ASPRS 10 Year Industry Forecast Phase IV Result Preview

ASPRS 2006 Annual Conference

Reno, NV

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Phase IV of the ASPRS Ten Year Forecast

- Motivations for Phase IV
  - Define use and needs for specific requirements in geospatial information
  - Understand use of moderate resolution imagery
  - Develop workforce hiring needs and requirements
  - Capture opinion on the role of U.S. governmental policy in geospatial industry

- Utilize an internet survey of ASPRS membership as a surrogate for the broader user community
  - Membership of ASPRS is approximately 6000
  - Equal numbers from government, private sector and academia

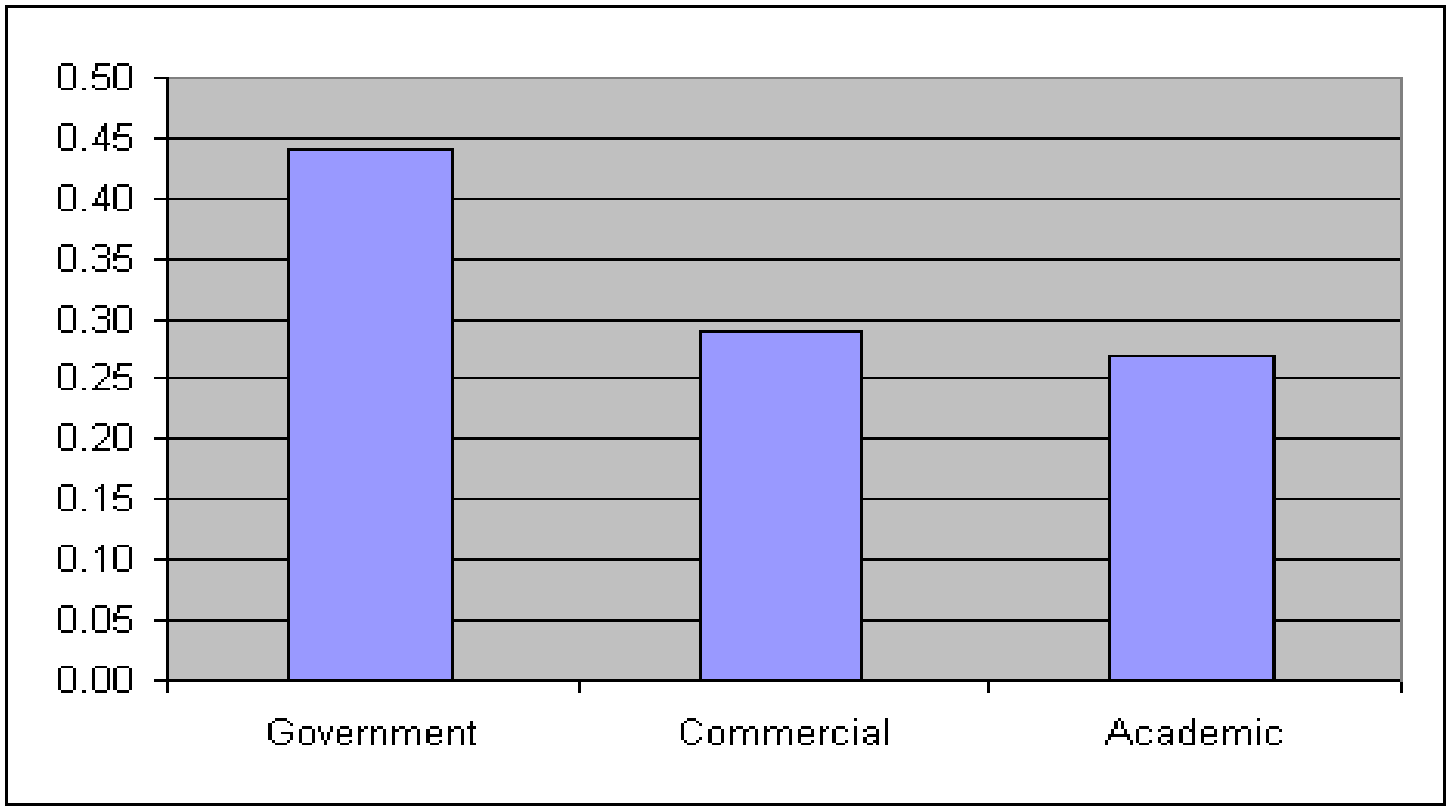
Forecast Phase IV Background

- The Forecast survey was made online from August through October of 2005
- Phases I-IV focus on civilian users
- Phase IV was more limited in data sources than Phases I-III
- The total number of completed responses to the internet survey was 386, or 6% of the survey population (+/- 4.8 confidence interval at 95%)

Topics of this Presentation

- -Respondent Profile
- -Workforce Issues
- -Technical Concerns
- -Moderate Resolution Issues
- -Governmental Policy Issues

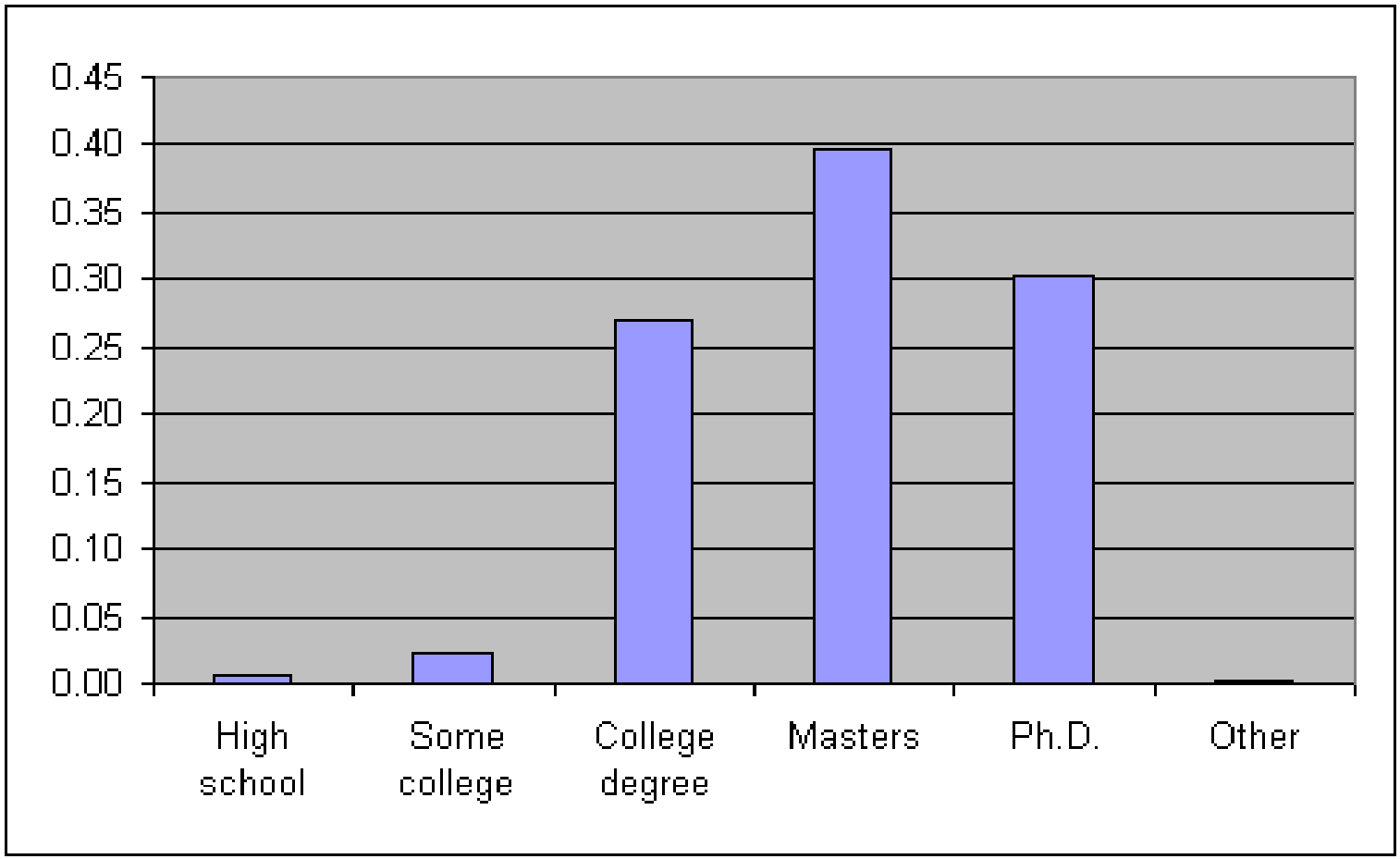
Primary Employment Area



- The survey population is equally comprised from the three employment sectors
- This population shows a nominal gov't bias possibly due to moderate res sector

Q. 3) In which of the Following Sectors and Sub-Sectors do you work? Select Primary?

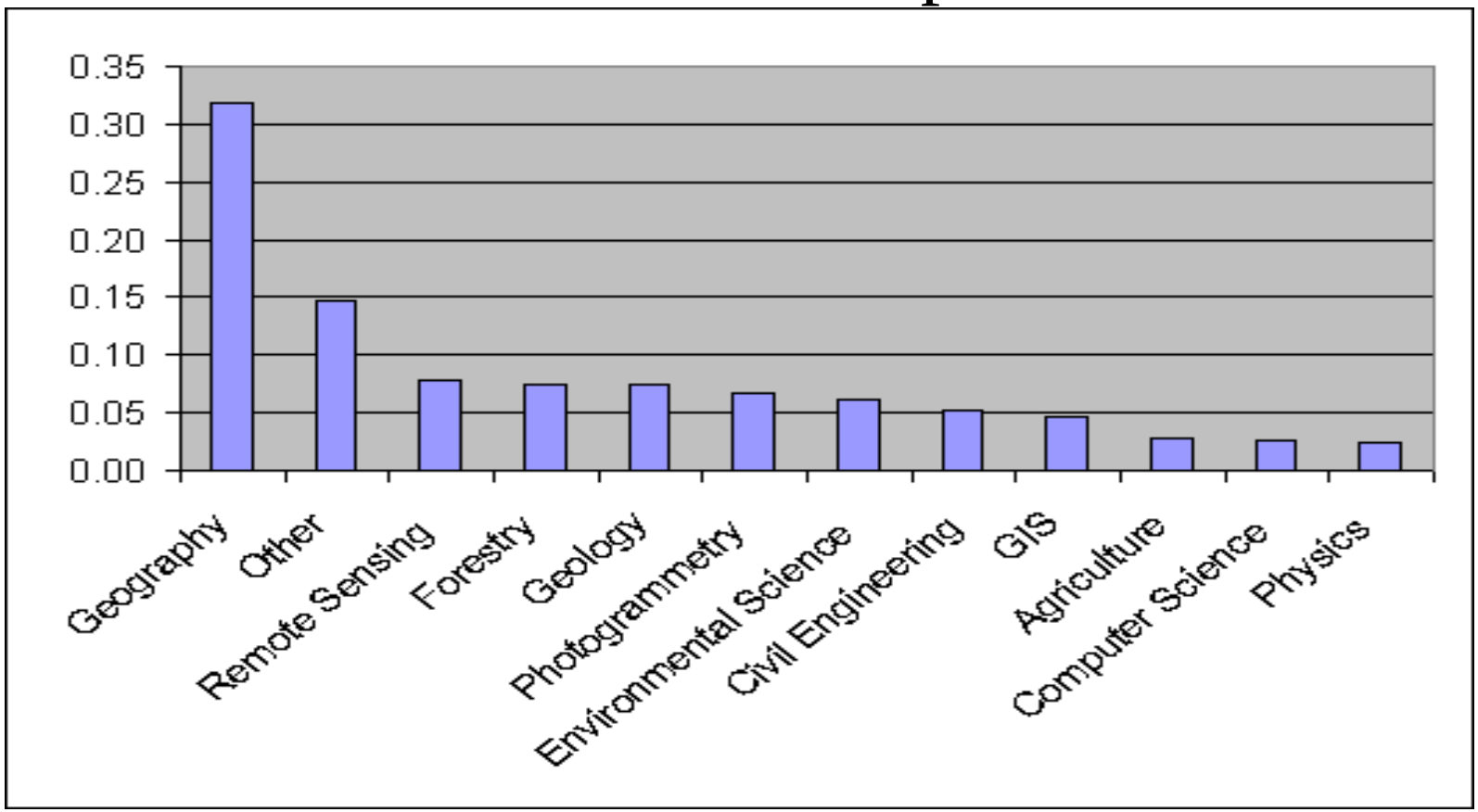
Level of Education



• In general, profile shows a significant number of advanced degrees—highly educated workforce

