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of Imaging Arts and Sciences in candidacy for the
degree of Master of Fine Arts

North American T-6

by
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The goal of my thesis was to use all of my design, illustration and photographic skills to create an excellent interactive CD on the North American T-6. The most widespread and versatile training aircraft ever built, the T-6 was used by more air forces world-wide than any other. A brilliant concept developed and modified throughout a decade resulted in more than 17,000 flying machines, of which, more than 600 are still flying fifty years later.

The best loved and most remembered single engine training aircraft of all time, the T-6 was an adaptable, rugged aircraft that performed in the unexpected roles of fighter aircraft, dive-bomber, COIN airplane, and ground attack machine. Now, most commonly seen at air displays and air races the T-6 is esteemed by stunt aces and formation teams alike, but best remembered as the aircraft that spawned sev-

eral generations of young pilots in countries as diverse as Brazil and the Soviet Union.

This ubiquitous aircraft had almost as many official destinations and names as it had uses and users. The NA-26, BC-1, NA-44, AT-6, SNJ, Texan, J-Bird, Harvard, Wirraway, Ceres and a host of other variants, marks and modifications to the same standard design proliferated down the years as engines and concepts were altered around the same basic airframe. Yet, all of these aircraft are manifestations of one– the North American T-6.

Many facets of this hugely versatile aircraft's repertoire have been covered within the limited format of a CD. While it is obvious that not every aspect of the T-6 could be encompassed, every effort has been made to include a broad range of subjects.

Through my research, I have contacted museums, flying teams, individual owners, and enthusiasts from all across North America. All parties interviewed were more than eager to share their vast knowledge of the T-6.

Index

To research the North American T-6, I obtained several books on its history and made several trips to places like the Hamilton Aircraft Museum in Hamilton, Canada and the Sun and Fun Airshow in Lakeland Florida. A brief summary of each of the books read for this project will be provided along with details of my trips abroad.

The book that offered the most insight was **T-6 Texan in Action** by Larry Davis, which provided a historical perspective of the North American T-6. Developments in design were discussed, along with some explanation of the North American T-6 's presence across the world. I was able to use the mechanical drawings in this book to create technically accurate illustrations of the North American T-6.
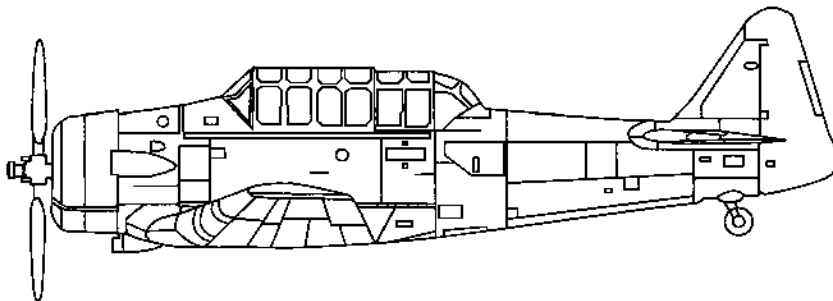
The second book I used to research the North American T-6 was **Harvard! The North American Trainers in Canada** by David C. Fletcher and Doug MacPhail. This book had vast information on the Harvard ranging from factories, models and modifications for Canadian use, along with the pilots and training schools that used it. It also has one of the best collections of Harvard photographs in any of the books I have seen. The illustrations of the Harvard in this book offered some inspiration to the illustrations I created in the **Export of the T-6** section on my CD. This book also contained the mechanical drawings used to create the top view of North American T-6 in my introductory animation.
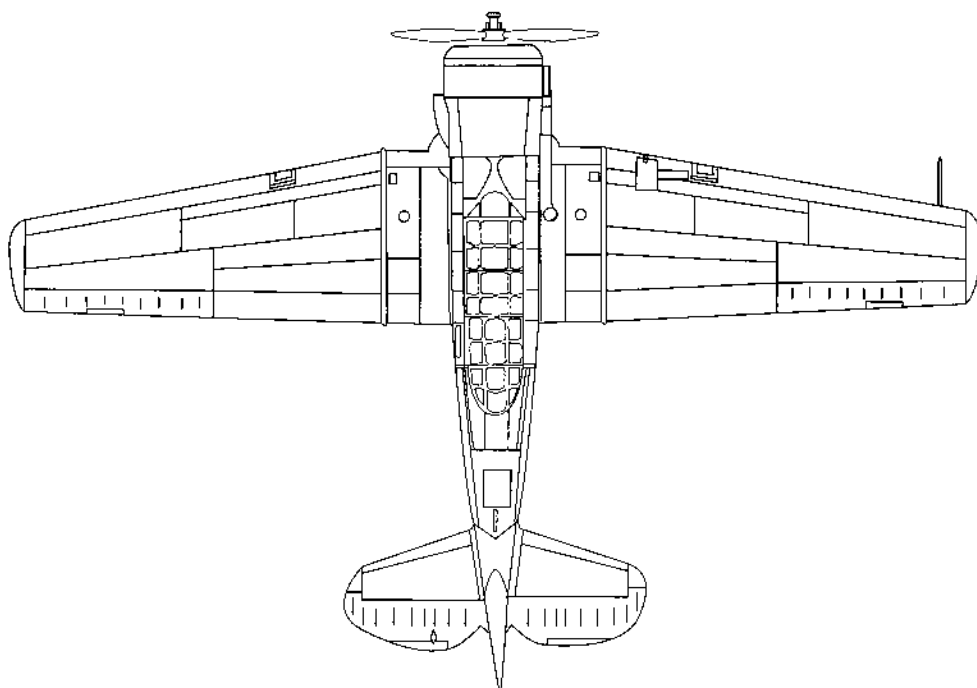
Drawing from Harvard, The North American Trainers in Canada.

