

MID-CENTURY MODERN STRUCTURES AND COMMUNITY: CAPTURING A BUILDING'S LIFE

ESTRUCTURAS MODERNAS Y COMUNIDAD DE MEDIADOS DE SIGLO: CAPTURANDO LA VIDA DE UN EDIFICIO

ROBERT A. MICHLOWITZ

Doctoral Candidate
Institute for Simulation & Training
University of Central Florida
3100 Technology Parkway
Orlando, FL (USA) 32826
01 4077961050
rob.michlowitz@knights.ucf.edu

LORI C. WALTERS

Research Associate Professor
Institute for Simulation & Training
University of Central Florida
3100 Technology Parkway
Orlando, FL (USA) 32826
01 4078821406
lcwalter@ist.ucf.edu

MICHELLE J. ADAMS

Associate Instructor
Department of History
University of Central Florida
12790 Aquarius Agora Drive
Orlando, FL (USA) 32816
01 4078232225
michelle.adams@ucf.edu

PALABRAS CLAVES

Escaneo láser, ambientes virtuales, historia urbana, herencia digital, historia oral, Moderna de Medios del Sglo

KEY WORDS

laser scanning, virtual environments, urban history, digital heritage, oral history, Mid-Century Modern



Abstract

As one of the great representations of Mid-Century Modern architecture, the Trans World Airlines (TWA) Flight Center represents the pinnacle of noted architect Eero Saarinen's career. Opening in 1962, the structure sits at the inflection point between travel on propeller-driven aircraft and the Jet-Age, marks when air travel ceased being reserved for the wealthy. Learning of its impending repurposing into a hotel, UCF's ChronoPoints initiative conducted a laser scan of the building as a step in developing a 'life history' and series of virtual experiences.

A structure's 'life history' encompasses the design of a building, and its cultural significance to the community. A laser scan and model of the Flight Center have been created, along with plans for virtual experiences similar to those created for another Mid-Century building, the Cocoa Beach Glass Bank. ChronoPoints gathered scan data and traditional materials, including official photographs and blueprints, enabling the digital recreation of the bank upon opening. Oral histories, personal photographs, and ephemera allow researchers to gain a sense of community. To date, augmented and virtual reality experiences have been developed addressing the Glass Bank and we intend to create a deeper experience for the TWA Flight Center due to its significance.

Resumen

Como muestra de una de las grandes representaciones de la arquitectura moderna de mediados del siglo, el Centro de Vuelos de Trans World Airlines (TWA) representa la cumbre de la carrera de Eero Saarinen. Inaugurado en 1962, la estructura se encuentra en el punto de inflexión entre los vuelos con aviones de hélice y la Etapa de los Aviones Jet y marca cuando los vuelos aéreos dejaron de estar reservados a los adinerados. Al saber de su inminente reutilización como hotel, la iniciativa ChronoPoints de UCF realizó un escaneo láser del edificio como paso inicial en el desarrollo de una "historia de vida" y una serie de experiencias virtuales.

La historia de vida de una estructura comprende el diseño del edificio y su importancia cultural para la comunidad. Se ha creado un escaneo láser y modelo del Centro de Vuelos conjuntamente con proyectos para experiencias virtuales similares a aquellos creados para otro edificio de Medios del Siglo, el Banco de Cristal de Cocoa Beach. ChronoPoints recopiló datos escaneados y materiales tradicionales, incluyendo fotografías y planos oficiales permitiendo, de este modo, la recreación digital del banco desde su apertura. Las historias orales, las fotografías personales y otras fuentes efímeras permiten que los investigadores logren adquirir un sentido de comunidad. A la fecha de hoy, se han desarrollado experiencias aumentadas y virtuales relacionadas con el Banco de Cristal y, debido a su importancia, nuestro propósito es crear una experiencia más profunda del Centro de Vuelos de TWA.



Introduction

Documenting Post World War II structures has many opportunities and challenges that preservation and research of more distant past structures and societies do not. Amongst the primary advantages in the study of Mid-20th Century America is the existence of living participants associated with significant and pedestrian events throughout the era. This provides a direct source of memories, memorabilia, photographs and documentation. This provides a rich, personalized view of a building, which might have been lost by waiting until those generations passed away. A challenge of dealing with the near past is that it often elicits a deep sense apathy by the public as some will feel that structures erected in their lifetimes are not “historic”. This paper examines the efforts of *ChronoPoints* at the University of Central Florida to document the “life history” of Mid-Century structures and accompanying dissemination efforts using virtual environments.

