FRIENDS OF SMART

SMART POSITION PAPER

LARKSPUR CONNECTIVITY - NEAR-TERM SOLUTIONS

Friends of SMART Position Paper

Larkspur Connectivity - Near-term Solutions

The Issue

The SMART station at Larkspur is situated about 0.4 miles from the ferry ticket booth--about a 9 minute walk as shown in the Google MAPS photo displayed in Figure 1. The term “current” is important because even in good weather the distance is too great for some to traverse by walking. When it is raining and windy it seems likely that most commuters would probably rather drive than take the train.

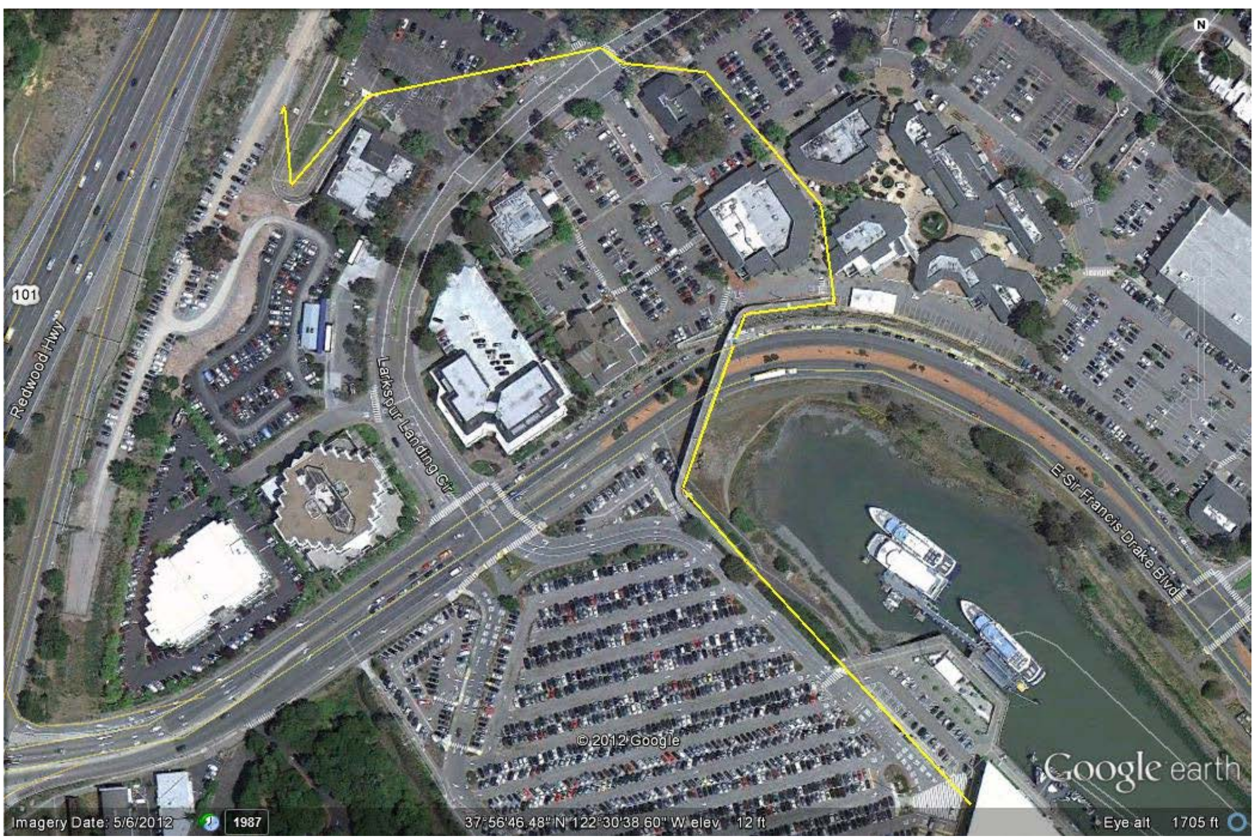

Figure 1. The walk from SMART to the ferry

The purpose of this Position Paper is to offer solutions to the connectivity problem. If SMART passengers could connect more directly to the ferry and vice-versa, not only would tourist trips from San Francisco increase, but so would commute trips to and from the city. In turn, this would improve local traffic in the Greenbrae area and reduce parking demand at the Ferry Terminal, which presently significantly exceeds parking supply. A connection to the ferry also provides a connection to BART and Muni, which connect to both Bay Area airports and Caltrain.

As shown in Figure 2, the Merchants of Marin Country Mart understand at least one argument for foot traffic between SMART and the Ferry.

