FEASIBILITY REPORT PROJECT

UHD AERIAL ROPEWAY TRANSIT SYSTEM

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Prepared By:

James Adams

University of Houston DOWNTOWN

Research Question: How can we make traveling around campus more efficient?

TABLE OF CONTENTS

Contents

EXECUTIVE SUMMARY

Executive Summary

BACKGROUND

"Houston is one of the top ten fastest growing cities in the United States" (Bureau). It is important to recognize that urban transit development is crucial to improving everyday public transportation issues such as traffic congestion. We must reevaluate traditional solutions and decide if these methods are alleviating or contributing to the problem. Our findings suggest that the current shuttle bus system is contributing to the problem, "The current transportation system of shuttle busses face daily issues such as traffic congestion and further add to auto dependency" (Vuchic xiii). By introducing an aerial ropeway transit system **("ARTS")** will bring forth seamless commuting options through highly dense, urbanized areas and consequently lighten traffic congestion by the constant stop-and-go traffic buses cause.

FINANCIAL IMPLICATIONS

Implementing an **ARTS** will require a substantial amount of capital investment that varies depending on factors such as material resources and labor, however, this type of investment can prove to be an extremely convenient and efficient improvement to the existing shuttle bus transportation system.

RENEWABLE ENERGY PRACTICES

We believe the transition to renewable energy will be beneficial from an economic standpoint when discussing the adoption of an electric mode of transportation. "… rooftop solar energy installations have become a sound financial investment for real property owners. Falling

EXECUTIVE SUMMARY

prices for photovoltaic ("PV") solar panels and various government incentive programs have vaulted rooftop solar energy" (Rule 117). Investing in solar will increase capital expenses but will theoretically cut operating expenses through the offerings of economic and government incentives. Any extra power generated can be feed into the city's grid to add an extra revenue stream or utilized to power other electric applications such as lighting.

ARTS OVERVIEW

Figure 1: Cable and cabin configuration of dual-haul aerial tramway

OPERATING HIGHLIGHTS

- Energy efficient / low emission rates
- Customizable, automated operations
- Highly reliable and frequent service, twenty-four-seven
- Limited staffing required
- Time-saving method of transportation
- Higher annual passenger usage and volume rate

CONSIDERATIONS

- Consulting for design and development
- Approval and permits needed for government agencies and organizations
- Cost for product can vary

INTRODUCTION

Introduction

We would like to answer the question; how can we make traveling across the University of Houston – Downtown **("UHD")** campus more efficient? Our proposal is to introduce an **ARTS** that will enrich the experience at **UHD** by providing a unique transportation method around campus in the effort to reduce annual operating costs, boost student recruitment and retainment.

UHD campus is located on highly valuable pieces of property positioned roughly seventeen acres inside the central business district of the fourth largest city in the nation. Students rely on a shuttle bus system to transport them from department buildings. This has proven effective, but we question the safety and more so, efficiency. The potential dangers of a student waiting for a bus in early mornings and late evenings to walking in poor weather conditions are worth consideration. Therefore, we believe our campus has an opportunity to be at the forefront of advancement and is the perfect test subject as it is virtually vertical.

The concept will interconnect atop existing **UHD** facilities by integrating terminals and utilize renewable energy practices with an aerial ropeway transit system like a ski lift. In this report, we researched the viability of this project by providing a comparative analysis from volume to annual passenger usage of the existing system. Also included, are potential legal requirements and recommendations to carry out this project.

FINANCIAL SUMMARY

Financial Summary

"University of Houston System **("UHS")** is composed of ten campuses and spends roughly six million dollars annually on shuttle bus costs through a seven-year agreement with a third-party vendor from Alabama, Dream Transportation" (University of Houston 3m). Within this report, we have estimated cost allocations of this contract to **UHD**.

