Joint Commercial Operations Common Communications Channel

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ABSTRACT

Since 2019, the Joint Commercial Operations (JCO) community has been utilizing commercial space data to improve and share global awareness of potentially concerning space events. During the last 6 years the JCO community has grown from a single nation to a group of 20 collaborative countries organized into 3 global regions. This rapid growth has elevated the need to have clear and information rich communication between each region and through various languages. The DRAGON Army (DA), in support of the JCO, has been actively cultivating new tools and technologies to deliver effective and game changing communication opportunities to improve cross-region and cross-language interoperation. Following an "Exploit, Buy, Build" methodology the JCO and DA team has leveraged the use of Mattermost, ClickUp, the Mission Management Board (MMB) and ForgeSteam to strategically fill capability gaps with speed and in a budget conscientious manner. The DRAGON Army hosts a customized Mattermost server that serves as the investigation hub for space events providing a quick and communal organization of event chatter and analysis product distribution. The JCO has engaged ClickUp to improve crew scheduling complexities and has established a pattern of using crew logs to clarify event processing progress during shift handovers. The MMB provides tracking, assignment, consolidation and publication of space event analysis through a user-friendly interface that is globally accessible [1]. The DRAGON Army in coordination with the JCO Futures team has cultivated a new video conference capability, ForgeStream, that focuses on accessibility, language translation and integrability with other DA tools. These tools together make up the Common Communications Channel (CCC) of the JCO. The JCO global community has grown rapidly over the last several years and is staged to continue to expand to over 45 countries in the next several years; The advances in clear communication mentioned in this paper will facilitate active and healthy growth in the future.

1. INTRODUCTION

Since its inception in 2019, the Joint Commercial Operations (JCO) community has undergone a rapid and transformative expansion, growing from a single-nation initiative into a network of over 20 partner countries, with many more projected to join in the coming years. This remarkable growth in geographic and operational scale has made one thing abundantly clear: successful space operations now hinge on a resilient and highly integrated Common Communications Channel (CCC). The ability to communicate clearly, rapidly, and across linguistic and cultural boundaries is no longer a luxury—it is a necessity. The accelerated expansion of the JCO community is a testament to the increasing need for global collaboration in space awareness. As new partners bring unique capabilities and operational contexts, the requirement for a universal communication framework becomes even more vital. Clear, adaptable communication not only prevents misinterpretation but also ensures synchronized decision-making during critical space events. Just as importantly, it fosters an environment of mutual trust and psychological safety, these are essential conditions for any coalition where members must feel empowered to speak up, share uncertainty, and act decisively across cultural lines.

The DRAGON Army, as a division of the JCO, has spearheaded a suite of cutting-edge communication tools designed to meet this evolving challenge. Mattermost, Mission Management Board (MMB), ClickUp, and ForgeStream each serve as individual powerhouses, but it is their combined orchestration that represents a true force multiplier. Together, these platforms form an interwoven fabric of communication that is both scalable and adaptable, enabling not just operational coordination, but also fostering the kind of shared context, transparency, and accountability that underpins psychological safety in a multinational collaboration. This is the infrastructure required not only to monitor space, but to sustain the human element of operations that keeps the mission responsive and aligned.

Mattermost is the backbone of persistent operational messaging. In an international coalition like the JCO, effective communication is more than a convenience, it is a mission requirement. As the JCO scales to include more nations, teams, and time zones, it becomes increasingly reliant on infrastructure that supports real-time coordination, operational triage, and the continuity of global awareness. Mattermost has become an indispensable part of the JCO's communication strategy. Beyond its real-time chat capabilities, its customized DRAGON Army-hosted features include tailored channels for operational triage, live event coordination, and seamless integration with event logs. With ongoing developments of plugins and automated tools, such as Raven Bot, which structures daily stand-ups and operational check-ins, Mattermost supports consistent information flow across the JCO by centralizing structured discussions, daily reporting, and operational updates, thus reducing fragmentation and reinforcing shared situational awareness.

The problem DRAGON Army's Mattermost addresses is rooted in the limitations of many commercial chat solutions. Stock and immutable messaging platforms may offer convenience, but they frequently fall short in environments that require high availability, data sovereignty, security compliance, and uninterrupted access across regions. These shortcomings become especially problematic in coalition operations like the JCO, where continuous communication and system flexibility are mission-critical. The JCO cannot afford gaps in communication caused by licensing limits, forced outages, or vague data policies. Moreover, relying on external systems where access is contingent on vendor priorities introduces risk. In scenarios where rapid response and coordination are vital, such as monitoring near-Earth objects or responding to emerging space events, even brief communication delays can result in duplicated analysis, missed tasking handoffs, or delayed distribution of critical alerts. These breakdowns not only waste time but can compromise situational awareness across the coalition, Mattermost fills this void with a purpose-aligned platform that prioritizes uptime, user control, and mission assurance.

What makes Mattermost uniquely suited for the JCO isn't just its messaging functionality; it is the architectural freedom and extensibility it provides. Through containerized deployment and tight identity integration, the platform allows the DRAGON Army to ensure secure access, enforce role-based controls, and make updates without

disrupting service. This architecture supports operational resilience—critical for an organization that runs 24/7, across continents. Equally important is the platform's ability to grow with the mission. As needs evolve, the open ecosystem behind Mattermost allows the JCO to introduce new integrations, build workflows, and adapt channels and plugins that fit emerging use cases without waiting for third-party support. As this paper will later explore in greater detail, Mattermost is more than a tool, it's an operational backbone. Its presence within the CCC is key to enabling a globally synchronized, mission-ready force.