Figure 2: Commercial benefit from foot traffic

For those who cannot or prefer not to walk, in what follows we present some near-term alternatives. In order of increasing capital cost these are:

1. Shuttles between the current SMART station and the ferry.
    a. Pedi-carts
    b. Electric Shuttles
    c. Autonomous vehicles

2. Personal Rapid Transit (PRT)
The following paragraphs provide illustrations and sources of further information for each alternative.

Alternative 1a: Pedi Carts

Figure 3: Pedi-Bikes seem like a good summer or short-term job for high-school or college students.

Alternative 1b: Electric Shuttles

As shown in Figure 4a-e, several companies offer a wide range of styles and sizes

Figure 4a: All Weather four-passenger electric shuttle

Figure 4b. Cushman 8-passenger Shuttle
(below: Spec sheet for Cushman 8-passenger shuttle)

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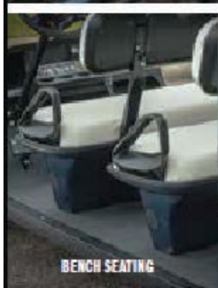
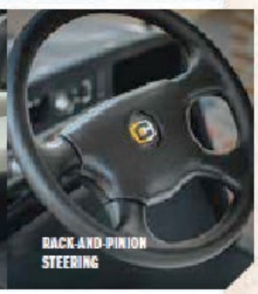
CUSHMAN SHUTTLE™ 8





	ELECTRIC MODEL	EFI GAS MODEL
BODY & CHASSIS		
FRAME	Welded Steel w/ DuraShield™ Powder Coat	
BODY & FINISH	Injection Molded TPO	
STANDARD COLOR	Patriot Blue	
DIMENSIONS		
OVERALL LENGTH	167.5 in (425 cm)	
OVERALL WIDTH	49.5 in (126 cm)	
OVERALL HEIGHT	45.5 in (116 cm) (w/o Roof) / 76.0 in (193 cm) (w/ Struts & Roof)	
WHEEL BASE	123.4 in (313 cm)	
WHEEL TRACK	36.0 in (91 cm) Front / 38.0 in (97 cm) Rear	
GROUND CLEARANCE	3.0 in (8 cm)	
CARGO DECK CAPACITY	400 lb (181 kg)	
POWER		
POWER SOURCE	72V DC	4-Cycle, 24.5 ci (401cc)
VALVE TRAIN	N/A	Single Cylinder OHV
HORSEPOWER (KW)	22.4 hp (16.7 kW) Intermittent	13.5 hp (10.1 kW)
ELECTRICAL SYSTEM	72V	N/A
BATTERY (QTY/TYPE)	Six, 12 Volt Deep Cycle	Starter/Generator, Solid State Reg.
BATTERY CHARGER	1000 Watt, 72V, 120/230V VAC UL Listed	One, 12V Maintenance Free
KEY OR PEDAL START	Pedal	
AIR CLEANER	N/A	Replaceable Dry Cartridge
LUBRICATION	N/A	Pressurized Oil System
OIL FILTER	N/A	Spin-On
COOLING SYSTEM	N/A	Air Cooled
FUEL CAPACITY	N/A	6 Gallon (22 L) Tank
SPEED CONTROLLER	350 Amp AC	N/A
DRIVE TRAIN	Motor Shaft Direct Drive	Continuously Variable Transmission
TRANSAXLE	Differential w/ Helical Gears	
GEAR SELECTION	Dash-Mounted Forward-Neutral-Reverse	Forward - Reverse
REAR AXLE RATIO	17:1	11.47:1 (Forward) 14.35:1 (Reverse)
PERFORMANCE		
SEATING CAPACITY	8-Person	
WEIGHT W/O BATTERIES	1203 lb (546 kg)	N/A
CURB WEIGHT	1695 lb (769 kg)	1265 lb (574 kg)
VEHICLE LOAD CAPACITY	1600 lb (726 kg)	
BED LOAD CAPACITY	400 lb (181 kg)	
OUTSIDE CLEARANCE CIRCLE	33 ft (10 m)	33 ft (10 m)
SPEED	16.5 mph ± 0.5 mph (26.4 kph ± 0.8 kph) (High Speed) 12 mph ± 0.5 mph (19.3 kph ± 0.8 kph) (Low Speed)	16 mph ± 0.5 mph (26 kph ± 0.8 kph)
STEERING & SUSPENSION		
STEERING	Self-Compensating Rack & Pinion	
SUSPENSION	Leaf Springs w/ Hydraulic Shock Absorbers	
SERVICE BRAKE	4-Wheel Hydraulic Brakes Front Disk, Rear Drum	
PARKING BRAKE	Self-Compensating, Single-Point Engagement	
TIRES (FRONT & REAR)	215/60-8	215/60-8

OPTIONS & ACCESSORIES

- Rearview Mirror
- Windshield
- Canopy
- Hour Meter
- Individual Key Switch
- Pinstripes
- On Board Charger
- Body Color (Forest Green, White, Ivory, Black or Custom Options)
- Turn Signal with Four-Way Flashers
- Brakelights
- LED Headlights
- CE Kit (gas only)

CUSHMAN CARE 2YR WARRANTY

COVERED WITH THE 2-YEAR CUSHMAN CARE TOTAL PROTECTION WARRANTY

www.cushman.com

Features and specifications of the vehicles are subject to change without notice. Vehicle as photographed may include options not included on base model.

