National Aeronautics and
Space Administration

NEPAG Report
NASA Electronic Parts Assurance Group

S. Agarwal

June 15, 2020

NASA Astronauts Launch from America in Historic Test Flight of SpaceX Crew Dragon

Credits: NASA/Bill Ingalls

Some Hi-Lites (Changes have kept us busy)

- **NEPAG Transition from M. Sampson (February 2020)**
  - This year happens to be the 20th anniversary of NEPAG
  - 20 years of Michael J. Sampson leadership will be missed.
  - Staying the course
  - Appreciate everyone's support, notably from the domestic and international partner agencies, during this transition
- **Impact of COronaVIrus Disease – 2019, COVID-19 (March 2020 onwards)**
  - **No / Minimal impact**
    - NEPAG, GWG, HWG telecons (No impact)
    - NEPP ETW (Virtual only)
    - Learn@Lunch Webinars (Virtual only)
  - **Cancelled / Postponed**
    - May 2020 JC-13/CE meetings in Portland, Oregon (Cancelled)
    - DLA Audits (Postponed)
    - NASA ESD Surveys (Postponed)
  - **Non-Travel Work**
    - ADC/DAC BoK (Irom)
    - NASA Parts Bulletin on PEMs (Hannelli)
    - Hybrid DPAs/FAs Review (Apple, Martinez, Evans)
    - Review of MIL-STD-883, TM 2012 (Bescup)
    - ESD Test Data Review/Analysis (Han)
    - Supply chain assessment (Khan)
    - Connectors (Billig)

NASA Activities for FY19 and FY20

Activity	Q1	Q2	Q3	Q4	Total
FY19					
DLA Audits Supported	5	2	7	12	26
NASA ESD Surveys	1	1	1		3
Standard Microcircuit Drawings (SMDs) & Slash Sheets	5	7	2	1	15
Domestic Telecons (Average Attendance)	6 (30)	10 (32)	5 (33)	8 (32)	29 (32)
Intl Telecons (Average Attendance)	2 (27)	2 (28)	3 (29)	2 (27)	9 (28)
EEE Parts Bulletin			1		1
Learn@Lunch Webinars	2	3	5	4	14
Meetings/Conferences (Agarwal)	1	1	3	2	7
FY20					
DLA Audits Supported	5	3	**		8
NASA ESD Surveys	**	**	**		
Standard Microcircuit Drawings (SMDs) & Slash Sheets	2	5	9		16
Domestic Telecons (Average Attendance)	7 (32)	9 (39)	7 (51)		23 (41)
Intl Telecons (Average Attendance)	3 (29)	2 (29)	3 (40)		8 (33)
EEE Parts Bulletin	*	*	1		1
Learn@Lunch Webinars	4	9	2		15
Meetings/Conferences	4	2	1***		7

- * 1 Bulletin in progress.
- ** Postponed ***NEPP ETW (100% Virtual)

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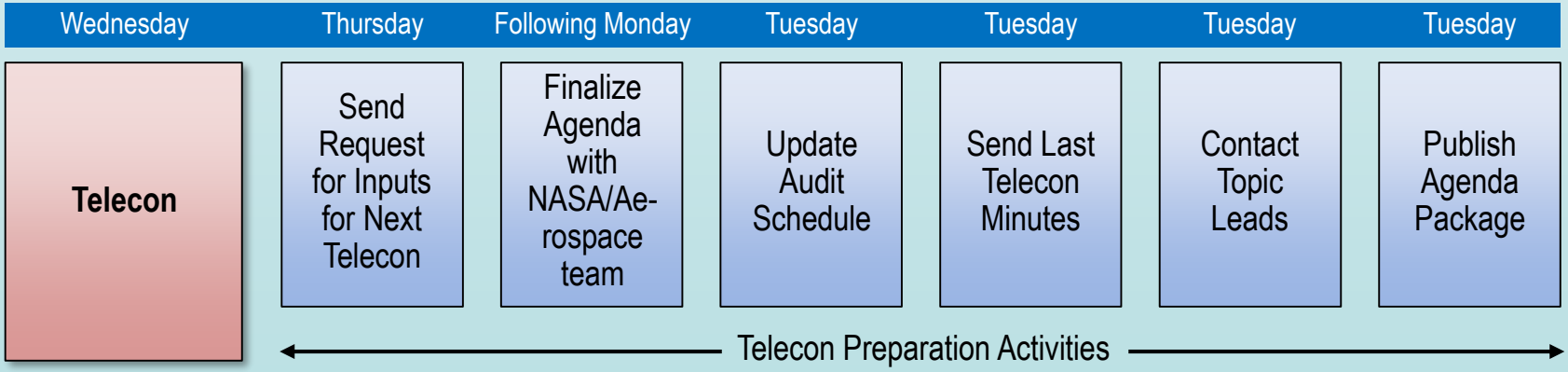
Telecons

- **NEPAG Telecons** (Team: S. Agarwal, K. Munsell, J. Pandolf, J. Brusse, K. Laird, L. Harzstark/Aerospace)
  - **Held since 2000, these telecons drive the NEPAG program. The weekly cycle is shown below.**
  - **Typical Telecon Agenda Package contains**
    - ❖ List of items for discussion
    - ❖ DLA audit schedule, SMD review status, Learn@Lunch Webinars, technical meetings, list of items for discussion at next JEDEC/CE-11, CE-12.
  - ***Return on Investment for NASA flight projects***
    - ❖ ***Coordination of parts issues with DLA and the space community***
  - **FY19 Annual Survey**: Had a total of 29 Domestic and 9 International telecons with average attendance at 32 and 28 respectively. Average participant work experience ~ 20 years.
  - **FY20 Status Report**: Had 7 Domestic and 3 International in Q3 (23 and 8 so far in FY20). The attendance on March 25 call was 52, a high for FY20.
  - **Impact of Coronavirus: None**