The MMB was purpose-built to bring structure and efficiency to the JCO's event coordination workflows. Designed to centralize analysis and streamline outreach, MMB ensures that critical space event data is accessible, actionable, and appropriately disseminated. It supports operators in managing event-related information from early identification through product generation and final notification, all within a structured, traceable environment. As JCO operations expanded across time zones and national partners, the need for a tool that could organize and prioritize event data became clear. Traditional methods of coordination, spread across email chains, spreadsheets, and isolated systems were no longer scalable. The MMB was developed to solve this challenge, enabling operators to coordinate in real time, generate shared situational awareness, and communicate structured outputs like NOTSOs to mission and allied stakeholders. What makes the MMB especially effective is its support for evolving mission needs. Features like the High Rate Revisit (HRR) list allow teams to dynamically update and distribute observational priorities, while integrated chat and notification capabilities reduce the need for duplicative effort across platforms. With the recent addition of a native chat module and tighter Mattermost integration, the MMB continues to mature into a responsive, low-friction environment where event data flows smoothly from detection to decision.

ClickUp serves as a central hub for designing, managing, and refining operational processes across the JCO. Initially introduced to unify scheduling and task management, it quickly evolved into a dynamic space for teams to build and improve workflows in real time. As the JCO expanded to include more partners and mission sets, process fragmentation became a growing obstacle. Documentation lived across multiple systems, creating confusion, duplication, and inefficiencies. ClickUp resolved this by providing a shared, customizable environment where teams could collaborate on procedures, track progress, and standardize operations across regions. Its greatest strength lies in its flexibility. Teams can prototype new workflows in sandboxed spaces, test improvements, and scale successful models—all without disrupting live operations. This has fostered a culture of experimentation and adaptation aligned with agile principles. With integrations to Mattermost and the Mission Management Board, ClickUp also strengthens ties across the Common Communication Channel, helping the JCO streamline communication, coordination, and execution.

The global expansion of the JCO community has ushered in not only an era of international space collaboration, but also a cascade of terrestrial challenges. As participation extends beyond English-speaking nations into a coalition of more than twenty and counting, the community faces steep hurdles in maintaining communication clarity, shift continuity, and mission persistence. These challenges are especially important during high-tempo operations, where even minor miscommunications can result in duplication of effort or the loss of valuable situational awareness. Enter ForgeStream, a novel, mission-tailored video conferencing tool commissioned and cultivated by the JCO in partnership with KT Software Technologies and the DRAGON Army. ForgeStream's adaptive interface and dynamic transcription capabilities represent a new era of real-time intelligence sharing. ForgeStream was developed in direct response to an unmet need within the global JCO coalition, a need for a communication platform that could transcend both time zones and language barriers while supporting continuous operations. While most commercial video conferencing platforms offer some level of functionality, none provide the persistent meeting environment and high-fidelity translation required by the JCO's mission. Rather than compromise or wait on external vendors to prioritize coalition-specific features, the JCO took the bold step of investing in a solution purpose-built to meet the evolving demands of international collaboration in space operations. The decision to pursue a custom solution was grounded in mission risk, operational urgency, and long-term strategic value.

ForgeStream addresses several layers of operational communication needs. At the most fundamental level, it ensures persistent meeting availability, eliminating interruptions due to session timeouts or expiring links commonly encountered in commercial off-the-shelf (COTS) video conferencing applications. At a more advanced level, it supports multilingual transcription and translation, allowing each individual to participate fully in their preferred language, an essential feature for coalition partners who may not share a common linguistic background. Forge Stream's integration with other JCO tools further positions it as a cornerstone of the CCC, allowing seamless interaction with systems like MatterMost, ClickUp, and the MMB.

Although more detailed examinations of Mattermost, the MMB, ClickUp, and ForgeStream follow in subsequent sections, their inclusion here reflects their foundational role in the JCO's communication ecosystem. Together, these tools exemplify how the JCO has strategically bridged critical operational gaps—enhancing real-time coordination, persistent awareness, and cross-partner collaboration. As the community expands in both size and complexity, these integrated capabilities ensure that the mission remains cohesive, adaptive, and inclusive across languages, regions, and operational shifts.

Each of these tools: Mattermost, MMB, ClickUp and ForgeStream embody a different acquisition approach: commercial off-the-shelf (COTS), internally developed, government off-the-shelf (GOTS), and commissioned solutions. This diversity is not a constraint; it is a strategic advantage. The JCO is uniquely positioned at the intersection of commercial innovation and military-grade coordination. As a commercially facing entity operating within a traditionally military framework, the JCO has an extraordinary opportunity to shape the future of coalition operations by leaning into this hybrid model of development. The CCC demonstrates how leveraging this diversity allows the JCO to remain agile, innovative, and deeply interoperable.

2. MATTERMOST

The JCO collaborates with numerous countries that depend on reliable and secure communication platforms to support their teams around the clock. As the number of mission partners expands, the need for a robust and scalable communication solution becomes critical. Instant messaging is crucial for these operations, requiring a chat server that guarantees uninterrupted access, efficient collaboration, and data compliance. Mattermost, a self-hosted, extensible chat platform, meets these requirements effectively. Mattermost offers security, compliance, high availability, reliability, and real-time collaboration. To ensure uptime, DRAGON Army employs a Kubernetes deployment of Mattermost, allowing updates with minimal to no downtime and ensuring continuous operation for the JCO. This is vital during active space events when the JCO team must communicate object changes within seconds. In evaluating their communication needs, the JCO identified several key problems with public SaaS chat applications, including data security, third-party dependency, and extended outages. These applications pose challenges related to compliance, auditing, and data sovereignty. Relying on single-server or SaaS tools can lead to unexpected outages, disrupting operations and delaying coordination when response time matters most. In the event of outages or security incidents, coordination through email or ticketing systems can be too slow, hindering effective response and resolution.