UHS ANNUAL SHUTTLE BUS VOLUME

- 16 buses in service everyday
- 98,000 trips
- 850,000 passengers
- $6 million annual costs

UHD ANNUAL SHUTTLE BUS VOLUME

- 2 buses in service everyday (Estimated)
- Unknown number of trips
- 145,000 passengers

UHD ESTIMATED COST ALLOCATION OF "DREAM TRANSPORTATION"

- 145,000/850,000 Passengers
- 17.06% x $6,000,000
- Estimated UHD Annual Cost, $1,023,600

ARTS ESTIMATED ANNUAL OPERATING EXPENSES

DESCRIPTION	DAILY	ANNUAL
Trips	64	23,360
Miles	64	23,360
Power Consumption (kWh)	3000	1,095,000
Cost per kWh	$360	131,400
Passengers	397	145,000

Figure 2: ARTS operating expenses based on Disney project numbers (Diffendal)

FINANCIAL SUMMARY

Operating expenses to power an **ARTS** is significantly reduced due to these systems run on electricity and not gasoline or diesel. However, many systems do use diesel fuel as a failsafe backup if power shuts down.

> "… the energy requirement for the motors the cable of the Whistler system is less than 3000 kWh per day. At a cost of 12c per kWh, that's $360 per day to operate the gondola" (Diffendal).

Using Diffendal's numbers, we made estimates on how much it would cost to operate an **ARTS** on **UHD** campus labeled in figure 2. The costs to operate an **ARTS** is more expensive than running one shuttle bus. To minimize operating expenses, **UHD** can explore the option of incorporating renewable energy practices such as solar power.

For more insight on the economic feasibility of this project, we examined a case study that highlighted the use of a similar **ARTS** at University in Calgary. They concluded that based on future population rates a monocable detachable gondola **("MDG")** serves to be most efficient whereas a personal rapid transit **("PRT")** will be the ultimate option for higher ridership volume and larger capital investment that brings back higher returns. "The MDG gondola system was shown to be the most efficient system; however, … TDG gondola systems would result in a higher profit and a larger positive cash flow" (Tahmasseby and Kattan 78-79).

Aerial Ropeway Transit System

CONCEPT

We have been using ropeway transit since the pulley system was invented to build the pyramids in Egypt.

The **ARTS** concept utilizes a motorized pulley system that will integrate terminals atop existing facilities infrastructure while utilizing renewable energy practices.

Figure 3: Aerial map of proposed route(s) at UHD

Disney is speculatively in talks with Austrian manufacturer, Doppelmayr Garaventa Group to spearhead their skyway project for their amusement parks. Their skyway project is the basis of our information and serves as an example for our study.

COSTS

The prices to manufacture an **ARTS** vary from one to twenty-million dollars. The costs vary by route distances, materials, gondola preferences, and etc. The ski town of Telluride, Colorado built a gondola system with two intermediate stations and expansion abilities when demand increases.

AERIAL ROPEWAY TRANSIT SYSTEM

"The gondola system, which extends for 3.2 km (2 mi) and cost $16 million… The system, which operates with 32 eight-passenger gondolas, has a line capacity of 480 people per hour, a 600% increase in line capacity compared to the alternate 12.9-km (8-mi) bus route, which has a total capacity of 80 people per hour" (Alshalalfah, Shalaby and Dale 7).