Objectives

The research objectives are to document endangered Mid-Century structures using a wide-ranging and encompassing fashion to preserve the history, culture and memories of the communities where they are. As a part of these objectives, it is to create multiple streams of information to support current and future scholarship in a wide array of disciplines, such as history, sociology, architecture and others. Furthermore, it is an objective to provide a greater context to the information gathered, adding understanding why the structure was designed as it was and how society influenced it. Finally, it is important to disseminate the gathered information in multiple ways such as reuse within virtual interactive experiences. Such experiences will imbue future generations with more direct and complete understanding of the structures.

Method

Due to the size of the TWA Flight Center (and because the inside and outside were done), four (4) laser scanners, the FARO Focus3D S120, FARO Focus3D X330, and Leica Scanstation C10 terrestrial laser scanners and the Leica Pegasus 2 Mobile Sensor platform, were utilized for its capture, while the smaller Cocoa Beach Glass Bank only required the FARO Focus3D S120. Since multiple (over 200 for TWA and 32 for the Glass Bank) scans were required to properly capture the buildings, the point cloud data needed to be registered (i.e. combined) into a single dataset with FARO’s *Scene* and Leica’s *Cyclone* 3D software. Using this unified point cloud, an Institute for Simulation and Training (IST) graphic artist created a 3D mesh model, composed of thousands of polygons, of the Glass Bank using *Autodesk’s Maya modeling software*. This conversion allows for the model’s use in 3D interactive environments. In this case, the *Unity 3D* game engine was used to create a variety of a virtual experiences for a computer, the *HTC Vive* head-mounted display and *Microsoft’s HoloLens* augmented reality device. While IST typically utilizes Maya for model building and the *Unity 3D* game engine for experiences, other tools, such as *Autodesk’s 3ds Max modeling software*, *Epic’s Unreal Engine* and/or other solutions could be used as well. Before, concurrently and after the development of the virtual models and experiences, University faculty gathered oral histories were in accordance with Oral History Association guidelines. The information gathered was used to enhance and correct the models and



virtual entities could then be used to prompt interviewees for additional details in follow-up interviews.

1. ChronoPoints Background

Established in 2013, *ChronoPoints* (<https://ChronoPoints.eecs.ucf.edu/>) is an initiative at the University of Central Florida's (UCF) Institute for Simulation and Training (IST) dedicated to digitally documenting historically significant Mid-Century American structures and subjects in a multidisciplinary fashion, and developing virtual and augmented experiences for education and the public. Our methodology is to record a structure's "life history" through the capture of digital data and then contextualizing it through contemporaneous photographs, documents, and oral histories of individuals associated with the artifact or building. As of date, digital capture is accomplished by employing terrestrial laser scanners, mobile sensor platforms and structured light 3D scanners. ChronoPoints has recorded significant mid-century items such as the Eero Saarinen's Trans World Airlines Flight Center at John F. Kennedy International Airport, Philip Johnson's New York State Pavilion from the 1964/65 New York World's Fair, Kennedy Space Center's Saturn V launch vehicle exterior, Project Mercury Mission Control consoles, Ft. Lauderdale's Pier 66 hotel tower and the Morelli House in Las Vegas.

The "life history" methodology might be familiar to many scholars from the digital humanities, as it is similar to the concept of deep mapping. Deep mapping allows for "a reflexivity that acknowledges how engaged human agents build spatially framed identities" over time and place (Bodenhamer, Corrigan, & Harris, 2013). It does this by exposing connections to other geographic locals, and by layering upon a map "personal, social and imaginary networks" and their projected perceptions upon a given location ("Deep Mapping | Geospatial Innovation in the Digital Humanities," n.d.). Deep maps are multi-layered, complex, and changing, attempting to reveal social, religious and civic ties over time. Such deep maps are open-ended and allow scholars to explore a "particular place" (Ridge, Lafreniere, & Nesbit, 2013). Our "life history" methodology uses mid-century structures as a touchstone to the community, this is circumscribed by the life of the structure. This differs from deep mapping in that the longitudinal heritage of a site prior to the mid-century structure's construction or following its demolition are peripheral to our goal of developing a rich digital tapestry whose threads are drawn from the acquired materials.

