



Society of Allied Weight Engineers, Incorporated

Aerospace • Marine • Offshore • Land Vehicle • Allied Industries

The Health of Mass Properties Engineering In Aerospace, Marine, Offshore, Land Vehicles and Allied Industries

*Results of a 2018 Industry Survey by
the Society of Allied Weight Engineers*



Background

- At the 2016 SAWE International Conference, President – elect Bill Boze gave a presentation entitled:
 - “The Mass Properties Discipline - Risk and Opportunity”
 - *Based on published material mostly over a decade old*
 - *To validate the observations based on dated material, a new survey was recommended to accurately assess the Mass Properties Engineering Discipline*
- In December 2017, the SAWE developed a survey and invited all members to participate via blog and email blasts
 - *All recipients were encouraged to distribute the survey to non-member colleagues serving the mass properties discipline*
 - *The ultimate objective was to stimulate increased collaboration between Academia, SAWE Company Members and Corporate Partners, society members, and the SAWE Executive Board towards a common objective in addressing the current risk and opportunities.*



Objective

- Results of the survey were presented and documented in a comprehensive 80+ page published paper
 - *SAWE Paper No. 3699, The Health of Mass Properties Engineering in Aerospace, Marine, Offshore, Land Vehicles and Allied Industries by Clint Stephenson and William Boze at 77th International Conference*
- This presentation summarizes the survey's major findings
- The SAWE Board of Directors encourages members to schedule and participate in a SAWE chapter meeting with the survey as the topic for presentation and discussion
- Recommendations on how to increase collaboration towards addressing the risks and opportunities are requested by the Executive Vice President from each chapter



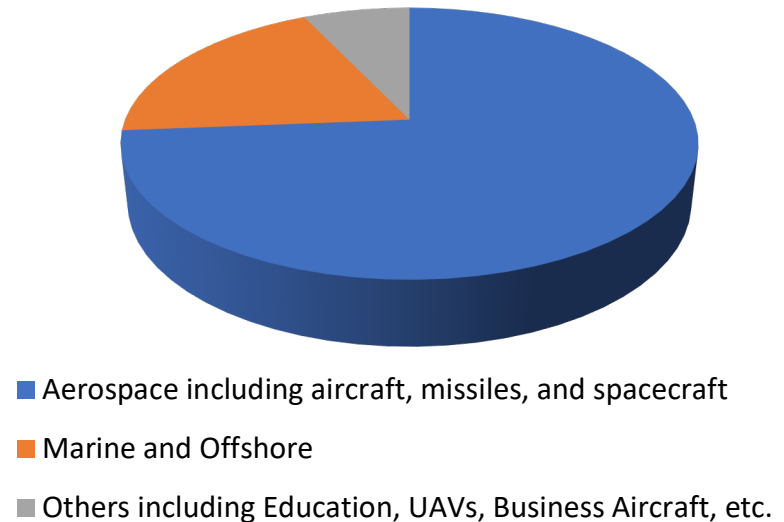
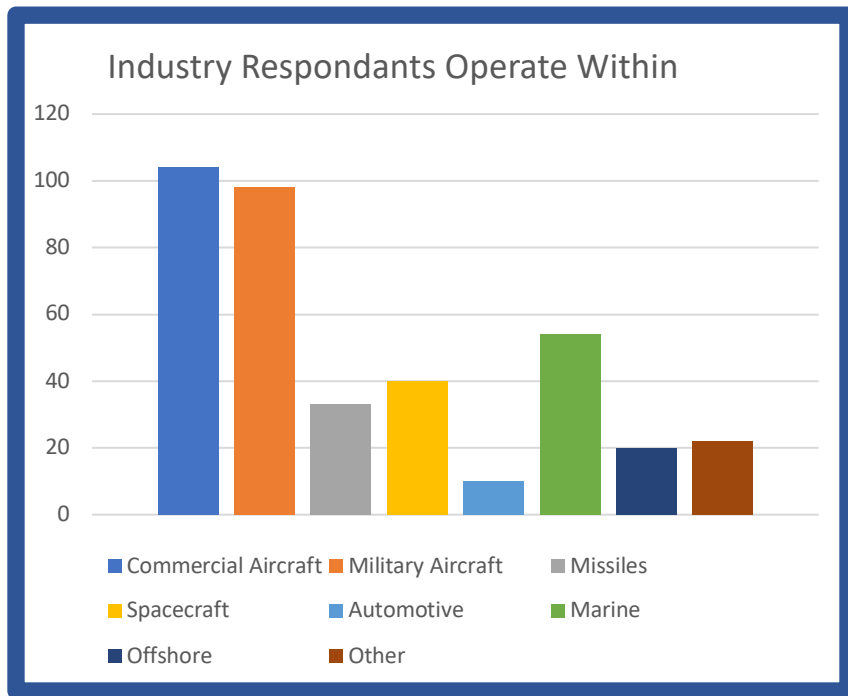
Survey

- Survey comprised of 26 questions including multiple choice, rating, and narrative responses
- Questions addressed areas such as:
 - *Organizational construct*
 - *Value of Mass Properties Engineering*
 - *Knowledge transfer*
 - *Demographics*
 - *Risks*
 - *Opportunities*
- 295 responses to the survey were received ... **48%** response!



Who do MPEs work for ?

