RK&A

IMPACT PLANNING • EVALUATION • AUDIENCE RESEARCH

SUMMATIVE EVALUATION

DESIGN BUILD FLY

Prepared for
Exploration Place
Wichita, Kansas

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SUMMARY & DISCUSSION

Funded in part by the National Aeronautics and Space Administration (NASA), the *Design Build Fly* exhibition and its associated programs was warmly received when it opened to the public at Exploration Place in December 2017. Results from a summative evaluation conducted by RK&A show that visitors enjoyed *Design Build Fly* and that it broadened their understanding of the aviation industry, which is important to the Wichita community. In this summary and discussion, we highlight key findings from the summative evaluation. Please see the findings sections of the report for detailed reporting of all results by methodology.

SUMMARY

RK&A collected (1): 100 timing & tracking observations of visitors seven years and older in the exhibition; (2): 40 interviews with visitors to the exhibition who participated in at least one *Design Build Fly* program (Cart Program, CreatorSpace, or Live Science Show); and (3): 28 interviews with adolescent visitors who experienced an Aviation is Awesome family event.

TIMING AND TRACKING OBSERVATIONS

Most observed visitors were in a group of adults and children. The median time spent in the exhibition is 10 minutes 33 seconds and the maximum time is 57 minutes 39 seconds. This is generally typical of time spent in similar interactive exhibitions; see benchmark examples from other timing and tracking studies conducted by RK&A on the next page.[1] It is notable that children age 11-17 spent triple the amount of time in *Design Build Fly* as children age 7-10 or adult visitors (19 minutes 44 seconds versus 6 minutes 37 seconds); this speaks to the exhibition's appeal to adolescents.

Looking beyond time spent in the exhibition to behaviors, the data indicate that the exhibition was highly engaging. Visitors were social during their visit to *Design Build Fly*, with more than three-quarters of observed visitors conversing and/or reading aloud and pointing and/or beckoning to others during their visit (85 and 77 percent, respectively). Several also took photographs of or with others (19 percent). However, very few visitors to the *Design Build Fly* exhibition were observed interacting with Exploration Place staff or volunteers (2 percent).

[1] Note that time spent does not account for visitors returning to the exhibition after visiting other areas of the museum, which is likely given Exploration Place's layout. Time spent at the Live Science Show is also not accounted for, given the show's location (across the Grand Hall from *Design Build Fly*).

Median time spent in other interactive exhibitions

Exploration Place
Design Build Fly
10 minutes 33 seconds

San Diego Natural History Museum
Coast to Cactus
13 minutes 9 seconds

Similar-sized space, more content, fewer interactives

Please Touch Museum
Flight Fantasy
8 minutes 15 seconds

Similar-sized space with more play-based exhibits

National Museum of Natural History
Q?rius
15 minutes 35 seconds

Similar-sized space with large collections area

National Museum of American History
Places of Invention
6 minutes 30 seconds

Smaller space with more content and fewer interactives

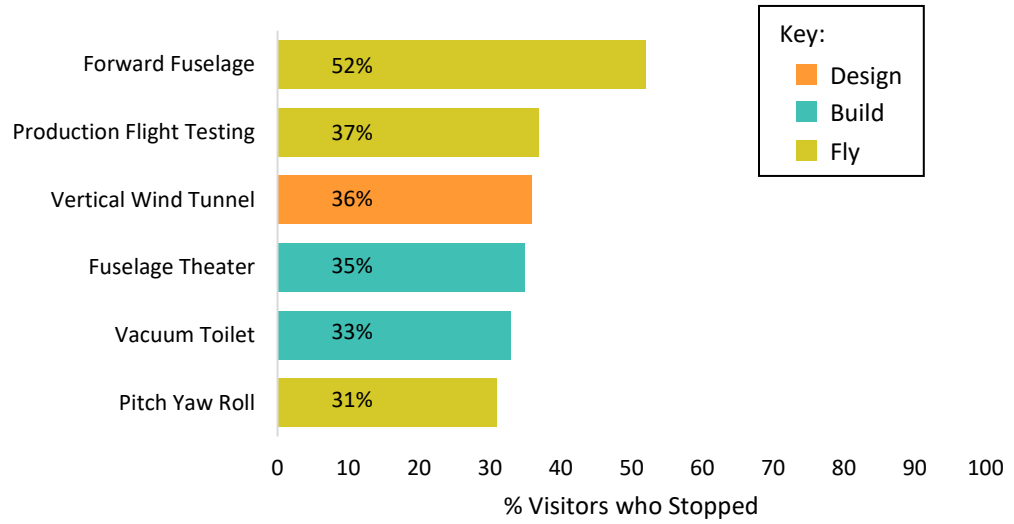
California Academy of Sciences
Earthquake
16 minutes 18 seconds

Larger space with exhibits inside and outside plus one exhibit requiring a line

To begin to understand components that shaped visitors' experiences in the exhibition, we will explore components that the largest number of visitors stopped at (i.e., high attraction) as well as those with the longest dwell time (i.e., high engagement).

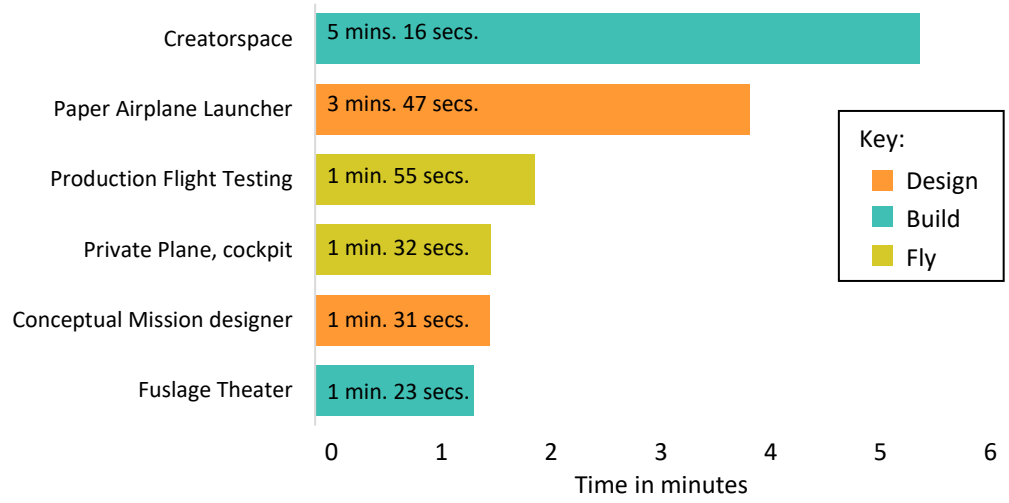
The most stopped at components are in three of the most immersive spaces—52 percent visited the Forward Fuselage, where visitors pretend and are photographed flying luxuriously in a Hawker 4000; 37 percent visited Production Flight Testing, where visitors can hop into the cockpit; and 35 percent visited the Fuselage Theater, where visitors view behind-the-scenes footage of Wichita aircraft manufacturing from inside a 737 fuselage. The three other most-visited components were hands-on, interactive components—the Vertical Wind Tunnel, where visitors design objects to fly in a wind tunnel; the Vacuum Toilet, where visitors place plush balls into an airplane toilet to see how the vacuum works; and Pitch Yaw Roll, where visitors manipulate an airplane model as a fan blows air at it. Significantly, these components span the three main sections of the exhibition—Design, Build, and Fly – which highlight different aspects of the aviation industry.

Most-visited components in *Design Build Fly*



Alternatively, the two components with longest dwell times are interactive spaces that invite making, such as CreatorSpace, which has the longest median time spent—at 5 minutes 16 seconds. At CreatorSpace, Exploration Place staff or volunteers guide visitors in hands-on activities, such as riveting. The Paper Airplane Launcher had the second longest median dwell time at 3 minutes 47 seconds; here, visitors make paper airplanes and launch them from a motorized launcher. Some of the components with long dwell times are also immersive, such as the aforementioned Production Flight Testing, Fuselage Theater, and the Private Plane cockpit. Again, positively, the components with the longest dwell time touch on the three primary sections of the exhibition— Design, Build, and Fly, as shown below.

Components with the longest dwell time in *Design Build Fly*



INTERVIEWS WITH VISITORS TO THE EXHIBITION

Visitors very much enjoyed *Design Build Fly* and particularly valued the hands-on and interactive qualities of the exhibition. Additionally, visitors spoke highly of their experience interacting with Exploration Place staff and volunteers in the exhibition. *Design Build Fly* measured up well against the intended outcomes identified in the impact framework, which was developed to help with planning the exhibition. Intended outcomes for families or casual walk-in visitors to *Design Build Fly* and evidence of achievement of those outcomes are described in the table below.

Intended outcomes from impact framework for families/casual walk-in visitors

Intended Outcomes	Achievement
Visitors experience wonder and delight at the scope and scale of aviation objects, concepts, and activities presented.	**High achievement ★★★** All interviewees described a positive experience with *Design Build Fly*; they enjoyed the high level of interactivity available as well as the opportunity to see inside aircraft. Observations also indicate wonder and delight based on visitation to a variety of components spanning all three primary sections of the exhibition and frequent social behaviors.
Visitors broaden their understanding of how engineering and manufacturing processes are integrated to create a functioning aircraft.	**High achievement ★★★** One-half of interviewees came away with a new understanding of the engineering and manufacturing processes used to create a functioning aircraft. Several specifically discussed the complexity of the production process, and several others described multiple specific engineering or manufacturing processes.
Younger visitors will broaden their knowledge, awareness, and understanding of STEM/aviation-industry career options.	**Moderate achievement ★★** At the time of the evaluation, Exploration Place had not fully implemented career pathways information to support this outcome as intended, so this outcome was not explicitly evaluated for walk-in visitors. Notably, even without targeted support, one-half of interviewees talked about specific aviation industry jobs that they became aware of as a result of their visit.
Visitors from Wichita will feel pride in how the aviation industry has shaped their family members' lives, Wichita's identity, and the world.	**Moderate achievement ★★** One-half of interviewees are from Wichita, and one-quarter have connections to the aviation industry; few of these interviewees expressed explicit feelings of pride in Wichita's aviation industry. However, one-half of interviewees thought about how the aviation industry shaped Wichita, particularly through the Fuselage Theater.

INTERVIEWS WITH ADOLESCENTS AT AVIATION IS AWESOME FAMILY EVENTS

Adolescents were motivated to attend the events primarily because they said the event sounded enjoyable, and some had a particular interest in pursuing aviation careers. Adolescents liked the hands-on activities at the event, including those in the CreatorSpace, and interacting with *Design Build Fly* components. Adolescents' experience with the Aviation is Awesome family event measured up well against the intended outcomes identified in the impact framework. Intended outcomes for out-of-school-time adolescents and evidence of achievement of those outcomes are presented in the table below.

Intended outcomes from impact framework for out-of-school time adolescents

Intended Outcomes	Evidence of Achievement
Adolescents broaden their knowledge, awareness, and understanding of the aviation industry.	**High achievement ★★★** Three-quarters described gaining a new understanding of the process involved in building aircraft. Responses were often about the production process and expressed newfound appreciation for the complexity and teamwork required to build aircraft.
Adolescents strengthen their knowledge of skills pertaining to STEM/ aviation-industry careers.	**High achievement ★★★** Three-quarters described skills needed to pursue jobs in the aviation industry, although the depth of understanding varied. The majority of adolescents recognized the complexity of the many steps involved in building aircraft and thus the collaboration required.
Adolescents feel a sense of connection to people working in the aviation industry.	**Moderate achievement ★★** The majority described some sense of connection to people in the aviation industry. Several were previously interested in working in aviation. Several others described positive changes in their perception of the industry; in particular, the event humanized the industry for adolescents through encounters with professionals.
Adolescents feel adults in the aviation community care about their future.	**Moderate achievement ★★** More than one-half said they talked with aviation professionals at the Aviation is Awesome family event and described their interactions as "positive," "interesting," and "friendly." However, specific comments about feeling cared for were absent.
Adolescents deepen their respect for older generations' contributions to the aviation industry.	**Moderate achievement ★** While over one-half identified an association with someone in the aviation industry, few described increased respect for these individuals. However, the majority described an increased appreciation for the complexity of the aviation industry or acknowledged the industry as more interesting than expected.

DISCUSSION

EXHIBITION AND PROGRAMS

Exploration Place should take pride in how the exhibition and programs measured up against the intended outcomes for visitors. Casual walk-in visitors certainly broadened their understanding of how engineering and manufacturing processes are integrated to create functioning aircraft. And while this new knowledge gained may not have been particularly deep or detailed, it is in alignment with what we can expect to be achieved by casual walk-in visitors who are experiencing *Design Build Fly* as one of many experiences they might have at Exploration Place on the day of their visit. The broadening of visitors' knowledge also left them with curiosities that they might pursue later—a hallmark of the types of experiences museums seek to provide.

If Exploration Place does seek to deepen the types of knowledge and ideas visitors are taking away, program experiences are certainly an avenue for extension. Visitors spoke highly of their encounters with Exploration Place volunteers in *Design Build Fly*—although observations indicate few visitors experienced programs.[2] If it is within Exploration Place's capacity, boosting the frequency and consistency of programs offered in the exhibition space would certainly be advantageous. Plus, these additional programming opportunities might be able to provide information about aviation career pathways, which Exploration Place hopes to provide to casual walk-in visitors in addition to adolescents at Aviation is Awesome family events.

Notably, one area Exploration Place may be disappointed in is its achievement of the outcome that visitors from Wichita will feel pride in how the aviation industry has shaped their family members' lives, Wichita's identity, and the world. Exploration Place was acutely aware that locals' feelings toward the industry may be mixed given its cyclical nature. This was evident in some visitor comments, although negative feelings were neither abundant nor vivid. In part, achievement of this outcome is limited because only one-half of visitors interviewed actually reside in Wichita, and only one-quarter have associations with the aviation-industry—thus reducing the pool of visitors for whom this outcome might manifest. Furthermore, timing and tracking observations indicated that the Wichita Stories component on the ground floor was often down or unavailable, while the Wichita Stories component on the top floor was moderately used. Perhaps, bolstering visits to these components might help drive up feelings of pride.

Yet positively, *Design Build Fly* further cements Wichita's identity as the "Air Capital of the World." Tourists were very interested in learning about all the aviation companies in the area. Perhaps, in celebrating Wichita's aviation legacy, *Design Build Fly* may have more long-lasting versus short-term results in deepening pride among visitors from Wichita in their aviation heritage.

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[2] A reminder that timing and tracking only included programs offered in the *Design Build Fly* space.