2. TWA Flight Center Background

2.1 Mid-Century Modern

What has become known as Mid-Century Modern has its start in the early 20th Century with architects Ludwig Mies van der Rohe (typically referred to as Mies), Le Corbusier, Walter Gropius and Frank Lloyd Wright. Rooted in Gropius's Bauhaus, the spar aesthetic they introduced using reinforced concrete, steel and glass. This combined with Wright's organic simplicity and Mies' "less is more" vision what we know as Mid-Century Modern evolved. Latter practitioners such as Eero Saarinen learned from them and added their own variations of this theme. The roots and influence of the early Mid-Century architects was not limited to Europe and North America, but established roots in South America. There it was embodied by Oscar Niemeyer, the



Brazilian architect who, influenced by Le Corbusier, designed most notably many of the key buildings for Brazil's new capital city of Brasilia (Jacobus, 1966).

2.2 Eero Saarinen

Saarinen was influenced by many architects of his time including his father, Mies and designers of the Cranbrook Academy of Art where his father was dean. By the time Saarinen had received the commission for the TWA Flight Center in 1955 (Ringli, 2015), he was already amongst the most prominent architects in the United States. His noted designs include, the General Motors Technical Center in Warren, MI, US Embassy in London, Bell Labs Holmdel (NJ) Research Complex, the main terminal at Washington (DC) Dulles International Airport and the Gateway Arch in St. Louis, MO. Just as he was approaching what became the zenith of his career, he was diagnosed with a brain tumor and died shortly thereafter in 1961 ("Eero Saarinen, 51, Architect, Is Dead," 1961; Gordon, 2004). Because of his untimely demise, Saarinen was unable to respond to rising criticism of his last wave of works allowing critics to relegate him to semi-obscurity for the next few decades (Ringli, 2015). Such criticism ranged from the technical, that the concrete shells of the terminal were inefficient and required a great deal to structural steel support, to the philosophical, that he tailored "his architectural style to the job, instead of tailoring the project to his style" (Fiederer, 2016). The latter was viewed as the greater sin by his peers, as Saarinen had moved away from the simpler Miesian style structures he had designed and delivered a corporatist building in the crimson and white colors of TWA (Fiederer, 2016). With the availability of his personal archives at Yale University, Saarinen's vision of the world has found a new audience (Pearson, 2006). This is coupled with retrospectives on his work and the movement to reuse the TWA Flight Center as part of a new hotel development at John F. Kennedy International Airport has caused a reevaluation of his work.

2.3 TWA Flight Center

By the 1950's, the post war airline industry was poised for massive expansion. While commercial propeller aircraft were growing larger, faster and more reliable, manufacturers were racing to develop jet powered commercial aircraft. Faced with these developments, the Port of New York Authority (PNYA) recognized the necessity to redesign its airports for modern air travel. PNYA determined LaGuardia Airport would focus on domestic flights, while Idlewild Airport would have domestic and become the main international airport. As the decade progressed, a number of development plans were put forward each bringing objections from the airlines as being inadequate. When faced with the possibility that air carriers could turn to Newark's (NJ) airport as an alternative to Idlewild, the "terminal city" plan was put forward by PNYA in 1955 with the airlines being able to develop their own unique terminal designs (Southwick, Foty, & Dennis, 2005). This was markedly different than what was occurring elsewhere at major air facilities throughout the country, like Chicago's O'Hare International, where the terminal facilities were designed as a singular entity with the airlines sharing the terminal space (Gordon, 2004).



Figure 1 Concept drawing of "Terminal City" with TWA depicted at center top. Note the lack of jet aircraft in this vision. (Era Postcard held by ChronoPoints)

Eero Saarinen's work was already well known when contracted to design the TWA Flight Center (Terminal 5) at Idlewild (later John F. Kennedy International) Airport. The genesis of his concept was taken from the design language for the Sydney Opera House that Saarinen saw while serving on the jury to select its design. On the return flight home from Sydney, Australia, Saarinen morphed the concept of concrete vaults into the now iconic TWA terminal. Days later using an grapefruit rind, he modeled the numerous vaults of the Flight Center roof into a design mimicking a bird taking flight (Gordon, 2004). Within a short time the terminal shape solidified and the design was finalized in 1957 (Southwick, Foty, & Dennis, 2005). Construction commenced in June of 1959, with the major structural concrete supports and roof shells being completed between September and November of 1960 (Southwick, Foty, & Dennis, 2005). Saarinen's design provided for two "flight wings" that were connected to the main terminal area, referred to as the "head house," these flight wings were where passengers would load onto the aircraft. Flight Wing 2 was constructed for the planned 1962 opening, with Flight Wing 1 construction being delayed until 1967 due to cost considerations (Southwick, Foty, & Dennis, 2005).