The third book, **T-6 Texan, The Immortal Pilot Trainer** by William Jesse had limited written information, but offered a wealth of rich color photography. This book was a great help in researching the different paint schemes of the North American T-6. It also proved quite helpful in studying aerial photography. When I examined the photographs to determine which angles and lighting methods were effective in showing the aircraft in its best form, I found that they could have been more technically precise for this purpose. They inspired me to take better photographs for my CD.

The fourth book I read was **T-6, A Pictorial Record of the Harvard, Texan and Wirraway** by Peter C. Smith. This book was rich in historical and technical information. It had a great collection of T-6's from across the world. This book was useful for sorting out the relationship between the factory codes of the

North American T-6 and the destination that the aircraft was given by the buyer. Below is a small section of the chart used to understand the names.

CHARGE No.	DATE	DESIGNATION	CUSTOMER	QUANTITY	FACTORY S/N
NA-16	–	NA-16	–	1	NA-16-1
NA-18	13-5-35	NA-18	Argentina	–	NA-18-1
NA-19	10-3-35	BT-9	USAAC	42	NA-19-1 NA-19-3 NA-19-5/11 NA-19-20/34 NA-19-50/67
NA-19A	–	BT-9A	USAAC Reserve	40	NA-19-4 NA-19-12/19 NA-19-35/49 NA-19-68/83
NA-20	–	NA-16-2H	Honduras	1	NA-16-2
NA-22	–	NA-22	USAAC	–	NA-16-1
NA-23	1-12-36	BT-9B	USAAC	117	NA-23-85/201
NA-26	20-10-36	BC-1	Canada	1	26-202
NA-27	1-12-36	NA-16-2H	Fokker	1	27-312
NA-28	14-12-36	NJ-1	USAAC for USN	40	28-313/352
NA-29	22-12-36	BT-9C	USAAC Reserve	32	29-353/384
		YIBT-10	USAAC	1	29-385
		BT-9C	USAAC	34	29-505/538
NA-30	–	YIBT-10	–	–	–

The fifth and last book read was **The Story of the Texan**, by Aviation Publications. For what this book lacked in glossy pictures, it more than made up for in its wealth of technical information. The book did not provide me with a lot of useable information for the CD but it gave a view into the inner workings of the North American T-6. It had detailed technical illustrations for every part of the aircraft. Everything from throttle controls to landing gear was meticulously illustrated with utmost detail.

During the First week of January 1997, I made a trip to Hamilton Air Museum, located about an hour south of Toronto. This museum has just been recently rebuilt due to a tragic fire several years ago that destroyed the hanger and most of the aircraft inside. The collection lacked substance since they were still trying to rebuild their collection. But they did have several North American T-6's on hand. There was little information about the histories of these planes and due to the lighting conditions of the museum, I was not able to obtain any decent photographs. I feel that this trip was a waste of time and effort. Perhaps in time, the museum will be able to expand and improve on their exhibits.

      The best source for information came when I had an opportunity to attend the Sun and Fun Airshow in Lakeland, Florida. I had five days to drive from New York to Florida, attend the airshow, and then make it back. It was well worth the effort. The drive took over twenty -three hours each way. There was little sleep during those five days. On day two, I arrived in Orlando and in a matter of hours I was up in the air doing aerial photography in a North American T-32, with two North American Harvards in formation. We flew from Orlando to Lakeland where the airshow was being held. There, I was able to meet and photograph several of the pilots attending the show who owned their own North American T-6's.

