On engineering students, their motivations, and their job aspirations:

How can we grow and retain the next generation of our engineering workforce?

Prof. Annalisa L. Weigel, Ph.D.

Massachusetts Institute of Technology

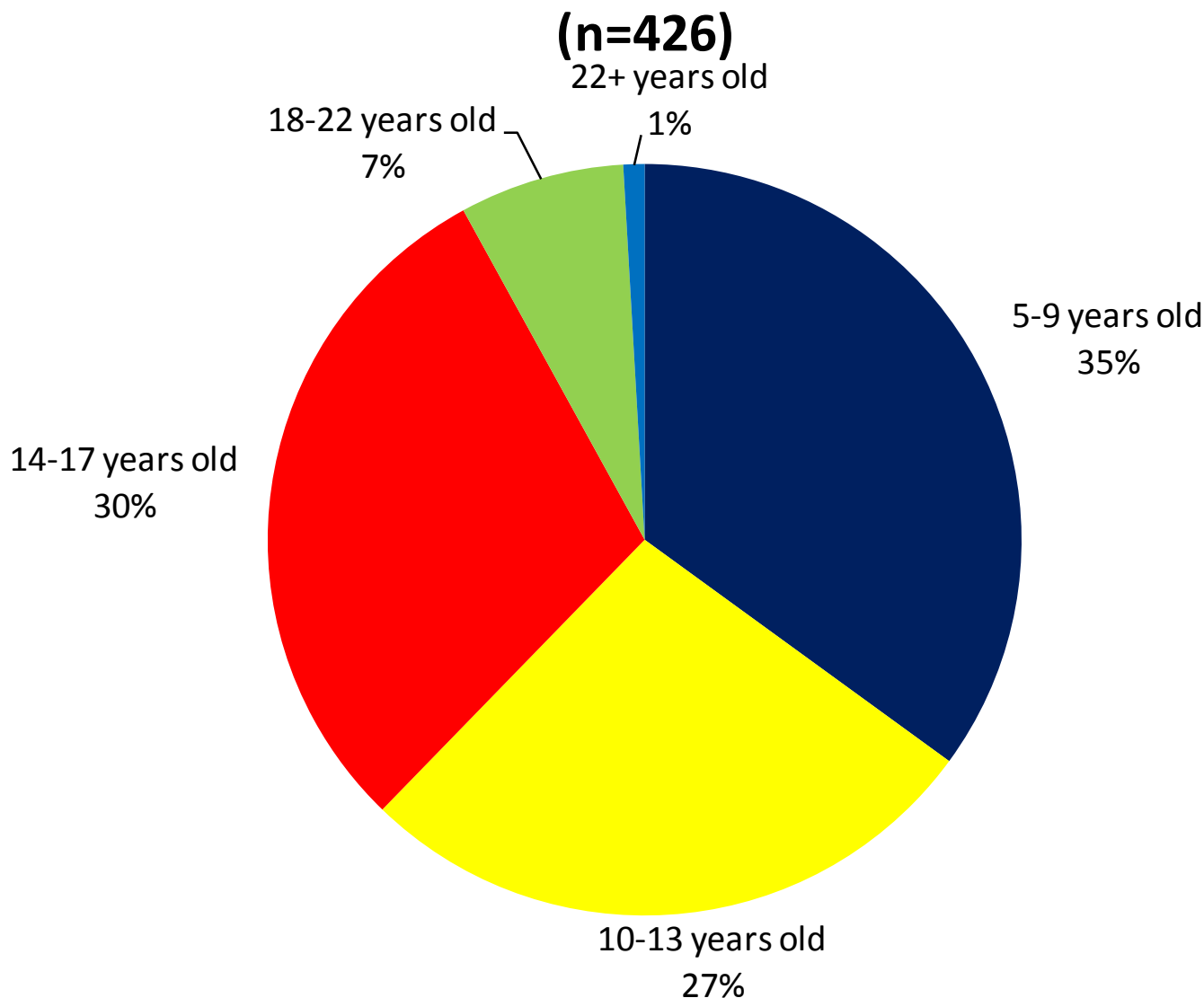alweigel@mit.edu, +1.617.253.1207

April 2010

Generational Poll

- 1981 – 2000: Generation Y / Millennials
- 1965 – 1980: Generation X
- 1946 – 1964: Baby Boomers
- 1926 – 1945: Silent Generation
- 1916 – 1925: Greatest Generation

- **This Millennial generation of engineering students is different:**
  - Expect mobility and frequent change
  - Want to excel and move ahead quickly
  - Value "killer" lifestyle, diversity, friends
  - Assume technology, internet, constant connectivity
  - Multitask fast
  - Institutions are irrelevant
  - Rewrite the rules
  - Optimistic / realistic
  - Nurtured as children
- **If we understand them better, we can design engineering work and organizations that will attract and retain them.**
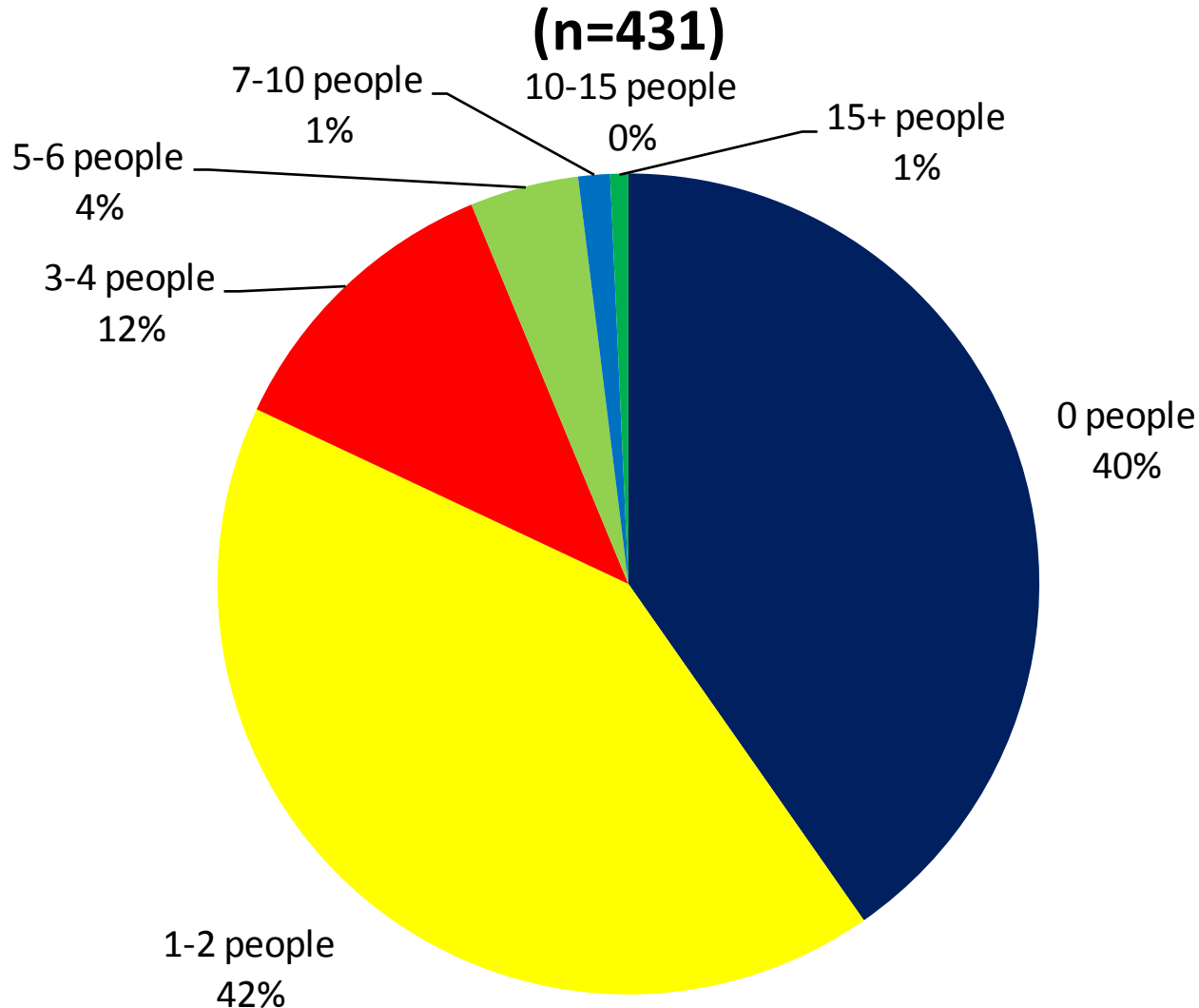
Survey of Aerospace Student Attitudes