Q. 5) What is the Respondent's Level of Education?

Skill Sets of the Respondents

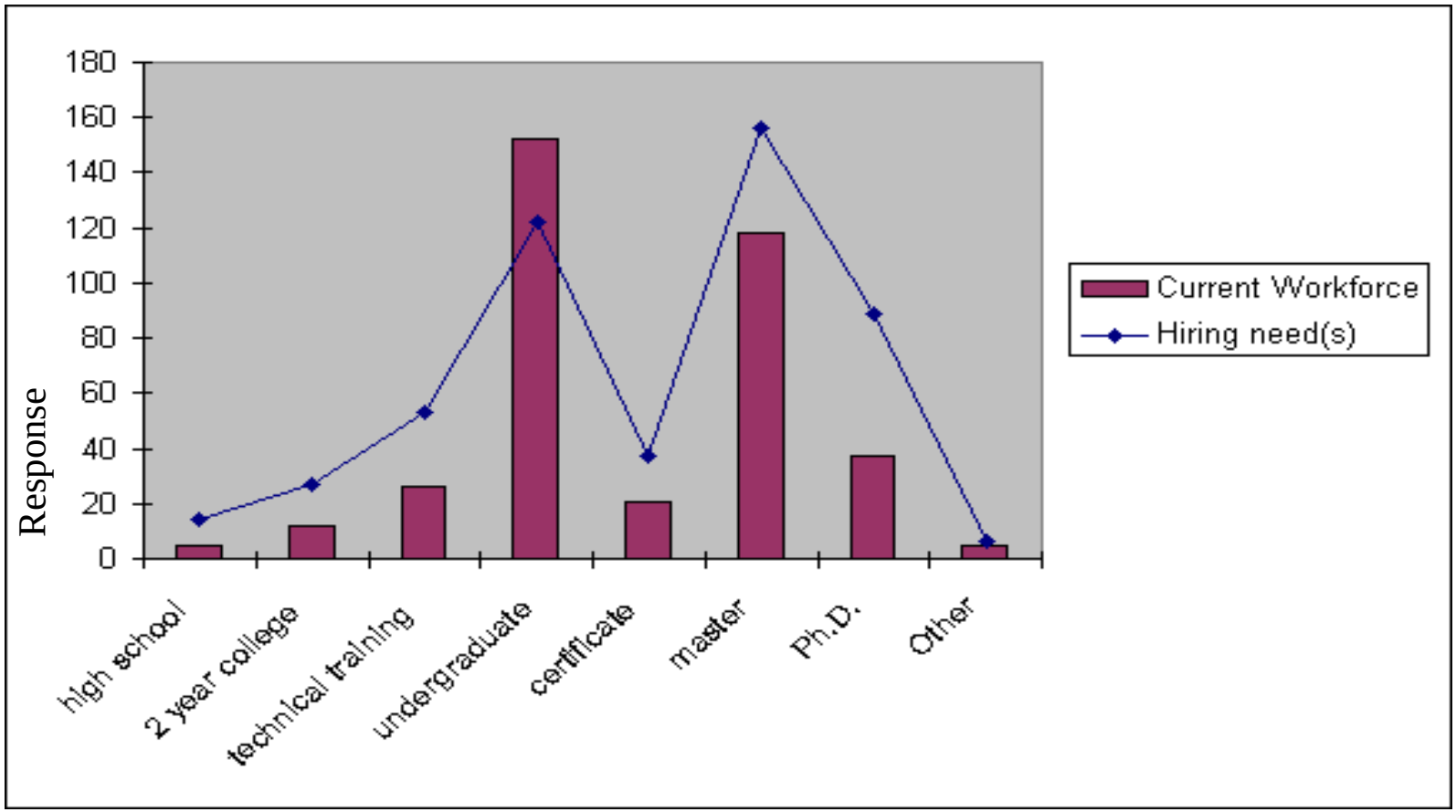


- **The industry has significant diversity in skill mix**
- **Other fields mentioned include:**

Biology,Surveying, Anthropology,Urban Planning, Environmental Policy and Mgmt, Atmospheric Science,Workforce Education, Landscape Architecture, Ecology, Music, Arts, Humanities, Other Engineering, Business Administration, Astronomy, Imaging Science, Fish / Wildlife Biology-ecology

Q. 6) In what discipline is your degree / certificate?

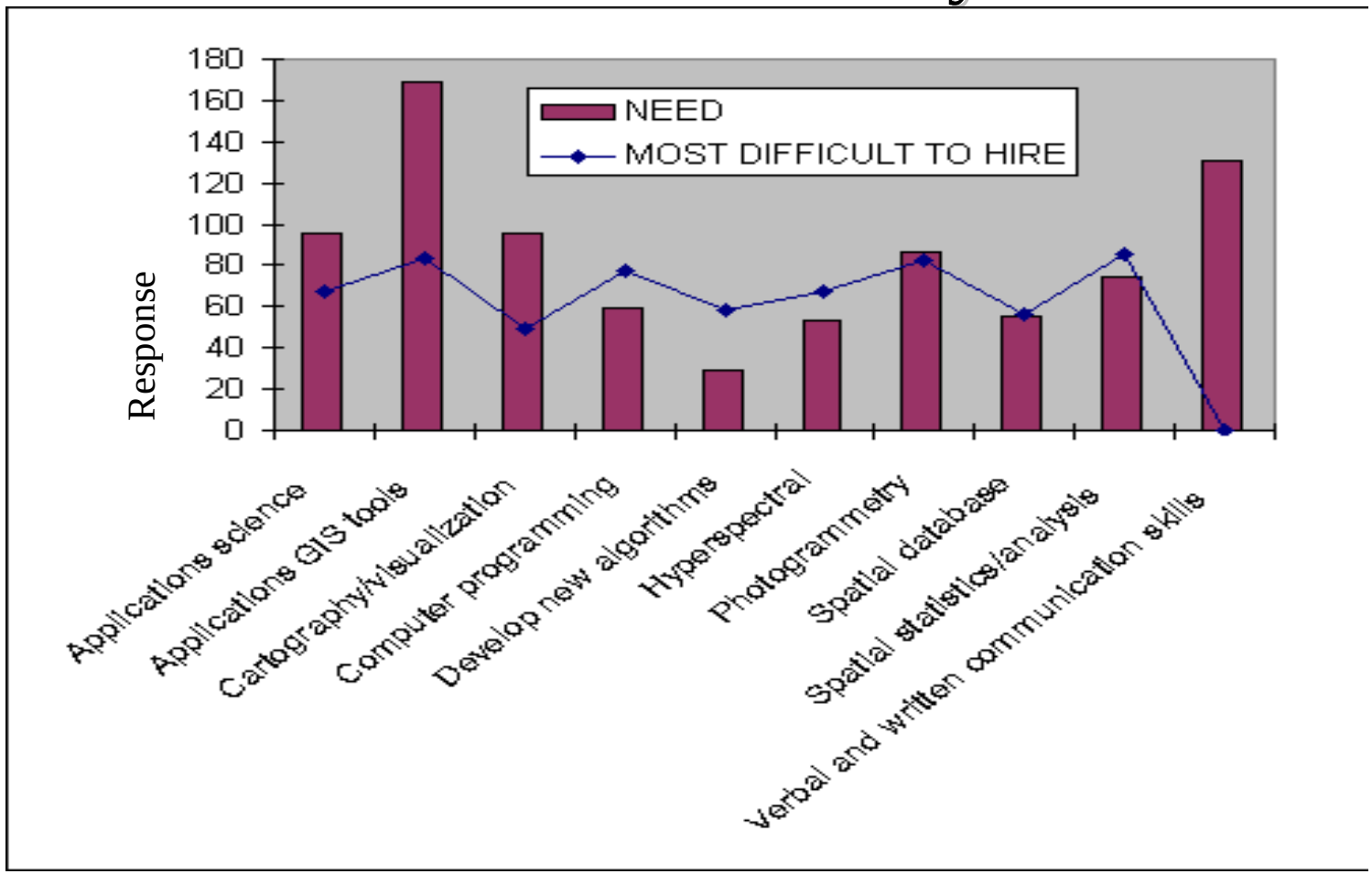
Current and Desired Workforce Education Levels



- Current workforce has mainly undergraduate and master's degrees
- Hiring needs center on technical training, certificates and post graduate degrees

Q. 26) For your agency or firm's needs which level of education is appropriate for the majority of your workforce? Also identify your hiring needs for the next 24 months.

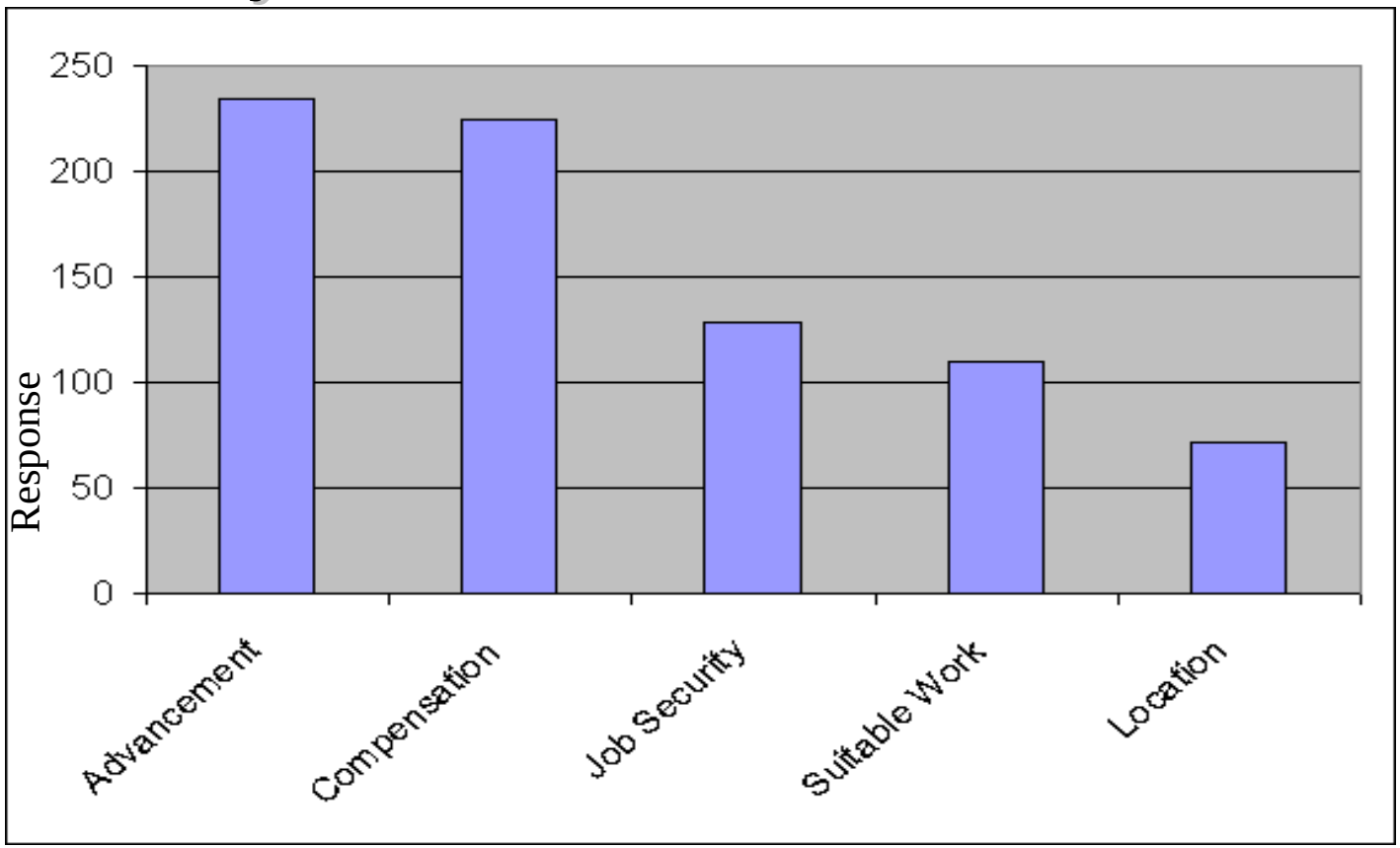
Needed Skills vs. Difficulty to Hire



- The educational community is still not providing sufficient graduates in many key areas

Q. 27) What are the knowledge and technical skills that are most needed by your employees for the future? (Select 3)

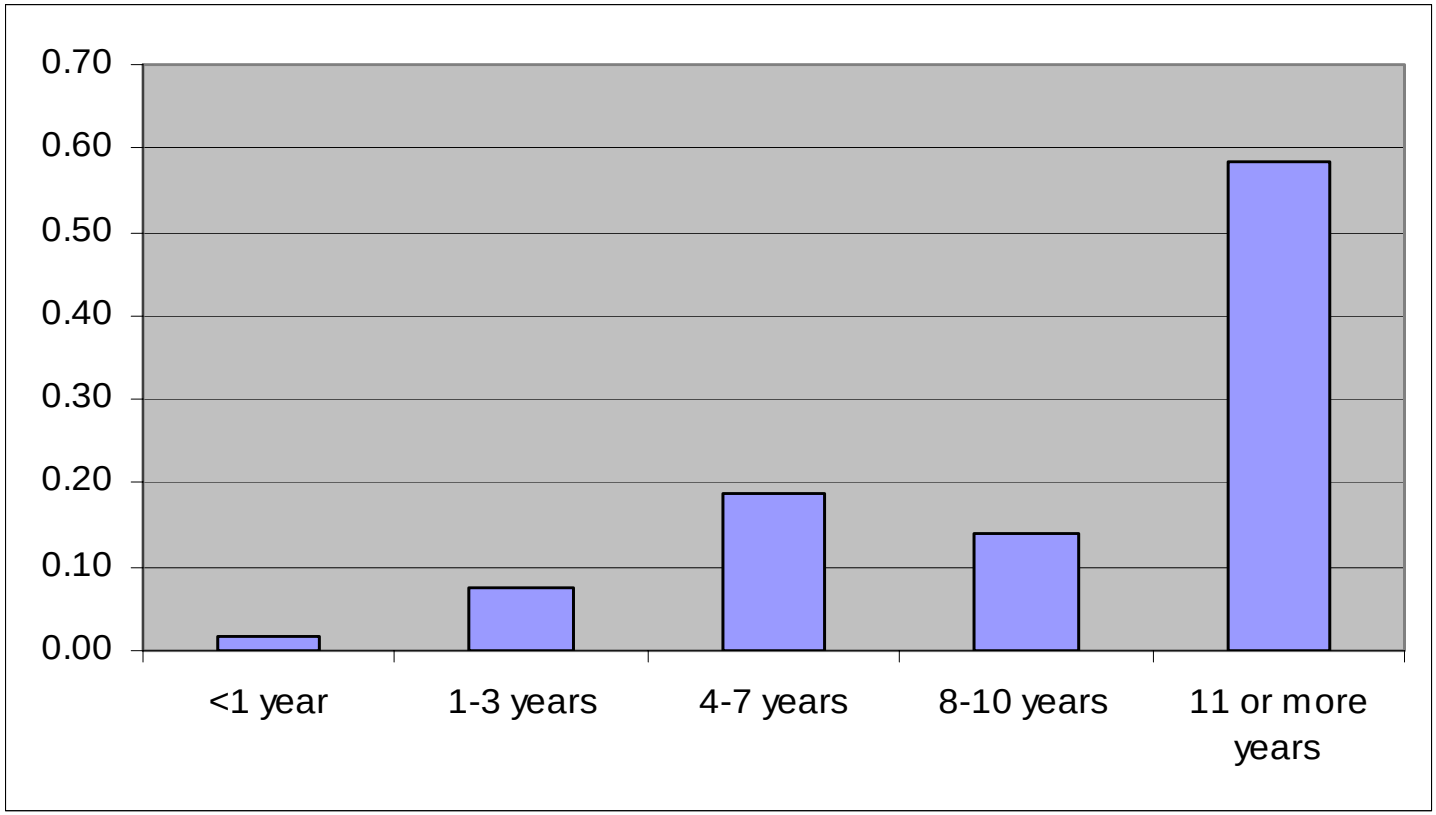
Primary Reasons for Job Dissatisfaction



• This may indicate that the remote sensing industry does not provide the opportunity and compensation of other high technology markets

Q. 28) Our previous study indicated that many technical staff in agencies and firms leave the remote sensing field within 5 years after initial employment. Can you suggest and rank three reasons that this might be happening?

