SPACE WEATHER DECADAL PANEL – THOUGHTS & OBSERVATIONS

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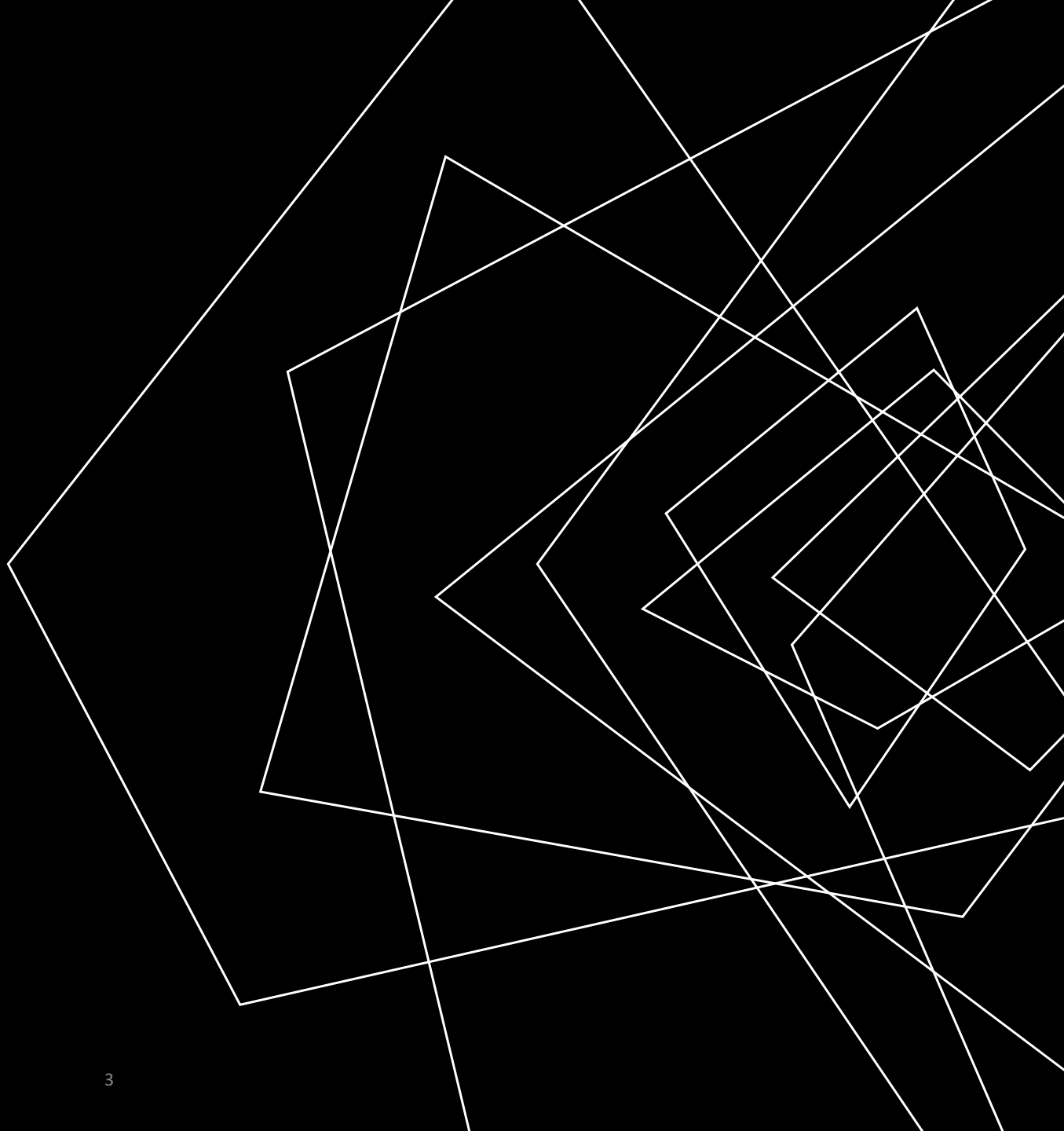
VARIOUS HATS