      I stayed just outside of Orlando, which was an hour away, so the next day I had to leave around 5:30 am in order to photograph the aircraft before the crowds arrived. I spent the next couple of days just talking with the pilots and taking video interviews and photos of the aircraft. The last day of the airshow, I had the opportunity to fly in a North American T-6 to the Leeland Air Ranch in Ocala Florida. The Air Ranch is a housing subdivision designed for pilots and

their aircraft. There is a landing strip right in the complex. People who live there have planes in their garages instead of cars. The variety of aircraft there, ranged from Czechoslovakian Migs to old-fashioned Bi-planes. Each year that they hold the Sun and Fun Air Show, the residents of the Leeland Air Ranch hold a picnic for the pilots of the show. At least one hundred warbirds showed for this gathering and performed some of the greatest aerobatic flying I have ever seen. We flew to the ranch in formation with four North American T-6's lead by formation leader Hannu T. Halminen. I will never forget the experience of flying with this group of people. The act of flying in formation is a very technical task that challenges each pilot's trust in the formation leader.

The day after visiting the Air Ranch. I unfortunately had to return to New York to process all of the information that I had gathered. This CD would be nothing close to what I accomplished had I not made this trip. I am extremely lucky to have family who could help me make this trip to the second largest gathering of North American T-6's in the world.

This is the North American T-32 that I flew in.

Formation Flying on our way to the Sun and Fun Air Show. The other pilots are Hannu Halminen and Doug Brown.
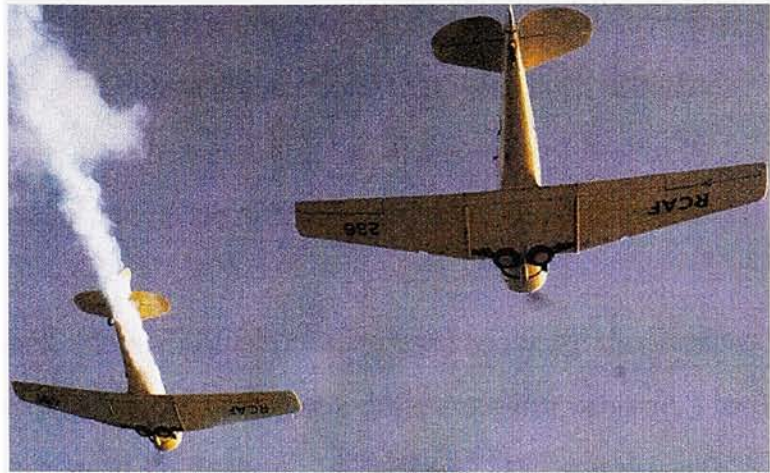
This is the North American T-6 that I flew in. It is owned and flown by David Wall and his father.

Formation Flying on our way to the Leeland Air Ranch. The other pilots are Bob Pingston and Doug Brown.
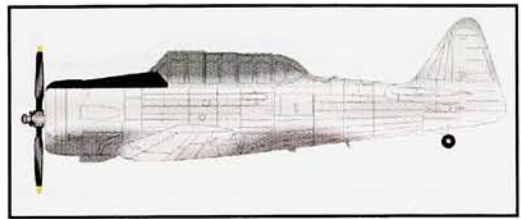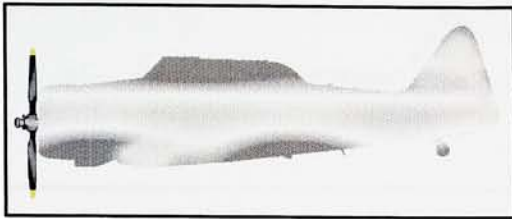
North American T-6

I have spent many long hours illustrating many of the different models of the North American T-6. I wanted to create illustrations that were both artistically appealing and technically sound. When creating the illustrations I had to be aware of all the different variations of the airframe and all of the different paint schemes that were used.