Saarinen would die in September 1961 less than a year before the Flight Center's official opening in May 1962 (Southwick, Foty, & Dennis, 2005). Even as the first passengers marveled at its magnificent form, the terminal was functionally obsolete. It had been designed for fewer passengers, and smaller propeller driven aircraft, but instead it was thrust into a high speed, high traffic jet-age that the terminal was ill equipped to handle. As with the rest of the "terminal city" complex at JFK International, the TWA terminal would face modifications to accommodate larger jet aircraft like Boeing's 747, increased passenger traffic brought to the



airline industry with the Airline Deregulation Act in 1978 and needs for improved traffic flows inside and out. But it would be the demise of Trans World Airlines itself that led to the terminal's closure in 2001. Recognizing the architectural significance of the TWA Terminal, the Port Authority of New York & New Jersey (PANYNJ) would maintain the vacant structure and seek its repurposing rather than demolition. Obsolescence brought forth the demolition most other original "terminal city" structures, including Pan American World Airways' striking Worldport (Terminal 3) and National Airlines' Sundrome (Terminal 6) designed by I.M. Pei. Eero Saarinen's masterpiece was designated a New York City Landmark in 1994 and placed on the National Register of Historic Places in 2005 (Southwick, Foty, & Dennis, 2005).

3. Life History - A Case Study: The Glass Bank

As humanity embarked on its initial voyages toward the lunar surface, no community would have as significant a connection to the space program than that of Cocoa Beach, Florida. Referring to itself as "Missileland: USA", the city was home to thousands of aerospace engineers and technicians that worked at the nearby launching facilities at Cape Canaveral. Visitors to the city often stayed at motels that sported Space-Age names such as the Astrocraft, Polaris, Sea Missile or Satellite, and dined at the Gemini Room. The city grew exponentially throughout the 1950s and 1960s, as many of the new buildings that rose from its sands appearing as if they could be equally at home in Cocoa Beach or on the moon. One of the finest representations was the First Federal Savings & Loan of Cocoa building, commonly known as the "Cocoa Beach Glass Bank," which opened in April, 1962 and quickly became a regional landmark. Designed by Sarasota School architect Reginald Knight, the building appeared as if an elegant glass cover had been delicately placed atop its four floors (Walters & Michlowitz, 2016). A balcony surrounded the top floor restaurant providing patrons an ideal spot to watch rocket launches. While the Glass Bank would undergo significant modifications in the 1980s, it still retained its Space-Age lines. A series of maintenance issues resulting from three damaging hurricanes in 2004 and accompanying legal conflicts between owners, laid the foundation for its demolition in 2015.

The City of Cocoa Beach provided the *ChronoPoints* team the opportunity to laser scan the Glass Bank in December 2014. Laser scanning is a process that captures highly detailed digital measurements of structures, which can be recorded prior to their demolition, impending modification or to simply document a moment in time. Scanned data can be helpful in the restoration of a structure damaged by natural disaster, deterioration, or war as reflected in the destruction of world heritage treasures in Iraq and Syria (Farrell, 2015). *ChronoPoints* utilized a FARO Focus3D S120 terrestrial laser scanner, which can record data with an accuracy of up to 2 mm, to scan the Glass Bank. The scanner emits an infrared laser beam to determine the distance between the unit and target structure, by measuring how long it takes for the light to return. The device records each laser reflection as a point in three dimensional space, and later assigns accurate colors to each of these recorded points with its accompanying optical photographic capabilities. A series of scans, 33 scans in the case of the Glass Bank, must be conducted to capture sufficient data to create a 3D point cloud of the structure - containing millions or billions of points - after processing with the appropriate software.



This 3D point cloud representation accurately documented the Glass Bank prior to its demolition containing its 1980s modifications and extensive hurricane damage. It was the goal of ChronoPoints to develop a realistic virtual 3D model of the building as it appeared shortly after its 1962 opening, and utilize this environment as an interactive learning platform for the connection between the Cocoa Beach community and the space program in the 1960s. Since the 3D point cloud representation is only a collection of individual points it is not directly usable in virtual environments, so software and/or skilled artists must use it to create a model consisting of polygonal mesh. For ChronoPoints purposes, the artist modelers had to combine this data with more traditional forms of historical resources, like photographs, video and eyewitness descriptions to develop the desired model.