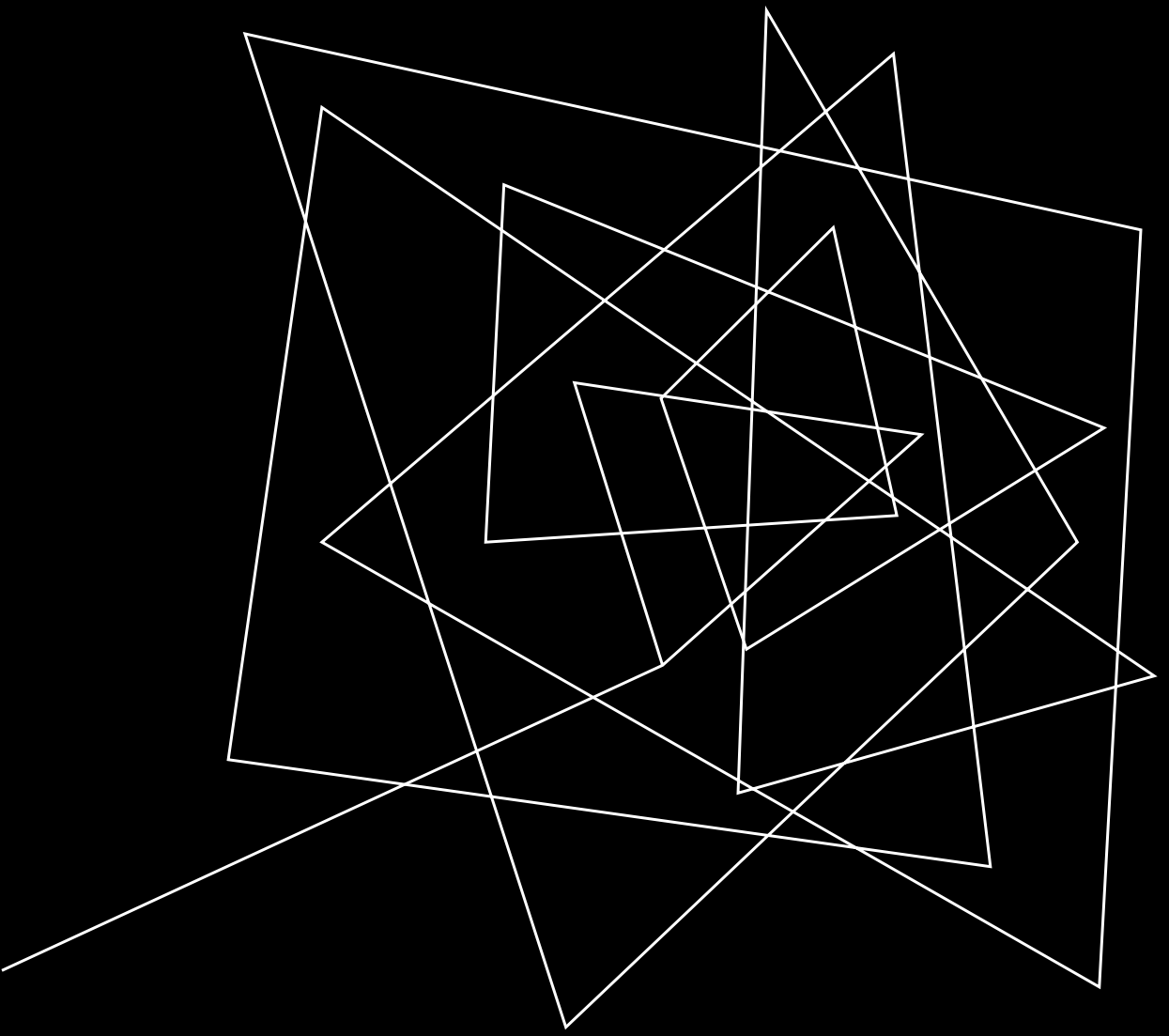
- PhD Research
  - Particle energization & transport in flares, RHESSI, GRIPS
- Industry/Ball Aerospace
  - Mission Design & Development
  - Space Sciences Manager, Helio/Space Weather Lead
- AAS/SPD Public Policy Committee
  - Congressional engagement
- Space Weather Advisory Group (SWAG)
  - Updating National Space Weather Strategy & Action Plan, Engagement across Enterprise, SWORM, PROSWIFT
- Chair of NASA's Space Weather Council (SWC)
  - Advise on NASA's space weather program