- Motivation
  - Replace anecdotes and hand wringing with real data
- Goals
  - Assess student perceptions about their education and the aerospace industry, motivations for studying aerospace, job and career aspirations, and job offers and acceptance
  - Explain why students take job in the aerospace industry
  - Over time, create a true longitudinal data set spanning college and early career stages
- Survey population
  - Sophomores and seniors (or their equivalents) in aerospace engineering
  - Eventually, students 2 and 5 years out from graduation
- Web-based survey takes 30 minutes
- 2009 response characteristics
  - ~600 students from 23 schools participated in spring of 2009
  - 80% male, 20% female
  - 96% US Citizens, 4% foreign nationals
  - 73% caucasian, 27% non-caucasian

- Pre-College Experiences

- College/University Undergraduate Experiences
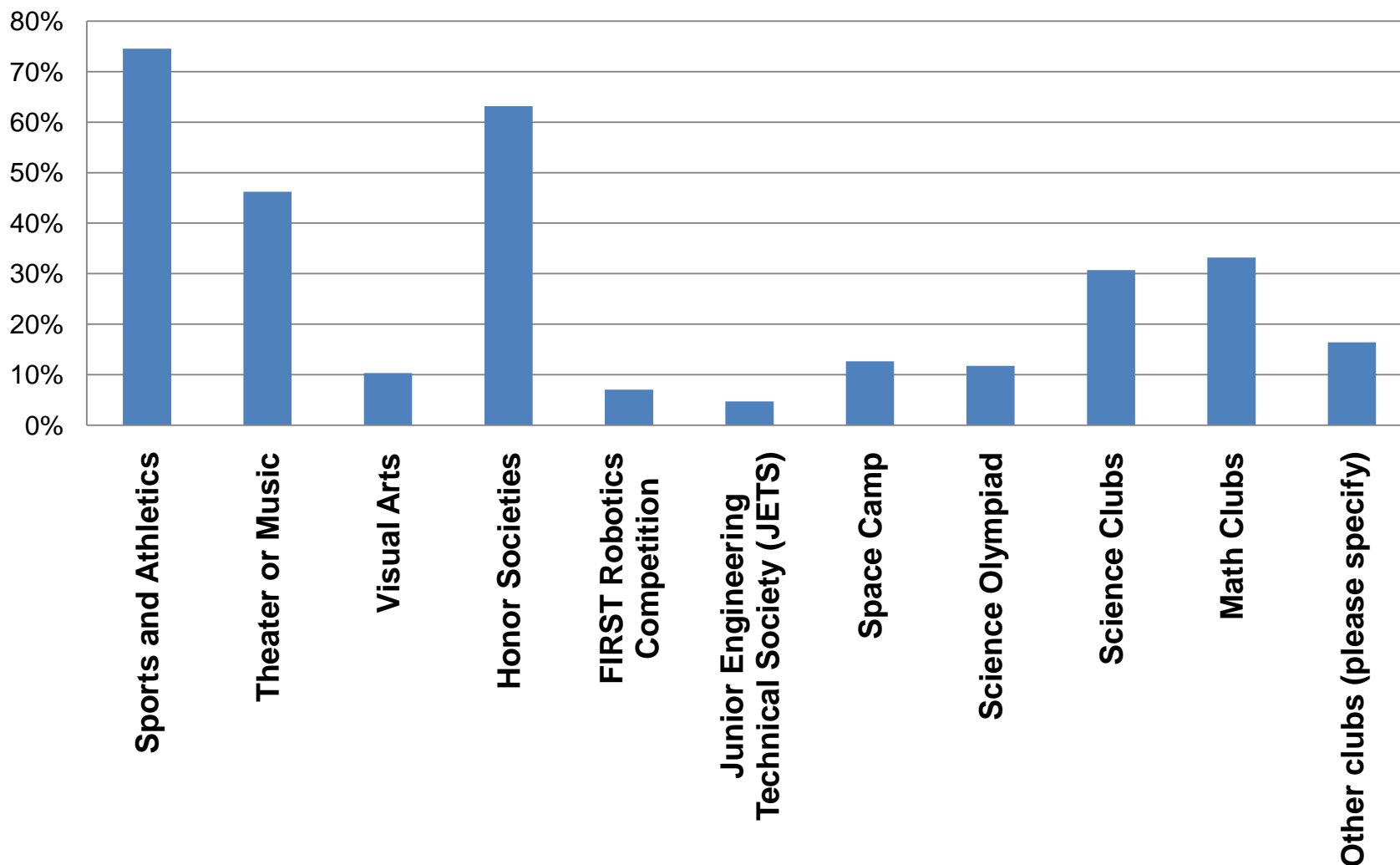
- Job and Career Expectations

Age of Engineering Inspiration

How old were you when you first became interested in aerospace? (n=426)

Pie chart:
- 5-9 years old: 35%
- 10-13 years old: 27%
- 14-17 years old: 30%
- 18-22 years old: 7%
- 22+ years old: 1%

How many family members or close family friends are engineers? (n=431)

Pie chart:
- 7-10 people — 1%
- 10-15 people — 0%
- 15+ people — 1%
- 5-6 people — 4%
- 3-4 people — 12%
- 0 people — 40%
- 1-2 people — 42%