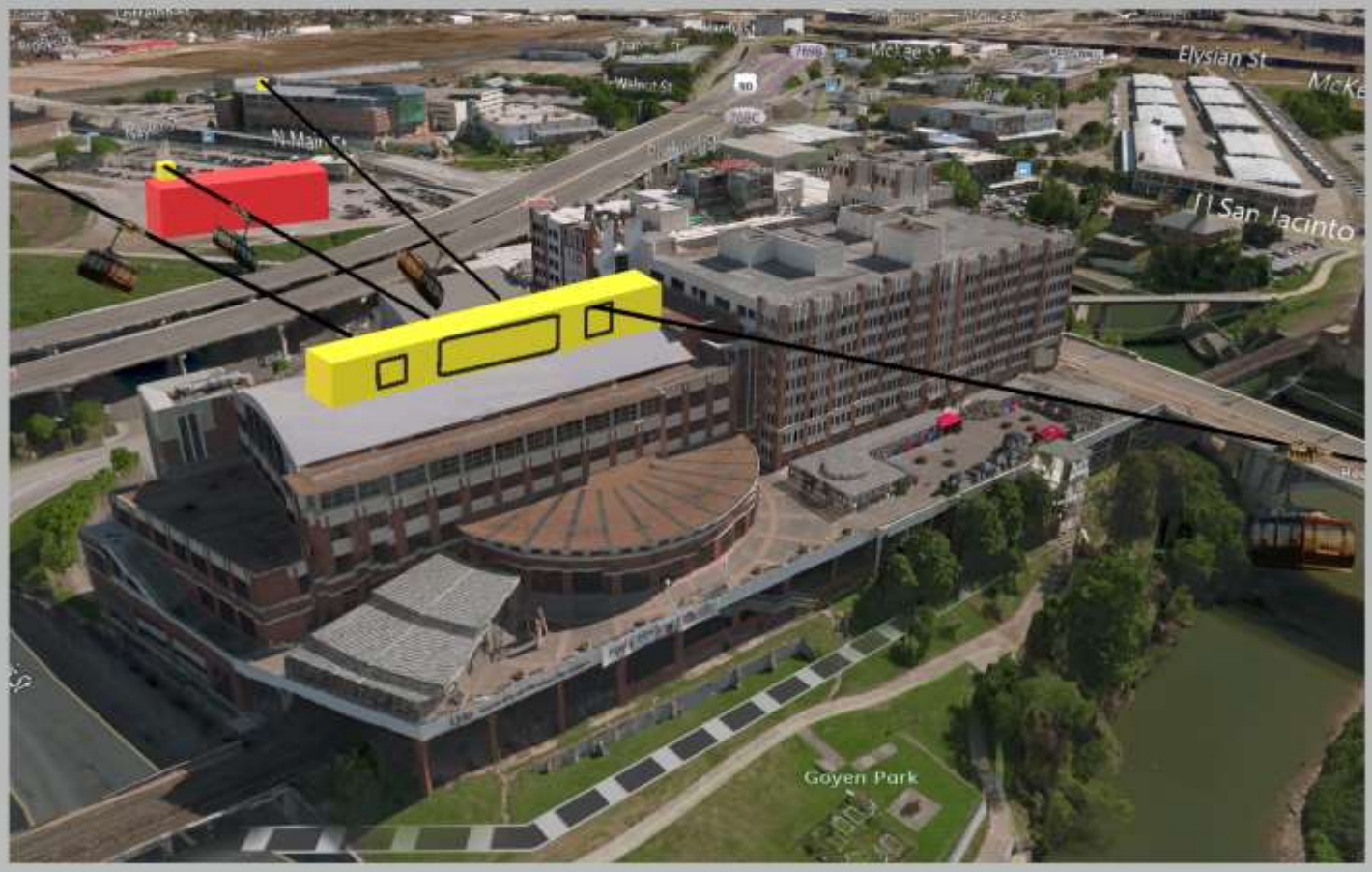

Figure 4: 3D image of proposed route(s) at UHD

CONTINGENT LIABILITIES

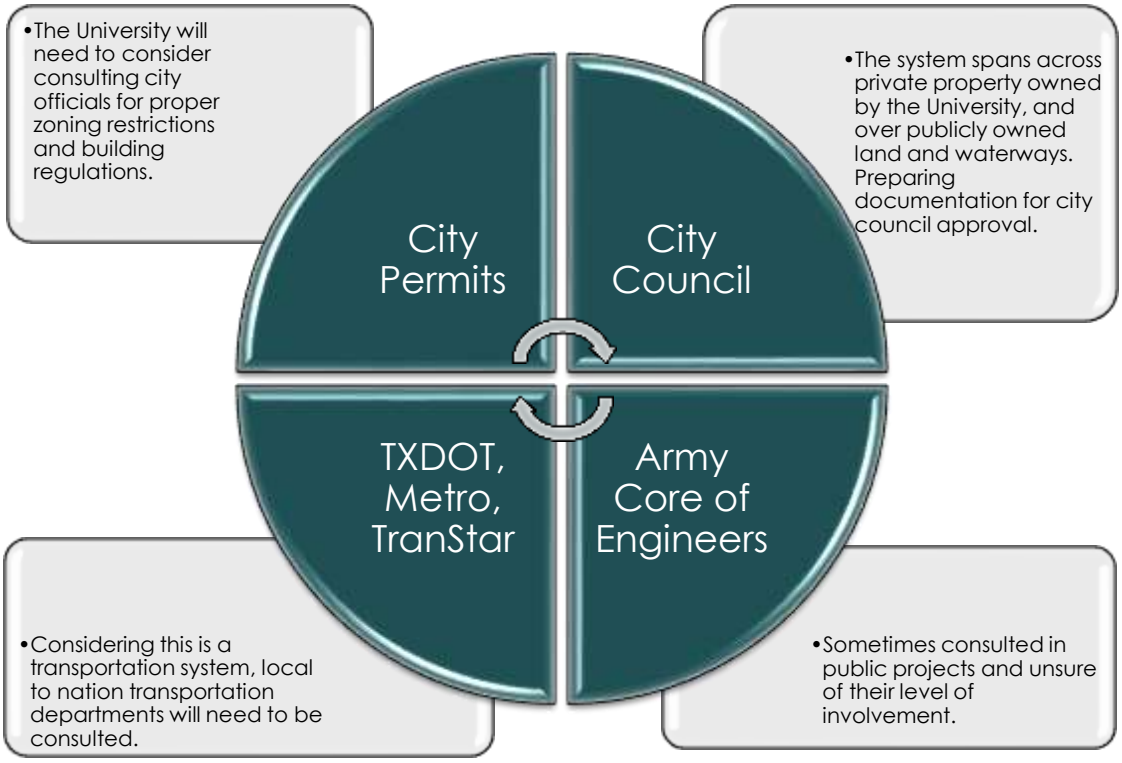

Figure 5: Municipal agencies and governmental organizations

TAKEAWAYS

The upfront capital requirements needed to integrate an **ARTS** for **UHD** is more expensive than the current shuttle bus system based on figure 2 in the financial summary. However, research suggests such a system is worth exploring,

> "… the success of these applications prove that ART is gaining more attention from transit agencies around the world that see ART as a viable and feasible transit mode especially in naturally constrained urban areas" (Alshalafah, Shalaby and Dale 821).

Figure 6: Representation of Gondola over I-10 at UHD

The projections in figure 2 are based on Disney's $200 million **ARTS** project**. UHD** might consider requesting a bid from a few **ARTS** manufacturers to provide an in-depth analysis of a more accurate representation of costs coupled with the investment of renewable energy practices that can further minimize operating expenses.

Austrian manufacturer, Doppelmayr Garaventa, seems to be the industry leader in relation to **ARTS** and would recommend requesting a quote from them along with a few other competitors to discover if this system is a viable solution for **UHD**.

Figure 7: Gondola from CJ to Main Building

Concluding Statements