All opinions expressed in this presentation are my own

DISCUSSION QUESTIONS

1) Thoughts on the survey
2) How the various SWx groups might provide input to the survey – later today
3) What you'd like to see from the survey





HOW DOES THE DECADAL FIT INTO THE NATIONAL SPACE WEATHER ENTERPRISE?

Answering this question is essential to maximizing the committee's impact.

A clear understanding can focus your task.

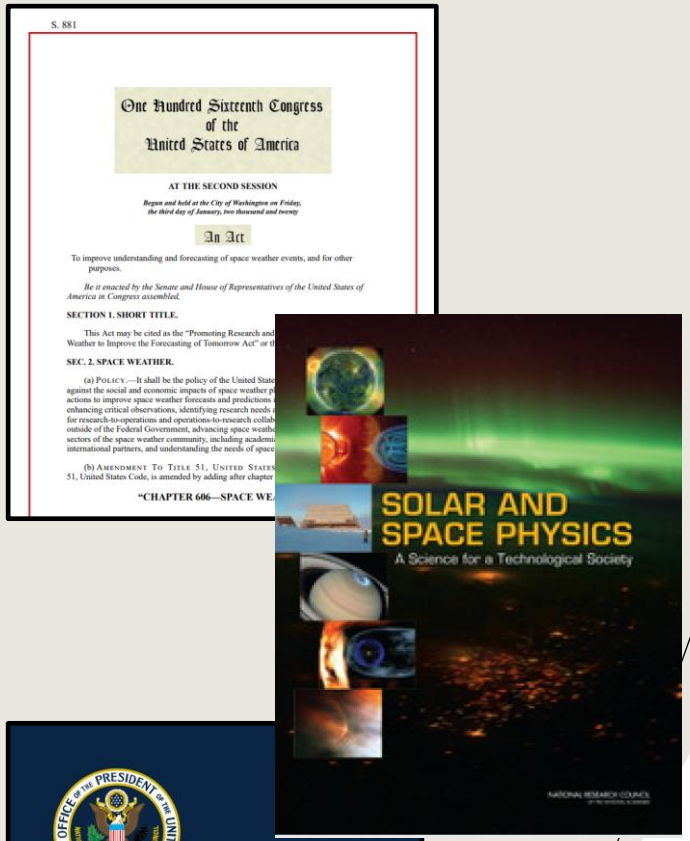
THE AGENCIES RECEIVE MULTIPLE INPUTS TO THEIR SPACE WEATHER PROGRAMS

PROSWIFT ESTABLISHES NATIONAL SPACE WEATHER POLICY & DIRECTS ROLES AND RESPONSIBILITIES

Reflected in the Decadal Statement of Work

Several agencies aren't Decadal sponsors

- DoD, Department of Interior & FAA.
- Impacts to R2O2R recommendations?