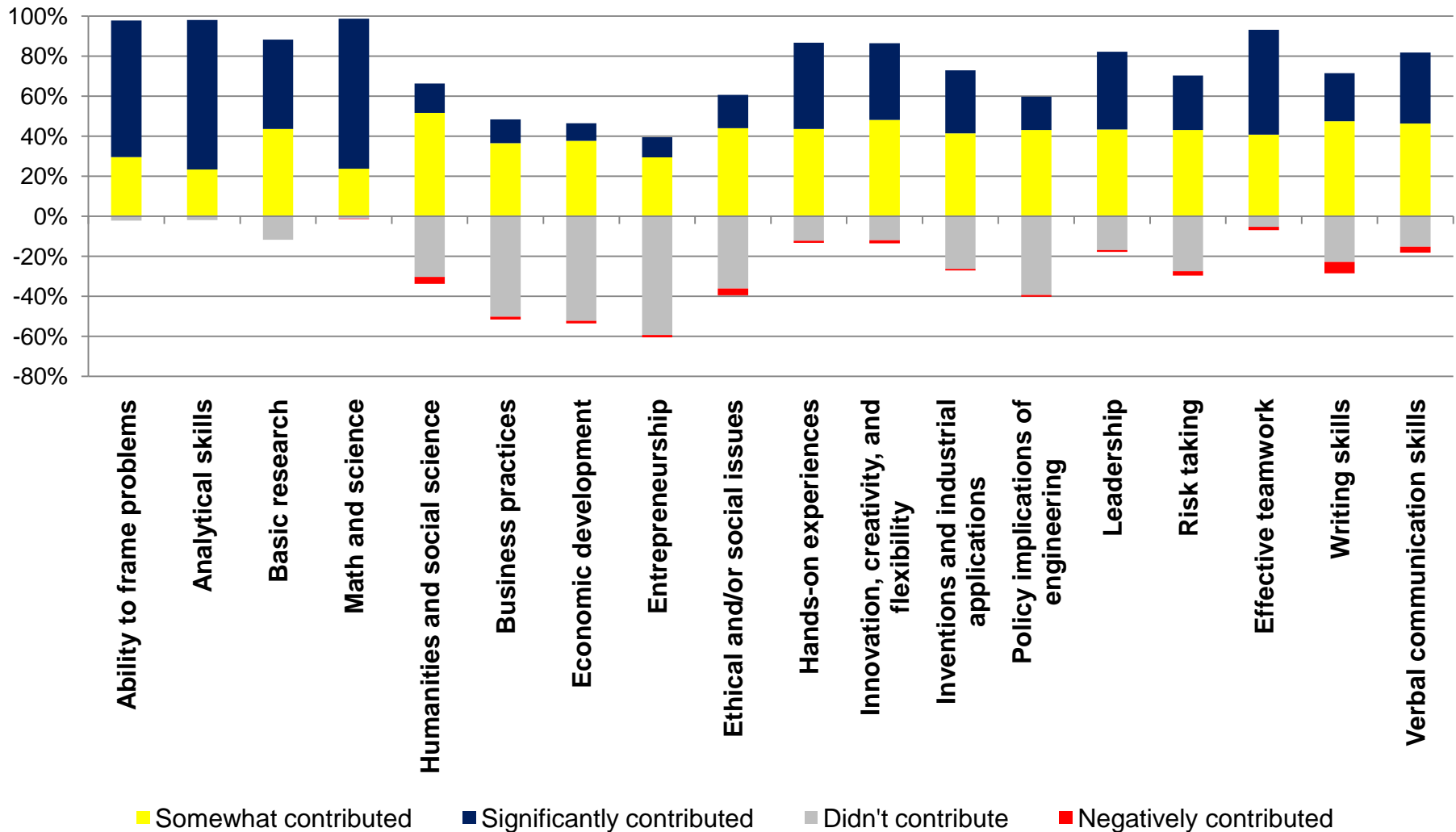# Pre-College Extracurricular Interests

Before applying to college, which activities did you participate in? (check all that apply) (n=554)
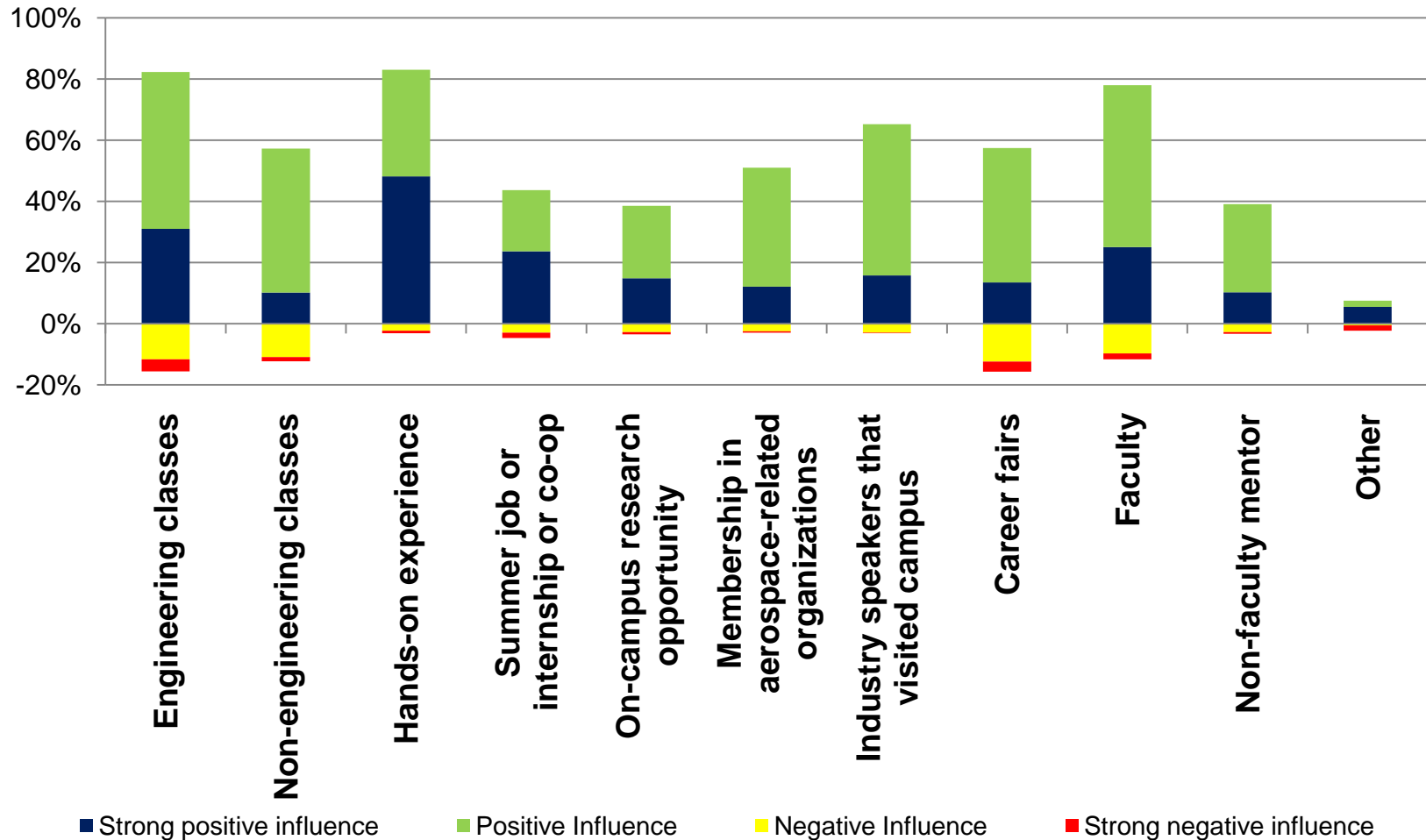
Results Agenda

- Pre-College Experiences

- College/University Undergraduate Experiences

- Job and Career Expectations

How has your college time contributed to your skills and experiences in the following areas?   (n=506)

Legend: ■ Somewhat contributed   ■ Significantly contributed   ■ Didn't contribute   ■ Negatively contributed

University Influences

Please indicate whether each of the following has influenced your desire to work in aerospace: (n=515)

Legend: ■ Strong positive influence   ■ Positive Influence   ■ Negative Influence   ■ Strong negative influence

Categories: Engineering classes, Non-engineering classes, Hands-on experience, Summer job or internship or co-op, On-campus research opportunity, Membership in aerospace-related organizations, Industry speakers that visited campus, Career fairs, Faculty, Non-faculty mentor, Other