Weekly Telecon Cycle



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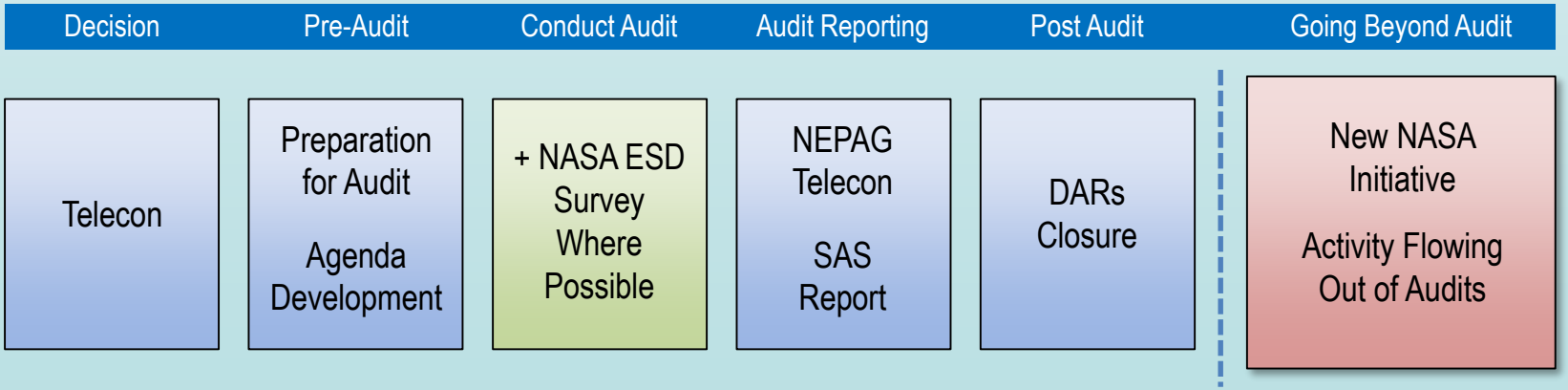
Defense Logistics Agency/Land and Maritime "DLA" Audits

- **DLA Audits**
  - **NASA supports DLA audits as technical experts. Responsibilities divided as follows:**
    - Passives: Brusse; Hybrids: Panashchenko, Pandolf and Majewicz; PWB: Gutierrez; Discretes: Damron; Connectors: Billig; Test Methods: Laird; Microcircuits: Agarwal
  - **Reports:** Verbal reports given on NEPAG telecons. SAS (Supplier Assessment System) report sent to M. O'Bryan at GSFC for posting on database at JSC.
  - ***Return on investment for NASA flight projects***
    - ***Ensure that NASA inputs are incorporated into part manufacturers' processes***
    - ***Review and resolve any parts issues with the manufacturers while on audit***
    - ***Develop contacts for future needs (e.g., finding critical parts)***
  - **FY19 Annual Survey**: NASA supported a total of 26 audits.
  - **FY20 Status Report**: NASA participated in 5 audits in Q1, 3 in Q2, none in Q3; 8 so far in FY20. Due to novel Corovirus crisis, DLA has postponed all travel until further notice.
  - **Impact of Coronavirus: Yes, no travel. Utilized funds to non-travel tasks.**

Audit Process



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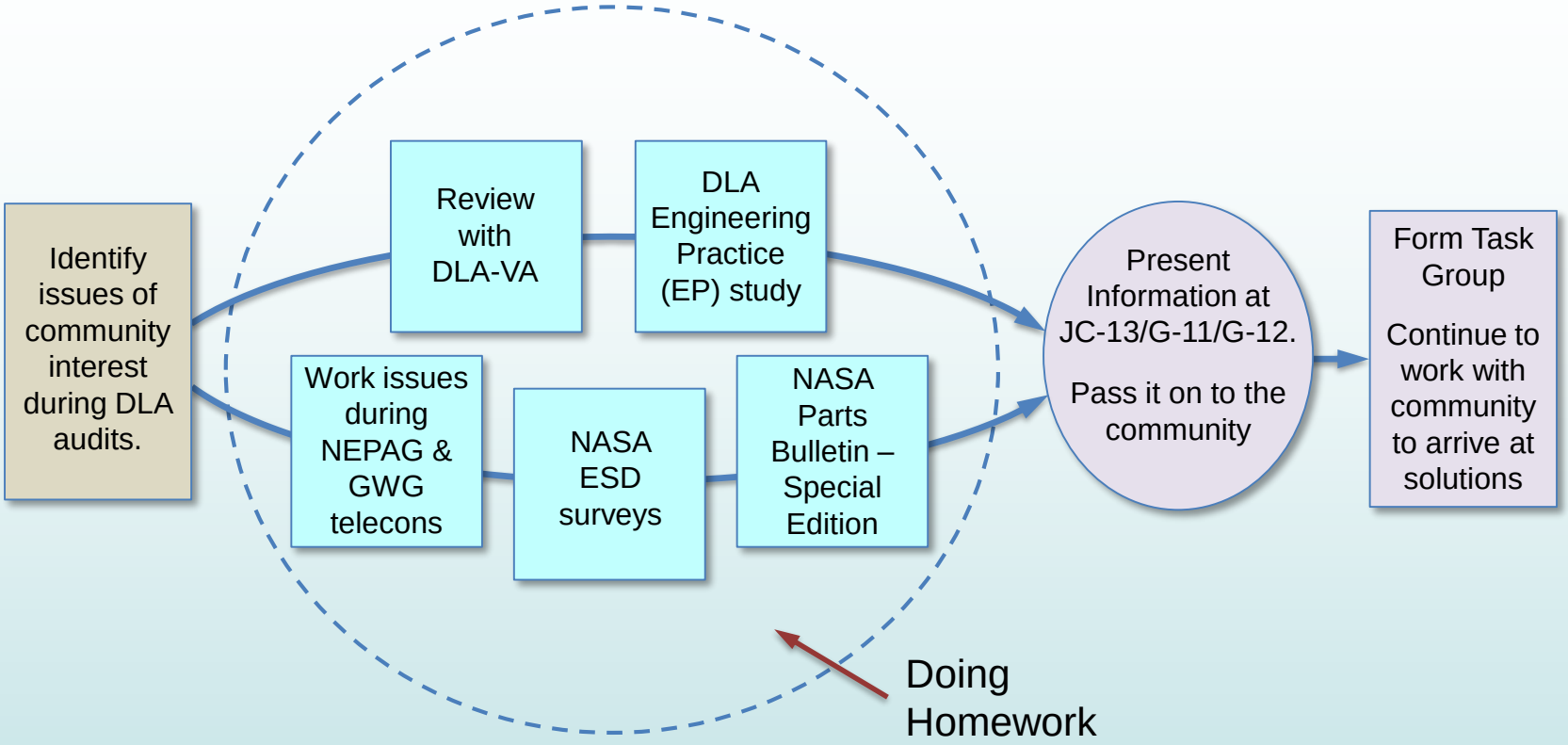
Taking Audit Findings a Step Further!