AVIATION IS AWESOME FAMILY EVENT

Aviation is Awesome family events were clearly successful in broadening knowledge, awareness, and understanding of the aviation industry among adolescents. Moreover, the events were highly successful in strengthening adolescents' knowledge of skills pertaining to aviation industry careers. Both access to the *Design Build Fly* exhibition and programs, as well as the presence of aviation professionals at the events, supported this achievement and should be retained if Exploration Place continues these programs in the future.

Notably, adolescents attending the events ranged in age from 10-18 years, with a median age of 14 years. This is useful context as adolescents on the younger end of this age range (less than 14 years) are in the very early stages of identifying their career interests, which emerged in their responses. While several adolescents identified a specific interest in aviation careers, the rest either had other career interests or were undecided on career plans. Therefore, we want to highlight the importance of showcasing fun and passion alongside building awareness of specific aviation industry careers. The current generation entering the workforce seek jobs that are both professionally and personally fulfilling, since they perceive life and work as extremely intertwined. Therefore, showing adolescents that there are a variety of opportunities in the aviation industry that are fun *and* interesting, is paramount. Exploration Place is already doing this well in the *Design Build Fly* exhibition and could emphasize this further in future Aviation is Awesome family events by encouraging professionals to share their passions for the industry. In turn, highlighting the passions of aviation professionals may lead to further achievement in both helping adolescents feel connected to people working in the aviation industry, and that the aviation community cares about their future.

Finally, paralleling findings from casual walk-in visitors' exhibition experiences, the Aviation is Awesome family events minimally encouraged adolescents to feel deeper resect for previous generations' contributions to the aviation community. Positively, respect and interest in the industry as a whole was garnered, which may eventually translate to respect for the individuals working in the field. Further, as noted previously, celebrating Wichita's aviation legacy in the Aviation is Awesome family events, as Exploration Place has done through the *Design Build Fly* exhibition, may have residual effects in deepening Wichita's aviation identity, enhancing pride, and promoting respect for past generations working the industry.

CONCLUSION

We commend Exploration Place on its diligent and intentional work on *Design Build Fly* over the past three years. We foresee the exhibition as one visitors will enjoy returning to again and again, which will help the key messages and outcomes resonate even further for visitors.

STUDY BACKGROUND

Exploration Place contracted RK&A, Inc. (RK&A) to conduct a multi-method summative evaluation of *Design Build Fly*. The *Design Build Fly* exhibition and programs explore what happens behind-the-scenes in Wichita's aircraft plants. While in this report we focus on the results of the summative evaluation of *Design Build Fly*, we want to draw attention to the thoughtful work Exploration Place has done over the past two years in its work on *Design Build Fly* that has resulted in the exhibition and education programs:

Winter 2016-2017	With RK&A, Exploration Place developed an impact framework to guide its work around *Design Build Fly*. The impact framework identified four distinct target audiences of *Design Build Fly* and intended outcomes for these audiences.
Spring 2017	During exhibition design, RK&A conducted formative evaluation of prototypes being designed by Roto and educational program ideas. The results were used to refine exhibits and programs.
Summer-Fall 2017	RK&A developed an Observation/Reflection Guide and trained Exploration Place staff to use it to conduct their own formative evaluation of education programs. RK&A provided mentorship to Exploration Place after the training.
Spring 2018	RK&A collected timing and tracking observations of visitors to the exhibition, exit interviews with visitors to the exhibition (who participated in at least one education program in the exhibition), and interviews with visitors to Aviation is Awesome family events.

STUDY OBJECTIVES

The goal of the summative evaluation is to determine the successes and challenges of the *Design Build Fly* exhibition and programs as compared to Exploration Place's intentions. Specifically, the objectives of the summative evaluation are to:

- Understand visitors' motivations for visiting the exhibition and participating in the programs;
- Identify how visitors are using the exhibition space overall (i.e., what components do they visit/use, time spent in space overall and at individual components; general behaviors) and what, if any, programs they participate in;
- Explore what meaning visitors make from their experience overall, and particularly, to what extent visitors' meaning-making aligns with the exhibition and programs' intended outcomes;[3]
    - Visitors will experience wonder and delight at the scope and scale of aviation objects, concepts, and activities presented.
    - Visitors will broaden their understanding of how engineering and manufacturing processes are integrated to create a functioning aircraft.
    - Younger visitors will broaden their knowledge, awareness, and understanding of STEM/aviation-industry career options.
    - Younger visitors will feel inspired to pursue STEM/aviation-industry careers.
    - Wichita families will feel pride in how the aviation industry has shaped their family members' lives, Wichita's identity, and the world.
- Identify the elements of the exhibition and programs that most influence visitors' meaning-making;
- Identify visitors' questions and curiosities after visiting the exhibition and participating in the programs.

[3] The outcomes used for the summative evaluation are drawn from the Impact Framework for *Design Build Fly* that Exploration Place developed with RK&A in winter 2016-2017 (see Appendix F).

METHODOLOGY

Two methods were employed: timing and tracking observations and in-depth interviews. The two methodologies provide a mix of quantitative and qualitative data. All data were collected between March and May 2018.

TIMING AND TRACKING OBSERVATIONS

Timing and tracking observations provide an objective and quantitative account of how visitors experience the *Design Build Fly* exhibition, including which components visitors use, for how long, and how visitors behave. Timing and tracking observations document visitor behaviors in a standardized manner, which we can analyze statistically.

Observations are unobtrusive, so visitors were not asked to participate, but they were selected randomly upon entering the exhibition. To select visitors, the observer imagined a line just in front of the entrance to the gallery and selected the first visitor age 7 years and older to cross this imaginary line. Once the visitor crossed the line, the observer started a stopwatch and discreetly observed the movements of the selected visitor through the gallery, recording the components used, time spent, and behaviors. Across data collection shifts, data collectors spent approximately 60 percent of their time observing visitors entering via the Grand Hall, about 20 percent of their time observing visitors entering via the Keva exhibition, and about 20 percent of their time observing visitors entering via the Explore Kansas exhibition. More time was spent observing visitors at the Grand Hall entrance because it is designed to be the primary entrance to *Design Build Fly*.

IN-DEPTH INTERVIEWS

RK&A conducted in-depth interviews with visitors to *Design Build Fly* in two scenarios. To complement the standardized observation data, RK&A conducted exit interviews to understand the meaning visitors make from the *Design Build Fly* exhibition and education programs. Visitors 18 years and older who visited the exhibition and participated in at least one education program (Cart Program, CreatorSpace, or Live Science Show) were eligible to participate. Interviewees were selected randomly as they exited the *Design Build Fly* exhibition.

RK&A also interviewed adolescents who attended an Aviation is Awesome family event. Aviation is Awesome family events are designed to help at-risk students and their families understand the benefits and realities of pursuing careers in the aviation industry. The event featured several activities, including panel and one-on-one conversations with industry professionals, hands-on activities, and access to *Design Build Fly* and the Creator Space activities. Adolescents age 10-19 years who attended an Aviation Family Event were eligible to participate. Interviewees were selected randomly during the events. Before conducting the interview, RK&A gained verbal consent from adult companions as well as assent from adolescents to participate.

Interviews are open-ended and encourage interviewees to express their opinions, understandings, and the meaning they construct using language and words that they naturally use to express themselves (as opposed to the language of the evaluator). The data collector used an interview guide to frame the discussion and asked probing and clarifying questions as necessary. All interviews were audio-recorded and transcribed to facilitate analysis.

DATA ANALYSIS AND REPORTING

TIMING AND TRACKING OBSERVATIONS

Data are quantitative and were analyzed using IBM SPSS Statistics Version 20. Analyses include:

- Frequency distributions (e.g., percent of visitors to stop at a component)
- Summary statistics (e.g., median time spent at a component)
- Inferential statistics[4] to examine the relationship among variables, including:
  - Cross-tabulations to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) to test the significance of the relationship (e.g., "stop" [yes or no] was tested against "gender" to determine whether components were attractive to a particular gender).
  - The Kruskal-Wallis (K-W) test, which is a nonparametric test for differences in the medians of two or more groups[5] (e.g., "total time in the exhibition" was compared by "gender" to determine whether time spent in the exhibition differed by gender).

INTERVIEWS

Interviews were analyzed qualitatively. That is, the evaluator read the interview transcripts and used codes to identify patterns and trends in the data. Trends are reported from most- to least-frequently occurring. Verbatim quotations, edited for clarity, are included to exemplify trends.

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[4] A 0.05 level of significance (p) was employed to preclude findings of little practical significance. When the level of significance is set to $p = 0.05$, any finding that exists at a probability (p-value) ≤ 0.05 is "significant." When a finding (such as a relationship between two variables) has a p-value of 0.05, there is a 95 percent probability that the finding exists; that is, in 95 out of 100 cases, the finding is correct. Conversely, there is a 5 percent probability that the finding would not exist; in other words, in 5 out of 100 cases, the finding appears by chance.

[5] The Kruskal-Wallis (K-W) test is a nonparametric statistical method for testing the equality of population medians of two or more groups. Nonparametric statistical methods do not assume that the underlying distribution of a variable is "normal" with a symmetric bell-shape, so they are appropriate for testing variables with asymmetric distributions such as "total time in the exhibition." The K-W test is analogous to a One-way Analysis of Variance, with the scores replaced by their ranks. The K-W test statistic H has approximately a chi-square distribution.

TIMING AND TRACKING FINDINGS

RK&A conducted 100 observations from March-April 2018. Observations are unobtrusive to provide an objective account of how visitors experience the *Design Build Fly* exhibition.

VISITOR BACKGROUND CHARACTERISTICS

Observations were unobtrusive, but data collectors noted some general characteristics of the 100 observed visitors. Most are adults (70 percent) and almost one-third are children (27 percent). And, almost all visited in social groups; namely, groups of adults and children (90 percent).

VISITOR CHARACTERISTICS

Gender	% of Observed Visitors
Female	53
Male	47

Age Range	% of Observed Visitors
7-10	9
11-14	18
15-17	1
18-34	35
35-54	25
55+	12

Group Composition	% of Observed Visitors
Adults and children	90
Alone	4
Adult-only	3
Children-only	3

GALLERY CONTEXT

All observations took place on weekend days (100 percent). The level of crowding was generally low (49 percent) or moderate (45 percent), and only occasionally high (6 percent). During most observations, *Design Build Fly* cart programs were not available (97 percent).[6] However, CreatorSpace was open during most observations (87 percent).

RK&A recorded any down or unavailable components as context for use and time spent at individual components. As is typical in science or children's museums, at least one component was down or unavailable during many observations (74 percent). These include:

DOWN OR UNAVAILABLE COMPONENTS

Component	% of Observations
Vacuum Toilet (no "flushables")	32
Drone (offline)	22
Landing Gear	21
Flying in Style[7]	20
Wichita Stories (Ground Floor)	15
Vertical Wind Tunnel (no paper or cones)	5
Pitch Yaw Roll[8]	3
Airplane Decoration	1
Rivet Trainer	1
Wing Inspection	1

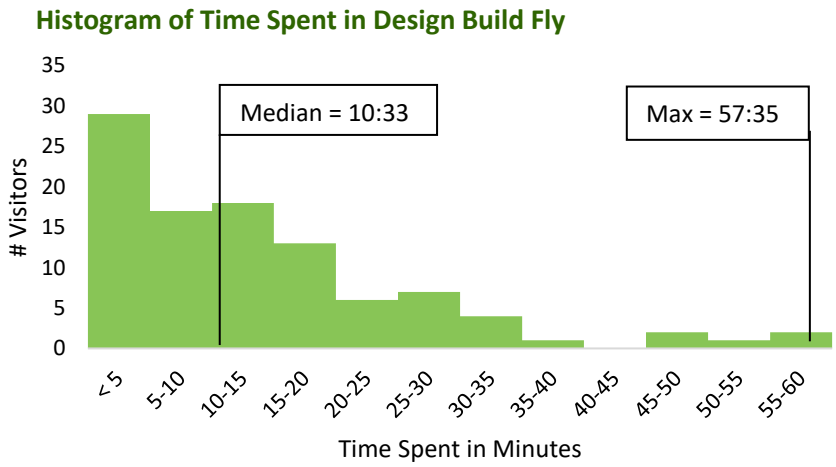
[6] RK&A only noted whether *Design Build Fly* cart programs were available inside the *Design Build Fly* exhibition. It is possible that during some observations, *Design Build Fly* cart programs were available just outside the exhibition; for example, in the Grand Hall.

[7] This component was called "Selfie Screen" on the Timing and Tracking Form (see Appendix A) to make it easier for data collectors to remember.

[8] This component was called "Steering an Airplane" on the Timing and Tracking Form (see Appendix A) to make it easier for data collectors to remember.

TIME SPENT

Observed visitors spent between 24 seconds (0:24) and 57 minutes 35 seconds (57:35) in the *Design Build Fly* exhibition, which is approximately 5,100 square feet. Some visitors spent a short amount of time in the exhibition (29 percent spent less than 5 minutes in the exhibition) while some others spent a long time (23 percent spent more than 20 minutes). The median time spent in the exhibition is 10 minutes 33 seconds (10:33).[9]



[9] Medians (versus means) are reported because, as is typical, the number of components used and the time spent by visitors are distributed unevenly across the range. When the distribution is extremely asymmetrical (i.e., "lopsided"), the mean is affected by the extremes and, consequently, falls further away from the distribution's central area. In such cases, the median is a better indicator of the distribution's central area because it is not sensitive to the values of scores above and below it.

STATISTICAL RELATIONSHIPS

Time spent in the exhibition was compared to several variables, and two statistical relationships emerged. Visitors who entered *Design Build Fly* through the Grand Hall or the Keva exhibition spent more time than those who entered the exhibition via Explore Kansas. And, children age 11-17 spent more time than adult visitors (age 18+) and children age 7-10.