- In what industries do Mass Properties Engineers Operate?

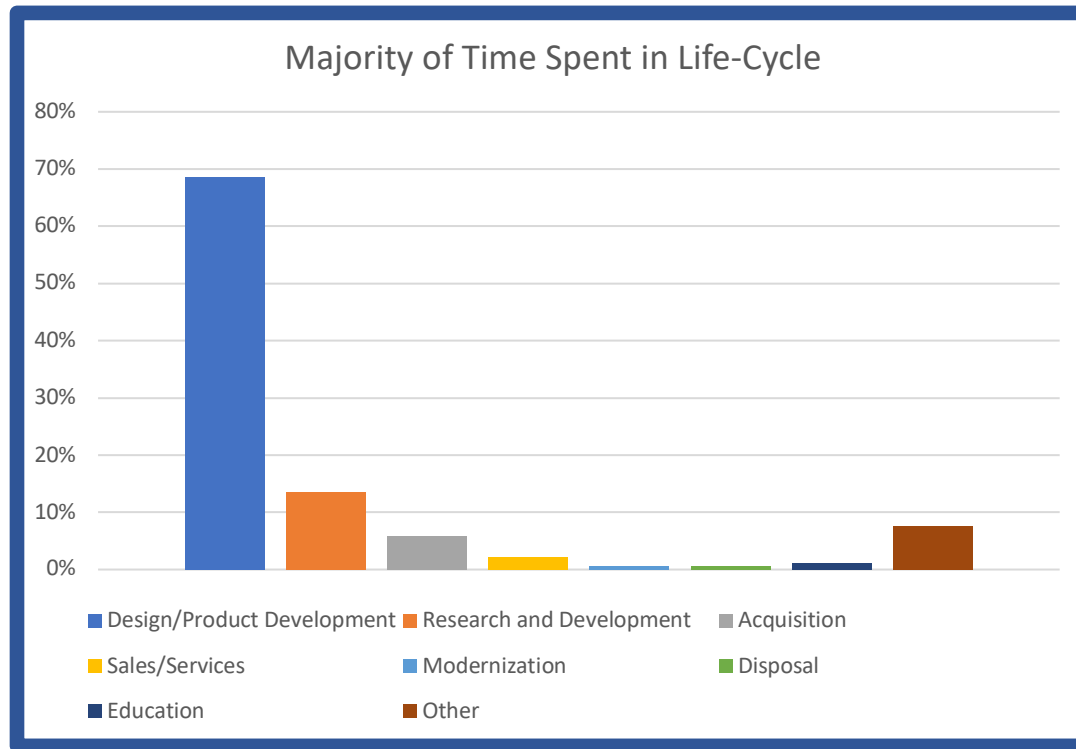


Military and commercial aircraft employ the greatest number of MPEs followed by marine industry



Where does MPE fit into the overall picture?

- Where in a product lifecycle do respondents spend their time?

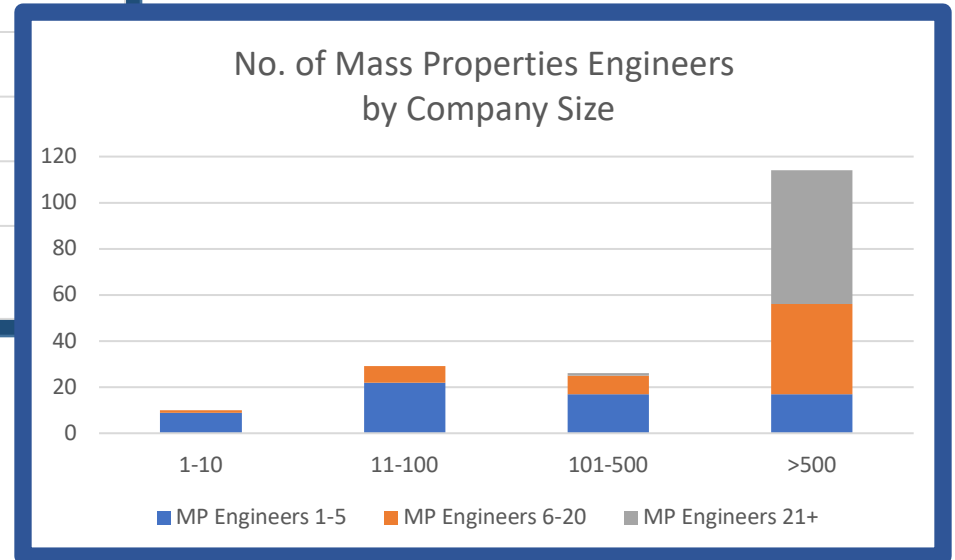
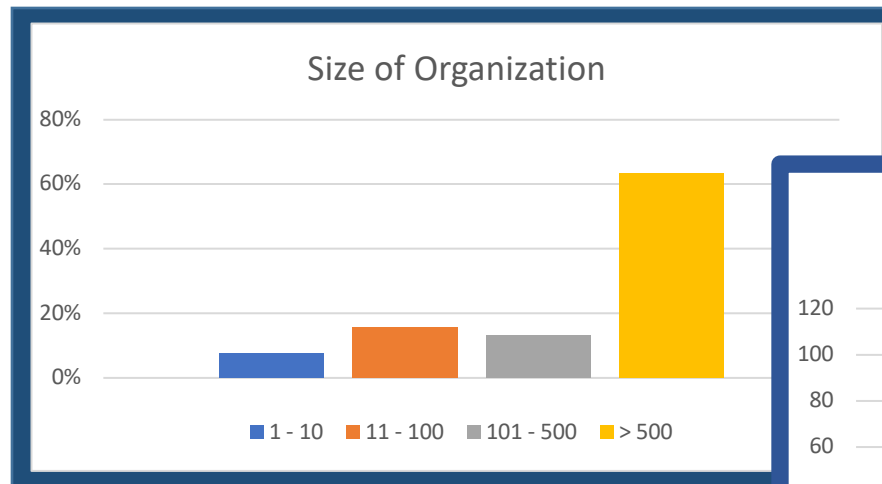


