e) The one potentially viable technology that VG developed was spun out of the company prior to the SPAC merger. Virgin Orbit is a CubeSat launch business which employs twice the number of employees as VG.

2) Historical spaceflight loss rates imply the likelihood of a catastrophic failure on an annual basis, which can likely lead to a major impairment of the VG business model. Unit economics become unattractive after factoring in failures. Customer demand is likely to rapidly shift to more viable competitors like Boeing, SpaceX and Blue Origin with safer flight vehicles.

a) F.A.A. calculations show failure rates for suborbital and orbital flights at 1% and 1.8%, respectfully. Link

a. Given VG's pro forma projects 571 spaceflights by year end 2023, the suborbital loss rate would imply 5-6 catastrophic failures within the first 3.5 years of operations.

b) Assuming one catastrophic loss per 150 flights (0.6% loss rate), VG will need to produce 2-3 vehicles per annum in order to cover annual operating expenses.

a. While the first SpaceShipTwo flight vehicles costed $133mn and $99mn to develop, VG believes they can reduce production costs to $25mn per unit.
b. VG's pro forma calls for the gross margin excluding D&A to increase from 63% in 2021 to 73% in 2023. VG's current unit level gross margin excluding D&A is 16%, as VG attributed an $1.2mn increase in revenue and a $1mn increase in cogs in their financials to a single flight occurring in February of 2019.
c. Assuming 150 flights per vehicle (fatality rate of .6%), a near term production cost of $50mn, a contribution margin of 45-70%, and a net revenue per flight of $1.25mn, the lifetime net cash flow generated per vehicle would vary between $34mn and $81mn.
d. Given VG's OpEx will run at $109mn in 2020 (vehicle production capitalized), VG would need to produce 2-3 aircraft per year to breakeven. VG's historical production has been 1 unit per 3-4 years.
e. These numbers assume no loss in demand from catastrophic loss of space vehicle and crew. This is highly unlikely. Savy, high net-worth customers are likely to rapidly chose alternatives which offer safer and more reliable access to spaceflight from VG's direct competitors (Boeing, SpaceX and Blue Origin).

Unit Economics: Lifetime net cash flow per SpaceShipTwo (000's)							
		SpaceShipTwo Contribution Margin					
		45%	47%	50%	55%	60%	65%	70%
SpaceShipTwo Vehicle Cost (000's)	25,000	59,375	63,125	68,750	78,125	87,500	96,875	106,250
	50,000	34,375	38,125	43,750	53,125	62,500	71,875	81,250
	75,000	9,375	13,125	18,750	28,125	37,500	46,875	56,250
	100,000	(15,625)	(11,875)	(6,250)	3,125	12,500	21,875	31,250

c) After 15 years in development, the durability of the SpaceShipTwo remains unknown. Relative to other aircrafts, this flight vehicle has barely been tested.

a. Through the entire flight test history, VG's SST has reached space only on two occasions, used its engine inflight only 9 times, and has achieved glided flight only 39 times. For comparison purposes, the 737 Max certification program (which some consider relaxed) required 297 flights by F.A.A. personal after thousands of flight hours by Boeing's flight test engineers.

b. In one of the nine flights where SST's rocket engine was ignited, the vehicle disintegrated, killing one of the pilots and seriously injuring the other pilot. Frame by frame disintegration can be found here, and a debrief of the accident can be found here. The vehicle crashed because the pilot unlocked the feather mechanism 14 seconds too early.

c. While VG has achieved suborbital spaceflight only twice over the last decade, their pro forma calls for achieving 571 flights by the year end of 2023. They also assume each vehicle can fly 55 times a year, which would be more flights in one year per vehicle than VG has flown since inception in two vehicles.

Cumulative SpaceShipTwo test flights by mission type					
	Captive	Glided	Powered	Space	Total
VSS Enterpise	1	32	4	0	37
VSS Unity	4	7	3	2	16
Total	5	39	7	2	53

d) Due to VG's catastrophic failure in 2014, VG may be regulated by the F.A.A. requiring an extensive and robust certification process which is likely to further impeded financial viability.

a. The Commercial Space Launch Act (CSLA) prevents the F.A.A. from regulating operators until October 2023. However, the F.A.A. may be able to regulate Virgin Galactic today, because the CSLA law specifically excludes operators who have killed people.

b. While it is unclear if the FAA will enforce stricter regulations for VG, VG is "required by the FAA to submit final integrated vehicle performance results conducted in an operational flight". These performance results include vehicle testing in extreme off-nominal situations.