STATISTICAL DIFFERENCES FOR TIME SPENT IN *DESIGN BUILD FLY*

DIFFERENCES BY GALLERY ENTRANCE

Entrance	Median Time Spent (min:sec)
Grand Hall	13:04
Keva exhibition	10:30
Explore Kansas	3:43

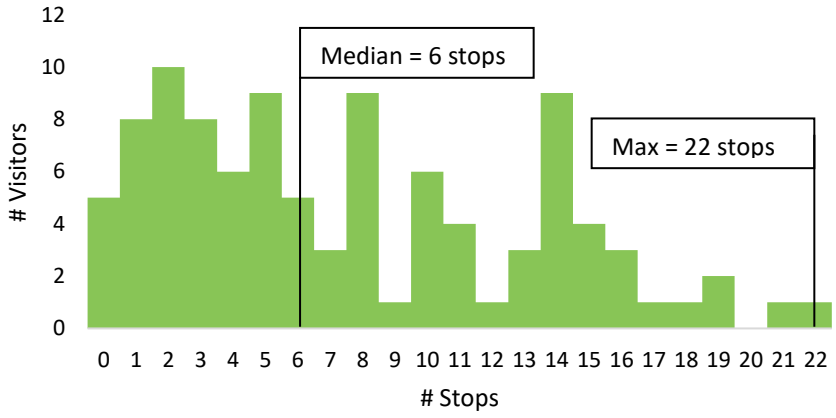
DIFFERENCES BY AGE

Age	Median Time Spent (min:sec)
7-10	6:37
11-17	19:44
18+	8:57

TOTAL NUMBER OF STOPS

RK&A and Exploration Place identified 46 components in the exhibition. Components were selected because they are distinct and observable sections, text panels, object cases, or interactives in the exhibition. Components vary in size; some are small (e.g., a singular text panel such as the introduction text) and some are large (e.g., the Fuselage Theater or the Paper Airplane Launcher). Of the 46 components, observed visitors stopped at between zero and 22 components. Like time spent, the number of stops does not follow a normal distribution; many visitors stopped at only a few components (e.g., 46 percent of visitors stopped at 10 or fewer components). The median number of stops is 6.

Histogram of Number of Stops in *Design Build Fly*



STATISTICAL DIFFERENCES

Number of stops was compared to several variables, and three statistical relationships emerged. First, visitors who entered via the Grand Hall visited more components than visitors who entered via the Keva and Explore Kansas exhibitions. Second, male visitors visited more components than female visitors. And third, children age 11-17 visited more components than adult visitors and children age 7-10.

STATISTICAL DIFFERENCES FOR NUMBER OF STOPS IN *DESIGN BUILD FLY*

DIFFERENCES BY GALLERY ENTRANCE

Entrance	Median # of Stops
Grand Hall	8
Keva exhibition	6
Explore Kansas	5

DIFFERENCES BY GENDER

Gender	Median # of Stops
Male	8
Female	5

DIFFERENCES BY AGE

Age	Median # of Stops
7-10	5
11-17	13
18+	6

STOPS AND TIME SPENT BY SECTION

STOPS

RK&A designated five sections of the exhibition and the median number of sections visited is 3. The most visited section is Fly (80 percent stopped), followed closely by Build (72 percent stopped),[10] Design (67 percent stopped); few stopped at CreatorSpace (13 percent stopped) or the Introduction section (4 percent stopped). Three variables have a statistical relationship to section visitation:

- **Exhibition entrance:** Visitors who entered via the Grand Hall were more likely to visit the Design and Build sections (versus those who entered through the Keva or Explore Kansas exhibitions).
- **Exhibition exit:** Visitors who exited via the Keva or Explore Kansas exhibitions were more likely to visit the Fly section (versus those who exited via the Grand Hall).
- **Gender:** Male visitors were more likely to visit the Build section that female visitors.
- **Age:** Children (both ages 7-10 and 11-17) were more likely to visit the Fly section than adult visitors.

TIME SPENT

Of the five sections, the highest median dwell time is in CreatorSpace (5 minutes 16 seconds) followed by Fly (3 minutes 16 seconds), Build (2 minutes 24 seconds), and Design (2 minutes 14 seconds). The shortest median dwell time is in the Introduction section (18 seconds). One variable has a statistical relationship to time spent by section:

- **Age:** Children age 11-17 spent more time in the Fly section than other visitors.

STOPS BY SECTION

Section	% of Observed Visitors Stopped
Fly	80
Build	72
Design	67
CreatorSpace	13
Introduction	4

TIME SPENT BY SECTION

Section	Median Time (min: sec)
CreatorSpace	5:16
Fly	3:16
Build	2:24
Design	2:14
Introduction	0:18

[10] The Build section includes the Build components on the ground floor and upstairs.

STOPS AT SELECT COMPONENTS

Eleven components were visited by more than 25 percent of visitors, and they comprise a mixture of immersive experiences and hands-on interactives (both analog and digital). Not surprisingly, almost one-half of the most-visited components are located in the most-visited section, Fly. A few variables affect stops at individual components:

- **Age:** Children age 11-17 were more likely to stop at Pitch Yaw Roll than adult visitors and children age 7-10. And, children age 7-10 were more likely to stop at Vacuum Toilet than adult visitors or children age 11-17.
- **Gender:** Males were more likely to stop at Exterior Paint Simulator and the Drone than females.
- **Exhibition entrance:** Visitors who entered via the Grand Hall were more likely to stop at Design a Propeller than those who entered via the Keva or Explore Kansas exhibitions.

MOST-VISITED COMPONENTS

Component	Section	% of Observed Visitors Stopped
Forward Fuselage	Fly	52
Vertical Wind Tunnel	Design	38
Production Flight Testing	Fly	37
Fuselage Theater	Build	35
Vacuum Toilet	Build	33
Pitch Yaw Roll	Fly	31
Cockpit, Private Plane	Fly	28
Exterior Paint Simulator	Build	26
Paper Airplane Launcher	Design	25
Design a Propeller	Design	25
Drone	Fly	25

TIME SPENT AT SELECT COMPONENTS

The 10 components with the highest dwell times are listed below. Notice that dwell time (or engagement) does not always correlate to the number of stops at a component (i.e., attraction). For instance, CreatorSpace has the highest median dwell time by far (5 minutes 16 seconds) but the percent of visitors who stopped there is few (13 percent). A few variables have a statistical relationship to time spent at components:

- **Age:** Children age 11-17 spent more time at Production Flight Testing than adult visitors or children age 7-10.
- **Crowding:** Visitors spent more time in Cockpit, Private Plane when crowding is low than when crowding is moderate or high.

TIME SPENT BY COMPONENTS

Components with Highest Median Dwell Time	% of Observed Visitors Stopped	Median Time (min:sec)
CreatorSpace	13	5:16
Paper Airplane Launcher	25	3:47
Production Flight Testing	37	1:55
Cockpit, Private Plane	28	1:32
Conceptual Mission Designer	10	1:31
Fuselage Theater	35	1:23
Composite Layering	12	1:17
Exterior Paint Simulator	26	1:15
Design a Propeller	25	1:00
Forward Fuselage	52	0:58

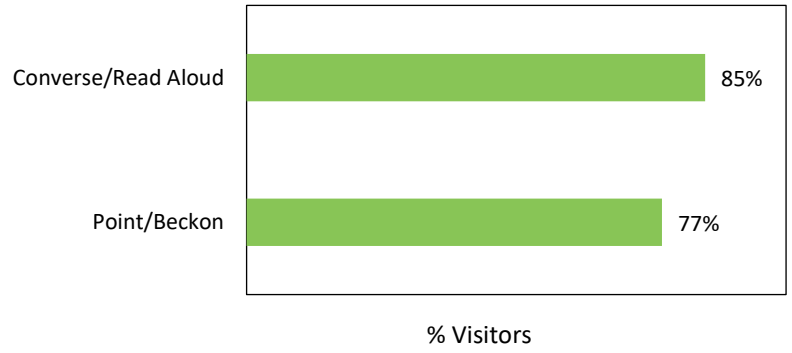
BEHAVIORS

During the observations, data collectors looked for several pre-determined behaviors. Two social behaviors (pointing/beckoning and conversing/reading aloud) and two general behaviors (talking with staff/volunteer and taking photos) were observed across the exhibition.[11]

SOCIAL BEHAVIORS

Social behaviors occurred most often: 85 percent of visitors were observed conversing with others and/or reading text aloud in the exhibition; and, 77 percent were observed pointing and/or beckoning to others in the exhibition.[12]

Social Behaviors

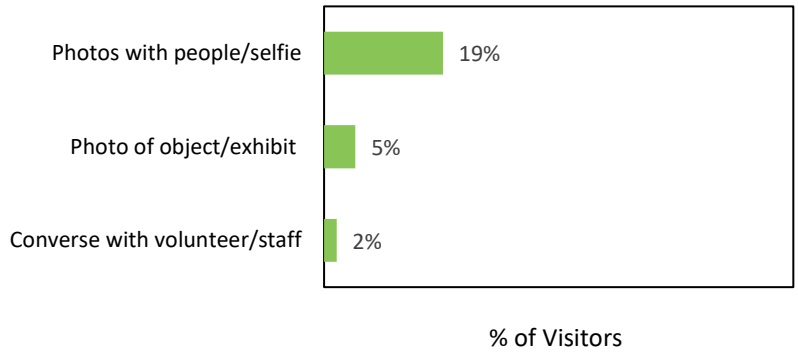


[11] See Appendix A for the complete behavior data, including component-specific behaviors.
[12] Since the observations are unobtrusive, "read aloud" is a difficult behavior to capture as the data collector has to be in close proximity to the observed visitor. Therefore, we can assume it may have happened more often than is reported here.

OTHER BEHAVIORS

Photos that included people (e.g., selfies) were taken by 19 percent of visitors, and photos of exhibits or objects were taken by 5 percent of visitors. The most popular photo locations include the Forward Fuselage and Cockpit of the Hawker 4000 Private Plane (8 visitors and 5 visitors took a photo, respectively). Additionally, two percent of observed visitors (2 visitors) conversed with staff or volunteers during their visit, and both conversations took place in CreatorSpace.[13] No variables have a statistical relationship to these behaviors.

Other Behaviors



[13] It is possible that the other 11 observed visitors to CreatorSpace also conversed with staff or volunteers, but that data collectors were unable to see this happening due to crowding or because they had a poor vantage point on the visitor while they were inside CreatorSpace.

VISITATION BY SECTION

There are three major sections in the *Design Build Fly* exhibition – Design, Build, and Fly. Each section is located in the same large exhibition gallery (versus in separate galleries), but they are distinguishable by color—orange for Design, blue for Build, and yellow for Fly. The following pages present a detailed look at visitors' use of individual exhibition sections. However, note that visitors were observed moving between the Design, Build, and Fly sections frequently since components are all located in the same gallery.

View looking across sections of *Design Build Fly* to entrance at the Grand Hall

DESIGN

The Design section contains 10 components that introduce visitors to the aviation design process. As noted earlier, visitation and engagement (dwell time) to Design were moderate (67 percent of observed visitors stopped and the median time spent in the section is 2 minutes 14 seconds). Not surprisingly, the majority of the most-visited components in Design are also among the components with the highest median dwell times; for instance, the Paper Airplane Launcher, had high visitation (37 percent) and the highest dwell time among Design components by far (3 minutes 47 seconds, the second-highest in the exhibition overall after CreatorSpace). This makes sense, given that the majority of visitors who stopped at Paper Airplane Launcher took the time to look at the instructions and make their own paper airplane (56 percent each). Notably, however, many struggled to use the actual launcher (44 percent), which may have contributed in part to the high dwell time. At the most-visited component in Design, Vertical Wind Tunnel, the majority of visitors who stopped watched others use the exhibit (61 percent) versus designing their own cone flyer to test (32 percent); this is perhaps not surprising since the tunnel is easy to see from afar due to its height. Additionally, one component in Design—Conceptual Mission Designer—had low attraction but a high dwell time (only 10 percent of observed visitors stopped, but the median dwell time is 1 minute 31 seconds); this is likely because 50 percent of those who stopped tested more than one airplane design.

DESIGN SECTION VISITATION

Percentages in the chart are based on the 67 percent who stopped in the Design section.
The median dwell time is 2 minutes 14 seconds.

Overall Stops and Time Spent	
Median # stops = 2	Range, # of stops = 1-7
Median time spent = 2:14	Range, time spent = 0:03 – 32:36

Component	% of Visitors who Stopped	Component	Median Time (min: sec)
Vertical Wind Tunnel	56	Paper Airplane Launcher	3:47
Paper Airplane Launcher	37	Conceptual Mission Designer	1:31
Design a Propeller	37	Design a Propeller	1:00
Wind Tunnel	27	Wind Tunnel	0:48
Seat Prototyping	24	Seat Prototyping	0:35

BUILD

The Build section contains 17 components designed to introduce visitors to the aviation production process; 13 on the ground floor of the exhibition and 4 upstairs, in an elevated, deconstructed fuselage. Visitation and engagement to Build were high (72 percent stopped and the median dwell time in the section is 2 minutes 24 seconds). Almost one-half of visitors to Build (49 percent) visited components only on the Ground Floor, many others (39 percent) visited components on the ground floor and in the fuselage upstairs, and a few (11 percent) only visited the fuselage. Two components in Build had high attraction and engagement—the immersive Fuselage Theater (49 percent of visitors to Build stopped and the median dwell time is 1 minute 23 seconds) and the Exterior Paint Simulator (36 percent stopped and the median dwell time is 1 minute 15 seconds). This makes sense, given that the majority who visited the Fuselage Theater watched one film (74 percent) and many watched multiple films (46 percent). At Exterior Paint Simulator, the majority used the sprayer to paint an airplane part (69 percent) and/or watched someone else spray a part (54 percent). Both components also encouraged socialization; many conversed or read aloud (54 percent at the theater and 65 percent at the paint simulator). Notably, two of the most-visited components in Build—Vacuum Toilet and Landing Gear—had low dwell times, perhaps in part because they were sometimes down or unavailable.

BUILD SECTION VISITATION

Percentages in the chart are based on the 72 percent who stopped in the Build section.
The median dwell time is 2 minutes 24 seconds.

Overall Stops and Time Spent	Part of Build Visited	% of Visitors who Stopped
Median # stops = 3	Ground Floor only	49
Median time spent = 2:24	Both	39
Range, # of stops = 1- 9	Upstairs Fuselage only	11
Range, time spent = 0:03 – 33:20		

Component	% of Visitors who Stopped	Component	Median Time (min: sec)
Fuselage Theater	49	Fuselage Theater	1:23
Vacuum Toilet	47	Composite Layer	1:17
Exterior Paint Simulator	36	Exterior Paint Simulator	1:15
Wichita Stories (Upstairs)	29	Rivet Trainer	0:54
Landing Gear	28	Airplane Smells	0:51

FLY

The Fly section contains 11 components designed to introduce visitors to the science and experience of flying. Fly was the most visited section in the exhibition (80 percent of observed visitors stopped) and engagement was also high (median dwell time of 3 minutes 16 seconds). Perhaps not surprisingly considering the high visitation, all of the top five most-visited components in Fly are also among the ten most-visited components in the exhibition; and, three—Production Flight Testing, Cockpit of the Private Plane, and Forward Fuselage—are also among the 10 components with the overall highest dwells times. As noted earlier, age has a statistical relationship to time spent in Fly: children age 11-17 spend more time in the Fly section than other visitors. This is perhaps due to the immersive experiences of flying provided by Fly components that visitors are unable to experience elsewhere; specifically, stepping into a pilot's shoes and flying a plane through the interactives in the cockpit of the Hawker 4000 and Production Flight Testing, and flying luxuriously in the Forward Fuselage.