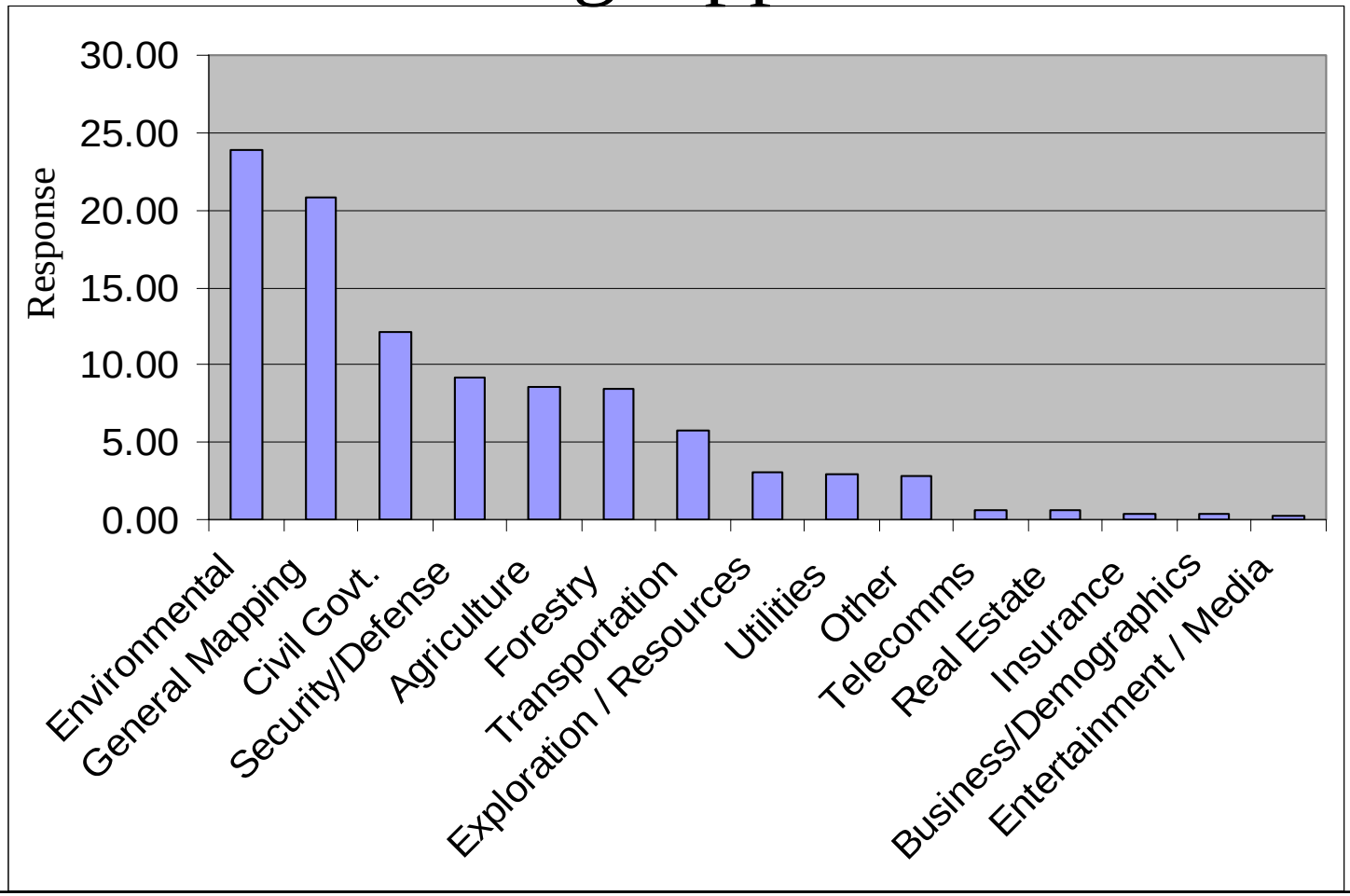
Remote Sensing Experience



- Most respondents (58%) have 11 or more years of experience with remote sensing
- 32% have four or more years experience
- Previous studies showed greater new hire percentage (under 3 year)

Q. 8) How many years of remote sensing experience do you have?

Remote Sensing Application Areas



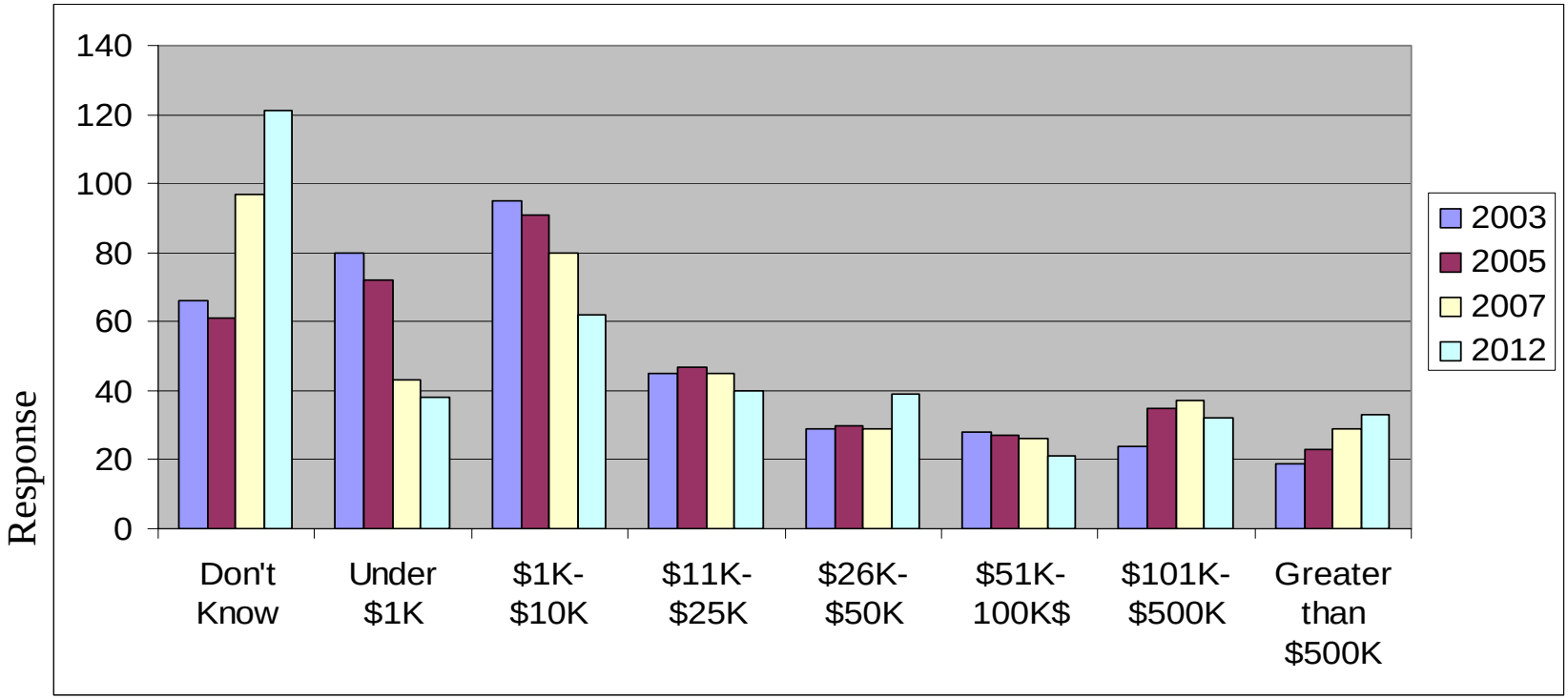
- Other areas cited include public health, law, flood studies, food security, search and rescue, history, cultural heritage
- Underserved areas are similar to past surveys; Online search may improve this

Q. 9) In which of the following Application Areas do you or your group work?

Commentary on Application Areas

- Respondents reveal a wide range of applications for remotely sensed data
- Three chief applications:
  - Environmental (24%)
  - General mapping (21%)
  - Civil government (12%)
- Underserved areas:
  - Telecom
  - Real estate
  - Insurance
  - Business demographics
  - Entertainment
- The underserved areas may be ones for future expansion if the cost-effective, simplified applications can be developed

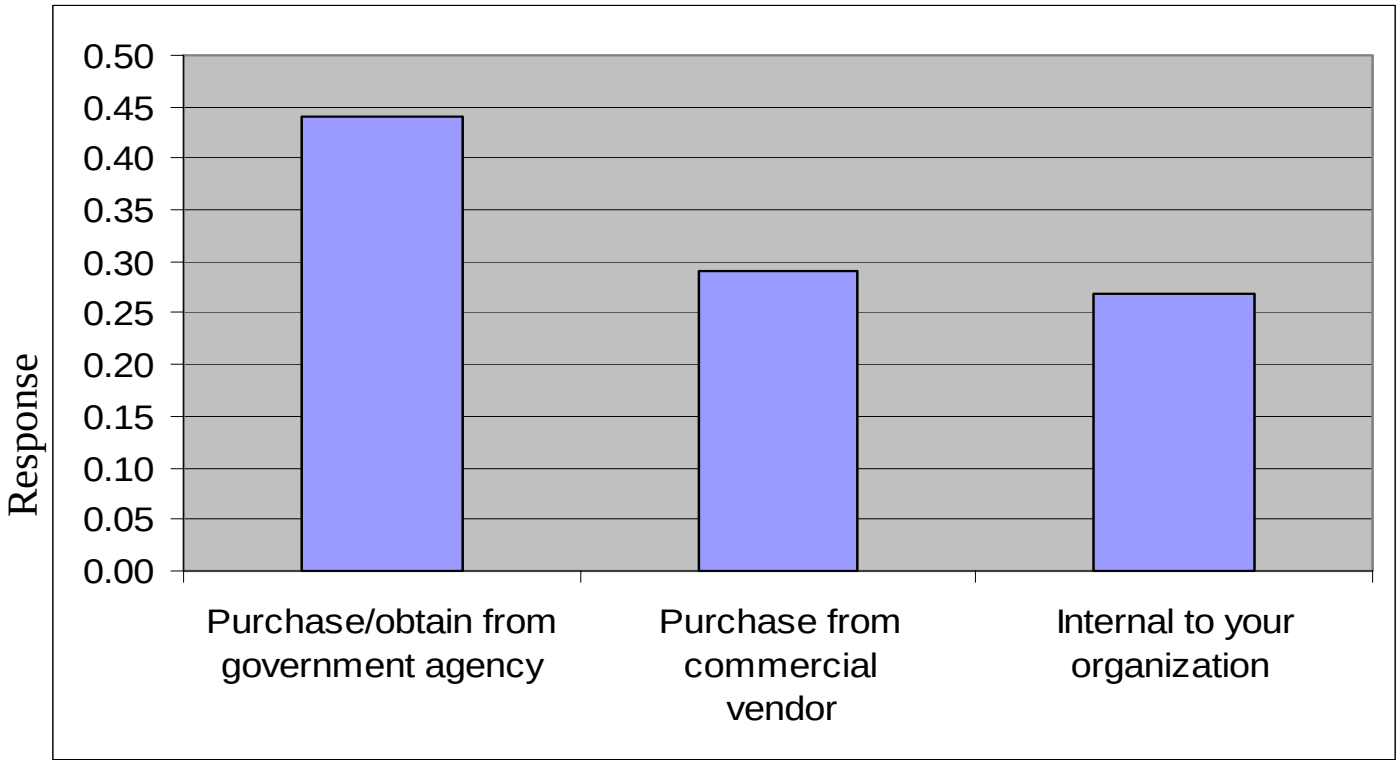
Estimated Spending on Remotely Sensed Data/Information