3) The customer demand for suborbital spaceflight tourism is over exaggerated.

a) VG believes that the TAM for suborbital spaceflight is the 1.9mn people with greater than $10mn in assets. This is an over exaggeration:

a. Polling by Monmouth University show 72% of population would reject a free flight to space. (Link) This would imply 530K of these people who go to space if it is free.

b. But the suborbital flight trip costs $250k, 4 days of time, and includes a 1% probability of death. Actual annual demand would be a fraction of this, possibly around 1,000 people per year.

c. It is worth noting that in a decade long presale, with considerable marketing hype orchestrated by Richard Branson, VG has sold only 603 tickets.

b) In 2012, the Federal Aviation Administration Office of Commercial Space Transportation and Space Florida funded a study to calculate the demand for suborbital spaceflight. The study, authored by The Tauri Group, can be found here.

a. The study analyzed the use for suborbital spaceflights from a research, business and consumer prospective. To analyze the consumer, they interviewed over 200 high net worth individuals.

b. Their results estimated that the commercial suborbital spaceflight market would demand 255, 533 and 1,592 seats, in their constrained, baseline, and growth scenarios. VG's pro forma assumes flying 1,565 customers in 2023, 98.3% of this study's most bullish market estimate.

c. The study also highlights that between 2004 and 2011, a total of 4,500 individuals paid $5,000 to fly on a zero-gravity plane, which is a useful comparison for measuring potential market demand.

4) Space tourism competition is intensifying. VG is likely to be significantly disadvantaged from both a financial resource and flight safety position against serious and well-endowed competition.

a) Boeing, Blue Origin, and SpaceX have each announced plans for orbital space vehicles. Boeing and SpaceX are being paid substantial amounts by NASA to develop their Starliner and Dragon spacecraft under the NASA's Commercial Crew Program to provide orbital access to the International Space Station. Blue Origin, a private aerospace company founded by Jeff Bezos, is on track to commence suborbital commercial flights in early 2020.

a. Boeing, SpaceX, and Blue Origin have considerably more resources available to develop superior products. Boeing and SpaceX have already received significant amounts from NASA under the Commercial Crew Program for their Starliner and Dragon spacecraft. Boeing and SpaceX's contracts were valued at $4.3 billion and $2.5 billion, respectively, as of May 2019. Blue Origin's current annual equity financing of $1bn per year (funded by Bezos's Amazon stock sales) is equal to the cumulative amount of investment VG has received since its inception 15 years ago and is 5x VG's current spend.

b. Orbital vehicles are likely to be the next step in space tourism. SpaceX's orbital tourism is currently planned to launch in 2023. Blue Origin's orbital vehicle, the New Glenn, will likely provide tourist access to space after it is launched in 2021. SpaceX and Blue Origin employ 9x and 3x the number of employees than VG.

b) Blue Origin's suborbital vehicle, the New Shepard, utilizes a reusable rocket and a more reliable capsule design which is vastly superior to VG's SST.

a. While both the New Shepard and the SST offer a similar experience of 3-4 minutes in space, the New Shepard travels past the Karman Line, the highest theoretical barrier to space. The SST stops 10km short of this distance. For potential space tourists, this is a huge deal, and creates a significant competitive advantage for Blue Origin. As Jeff Bezos put it: *"We've always had as our mission that we wanted to fly above the Karman Line, because we didn't want there to be any asterisks next to your name about whether you're an astronaut or not*" (link)

b. The autonomous design of New Shepard reduces the possibility for human error, and the capsule design is likely to be safer than a fixed wing glider. VG's decision to go with a human piloted fixed wing design illustrates their technical maturity, as these types of vehicles are likely to have higher operating costs and lower reliability than fully autonomous spacecraft.

c) The key differentiator in space tourism will be safety, and we expect this to become a major selling point when competitors enter into the market. We expect that high net worth customers who have the capability of spending $250k to reach space are likely to pay significantly more for a system with a lower fatality rate. VG will be significantly disadvantaged here because a fixed wing solution will always be more complex and inherently more dangerous than a space capsule. VG has already demonstrated poor safety with serious fatalities during flight testing.

d) Considering that the spaceflight technology offered by Boeing, Space X and Blue Origin is faster, safer, and goes farther, we think it is very likely that VG will not be the eventual leader in space tourism.