While this example's final goal was the development of an interactive learning platform, the research methodology enabled ChronoPoints to capture the rich 'life history' of the Cocoa Beach Glass Bank. A structure's 'life history' encompasses the design of a building, and contextualizes its cultural significance to the community. With the Glass Bank it was discovered the residents of the area identified with the building not only as the source of funding for their homes, but also as a public space for hosting various organizational meetings and private events such as wedding receptions. During its first decade of operation, it was not uncommon for tourists to photograph this architectural landmark to the Space-Age and request a tour. Many of the era's Las Vegas headliners would perform at Ramon's Rainbow Room atop the fourth floor. Behind its glitzy facade, however, oral history accounts noted many problems including leaking windows, poor insulation, sound reverberation, and asbestos - which was quite common for that era.

The demolition of the Glass Bank, which followed immediately after *ChronoPoint's* laser scanning, was extensively photographed to record the final chapter of the structure's history. As the building was erected in 1962, it was surmised there was a possibility of individuals who participated in its construction and/or daily operation could still be alive and a sense of nostalgia would drive them to witness the event. During the period of the demolition, *ChronoPoints* staff repeatedly visited the site, and proceeded to speak with individuals present to locate potential oral history candidates or those possessing relevant photographs. This strategy proved beneficial as it provided leads to individuals who had remained in the community with significant connections to the Glass Bank and/or knowledge of and links to others.

As is typical to *ChronoPoint's* process, the building's 'life history' research began by researching at local and state archives, libraries and municipal departments to locate the documents, photographs and blueprints needed to assist in the virtual recreation. As a commercial structure, it was anticipated there would be a limited interior images at these facilities and this could only be secured by personal collections held by the general public. To facilitate to gathering of historical resources held by the public, Dr. Lori C. Walters of *ChronoPoints* held a series of public talks pertaining to the history of Cocoa Beach and the Glass Bank at the Cocoa Beach Public Library. These events provided a number of excellent images, as did monitoring several Facebook groups that address the area's history.



Since the building had been altered significantly in the 1980s, one of the greatest challenges with this particular project was the lack of original architectural blueprints. Discussions with municipal governments and libraries revealed blueprints from the 1980s renovation, but none from its original configuration. The First Federal Savings & Loan of Cocoa ceased operation during the savings & loan crisis of the 1980s and while *ChronoPoints* contacted family members of its original president, no blueprints were found. Additionally, the Glass Bank's architect, engineer and site construction manager are deceased, and their family members did not possess copies. The laser scan data, when combined with the images, documents, and ephemera gathered, enabled *ChronoPoints* artists to develop an excellent virtual representation of the Glass Bank's architecture as it appeared in 1963.

Oral history interviewees provided key insights to the interior details and daily operations, as well as an understanding of the structure's significance to the community. This first-hand detail breathes life into the model *ChronoPoints* constructed, avoiding a sterile recreation of this Cocoa Beach landmark. One interviewee, who had been employed at the Glass Bank at its opening, was asked to provide detail regarding the First Federal Savings & Loan lobby furniture. Based on the cost and description of one style, we surmised they were Barcelona chairs designed by Mies van der Rohe. This was confirmed in an unbiased fashion by presenting unlabeled images of several 1960s chairs of the style described, and the interviewee selected the Barcelona style. Later, this was confirmed by other interviewees. Because of this iterative process, these 'lost' details of the bank lobby and Ramons Rainbow Room restaurant atop the building provide a rich, vibrant and period correct environment for individuals to learn about Mid-Century style and culture and that of Cocoa Beach itself.

In addition to providing the life history of the Glass Bank in a traditional format on our *ChronoPoints* website, we developed a prototype virtual reality experience utilizing the Unity 3D game engine enabling users to navigate the building and surrounding environs on traditional computer screens. This environment was shown to several oral history interviewees and seemingly the 3-Dimensional environment elicited increased recall of fine details of the Glass Bank such as carpet color, office equipment and issues with the structure. This additional information is planned to be incorporated into a future revisions of the virtual experience. Development using the Unity engine affords the opportunity to target multiple platforms, like head-mounted virtual and augmented reality experiences for HTC Vive, Oculus Rift, Microsoft HoloLens and others. Oral history interviewees can again be invited to explore the Glass Bank on these platforms and a physical 3D printed model to examine their influence on being able to remember other details or stories. Once all new details have been recorded, they will be incorporated into the virtual Glass Bank allowing for an accurate experience to be made available to the public for download on the *ChronoPoints* website. In addition, an enhanced learning experience for youths age 8-12 is planned that will convey the community's rich and distinctive heritage.