The JCO needed real-time communication capabilities, including support for threaded conversations, reactions, and mentions. Secure and compliant messaging was also a priority, requiring end-to-end encryption, role-based access control, private cloud deployment, audit logs, data retention policies, and compliance with regulations. Additionally, the solution needed to be scalable and redundant, capable of handling large teams or organizations and supporting horizontal scaling via Kubernetes. One of the biggest issues with messaging platforms is the ability to easily follow chat threads and edit them to best fit the information that the JCO requires for performing job duties. Mattermost addresses these issues by providing a capable system with searchable threads and the ability to edit threads if information changes or needs to be updated later. In addition to threads, the JCO can attach multiple large files to chats, providing more detailed information. Having all these functionalities within a single platform, Mattermost, is crucial for fast response times and efficient information sharing. Mattermost also provides unlimited message

retention and access to historical context for onboarding and auditing, matching JCO requirements. The request for control, customization, and scalability led to the selection of an open-source solution that DRAGON Army could shape into their needs. The JCO required full control over their data and deployment to avoid potential data breaches associated with vendor-controlled data. Customizability and the flexibility of an open-source solution were essential, allowing them to tailor the platform to their specific requirements.

Mattermost fits within the CCC by providing a unified, secure, and reliable platform for real-time communication and collaboration. Mattermost covers several key parts of an CCC:

1. Unified Communication Platform: Mattermost consolidates different communication methods, including instant messaging, threaded conversations, file sharing, and integrations with other tools. With Mattermost being a one stop shop for messaging, the JCO can focus on one chat service without the need to switch between multiple applications.

2. Security and Compliance: Mattermost includes end-to-end encryption, a crucial security feature for protecting the information transmitted through the platform.

3. High Availability and Reliability: With a Kubernetes deployment, Mattermost provides high availability and reliability, ensuring 24/7 operations can be successful for the JCO. It is mission critical that the DRAGON Army Mattermost remains available with an uptime of 95% or higher throughout the year.

4. Scalability and Performance: To support the large number of individuals sending messages simultaneously, Mattermost can scale to meet resource demands effectively. Kubernetes facilitates this process by enabling seamless scaling as needed.

5. Searchable History: Mattermost offers a powerful searchability feature that allows users to search through all their messages, making it easy to locate discussions about specific topics and items. Maintaining a complete history from the inception of Mattermost is crucial for the JCO, as it ensures the ability to review and audit past discussions.

6. Real-Time Collaboration: Mattermost supports real-time communication features such as reactions, mentions, and notifications, enabling teams to discuss and track work items effectively.

Mattermost effectively addresses several critical CCC problems for the JCO mission, unified communication platform, security, compliance, high availability, reliability, and real-time collaboration. With these solutions Mattermost is being integrated with other DRAGON Army tools and third-party vendors, such as Forge Stream and MMB Chat. MMB Chat will incorporate chats from Mattermost and display them within the Mission Management Board application, eliminating the need to have both the chat server and MMB open simultaneously. These integrations will enable the JCO to utilize a unified messaging platform across multiple applications, reducing the need to keep multiple desktop and web applications open to view important messages. This streamlined approach not only enhances efficiency but also reduces the complexity of managing various communication channels. The convergence of tools signals a shift toward a unified operational ecosystem, simplifying workflows across the JCO.

Mattermost has proven to be an essential communication platform for the JCO operators, team, cohort, and community, addressing their need for reliable, secure, and efficient communication. It provides direct messages, group chats, and channels for individuals who need to be aware of certain objects' movements. As mission demands continue to grow, integrating Mattermost into our DRAGON Army applications ensures that these channels are accessible within a single web application—our Mission Management Board via MMB Chat. This integration

enhances our ability to streamline communication and improve operational efficiency by consolidating vital information into one platform.

3. MISSION MANAGEMENT BOARD

The JCO interfaces with the global community through various channels, offering operational and functional insights during key training, exercise, and live events. Since the JCO operates 24/5 using a “follow the sun” model, having a centralized platform to track active space event analyses is crucial for seamless handovers between shifts. To conduct a thorough analysis of space events, the JCO requires a method to provide sensor and fusion providers with a list of the most interesting objects, enabling them to gather more data on those items. Furthermore, the JCO needs a way to notify allies and interested parties about these events. The DRAGON Army MMB fulfills all these requirements for the JCO, as it provides a centralized platform for tracking active events, functionality to manage and publish ordered object lists to providers, and the ability to send notifications [2].

For tracking and monitoring events, the JCO utilizes the DRAGON Army MMB. The MMB allows space operators to coordinate evaluations and analyses of commercially available space object positional data. Using this application, they share information and products related to events, generate outputs from their analysis, and discuss the processing and preparation of Notices to Space Operators (NOTSOs). A NOTSO is a notification published by the MMB that is then sent via email and published to the UDL. The NOTSO is used as an indication and warning (I&W) alert, notifying the NSDC and allied and mission partners of interesting events [1] .