- Bring general awareness (Via NASA Bulletins, Surveys)
- Work with DLA to conduct engineering practice (EP) study
- Generate a basic proposal and related information so the potential task group (TG) has a strong starting point.
- This path has **saved time** in resolving major issues found during audits.

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Standard Microcircuit Drawings (SMDs) Review

- **SMDs Review/Standards Activity** (All centers with NEPAG Partners)
  - **NASA Specific Goals**
    - Provide comments to DLA-VA on newly drafted SMDs.
      - 10 day comment period
    - As part of QA (Qualifying Activity), review qualification data on new microcircuits
      - Several telecons are held with Aerospace, DLA and manufacturer
    - Work with/lead JC-13/CE-11/CE-12 communities to develop/maintain standards.
      - Vice-Chair CE-12
      - Part of Executive Council
      - Chair, CE-11/CE-12 Space Subcommittee
      - Actively support various TG meetings
        - ✓ Present status update on Class Y that was developed under NASA leadership
        - ✓ Participate in ESD, COTS/PEMs and other task groups,
      - Organize NEPAG@JEDEC
      - Take CE-12 meeting notes
  - **Return on investment for NASA flight projects. NASA gets to bring in their perspective on standards issues. JC-13/CE-11/CE-12 represent a big investment on standards activity for NEPAG. The community works well with NASA on standards issues.**
  - **FY19 Annual Survey**: Reviewed 15 SMDs. Supported JC-13/CE-11/CE-12 meetings in May and September.
  - **FY20 Status Report**: Reviewed 9 SMDs in Q3, 16 total this FY. Supported January JC-13/ CE-11/CE-12 meetings. Sponsored the ON Semi Technical Talk on their ESD program.
  - **Impact of Coronavirus: Partial. No JEDEC meeting. Continued document reviews.**

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Electronic Parts and ElectroStatic Discharge (ESD)

- **Electronic Parts and ESD** (N. Ovee, M. Doe, M. Nelson, M. Han, E. Kim, S. Agarwal)
  - **NASA Specific Goals**
    - During the DLA audits of the supply chain, we realized that there were practically no requirements for ESD. Need to update standards.
    - Microcircuit pin count has increased significantly (e.g., Vertex FPGAs have 1752 columns). Current qualification standards were developed years ago with pin counts in the twenties. Applying these old device testing standards to modern high-pin count products can cause severe problems (e.g., testing times increase dramatically).
    - Furthermore, microcircuit part production is no longer under one roof, but landscape of supply chain is multiple specialty houses.
    - Costs can not be ignored – per unit price for advanced devices is approaching $200k. ESD mitigation costs are minute compared to the device unit costs.
    - ESD surveys/audits of COTS hardware/parts suppliers should be mandatory.
    - Mitigation strategies include ESD surveys, observations during audits, standards updates & outreach to the military & space communities. There is always a latency risk from ESD.
    - Outreach: NASA has published extensively on this subject (released 4 Parts Bulletins). We plan to publish a guideline document, and will continue to report at conferences.
  - ***Return on investment for NASA flight projects***
    - ***NASA initiated and led the Electronic Parts and ESD effort. We provide updates at JC-13 TG, SPWG and ETW meetings.***
    - ***Supply chain is deriving benefits from NASA ESD Surveys.***
  - **FY19 Annual Survey**: NASA conducted 3 ESD Surveys. Released a Compendium on ESD. Presented at JC-13 ESD TG, SPWG and ETW meetings.
  - **FY20 Status Report**: Presented at JC-13 TG meeting in January. Conducting limited testing per human body model (HBM). Working on a guidelines document.
  - **Impact of Coronavirus: Partial – no NASA ESD surveys. Continued testing and meetings.**

NASA EEE Parts Bulletins

- **EEE Parts Bulletins** (All centers with NEPAG Partners)
  - **NASA Specific Goals**
    - An outreach activity since 2005
    - The EEE Parts Bulletin is a 4-10 page newsletter with articles of interest to the community.
      - Goal is to issue one to four times per year
      - Distribution is to roughly three thousand individuals in the user/supplier communities
    - As part of QA (Qualifying Activity), review qualification data on new microcircuits
      - Several telecons are held with Aerospace, DLA and manufacturer
  - ***Return on investment for NASA flight projects. A unique NASA outreach activity which is appreciated by the space community around the world.***
  - **FY19 Annual Survey**:
    - Released one Bulletin which is compendium on ElectroStatic Discharge (ESD)
    - Non-Hermetic Devices. Draft done. Compiled with inputs from major manufacturers. (Ovee, Hannelli)
    - Connectors. Envisioning it as a set of bulletins. The draft of the first one is done. Being compiled with inputs from major manufacturers. (Billig, Gutierrez)
  - **FY20 Status Report**: Released the Bulletin on non-hermetics.
  - **Impact of coronavirus: None**