Adobe Illustrator and Adobe Photoshop were used to create the illustrations. Since many had the same model with just a different paint scheme, I took advantage of the layers function in Photoshop. Below I will take you through the process used to create each illustration.
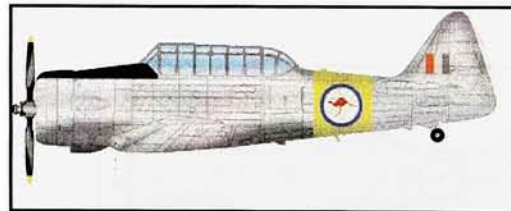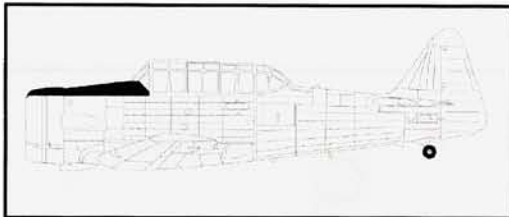
Each model of the North American T-6 was scanned into Photoshop using Microtek Scan Wizard and saved into an EPS format. Each model was then placed into Illustrator and used as a template to create crisp line drawings. This process was very time consuming but the increase in quality and the ability to infinitely scale the new line drawings left more options available for future uses. The pen tool was used to trace the templates. After they were traced, they were exported back into Photoshop, where the coloring and shading were completed.

Since there were many different paint schemes for the North American T-6, a layer was created that would hold the information on the outer surface of the aircraft. Above, you see a North American T-6 with a polished metal surface. KPT Gradient Effects were used to create the wavy shades of grey to create the illusion of polished metal. In some cases this layer housed solid yellow information and camouflaged information in others.
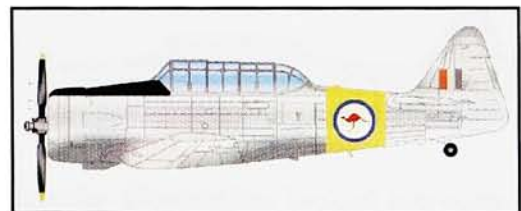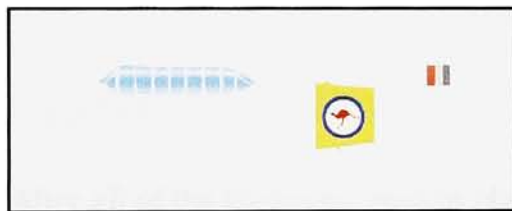
I created a layer that would hold all of the information of the specific markings found on each aircraft. These markings were created in Illustrator based on the photographs I collected and from books. They were then brought over to Photoshop to be placed in by using the opacity controls on the layers pallete. It was important to have a separate layer for the markings because certain aircraft only differed in that way. The Russian T-6 and the Austrian T-6 (Wirraway) are proof of this. A lot of time was saved just by swapping the markings.
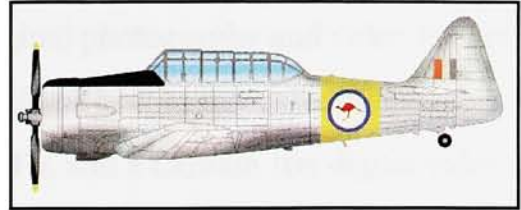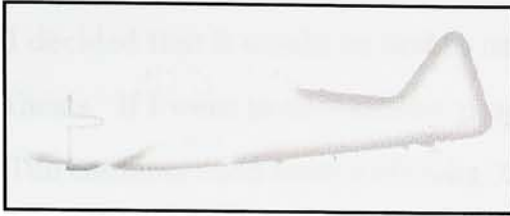
To add depth to the illustrations, I created a layer to house the shadow information. The airbrush tool in Photoshop was used to apply shadowing. The opacity controls proved quite important in blending the shadows into the illustrations. The shadows had to be kept on separate layers due to the constant paint scheme changes. Depending on the lightness or darkness of the paint scheme, the lightness and darkness of the shadows would change accordingly.
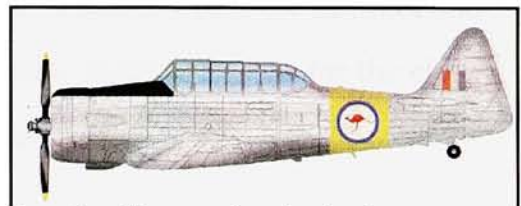
After all of the elements were in place, I felt that the illustration looked too computer generated and lacking in character. I decided to use some tricks to roughen up the texture of the illustrations. I took a sheet of paper, covered it completely with scribbles from a black pen and then scanned it. Then, I imported the file into a channel and inverted it in Photoshop. I loaded that channel and created a new layer, filled the selection with black and deleted the excess scribbles from the area around the plane. I used the opacity controls to blend the scribbles into the illustration and then I flattened those layers. Finally, I added monochromatic noise at an amount of 7 to roughen the image a little more. The image was then converted into an indexed format and saved as a Pict File.