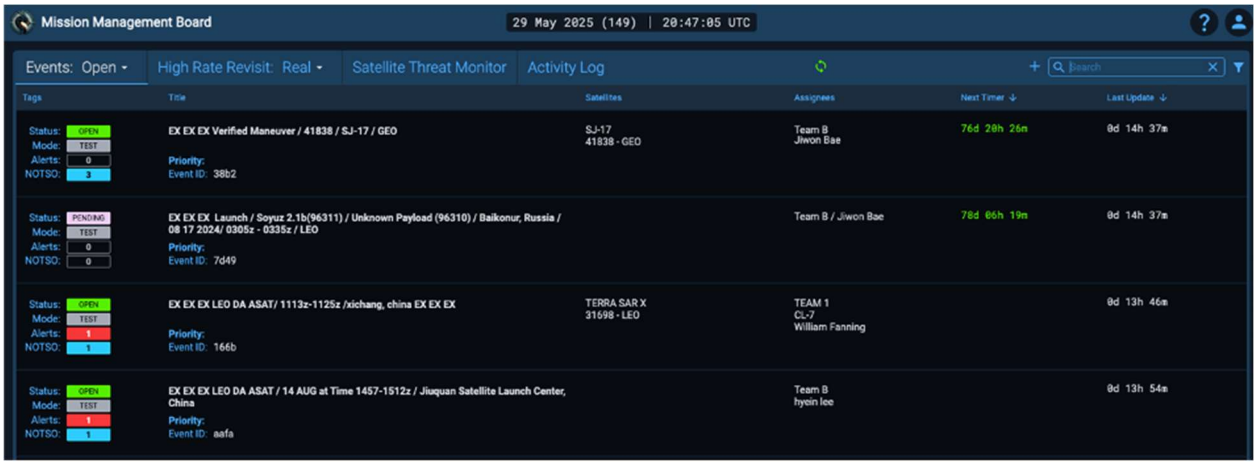

Fig. 3.1: MMB Events List

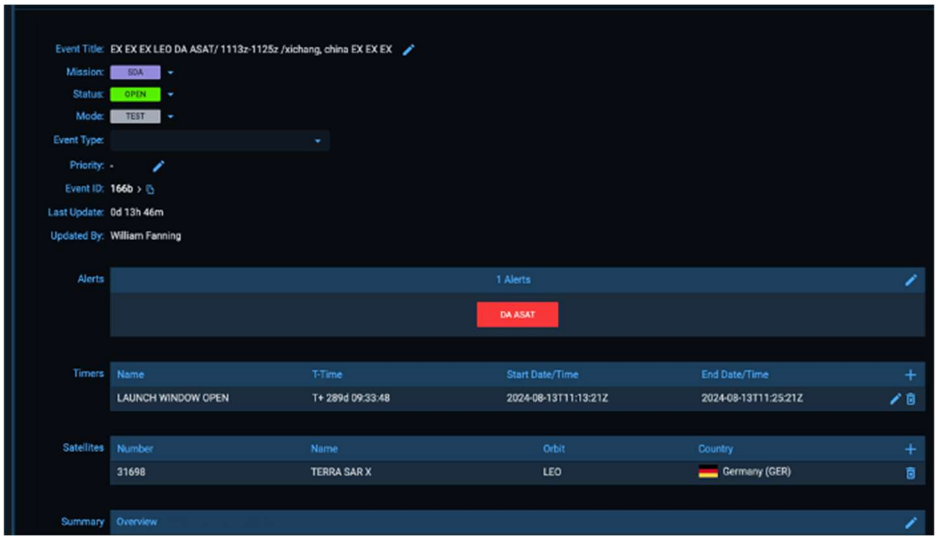

Fig. 3.2: Top of the Event detail view

The feature provided by the MMB that allows the adjustment and publishing of a prioritized object list for providers is the High Rate Revisit (HRR) list, as seen in Figure 3.3. Site Leads and Deputy Site Leads can manually update an object's ranking to increase or decrease the number of observations depending on current space events. When an object's rank goes up, that tells the providers that the JCO wants more frequent observations on that object. Likewise, when an object's rank drops, the JCO wants less frequent observations as that object is now of less interest. Increased observations mean more products that operators can use in their analysis, so an object's rank will increase if it is part of an active event. Sensor providers receive this list by way of the Unified Data Library (UDL) – Site Leads and Deputy Site Leads publish the HRR list to the UDL from the MMB. Most sensor providers monitor the UDL HRR list for new publications. Additionally, they'll also receive notifications through a new Mattermost chat as an extra way to stay informed.