FLY SECTION VISITATION

Percentages in the chart are based on the 80 percent who stopped in the Fly section.
The median dwell time is 3 minutes 16 seconds.

Overall Stops and Time Spent	
Median # stops = 3	Range, # of stops = 1- 8
Median time spent = 3:16	Range, time spent = 0:03 – 27:04

Component	% of Visitors who Stopped
Forward Fuselage	65
Production Flight Testing	46
Pitch Yaw Roll	39
Cockpit, Private Plane	35
Drone	31

Component	Median Time (min: sec)
Production Flight Testing	1:55
Cockpit, Private Plane	1:32
Forward Fuselage	0:58
Balance Chair	0:50
Pitch Yaw Roll	0:41

EXIT INTERVIEW FINDINGS

RK&A conducted 40 interviews with visitors who visited *Design Build Fly* and experienced programming associated with the exhibition, such as the CreatorSpace, Fright Control Live Science Show, or Cart Programs. Data collectors recruited adults who were 18 years or older and visiting alone or in social groups; individuals who were part of organized groups were not eligible. Interviews had a participation rate of 63 percent.[14]

Of the participants interviewed:

- Nearly three-quarters experienced the CreatorSpace, about one-quarter saw the Fright Control Live Science Show, and two experienced Cart Programs.
- Slightly more than one-half are female and almost one-half are male.
- Participants range in age from 18 to 68 years; the median age is 38 years.
- Two-thirds identify as Caucasian/White; about one-quarter as Hispanic/Latino; a few each as African American/Black, American Indian, or Asian/Pacific Islander.
- Almost all visited in a group of adults and children. Two-thirds visited with at least one child age 3-6 years; one-third each visited with at least one child younger than 3 years, 7-10 years, and 11-14 years. A few visited with children ages 15-17.[15]
- One-half of participants are local to Wichita. Their length of time spent living in the area ranges from one to 40 years; the median is 3 years. About one-quarter are from other places in Kansas, including Lawrence, Colby, and Pratt. One-quarter are from out-of-state, visiting from Arkansas, California, Illinois, Indiana, Michigan, Missouri, New Hampshire, and Oklahoma.
- More than one-half have previously visited Exploration Place, while almost one-half are first time visitors.
- Several are Exploration Place members; most are not.
- One-quarter have connections to the aviation industry. A few work in the industry themselves or used to work in the industry. A few know family members or friends who work in or formerly worked in the industry.
- Most were recruited at *Design Build Fly*'s main exit (Grand Hall). About one-quarter were recruited at the Keva exit; one was recruited at the Explore Kansas exit.

[14] Data collectors intercepted 283 visitors in March and April. Of those, 66 were eligible to participate based on the criteria and proficiency in English. Of the 66 eligible visitors, 42 agreed to participate.
[15] Proportions exceed 100% as most visited with multiple children.

MOST ENJOYABLE ASPECTS

Participants were asked what they most enjoyed about *Design Build Fly* and the associated programming:

- **"Hands-on" approach:** Two-thirds most enjoyed the interactive, hands-on nature of *Design Build Fly*. The majority spoke generally about the hands-on approach. As one put it, the approach engages children at "their level" by allowing them to "touch and feel" airplanes. Another said the interactivity matters because their children are "inquisitive," and the opportunity to explore with their hands encourages learning. When describing the hands-on approach, the majority mentioned specific components that they considered highly interactive. For example, a few said they most liked the Paper Airplane Launcher because it encouraged their children to make their own plane and experiment with "shooting" it through the hula hoops. Two liked Seat Prototyping; one said their children enjoyed the process of building, testing the seat for comfort, and making adjustments. Notably and positively, a wide variety of components were named.
- **Seeing inside the aircraft**: One-quarter most enjoyed going inside or seeing the exposed innerworkings of the aircraft in the exhibition. Several liked that they could go inside the Upstairs Fuselage and the Private Plane. A few said their children enjoyed pretending to fly an aircraft; one noted that being in the cockpit is a new and different experience than flying in the cabin as a passenger. A few said they most enjoyed seeing the inside "structure" of the fuselage and the Exposed Wing.
- **CreatorSpace:** A few liked the CreatorSpace most. A few enjoyed that the activities got them "involved" in the "nuts and bolts" of building aircraft. One said that teaching children how to rivet and 3D-print encourages people who "want to learn a trade," which they connected to Wichita's "occupational shortage" of workers in the aviation industry. One praised Exploration Place staff for engaging their children in the activity and making them "feel comfortable" enough to use the rivet gun.
- **Aesthetics/design:** Two enjoyed the overall design of the exhibition and looking at aircraft in general.
- **Fright Control:** Two said they most enjoyed the Live Science Show. One said learning about how the planes fly and how pilots control them "eases our mind" about flying. The other said they liked the facilitator's energy.
- **Industry-focus:** One liked *Design Build Fly's* emphasis on the aviation industry because seeing "the process of going from the ground up" in building aircraft was new to them.

LEAST ENJOYABLE ASPECTS

Respondents were asked what, if anything, they liked least about *Design Build Fly*:

- **Nothing**: Nearly three-quarters said there was nothing that they liked least.
- **Age appropriateness**: A few wondered about the intended age-level for the exhibition. Two noted that their children (toddler and pre-school age) were "too young" for most of the components in *Design Build Fly* and the CreatorSpace, particularly because CreatorSpace had scissors available. By contrast, another suggested the "higher educational" aspects of the components are too advanced for their 14-year-old. Another two desired more content aimed at adults; one would like to see "more in-depth" information alongside the components.
- **Components:** Three described components they found least enjoyable. One said the Thrust Reverser was not "hospitable," but did not expound. One said they did not like the touchscreens, because it is not their "thing." One said the 3D-printer in CreatorSpace was not working and they had hoped to see it "in action."
- **Environment:** Two did not like the crowding and noise—from Landing Gear, in particular.

CONFUSING ASPECTS

Respondents were asked what, if anything, was confusing or hard to understand.

- **Nothing:** Almost all said there was nothing confusing.
- **Age appropriateness:** Two said the information is "over the heads" of their toddlers.
- **Fix the Wiring:** One said Fix the Wiring was challenging because the activity requires the visitor to work underneath the wing, while the instructions are on top of the plane and thus not visible to someone working underneath.

WHAT, IF ANYTHING, WAS CONFUSING OR HARD TO UNDERSTAND?

"Nothing… I liked the signage, because it told me what questions I was supposed to be asking [my kids]. I always have a hard time explaining scientific concepts to kids in a way they can understand, so I like the signage, because it helped give me the right words for that."

— *Female, 34; visiting with toddler and preschooler*

EXPERIENCE WITH *DESIGN BUILD FLY* PROGRAMMING

Participants were asked what they liked most and least about what they did during associated *Design Build Fly* programming. Responses are organized by program:

CREATORSPACE

Nearly three-quarters of participants experienced the CreatorSpace.

- Many did riveting; a few did dexterity aptitude test, and a few just watched others.
- Several said they most enjoyed that the activities were "hands-on" and engaging for their children. A few said they most enjoyed doing the activity, or watching their children do the activity. A few said they most enjoyed their interactions with staff. One parent recounted an interaction between staff and her daughters, and praised the staff for persuading her girls to try the rivet gun.
- Most said there was nothing that they liked the least. One disliked that the 3D-printer was broken; another did not understand how to design the foam pieces and suggested adding more explanation; another did not like waiting for their turn.

FRIGHT CONTROL LIVE SCIENCE SHOW

About one-quarter saw the Fright Control Live Science Show.

- A few most liked the "interactive" nature of the program, particularly if their child was selected as a volunteer to participate in experiments. The majority of these participants liked the facilitator, especially their "humor"; one felt the "silliness" kept their child engaged.
- Most said there was nothing they disliked about the show; one suggested adding more activities for younger children.

CART PROGRAMS

Two initially said they participated in cart programs during recruitment. One participant, who did Chicken Gun, liked that their son enjoyed the activity; there was nothing they liked the least. Another thought they had participated in a Cart Program but could not recall specifics when asked for feedback.

WHAT DID YOU LIKE MOST ABOUT WHAT YOU DID IN THE CREATORSPACE?

"The person in CreatorSpace was really engaging and wonderful. My kids were a little bit nervous about doing riveting, and she was really great about getting them not only interested, but making them feel comfortable enough to try with the riveting gun."

— *Female, 37; visiting with toddler, elementary-age, and preteen children*

IDEAS ABOUT THE AVIATION INDUSTRY

Respondents were asked what overall ideas about aviation or the aviation industry they took away from their visits, and what about *Design Build Fly* prompted them to consider those ideas. They shared several ideas:

- **Complexity of production process and industry:** More than one-quarter took away ideas about the complex nature of the aviation industry. Several said they did not realize how much time and work is involved in the aircraft production process, or that the industry is a "massive organization." One said, like aircraft, the industry has many "moving parts" to it.
- **Aircraft design:** One-quarter took away new information about aircrafts' various design, mechanical, and technical elements. A few described new understanding of design elements based on interactions with Composite Layering and Seat Prototyping. Two described new understanding of balance after interacting with their children at the Balance Tip Table. One learned about the emergency hatch release.
- **Flying aircraft:** Several gained new understandings of how aircraft fly and how challenging it is to fly and ensure safety. A few said they grew more aware of what goes into readying an aircraft for flight, such as managing the air pressure. One said *Design Build Fly* components made them think about how air flows over the wings and that understanding how aircraft fly makes it seem less like "magic." Two said Fright Control made them think about how professionals take passengers' fear of flying into account, and what steps they take to prevent accidents.
- **Wichita's role in aviation:** A few described Wichita's relationship with the aviation industry. Two said the background information about Wichita's role as the "air capital" was new to them. Another, who works in aviation locally, was reminded of the extent of the work involved in the aircraft production process because they "deal with it every day."
- **Seeing inside aircraft:** A few said seeing the inside of the aircraft revealed, such as the Upstairs Fuselage, made them think about all the work and parts involved in the production process. In particular, one liked seeing how the aircraft is wired; another liked the bathroom.
- **Women in aviation:** One described an interaction between her mother and daughters about Rosie the Riveter during the riveting activity in the CreatorSpace; the parent said this connection "exposed" her children to thinking they "could do that."

IDEAS ABOUT THE AIRCRAFT PRODUCTION PROCESS

Respondents were told that one of the things Exploration Place wanted to show through *Design Build Fly* is the production process for making aircraft—essentially, how aircraft are made. Respondents were asked what, if anything, they saw or heard in the exhibition or programming made them think about this. Responses include:

- **Exhibition components:** One-third shared certain components that made them think about the production process; in particular, those listed below. Additionally, a few mentioned What's that Noise, Vacuum Toilet, Balance Chair, Vertical Wind Tunnel, and Design a Propeller, but did not expound.
  - **Airplane Decoration:** Three said the painting interactive made them think specifically about the design aspect of the production process.
  - **Tiny Parts Wall:** Two mentioned this, and one said they conversed with their child about "how all those little tiny things hold together massive airplanes," and looked for the parts from the Wall in exposed aircraft pieces throughout *Design Build Fly*.
  - **Landing Gear:** Two mentioned Landing Gear; one said seeing "how the hydraulic operated on the wheels" made them think about the production process.
  - **Fix the Wiring:** One said this component made them think about the production process because visitors could fix the airplane themselves.
- **Seeing inside aircraft:** About one-quarter said seeing exposed aircraft parts or going inside an aircraft prompted them to consider the production process. Nearly all said that seeing "all the pieces" and raw materials inside the aircraft, such as hoses, electrical lines, wires, and hydraulic wheels, was new or surprising.
- **Riveting:** Several said doing riveting, whether in the CreatorSpace or at Rivet Trainer, made them think about the production process. One said Rivet Trainer prompted him to think about the different metals in aircraft. Another, who did the CreatorSpace riveting activity, said that experience plus the exhibition components made them think about how the elements of the production process "come together." Two others said they noticed rivets in many places throughout *Design Build Fly* and shared that they had never thought about what is involved in holding an aircraft together before.
- **Fuselage Theater:** A few said the videos in the Fuselage Theater, especially the time-lapse video, illustrated the production process. One said seeing the fuel tanks in the wings, and how the aircraft are put together "like a jigsaw puzzle" made them think about a new aspect of aircraft production. Two said seeing the aircraft moved for shipping made them think about this.

CAREERS IN AVIATION

Respondents were asked what they learned about aviation careers during their visit:

- **Riveter:** Several said they learned about riveters. Two said learning about riveters made them think about the people involved in the production process for the first time—as one put it, that "people actually make the planes." One shared details about tech school training programs and wages for riveters.
- **Aircraft builder:** Several said they generally considered or learned about people who "build" aircraft. One said "assemblers" was a new career to them. One said Fright Control made them think about the people who build aircraft overall.
- **Technology and design:** Two said they learned that there are aviation careers in the technology and design fields but could not expound.
- **Pilot:** One learned new information about piloting—that the pilot must have a strong "internal sense of balance" to fly.
- **Engineer:** One said they learned about machinist engineers who invent and design new aircraft components, but that the information was not necessarily new to them.

ADVICE FOR THOSE INTERESTED IN AVIATION CAREERS

Participants were asked what advice they would give to someone who wants to have a career in aviation when they grow up:

- **No advice:** One-quarter said they did not know what advice to give or had none.
- **Learning and studying:** Several advised training in STEM or attending technical college. One, who works in the industry, said it is important to have a science and mathematical background to understand "how everything comes together."
- **Cursory advice:** Several shared general advice such as "go for it" and "work hard."
- **Understand the industry:** Several suggested learning more about the industry by talking with professionals or touring aviation facilities. A few recommended studying industry trends. For instance, one said the industry is "growing" because of NASA and government involvement. Another suggested "being prepared for anything," as industry changes could mean lay-offs, despite there being "good money" in the industry. Another said aviation is "a 40-year job if you stick with it."
- **Knowledge of machinery/materials:** Two recommended gaining experience with "building," such as working with sheet metal and learning to use tools.
- **Would not recommend aviation career:** One, who worked in the industry for 14 years, would discourage an aviation career because the industry is "so topsy-turvy."
- **Location:** One advised moving to Wichita because it has many aviation companies.