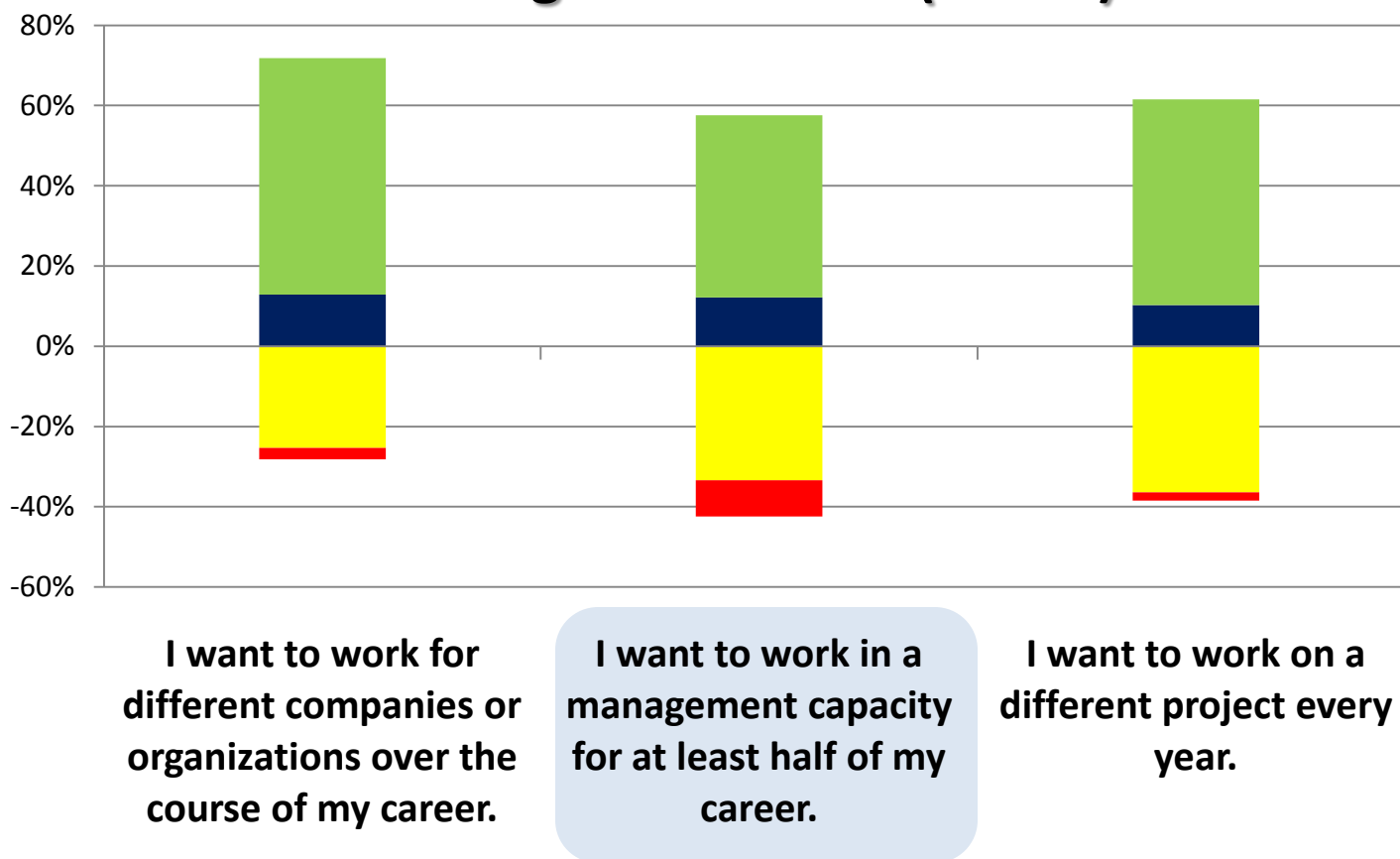- Pre-College Experiences

- College/University Undergraduate Experiences

- Job and Career Expectations

Tenure at First Organization

How long would you expect to stay with the first company / organization you work for after graduation?   (n=480)
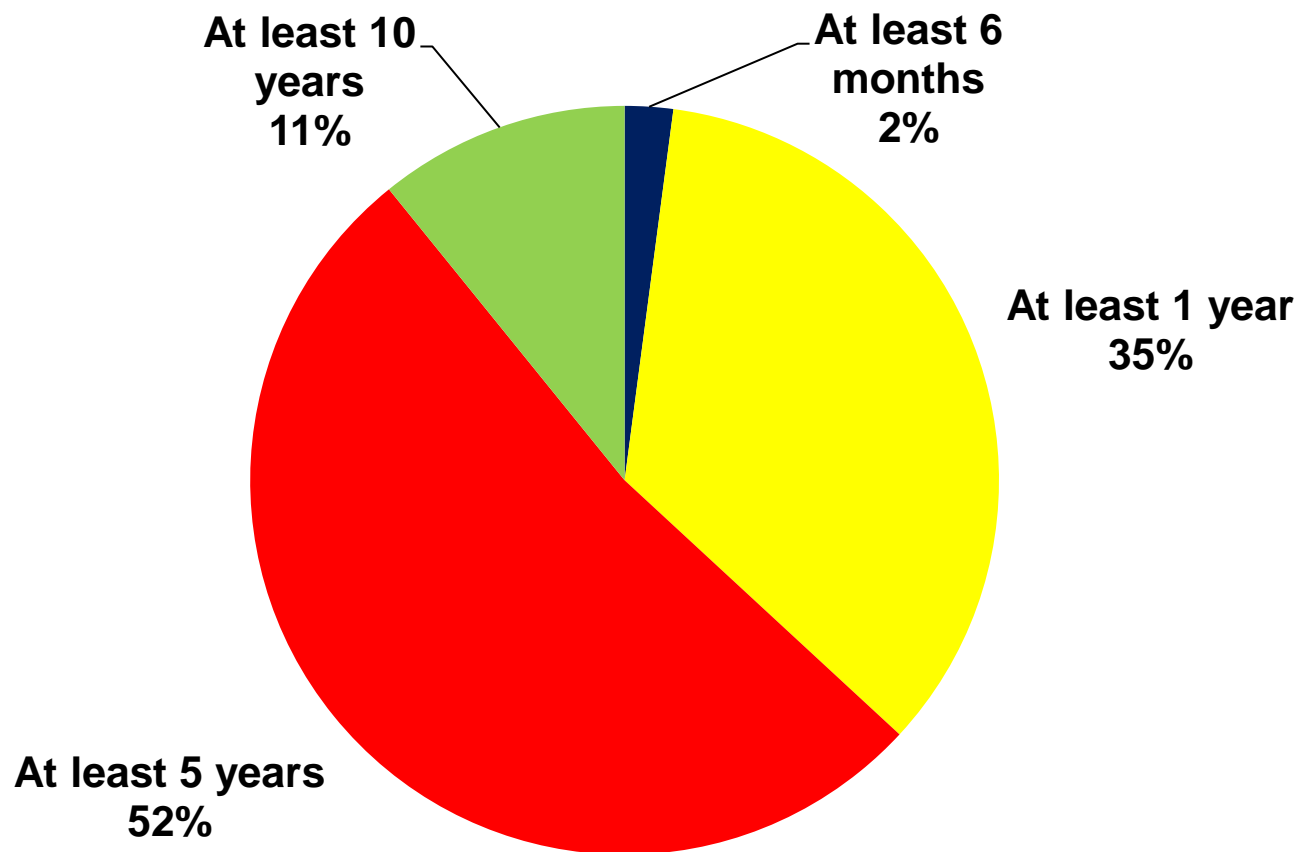
Job Expectations: Variety
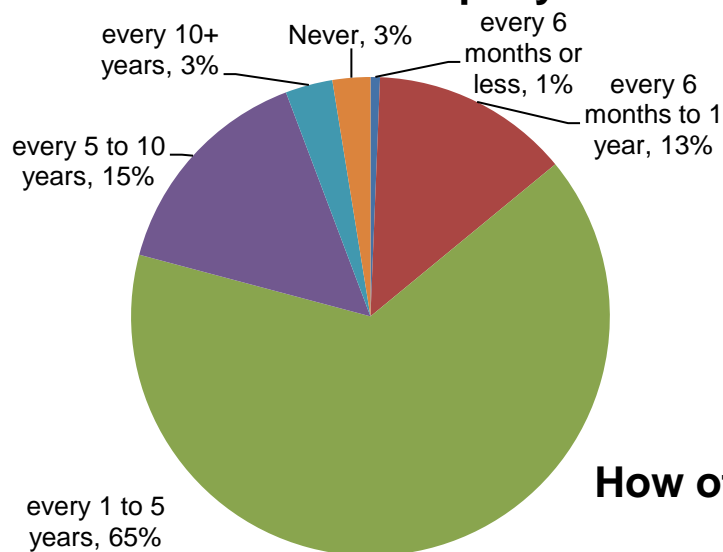

Please indicate how you feel about the following statements: (n=483)

Job Expectations: "Mobility"

How often you will switch jobs in the same company.

- every 10+ years, 3%
- Never, 3%
- every 6 months or less, 1%
- every 6 months to 1 year, 13%
- every 5 to 10 years, 15%
- every 1 to 5 years, 65%

How often you will switch companies in the same career.

- every 6 months or less, 0%
- Never, 7%
- every 6 months to 1 year, 0%
- every 1 to 5 years, 18%
- every 10+ years, 28%
- every 5 to 10 years, 47%
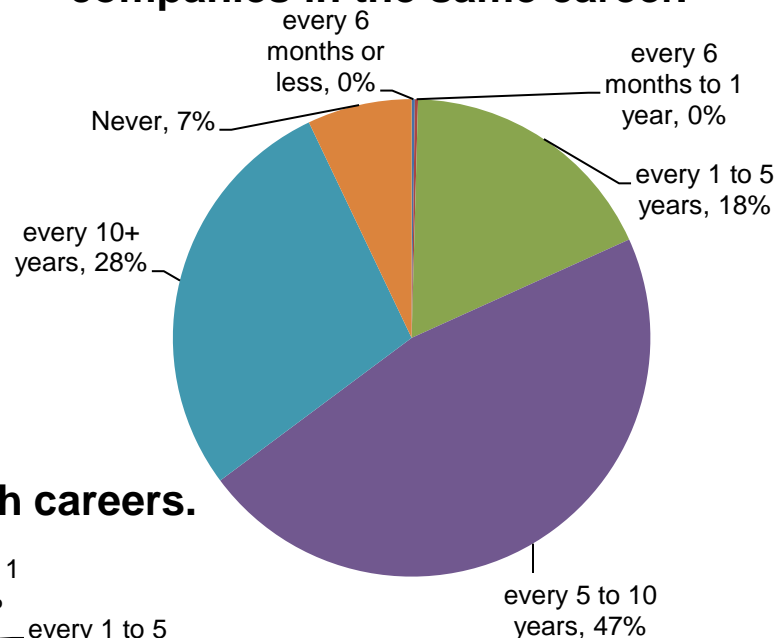
How often you will switch careers.