82305-G5 (Rev. 12/2018)

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Figure 4c: Star EV line of shuttles https://www.starev.com/

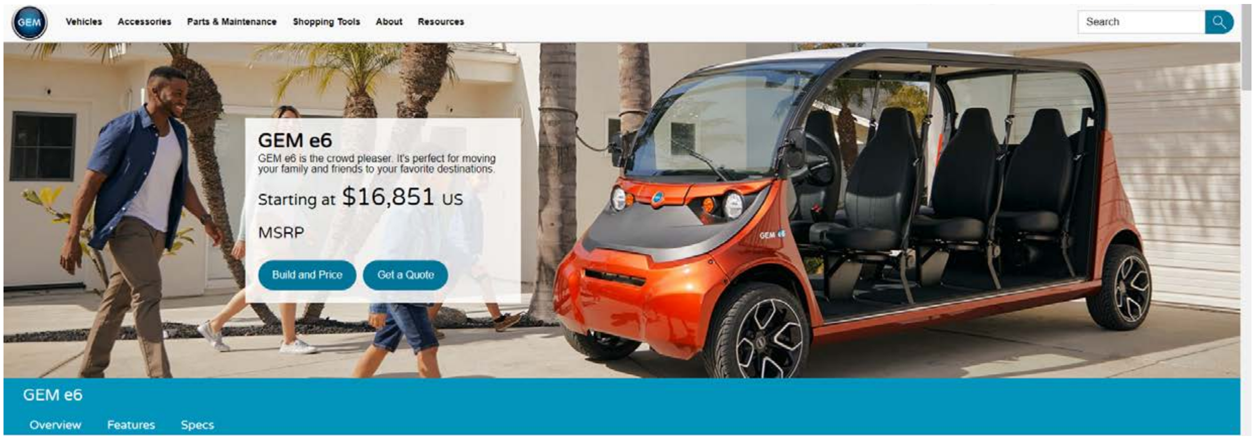

Figure 4d: Polaris shuttles https://gem.polaris.com/en-us/e6/

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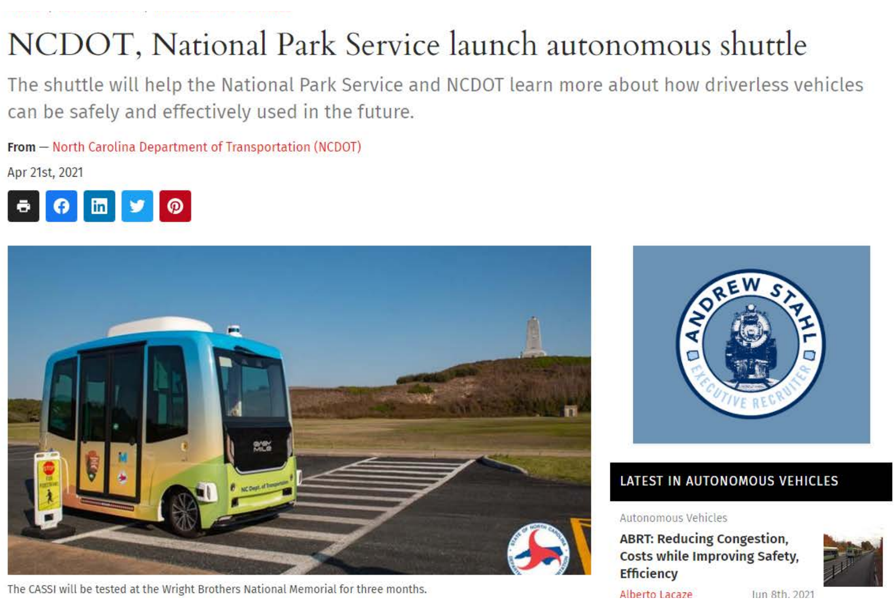
Figure 4e: MotoEV ElectroTransit Bus https://motoelectricvehicles.com/electric-vehicle/motoev-electro-transit-buddy-15-passenger-shuttle

Alternative 1c: Autonomous vehicles



NCDOT, National Park Service launch autonomous shuttle

The shuttle will help the National Park Service and NCDOT learn more about how driverless vehicles can be safely and effectively used in the future.