I decided that it would be best to capture original photography and video for my thesis. If I were to ever sell my project it would be best to have all original work. The cameras used were a Minolta 7xi, Nikon F4, and a Cannon 10x digital video camera. The following lenses were used: 22mm Sigma, 28-150mm Minolta, and an 300mm Nikon. Kodak Gold film was used at both 100 and 200 ISO.

The majority of the photo work was done in Florida at the Sun and Fun Airshow. Taking these photos was nothing like work, it was almost impossible to take a bad photo in the perfect Florida weather. The first photo session took place in the first few hours of my arrival, at a small grass airfield that stored several war-birds including several T-6's that were flying to the airshow. I was fortunate enough to fly alongside a T-32, taking pictures. I carried both the Minolta and the Nikon for this first flight. The Minolta carried the 28-150 lens for the close ups and the Nikon held the 300mm for the distance shots.

Once I was strapped in and prepped for flight we taxied down the runway. The engine started to roar and the next thing I knew we were up and away. I had to open the canopy to get a clear shot at the T-6's. I wore a radio headset and was able to stay in contact with all of the pilots in the formation to arrange the positioning of the aircraft. It was like moving apples in a still life, only much more exciting. I could direct the pilot of the T-32 to climb, dive and circle the other aircraft, while telling others to expel smoke by squirting oil onto the muffler for visual effects. There was minimal jet stream, so I was able to hang outside of the plane to get shots below the wing. Hanging out the side was a total rush. I felt

that I may have taken too many pictures during the flight. A total of six rolls of film were shot in a twenty minute period. This first flight was a great preparation for the second flight.
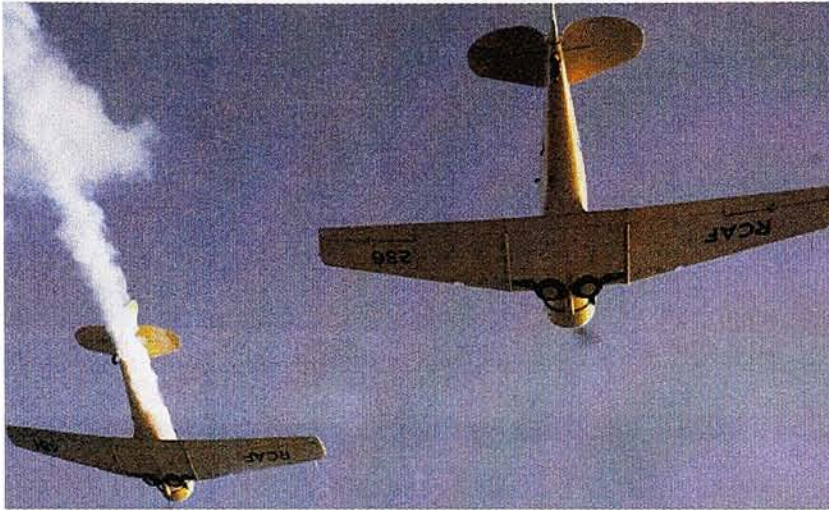

For the next couple of days I travelled around the airshow taking photos of all of the different T-6's. I tried to set standard angles for photographing the aircraft: one shot at the front, one from the side and also any unusual markings on the fuselage.

I found it difficult to take pictures of the aircraft because people were always in the background. Most of them were just bystanders, but a few actually tried to sneak into the picture. I decided it would be best to photograph the aircraft before and after the show. I was able to capture almost every aircraft without anyone in the background. The only photographic retouching involved removing dust spots, litter and the tie downs from the wings.