PERCEPTION OF AVIATION INDUSTRY'S SHAPING OF WICHITA

Participants were told that Exploration Place wanted to highlight how the aviation industry has shaped Wichita, and asked what, if anything, made them think about that idea. Responses include:

- **Nothing:** Almost one-half said nothing prompted them to think about how the aviation industry has shaped Wichita.
- **Fuselage Theater and Wichita Stories:** Several said the videos in the Fuselage Theater and Wichita Stories made them think about Wichita's role in the aviation industry because it featured places in Wichita and describes the city as the "Air Capital of the World." One, who is retired from the industry, used the Fuselage Theater video to show their grandchildren their former workplace and what they used to do. Another said that Wichita Stories "applied to my historical background for Wichita aviation;" and, this participant suggested adding a storyboard or timeline to illustrate key innovations in aviation from Wichita.
- **Wichita-focus**: A few said *Design Build Fly*'s general focus on Wichita made them think about how the industry has shaped the area.
- **Fright Control Live Science Show:** Two said the Live Science Show made them think about Wichita but did not expound.
- **Industry-focus:** One, who is not local, said that seeing the complexity of the aviation industry made them think about how the different jobs in aviation can "be useful to a community."
- **Wind Wall Text:** One said that knowing that the 350,000 metal disks "represent Wichita" made them think about the industry's impact on the area.

WHAT MADE YOU THINK ABOUT HOW THE AVIATION INDUSTRY HAS SHAPED WICHITA?

"The [Fuselage Theater] video described Wichita as the Air Capital of the World. The aviation industry has increased the quality of life for people in this region. Because aircraft, by nature, are very complex, very expensive to manufacture. So, having that talent base in town, relying on that…increased the quality of life for people who work in the aviation industry."

— *Male, 33; visiting with preteen*

"Just knowing that planes are built here, it's cool that we have such a connection to that, being close here."

— *Female, 38; visiting with preschooler*

LINGERING CURIOSITIES

Respondents were asked what they were left wondering about after experiencing *Design Build Fly*. Responses include:

- **Nothing:** The majority did not have any lingering curiosities.
- **More information:** Several wondered about aircraft. Their questions include:
  - Why can't passengers have more room on the plane?
  - How are planes maintained for "wear and tear"?
  - What are all the components involved in making an airplane?
  - What is the historical timeline of Wichita's involvement with the aviation industry?
  - How did Exploration Place get the aircraft into the museum?
- **Program schedule:** One wondered what other activities happen in the CreatorSpace, and when.

WHAT ARE YOU LEFT WONDERING ABOUT AFTER EXPERIENCING *DESIGN BUILD FLY*?

"How they got [the planes] in here. Because I see the 737s go out almost every day, and they're just massive, massive things."

— *Female, 38; visiting elementary-age child*

"I wonder – especially in the CreatorSpace – are there different programs throughout the day? What's the schedule? That's not something we have ever done here before… I thought it was cool that the [kids] were exposed to that."

— *Female, 37; visiting with elementary-age and preteen children*

"A timeline would be great, something that started … from 1904 and then when Wichita started becoming great… Boeing was here at one time, Spirit was here at one time. It's just some great legacy and some heritage here that they could capture in this exhibit."

— *Male, 45; visiting with elementary-age and preteen children*

AVIATION IS AWESOME FAMILY EVENT INTERVIEWS

RK&A conducted 28 interviews[16] with adolescents (age 10 to 18 years) who attended an Aviation is Awesome family event at Exploration Place. Aviation is Awesome family events are intended to help at-risk students and their families understand the benefits and realities of pursuing careers in the aviation industry. The events feature several activities: a forum with aviation industry professionals, one-on-one interviews with industry professionals, hands-on aviation activities, plus the opportunity to explore the *Design Build Fly* exhibition, CreatorSpace, as well as food, booths, and giveaways run by industry professionals. Adolescents were the primary audience for these interviews, although adult companions were invited to comment throughout the interview.[17] Data collectors recruited adolescents and their adult companions as they moved between event activities. Interviews had a participation rate of 92 percent.[18]

Of the adolescents interviewed:

- Slightly more than one-half are female, and almost one-half are male.
- The median age is 14 years.
- Most have visited Exploration Place before; several are first-time visitors.
- One-half know someone who works in aviation. Several of these participants know where or what job their friend or family member has; the others could not expound.
- Two-thirds said they plan to go to college or trade school, and many of these participants already have some idea of what they would like to study, including medicine, veterinary care, editing, teaching, criminal justice, social work, railroad work, and computer science. Three said they plan to pursue a career in aviation—two are interested in becoming pilots, and one is interested in an aviation career in general. By comparison, a few each want to pursue sports, the arts, and the military.

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[16] Due to cancelled events and attendance, the number of interviews completed is lower than initially planned but still a reliable sample size.

[17] Adult companions were invited to participate in the interview, but they were not required to stay with the adolescent after giving consent. As such, some adults wandered off; four stayed and responded to a few questions designed to invite adult feedback.

[18] A total of 36 adolescents were asked to participate in the interview; 33 agreed to participate. Adult companions were required to give consent before the data collector asked the adolescents to assent.

MOTIVATION TO ATTEND

Adolescents were asked what motivated them to attend the Aviation is Awesome family event.

- **Something fun:** Nearly one-half said they were motivated to attend because the event sounded interesting or fun. A few also said they came because they like Exploration Place and like to learn about aviation in general.
- **Interest in aviation and industry:** Several said they wanted to learn "everything about aviation" or the "entire industry." A few specifically came to the event to hear more about engineering and aircraft mechanics. Two middle schoolers said they wanted to learn more about the work of aviation professionals in their families.
- **School invitation:** Several said they were initially motivated to attend because they were invited by their school or teacher, and then attended because it sounded interesting or they wanted to bring their families. One compared the invitation to a field trip.
- **Someone else wanted to come:** Several attended because their siblings wanted to come, or because their siblings received free tickets through their school. One said their parent wanted to attend.
- **Interest in *Design Build Fly*:** One specifically came to see the exhibition.

MOST ENJOYABLE ASPECTS

Adolescents and adult companions were asked what they liked most about the event:

- **Aircraft/exhibition components:** Over one-half most enjoyed *Design Build Fly*'s components. Several liked the hands-on nature of the components because they felt the "interactive" elements encouraged exploration. In particular, these adolescents liked Production Flight Testing and going inside the Private Plane. Others discussed the components or aircraft more generally; one adult noted that being in the space was "a way to be a kid again" because it reminded them of previous visits.
- **Interactions with aviation professionals:** Several adolescents said they enjoyed interacting with aviation professionals, mostly through the Aviation Industry Forum in the theater and Q&A with professionals because of their "honest" responses to questions about their work and their career paths. Two specifically liked talking with members of the military.
- **Hands-on activities:** Several said they most enjoyed doing a "hands-on" activity, such as riveting in the CreatorSpace or using the crane, because they could experiment with using different tools. One said that this activity made them aware of what aviation professionals do by enabling visitors to "experience it."
- **Interacting with family during activities:** One adult and one adolescent said they liked doing the activities with their families but did not expound.
- **Exploration Place staff:** One adult enjoyed how Exploration Place staff engaged their child, who has a learning disability, without rushing her through the activity.

LEAST ENJOYABLE ASPECTS

When asked what they liked least about the event, adolescents and their adult companions said:

- **Nothing:** Over one-half said there was nothing they liked least.
- **Aviation industry forum:** Several, including both adolescents and adults, said the career forum with aviation professionals was "too long" and difficult to sit through. Two adolescents explained that they do not like to sit still for that amount of time. Along these lines, a few also found it "boring." One adult noted that while the panel is "informative," it lost their ten-year-old's attention because it was long and assumed it was designed for high school students.
- **One-on-one interviews:** One adolescent said participating in the one-on-one conversations with professionals was challenging because they are introverted.
- **Event logistics:** One adult was frustrated that the registration process took so long because they were eager to begin exploring the event activities when they arrived.

IDEAS ABOUT AVIATION INDUSTRY CAREERS

Adolescents were asked what ideas about aviation industry careers they took away from Aviation is Awesome. They shared a range of ideas, though not all responses were career-specific:

- **Insights into the production process:** About three-quarters described gaining a new understanding of the process involved in building aircraft.
  - Several said they had not thought about all the "parts" of aircraft, how they work, and the process for putting them together. Several shared figures or facts they learned about the aviation industry at the Aviation Industry Forum, such as the cost of building an aircraft, how long it takes to build an aircraft, and how much paint is used on each aircraft. Two discussed the production process in greater depth, such as one who explained that aircraft parts can be made in Wichita and assembled elsewhere. Another had imagined aircraft mechanics were similar to auto mechanics and was surprised by the differences after talking with a professional about aircrafts' electrical components.
  - A few described new understanding of the teamwork involved in the aircraft production process. One noted that working together to build and maintain "safe" aircraft is effectively "saving other people's lives." One said working with their sibling as a "team" on *Design Build Fly* components made them think about this.
  - A few said they had not realized the amount of effort involved in building aircraft, or, as one put it after experiencing CreatorSpace, that it takes time, focus, and dexterity to finish the final product. One adolescent commented that, despite the amount of work, the industry "pays well" and seems "fun."
- **Job awareness:** Several said they developed new awareness about aviation careers. A few mentioned specific jobs: pilot/test pilot, engineer, and mechanic. While others did not elaborate on what those careers entail, one could describe what engineers do. Also, one became more aware of creative jobs in the industry, such as photography and graphic design.
- **Kansas:** One did not realize that Kansas is "big in the industry" before the event.

WHAT IDEAS ABOUT AVIATION INDUSTRY CAREERS DID YOU TAKE AWAY FROM TONIGHT'S EVENT?

"I understood the best how people get to put together the airplanes. I really liked how, number one, they worked together as a team, and they would be engineering, like I've always wanted to be in an environmental engineer, that's really important to me. So, I got some more ideas on that."

— *Female, 14*

CONVERSATIONS WITH INDUSTRY PROFESSIONALS

Adolescents were asked 1) if they interacted with any aviation industry professionals who were present at the Aviation is Awesome family event, 2) if so, what that conversation was like, and 3) when (or at what activity) they interacted with the aviation professional(s). More than one-half said they talked with aviation professionals at the event, and for the most part they described their interactions as "positive," "interesting," and "friendly." Specific topics adolescents discussed with aviation professionals include:

- **Career paths:** Several talked with industry professionals about their jobs; namely, professionals explained what they do and how they entered the field. For instance, one talked with an engineer about the steps involved in becoming an engineer. Another talked with a test pilot; they discussed the benefits and risks involved in that career. One, who participated in the one-on-one interview activity, talked with a professional about electronics, fuel tanks, and the future of the aviation industry.
- **Adolescents' lives and interests:** A few said industry professionals asked them questions about their lives and interests, or about their knowledge of aircraft.
- **Aircraft:** A few talked about aircraft. Two discussed specific airplanes with professionals, such as the KC 135; the others spoke generally about how aircraft are built.

WHAT WAS YOUR CONVERSATION WITH AN INDUSTRY PROFESSIONAL LIKE?

"I got to talk about engineers and stuff, and – 'cause I want to be one when I grow up, so we were talking about that and what I need to do, and how it works."

— *Male, 14*

"One of them was with a gentleman, a test pilot, he's flying the airplane, and he showed us a little video about it. Talked about, my mom had a little conversation with him, and such, but it's about how much he liked his job and doing it, even though it's a lot of risk."

— *Male, 17*

PERCEPTION OF SKILLS REQUIRED TO WORK IN AVIATION

Adolescents were asked to share what skills people might need to work in the aviation industry and how they might acquire those skills:

- **Knowledge of science and technology:** Several said some combination of math and technology skills are required for working in the industry. A few mentioned mechanics, engineering, wiring, design, and reading blueprints. These adolescents said speaking with a professional one-on-one or listening to the aviation industry forum prompted them to consider these skills. A few said they could acquire these skills through studying or attending school, or through specialized training programs; one said seeing the aircraft at Exploration Place and "how they were designed and built" made them think about the skills required for building aircraft.
- **Life skills:** Several described life skills industry professionals need, such as teamwork, integrity, listening or following directions, and cooperation. As one put it, "you have to be prepared, organized, and…on top of that, we have to be responsible" for their own work and learning. Another said following directions is important because they "wouldn't want to miss a step" when building aircraft. A few said they would not know how to go about learning those skills, but a few others said these skills can be learned through school, work experience, and talking with other professionals. A few said both technical and interpersonal skills are needed to work in the industry and that the career panel prompted them to think about this. One said spending time with people in their community would help them to develop the skills needed to "get along with people so that you're able to work together to fly the planes."
- **Physicality:** A few mentioned physical attributes or capabilities required for building aircraft, such as fine motor skills, hand-eye coordination, and "thick hands" for conducting maintenance. One said training could help with developing hand-eye coordination.
- **Additional schooling:** A few said that a college degree or specific training is required but did not expound. One of these said the panel discussion made them think about this idea.
- **Unsure:** A few were unsure what skills they might need to work in aviation.

WHAT SKILLS DO YOU THINK SOMEONE MIGHT NEED TO WORK IN THE AVIATION INDUSTRY?

"Probably lots of math, and probably knowing measurements and numbers of things. At the panel they were just saying how most of the jobs here, people have gone to college or something like that, like school, education, to do."

— *Female, 11*

PERCEPTION OF WORKING IN THE AVIATION INDUSTRY

Adolescents were asked what, if anything, they think they would like about working in aviation; responses include:

- **Flying aircraft:** Several said they would enjoy being a pilot, test pilot, or flying in general. A few said they would like this because they enjoy flying or want to travel. One said that "seeing the planes right here" made them think about this.
- **Design or production roles:** Several named specific aviation jobs that they would like. Two were interested in building aircraft; one in inspecting aircraft safety; one in engineering; and one in aircraft mechanics and logistics management. Another became interested in designing aircraft after interacting with *Design Build Fly*.
- **Working with people**: A few said they would like meeting new people and talking with others. A few said they like "the teamwork" aspect of aviation work; one hypothesized that collaborating to produce aircraft would make them feel "proud."
- **Satisfaction of finishing a job:** A few said they would most enjoy seeing the final product and the progression of transforming "little" parts into an aircraft. One said they would take pride in knowing they built an aircraft.
- **Lifestyle benefits:** A few shared ideas related the lifestyle associated with working in aviation. One would like what they perceived of as "better pay" compared to the automotive industry. One would like to travel. One, whose family members have worked in the industry, would like to continue their family legacy.
- **Hands-on work**: Two said they would like the "hands-on" nature of aviation work.

Adolescents were also asked what they would not like about the industry. Responses include:

- **Time and effort involved:** Several perceived the industry as a stressful setting because of the "set" work schedule or "long" hours of daily work. One said they would not like "working all the time."
- **Making a mistake:** A few did not like the idea that something could "go wrong," and they could get "stuck" when problem-solving. Two shared concerns about being "blamed" or taking responsibility for mistakes involving aircraft. One said the "complicated systems" involved in building aircraft made them think about this.
- **Hands-on work:** A few said they would not like doing "handy work." One said this is because they do not "work well" with their hands; another noted they would need to be taught to fix aircraft. One said they would specifically dislike the process of moving aircraft between the warehouse or hanger and the shipping trains.
- **Flying aircraft:** A few said they would not like being a pilot or flying in general, one of whom dislikes heights.
- **Academics:** Two said they would not like the "extra school," or dislike math.