5) VG management has misled customers, the public, and others about their timeline for achieving commercial launch operations for 15 years. VG's history of continuous delays should make investors cautious of trusting management's estimates on the commercial viability of their program.

a) In 2004, Richard Branson originally convinced customers that viable passenger spaceflights would commence within 3-4 years. In 2008, that estimate was extended to the 2009/2011 timeframe; and in 2009 it was extended to the 2011 to 2012 timeframe. In 2013 and 2014, VG predicted they were within one year of offering suborbital spaceflights with commercial passengers. In 2017 and 2018, Virgin estimated they were just 6 months to one year away. In early 2019, suborbital passenger spaceflights were expected to commence by the end of the year. And in the prospectus issued to investors over this summer, suborbital passenger spaceflights were project to commence in mid-2020.

b) VG's pro forma calls for an aggressive ramp of flights despite having only reached space twice.

Flights/Passengers assumptions in VG Proforma				
	2H' 2020	2021	2022	2023
Flights	16	115	170	270
Passengers	66	646	965	1565

a. This ramp up period would expend 15 years of pre-sales within 18 months and assumes no issues or additional expenditures in generating new customer demand in the future. While the total number of tickets outstanding reached 650 in 2017, 75% of these tickets were sold prior to 2012, which indicates the VG space tourism offering may be less attractive than before, considering continued delays, fatal test flights, and the emergence of well financed and technically capable competitors with similar or superior offerings.

b. This ramp up period is inconsistent with previous VG statements. In 2017, VG stated that they expect to fly a cumulative 650 customers within their first three years of service, while their current pro forma optimistically assumes more than 3000 people will fly within their first three years of operations.

c. To accommodate the ramp up in passengers, VG believes they will complete a new SpaceShipTwo every year for the next four years. This is incredibly optimistic.

   i. The original two vehicles took 3-4 years each to fabricate.

   ii. VG has two vehicles in development. One vehicle recently had the fuselage successfully mated to the wing assembly, but is not yet standing on its own wheels. The last SST completed had a vehicle "roll out celebration" 10 months after standing on its own wheels. It did not fly its first glided flight until 21 months after standing on its own wheels or reach suborbital altitude until 45 months after. No update has been given on the other vehicle in development. While process improvements will undoubtedly speed up the rollout, it seems unlikely the second vehicle will fly in 2020.

c) VG assumes that each vehicle will be able to fly 55 missions a year, with an infinite lifecycle. Underestimating costs related to safety, quality and reliability control has been a serious mistake with other better financed space programs.

a. This is an unproven assumption for VG given the single quickest turn around on a powered flight has been 8 weeks (6.5 missions/year), and for a glided flight, 3 weeks (17 missions/year).

b. Efficiency estimates limited the viability of NASA's Space Shuttle program, which originally planned to launch 60 missions per year, with turn times of 160 hours. The fastest turnaround was 87 days. Turnaround time for the Space Shuttle was slow due to unforeseen inspection and maintenance issues with tiles, main engines, and other components.

d) VG's current free cash flow burn rate is around $200mn. Given approximately $430mn of cash post SCH merger, VG will either need to start significant operations by year end 2021 or raise significant additional funding.