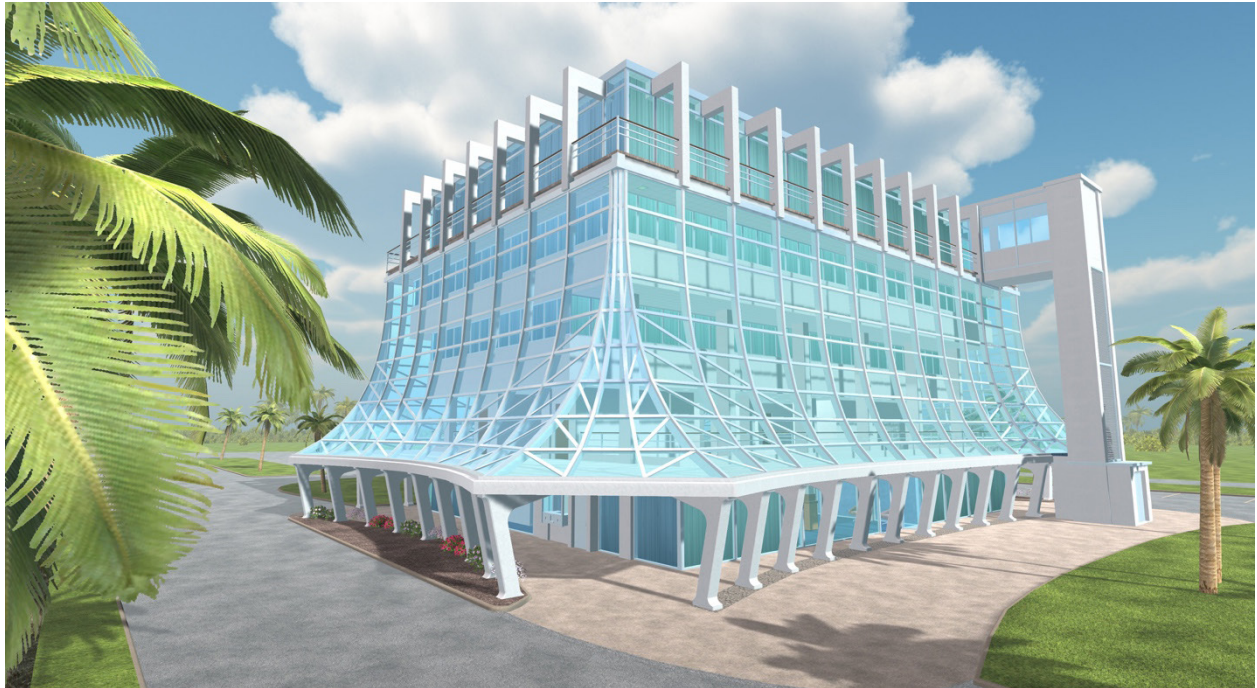


Figure 2 Maya model of Cocoa Beach Glass Bank as seen within the Unity 3D game engine environment. (ChronoPoints Image)



Figure 3 Three dimensional print of Glass Bank from Maya model. (ChronoPoints Image)



4. Preserving the Recent Past

While the National Trust for Historic Preservation officially recognizes the need to preserve modern designs, there still remains debate within the larger preservation community and the general public (French, 2010). One of the greatest challenges to the preservation of 'recent' heritage, that designated as 50 years or less, is that of the "it happened in my lifetime syndrome" by the general public. This is where at times the public and parts of the preservation community itself place less significance on structures erected in their lifetime as opposed to those who had existed prior to the beginning of their recall abilities. When a structure is from a noted architect or has significant events attached to it, this may increase community concern in regard to demolition. This might not occur with a commercial structure that was an exceptional representation of the era, but underwent extensive modification as it was viewed as purely for its function as was the case in the Cocoa Beach Glass Bank. Fortunately, the TWA Flight Center did not suffer from a lack of interest in its preservation "as it is easy to advocate for buildings by major architects that have been part of the modernist narrative (Forum Journal, 2010), nor did it undergo significant modification as did the Pan American Worldport terminal, also at JFK International Airport.