Majority (nearly 90%) of all responding MPEs support product acquisition



Size of Organization vs. Number of MPEs

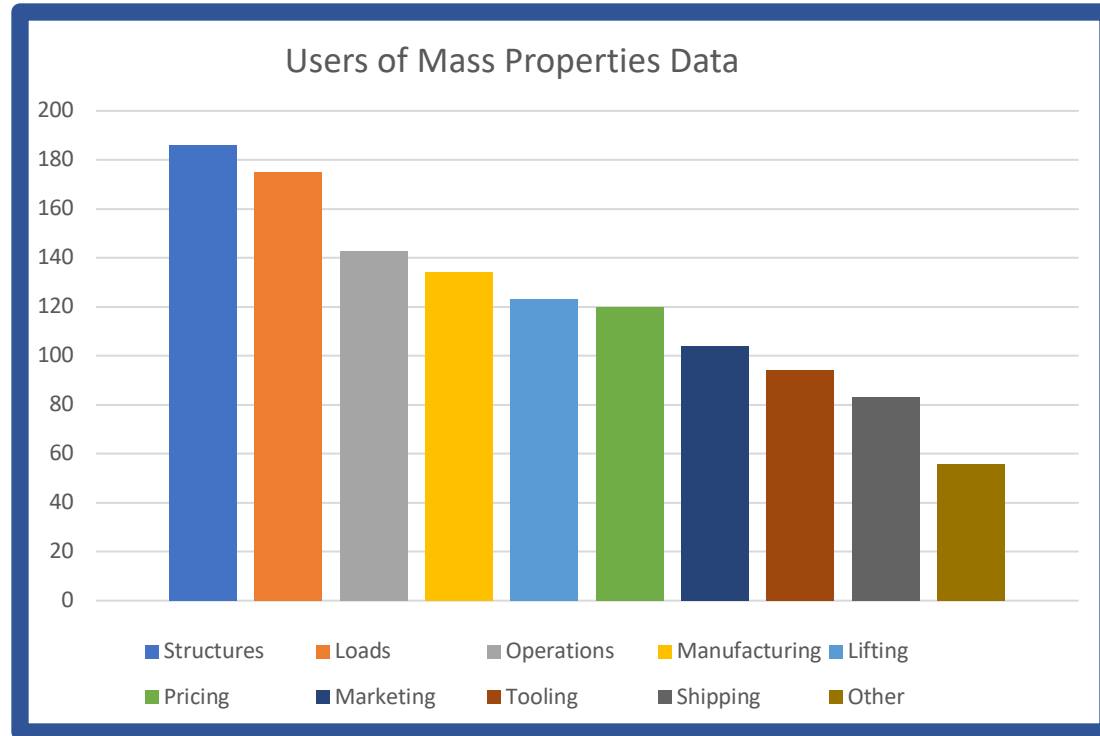
- How large is your organization and how many people are in MPE?