- In general, total purchases will decline annually (Opposite Phase I-III trends)
- Uncertainty about estimated future purchases increases rapidly with time
- Approx 18% of respondents in past forecasts “didn't know” how much was spent
- Phases I-III suggested future growth of 9%-14%, this outlook shows a more pessimistic outlook

10) & 11) Estimate the dollars you expect to (spend / allocate / authorize) to purchase / acquire remotely sensed data/information at work for the following years: (in thousands)

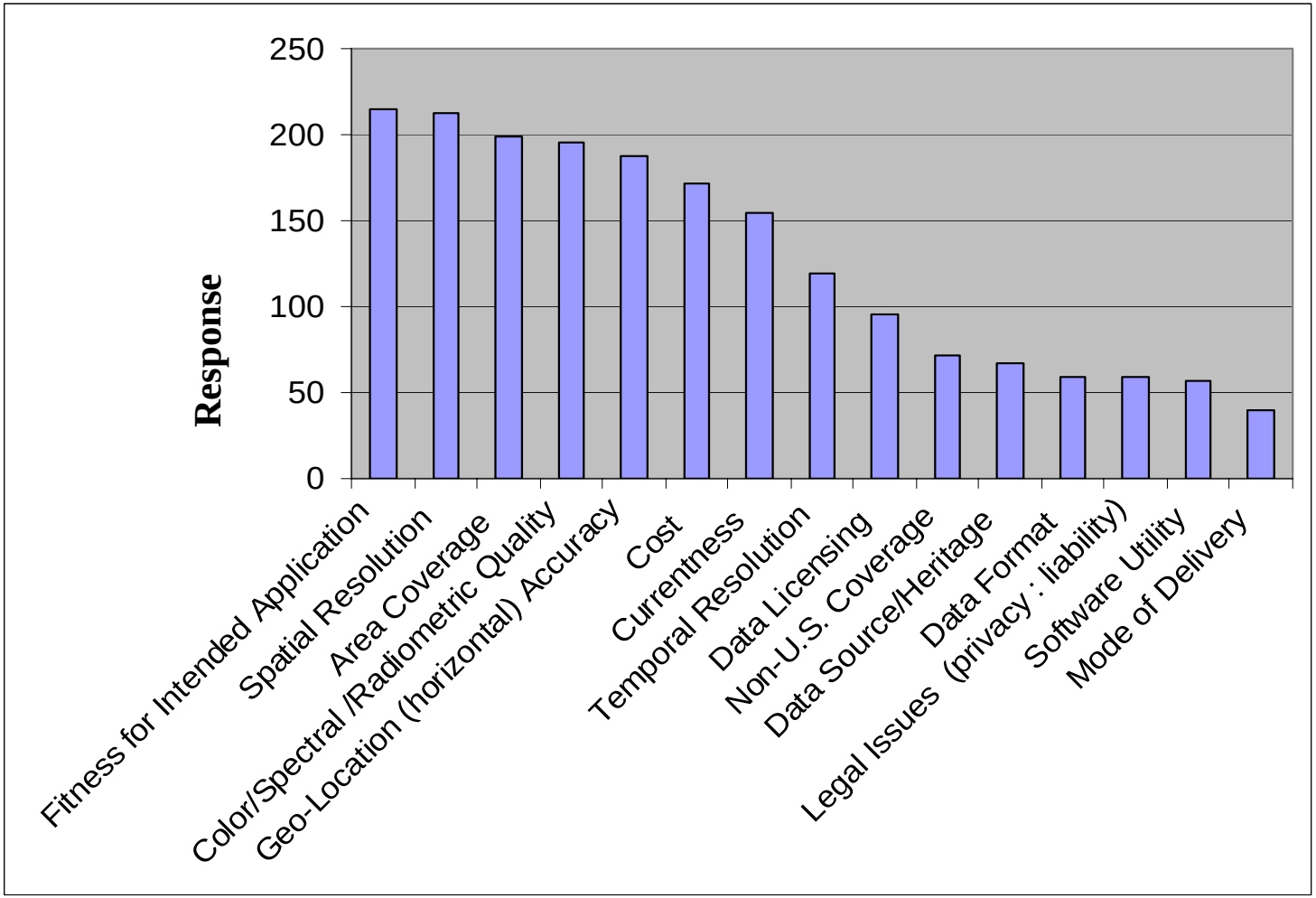
Primary Sources of Funding for Data



- Most (44%) purchase/obtain data through a government agency
- About 29% purchase data from a commercial vendor
- As in earlier Phases, government remains the largest single primary customer for RS data

Q.12) How do you purchase/obtain the remotely sensed data/information that you use to accomplish your job?

Desired Characteristics of Remotely Sensed Data



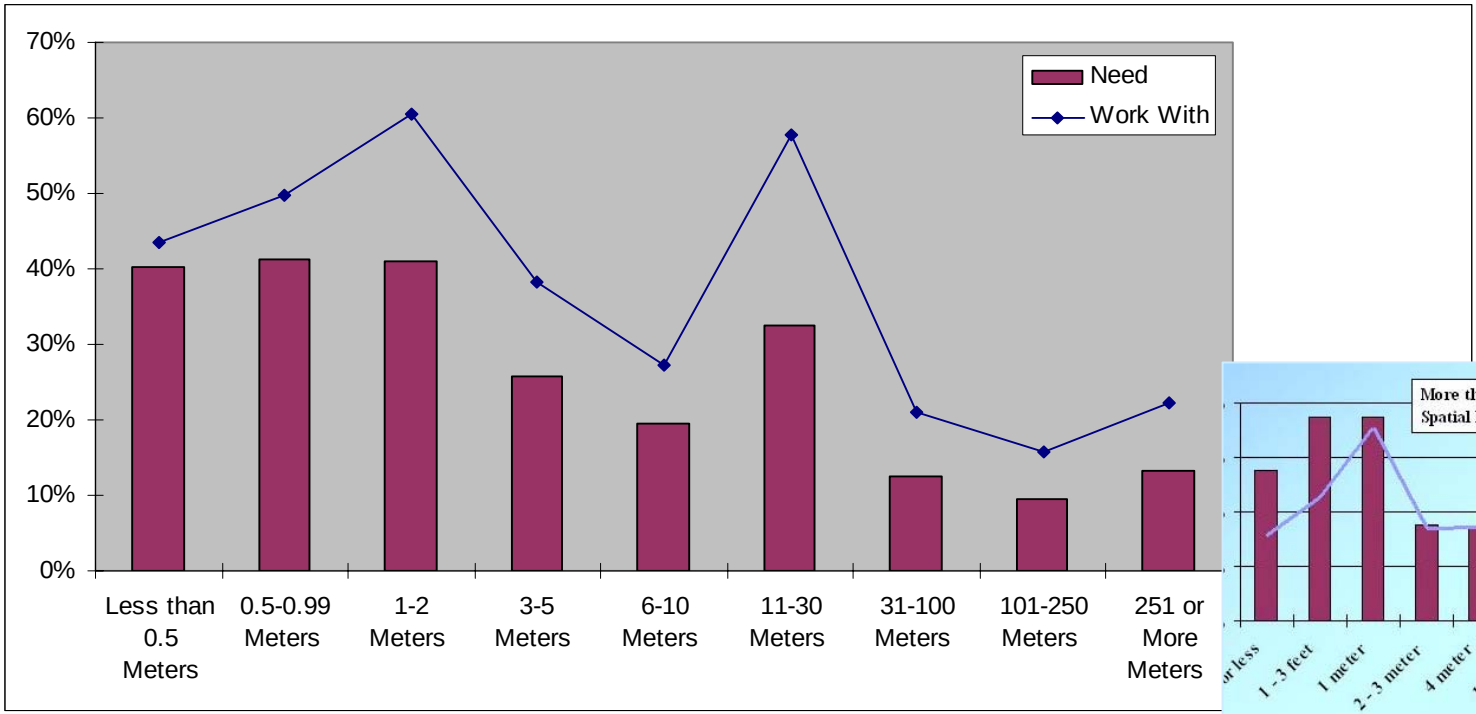
- Traditional metrics have not wavered from previous studies
- Importance of radiometric accuracy probably due to mid resolution influence

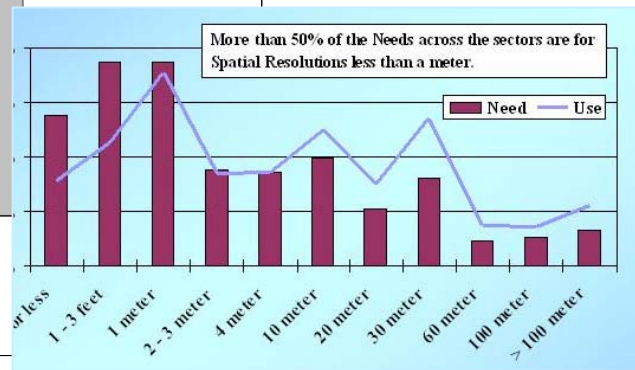
Q. 13) Based on your job requirements, how important are the following general characteristics of remotely sensed data or information?

Importance of Data Characteristics Continued

- The four most important data characteristics (cited by more than 50% of respondents) are:
  - Fitness of the data for the task
  - Appropriate resolution
  - Area coverage
  - Color/spectral/radiometric quality
- Mode of data delivery is the least important characteristic of RS data
- Resolution remains the most important characteristic beyond overall data fitness

Resolution: Work With vs. Needed



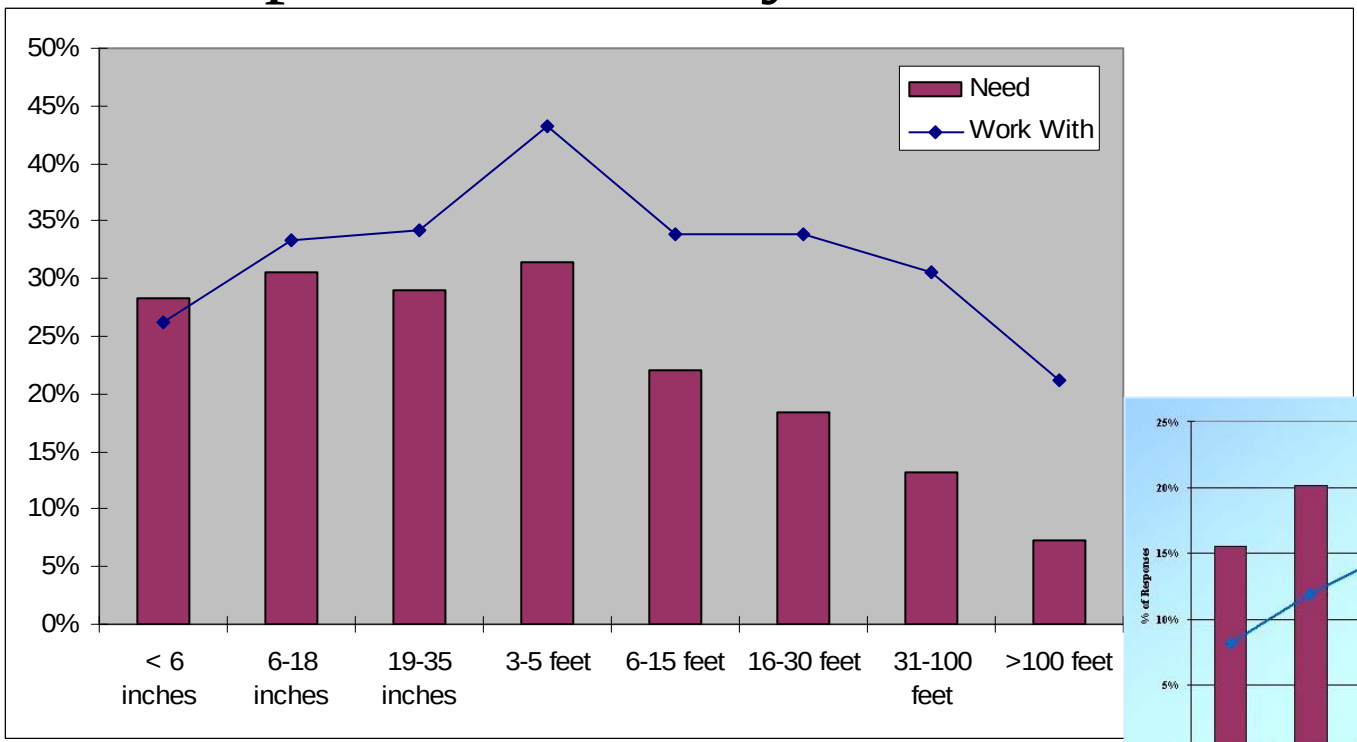


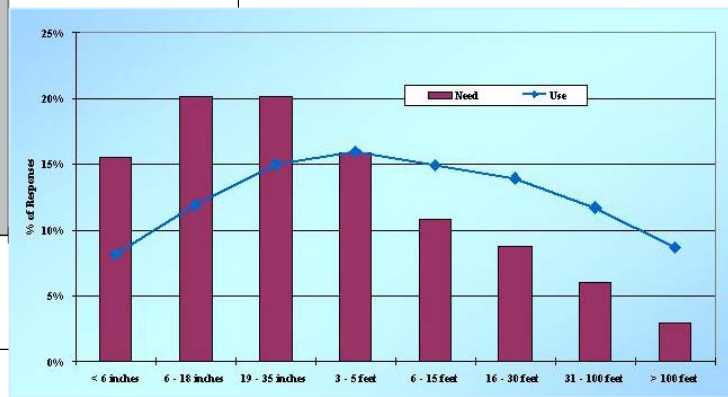
Previous Phase I-III results

- High resolution need closely tracks demand. This is of interest given the rise of digital aerial as well as the continued operation of satellite sensors. In past surveys demand was clearly not met in this region. Digital aerial has come to fruition with multiple vendors now offering solutions. 1m satellites are now online through multiple sources. <0.5 M data is now the area most likely to be targeted by vendors
- Overcapacity appears to be seen at the more commonly historical resolution levels 1m & 10-15m
- Differences in population and ranges exist with past surveys