GETTING INVOLVED WITH AVIATION/STARTING AVIATION CAREER

Adolescents were asked what, if anything, they saw or heard during the event which made them think about the ways they might get involved with aviation. The adolescents shared a range of ideas about possible careers in the aviation industry and related STEM industries:

- **Uncertain about an aviation career:** Many seemed uncertain about aviation careers because they are undecided or have developed interests in different career areas, including related STEM fields or in the arts. Most said their post-graduate plans tentatively involve attending college or trade programs to study a range of disciplines, including teaching, veterinary work, medicine, railroading, and writing. Despite their uncertainty with pursuing aviation careers, most shared thoughtful ideas about industry professionals and skills required to work in aviation. When asked what they could do if they wanted to get involved with aviation, most said they would need to learn more about the industry. A few said the aviation industry forum made them think about this. One, who is interested in video production, grew more interested after hearing about aircraft photography from an aviation professional. Many in this group are 10-14 years old.
- **Excitement about working in the industry:** Several were excited about aviation careers, usually because they were already interested in aviation before the attending event. Almost all named specific jobs that interested them, such as aerospace, mechanical or technical engineer, and logistics manager. A few discussed these jobs in-depth by providing details summarizing the job; for instance, one who was interested in electrical engineering, said they are "into" power plants, mainframes, and airframes. One said the event prompted them to think about joining the military because they would like to rescue people and "make a difference." Another said they would like to do in-air refueling after a conversation with Air Force representatives. Most said they would need to learn more and develop experience to do this work, for example by talking with industry professionals or taking classes and summer trade programs.
- **Not interested in working in aviation:** Several were generally uninterested in aviation careers. Most said they could not think of any careers they wanted to learn more about, and shared little to nothing to indicate that they had considered ways to get involved with the industry. Most identified post-graduation plans involving college, trade school, or the military, while a few are interested in sports and the arts.

PERCEPTION OF INDUSTRY PROFESSIONALS

Adolescents were asked what, if anything, they saw or did at the event which made them think about people who work in aviation in a new or different way. In some instances, adult companions also responded:

- **No change:** About one-half said their perception did not change.
- **Appreciation for complexity:** Several said they gained a new appreciation for the process of building aircraft and the amount of work aviation professionals do. Specifically, two adolescents said they had not realized how "complicated" building aircraft is; another said they had not considered how many people are involved in the production process. One adolescent said the complexity made them think about the "techniques" and effort involved in aircraft production. One adolescent said the Fuselage Theater videos made them think about this idea. A few adult companions shared similar insights; one said thinking about the complexity helped her to think differently about her husband, who works in aviation, as he had previously alluded to the many "parts" of the aircraft and production process.
- **Job awareness:** A few described new awareness of different aviation jobs, such as design; as one adult put it, "I have respect for people that… have the eye especially for" design work. One 11-year-old said they were aware that aircraft required building but had not imagined the role of nanotechnology and 3D printing. A high schooler, who spoke with an Air Force member, learned about a career involving refueling aircraft midflight, which they find "amazing." One adult also described new awareness of aircraft photography.
- **Interesting, but not for me:** Two adolescents said that, while they now recognize that aviation is "not as boring as it seems," they do not see themselves working in the industry.

WHAT MADE YOU THINK ABOUT PEOPLE WHO WORK IN AVIATION IN A NEW OR DIFFERENT WAY?

"It showed me that it's more complicated than it looks, of course, and there's a bunch of other techniques you really need to focus on to finish to the final product and make sure it's able to fly safe, and able to do anything, really."

— *Female, 14*

LINGERING CURIOSITIES

Adolescents were asked what, if anything, they were left wondering about after the event. Two adults also shared curiosities. Responses include:

- **Nothing:** Almost one-half did not have any lingering curiosities.
- **More information about aviation careers:** Several wondered about working in the industry and raised the following questions.
  - How many different jobs are in the aviation industry? What is the difference between the different jobs?
  - What kind of training or schooling prepares someone for working in the industry?
  - What personal value do professionals place on their careers? How has their work affected their lives?
  - How do professionals "start from the bottom and work their way" up the career ladder? And, how do they have the "courage" to do this?
  - What are aviation professionals' typical salaries?
- **More information about aircraft and flight:** Several wondered about the aircraft production process, and how aircraft work. They raised the following questions:
  - How do planes fly?
  - How do the aircraft parts work together?
  - How long does it take to build a plane?
  - Where did the idea of using a 3D printer for parts and tools come from? And, an adult wondered, how do they make the tools required for aircraft production?
- **Significance of aviation:** One wondered, "Why is aviation such an important thing in our country?"
- **Aviation in Wichita:** One adult wondered why they were not "told" about opportunities like those discussed at the panel when their generation was in high school.

APPENDIX

APPENDIX A: OBSERVATION DATA

See next page

EXPLORATION PLACE DESIGN BUILD FLY - T&T OBSERVATION FORM ID # _____

INTRO **ENTRANCE:** Main (Grand Hall): n = 63, 63% Keva: n = 8, 8% Explore Kansas: n = 29, 29%

	Component	Number (n) and % stopped	Time (mins : secs)	General Behaviors: Number to do Behavior, % stopped to do behavior	Social Behaviors: Number to do Behavior, % stopped to do behavior
1	Intro Label & DBF Sign	n = 0, 0%	Median = 0:0 Min = 0:0 Max = 0:0	[redacted]	Point/beckon: n = 0, 0% Converse/read aloud n = 0, 0%
2	Past Present Future Puzzle	n = 4, 4%	Median = 0:18 Min = 0:04 Max = 0:40	Look text/photos: n = 4, 100% Flip panels: n = 1, 25%	Point/beckon: n = 1, 25% Converse/read aloud: n = 1, 25%

DESIGN

	Component	Number (n) and % stopped	Time (mins : secs)	General Behaviors: Number to do Behavior, % stopped to do behavior	Social Behaviors: Number to do Behavior, % stopped to do behavior
3	Design a Propeller	n = 25, 25%	Median = 1:00 Min = 0:10 Max = 6:51	Look text/photo: n = 15, 60% Pick up foam piece(s): n = 18, 72% Build propeller: n = 12, 48% Button Push: n = 19, 76% Button Hold: n = 16, 64% Misuse: n = 2, 8%	Point/beckon: n = 14, 56% Converse/read aloud: n = 17, 68% Watch someone use: n = 19, 76%
4	Match the Materials	n = 8, 8%	Median = 0:32 Min = 0:10 Max = 1:11	Look text/photo: n = 5, 63% Buttons Push: n = 5, 63% Buttons Guesses: n = 3, 38% Touch material(s): n = 5, 63%	Point/beckon: n = 3, 38% Converse/read aloud: n = 4, 50% Watch someone use: n = 3, 38%
5	Wind Tunnel	n = 18, 18%	Median = 0:48 Min = 0:13 Max = 5:20	Look text/photo: n = 9, 50% Add 1 shape: n = 12, 67% Add multiple shapes: n = 6, 33% Push button (for wind): n = 15, 83% Adjust knob: n = 13, 72% Misuse: n = 0, 0%	Point/beckon: n = 6, 33% Converse/read aloud: n = 9, 50% Watch someone use: n = 9, 50%
6	Wind Wall Text	n = 1, 1%	Median = 0:16 Min = 0:16 Max = 0:16	[redacted]	Point/beckon: n = 0, 0% Converse/read aloud: n = 0, 0%
7	Seat Prototyping	n = 16, 16%	Median = 0:35 Min = 0:03 Max = 2:32	Look text/photo: n = 9, 56% Pick up bar(s): n = 8, 50% Design seat: n = 1, 6% Sit: n = 4, 25% Misuse: n = 5, 31%	Point/beckon: n = 5, 31% Converse/read aloud: n = 9, 56% Watch someone use: n = 9, 56% Use w/ others: n = 4, 25%
8	Airplane Decoration	n = 11, 11%	Median = 0:13 Min = 0:07 Max = 2:43	Look text/photo: n = 4, 36% Touch screen to start: n = 5, 46% Decorate plane: n = 2, 18% Misuse: n = 0, 0%	Point/beckon: n = 3, 27% Converse/read aloud: n = 5, 46% Watch someone use: n = 6, 55% Use w/ others: n = 4, 36%
9	Conceptual Mission Designer	n = 10, 10%	Median = 1:31 Min = 0:10 Max = 3:45	Look text/photo: n = 7, 70% Touch screen to start: n = 6, 60% Test 1: n = 5, 50% Test multiple: n = 5, 50%	Point/beckon: n = 2, 20% Converse/read aloud: n = 4, 40% Watch someone use: n = 4, 40% Use w/ others: n = 3, 30%

				Misuse: n = 0, 0%	
10	Balance Tip Table	n = 15, 15%	Median = 0:12 Min = 0:04 Max = 1:00	Look text/photo: n = 5, 33% Pick up piece(s): n = 8, 53% Put piece(s) on table: n = 6, 40% Misuse: n = 1, 7%	Point/beckon: n = 3, 20% Converse/read aloud: n = 7, 47% Watch someone use: n = 5, 33% Use w/ others: n = 2, 13%
11	Paper Airplane Launcher	n = 25, 25%	Median = 3:47 Min = 0:04 Max = 17:37	Look text: n = 14, 56% Make plane: n = 14, 56% Launch Own: n = 12, 48% Pre-made: n = 7, 28% Struggle w/ launcher: n = 11, 44% Misuse: n = 2, 8%	Point/beckon: n = 16, 64% Converse/read aloud: n = 19, 76% Watch someone use: n = 21, 84% Use w/ others: n = 16, 64%
12	Vertical Wind Tunnel	n = 36, 36%	Median = 0:24 Min = 0:03 Max = 20:45	Look label: n = 14, 37% Look pad: n = 7, 18% Design Cone: n = 12, 32% Design Paper: n = 0, 0% Test 1: n = 14, 37% Test Multiple: n = 8, 21% Misuse: n = 4, 11%	Point/beckon: n = 16, 42% Converse/read aloud: n = 18, 47% Watch someone use: n = 23, 61% Use w/ others: n = 14, 37%

CREATOR SPACE

	Component	Number (n) and % stopped	Time (mins : secs)	General Behaviors: Number to do Behavior, % stopped to do behavior	Social Behaviors: Number to do Behavior, % stopped to do behavior
13	Entire section	n = 13, 13%	Median = 5:16 Min = 0:10 Max = 13:05		Point/beckon: n = 7, 54% Converse/read aloud: n = 9, 69%

BUILD

	Component	Number (n) and % stopped	Time (mins : secs)	General Behaviors: Number to do Behavior, % stopped to do behavior	Social Behaviors: Number to do Behavior, % stopped to do behavior
14	Fuselage Theater	n = 35, 35%	Median = 1:23 Min = 0:05 Max = 16:04	Look sign: n = 5, 14% Stand outside to watch: n = 16, 46% Enter theater: n = 26, 74% Sit: n = 26, 74% Watch: 1 film: n = 26, 74% Watch Multiple: n = 16, 46%	Point/beckon: n = 8, 23% Converse/read aloud: n = 18, 54%
15	Wooden Airplane	n = 17, 17%	Median = 0:41 Min = 0:09 Max = 3:44	Touch: n = 10, 58% Pick up shapes in bin: n = 7, 41% Add shapes to plane: n = 2, 12% Sit on plane: n = 0, 0%	Point/beckon: n = 7, 41% Converse/read aloud: n = 11, 65% Watch someone use: n = 16, 94%
16	Airplane Rings	n = 2, 2%	Median = 0:19 Min = 0:04 Max = 0:34	Look text: n = 1, 50% Look up at rings: n = 2, 2%	Point/beckon: n = 0, 0% Converse/read aloud: n = 1, 50%
17	Airplane Smells	n = 12, 12%	Median = 0:51 Min = 0:04 Max = 1:29	Look text/photo: n = 10, 83% Buttons: Push: n = 10, 83% Buttons: Guesses: n = 8, 67%	Point/beckon: n = 8, 67% Converse/read aloud: n = 9, 75% Watch someone use: n = 10, 83%

18	Exterior Paint Simulator	n = 26, 26%	Median = 1:15 Min = 0:08 Max = 23:47	Look text/photo: n = 14, 54% Touch sprayer: n = 18, 69% Spray 1 part: n = 18, 69% Multiple: n = 11, 42% Misuse: n = 1, 4%	Point/beckon: n = 10, 39% Converse/read aloud: n = 17, 65% Watch someone use: n = 14, 54%
19	Composite Layering	n = 12, 12%	Median = 1:17 Min = 0:09 Max = 4:59	Look text/photo: n = 7, 58% Touch screen to start: n = 6, 50% Touch piece(s): n = 9, 75% Layer Part: n = 6, 50% Layer Whole: n = 3, 25% Misuse: n = 0, 0%	Point/beckon: n = 5, 42% Converse/read aloud: n = 6, 50% Watch someone use: n = 6, 50% Use w/ others: n = 5, 42%
20	Thrust Reverser	n = 19, 19%	Median = 0:27 Min = 0:03 Max = 1:27	Look text: n = 9, 47% Buttons: Left: n = 12, 63% Buttons Right: n = 10, 53% Look up at engine: n = 16, 84% Look wind wall: n = 11, 58%	Point/beckon: n = 5, 26% Converse/read aloud: n = 8, 42% Watch someone use: n = 5, 26%
21	Wing Inspection	n = 9, 9%	Median = 0:23 Min = 0:03 Max = 4:32	Touch screen to start: n = 7, 78% Use interactive: n = 4, 44% Misuse: n = 0, 0%	Point/beckon: n = 1, 11% Converse/read aloud: n = 2, 22% Watch someone use: n = 2, 22% Use w/ others: n = 2, 22%
22	Rivet Trainer	n = 17, 17%	Median = 0:54 Min = 0:12 Max = 6:13	Touch screen to start: n = 15, 15% Start timer (button): n = 14, 82% Rivet gun: Pick up: n = 13, 77% Rivet gun: Use: n = 10, 59% Use multiple times: n = 8, 47% Misuse: n = 3, 18%	Point/beckon: n = 4, 24% Converse/read aloud: n = 7, 41% Watch someone use: n = 7, 41% Use w/ others: n = 5, 29%
23	Landing Gear	n = 20, 20%	Median = 0:35 Min = 0:10 Max = 1:42	Look text/photo: n = 9, 45% Touch wheel: n = 14, 70% Drop Once: n = 6, 30% Drop Multiple: n = 1, 5%	Point/beckon: n = 2, 10% Converse/read aloud: n = 7, 35% Watch someone use: n = 9, 45% Use w/ others: n = 5, 25%
24	Wichita Stories (Ground Floor)	n = 1, 1%	Median = 0:14 Min = 0:14 Max = 0:14	Touch screen to start: n = 1, 100% Watch 1: n = 1, 100% Watch Multiple: n = 1, 100%	Point/beckon: n = 0, 0% Converse/read aloud: n = 0, 0%
25	Tiny Parts Wall	n = 11, 11%	Median = 0:13 Min = 0:05 Max = 1:13	Look text: n = 5, 46% Look object case: n = 10, 91%	Point/beckon: n = 2, 18% Converse/read aloud: n = 4, 36%
26	Toolbox	n = 4, 4%	Median = 0:49 Min = 0:25 Max = 1:31	Look text: n = 3, 75% Open 1: n = 4, 100% Open Multiple: n = 4, 100%	Point/beckon: n = 4, 100% Converse/read aloud: n = 1, 25%