Customers of MPE

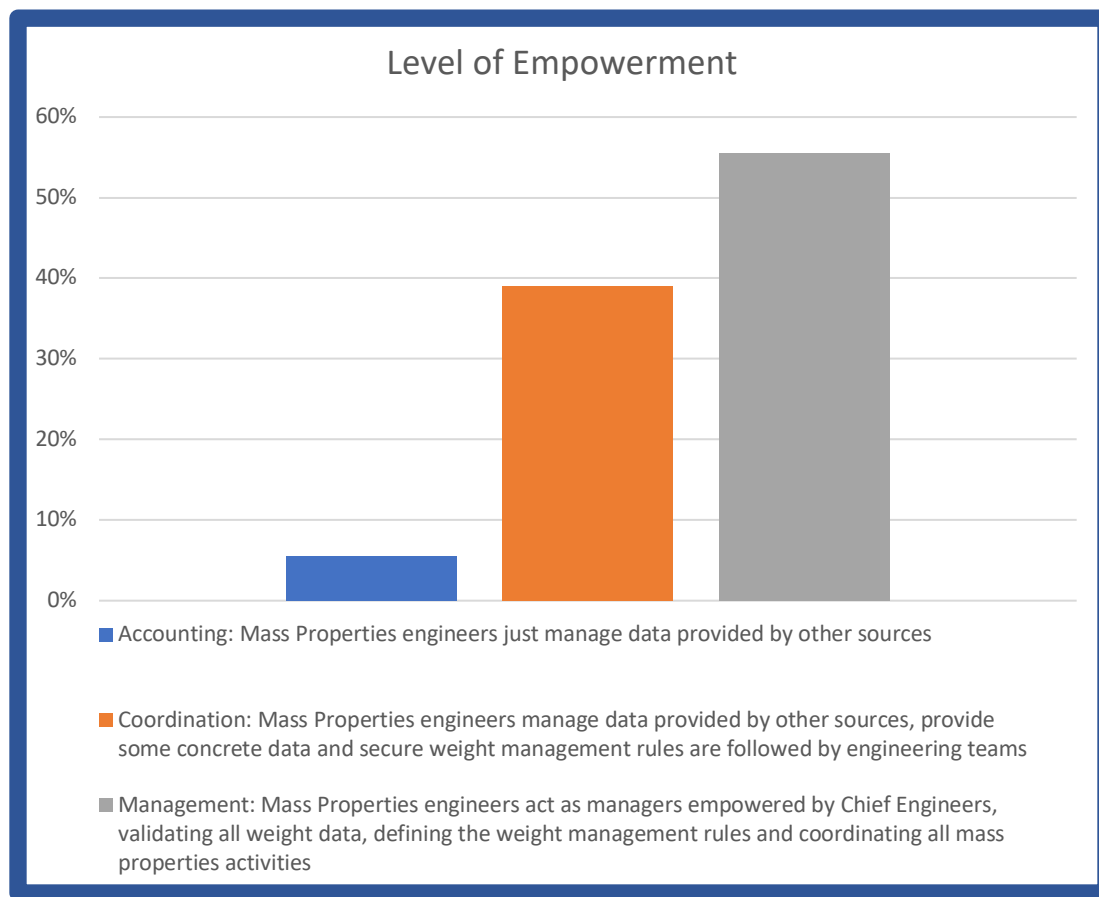
- Who are the customers for MPE products?



Customers of MPE are many; Structures and Loads are greatest but many others strongly rely on MP products



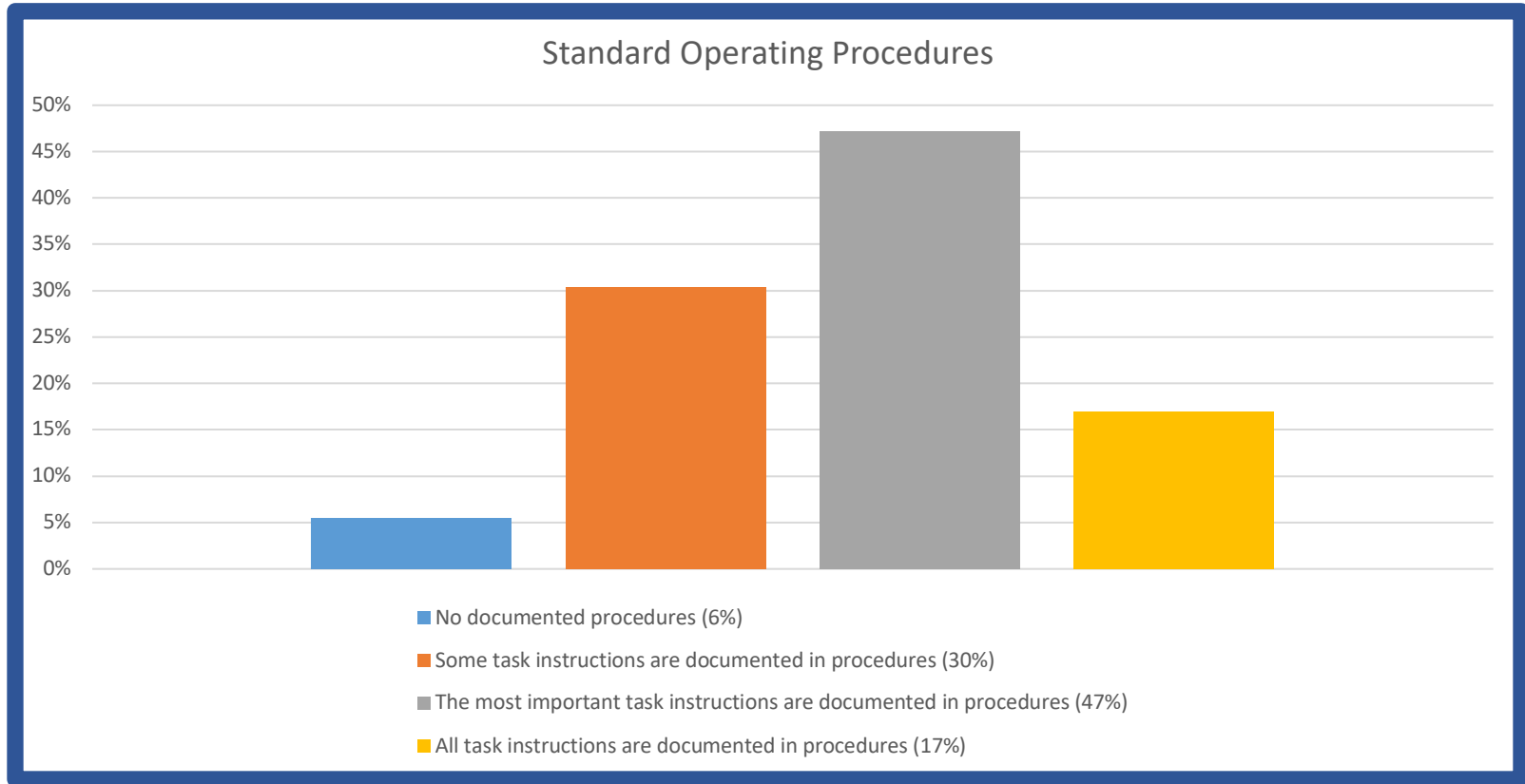
How much responsibility do MPEs have?