6) VG's pro forma implies a rocket ship like trajectory into profitability. Realistically, certain line items are most likely overestimated, amplifying implied operating leverage effects.

a) VG estimates that free cash flow per year will increase from $-200mn in 2019 to $+219mn in 2023. They expect to achieve this breakthrough by keeping operating costs relatively flat, as revenue and gross margins accelerate quickly. Management's estimated terminal year EBITDA margin of 46.4% would place it in the top decimal of public company EBITDA margins.

b) The most critical assumptions are at the top line.

a. The weighted average revenue per ticket in the model is $356k. This is 42% higher than the $250k ticket price VG advertises, and 78% higher than what the average revenue per ticket is for the pre-sale cohort (S-4 shows 603 pre-sales represent $120mn in revenue). Adjusting for the pre-sale flights revenue within the model would suggest a ticket price of $392K. Management has given two reasons for this:

   i. They believe they can sell (currently unknown) add on products and experiences.

   ii. They believe they can charge more for the tickets at the front of the queue.

b. VG's pro forma assumes over 3,000 customers will be flown within the first 3.5 years. This would drain 15 years of pre-sales in 18 months.

c. VG claims unrealistic vehicle availability and efficiency assumptions such as one new flight vehicle delivered per year and 55 flights per vehicle per year:

c) Multiple efficiencies are also assumed within the model, dramatically increasing bottom line:

a. VG expects that through "manufacturing capabilities and economies of scale", they can reduce the "Rocket Motor and Fuel" cost per flight from $313k in 2020 to $152k in 2023, contributing an additional $41mn to VG's bottom line by 2023.

b. VG believes OpEx will increase at a rate of $16mn per year (7% annualized) between 2019 and 2023.

i. Historically, OpEx has been rising at a rate of $30mn per year (20% annualized).

ii. This is unrealistic, as in this period of decelerating spend, VG plans to 1) build out an entire direct sales force to capture future customers 2) increase SST production significantly 3) develop future technologies such as hypersonic travel 4) grow revenue from $2mn per year to $600mn per year.

c. VG assumes that in the near term, the cost to produce a SST will drop considerably.

i. The cumulative capex for 4 additional SSTs and one additional WKT is estimated to cost just $181mn. Previous expenditures per craft would indicate costs around $480mn.

ii. While the first two SSTs cost $133mn and $99mn, and the original WKT cost $84mn, VG believes they can produce future SSTs at $25mn.

7) The SPAC transaction raises several red flags:

a) Richard Branson and other long-term insiders are using SPAC funds as a liquidation event. $52mn of proceeds from the business combination were used to repurchase shares from VIECO (80% Virgin Investments, 20% Aabar Space). Branson stated on Sky News that he personally was receiving a prorated amount of the excess proceeds. (link) Given Richard Branson has been involved for 15 years and the current valuation is marketed as an affordable 5.5x EBITDA 2023 investment, it is surprising that he is looking to get out.

b) The $IPOA SPAC was originally created to invest in three types of technologies: Ride Sharing, Enterprise Software, and Cryptocurrency. Virgin Galactic is none of these.

c) Considering the merger was announced about 90 days prior to the end of the SPAC's investment period, we think the team likely rushed through the deal to get it done, as the SCH management team was highly incentivized to make a deal. The creators of the SPAC got ownership in the new company worth approximately $160mn for completing the merger.

d) SCH originally attempted to acquire both Virgin Galactic and Virgin Orbit, which would have provided a diversified platform, at a combined valuation of $2bn. However, Virgin ownership rejected the offer and took Virgin Orbit off the table. After several weeks, SCH offered to purchase just the Virgin Galactic entity at a valuation of $850mn. After several more rounds of negotiations, SCH nearly doubled the valuation to $1.3bn.

REALISTIC SCENARIOS & VALUATION

1) Assuming VG can conduct operations without loss of vehicles and passengers.

a) Market size and market share: Considering market competition, we assume that VG can take a 65% market share of suborbital flights, and that the market demand for suborbital flights is at the high end of the F.A.A. analysis. This would put VG at 1,020 passengers in 2023 and decrease revenue by $192mn vs. the VG model.

b) Revenue per passenger: We assume VG can generate $300k per passenger for the first two years, and $275k in subsequent years. VG has stated it is their long-term goal to bring down the cost below than $250k and actively markets the cost of around $250k. This would decrease revenue by $113mn vs. the VG model.

c) SpaceShips and efficiency: We assume VG introduces its second vehicle at the beginning of Q2 2021, and completes an additional vehicle each year. We assume 50 flights per year per spacecraft at the terminal year. This impacts cash burn in the earlier years; however, it does not impact the terminal value.

d) Costs: We assume synergies can cut down rocket motor and fuel costs per flight by 37% vs. VG's estimate of 50%. We assume OpEx grows at only 7% per year, despite this being unrealistic. We assume VG can create the vehicles at the reduced costs they estimate.

e) The result of these optimistic scenarios would be $311mn in revenue, $47mn in EBITDA, and $-6.7mn in FCF in 2023. Considering the cumulative cash burn through year end 2023 would be $424mn, today's valuation would imply a $2bn EV, a multiple of around 43x EBITDA.