- every 6 months or less, 1%
- every 6 months to 1 year, 0%
- every 1 to 5 years, 4%
- every 5 to 10 years, 9%
- Never, 55%
- every 10+ years, 31%

Job Expectations: "Moving Up"
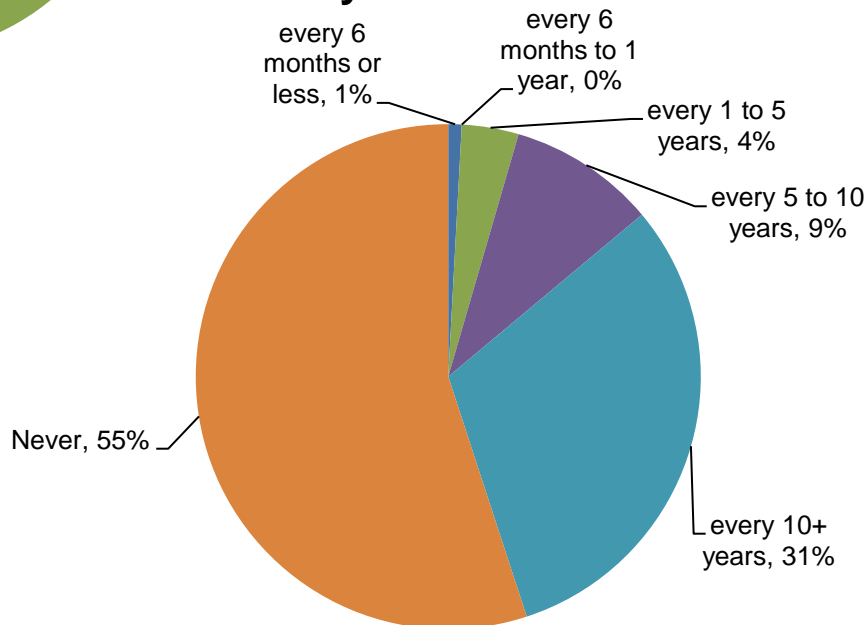
How often you will gain new engineering responsibility.

- every 10+ years, 2%
- Never, 1%
- every 6 months or less, 14%
- every 5 to 10 years, 12%
- every 6 months to 1 year, 32%
- every 1 to 5 years, 39%
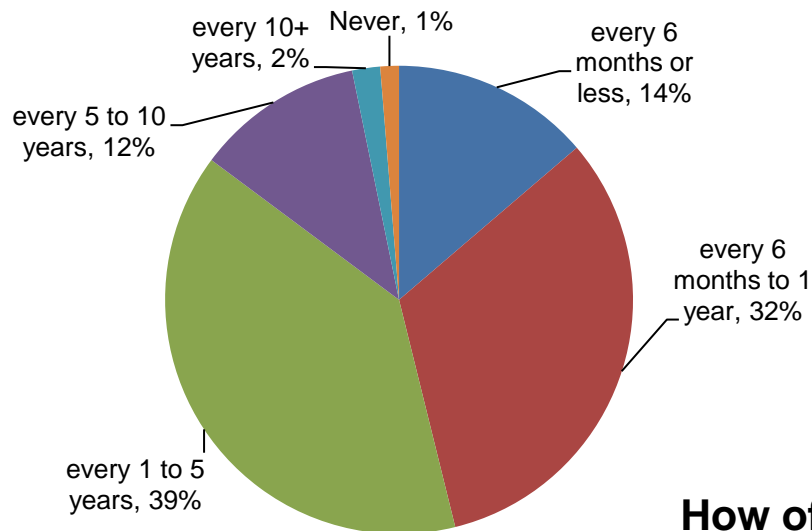
How often you will gain promotions.

- every 10+ years, 2%
- Never, 0%
- every 6 months or less, 2%
- every 5 to 10 years, 13%
- every 6 months to 1 year, 19%
- every 1 to 5 years, 62%
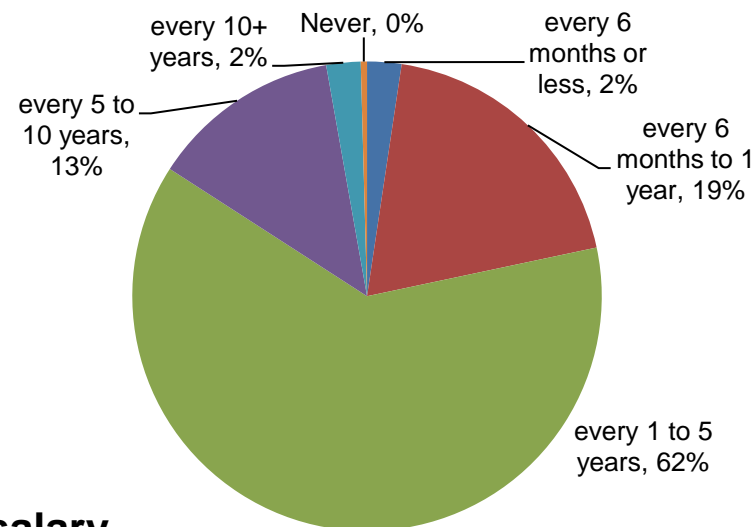
How often you will get salary raises.

- every 10+ years, 1%
- Never, 0%
- every 6 months or less, 4%
- every 5 to 10 years, 9%
- every 6 months to 1 year, 27%
- every 1 to 5 years, 59%

Desired Job Attributes
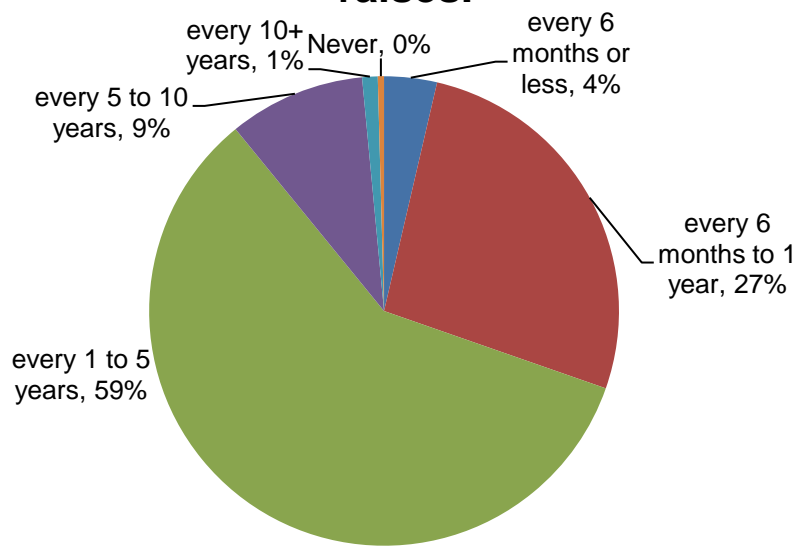
Please rank your top four job attributes. (n=476)