On the last day of Sun and Fun I had the chance to fly in a four plane formation in a T-6. This was a totally different experience than flying in a T-32. It is a much rougher and louder ride. The jet stream would have snapped the lens right off the camera. The 300mm lens on the Nikon F4 was too long and would hang outside the canopy, so I decided to use the much shorter 28-150mm lens of the Minolta 7xi, instead. I also brought the video camera on the flight. After I was strapped in we taxied and gathered in formation at start of the runway. I could not take photographs because the canopy had to be closed during take off and landing. Once we were in the air I slid back the canopy and started shooting. I shot more wisely this time, only taking one roll of film. The percentage of use-able shots was higher than on my first flight. We landed at the Leeland Air Ranch and I witnessed some of the best flying I have ever seen. I positioned myself right on the runway and let the film roll. Below, you can see some of the shots taken from this location. The goal of my thesis was to use all of my design, illustration and photographic skills to create an excellent interactive CD on the
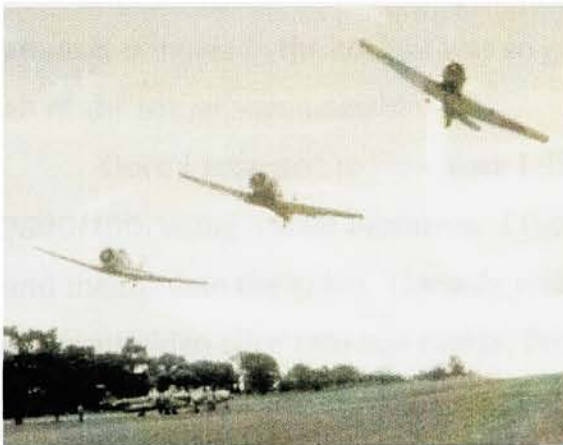
Three T-6's in aerobatic formation at the Leeland Air Ranch.

A MIG buzzes the runway no more than twenty feet away at the Leeland Air Ranch.

Shooting the video was somewhat of a problem. I did not have the proper equipment with me. A microphone and a tripod would have gone a long way. The Canon video camera had an omni-directional microphone on it, and thus had a tendency to pick up every noise in the area. Many of the first interviews I recorded had to be re-shot because you could not hear any voices (only the roar of the airplanes). All that could be done to solve this problem was to get closer to the subjects and to time the interviews when there was no aircraft in the area. The last part of the solution was quite difficult to do, since the people being interviewed were the pilots, who were, of course, only around when they were flying.

I also had a problem with camera shake as it zoomed out. A small shift in the camera would cause a large movement in the video. A tripod would have cleared up this problem. Recording in the air in an open cockpit created more problems with camera shake. The wind and noise were so great, the electronic components couldn't handle the stress. Massive distortion appeared in the video. It resembled a puck hitting the net cam in a hockey game. Perhaps an analog camera would solve this problem, rather than using a digital one. The amount of noise in the cockpit was so great, I turned off the microphone because all of the sound was unusable.

Once I returned to New York I digitized the video on a Macintosh 7500/100, using Adobe Premiere. I then used Adobe Premiere to color correct and manipulate the video. The only real manipulation was incorporating several different video clips into one movie. From all of the recorded footage, I was able to create ten separate movies, using only six in the thesis. The other four were not used in order to conserve space on the CD. There's only 650 megabytes in a CD and the video would have taken over three quarters of that, alone.

I spent many hours pondering how to design the look and feel of the T-6 CD. It was very difficult to create a look that would represent the total feel of the T-6, since the aircraft has had such a colorful history. I decided it would be best to choose one color scheme based on one T-6 and within that main scheme incorporate the many different visual elements. The paint scheme I chose was that of an American Texan, owned by WAYNE DORMAN. The dark blue color provided a nice contrast with the content of the CD and the checkers added an interesting detail to the interface. It was important to use structural elements of the aircraft in the screen design of this project. Parts of the nose cone were used in the main interface and aluminum skin from the fuselage was used to give depth in the background.

I wanted to keep the design of the main menu simple and clean, while stirring as much interest and excitement as possible. I chose to include looped footage of a Harvard performing aerobatic maneuvers inside an air squadron logo, which was modified to act as a video screen. To create the animation, I did not use a Quicktime movie as most people would expect, but rather, a series of PICT images rendered from a movie in Adobe After Effects. I found this method better for integrating the logo into the video, thereby avoiding the problems of antialiasing. I chose to place the section buttons in the middle of the window, in order to make it extremely simple to figure out the navigation. A comprehensive order of the sections enables the user to understand the next section. By the time a user gets to the photo section he/she would be able to identify the type of plane, markings and so on.
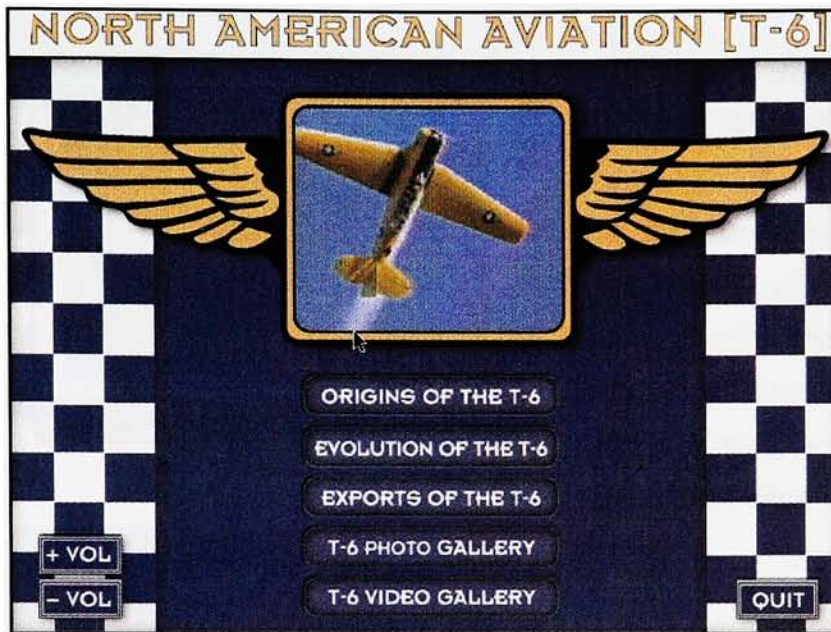
This is a screen capture of the main menu. Clean, clear, and interesting design was used to create this interface. Great attention was payed to incorporate the feeling of the T-6 into the design.