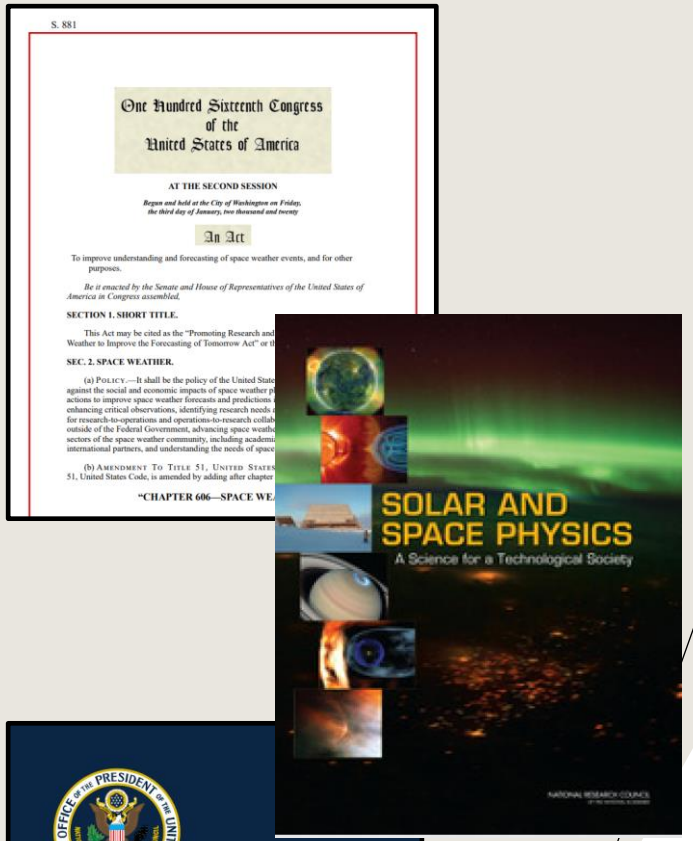


PROSWIFT DIRECTS OSTP TO DEVELOP AND MAINTAIN A NATIONAL SPACE WEATHER STRATEGY AND ACTION PLAN

SWORM IS UPDATING THE 2019 PLAN IN 2023, WITH INPUT FROM THE SWAG

Next update 2027

- Process considers input from Decadal
- How is your statement of task connected?
- How to frame relevant inputs?