NASA EEE Parts Bulletin, May 2020

National Aeronautics and Space Administration

EEE Parts Bulletin

Electrical, Electronic, and Electromechanical

A periodic newsletter of the NASA Electronic Parts Program / NASA EEE Parts Assurance Group and the Jet Propulsion Laboratory

October 2019–March 2020 • Volume 11, Issue 1,[1] May 15, 2020

Non-Hermetic and Plastic-Encapsulated Microcircuits

The mission assurance organizations at NASA have supported many large and small space missions and programs over the years. Today that spectrum has expanded, ranging from flagship missions such as Mars 2020 with its Perseverance Rover, Europa Clipper, and the proposed Europa Lander, to SmallSats/CubeSats such as the Temporal Experiment for Storms and Tropical Systems—Demonstration (TEMPEST-D) and Mars Cube One (MarCO). Plastic-encapsulated microcircuits (PEMs) have become more attractive since leading-edge alternatives are not available as space-qualified products. PEMs generally have smaller footprints and are lighter than the ceramic packages used in space-qualified products [1]. As the demand and use of non-hermetic and plastic-encapsulated microcircuits for space has increased, the scope of what future missions are capable of has also widened. This changing climate related to EEE parts selection presents new challenges for NASA, which—as always—holds the success of every mission paramount.

Growing Use of NASA SmallSats and CubeSats

Due to the need for low-cost communications satellites and new businesses evolving around Earth-observation services, there's been an increased interest in the use of CubeSats and SmallSats. Many NASA centers have been involved in developing and flying CubeSats and SmallSats, working together with multiple universities and industry partners. These undertakings require new product solutions for smaller, lighter, and lower-cost spacecraft, which cannot be produced using traditional space-qualified electronic parts.

The reliability and radiation requirements for CubeSats and SmallSats are significantly lower than for larger spacecraft because these smaller satellites operate mainly in low Earth or geosynchronous orbits (LEO or GEO, as opposed to deep space) and for relatively short periods. Radiation-hardened, high-reliability, space-grade parts are often too expensive for such missions and do not match well with their requirements.

There are a few notable exceptions to the usual use of CubeSats, particularly MarCO-A and MarCO-B, which were the first CubeSats to fly to deep space, where they successfully supported the Interior Exploration Using Seismic Investigations, Geodesy, and Heat Transport (InSight) mission by relaying data to Earth from Mars during the entry, descent and landing stage (Figure 1). MarCO successfully demonstrated a "bring-your-own" communications-relay option for use by future Mars missions in the critical few minutes between Martian atmospheric entry and touchdown. Further, by verifying that CubeSats are a viable technology for interplanetary missions, and feasible on a short development timeline, this technology demonstration could lead to many other applications to explore and study our solar system.

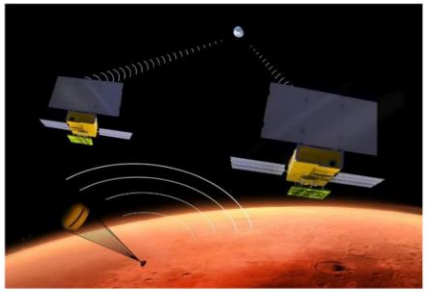

Figure 1. MarCO accompanying the InSight Mars lander and relaying data to Earth as it landed on Mars.

[1] The EEE Parts Bulletin was not published in fiscal year 2019 (FY19). The two issues of Volume 10 were published in FY18.

Learn at Lunch (L@L) Webinars with Supply Chain

- **NASA L@L Webinars**
  - **NASA Specific Goals**
    - Supply chain is asked to present technical descriptions of existing, new products under development, and their near-term vision. Marketing pitches are kept to a minimum.
    - Usually held on Wednesdays at lunch time
    - Audience: All NASA centers and space community. On-site and remote participation.
    - Representatives from Standards organizations (e.g., DLA and ESA) have also presented on status/trends of EEE parts specifications.
    - We gather manufacturer data on status of parts functions, e.g., A/D Converters.
    - The supply chain likes these meetings because they get to meet their customers (hardware designers, parts engineers), see the campus and buy NASA souvenirs for their families/friends. Separate meetings are scheduled to review any on-going issues.
    - The support is provided by JPL Component Engineering and Assurance Office (CEAO).
      - Management: M. Mojarradi, J. Bonnell, H. Herman
      - Organizing Team: B. Brodkin, N. Ovee, S. Agarwal
  - ***Return on investment for NASA flight projects***
    - ***These Webinars give NASA (and the space community) an opportunity to get to know our supply chain.***
  - **FY19 Annual Survey**: Organized 14 Webinars.
  - **FY20 Status Report**: Had 2 Webinars in Q3, total 15 so far this FY. Had been put on hold for a few weeks due Coronavirus. Reconvened Webinars, no face-to-face meetings.
  - **FY21 Budget Request:** None. This work is supported by JPL Component Engineering and Assurance Office (CEAO).
  - **Impact of coronavirus**: Limited – supplier are no longer able to come on campus for face-to-face meetings with designers/parts engineers.

Automotive Parts

- **Automotive Microcircuits (I.C.s) Evaluation (Agarwal)**
  - **NASA was the first organization to begin the evaluation of automotive parts. Due to funding limitation, a minimal set of I.C.s were chosen: one digital (Differential Bus Transceiver) and one linear (Comparator) function.**
  - **NSWC developed test, burn-in and life test boards, and test programs. Took read and record data over temperature. Extensive technical dialog took place between NASA and Navy Crane**.
  - **Some findings/lessons from testing:**
    - Found FOD on IC terminals,
    - All digital parts failed dynamic burn-in, turned out they went into overstress (due to lack of details in vendor data sheet),
    - Careful handling required: Lost several test units (very tiny, easy to misplace/lose).
  - ***Return on investment for NASA flight projects***
    - ***NASA is in a unique position to lead the community in issuing guidelines on the use of automotive microcircuits in space.***
  - **FY19 Annual Survey**: Completed upscreening (including burn-ins), but life tests were not done. Stopped work due to contractual issues with Navy Crane. Crane shipped all hardware, software and test units to GSFC.
  - **FY20 Status Report**: On hold status. Options : (a) Perhaps we could go back and negotiate with Navy Crane to complete the work. (b) Have a DLA approved test lab do the work.
  - **Impact of Coronavirus: N/A**.