Very few MPEs are “bean counters” or accountants



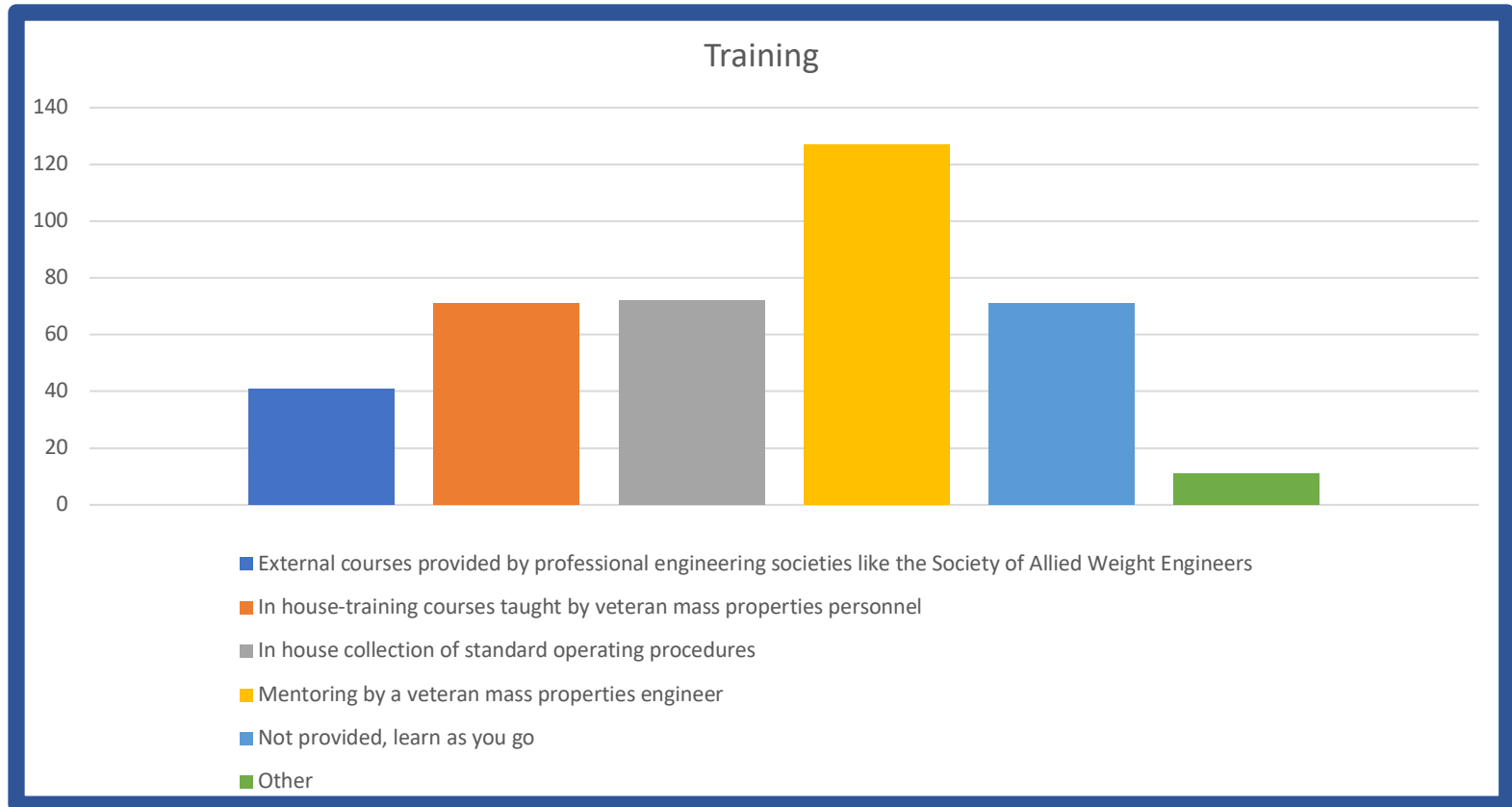
Knowledge Transfer



Only 17% of respondents report having complete documentation of MPE practices



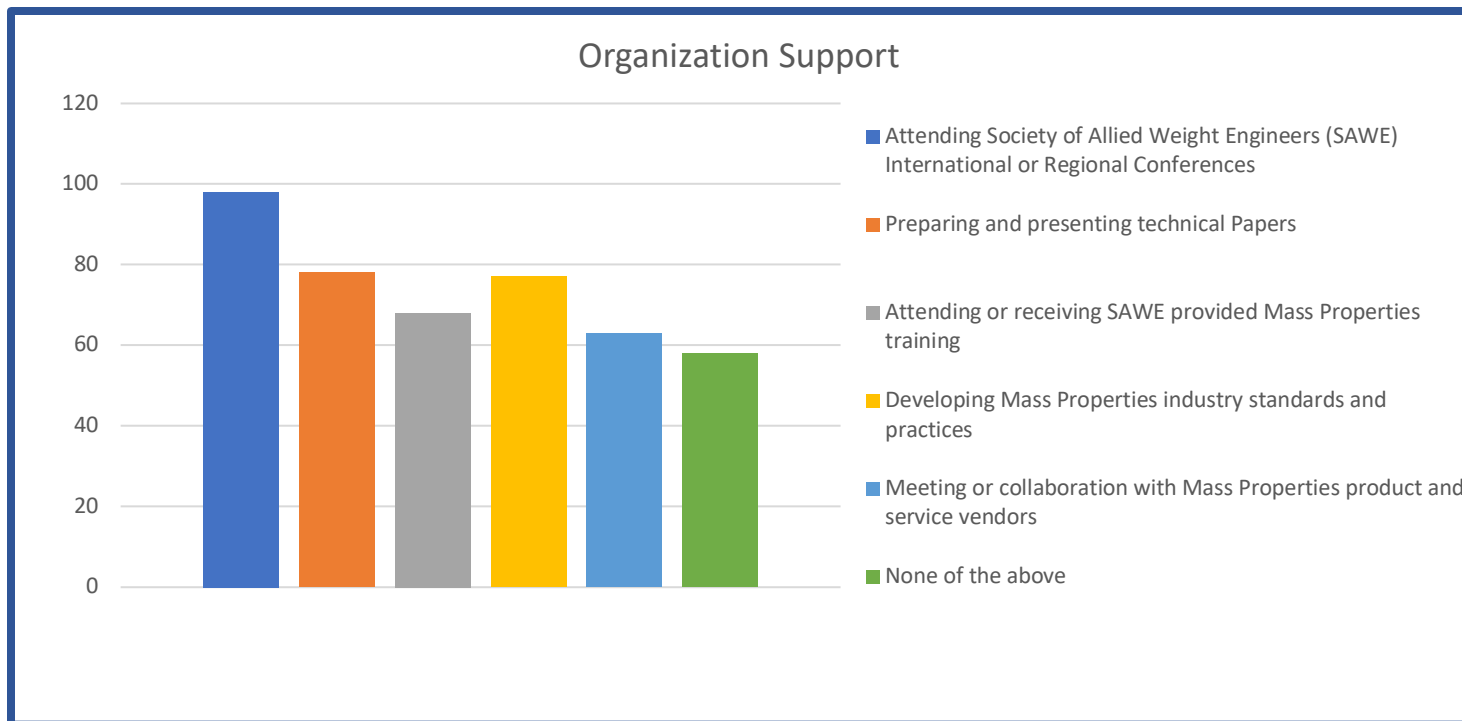
Training



Mentoring is the most common means of training



What support do employers provide?



Respondent comment: *“Loss of experience and lack of support from program offices have degraded all weight control efforts at my organization. Since participation with professional societies is no