2) The right multiple:

a) As discussed above, VG lacks the technological ability to reinvest capital. They have jettisoned a more valuable piece of their business, are decades away from additional commercial opportunities, and unlike their competition, have no plans for orbital spaceflight. Additionally, by 2023, they will likely have already saturated the market and growth will start to slow considerably.

b) Since VG intends to operate spaceflight vehicles for commercial space tourism, and has a limited future beyond this, an appropriate set of comparables would be attraction operators and tourism companies. Our comp set of Lindblad Expeditions, Six Flags, Sea World, and Merlin Entertainment would imply a terminal EBITDA multiple of around 10x. Given Virgin Galactic should still be growing faster than its peer set in 2023, we think a conservative multiple would be 20x. This would imply an EV of $1bn, implying a per share price of $5.

c) Given that an unfortunate catastrophic failure will likely impact VG materially, investors should require a higher rate of return. We suspect that the longer VG can go without a fatality, the less material a catastrophic failure will be to future operations.

d) Given a fair value of $5 per share in 2023, assuming a 15% required rate of return, fair value today is $3.30 per share.

3) Non-asymmetric upside:

a) Spaceport America's capacity is limited to five SpaceShipTwos, limiting near term operational capacity.

a. VG management believes they could expand elsewhere with local cities funding new spaceports. However, Spaceport America is widely considered a public financing disaster as the state of New Mexico spent $200mn to build the facility, and nearly ten years later VG has yet to use it.

b) In our Blue-sky scenario where VG can achieve all of their cost, operational, and efficiency goals, with 5 SpaceShipTwos, and tickets prices of $250k (as VG management advertises), VG would make $106mn in EBITDA and $52mn in FCF. At today's valuation (and after cash burn) VG would already be priced 18x 2023 EBITDA / 45x 2023 FCF.

4) Valuation summary, assuming no catastrophic incidents.

a) Fair value today: $3.30

b) Fair value in 2023: $5

c) Blue sky scenario in 2023: $10

CATALYSTS & RISKS:

1) Catalysts.

a) Virgin Galactic will slowly and continuously delay estimates for operating at full capacity, which will increase cash flow burn eventually requiring them to raise additional funding.

b) Historical loss rates for spaceflight vehicles imply that there is a significant likelihood that VG will crash a spacecraft within the first three years of businesses.

a. Assuming a historical crash rate of any space vehicle (1.8%), the probability they will not crash a vehicle by 2023 is 0.23%.

b. Assuming a historical crash rate of the X-15 (an experimental NASA and Air Force funded rocket plane which had a similar design), the probability of not losing a space vehicle by 2023 is only 13.5%.

2) Risks.

a) The biggest risk of shorting VG is that it momentarily becomes the next Bitcoin/Tesla/Beyond Meat/CNBC stock. An example of this already occurring is that Mr. Palihapitiya, a Bitcoin and Tesla fanatic, who frequents CNBC on a quarterly basis, is now the second largest shareholder and the Chairman of the company.

b) VG often hosts large celebrations at each milestone, leveraging Richard Branson's marketing expertise. We expect this media buzz to impact the price considerably. Investors should pay close attention to media invitations by VG. Tactically, we would recommend pressing the short shortly after VG's inaugural flight with Richard Branson, as we suspect press momentum around VG will peak at that time.

c) The company has a large number of warrants outstanding. If the share price rises above $18 in the short term, these warrants will be redeemed, providing the company with an additional $100mn in funding.