Crystal Oscillators

- **Crystal Oscillators (Martinez, GWG, DLA-VA)**
  - **Background**
    - During the DLA audits of crystal oscillator suppliers, we found that no one was buying QPL Class S oscillators. Instead, the manufacturers were selling catalog parts to their own “Class S-like” flow.
    - Simply stated, the specification MIL-PRF-55310 was out of date and needed a lot of work.
    - DLA lead auditor at the time made presentation in CE-12 Space Subcommittee meeting chaired by NASA.
    - NEPAG GWG group worked with DLA to revise the specification (Y. Afroz of DLA-VA worked very diligently to make it happen)
  - ***Return on investment for NASA flight projects***
    - ***NASA is in a unique position to lead the community in updating requirements for the use of crystal oscillators in space.***
  - **FY19 Annual Survey**: NASA worked with DLA and other organizations to update MIL-PRF-55310, the current released version is Rev. F.
  - **FY20 Status Report**: Supported the Aerospace proposed amendment. This Amendment has manufacturers buy-in. It has been released.
  - **Impact of coronavirus: None**

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Analog to Digital Converter BoK

- **A/D BoK (N. Ovee, F. Irom)**
  - **Background**
    - The last NASA A/D selection guide was published by S. Agarwal in 2005
    - Many new products have since become available for NASA applications.
    - This effort is to update the document.
  - ***Return on investment for NASA flight projects***
    - ***The updated guide would be a resource for NASA designers of Analog-to-Digital converters.***
  - **FY19 Annual Survey**: We collected information during L@L Webinars but due to resources limitation (flight projects had priority), the guide could not get started.
  - **FY20 Status Report**: The number of A/D and D/A products has proliferated in the last 15 years, (close to 1000 counting standard and non-standard parts). This task has therefore been broken down into phases. The first phase was the radiation aspect of standard A/D and D/A devices. This has been completed and the document was delivered to the HQ. This was a NEPAG supported telework task.
  - **Impact of coronavirus: None**.

Connectors

- **Connectors (Billig, Gutierrez as backup)**
  - **Background**
    - Connectors is a fascinating commodity but it has had many problems
    - M. Sampson in late 2019 asked that a small task be opened to
      - Work on an introductory Parts Bulletin on connectors and then develop others covering various applications.
      - Have NASA presence in some of the prime conferences
      - Support DLA audits of widely used connector suppliers
    - JPL Wire, Cable and Connector specialist Ray Billig was asked to provide support. Tony Gutierrez was designated as his back-up (Ray had been very busy supporting flight projects).
  - ***Return on investment for NASA flight projects***
    - ***NASA to help provide solutions to the nagging issues with connectors.***
  - **FY19 Annual Survey**: (a) Prepared draft bulletin (b) Participated in one DLA audit.
  - **FY20 Status Report**: (a) Presented at a conference. (b) Need to get back on finishing the bulletin. Note: The audits and meetings are on hold. (c) supported all NASA meeting on wires and connectors.
  - **Impact of coronavirus: Partial – no audits, no technical meetings. Continued work on NASA bulletin.**

JEDEC

- **Support to JC-13/CE-11/CE-12**
  - **Last meeting was in Q2 (Week of January 6, 2020 in New Orleans)**
    - Contracted with hotel to hold NEPAG@JEDEC that Monday
    - Developed agenda for Space subcommittee meeting
    - Presented status update on Class Y
    - Supported the Executive Council meetings
    - Took CE-12 meeting notes
    - Participated in task group meetings, e.g., burn-in, organic Class Y, ESD, etc.
    - Sponsored other participants
  - **CE-12 Leadership**
    - Current chair has agreed to continue one more term
    - NEPAG has a lot of investment in these meetings
    - Agencies and the primes have to develop a succession plan
  - **Future Meetings**
    - The next meeting is scheduled for the week of September 14, 2020 in Columbus, Ohio.

NEPAG Activities

- **Other Significant Items**
  - **NASA Parts Consolidation**.
    - Organized an all NASA face-to-face meeting at JPL (B. Bodkin, S. Agarwal)
  - **Component Engineering and Assurance Office (JPL Office 5140)**
    - S. Agarwal Chairs the bi-weekly meetings on path to resolve flight parts issues.
      - **Wiki Page**. A wiki page has been created to simplify the effort.
      - ***Booklet.*** A booklet summarizing our experiences for the first 25 issues is being compiled. (R. Brandon, C. Marie-Peterson)
      - ***NEPAG Connection.*** Used NEPAG, GWG and HWG telecons as a resource.
      - ***Hybrid DPAs and FAs.*** Since hybrids had the most problems, created a telework task to review their DPAs and FAs. This work is close to completion – will be presented in the DPA/FA session. (S. Gore, T. Apple, J. Martinez, R. Evans)
      - ***MIL-STD-883/Test Method 2012 Review.*** There were questions raised on third party disposition of hybrid X-ray results. A telework task was opened to review the radiography test method for any ambiguities. This work is complete and was submitted to the HQ. The comments were also passed on to the GWG for further discussion and recommendations. (J. Bescup)
  - **Impact of Coronavirus**
    - **DLA Audits and NASA ESD Surveys were postponed**
      - A telework task was created to make **supply chain assessment**. The progress is reported on NEPAG domestic and international telecons. This task will end this month. (I. Khan, S. Grover, L. Boyle)