Additional challenges to preserving Mid-Century buildings come in the form of the attitude toward historical materials, such as photographs, documents and ephemera, themselves rather than the structures. The introduction of inexpensive and easy to use cameras like Kodak Instamatics and Polaroids and their proliferation in the 1960s potentially provide historians with an abundance of period images, unfortunately, individuals often fail to understand that their personal images have tremendous value documenting a structure. An excellent example stems from ChronoPoints research into the Cocoa Beach Glass Bank, during an oral history interview it was learned that a wedding reception had been held at the building's mezzanine level in 1969. Fortunately, the couple lived in the Greater Orlando area, and agreed to an interview and the digitization of their reception photos. Initially, they felt the photos would not be of use to the project as they were not of the full structure, while in reality they were some of the most valuable as along with memories of the event itself they revealed some of the most telling details for our virtual reconstruction of the building. While it is clear that as time progresses, we face the loss of individuals associated with these buildings, this loss is not limited to only the capture of their memories through oral histories, but often access to images and memorabilia they owned. After their passing, such items are typically boxed up and placed in a closet by family members, thrown out or sold on eBay as "1969 wedding reception photos" without any of the relevant stories connected to them such as where it was held nor their value to historians or virtual restorations.

5. TWA Project

5.1 Project To Date

Upon learning of the TWA Flight Center's impending repurposing into a hotel, ChronoPoints was granted permission by the Port Authority of New York & New Jersey (PANYNJ) to conduct a laser scan of the facility during the summer of 2015. While it was understood the planned TWA Hotel incorporating the Flight Center



would preserve much of its integrity, the scans were designed to document all public areas of the Flight Center's interior, including the two arrival/departure tubes, and the full exterior prior to any modifications ("TWA Hotel at JFK Airport," n.d.). This scan formed the basis for a highly accurate digital preservation of the structure and surrounding environment - a snapshot of a moment in time. *ChronoPoints* utilized two terrestrial laser scanners, the FARO Focus3D S120 and FARO Focus X330. To demonstrate the level of detail undertaken with this project, 13 scans were conducted of the crimson sunken seating area alone. *ChronoPoints*' project partner *Langan Engineering* provided assistance with the scanning with a Leica C10 and a Leica Pegasus 2 Mobile Platform, which scanned the majority of the building's exterior and surrounding environment. Additionally, extensive digital photographs were taken to supplement the laser scans. As with the Glass Bank, the resulting point clouds enabled the development of detailed mesh model of the Terminal as some of the initial steps in developing its 'life history' and series of virtual experiences addressing the TWA Flight Center.



Figure 4 TWA Point Cloud Model Capture with Leica Pegasus 2 Mobile Platform. (ChronoPoints Image)

5.2 Vision

As one of the great examples of Mid-Century Modern architecture, TWA Flight Center represents the pinnacle of Eero Saarinen's career. With its 1962 opening, the structure sits at the inflection point between travel on propeller-driven aircraft and the Jet-Age and marks when air travel ceased being reserved for the wealthy. While the design and development of the Flight Center has been well documented, it is our goal to fully document construction from the perspective of construction personnel, TWA ground and flight crews, service workers, members of the public who traveled through the facility, PANYNJ personnel and those affiliated with the TWA Hotel design and operation. Two levels of oral histories will be gathered - in depth and micro. Traditional in depth oral histories will be conducted with individuals who worked in the Flight Center or participated in its construction. The micro oral histories are briefer discussions to capture the reflections of members of the general public who had only fleeting, periodic interaction with the terminal and its workers



or patrons. It is critical to note as the construction of TWA Flight Center approaches its 60th anniversary, many potential interviewees are advanced in age and the gathering of the oral histories cannot be delayed. *ChronoPoints* researchers developed an oral history project capturing the reflections of space workers at Cape Canaveral and the Kennedy Space Center. Unfortunately, it can be noted that a significant portion of these individuals, many of whom are of the generation we are seeking to interview, have passed away since that project's inception in the early 2000s. As with the Cocoa Beach Glass Bank project, *ChronoPoints* will gather images and ephemera from the general public to expand the project's online research resources and augment the development of models for virtual explorations.

The envisioned virtual experiences will not be a trite virtual trip into the perceived ultra-cool world of *Mad Men*, AMC's long running television series, or the ABC television network's period drama, *Pan Am*. The TWA Flight Center is an ideal setting for a multidisciplinary environment where STEM (Science, Technology, Engineering and Mathematics) topics addressing aviation, construction, and the symbiotic relationship between STEM and the humanities can be explored. Greater 1960s culture and the history of aviation, New York City, national and global events will be incorporated to enhance STEM learning experiences. The STEM and humanities subjects addressed will not remain in a 1960s time bubble as links to the future and evolution of society are also planned. One feature that is critical to such an environment is contrasting the culture and technology of the focus period to where society is today. The purpose of this is to give perspective to users and value to such historic settings.

