

Atlas: Navigating NASA's Knowledge Universe with AI-Powered Natural Language Queries



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INTRODUCTION

Atlas is a generative AI assistant prototype, allowing anyone within the agency to pose natural language questions using a chat interface. Developed through rounds of feedback and iteration with NASA as part of the NASA 2040 Agency wide initiative, Atlas uses LLM technology to answer technical and scientific questions with high levels of accuracy. Atlas' data sources were chosen by NASA 2040 initiative to learn what content employees felt was not accessible and which GenAI might help.

Goals

- Demonstrate utility of Generative AI to answer natural language questions about important NASA topics
- Streamline and improve employee access to large, dense, and complicated resources
- Provide accurate and clear answers without ambiguous, unclear, or hallucinated text

Data Sources

- NASA Directives
- NASA Procedural Requirements
- NASA Standards
- Space Act Agreements

How Atlas Works

Atlas uses Retrieval-Augmented Generation (RAG) to answer questions using relevant portions of source documents. RAG involves a pre-compute step where an LLM identifies semantic concepts in each source document, a process called "vector embedding." Atlas uses these embeddings to find documents semantically similar to a user query. Finally, those documents are passed to an LLM along with the user's questions and a prompt instructing the LLM to generate a helpful answer.

Atlas is designed to outperform off-the-shelf RAG solutions through improved document preparation, optimized chunking strategies, fine-tuned prompts, and incorporated subject-matter expert feedback in its iteration processes.

Atlas In Action

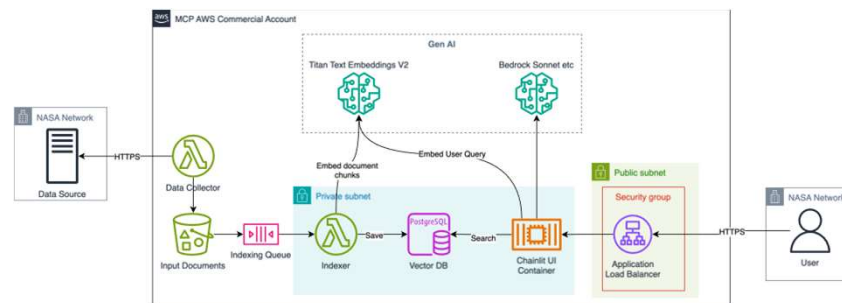
You 07:08 PM
What level of electronic parts would be expected in a Class B mission?
Took 3 steps

MCP Generative AI Demo 07:09 PM
Based on the provided documents, for a Class B mission, Level 2 electronic parts or equivalent would be expected. Here are the relevant details:
According to NPR 8705.4A, Appendix D:
"For Class B missions, the accepted standard for Electronics, Electrical, and Electromechanical (EEE) Parts is Class A criteria or Level 2 parts, equivalent Source Control Drawings (SCD) or requirements per Center Parts Management Plan."
This is further supported by NASA-STD-8739.10, which provides more context on Grade 2 (equivalent to Level 2) parts:

You 07:12 PM
How would a mishap be categorized if there is \$25,000 of damage?
Took 3 steps

MCP Generative AI Demo
Based on the information provided in the documents, a mishap with \$25,000 of damage would be categorized as a Type D Mishap. Here's the detailed explanation:
According to NPR 8621.1D, mishaps are classified based on the severity of personnel injury and the direct cost of property damage or mission failure. For a Type D Mishap, the criteria related to property damage is defined as follows:
"Type D Mishap. A mishap resulting in [...] a total direct cost of mission failure and property damage of at least \$20,000, but less than \$50,000."
NPR 8621.1D: NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and

Atlas Architecture



Challenges/Lessons Learned

- Getting clean text from disparate source documents
- Measuring quality
- LLM hallucinations
- Handling structured and unstructured data types
- Debugging "black box" LLM behavior
- Completeness vs clarity
- High cost of GPUs
- LLM parameters and variability
- General NASA security requirements

What's Next

- Additional data sources
 - NIST Publications
 - FIPS Books
 - Acquisition Regulations
 - Travel Regulations
- Knowledge graphs
- Role-based access control
- BYO documents (upload feature)
- Balance answer completeness vs succinctness

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