In the next few pages I will overview all of the different sections of the CD, briefly going over the thought behind them and how they were created.

In each section of the CD, I chose to open with an illustration that would represent the content of the section. This section deals with the origins of the T-6. I thought it was appropriate to incorporate images of the designer of the first T-6, along with blueprints, illustrations and photography. With these images, I captured the feeling of one man's idea put to paper. That idea developed and transformed into what we have today. Inside the section, I tried to keep the information as clear as possible, to ensure easy reading. Because reading from a screen is already difficult, there was no reason to make legibility harder– just for design sake.
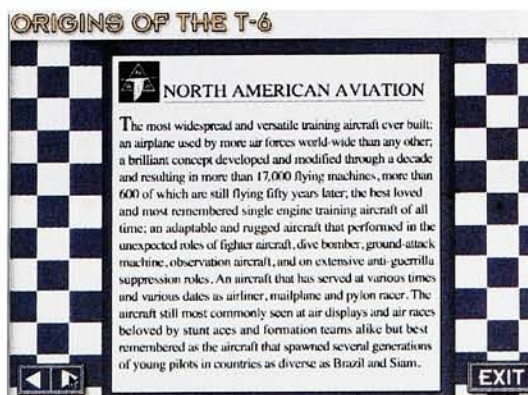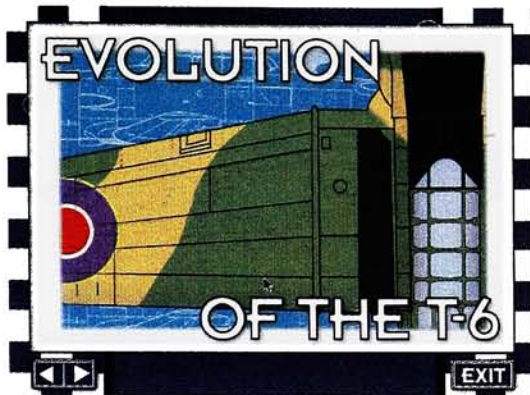
In the section about the evolution of the T-6, I decided to use a simpler illustration. The thinking behind this was that the T-6 is a very simple aircraft. I used a cropped section of a T-6 placed over its blueprints. The majority of the illustration was done in Adobe Illustrator and then imported into Adobe Photoshop to add texture and depth.

Since the evolution of the T-6 dealt mainly with technical issues, I thought it appropriate to incorporate the style of blueprints into the overall design. In this section you can see the most important developments of the T-6 and why many of the changes were made. Each section includes key information that is specific to each variation of the plane, such as wingspan, powerplant, speed and service ceiling. To reinforce the feeling of looking at a blueprint, I chose a transition that looked like a page flipping over. Again, emphasis was on clarity. The desired information should only be a click-away. And, I tried to keep the technical content interesting.

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The T-6 was such an international aircraft with so many different paint schemes and variations it was obvious that the illustration needed to be as colorful and rich as the T-6, itself. I collected several flags from countries where the T-6 served and placed those images overtop, like the South African Harvard. I designed the screen to show the various paint schemes as well as to provide information about the aircraft.

This section was the most time consuming section of the entire CD, each colour scheme had to be researched to determine the correct designs. Many of the current photos of the T-6 show inaccurate designs that are there more for show than for authenticity. Once I determined which designs were correct, I created them in Illustrator and then applied them to the various airframes in Photoshop. I chose a simple slide show transition for this section. With the heavy graphical content a complex transition would take away from the performance of the machine.