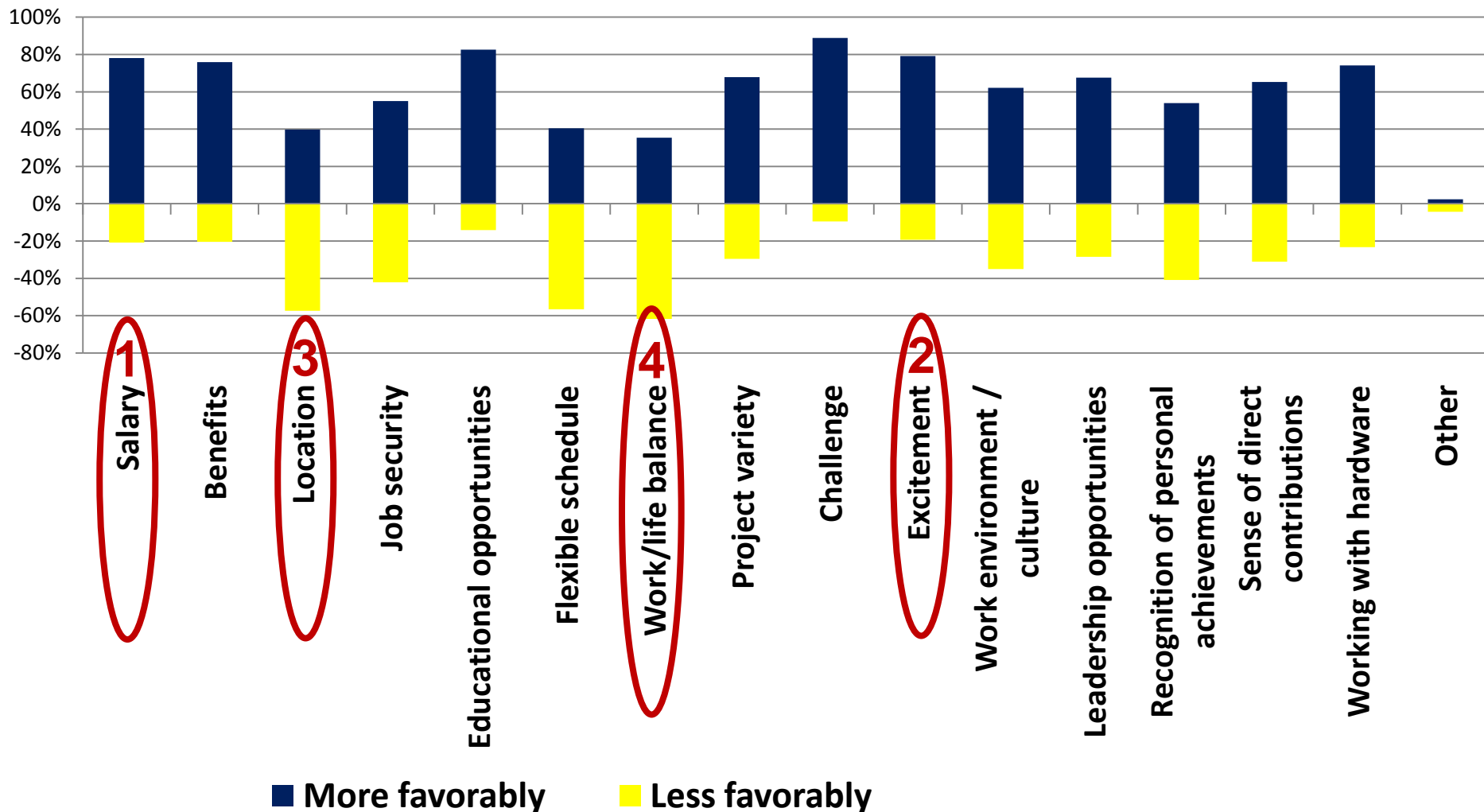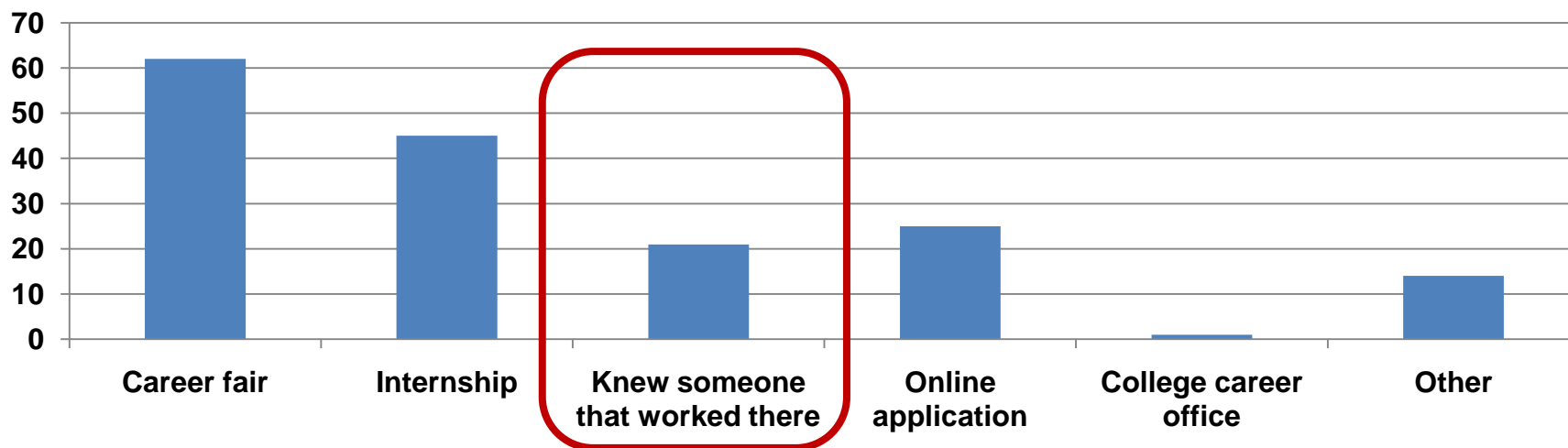Legend: ■ 1st choice ■ 2nd choice ■ 3rd choice ■ 4th choice
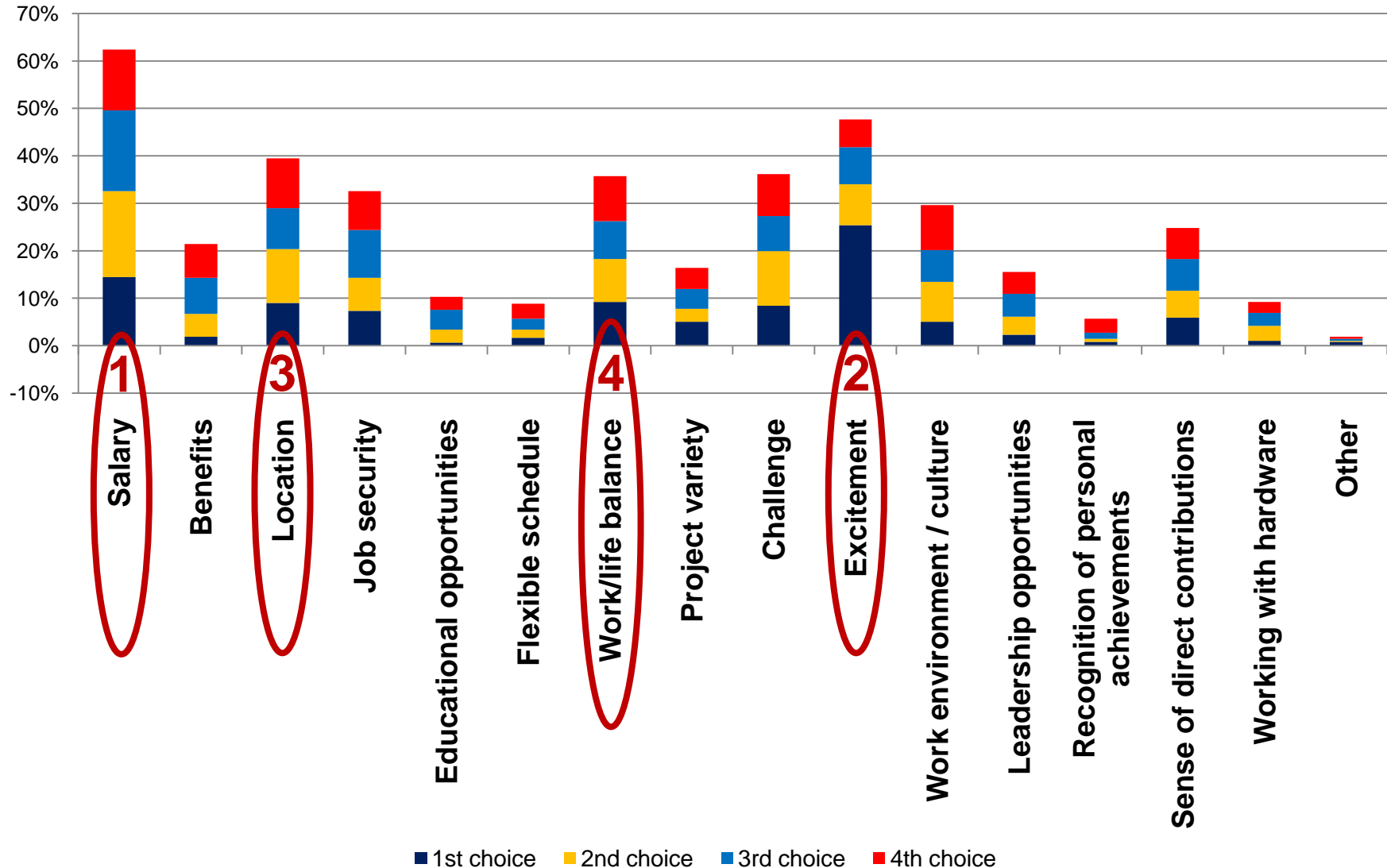
Perception of Aerospace Compared to Other Industries