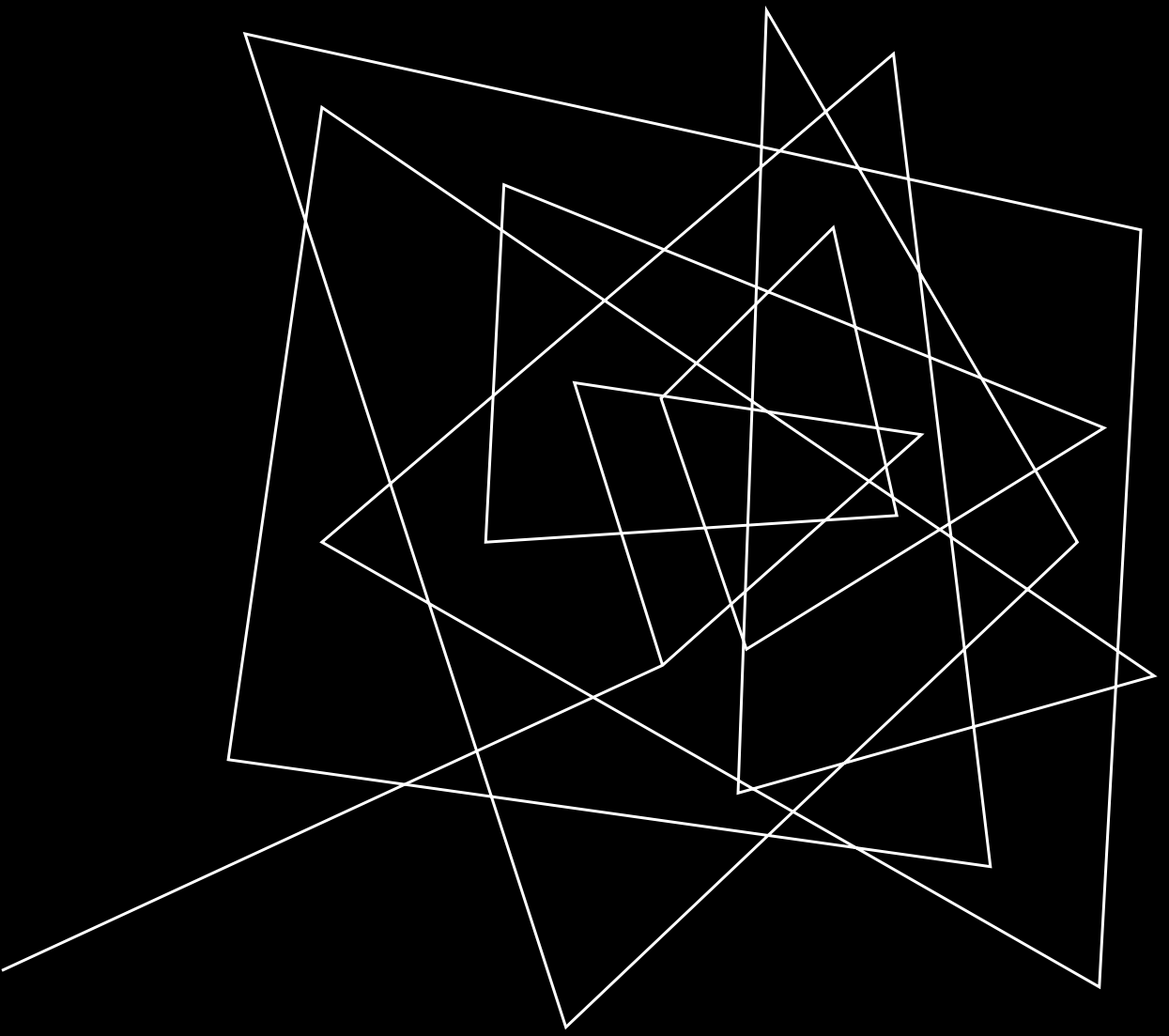


PROSWIFT DIRECTS ACTIVITIES THAT ARE REFRESHED OUTSIDE THE DECADAL PROCESS, AT <10-YEAR CADENCE

SWAG'S USER NEEDS ASSESSMENT

SWORM'S GAP AND BENCHMARKING ACTIVITIES

How can the Decadal recommendations compliment these activities?



WHAT QUESTIONS CAN THE PANEL ASK TO MEET THE CURRENT MOMENT?

The national policy framework is established, progress has been made and plans are in motion

SPACE WEATHER - MANY STAKEHOLDERS MANY OPINIONS ON SCOPE.

Space Weather vs Space Science

- Decadal should provide definition
- Specific questions vs broad definition
- Weather analog
- May be easier to define what space weather isn't
- Overlap with other panels

Consider the next 10 years

- Don't restrict to Earth-Sun
- Changing national priorities and global politics

THE PAST 10 YEARS SAW RAPID CHANGES IN THE ENTERPRISE

STAKEHOLDER NEEDS WILL CONTINUE TO EVOLVE IN THE NEXT 10 YEARS.

Provide flexible recommendations that remain relevant

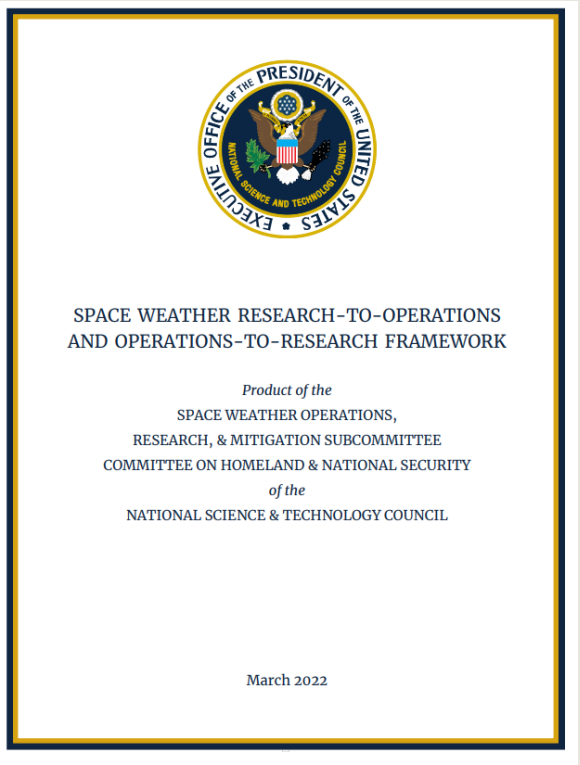
- Strategic prioritization at program vs discipline levels
- Decision rules
- Mission recommendations that allow the agencies flexibility in development
- Address the Decadal Statement of Work with specific recommendations

SPACE WEATHER DISCIPLINES AND COMMUNITIES ARE SILOED

WHAT OVERARCHING QUESTIONS CAN BE USED TO LOOK ACROSS SILOS AND PROVIDE RELATIVE PRIORITIZATION?