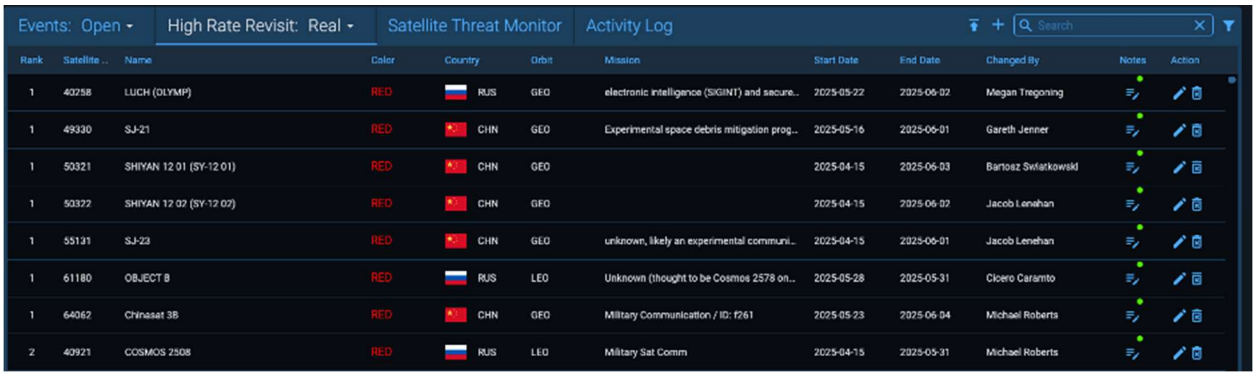

Fig. 3.3: HRR List

The decision to create a new event in MMB is made by operators based on discussions in Mattermost. Mattermost, as the JCO's primary chat communication channel, is used to discuss space event-related data and topics of interest. Sensor and data fusion providers, along with the Publicly Available Information Repository (PAIR) team, will create new chats to provide any information and data that the JCO may find interesting. Operators use that information to determine whether a new event should be created and may even request additional information from other providers to help make that determination.

When an MMB event is created, the operator who created the event will create a new chat thread with the event's title. In that chat thread, all textual communication, products, and TLEs related to that event will be posted. As new products are posted, the operators use them to determine if it is helpful for the event's analysis. If a product is valuable, the operator will upload it to the event in the MMB, which enables the product to be added to a NOTSO.

Using the products and data provided by the providers, operators conduct their analysis of the event. The analysis is entered into the Summary section of the event and organized in a consistent manner to enhance readability and reference. Thorough analysis is crucial to fully understand the event. The Summary, along with the event's products, are the most essential details in a NOTSO. Once the analysis is finished and all products are included, a NOTSO can be published.

When a NOTSO is published from the MMB, two things happen: an email is sent to a list of people with all information about the event, and the NOTSO is published to the UDL. People do not need access to the MMB to receive the email or UDL notifications, providing the JCO with an additional channel of outward communication. In addition to these notifications, an operator will create a new chat in Mattermost indicating the publication of the NOTSO.

A new feature of the MMB is the integration of a Chat module that interfaces directly with the Mattermost server. The Chat module provides streamlined Mattermost capabilities, with a focus on event channels, so that operators won't have to keep both applications open. Additionally, the Chat module automatically creates new chat channels to correlate with new events. These chat channels are used similarly to the event chat threads, with an additional feature – products uploaded into the event chat channel can be uploaded directly to the event. This enables operators to perform their duties more efficiently by eliminating the need to download products to their computer before uploading them to the MMB. This integration contributes to the CCC by reducing the duplicative work operators must do to communicate and collaborate with people who have MMB access and those who do not.

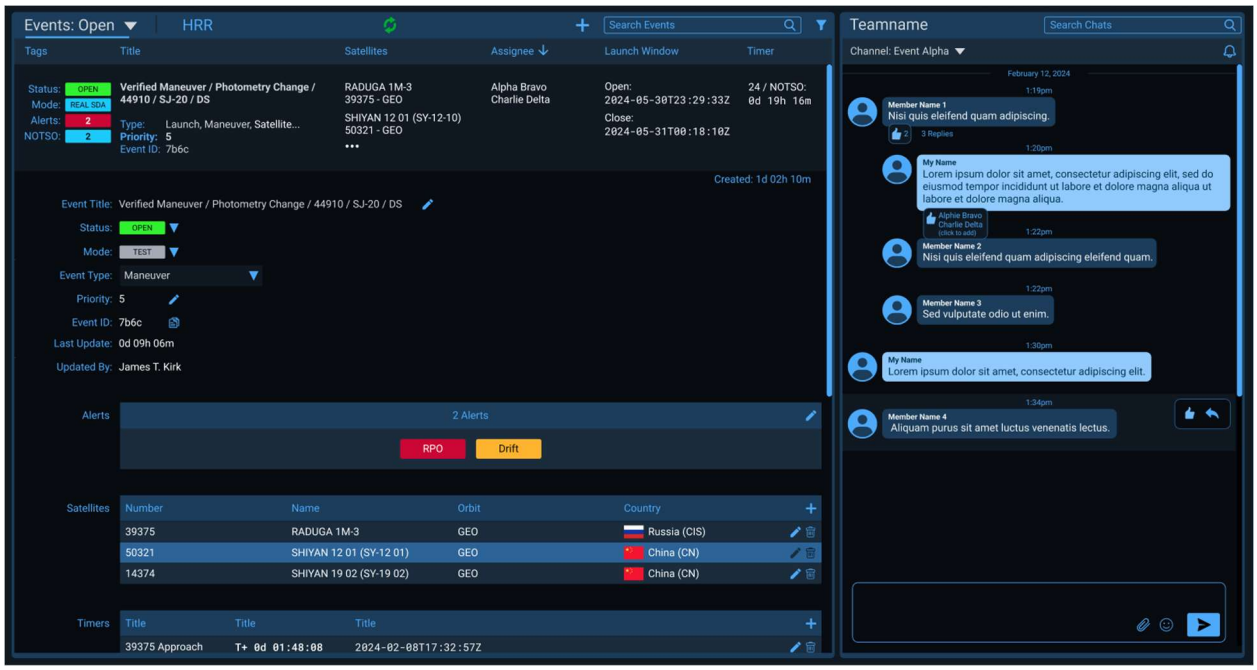

Figure 3.4: MMB Chat Module Figma design

As the JCO onboards more partners to support space domain awareness, having a tool to monitor and notify mission and allied partners of significant space events becomes increasingly essential. The MMB, alongside the other communication channels, remains one of the most critical tools in the CCC, enabling the JCO to continue its

mission. Although the MMB meets a wide range of requirements for the JCO, it currently lacks the ability to coordinate shifts and facilitate inter-team collaboration. However, when used in conjunction with Clickup, these tools provide a seamless operational capability.