Q. 14) & 14a) What levels of Spatial Resolution do you currently WORK WITH today? Do you NEED most to do your job? (check all that apply)

Geospatial Accuracy: Work With vs. Needed



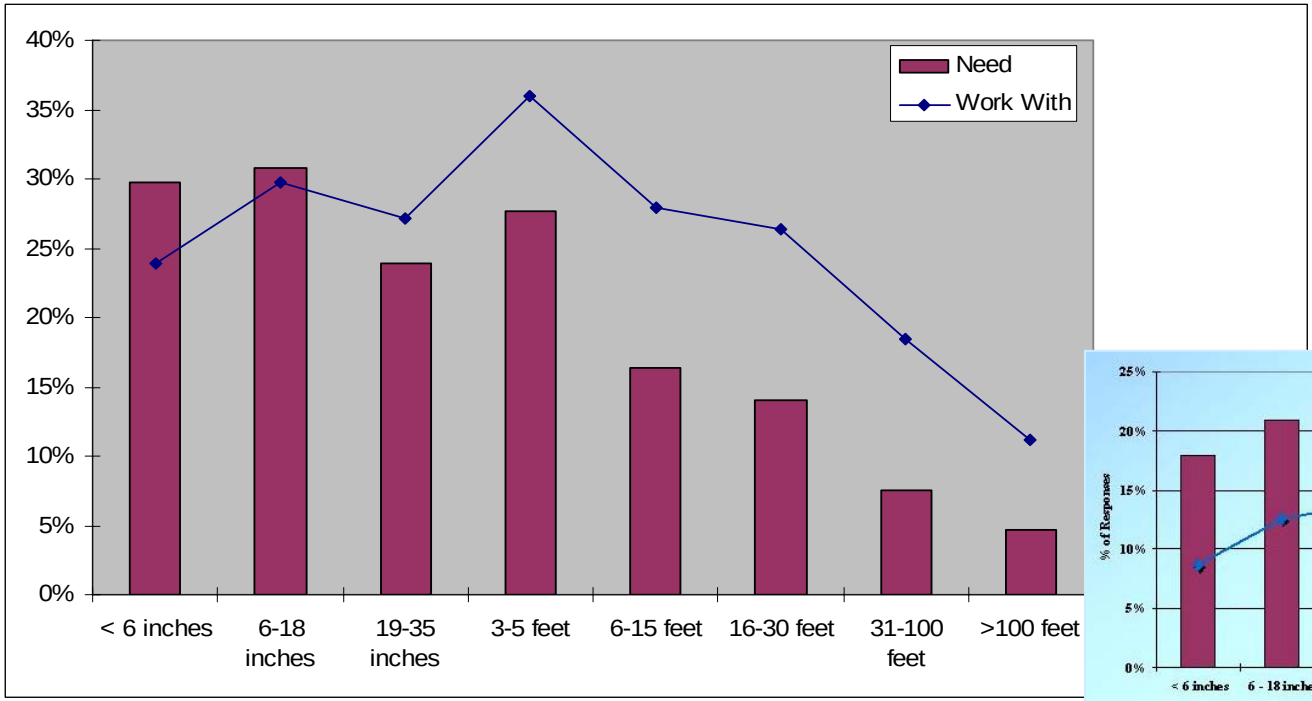


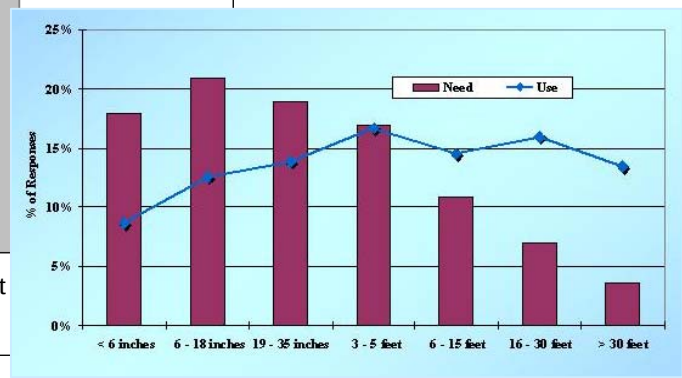
Previous Phase I-III results

- The industry overall needs high accuracy data
- Given the growth in automated AT, Lidar as well as direct geo-registration, much of the demand is being well supported
- New digital sensors are driving elevation data demand, which in turn causes growth in the positional accuracy segment
- GSDs of 6” and better causes users to focus on smaller and smaller targets, each requiring positional knowledge
- Differences in population and ranges exist with past surveys. The overall trend shape is similar to earlier surveys

Q15) & 15a) What levels of geo-location accuracy do you currently WORK WITH today? Do you NEED most to do your job? (check all that apply)

Vertical Accuracy: Work With vs. Need



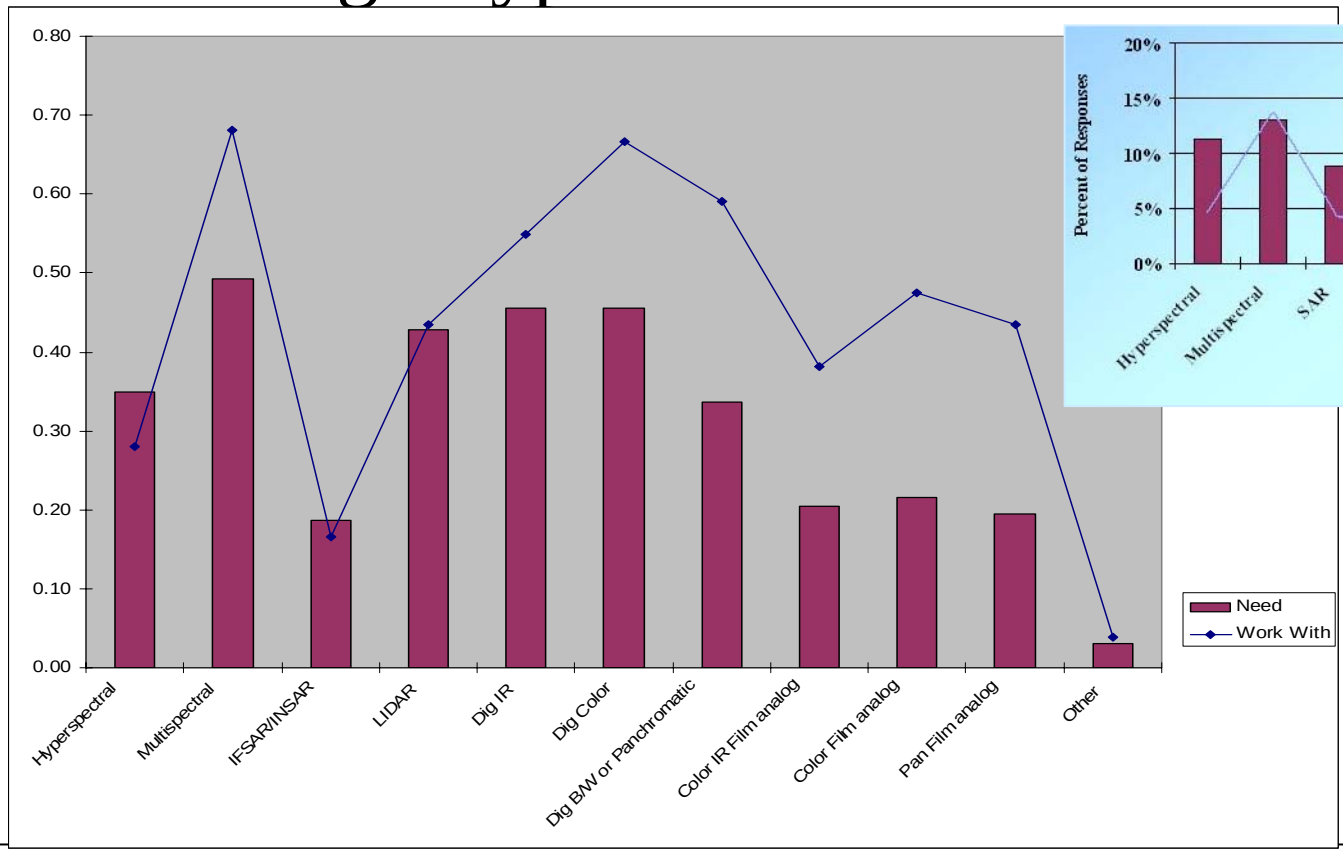


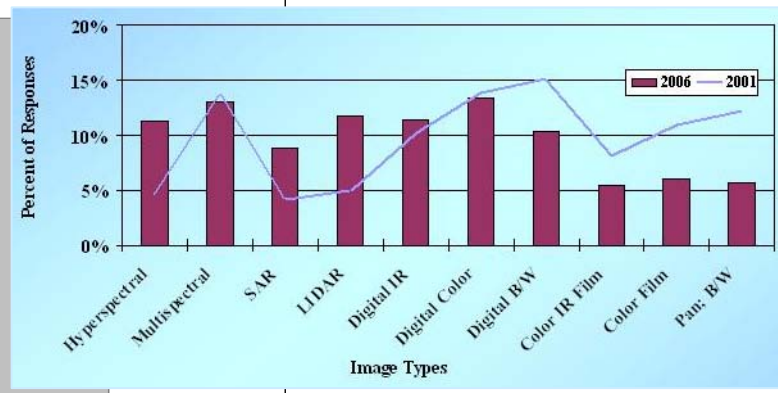
Previous Phase I-III results

- Highest quality vertical accuracy still shows demand in excess of capacity
- These slides track with geo-positional accuracy
  - Both sets showing the gap closure between supply and demand
- Both also show the highest growth still at the tightest accuracies and data qualities
- This is readily driven and supported by Lidar and automated elevation extraction
- Differences in population and ranges exist with past surveys, however demand tracks between both data sets and clearly decreases at courser quality levels

16) & 16a) What levels of elevation (vertical) accuracy do you currently WORK WITH today?
Do you NEED most to do your job?

Image Types: Work With vs. Needed



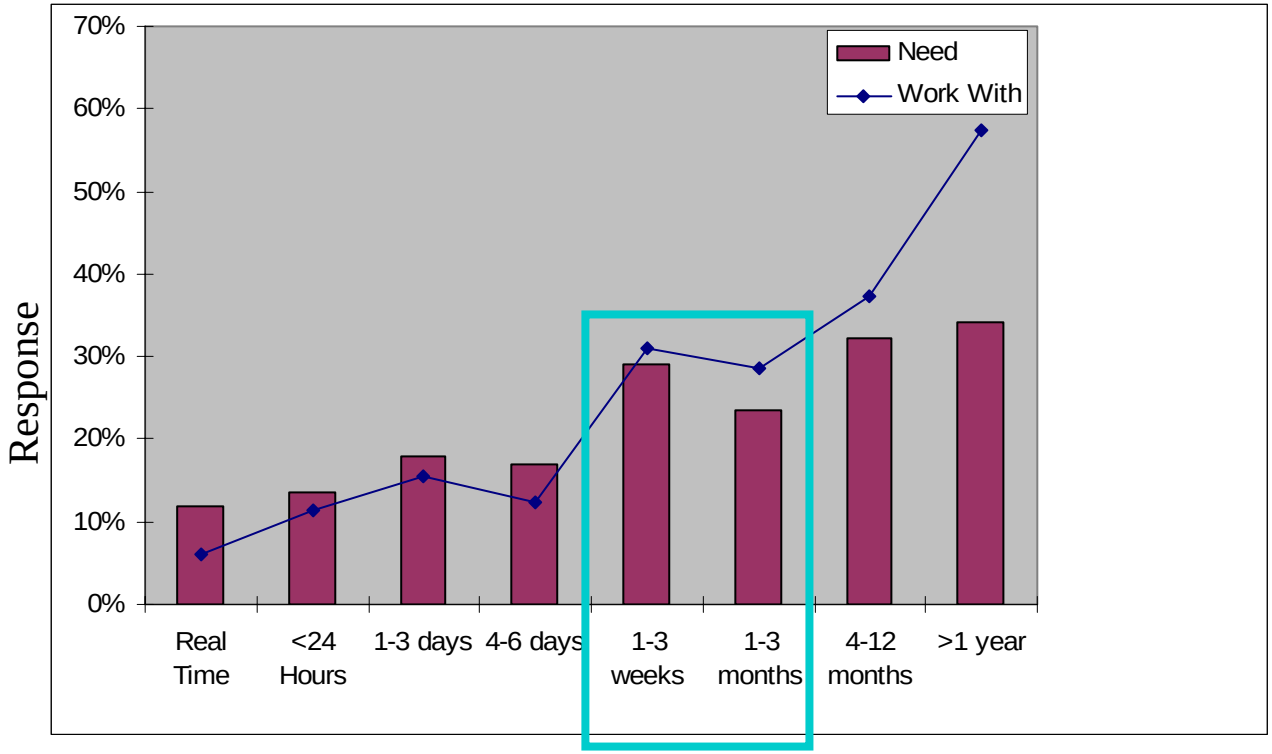


Previous Phase I-III results

- Film continues to track historical drops in use with previous surveys
- In this forecast Lidar shows a better match in use versus need than previous studies. The industry has also seen a clear reduction in Lidar data prices, which further correlates to these results.
- Digital sensors show the industry is now becoming saturated and price will become a driver as supply begins to outweigh demand.
- Hyperspectral, as with previous studies, is still a growth opportunity (broad area coverage need)
- Differences in population and ranges exist compared with past surveys, but the overall trend shapes are consistent