How does aerospace compare to other industries on the following job attributes? (n=460)

■ More favorably   ■ Less favorably

Contrasting Sources of Jobs

Recruiting Avenues for Aerospace Job Offers (n=74)

Recruiting Avenues for non-Aerospace Job Offers (n=48)
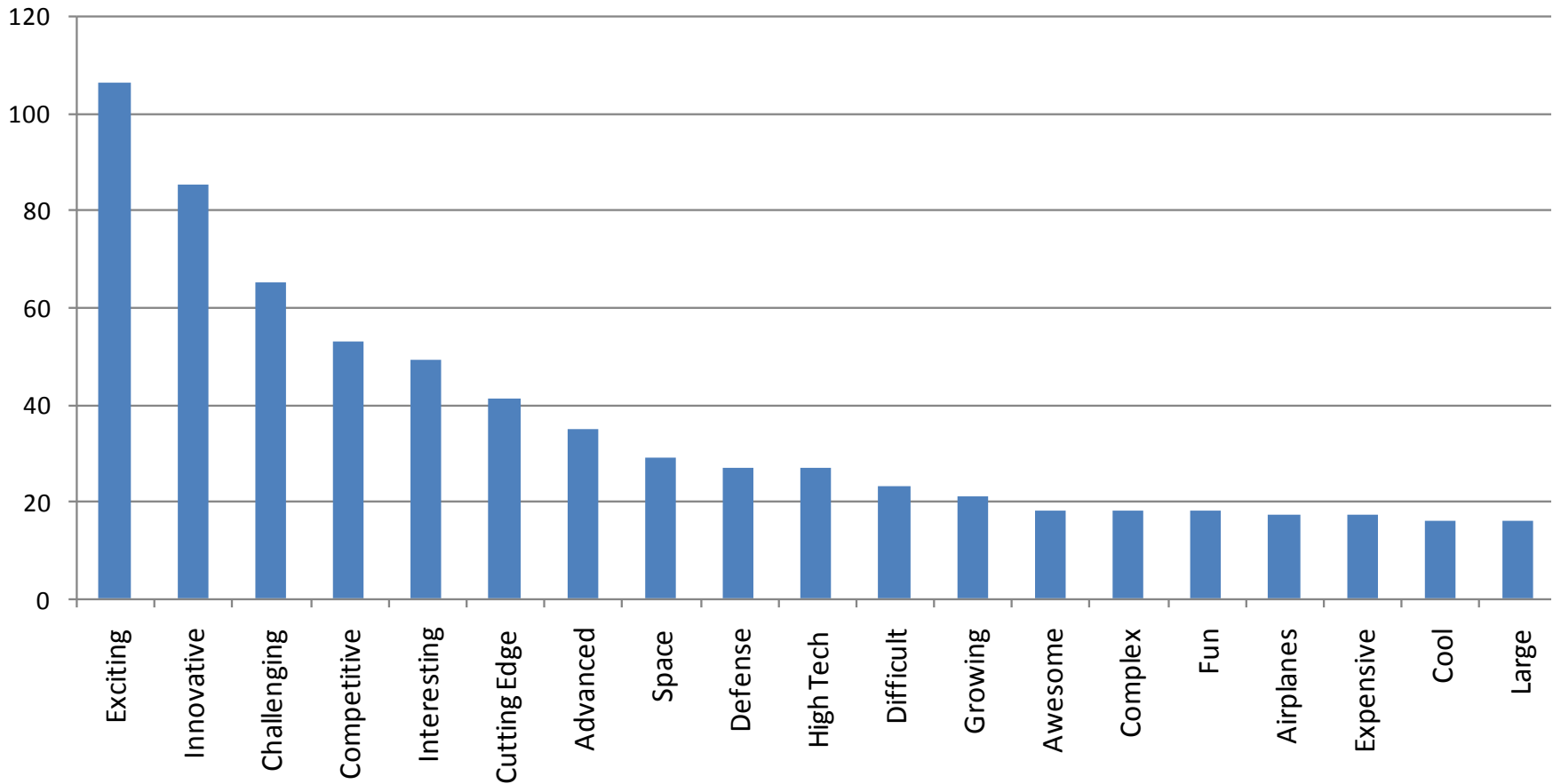
Post-Undergraduate Plans
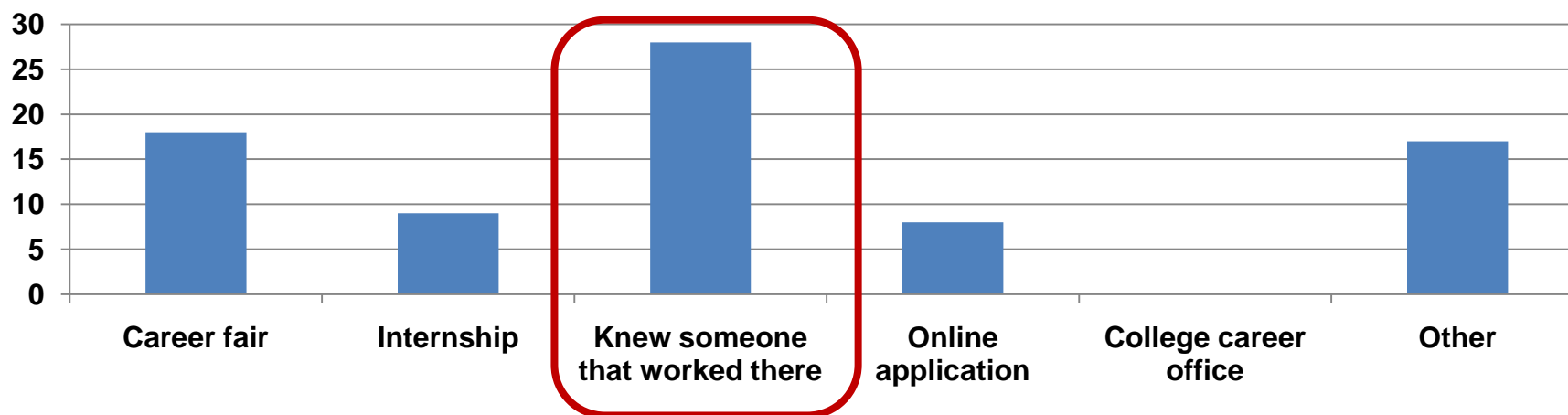
- Of graduating aerospace engineering students
  - 80% took aerospace-related jobs
  - Leadership opportunities, excitement, challenge, benefits were the top four ranked factors for accepting a job outside aerospace
  - Salary, location, challenge, work environment were the top four factors for accepting a job in aerospace
- 56% have seriously considered working outside their major field of study
- 59% desire to go to graduate school