SPCE: VG

	SPCE ProForma				Realistic Opportunistic ProForma				Full capacity, all synergies @ 250k/ticket
	2020E	2021E	2022E	2023E	2020E	2021E	2022E	2023E	2023E
Key Model Drivers									
Vehicles by Year End	2	3	4	5	1	2	3	4	5
Est. Average Vehicles	1.08	2.08	3.08	4.08	1	1.75	2.75	3.75	5
Annual Flights	16	115	170	270	10	77	127	180	275
Passengers Flown	66	646	965	1565	40	385	713	*1032*	*1595*
Revenue Per Passanger	318	302	390	359	300	300	275	275	250
SpaceShip Efficiency Metrics									
Flights per Average Vehicle	14.77	55.20	55.14	66.12	10	44	46	48	55
Days per Vehicle Flight	24.4	6.5	6.5	5.4	36.0	8.2	7.8	7.5	6.5
Passengers per Flight	4.13	5.6	5.7	5.8	4	5.0	5.6	5.7	5.8
Flights per Month	2.67	9.58	14.17	22.50	1.67	6.42	10.54	15.00	22.92
Flights per month per Average Vehicle	2.46	4.60	4.59	5.51	1.67	3.67	3.83	4.00	4.58
Revenue									
Ticket Revenue	21,000	195,000	376,000	562,000	12,000	115,500	196,075	283,800	398,750
Other Revenue	10,000	15,000	21,000	28,000	10,000	15,000	21,000	28,000	28,000
Total Revenue	**31,000**	**210,000**	**397,000**	**590,000**	**22,000**	**130,500**	**217,075**	**311,800**	**426,750**
Cost of Good Sold									
Rocket Motor Costs & Fuel Costs	5,000	24,000	36,000	41,000	3,125	19,250	28,463	36,000	41,800
RMC&FC Per Flight	*313*	*209*	*212*	*152*	*313*	*250*	*225*	*200*	*152*
Flight Operations & Maintenance	19,000	30,000	37,000	50,000	10,857	17,769	19,295	25,249	50,875
FO&M per Flight	*1,188*	*261*	*218*	*185*	*1,086*	*231*	*153*	*140*	*185*
Customer Costs & Insurance	3,000	24,000	40,000	68,000	1,875	16,070	29,765	45,333	69,300
CC&I per Flight	*188*	*209*	*235*	*252*	*188*	*209*	*235*	*252*	*252*
Total COGS	**27,000**	**78,000**	**113,000**	**159,000**	**15,857**	**53,089**	**77,522**	**106,582**	**161,975**
Gross Profit	**4,000**	**132,000**	**284,000**	**431,000**	**6,143**	**77,411**	**139,553**	**205,218**	**264,775**
Gross Margin	*13%*	*63%*	*72%*	*73%*	*28%*	*59%*	*64%*	*66%*	*62%*
Operating Expenses									
SGA									
R&D									
Total Operating Expenses	**109,000**	**120,000**	**139,000**	**158,000**	**109,000**	**120,000**	**139,000**	**158,000**	**158,000**
EBIT	(105,000)	12,000	145,000	273,000	(102,857)	(42,589)	553	47,218	106,775
EBIT Margin	*-339%*	*6%*	*37%*	*46%*	*-468%*	*-33%*	*0%*	*15%*	*25%*
EBTIDA	(105,000)	12,000	145,000	273,000	(102,857)	(42,589)	553	47,218	106,775
EBITDA Margin	*-339%*	*6%*	*37%*	*46%*	*-468%*	*-33%*	*0%*	*15%*	*25%*
Capex	52,000	59,000	60,000	54,000	52,000	59,000	60,000	54,000	54,000
Capex Margin	*168%*	*28%*	*15%*	*9%*	*236%*	*45%*	*28%*	*17%*	*13%*
Capex + Opex	161,000	179,000	199,000	212,000	161,000	179,000	199,000	212,000	212,000
Capex + Opex Margin	*519%*	*85%*	*50%*	*36%*	*732%*	*137%*	*92%*	*68%*	*50%*
EBIT-Capex	**(157,000)**	**(47,000)**	**85,000**	**219,000**	**(154,857)**	**(101,589)**	**(59,447)**	**(6,782)**	**52,775**
EBIT-Capex Margin	*-506%*	*-22%*	*21%*	*37%*	*-704%*	*-78%*	*-27%*	*-2%*	*12%*

Important Disclosures/Information:

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