Q. 17) & 17a) What image types do you currently WORK WITH today?
Do you NEED most to do your job?

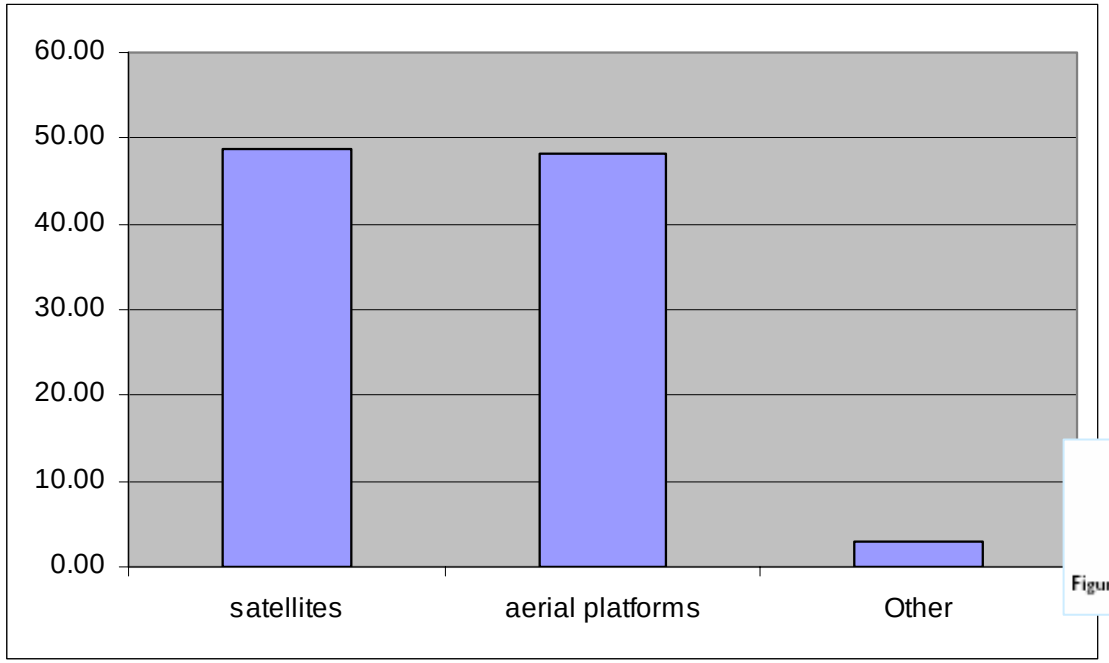
Temporal Requirements: Use vs. Need

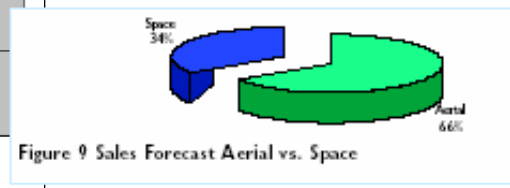


• After 9/11/01, experts felt that increased frequency in imaging would become critical, as one aggregates the data a break point appears to exist in the one month or greater revisit time. But clearly the proposed market demand for real time data and those acquired in less than 24 hours delay has not appeared. Reasonable price, capture and delivery windows appear to be common place, and in highest demand.

Q. 20) & 20a) What are your current data/information temporal (revisit) requirements? Do you NEED?

Remote Sensing Data Used vs. Collection Platform



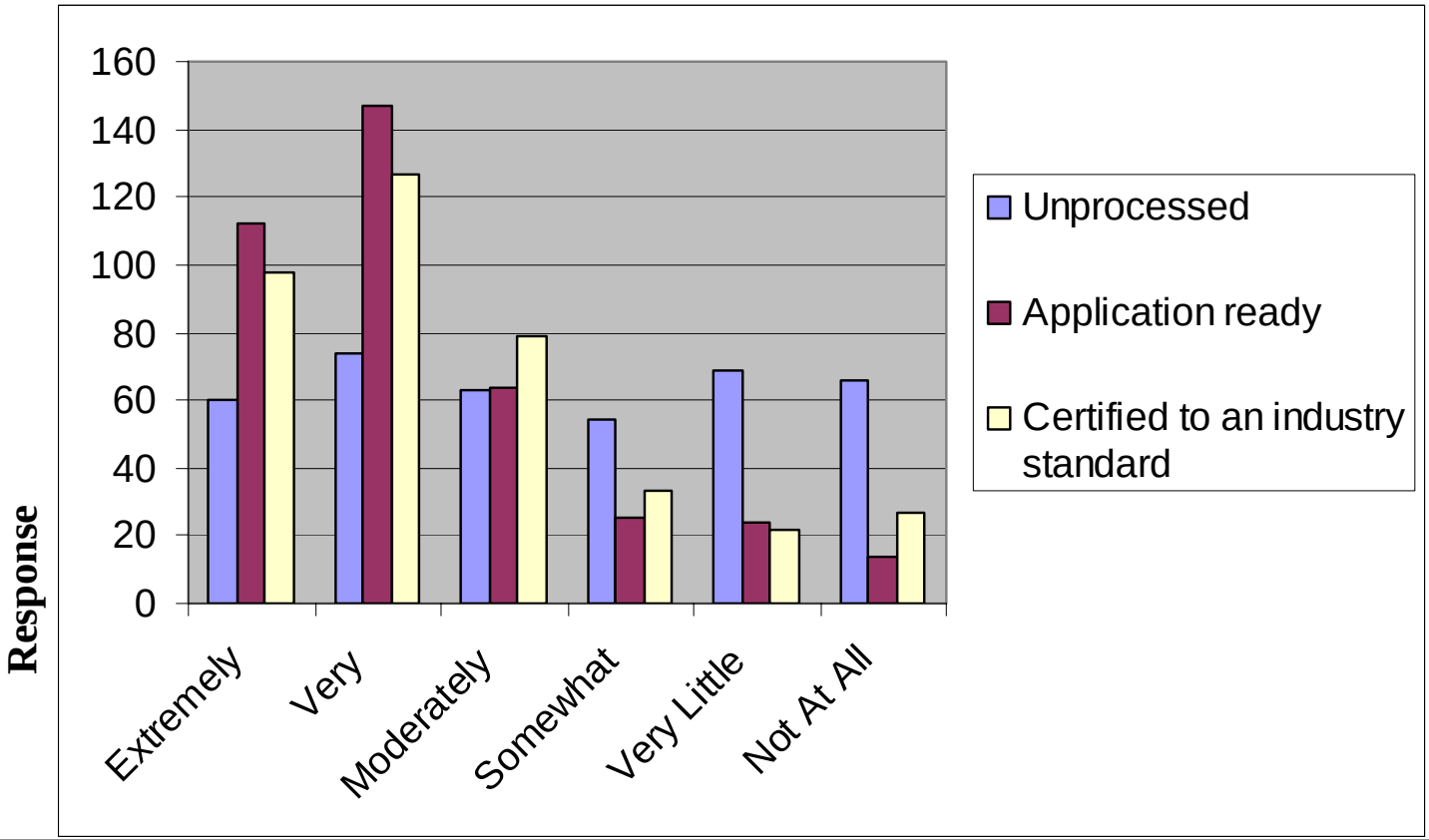


Previous Phase I-III results

- High resolution satellites have influenced the market in aerial versus space based collection. The industry has established the capacity limits for 1m space based systems as seen by the recent events
- Of interest in this study is the "other" option in which an open ended question was offered
  - The terrestrial market is an obvious area of future study
  - Lidar, Unmanned Air Vehicles, Seismic sensors, Ground penetrating radar, Tripod mounted Lidar, Terrestrial cameras, Marine based sensors
- Differences in population and ranges exist compared with past surveys

22) What proportion of your remote sensing data/information is collected by different platforms?

User Preferences Regarding Data Preprocessing

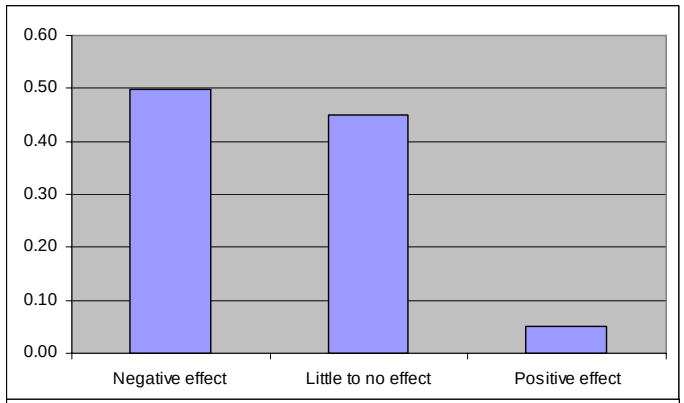


• Most data users prefer data that are application ready or certified to an industry standard, though many prefer starting with unprocessed data.

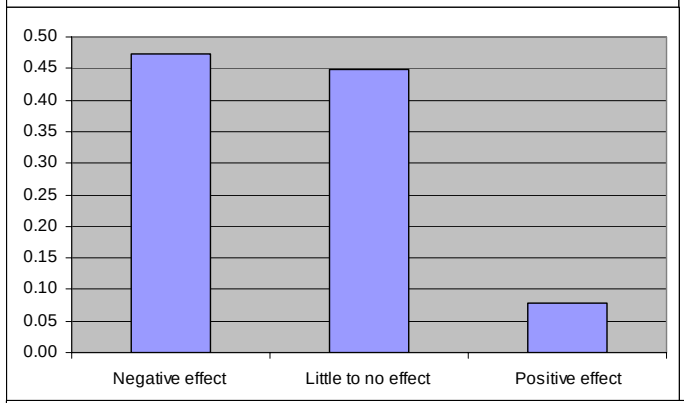
Q. 23) How important is it that the remote sensing data/information you use has been: - Unprocessed? - Application ready? - Certified to an industry standard?

Effects of Controls on Data Access or Data Quality

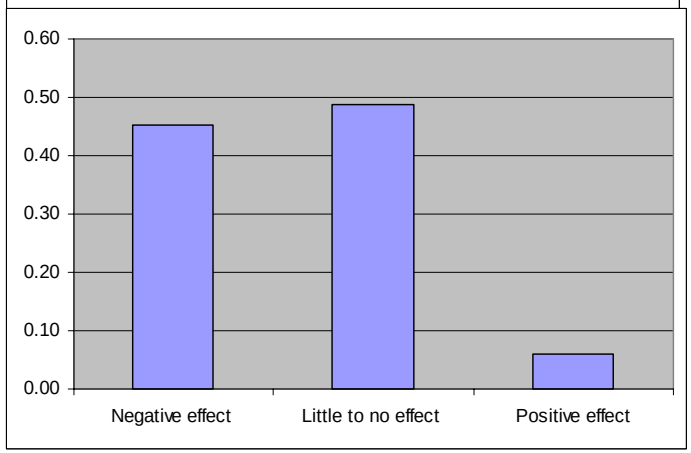
24a) Data licensing and/or sharing restrictions
- 50% cite negative effect
- 45% little or none



24b) Data ownership and/or copyright restrictions
- 47% cite negative effect
- 45% little or none
- 6% positive



24c) Government restrictions on access to or quality of data
- 45% cite negative effect
- 49% little to none
- 6% positive

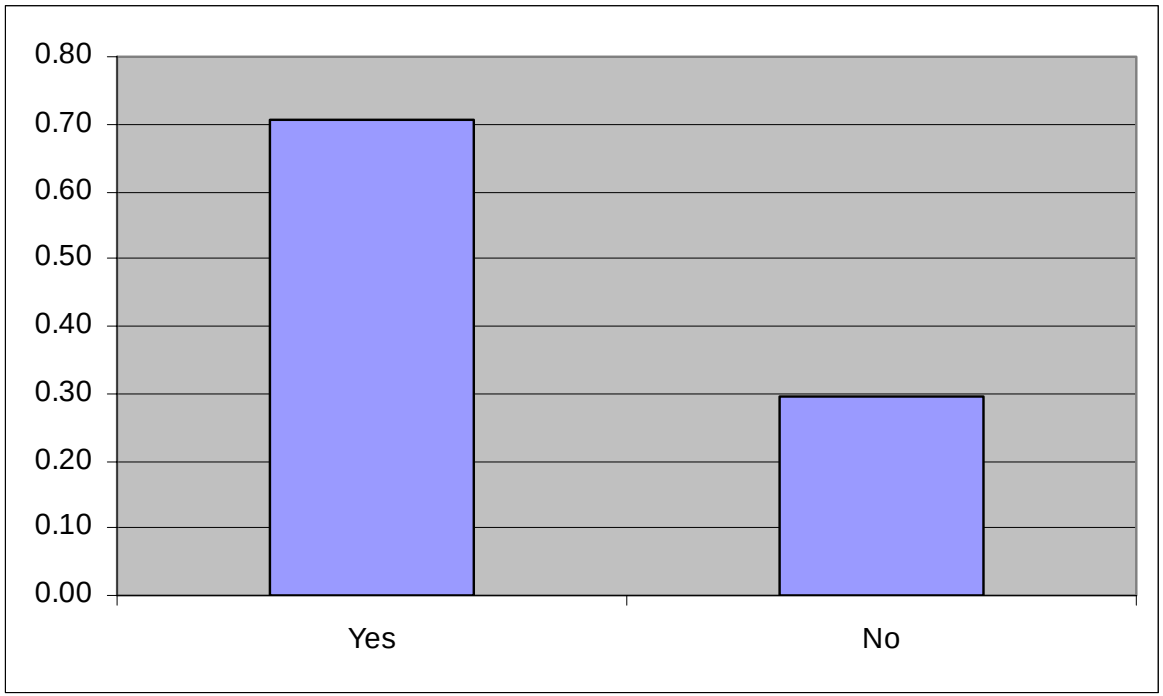


Q. 24) What controls on the use of, or access to, data/information most affect your work?

Discussion: Controls on the use of, or access to, data/information

- Controls negatively affect nearly half of the respondents:
  - Data licensing and/or sharing restrictions: 50%
  - Data ownership and/or copyright restrictions: 47%
  - Government restrictions on access to, or quality of, data: 45%
- Ownership and copyright restrictions have a positive benefit for about 6% of respondents
- Government restrictions on access to, or quality of, data have positives benefits for about 6% of respondents
- These responses indicate that market growth is hampered in about ½ of the industry by controls in place. Over time, this may threaten U.S. leadership in the RS industry.