From — North Carolina Department of Transportation (NCDOT)

Apr 21st, 2021

The CASSI will be tested at the Wright Brothers National Memorial for three months.

Figure 4e: National Park Service Shuttles https://www.masstransitmag.com/alt-mobility/autonomous-vehicles/press-release/21219530/north-carolina-department-of-transportation-ncdot-ncdot-national-park-service-launch-autonomous-shuttle

Alternative 2: Personal Rapid Transit

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Figure 5: Personal Rapid Transit https://en.wikipedia.org/wiki/Personal_rapid_transit

Personal rapid transit (PRT), also referred to as podcars or guided/railed taxis, is a public transport mode featuring small automated vehicles operating on a network of specially built guideways. PRT is a type of automated guideway transit (AGT), a class of system which also includes larger vehicles all the way to small subway systems. In terms of routing, it tends towards personal public transport systems.

PRT vehicles are sized for individual or small group travel, typically carrying no more than three to six passengers per vehicle.[1] Guideways are arranged in a network topology, with all stations located on sidings, and with frequent merge/diverge points. This allows for nonstop, point-to-point travel, bypassing all intermediate stations. The point-to-point service has been compared to a taxi or a horizontal lift (elevator).

Numerous PRT systems have been proposed but most have not been implemented. As of November 2016, only a handful of PRT systems are operational: Morgantown Personal Rapid Transit (the oldest and most extensive), in Morgantown, West Virginia, has been in continuous operation since 1975. Since 2010 a 10-vehicle 2getthere system has operated at Masdar City, UAE, and since 2011 a 21-vehicle Ultra PRT system has run at London Heathrow Airport. A 40-vehicle Vectus system with in-line stations officially opened in Suncheon, South Korea, in April 2014. A PRT system connecting the terminals and parking has been built at the new Chengdu Tianfu International Airport, which is due to open in 2021.

Discussion

- CAPEX

The alternatives are listed in order of increasing capital cost and also of permanence. Justification for the more expensive alternatives would be on the basis of

1. Faster connection between train and ferry
2. Inclement weather protection
3. ADA support
4. Increased ridership

- O&M

1. Even Pedi-bikes must be maintained.
2. Electric shuttles must be recharged periodically. Ideally this could be done at night.
3. Flat tires must be repaired.
4. All the equipment must be safely stored when not in use.
5. All equipment will require regular cleaning--plus sanitization in times of pandemic.

- Insurance
  Drivers, operators (of PRT) and shuttles will require liability insurance.

- Other issues
  Space will be required for shuttles to safely pass pedestrians, bicycles, and other shuttles on either bridge across Sir Francis Drake Blvd. The shuttles could cross at street level, but for safety reasons this is highly undesirable.

Readers might be inclined to pursue a cost-benefit analysis to help select the best alternative. However, without numerical values for the ridership gains to be achieved by each alternative, the benefits cannot be quantified. A reasonable starting point is to count the number of train-to-ferry (and vice-versa) passengers for each ferry and train. The decision on what vehicle(s) to begin service with would be determined by the required capacity. If sufficient time is available the vehicle might be able to make two round trips between ferry and train; but this wouldn't provide contingency for late arrivals.

It could be argued (and has) that PRT is designed for mass transit and is therefore not suitable for the short shuttle distance under consideration here. PRT would be capable of meeting most likely ridership forecasts--and might be the safest alternative--but the installation cost would almost certainly exceed that of shuttles. We include this option for completeness--and the possibility that the developer would be willing to offer a scaled-down version.

Recommendations

A staged approach, beginning with the cheapest--is likely to begin with Pedi-cabs. Certainly the capital cost would be smallest for this option; but the smaller capacity might necessitate additional vehicles and more "drivers" in comparison to electric shuttles. Whichever technology is chosen as the starting option, the first step is to assess the number of passengers who currently transfer between each ferry and each train.

Pedicabs are viable when there is a steady stream of traffic. In this application the sponsor might need to find something else for the drivers to do between train & ferry arrivals.

If Pedi-Cab is chosen, begin with several vehicles and increase the number when and if ridership grows. If the number of transferring passengers requires an unreasonable number of Pedi-cabs, begin unstead with electric shuttle instead and repeat the evaluation process. Since electric shuttles can carry anywhere from three to twenty or more passengers, acquisition of these vehicles should be guided by ridership figures observed to date.

We recommend that the shuttle rides be free--or at least nominal in cost. Pedi-cab drivers, on the other hand, should be worthy of receiving tips.