4. CLICKUP

As JCO operations scaled rapidly across nations and mission sets, it became clear that traditional coordination methods couldn't keep pace with the complexity. The increased need for common communication channels between all the global players involved raised a new question: How can this quickly evolving large organization of global partners efficiently improve organizational productivity? Enter ClickUp.

ClickUp is a multifunctional project management and productivity platform designed to support a wide range of organizational and collaborative workflows. It provided a centralized digital environment where the JCO could structure and manage tasking, track and record progress, and coordinate team activities across the organization through various configurable views. The platform included features such as task hierarchies, time tracking, goal setting, and workflow automation, which enabled the JCO to adapt it to the diverse project requirements and operational scaling needs that have arisen.

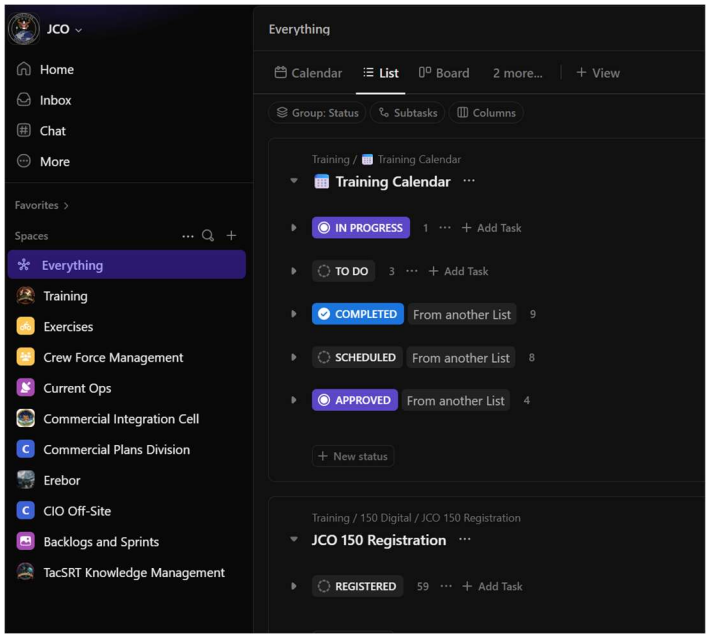

Fig 4.1 - JCO Organizational Spaces in ClickUp

Prior to the introduction of ClickUp, the JCO and its partners had multiple avenues throughout the organization for information to be posted for scheduling and planning needs, as well as individual team communications systems. This resulted in a lot of confusion as planning across teams was incredibly disjointed and all of the individual teams were virtually isolated. It became evident that the growing organization needed a functional layout. Thus a normalization effort began that saw staff and processes naturally fall into functional areas as the org chart was reimagined, as seen in Fig 4.1. These functional areas of the organization needed a joint task tracking, and scheduling platform that could easily be integrated into the existing JCO global comms systems and expanded for future scaling needs.

Partner nations and vendors that could feel isolated from the JCO, often finding it difficult to navigate through the various systems, needed a common space that brought all of the teams together to act and work collaboratively. A

“virtual office space” that was accessible by all and could be tailored to the unique needs of the expanding JCO organization.

ClickUp helped to provide the JCO with the virtual space that was needed. The platform was used as a unified operational backbone that brought the organization’s geographically disconnected teams together in a common space to brainstorm, plan, and collaborate on anything from procedures to process documents and all other team scheduling and tracking needs.

One of the biggest issues with organization was that between the 20 partner nations, the various contractors, DOD, and the Allied Military partners, there was no single common global operations platform that allowed the collaborative work that was necessary for success. ClickUp helped enable the teams to share information with ease, have common global calendars for scheduling, and a common workspace for collaborative document/process creation.

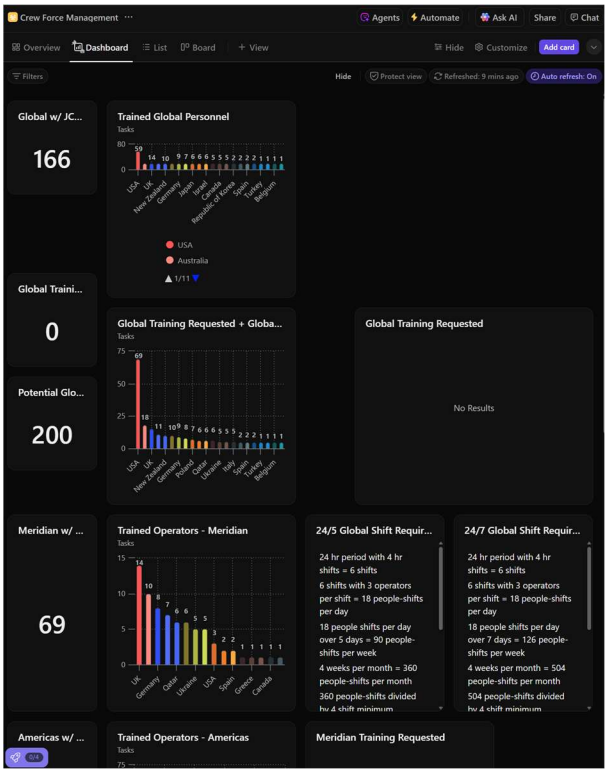

Fig 4.2- Crew Scheduling space

This lack of a global platform became a significant problem when it came to global crew force management. With over a hundred trained personnel across the globe, and almost double that number of requested training sessions, it had become difficult to arrange appropriate crew schedules. The organization had relied on a google sheet to track scheduling and did this without any official global personnel roster until migrating scheduling needs to ClickUp.