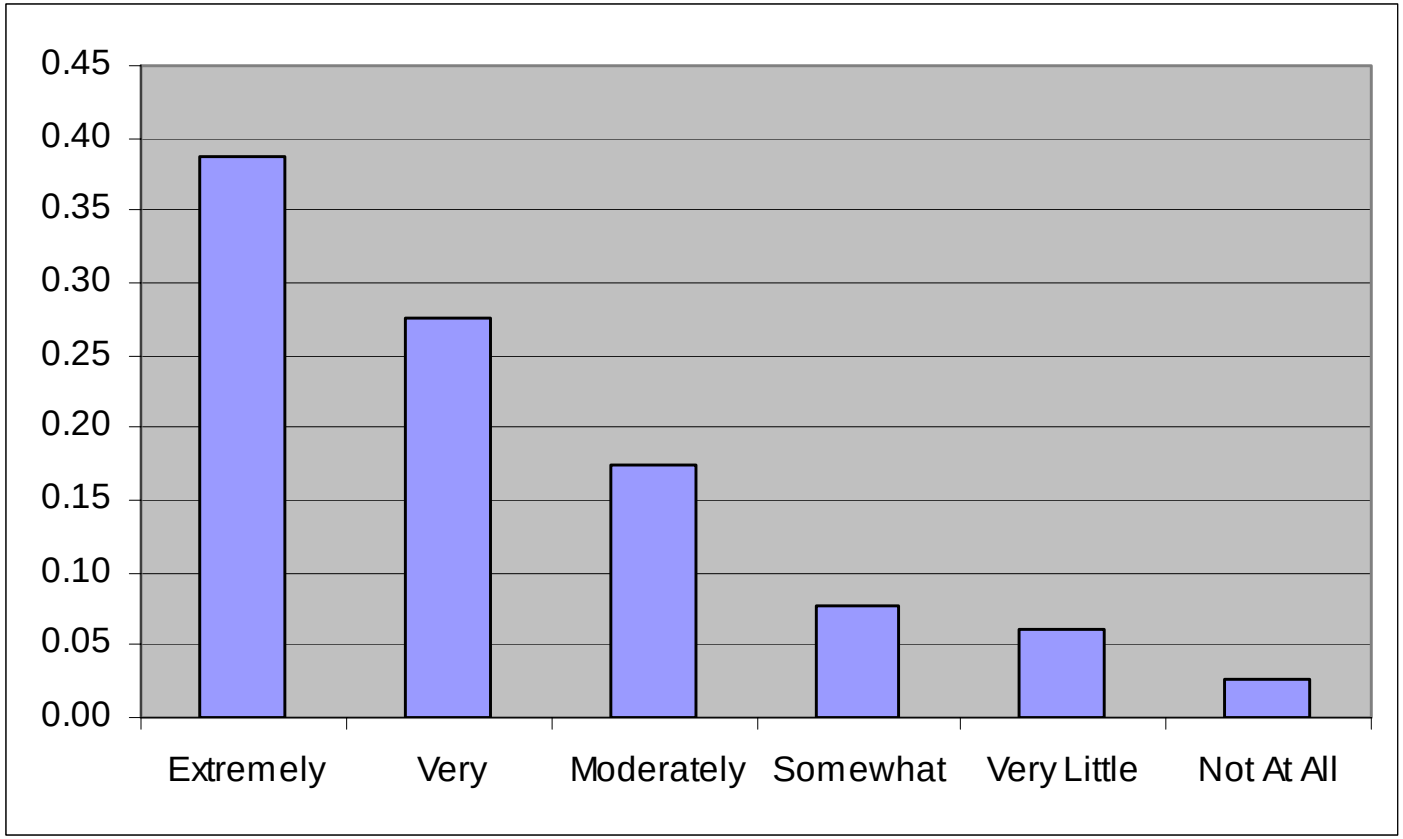
Use of Moderate Resolution Data (10 -100 m)



- Significant demand (70%) among respondents for medium resolution data
- This supports the view that medium resolution data often undergird the use of higher resolution data

Q. 25) Do you use moderate resolution (10 meter - 100 meter) satellite data?

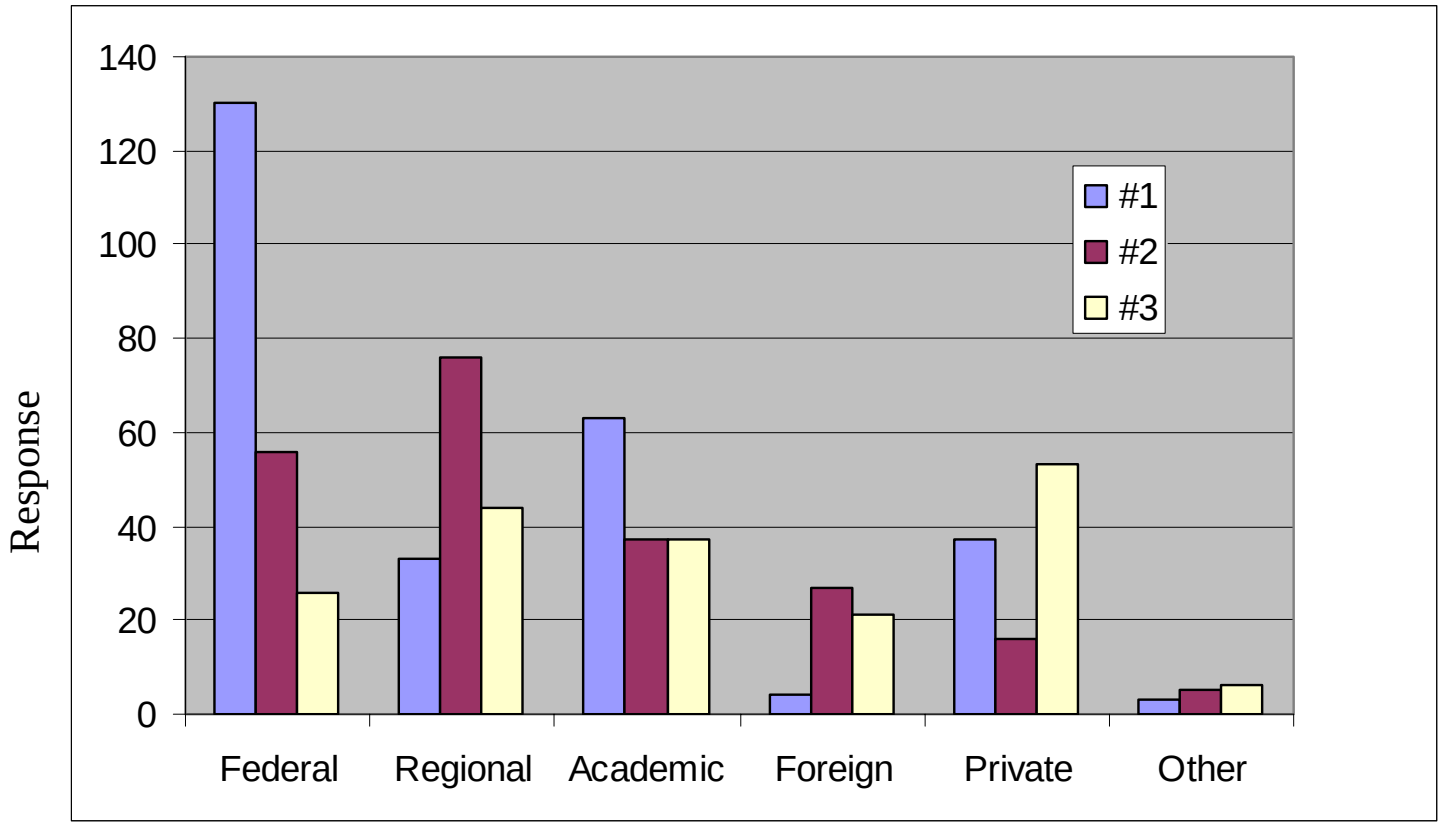
Criticality of Moderate Resolution Data



- Some 65% of respondents found moderate resolution data critical to their work

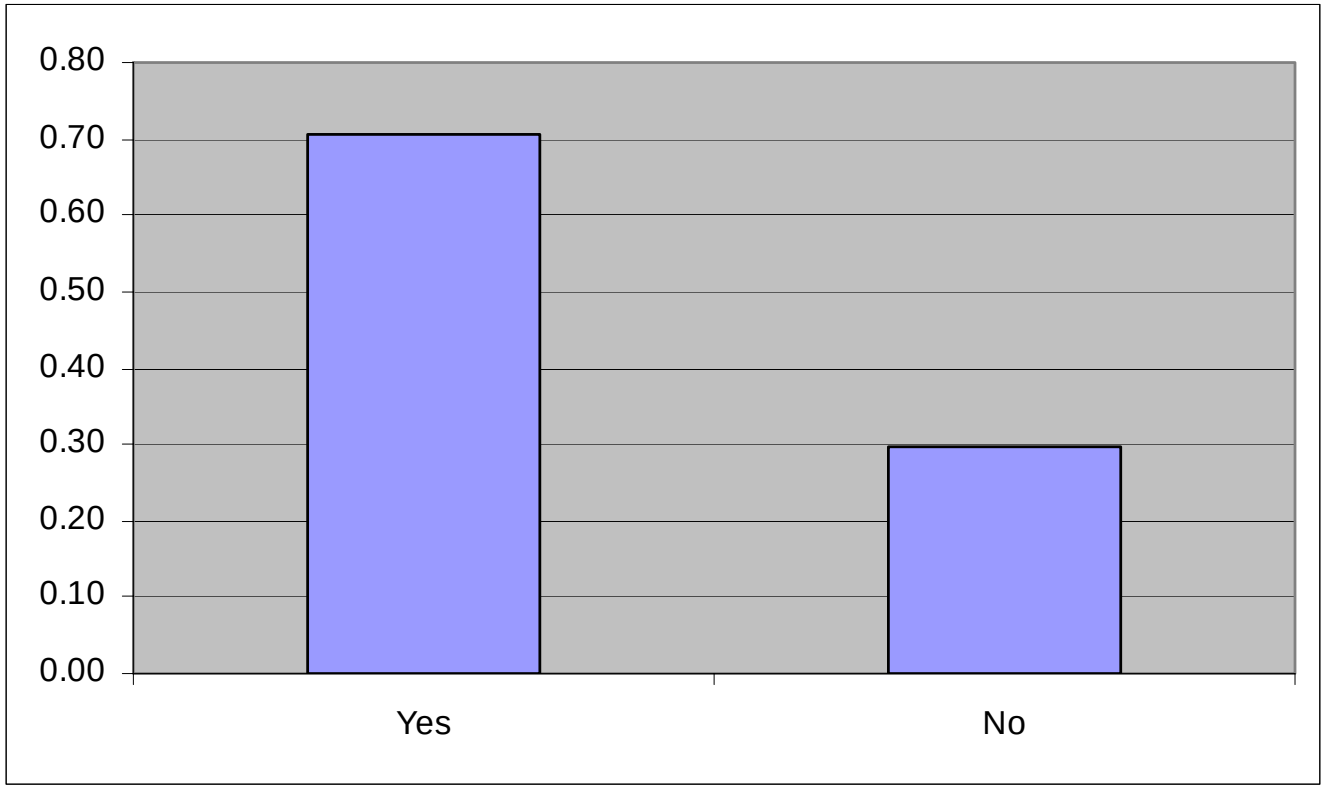
Q. 25a) How critical is moderate resolution (10 meter - 100 meter) satellite data to your work?