longer encouraged, I don't think SAWE standards will be supported in the future and we will likely go back to MIL-STDs and support for the SAWE will cease. I am not sure this unfortunate trend is reversible.”*



Risks

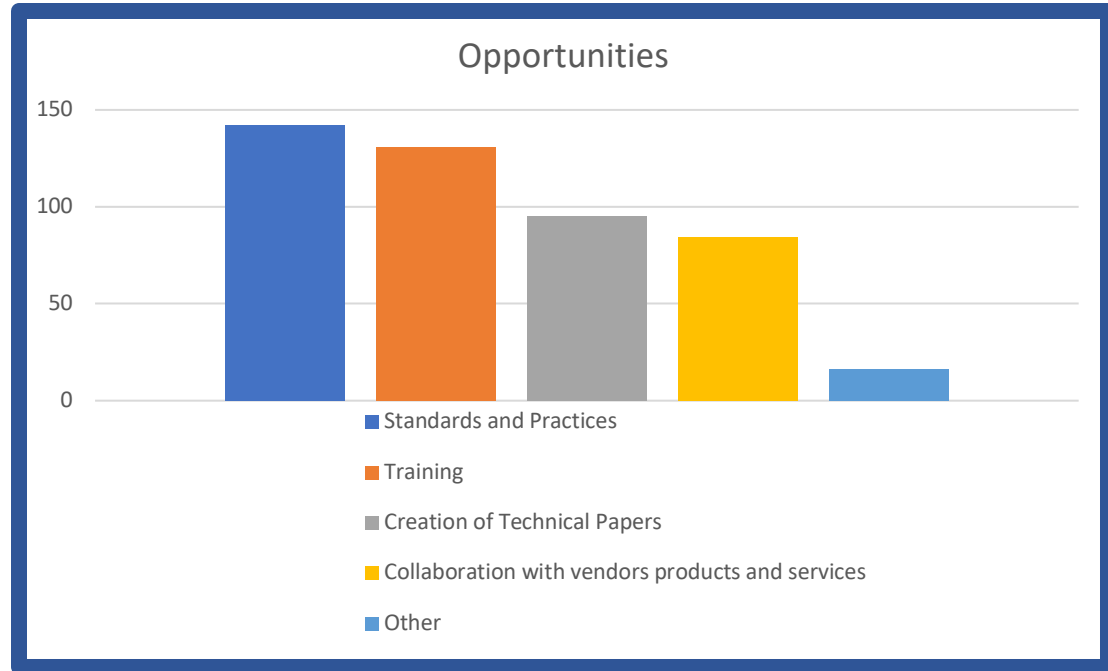
- Consequence of inadequate Mass Properties Engineering include:
 - ***Extensive and costly vehicle redesign and/or modification***
 - ***Program or order cancellation***
 - ***Reduced operational capability***
 - ***Wrecked or damaged vehicles***
 - ***Loss of life***