UPSTAIRS (FUSELAGE, PART OF BUILD)

	Component	Number (n) and % stopped	Time (mins : secs)	General Behaviors: Number to do Behavior, % stopped to do behavior	Social Behaviors: Number to do Behavior, % stopped to do behavior
27	Reader Rail	n = 1, 1%	Median = 0:42 Min = 0:42 Max = 0:42		Point/beckon: n = 0, 0% Converse/read aloud: n = 0, 0%

28	Wichita Stories	n = 21, 21%	Median = 0:29 Min = 0:07 Max = 1:42	Touch screen to start: n = 19, 91% Watch 1: n = 16, 76% Watch multiple: n = 6, 29%	Point/beckon: n = 11, 52% Converse/read aloud: n = 10, 48%
29	Floor Systems Console	n = 8, 8%	Median = 0:17 Min = 0:04 Max = 1:32	Look text: n = 4, 50% Push button(s): n = 7, 88% Look floor/ceiling lights: n = 4, 50%	Point/beckon: n = 1, 13% Converse/read aloud: n = 2, 25%
30	Vacuum Toilet	n = 33, 33%	Median = 0:15 Min = 0:04 Max = 3:09	Stuff toilet: n = 12, 36% Can't see (crowded): n = 8, 24%	Point/beckon: n = 16, 49% Converse/read aloud: n = 19, 58%

FLY

	Component	**Number (n) and % stopped**	**Time (mins : secs)**	**General Behaviors: Number to do Behavior, % stopped to do behavior**	**Social Behaviors: Number to do Behavior, % stopped to do behavior**
31	Exposed Wing	n = 17, 17%	Median = 0:29 Min = 0:05 Max = 5:30	Look text: n = 9, 53% Buttons 1: n = 9, 53% Buttons Multiple: n = 8, 47% Look wing lights: n = 9, 53% Misuse: n = 2, 12%	Point/beckon: n = 8, 47% Converse/read aloud: n = 8, 47% Watch someone use: n = 6, 35%
32	Balance Chair	n = 23, 23%	Median = 0:50 Min = 0:08 Max = 2:01	Look text/photo: n = 11, 48% Sit: n = 16, 70% Test Once: n = 16, 70% Test Multiple: n = 13, 57% Misuse: n = 2, 9%	Point/beckon: n = 11, 48% Converse/read aloud: n = 13, 57% Watch someone use: n = 11, 48% Use w/ others: n = 9, 39%
33	Fix the Wiring	n = 9, 9%	Median = 0:24 Min = 0:04 Max = 2:11	Touch screen to start: n = 5, 56% Go under plane: n = 2, 22% Touch button/wiring: n = 6, 67% Misuse: n = 0, 0%	Point/beckon: n = 2, 22% Converse/read aloud: n = 3, 33% Watch someone use: n = 2, 22% Use w/ others: n = 0, 0%
34	Steering an Airplane	n = 31, 31%	Median = 0:41 Min = 0:06 Max = 2:25	Look text/photo: n = 4, 13% Push button: n = 20, 65% Adjust knob: n = 20, 65% Misuse: n = 0, 0%	Point/beckon: n = 13, 42% Converse/read aloud: n = 21, 68% Watch someone use: n = 20, 65% Use w/ others: n = 16, 52%
35	Airport Play Table	n = 10, 10%	Median = 0:25 Min = 0:10 Max = 15:27	Sit in chair: n = 5, 50% Play with table: n = 2, 20%	Point/beckon: n = 4, 40% Converse/read aloud: n = 6, 60% Watch someone use: n = 5, 50%
36	Drone	n = 25, 25%	Median = 0:40 Min = 0:40 Max = 4:23	Look text: n = 3, 12% Look screen: n = 18, 72% Look up at drone: n = 25, 100% Adjust knob (fly drone): n = 14, 56% Misuse: n = 0, 0%	Point/beckon: n = 11, 44% Converse/read aloud: n = 14, 56% Watch someone use: n = 9, 36% Use w/ others: n = 9, 36%
37	Foam Wings	n = 14, 14%	Median = 0:39 Min = 0:09 Max = 4:54	Look text/photo: n = 7, 50% Wings 1 shape: n = 7, 50% Wings Multiple: n = 3, 21% Misuse: n = 3, 21%	Point/beckon: n = 6, 43% Converse/read aloud: n = 7, 50% Watch someone use: n = 8, 57%
38	Selfie Screen	n = 17, 17%	Median = 0:16 Min = 0:03 Max = 3:06	Look Text: n = 5, 29% Look Screen: n = 16, 94% Misuse: n = 2, 12%	Point/beckon: n = 8, 47% Converse/read aloud: n = 10, 59%

39	Cockpit, Private Plane	n = 28, 28%	Median = 1:32 Min = 0:10 Max = 7:17	Use interactive: n = 11, 39%	Point/beckon: n = 16, 57% Converse/read aloud: n = 22, 79%
40	Middle, Private Plane (Forward Fuselage)	n = 52, 52%	Median = 0:58 Min = 0:06 Max = 12:05	Sit: n = 28, 53% Pick up props: n = 28, 53%	Point/beckon: n = 22, 42% Converse/read aloud: n = 30, 57%
41	Production Flight Testing	n = 37, 37%	Median = 1:55 Min = 0:04 Max = 15:41	Look text: n = 8, 22% Sit Pilot: n = 10, 27% Sit Co-pilot: n = 12, 32% Misuse: n = 1, 3%	Point/beckon: n = 25, 68% Converse/read aloud: n = 28, 76% Watch someone use: n = 23, 62% Use w/ others: n = 20, 54%
42	Vibrations	n = 10, 10%	Median = 0:37 Min = 0:15 Max = 1:27	Look text/photo: n = 4, 40% Touch vibration pad: n = 9, 90% Buttons push: n = 9, 90% Buttons guesses: n = 8, 80%	Point/beckon: n = 5, 50% Converse/read aloud: n = 5, 50% Watch someone use: n = 5, 50%
43	What's a Hatchway?	n = 17, 17%	Median = 0:11 Min = 0:03 Max = 0:53	Look text/photo: n = 8, 47% Look hatch left: n = 16, 94% Look hatch right: n = 13, 77% Touch left: n = 12, 71% Touch right: n = 9, 53%	Point/beckon: n = 1, 6% Converse/read aloud: n = 3, 18% Watch someone use: n = 2, 12%
44	Match Sounds	n = 9, 9%	Median = 0:40 Min = 0:10 Max = 6:09	Look text/photo: n = 3, 33% Pick up earphone: n = 4, 44% Buttons push: n = 4, 44% Buttons guesses: n = 3, 33%	Point/beckon: n = 3, 33% Converse/read aloud: n = 5, 56% Watch someone use: n = 4, 44%
45	How Busy are the Skies?	n = 16, 16%	Median = 0:26 Min = 0:04 Max = 2:44	Look text/photo: n = 6, 38% Look big screen: n = 13, 81% Look kiosk: n = 12, 75% Use interactive: n = 8, 50% Misuse: n = 1, 6%	Point/beckon: n = 2, 13% Converse/read aloud: n = 8, 50% Watch someone use: n = 4, 25% Use w/ others: n = 6, 38%
46	Flying into the Future	n = 11, 11%	Median = 0:31 Min = 0:07 Max = 1:09	Look text/photo: n = 8, 73% Viewer 1: n = 8, 73% Viewer multiple: n = 7, 64%	Point/beckon: n = 4, 36% Converse/read aloud: n = 6, 55%

EXIT: Main (Grand Hall) = 37, 37%, Keva = 20, 20%, Explore Kansas = 42, 42%

APPENDIX B: BEHAVIOR DEFINITIONS FOR TIMING AND TRACKING

Social behaviors (applies to all components)
Point / beckon = Point out an object or area to someone in your group or to beckon a group member to join you at an activity
Converse / read aloud = Talk within your group at a component or read aloud content to someone in your group.
Watch someone use = Watch someone else use the component
Use w/ others = Use the component with others (either within your group or with others outside of your group)

General behaviors (that apply to many components)
Look text/photos = Look at text panel and/or large photos on or next to text panel for any amount of time
Misuse = use a component (usually an interactive) inappropriately *See section below for examples of *possible* misuse for specific components. Other instances of misuse could still occur.

General behaviors (by specific component)	
Intro	
2. Past, Present, Future Puzzle	**Flip panels =** Rotate or move one or more of the panels
Design	
3. Design a Propeller	**Pick up foam pieces =** Pick up one or more of the foam propeller pieces from bin **Build propeller =** Attach one or more foam pieces to propeller frame **Button, Push =** Touch or press test button casually, without holding to test **Button, Hold =** Press and hold button to test propeller (will see screen light up) **Misuse =** E.g., using foam pieces to play or build something else, hitting with them
4. Match the Materials	**Buttons, Push =** Tap or casually press one or more buttons, w/out deliberate attempt to match materials (e.g., child pressing buttons rapidly at random) **Buttons, Guesses =** Press one or more buttons, making deliberate attempt to match **Touch material(s) =** Touch one or more cylinders
5. Wind Tunnel	**Add shape, 1 =** Add one foam shape to wind tunnel **Add shape, multiple =** Add more than one foam shape to wind tunnel **Push button (for wind) =** Push button to start wind in wind tunnel **Adjust knob** = Turn knob to rotate shape in wind tunnel **Misuse =** E.g., putting more than one shape in tunnel at once, building something with pieces outside of tunnel
7. Seat Prototyping	**Pick up bars** = Pick up one or more of the bars, from bin, floor, or from seat itself **Design seat** = Use bars to create a seat shape (could be just one or two or could be rearranging many) **Sit** = Sit in seat (could be one of own design or one that others' designed) **Misuse =** E.g., swordfights with rods
8. Airplane Decoration	**Touch screen to start** = Tap attract screen to begin using interactive **Decorate plane** = Make selections to decorate plane (select aircraft, paint, etc.) **Misuse =** E.g, hit screen or tap haphazardly
9. Conceptual Mission Designer	**Touch screen to start** = Tap attract screen to begin using interactive **Test, 1 =** Design one plane and launch it (will see launch on screen) **Test, multiple =** Make edits to plane after seeing launch and test a second time (or more times) **Misuse** = E.g, hit screen or tap haphazardly
10. Balance Tip Table	**Pick up piece(s)** = Pick up one or more of the pieces **Put pieces(s) on table** = Put one or more of the pieces on tip table to try to balance **Misuse =** E.g, hit table, dump piece on floor, throw pieces
11. Paper Airplane Launcher	**Make plane** = Fold provided paper to make one or more paper airplanes **Launch, own** = Uses launcher to launch a plane that they made

	Launch, pre-made = Uses launcher to launch a plane that someone else made (either someone else in their group or a plane that was left over and already there) **Struggle w/ launcher** = Encounter difficulty launching plane, possibly because 1) plane is too wide so doesn't move when attempt to push through launcher, 2) plane does not move because they do not push it forward through wheels (i.e., press button and wait for something to happen without pushing it forward) or 3) sticks plane in incorrect starting point (i.e., between launcher wheels instead of below wheels) **Misuse =** E.g., toss plane on own (not using launcher)
12. Vertical Wind Tunnel	**Look label =** Look at fixed label/sign on table **Look pad** = Look at one or more "mousepads" with directions **Design, Cone** = Make a flyer out of provided cone **Design, Paper =** Make a flyer out of provided paper **Test, 1 =** Place one cone or paper creation in air tunnel to see what happens **Test, multiple** = Place cone or paper creation in air tunnel to see what happens more than once and/or test multiple designs **Misuse** = E.g., throw cone or paper creation outside of tunnel
Build	
14. Fuselage Theater	**Stand outside to watch** = Stand outside theater to watch film from afar **Enter theater** = Physically enters theater **Sit** = Sits in one or more seats in theater **Watch, 1 film** = Watches all or part of one film **Watch, multiple =** Watches all or part of multiple films
15. Wooden Airplane	**Touch** = Touch any part of plane **Pick up shapes in bin** = Pick up one or more shapes from bin **Add shapes to plane** = Add one or more shapes to outside of plane (in grooves) **Sit on plane =** Sit in pilot seat
16. Airplane Rings	**Look up at rings =** Intentionally look up at rings for any amount of time (might be after reading text or might not be)
17. Airplane Smells	**Buttons, Push =** Tap or casually press one or more buttons, w/out deliberate attempt to match smells (e.g., child pressing buttons rapidly at random) **Buttons, Guesses =** Press one or more buttons, making deliberate attempt to match
18. Exterior Paint Simulator	**Touch sprayer =** Touch pain sprayer (might pick up, might not) **Spray, 1 part =** Spray-paint one airplane part any amount **Spray, multiple =** Spray-paint more than one airplane part any amount **Misuse =** E.g., touch sprayer directly to screen
19. Composite Layering	**Touch screen to start =** Tap attract screen to begin using interactive **Touch piece(s) =** Touch or pick up one or more composite pieces (e.g., from bin) **Layer, part =** Layer composite pieces on model but do not finish whole layer (e.g, incomplete) **Layer, whole =** Layer composite pieces on model and form complete, finished layer **Misuse =** E.g., play with pieces on own, not placing deliberately on model
20. Thrust Reverser	**Buttons, left =** Push left button (blower) **Buttons, right =** Push right button (thrust reverser) **Look up at engine =** Deliberately look up at engine on top of tower **Look wind wall =** Deliberately look at wind wall to see effects of thrust reverser (probably after button is pushed)
21. Wing Inspection	**Touch screen to start =** Tap attract screen to begin using interactive **Use interactive =** Touch screen to do any part of the activity on screen (some or all) **Misuse =** E.g., hit screen, touch wing light
22. Rivet Trainer	**Touch screen to start =** Tap attract screen to begin using interactive **Start timer (button) =** Press button to start timer **Rivet gun, pick up =** Pick up rivet gun but do not use to rivet **Rivet gun, use =** Pick up rivet gun and use to rivet **Use multiple times =** Use interactive multiple times (e.g., multiple rounds of riveting, trying to beat previous time) **Misuse =** E.g., touch rivet gun to screen, play with rivet gun outside of activity