25b) When you purchase moderate resolution satellite data, what is your source of funds? Rank the top three most important with (1) as highest rank



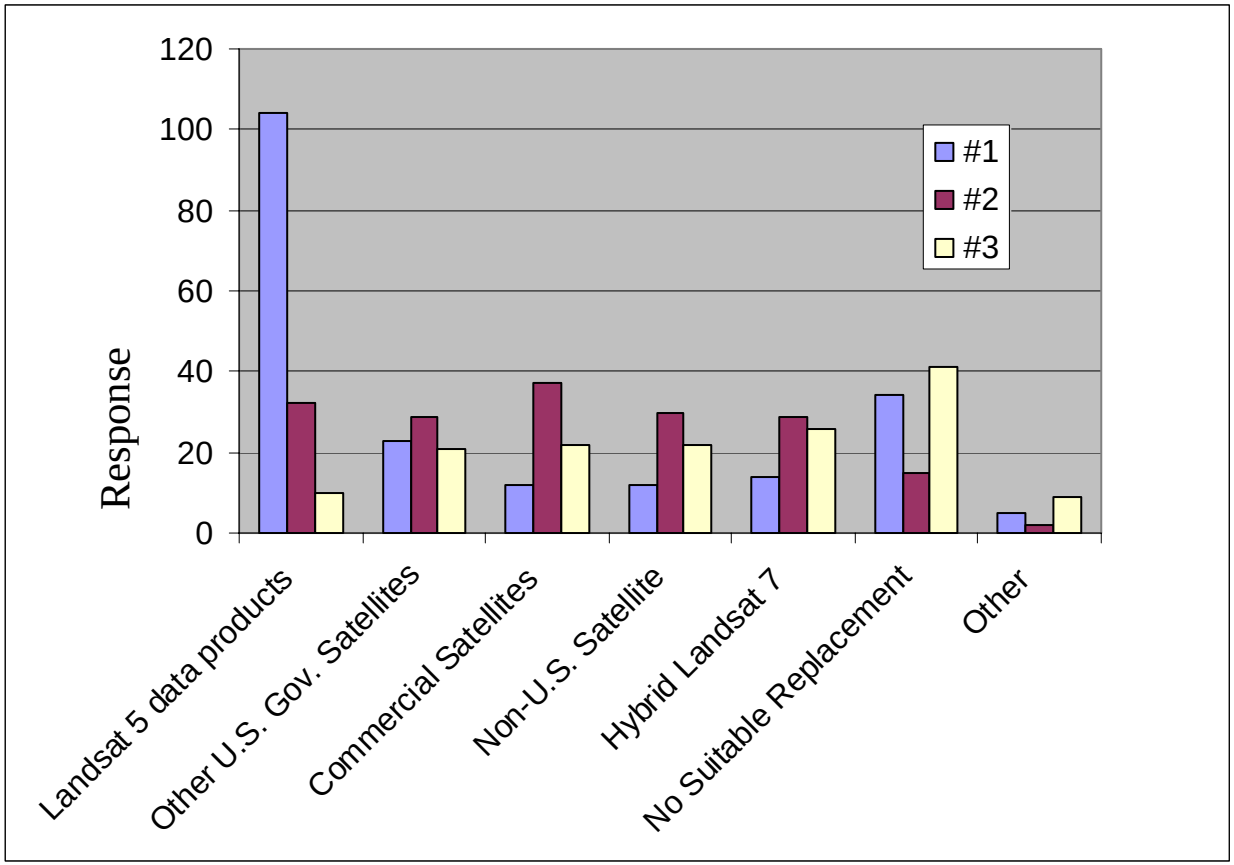
- Most respondents used federal funds to purchase moderate resolution data
- Regional funds are the next most important source of funding

25c) Do you use Landsat 7 data?



- Some 70% of respondents use Landsat 7 data in their work, which is generally consistent with the use of moderate resolution data

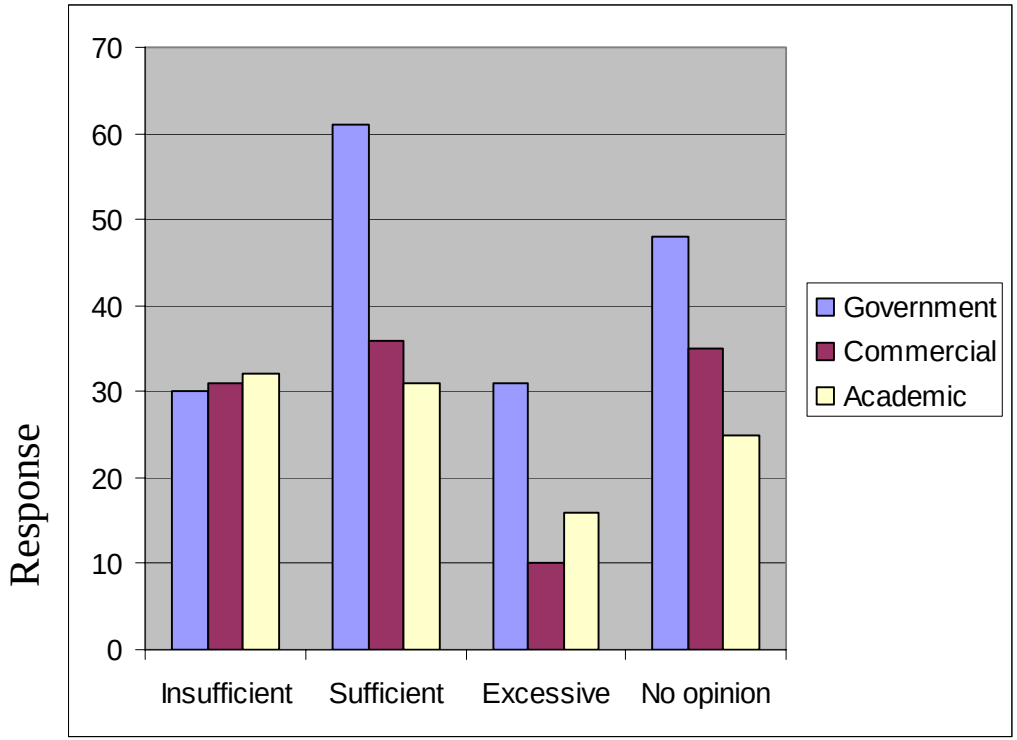
Issue of Scan Line Corrector Failure in Landsat 7



- Most respondents who used a replacement source of data for Landsat 7 data employed Landsat 5 data products

Q. 25d) If the Scan Line Corrector problem has impacted your use of Landsat 7 data, have you been able to use a replacement source? Rank top three most important, with (1) as highest rank

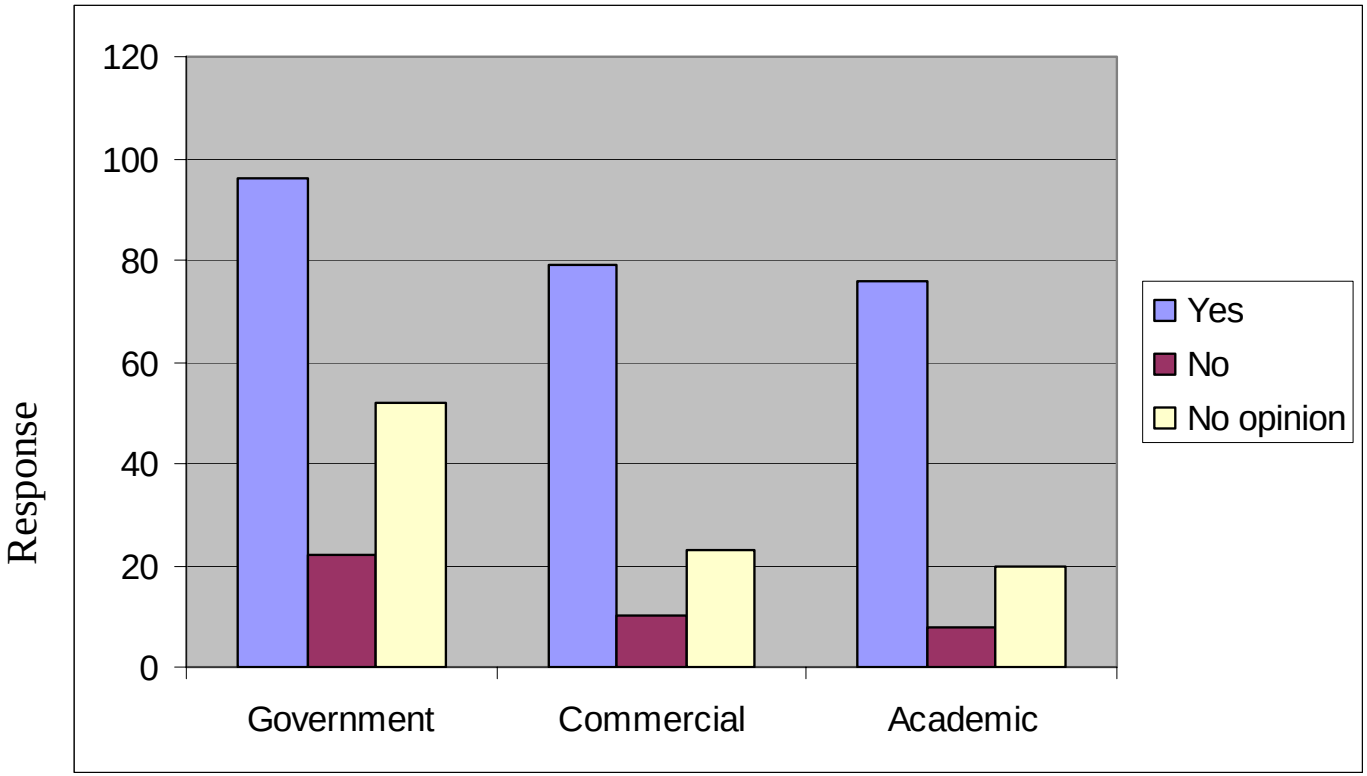
Sufficiency of Government Policy for Promoting Sales of RS Data from Commercial Satellites



- Most respondents feel that government policy is sufficient, though some 30% opine that it is insufficient
- This suggests that some "tweaking" of government policy may be advisable

Q. 29) In your opinion is the government policy to promote the sale and use of remotely sensed data from commercial satellites,...?

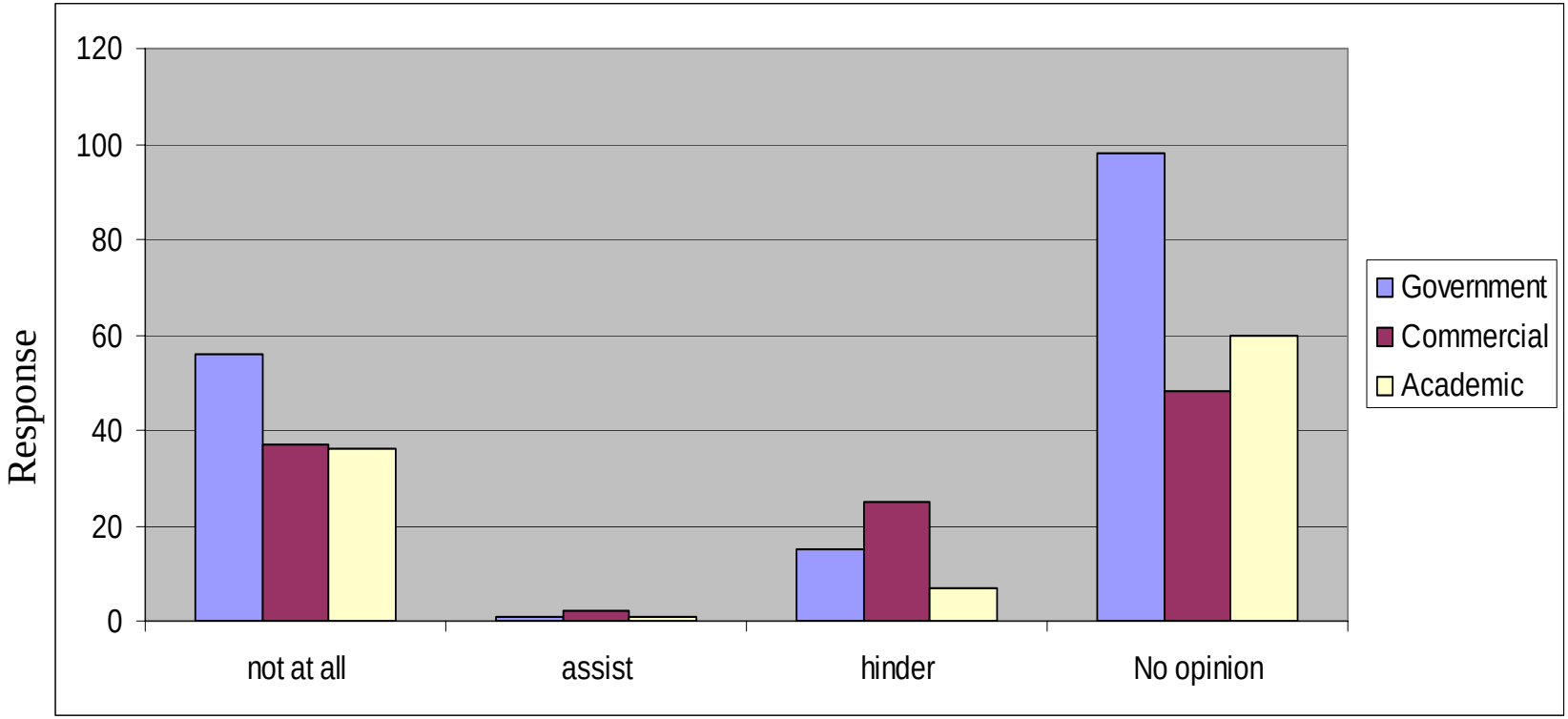
Government Promotion of Use of Aerial Data



- Most respondents were supportive of the federal government developing enhanced policies to promote the use of aerial RS data.

30) Should the Federal Government develop enhanced policies to promote the use of aerial remotely sensed data in the future?

Effects of Overseas Technology Transfer Restrictions



- Government technology transfer or export requirements have relatively little effect on most respondents but do continue to hinder overseas sales by some companies

Q. 31) How do government technology transfer or export requirements to foreign buyers affect your company's ability to conduct overseas sales?

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