The likelihood continues into the 21st Century as revealed in worldwide news reports



Opportunities for Strengthening MP

SAWE's top area for support of MPE improvement is Standards and Practices



The top areas in which MPEs can personally enhance their value are:

- Improve communication with management about how MPE is critical to satisfy contractual obligations***
- Take better opportunity to collaborate with other MPEs in Government, other industries, vendors, etc.***

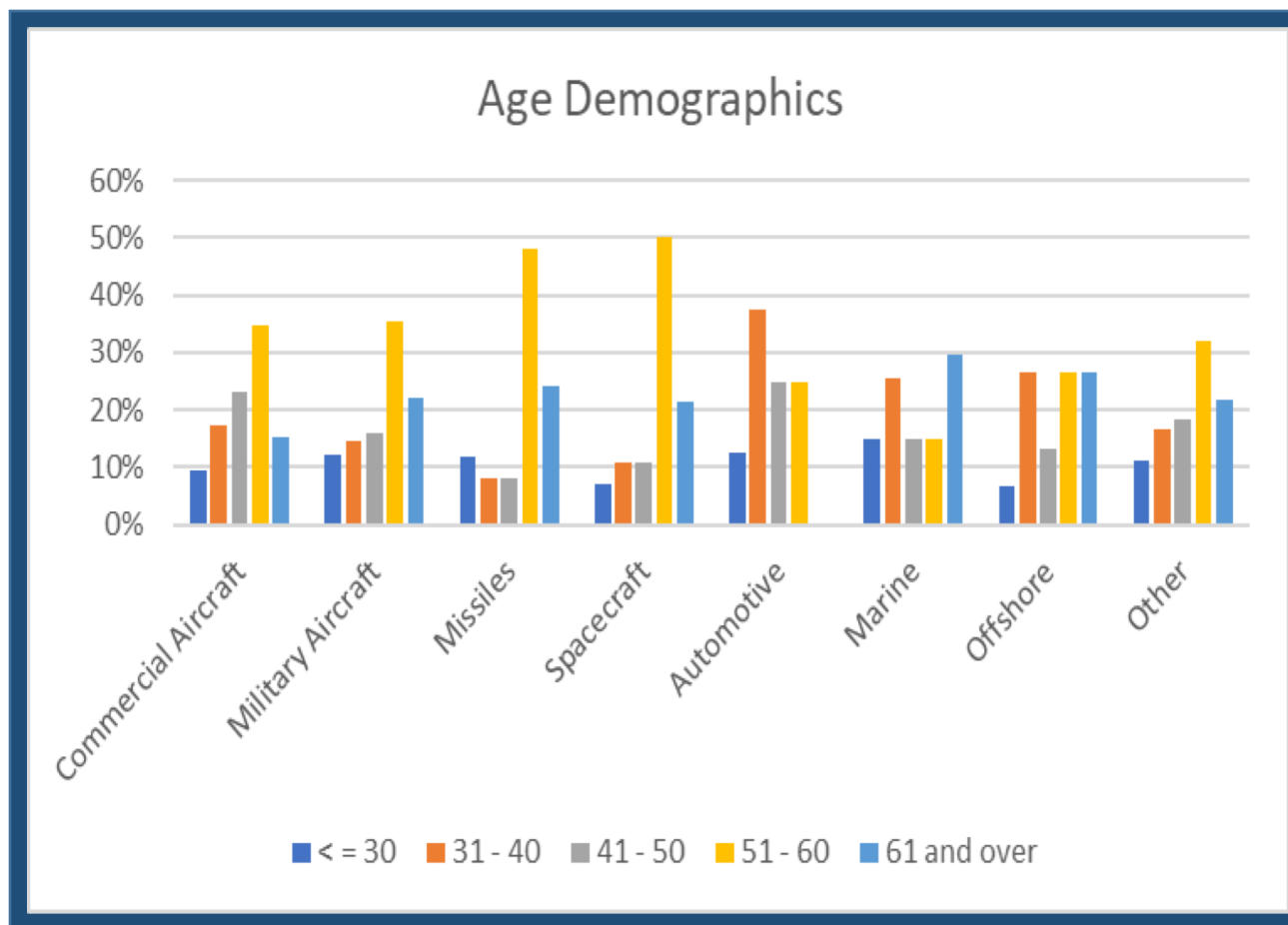


Demographics of Mass Properties Engineers

- **Education** - *MPEs tend to be well educated*
 - 41 % of respondents have a Bachelors Degree
 - Another 35% have a Masters Degree
- **Experience** - *MPEs are experienced*
 - Nearly half of all respondents have at least 21 years experience
- **Age** - *More than half of all MPEs are over 50*
 - 54% of respondents are 51 years old or more