What impacts the accuracy and lead-time of all forecasts?

What is the biggest source of error in forecasts?



SPACE WEATHER RESEARCH-TO-OPERATIONS
AND OPERATIONS-TO-RESEARCH FRAMEWORK

Product of the
SPACE WEATHER OPERATIONS,
RESEARCH, & MITIGATION SUBCOMMITTEE
COMMITTEE ON HOMELAND & NATIONAL SECURITY
of the
NATIONAL SCIENCE & TECHNOLOGY COUNCIL

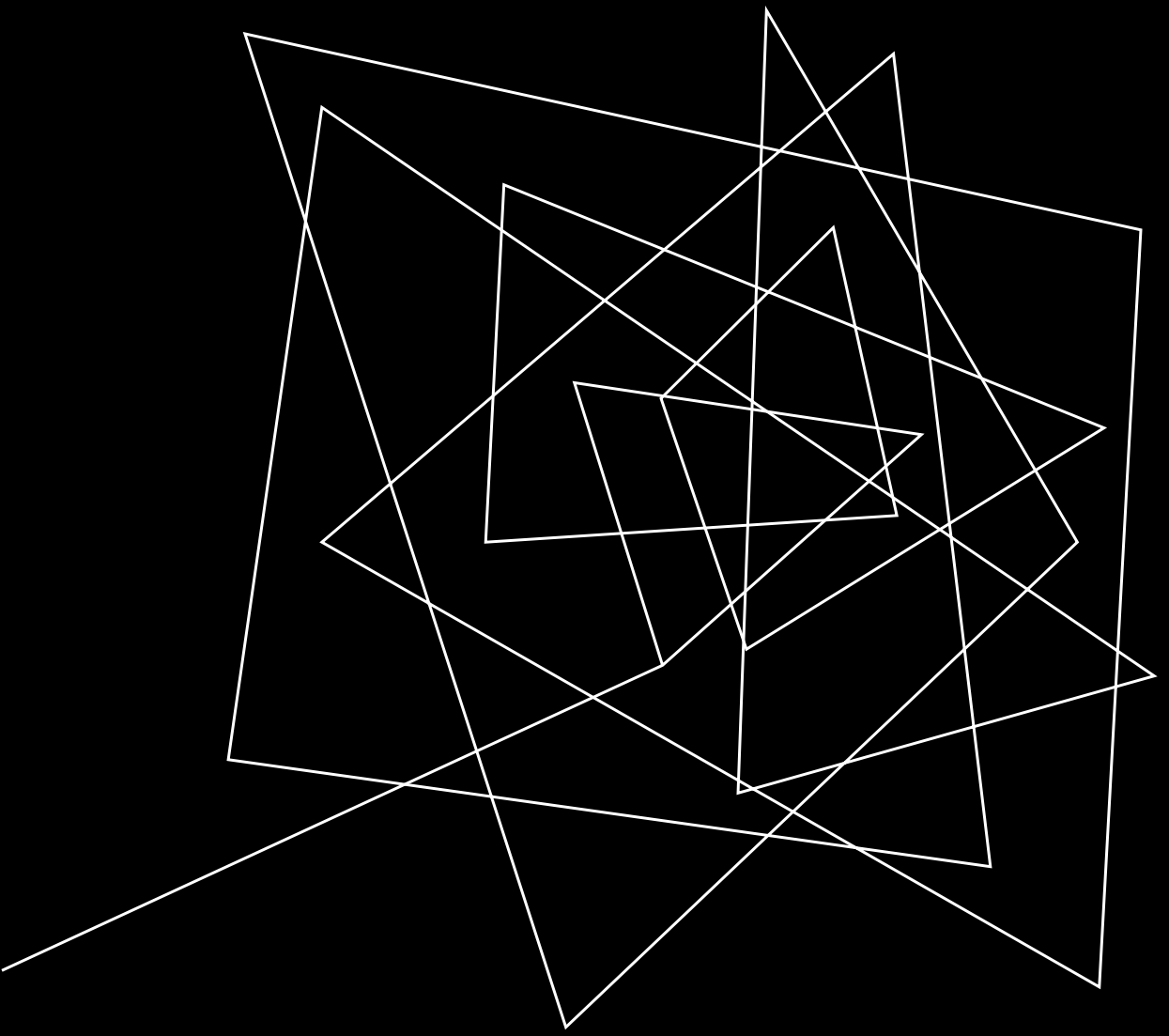
March 2022

THE AGENCIES HAVE MADE CONSIDERABLE PROGRESS IMPLEMENTING AN R2O2R PROGRAM.

HOW CAN THE DECADAL STRENGTHEN R202R?

Possible opportunities include:

- Applied research function within NOAA to support transition to operations & PROSWIFT responsibilities – similar to OAR
- Higher-TRL R2O grants – new program for NOAA
- Increased O2R feedback in mission formulation and standardizing inputs
- Centralized data portal to improve access & utilization across user communities



NEW MISSIONS AND EXPANDED OPERATIONS ARE NEEDED TO SUPPORT THE EVOLVING ENTERPRISE

Large questions are motivating large missions as the nation, and the world, establish a sustained presence beyond Earth

THE US SPACE INDUSTRY IS MOVING BEYOND LEO.

DEFENSE, COMMERCIAL, ECONOMIC AND HUMAN EXPLORATION HAVE EXPANDED TO MEO, GEO, CIS-LUNAR AND MARTIAN SPACE.

Space weather data is needed support growing activity in these regions

What are the baseline research, application, observation and operational needs in these environments?

- Consider commercial and government operators

FUTURE RESEARCH MISSIONS ARE AMBITIOUS AND COULD EXCEED AVAILABLE FUNDING.

Be bold but realistic in making recommendations.

- Cubesats have extremely limited capabilities and are high-risk