BACK - UP

NASA Parts Bulletin

- **NASA EEE Parts Bulletin (June 2018 – September 2018)**

National Aeronautics and Space Administration

EEE Parts Bulletin

Electrical, Electronic, and Electromechanical

A periodic newsletter of the NASA Electronic Parts Program / NASA EEE Parts Assurance Group and the Jet Propulsion Laboratory

June 2018 – Sept. 2018 • Volume 10, Issue 2 (Published since 2009), April 30, 2019

Compendium Special Edition on Electrostatic Discharge (ESD)

Damage from ESD is a major cost to the microcircuit industry in terms of time, money, and mission risk. The *EEE Parts Bulletin* has released three special issues on ESD, and this issue is a compendium of these three issues plus an overall view of the subject matter. The first issue dealt with the need to upgrade specifications related to ESD and suggestions for better ESD practices wherever parts are manufactured, stored, or prepared for shipment. The second ESD special issue focused on a parts failure investigation that ultimately concluded that ESD was the most likely cause of the failure. The second issue also included an important reminder about regular ESD testing. The third issue provided an example demonstrating the importance of maintaining ESD discipline and a high-level risk analysis related to electrostatic discharge. This compendium issue begins with an overview of the subject of electronic parts and ESD. Figure 1 provides a reminder that the familiar static sparking from rugs or rubber combs can generate ESD effects. ESD damage can easily go undetected.

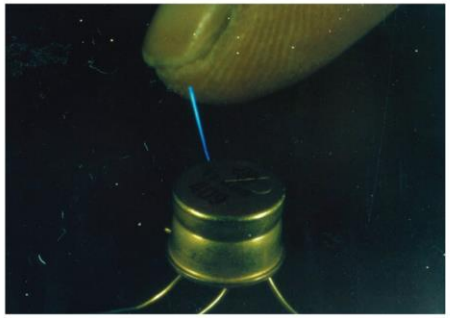

Figure 1. Electrostatic discharge is everywhere (image courtesy of Hi-Rel Laboratories).

Gaps and Mitigation Strategies for ESD

Progressively smaller and more complex microelectronic parts have grown steadily more susceptible to ESD. Consequently, they require more testing effort.

Furthermore, ESD damage can easily be too small for detection by many typical methods. As Figure 2 shows, serious ESD damage can be invisible to optical viewing and even to 6400 X by scanning electron microscope (SEM). In this instance, only a 33,000 X SEM view made the damage visible.

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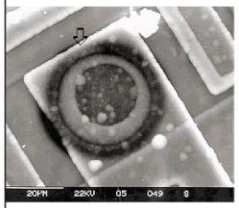
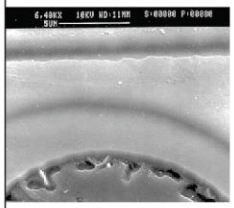
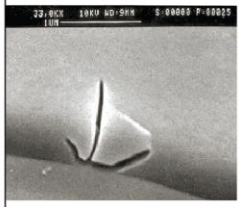
Damage Is Not Optically Visible



Not Visible at 6400 x In SEM



Damage Visible at 33,000 x In SEM



ESD damage to most semiconductors is often so subtle that it cannot be seen without very high magnification (image courtesy of Hi-Rel Laboratories).

Such ESD damage affects all types of commodities for both military and commercial parts, and the less-controlled commercial-off-the-shelf (COTS) parts may be affected more severely than the military.

The parts community must promote an ESD-safe environment. Such efforts must extend from parts fabrication, through shipping, and all the way through installation of parts in the final products.

NASA has supported this effort first by bringing ESD concerns to the attention of the parts community. Mitigation strategies have been developed in response to this rising threat. Mitigation strategies include NASA ESD surveys, observations during audits, standards updates (including harmonization of standards), and outreach to the military and space communities.

NASA has been supporting Defense Logistics Agency (DLA) audits of the supply chain for many years. During the audits in recent years, the auditors observed that the MIL-PRF-38535 requirements were practically non-existent regarding ESD aspects of electronic parts.

Hence, integrating ESD requirements into MIL- PRF- 38535 has become a key goal for the electronic parts community. The current qualification standards for MIL-PRF-38535 and related standards were developed years ago with pin counts in the twenties. Now, pin counts are in the hundreds or more. For instance, Virtex field-programmable gate arrays (FPGAs) have 1752 columns, and manufacturers are striving for even higher counts.

Applying the old device testing standards to modern high-pin count products can cause severe problems. Testing times and costs can increase dramatically. However, costs also drive the need for adequate quality assurance. Per-unit prices for advanced devices are approaching $200K, and the costs would multiply for failures discovered after a part was mounted or (worse) was in the field… or worst of all, in space.

Another issue is that multiple organizations have developed ESD mitigation standards/specifications. Gaps have evolved not just because of new technology, but also because of inconsistencies of standards development.

For the military and space community, the most glaring issues are as follows:

MIL-STD-883, Test Method 3015 Issues:

- Too old
- Does not include the charge device model (CDM), only the human body model (HBM)
- The test method needs to be revisited for smaller feature sizes down to 30 nm.
- The test method needs to be revisited for large numbers of contacts/pins, and vastly increased

2

- Continuing to conduct NASA ESD surveys.
- Interfacing with industry standards groups (e.g., JC-13, JC-14, ESDA, EC-11, EC-12).
- Working especially with the JC-13 newly-formed task group to address ESD issues. [JC-13 defined in the bullet above—just added standards.]
- Harmonizing ESDA 20.20, JEDEC 625, and other ESD standards.

Final ESD Reminders

- ESD is a serious and growing risk for electronic parts use.
- Updated standards are coming, and they will help mitigate ESD risks.
- However, the most important point to remember is that mitigation of ESD risk requires continuous vigilance in identification of risks and discipline in maintaining safeguards.