Conclusion

By converting these physical structures into virtual entities, this gives them and their creator's visions the ability to continue existing even if they are long gone. Providing potentially flawed structures as platforms for virtually examination gives people today an appreciation of current standards, why they exist and how to further integrate older structures into society's future. Virtual environments permits individuals anywhere to gain understanding of significant microenvironments, such as a single iconic structure for various communities. Creating such virtual heritage sites, we will be able to create a living history, that can be easily be reexamined, integrated with new stories of our world. Pieces of these virtual environments can become building blocks that can be used in a multitude of ways to different stories and teach a multitude of lessons.

While deep mapping encounters a look at place by broader geographies and multiple eras of time, *ChronoPoints*' life history contracts with this approach by looking at an extended but finite era of history and the smaller group that was touched by those events. Incorporating oral histories, photographs, documents, ephemera and 3D digital captures associated with each structure and combines preservation, digital storytelling, and digital archiving to a project, allows researchers to construct histories that place the structures within the macro and micro frameworks of the period. This provides future generations with richer tapestries reflections and information in a historical context.



Acknowledgements

The authors would like to thank the following for their assistance and contributions to the ChronoPoints initiative at the University of Central Florida: *Langan Engineering, FARO Technologies, The City of Cocoa Beach, The Port Authority of New York & New Jersey, The Institute for Simulation & Training, College of Arts & Humanities, and the E2i Creative Studio at the University of Central Florida, Mr. Joseph Romano, Dr. Connie Lester, Mr. Jack Stubbs, Ms. Vivian Lindauer and Mr. Alex Zelenin.*

References

- Bloom, N. D. (2015). *The Metropolitan Airport: JFK International and Modern New York*. Philadelphia, PA: University of Pennsylvania Press.
- Bodenhamer, D. J., Corrigan, J., & Harris, T. M. (2013). *Deep mapping and the spatial humanities*. *International Journal of Humanities and Arts Computing*, 7(1–2), 170–175.
- Deep Mapping | Geospatial Innovation in the Digital Humanities. (n.d.). Retrieved November 8, 2017, from <http://wp.lancs.ac.uk/lakesdeepmap/the-project/gis-deep-mapping/>
- Eero Saarinen, 51, Architect, Is Dead. (1961, September 2). *New York Times*.
- Farrell, S. (2015, December 27). Using Lasers to Preserve Antiquities Threatened by ISIS. *The New York Times*. Retrieved from <https://www.nytimes.com/2015/12/28/arts/design/using-laser-scanners-to-preserve-antiquities-in-isis-cross-hairs.html>
- Fiederer, L. (2016, June 13). AD Classics: TWA Flight Center / Eero Saarinen. Retrieved November 21, 2017, from <http://www.archdaily.com/788012/ad-classics-twa-flight-center-eero-saarinen>
- French, C. M. (2010). Introduction: Modernism + The Recent Past. *Forum Journal*, 24(4).
- Gordon, A. (2004). *Naked Airport: A Cultural History of the World's Most Revolutionary Structure*. New York, NY: Metropolitan Books.
- Jacobus, J. (1966). *Twentieth-Century Architecture: The Middle Years 1940-1965*. New York, NY: Frederick A. Praeger, Publishers.
- Pearson, C. A. (2006). Long ignored, Eero Saarinen makes a grand comeback. *Architectural Record*, 194(12), 26. Retrieved from <https://login.ezproxy.net.ucf.edu/login?auth=shibb&url=http://search.ebscohost.com/login.aspx?direct=true&db=ulh&AN=23544389&site=eds-live&scope=site>
- Ridge, M., Lafreniere, D., & Nesbit, S. (2013). *Creating Deep Maps and Spatial Narratives through Design*. *International Journal of Humanities and Arts Computing*, 7(1–2), 176–189. <https://doi.org/10.3366/ijhac.2013.0088>
- Ringli, K. (2015). *Designing TWA: Eero Saarinen's Airport Terminal in New York*. Zürich, Switzerland: Park Books.
- TWA Hotel at JFK Airport. (n.d.). Retrieved November 22, 2017, from <http://twahotel.com/>
- Southwick, R., Foty, M., & Dennis, W. (2005). *TRANS WORLD AIRLINES FLIGHT CENTER (HISTORIC AMERICAN BUILDINGS SURVEY No. HABS NY-6371)*. Washington, DC: National Park Service, U.S. Department of the Interior. Retrieved from <https://cdn.loc.gov/master/pnp/habshaer/ny/ny2000/ny2019/data/ny2019data.pdf>
- Walters, L. C., & Michlowitz, R. (2016). *A Retrospective Perspective of the Digital Recreation of Mid-Century Subjects*. *Visual Ethnography*, 5(2).