To answer our research question; how can we make traveling around campus more efficient? We reply with, through a dynamic, dedicated **ARTS** that integrates terminals with existing facilities infrastructures while utilizing renewable energy practices. Incorporating **ARTS** to **UHD** will provide a higher volume of annual passenger usage in comparison to the existing shuttle bus system.

Introducing an **ARTS** to **UHD** can prove to be cost-effective, and a highly efficient form of transportation for students and staff alike. As described, initial capital requirements to fund an **ARTS** can initially be expensive however, **UHD** will make a return on their investment through the minimal operating expenses needed to maintain and power an **ARTS**.

While the expenses needed to start-up **ARTS** are not concrete in comparison to the current shuttle bus system, the efficiency is projected to deliver a higher volume and passenger usage rate while proven to be cost-effective. Implementing **ARTS** will eliminate the need for gas or diesel as they run on electricity granted, diesel will still be used for **ARTS** backup power options.

We recommend **UHS** to consider applying for governmental incentives to green projects in the effort of reducing costs. As well as, updating the existing infrastructure of its facilities with renewable energy practices in likes of a solar system to further reduce operating expenses. Liabilities to take into consideration include zoning restrictions plus, approval and permits needed from governmental agencies and organizations.

Student Information

James Adams

BS IS – Engineering Technology with Minor in Economics and Sustainability

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