Formation over Florida

Smokin' Harvard MK IVs
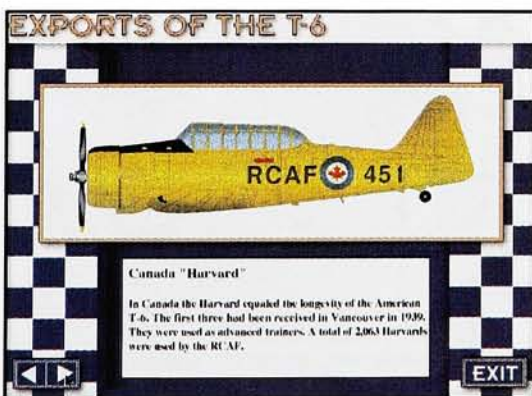
The photo gallery was the easiest section and the most fun to complete. There is nothing like seeing your work come to life in the final end-user application. For the opening, I decided to go with a clean photo illustration that gave a clear idea of what the section was about. While designing the screen, I wanted to put great emphasis on the imagery but also maintain the overall look and feel of the T-6 interface design standards. I felt that it would be nice if the pictures spoke for themselves. Too much information would just clutter up what I was trying to do. To enhance the concept of a photo gallery I included the sound of a shutter clicking as you cycle through the pictures, along with a transition that imitated the aperture opening and closing. Again, all of the images used in this section were of my own creation. They were scanned and prepared in Adobe Photoshop, where they were compressed into 8 bit images to increase the computer's performance, without losing image quality.

The front illustration of this section is meant to show the pilots and their planes. To reinforce this as the video section, I enclosed the illustration in a video record frame. This section was likely the hardest to create of all of the sections. The design aspect was straightforward, but the challenge was to work through the technical issues of integrating the movies into an interesting interface.

I decided it was best to sort the movies into two groups. The first group was for the pilots that fly T-6's and second group for the T-6 in action. By planning ahead, I was able to photograph each pilot before they were videotaped. These photos served as buttons to prompt the corresponding video. They were also reused in the background as the movies played to enhance their presentation. A recording light was integrated into the video record frame for a "point-of-view" feel. This added a sense of raw excitement to the movies.

When I decided to produce this CD I decided I would focus on content rather than technical wizardry. To me content is king. I have found that many of the CD's on the market today rely on bells and whistles to cover up the lack of content. I wanted a simple clear interface with the best, self-produced content possible. I had to create a balance between how much effort I would put toward creating the CD and how much time I would spend producing the content. That split would be roughly 20% towards making the CD and 80% towards producing the content. Below you will seen many of the scripts used to produce the T-6 CD.

```
on mousedown

repeat while the stilldown
set the castnum of sprite 4 to 10

updatestage
end repeat
set the castnum of sprite 4 to 9
updatestage

end
```

```
on exitFrame
  go the frame
end
```

```
on exitFrame
  go to "vid"
end
```

```
on mousedown
puppetsound "clicksound"
repeat while the stilldown
set the castnum of sprite 3 to 100

updatestage
end repeat
set the castnum of sprite 3 to 99
updatestage
go to "blue"

end
```

```
on enterFrame
puppetsound "bg sound2"
end
```

The goal of this thesis was to integrate my design, illustration and photographic skills to create an excellent interactive CD on the North American T-6. I believe more than this has been accomplished. However, with the proper time and equipment (professional camera with microphone and tripod) the video on the CD could be significantly improved. A hand held camcorder simply wasn't sufficient.

Considering the volume of information and imagery I have gathered for this project, it seems a shame to limit it's distribution to a CD. If this project were to begin today, I would choose the Internet medium over CD-ROM. The web has begun to mature, and many bandwidth limitations are being resolved. I could display everything about the T-6 to anyone with a connection. I had hoped to distribute the CD when it was finished, but now it only makes sense to put this information online.

I would like to thank several people who made this thesis of the North American T-6 possible:

My Parents, who have supported me and made my education possible. Through their sacrifice I have been able to have the fortunate opportunity to receive an education that other less fortunate people only dream of. A special thanks goes to my father who had the wisdom to steer my life and guide me down a better path when I was in need of direction.

To the T-6 pilots. Without their co-operation my CD would be nothing more than a rehash of information and photography from books. I would like to give a special thanks to Hannu Halminen and his family. Hannu's love for the T-6 has been the inspiration for this CD and with his help he has provided a vast amount of information and experience. Long many safe and happy hours.

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