References

ANSI/ESDA/JEDEC JS-001-2014, ESDA/JEDEC Joint Standard for Electrostatic Discharge Sensitivity Testing–Human Body Model (HBM)–Component Level.

ANSI/ESD S20.20-2014, Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices), Electrostatic Discharge Association, 2014.

JESD 625, Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices. JEDEC Solid State Technology Association, 2012.

MIL-STD-883K, *Test Method Standard*, *Microcircuits*, Defense Logistics Agency, Columbus Ohio, April 25, 2016.

MIL-PRF-38535K, *Integrated Circuits (Microcircuits) Manufacturing, General Specification for*, Defense Logistics Agency, Columbus Ohio, Dec. 20, 2013. (Revision L is in review).

For more information, contact

Shri Agarwal 818-354-5598

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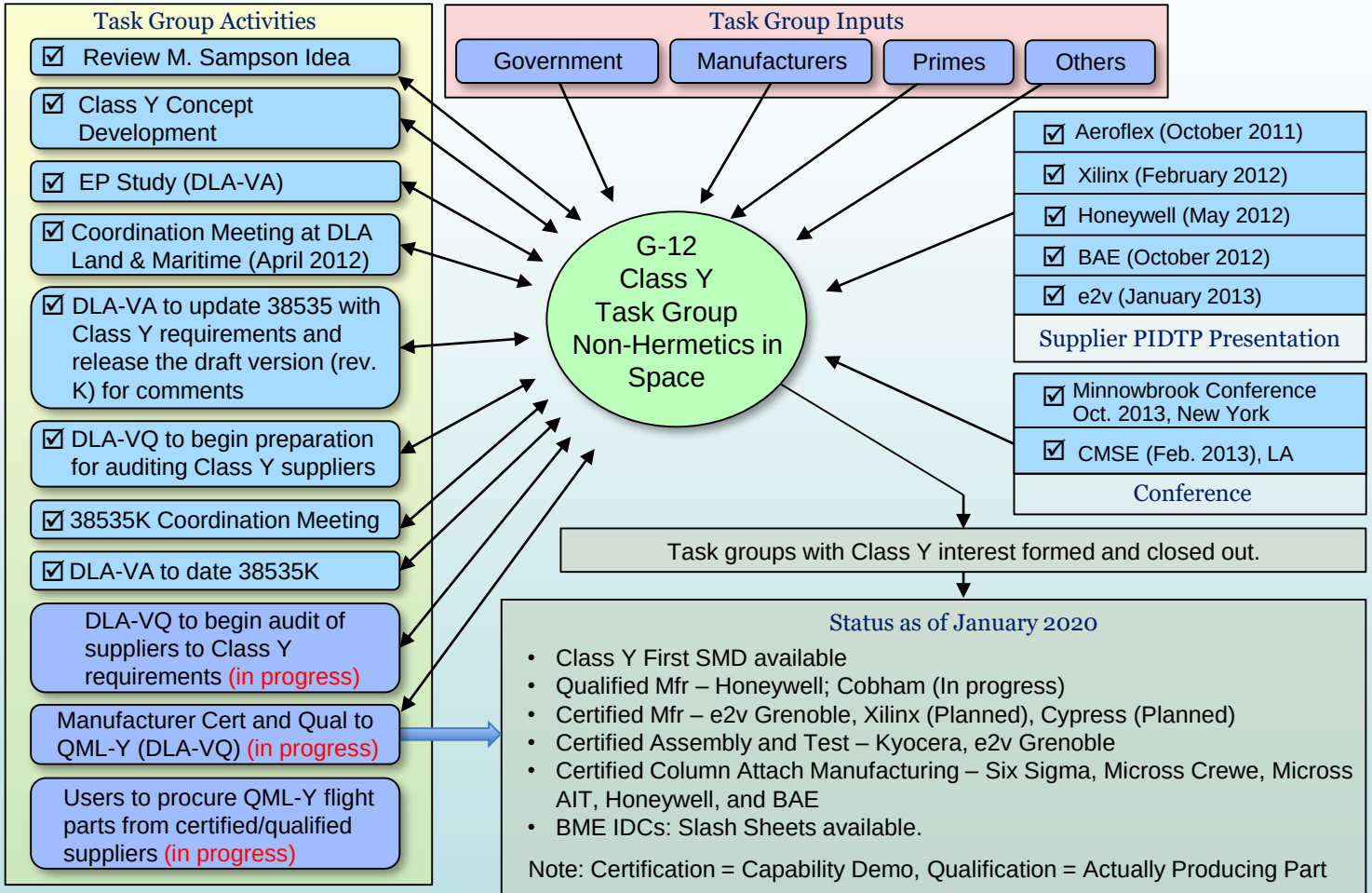
NEPAG

Infusion of the New Class (Y) Technology into the QML System for Space (Status given at JEDEC in January 2020)