- Mission class should be determined by National Priority, not to try and fit into a cost box
- Community frequently comes from “do more with less” than “what’s the best science” mentality
- Magnetically-clean and low-energy plasma missions are technically challenging
- Modern telecom solutions can leverage plans in Planetary Science, Human Exploration and DoD
- Mission cost is determined by technical need and Class

CAN LARGE-SCALE, INTERCONNECTED, SPACE WEATHER TOPICS BE ANSWERED ACROSS MISSIONS?

DEVELOP A SYSTEMATIC AND COORDINATED APPROACH TO RECOMMENDING THE HSO ARCHITECTURE ACROSS PROGRAM ELEMENTS.

What approaches can enable a comprehensive HSO architecture?

- Do not rely on Explorers to close space weather gaps
- Consider how to weigh research goals across missions against those enabled by single complete missions
- OSSEs can support prioritization exercises across the HSO

FUTURE RESEARCH AND OPERATIONAL MISSIONS INCLUDE NEW VANTAGE POINTS, CONSTELLATIONS AND MULTI-POINT MEASUREMENTS IN LEO AND THROUGHOUT THE SOLAR SYSTEM.

What approaches can enable these missions at lower cost?

- Constellations deployed over time
- Increased domestic/international cooperation
- Focused pathfinder missions to constrain parameter space
- Aggressively seeking hosted payload opportunities
- Reliability vs redundancy trades
- Data buys are attractive, but feasible in limited contexts

SUMMARY

The space weather panel has an enormous and challenging task.

- National Policy can help focus scope and maximize impact
- The current moment is unique
- Bold missions can be realized in the current budget

THANK YOU

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