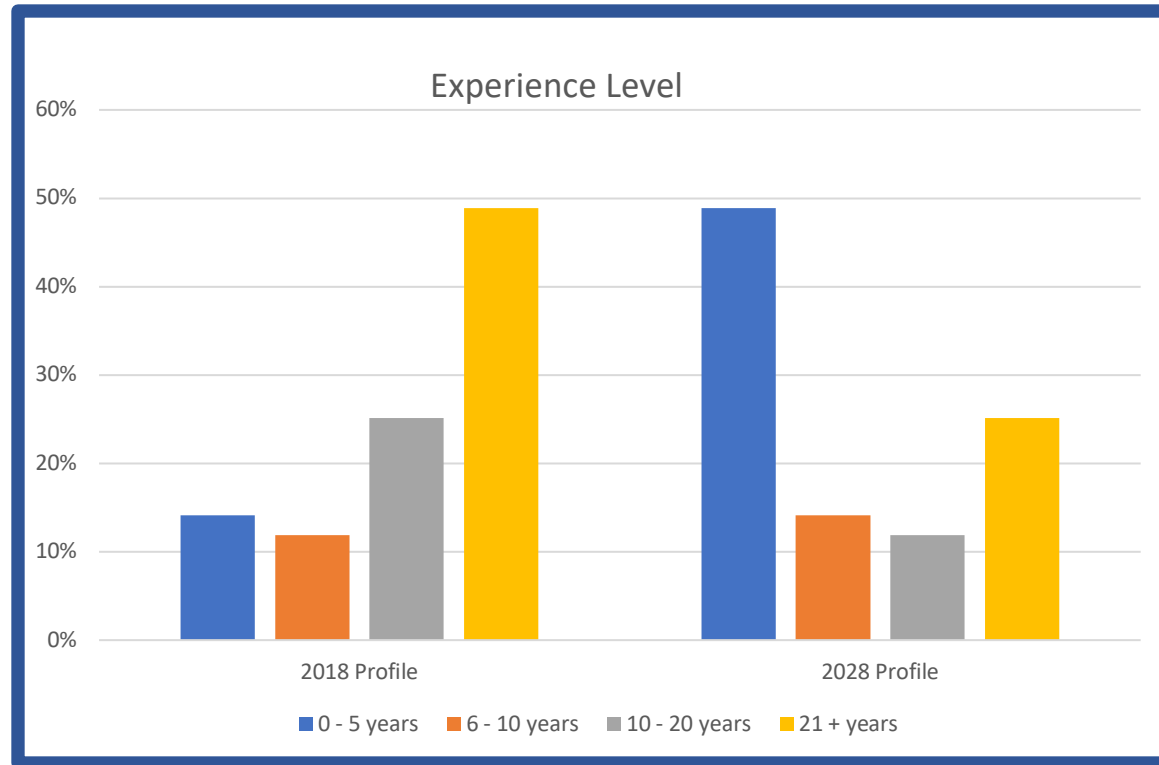


Age demographics for your Industry





Ten year Forecast



By 2028, numbers of new MPEs must increase to offset the numbers of experienced veterans that will decrease significantly



Future Demographics

- Nearly 2 out of 3 MPE practitioners plan to retire within the next 10 years
- This will create a workforce impact that will result in a degradation in MPE capability and knowledge
- By 2028, it is forecast that 50% of MPEs will have 0 to 5 years experience

Steps must be taken soon to address this wave of retirements to eliminate negative effects



Knowledge Transfer

- There are 3 main mechanisms for the transfer of MPE knowledge:
 - *Most important is the mentoring of less experienced MPEs by those with more experience*
 - *Formal training courses such as that offered by the SAWE*
 - *Documentation such as technical papers, in-house or industry standards, recommended practices and exposure to knowledge at conferences such as SAWE*

No formal degree programs in MPE exist to train incoming MPEs and most engineering programs provide students very little exposure to MPE



Most Significant Concerns voiced by Respondents

- *Many people believe myth that MPE is a “push button” product of CAD/product modeling systems.*
- *MPEs often seen as “bean counters” or accountants rather than “real engineers.”*
- *Program Mgt. does not understand MP and often results in function being shunted from one org to another.*
- *Widespread cost-cutting often hits MPE harder than other disciplines.*
- *Lack of recognition means MP often experiences lack of sufficient budget to perform the job.*



More concerns....

- *Need for MP expertise not recognized early in design even though MP limits are usually a Key Performance Parameter*
 - ***More than 90% of respondents report that MP limits are KPPs***
- *Lack of training for new MPEs as older MPEs retire*
- *Lack of organizational support for conference attendance (and professional societies in general)*
 - ***Only 13% of respondents report their organizations encourage them to write technical papers***



Conclusions to be drawn from Survey

- Steps must be taken soon to prepare new entrants to field of MPE to replace a significant exodus of current MPEs due to retirements expected in next 10 years
- The entire design and engineering community must be more aware of the importance of MPE to the final product and its successful performance
- MPE plays a major role in reducing the risk associated with a new design
- The SAWE can play a vital role in training new entrants to the field of MPE and enhancing its future



What next?

- We have surveyed ourselves. Now we need to survey Program Managers and other non-MPEs for their perspective.
- Repeat MPE survey in 5-years to identify trends
- Plan SAWE activities to:
 - *Increase awareness of MPE and importance*
 - *Promote the development of standards and training to prepare future MPEs to meet demand*
 - *Work with Corporate Partners to support their objectives*
 - *Further the state-of-the-art of MPE to become more accurate, responsive, efficient, and economical*