23. Landing Gear	**Touch wheel =** Touch wheel that moves landing gear (could touch or spin to move gear, either counts) **Drop, once =** Drop landing gear to test once **Drop, multiple =** Drop landing gear to test more than once
24. Wichita Stories (Ground Floor)	**Touch screen to start =** Tap attract screen to begin using interactive **Watch, 1 =** Watch all or part of one Wichita story **Watch, multiple =** Watch all or part of more than one Wichita story
25. Tiny Parts Wall	**Look text =** Look label next to object case for any amount of time **Look object case =** Look at object case full of tiny parts
26. Toolbox	**Look text =** Look at label on wall for any amount of time **Open, 1 =** Open one drawer **Open, multiple =** Open more than one drawer
Upstairs (Fuselage, part of Build)	
28. Wichita Stories	**Touch screen to start =** Tap attract screen to begin using interactive **Watch, 1 =** Watch all or part of one Wichita story **Watch, multiple =** Watch all or part of more than one Wichita story
29. Floor Systems Console	**Push button(s) =** Push one or more buttons to illuminate floor systems **Look floor/ceiling lights =** Look at illuminated floor or ceiling lights after pushing button(s)
30. Vacuum Toilet	**Stuff toilet =** Put ball in toilet **Can't see (crowded) =** Visitor is in the vacuum toilet exhibit but I can't see what they are doing because it is too crowded
Fly	
31. Exposed Wing	**Buttons, 1 =** Push one button to illuminate wing part **Buttons, multiple =** Push more than none button to illuminate wing parts **Look wing lights =** Look at illuminated wing one or more times **Misuse =** E.g., touch parts in wing wheel well, hit buttons haphazardly
32. Balance Chair	**Sit =** Sit in balance chair for any amount of time **Test, once =** Push button on handle to test balance one time (will see screen light) **Test, multiple =** Push button on handle to test balance more than one time (will see screen light) **Misuse =** E.g., sit on chair and play w/out deliberating doing balance activity
33. Fix the Wiring	**Touch screen to start =** Tap attract screen to begin using interactive **Go under plane =** Go under plane to do activity **Touch button/wiring =** Push button and/or unplug/plug wiring on top of wing **Misuse =** E.g., hit screen or press haphazardly, play under plane but not doing activity
34. Steering an Airplane (Pitch Yaw Roll)	**Push button =** Push button to start throttle (wind) **Adjust knob =** Move one or both knobs to adjust plane **Misuse =** E.g., touch cage, hit button haphazardly
35. Airport Play Table	**Sit in chair =** Sit in adjacent airplane seat **Play with table =** Deliberately play with pieces on table
36. Drone	**Look text =** Look text panel next to component (on plane) **Look screen =** Look at kiosk showing camera view from drone **Look up at drone =** Deliberately look up at flying drone **Adjust knob (fly drone) =** Move knob to fly drone **Misuse =** E.g., tap screen haphazardly
37. Foam Wings	**Wings, 1 shape =** Test one wing *shape* by wearing (or holding) in front of fan **Wings, multiple =** Test more than one wing *shape* by wearing (or holding) in front of fan **Misuse =** E.g., put on wings and play w/out deliberately testing, stand in front of fan w no wings on
38. Selfie Screen (Flying in Style)	**Look, text =** Look label **Look, screen =** Look screen (displaying selfies) **Misuse =** E.g., touch screen (it's not a touchscreen)
39. Cockpit, Private Plane	**Use interactive =** Sitting in seat and deliberately using interactive. May see touch screen and/or smile or pose for selfie

40. Middle, Private Plane (Forward Fuselage)	**Sit =** Sit in one or more chairs in private plane **Pick up props =** Pick up one or more props in private plane, e.g., briefcase
41. Production Flight Testing	**Sit, pilot =** Sit in pilot seat (left) **Sit, co-pilot =** Sit in co-pilot seat (right) **Misuse =** E.g., sit in chairs and goof off, pretending to be pilots but not doing activity (or similar)
42. Vibrations	**Touch vibration pad =** Touch or place hand on vibration pad **Buttons, Push =** Tap or casually press one or more buttons, w/out deliberate attempt to match vibrations (e.g., child pressing buttons rapidly at random) **Buttons, Guesses =** Press one or more buttons, making deliberate attempt to match
43. What's a Hatchway?	**Look hatch, left =** Look at left hatchway (left when facing) **Look hatch, right =** Look at right hatchway (right when facing) **Touch, left =** Touch left hatchway one or more times **Touch, right =** Touch right hatchway one or more times
44. Match Sounds (What's that Noise?)	**Pick up earphone =** Pick up earphone (may hold to ear, may not) **Buttons, Push =** Tap or casually press one or more buttons, w/out deliberate attempt to match noises (e.g., child pressing buttons rapidly at random) **Buttons, Guesses =** Press one or more buttons, making deliberate attempt to match
45. How Busy are the Skies?	**Look big screen =** Look at big map screen for any amount of time **Look kiosk =** Look at kiosk screen for any amount of time **Use interactive =** Touch kiosk screen to use interactive for any amount of time **Misuse =** E.g., touch big map screen (it's not a touchscreen)
46. Flying into the Future	**Viewer, 1 =** Look into one viewer **Viewer, multiple =** Look into more than one viewer

APPENDIX C: WAYFINDING

During the observations, data collectors noted which exhibition entrance and exit visitors used—the Grand Hall, Keva exhibition, or Explore Kansas exhibition.[19]

- **Exhibition entrance:** The majority entered via the Grand Hall (63 percent versus 29 percent via Explore Kansas and 8 percent via Keva). No variables have a statistical relationship to entrance used.
- **Exhibition exit:** No exit was used by a majority of visitors. Many exited via Explore Kansas (42 percent), many others via the Grand Hall (37 percent), and one-fifth via the Keva exhibition (20 percent).[20] No variables have a statistical relationship to exit used.

DESIGN BUILD FLY ENTRANCE AND EXIT USED

Entrance Used	% of Observed Visitors
Grand Hall	63
Explore Kansas	29
Keva	8

Exit Used	% of Observed Visitors
Explore Kansas	42
Grand Hall	37
Keva Exhibition	20
No data	1

[19] Across data collection shifts, data collectors spent approximately 60% of their time observing visitors entering via the Grand Hall, about 20% of their time observing visitors entering via the Keva exhibition, and about 20% of their time observing visitors entering via the Explore Kansas exhibition. More time was spent observing visitors at the Grand Hall entrance because it is designed to be the primary entrance to *Design Build Fly*.

[20] Note that the exit used was not recorded for 1 visitor due to data collector error.

APPENDIX F: DESIGN BUILD FLY IMPACT FRAMEWORK

IMPACT PLANNING FRAMEWORK	
MISSION What Exploration Place does	Inspiring a deeper interest in science through creative and fun experiences for people of all ages.
IMPACT The result of the *Design Build Fly* project on audiences	Visitors feel proud of Wichita's leadership role in the aviation industry, are astonished by the range of STEM skills and processes needed to produce aircraft and the diversity of professionals applying those skills, and consider aviation as a possible career path.
PROGRAMS/AUDIENCES Whom the Aviation Gallery serves through *Design Build Fly* and associated programs	• Children on school field trips (3rd grade – 8th grade) • Families (casual walk-in visitors) • Aviation professionals (current and retired) • Out-of-school time adolescents
UNITING PASSIONS What motivates staff and others to work on this project	• Inspiring youth interest in STEM and motivating youth to pursue STEM/aviation careers • Reinvigorating community pride in the aviation industry • Expanding visitors' knowledge and understanding of the aviation industry • Fostering lifelong learning and discovery
DISTINCT QUALITIES What makes the *Design Build Fly* project distinct	• Exposes the process of aviation design and manufacturing • Highlights the diversity of the aviation industry—from people to job/skill types • Focuses on developing the next generation of aviation workers • Reveals what hides beneath an aircraft's surface • Is supported by a united group of aviation professionals • Celebrates Wichita's pride in the aviation industry • Initiates the healing process in Wichita's aviation industry

Please note: the outcomes and indicators described in the following pages apply to the *Design Build Fly* exhibition *and* associated programming. We do not expect that all visitors will achieve all outcomes and indicators as described here. We recognize that visitors start out in different places and some will achieve outcomes to a greater extent than others. Ultimately, we look for growth, to varying degrees, across target audiences.

AUDIENCE OUTCOMES & INDICATORS

Children on school field trips (3rd grade – 8th grade) will:

Broaden their understanding of how engineering and manufacturing processes are integrated to create a functioning aircraft.

- Children explain that the production process needed to produce a functioning aircraft has many steps.
- Children provide examples of two or more of these steps.
- Children explain how two (or more) of the different steps in the aviation production process are related and together contribute to building a functioning aircraft; responses hint at the complexity of the production process and the close relationship between design and manufacturing.

Experience wonder and delight at the scope and scale of aviation objects, concepts, and activities presented.

- Children share ideas, are attentive, enthusiastic, and/or ask and answer questions in the exhibition or during a program.
- Children describe something about the aviation industry they had never thought of before (e.g., "I didn't know…").

Realize that many diverse skills and people are needed in the aviation industry and related STEM industries.

- Children explain that there are many jobs types or skills in the aviation industry.
- Children provide examples of two or more of these jobs/skills.
- Children articulate that the aviation industry employs men as well as women and people of varying ages and cultures.

Appreciate the importance of the aviation industry to the Wichita community.

- Children say they are proud to live in Wichita because of its important place in aviation industry.
- Children talk proudly about their family members or people they know who work (or worked) in the aviation industry.
- Children talk about wanting to pursue careers in the aviation industry or related STEM industries.

AUDIENCE OUTCOMES & INDICATORS

Families (casual walk-in visitors) will:

Broaden their understanding of how engineering and manufacturing processes are integrated to create a functioning aircraft.

- Family members explain that the production process needed to produce a functioning aircraft has many steps.
- Family members provide examples of two or more of these steps.
- Family members explain how two (or more) of the different steps in the aviation production process are related and together contribute to building a functioning aircraft; responses hint at the complexity of the production process and the close relationship between design and manufacturing.

Experience wonder and delight at the scope and scale of aviation objects, concepts, and activities presented.

- Family members share ideas, are attentive, enthusiastic, ask and answer questions in the exhibition or during a program.
- Family members describe something about the aviation industry they had never thought of before (e.g., "I didn't know…").
- Family members use the exhibits/activities together.

Younger visitors will broaden their knowledge, awareness, and understanding of STEM/aviation-industry career options and pathways.

- Younger family members identify something about the aviation industry that they never knew before (e.g., the industry is more culturally diverse than thought, there are more types of jobs than thought, and/or the workforce includes men *and* women of varying ages)
- Younger family members describe at least two aviation-industry jobs that require widely different skill sets.

Younger visitors will feel inspired to pursue STEM/aviation-industry careers.

- Younger family members will ask adults questions about possible career options.
- Younger family members will identify one (or more) jobs in the aviation industry or related STEM industries that they would like to have.
- Younger family members express excitement and enthusiasm when discussing STEM/aviation industry careers and/or topics.
- Younger family members describe feeling more confident pursuing STEM interests.

Wichita families will feel pride in how the aviation industry has shaped their family members' lives, Wichita's identity, and the world.

- Family members say they are proud to live in Wichita because it is an important place in aviation industry.
- Family members speak proudly about their family members or others they know who work (or worked) in the aviation industry.
- Family members describe Wichita's identity as strongly associated with the aviation industry.
- Family members describe the aviation industry as the economic engine for Wichita.

AUDIENCE OUTCOMES & INDICATORS

Out-of-school time (OST) adolescents will:

Broaden their knowledge, awareness, and understanding of the aviation industry.

- OST adolescents identify something about the aviation industry that they never knew before (e.g., the industry is more culturally diverse than thought, there are more types of jobs they could have than thought, and/or the workforce includes men *and* women of varying ages)
- OST adolescents describe and compare at least two aviation industry jobs or careers that require widely different skill sets.

Feel a sense of connection to people working in the aviation industry; they will "see themselves" reflected in the current industry workforce.

- OST adolescents express excitement about a possible career in the aviation industry or related STEM industries.
- OST adolescents describe the connection they feel (in terms of gender, culture, or ethnicity) to an individual or a group working in the aviation industry.

Strengthen their knowledge of skills pertaining to STEM/aviation-industry careers.

- OST adolescents identify at least two skills that pertain to the aviation industry.
- OST adolescents identify aviation-industry skills that are also applicable to other industries (STEM or non-STEM).
- OST adolescents explain that college or technical education is required to enter the aviation workforce.

Deepen their respect for older generations' (including family members') contributions to the aviation industry.

- OST adolescents identify contributions their family members or other adults they know have made to the aviation industry.
- OST adolescents express admiration towards their elders for their contributions to the aviation industry.

Feel adults in the aviation community care about their future.

- OST adolescents express enthusiasm and excitement about their futures.
- OST adolescents share aspirations for their careers.
- OST adolescents ask adults questions about careers in the aviation industry.
- OST adolescents speak positively about their interactions with museum staff and/or adults in the aviation community.
- OST adolescents share an example of a time when museum staff and/or an adult in the aviation community encouraged them to pursue an interest in a STEM and/or aviation topic.

AUDIENCE OUTCOMES & INDICATORS

Aviation professionals (current and retired) will:

Embrace current and future technological advances in the aviation industry.

- Aviation professionals describe positive changes that technological advancement has had on the aviation industry.
- Aviation professionals share with others in their visit group how technology has advanced the aviation industry.

Feel proud of and valued for their personal contributions to and accomplishments within the aviation industry.

- Aviation professionals describe a sense of pride and/or improved self-esteem after visiting the exhibition and/or attending a program.
- Aviation professionals express a desire to share their experiences/expertise with the intent of cultivating the next generation of aviation professionals.

Appreciate the interdependence of diverse aviation-industry jobs and the integral role the jobs play in the entire aviation production process.

- Aviation professionals describe aviation production as a complex and holistic endeavor, encompassing a variety of people, skills, and trades.
- Aviation professionals describe a concrete and specific way their own job (current or former) fits into the larger whole (i.e., is part of the entire production process).
- Aviation professionals explain that individuals who may specialize in one or two jobs must work with others who have a different expertise, and provide a concrete and specific example to illustrate this phenomenon.