Take Aways

- This Milennial generation of engineering students is different:
  - Expect mobility and frequent change
  - Want to excel and move ahead quickly
  - Value "killer" lifestyle, diversity, friends
  - Assume technology, internet, constant connectivity
  - Multitask fast
  - Institutions are irrelevant
  - Rewrite the rules
  - Optimistic / realistic
  - Nurtured as children
- If we understand them better, we can design engineering work and organizations that will attract and retain them.
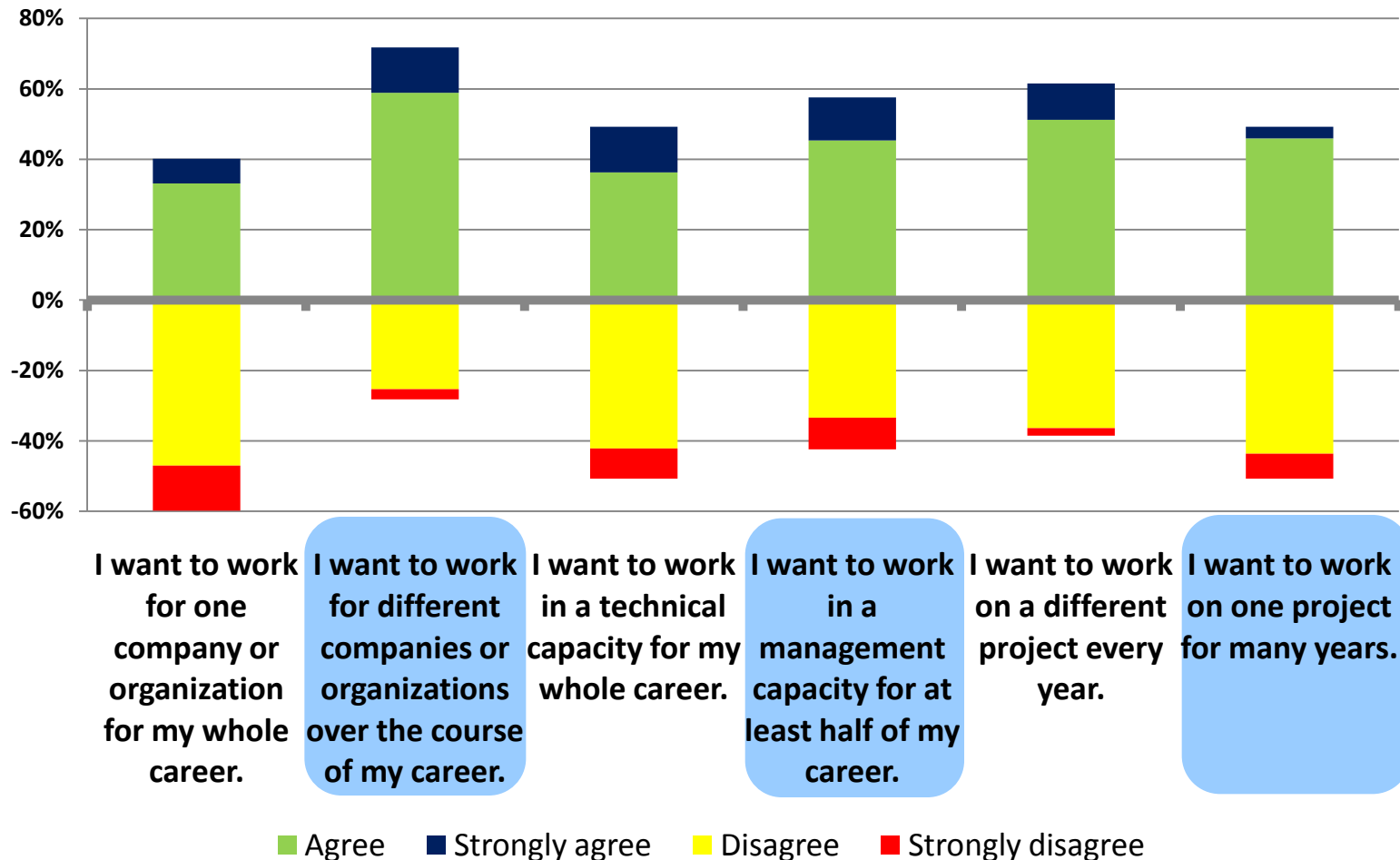
Backups

Survey Observations

- Aerospace engineering sophomore and senior students
  - 78% see themselves entering the aerospace industry upon graduation, and 78% see themselves as likely or highly likely to remain in the aerospace industry for their whole career

  - Over 70% want to work for more than one company/organization over the course of their career

  - Almost 60% want to work in a management capacity for at least half their career

  - Over 60% want to work on more than one project each year

  - 45% expect to gain new engineering responsibility at least every year

  - 45% expect to switch careers at least every 10 years

Aerospace is Exciting…Literally!

Using the first one, two, or three words that come to mind, how would you describe the aerospace industry? (n=528)

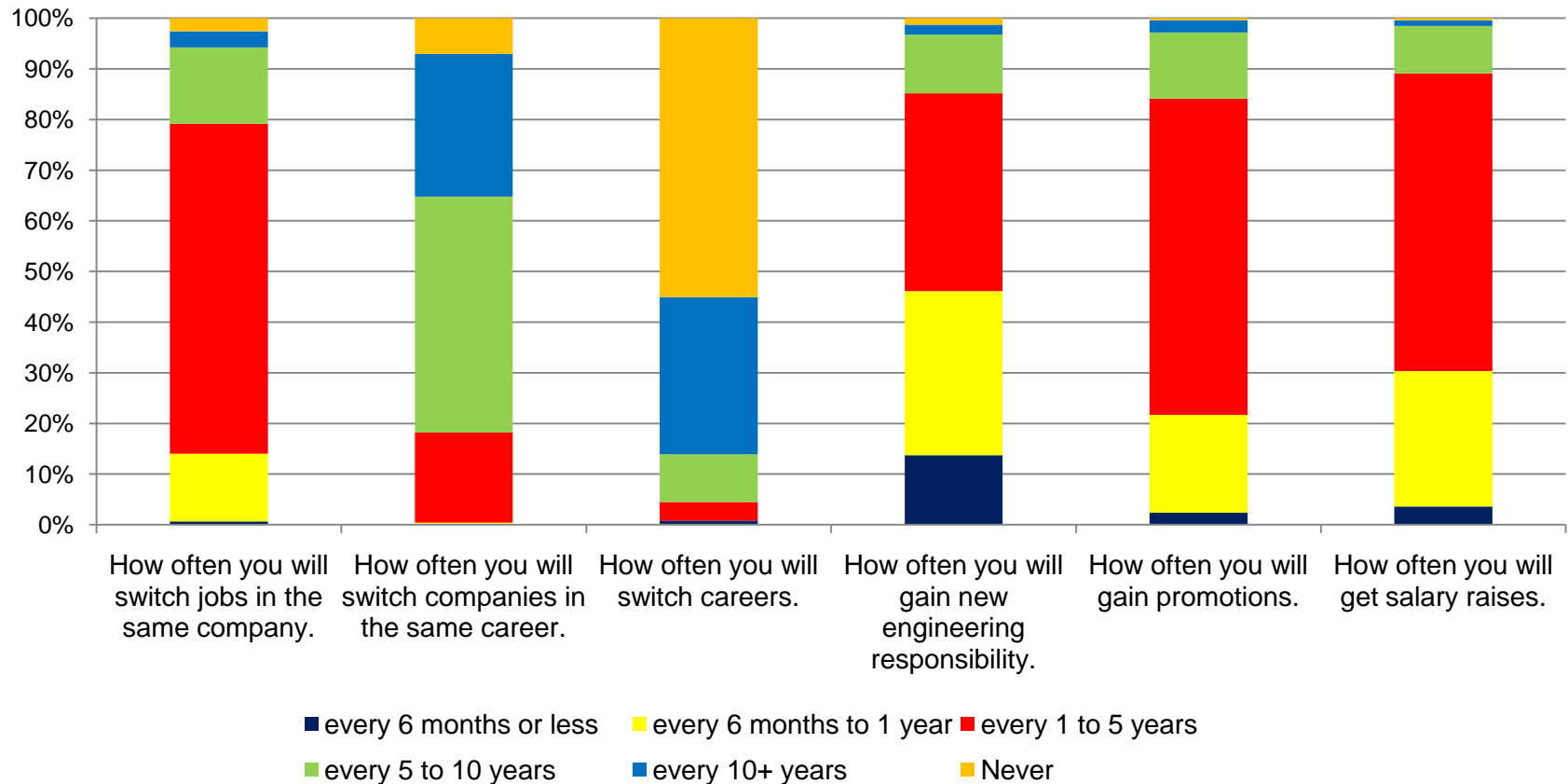# Mobility, Job Focus, Project Diversity

Please indicate how you feel about the following statements: (n=483)

Legend: Agree (green), Strongly agree (dark blue), Disagree (yellow), Strongly disagree (red)

Statements:
- I want to work for one company or organization for my whole career.
- I want to work for different companies or organizations over the course of my career.
- I want to work in a technical capacity for my whole career.
- I want to work in a management capacity for at least half of my career.
- I want to work on a different project every year.
- I want to work on one project for many years.

- Data gathered in 6 areas
  - Initial interests in aerospace (pre-college)
  - College experiences
  - Career expectations
  - Desired job attributes
  - Perception of aerospace industry
  - Demographics
- Survey population
  - Sophomores and seniors (or their equivalents)
  - Eventually, students 2 and 5 years out from graduation
- Web-based survey takes 30 minutes
- 2009 response characteristics
  - ~600 students from 23 schools participated in spring of 2009
  - 80% male, 20% female
  - 96% US Citizens, 4% foreign nationals
  - 73% caucasian, 27% non-caucasian

- 27% are the first in their family to go to a 4-year college
- 56% have seriously considered working outside their major field of study
- 59% desire to go to graduate school, 19% do not wish to pursue graduate school, balance are undecided