As the staff was organized into the appropriate spaces in the platform, a global personnel roster started to form. Figure 4.2 shows the global personnel roster that had formed via ClickUp and the process to schedule crews that was implemented. The platform allowed tasking to effectively be shared between teams and for tasks to roll from one team to another as the scope of the tasking changes. This also provided an additional record of the activities being tracked for auditing purposes and future inquiries. As people moved throughout the organization, traditional methods for task tracking and auditing started to break down.

With over 20 countries each requesting over a dozen training sessions per year, things started to slip through the cracks and requests were increasingly difficult to fulfill. Partner nations asked for additional responsibilities but there was no way to evaluate the capabilities of their personnel without some record. To answer this growing problem, the platform was utilized to create and refine a process for Global Training Requests. This process was a big improvement to the management and prioritization of the global team needs, while additionally giving a lot of visibility by tracking reports from the participating nations and the eleven COCOMs in the JCO.

The processes created in ClickUp allowed historical records for task tracking to be automatically created with ease and have made it possible for the organization to check the responses to taskings, who supported the event, and still retain the information when individuals have moved on from the organization rather than lose that information. The JCO now had an at-a-glance system to understand the personnel and global team needs.

Using ClickUp, the organization has been able to create and prototype new processes and procedures for JCO operations also, such as visit and exercise request registration and tracking. By providing a platform to receive these requests internally, schedule the needs, and provide automated notifications up-channel to the S4S command engagement board, the process created via the ClickUp platform has enabled the JCO to remove the “human-in-the-loop” and have all requests go directly to the platform for processing, tracking, and recording the visit metrics. This ability allows the ingestion of requests to scale as much as the organization needs without exhausting a single internal resource.

Additionally, the integration between ClickUp, the MMB, and Mattermost has created the common communications platform that has become the JCO Operations floor. The crew logs and any events in the log are tagged in ClickUp to MMB events, as seen in Fig 4.3, via an ID to easily develop multi-system reporting, track assignees to tasks, automatically pull and create Mattermost chat topics, and ultimately create the big picture view of operations that allows commands to make quick, well-informed operational decisions.

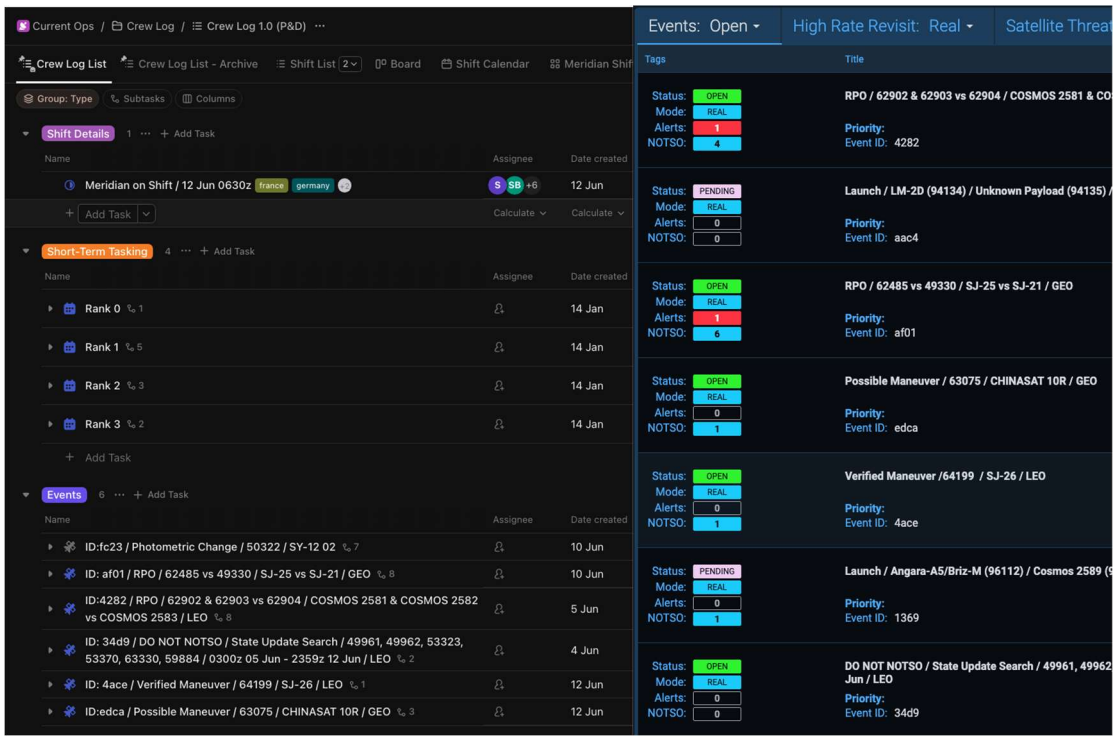

Fig 4.3: ClickUp Crew Log reporting (left), MMB Event Tracking (right)

This platform has helped to provide the necessary common ground for communications between all parts of the organization that helps manage a growing crew force in many ways. ClickUp bridges the gap between MMB's tasking and event tracking and Mattermost's live team coordination and communication, with event reporting, historical data and scheduling transparency that facilitates a unified global organization. From allowing a simple searchable global personnel directories to maintaining qualifications and proficiency of the crews, ClickUp has enhanced the ability for the organization to analyze crew needs, determine paths forward, and implement tasking orders at a speed that can grow and accommodate the changing needs of the organization.