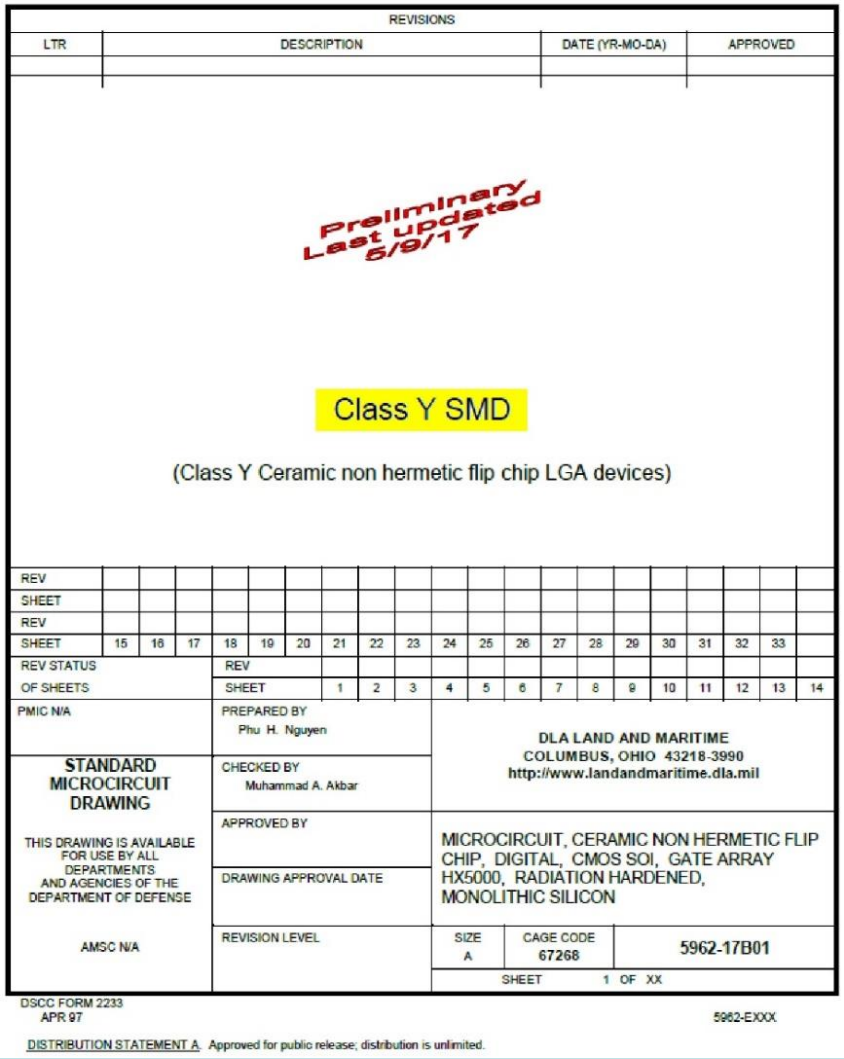


BGA / CGA = Ball-Grid Array / Column-Grid Array
BME = Base Metal Electrode
IDC = Inter Digitized Capacitor

PIDTP = Package Integrity Demonstration Test Plan
SMD = Standard Microcircuit Drawing

NEPAG

First Released SMD for Class Y Part



REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

Preliminary
Last updated
5/9/17

Class Y SMD

(Class Y Ceramic non hermetic flip chip LGA devices)

REV																			
SHEET																			
REV																			
SHEET	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

REV STATUS	REV													
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A	PREPARED BY Phu H. Nguyen	DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 http://www.landandmaritime.dla.mil
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	DRAWING APPROVAL DATE	
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		SHEET 1 OF XX

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APR 97

5962-EXXX

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: XX-XX-XX

Approved sources of supply for SMD 5962-17B01 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime-VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at https://landandmaritimeapps.dla.mil/programs/smcr/default.aspx

Standard microcircuit drawing PIN 1/ 2/	Vendor CAGE number	Vendor similar PIN
5962H17B0106YXC	34168	HX518X
5962H17B0106YYC	34168	HX518Y

1/ Microcircuits devices supplied to this drawing are land grid array (LGA) packages with lead finish mark letter C (gold). However,for future AID drawing column grid array (CGA) or ball grid array (BGA) packages terminal lead finish mark shall be provided with "F".

2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
34168	Honeywell Aerospace - Plymouth 12001 Highway 55 Plymouth, MN 55441-4744

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NEPAG

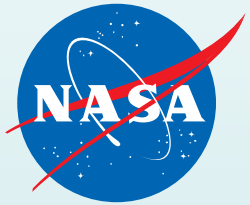
Upscreened Zynq Processor as a Poster Child for Organic Class Y Devices

- **This slide was presented at the Space Subcommittee meeting in Columbus, 9-18-19**
- **Xilinx Zynq processor is used at NASA/JPL**
- **It is being screened by a third party vendor**
- **The Screening Position EEE-INST-002 (Level 2)**
- **What level of Screen & Qual. is required for the mission?**
  - **Screening**
    - Electrical Measurement, including Dynamic Burn-in with pre & post AC & DC characteristics.
  - **LOT Qualification**
    - Groups B, C & Dto qualify their own Lots.
- **Additional details were presented in the Joint 13.7/CE-12 meeting.**
- **The screening/qual information gathered will be shared with the Organic Class Y task group.**
- **JPL will continue to work with the manufacturer to share findings.**
- **FYI, for the space community**

FY19-FY20

- **Infrastructure Readiness to Support HPSC**
  - **Supply Chain:** All are QML V and Y, and have been surveyed for ESD by NASA.
    - Cobham COS; Kyocera, San Diego; Six Sigma; Micross AIT.
  - **Standards:**
    - Ceramic Class Y and V, and ESD: requirements in place in 38535 Rev L (Released Dec 2018). On-going work e.g., underfill updates.
    - Organic Class Y: Scott Popelar leading TG – 2 yr timeframe, looks doable since most of the building blocks, e.g., the concept of PIDTP developed for the ceramic version, are in place.
    - DLA EP Study: Reviving Class N and adding Appendix K (New Technology) to 38535. Reported results at May JEDEC. Also, connected with standards for COTS/PEMS to support CubeSats/SmallSats. The community is reviewing DLA proposal to develop a new specification MIL-PRF-ATM which would replace Appendix K. The ATM document could be used for all new technology without having to first classify it as a hybrid or a monolithic circuit.
- **Reviving QML Standards to include COTS/PEMs/New Technology/2.5D Packaging**
  - **To support CubeSats/SmallSats and similar missions**
  - **See bullet above (ties into other work)**
  - **A NASA Parts Bulletin being worked. It will summarize all of the above activities.**
  - **Aerospace effort for COTS database – just starting. Provided NEPAG support as needed.**

http://nepp.nasa.gov



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