The integration of these tools provided additional mission critical data and information in an easy to access location, like the ability to pull NOTSO (notice to space operators) information off the MMB and post requests, issues, or immediate needs directly into the Mattermost live chat server. The powerful combination of these tools together has provided the organization with the ability to save time and effort in a variety of ways and increase productivity in many areas of effort. This boost in productivity is essential for multinational organizations aiming to maintain efficiency despite the complexities of global operations.

ClickUp was implemented in the organization because there was a need for a comprehensive and powerful project management tool that helped to meet the needs of this global organization. The centralized platform provided a standard that aligned with mission critical outcomes for global operations success. As the JCO's mission continues to scale in size and scope, ClickUp remains a core enabler for operational clarity, team management and accountability, and multinational cohesion.

By improving productivity, communication, and coordination, ClickUp has assisted the organization in streamlining global operations and driving success on a large scale. The centralized platform, customizable workflows, and robust collaboration features have made it a common communication asset for operating across multiple regions, teams, and time zones. In tying all of the disparate teams together in this "virtual office space", ClickUp has facilitated collaboration and cohesion that can grow with the organization but didn't entirely answer a lingering global communications problem, no single common language for live voice communications.

5. FORGESTREAM

The global initiative of the JCO to partner with dozens of countries to jointly monitor and report on space events presents terrestrial challenges in addition to celestial ones. Among them are language barriers between cultures and nations, keeping continuity of work between crew shifts, and maintaining persistence of the mission despite software limitations and adjusting for a lack of incentive in the software industry to fill these capability gaps. Two years ago, the JCO started to expand from a handful of English speaking countries to more than a dozen nations comprising many languages. This realized and anticipated future diversification inspired a search for a video conferencing application that could support the requirements of a growing cohort but found that the large commercial vendors could not support it and were not interested in exploring the development of such features. In response, the JCO committed to taking the risk of partnering with a small software development company to cultivate the capability from scratch. The partnership between KT Software Technologies, the DRAGON Army and the JCO has yielded a set of capabilities specifically targeting the needs and challenges of the JCO's international community. KT Software Technologies's product, ForgeStream, seeks to overcome language barriers, mission persistence and crew continuity in support of the JCO's growing mission set.

The JCO community counts nearly twenty nations among its ranks and is anticipating continued outreach for years to come. As this community has diversified, several challenges have arisen around both verbal and written communication, phrasing and colloquialisms. The JCO's initial members were English speaking countries which posed only minor difficulties across cultural lines. That small concern has grown to a chasm spanning numerous languages and many cultures. The differences in communication style across the JCO community members are exemplified during shift hand-offs when an outgoing crew briefs an incoming one about ongoing events and investigations. During these short meetings important information can be lost or fails to cross the language barrier

due to insufficient supporting applications. These misalignments often result in misunderstandings, rework, and reduced operational efficiency during critical events.

To begin to address some of these communication issues, the JCO established key capability gaps in the tools they used and codified those into a short list of requirements. From the onset the primary requirement was meeting persistence and the ability to have a virtual meeting that did not expire, resolve nor timeout. This capability would establish a common meeting place for operators and site leaders to discuss, investigate and report on SDA mission related events that was not subject to commercial limitations on meeting durations. The JCO also sought to interleaf translation and transcription features into the meeting to allow all participants to read and participate in the meeting in the language of their choice regardless of the language being employed by the other participants. This "Universal 'Star Trek' Translator" (Quote by Barb Golf), was a lofty goal based in science fiction, but a requirement of the application, nonetheless. It was expected that the application would leverage AI technology to augment the operators and site leader's effectiveness through strategic documentation, summary and data extraction algorithms. Any viable solution for the JCO would also need to corroborate with other tools such as MatterMost and Clickup for a joint solution to the CCC.

Following the adage that "It's cheaper to Buy than Build", the JCO searched for COTS products that could satisfy their needs for increased communication clarity within the global JCO community. They reached out to the developers of the top ten video conferencing applications to see if they would augment their tools with the features that the JCO had identified as capability gaps and were disappointed with the responses. Many companies contacted did not respond to the query. Of those that did, the larger vendors prioritized mass-market features over JCO coalition specific needs. The JCO also considered open-source options which offer customization and integration capabilities but those were ruled out due to foreign investments. After the investigation the JCO was left with the reality that they would need to author their own video conferencing application in order to get what they needed in an impactful time frame.

Throughout the last several years the JCO commissioned and cultivated a new video conferencing application, ForgeStream, to address the challenges of international cooperation and collaboration in the space community. ForgeStream was designed to fill the communication and capability gaps that the JCO identified and continue to evolve with the JCO's mission set to address the communication challenges of persistence, multiple allied languages, integration with 3rd party applications, and AI support.

"Commercial off the shelf" video conferencing software limits the duration of their meetings for various reasons such as stability, resource consumption, and marketing. In contrast, ForgeStream was cast with the purpose of supporting a 24/7/365 SDA mission that necessitated everlasting meetings. The meetings within ForgeStream do not expire or become stale nor need to be restarted after some hours via human intervention. The last of which was of particular interest to the JCO, "the need for human intervention". This software dependence of human timing and cognition represented a risk that collaboration would be interrupted at potentially critical mission times. The JCO sought to resolve that risk through the development of this application.

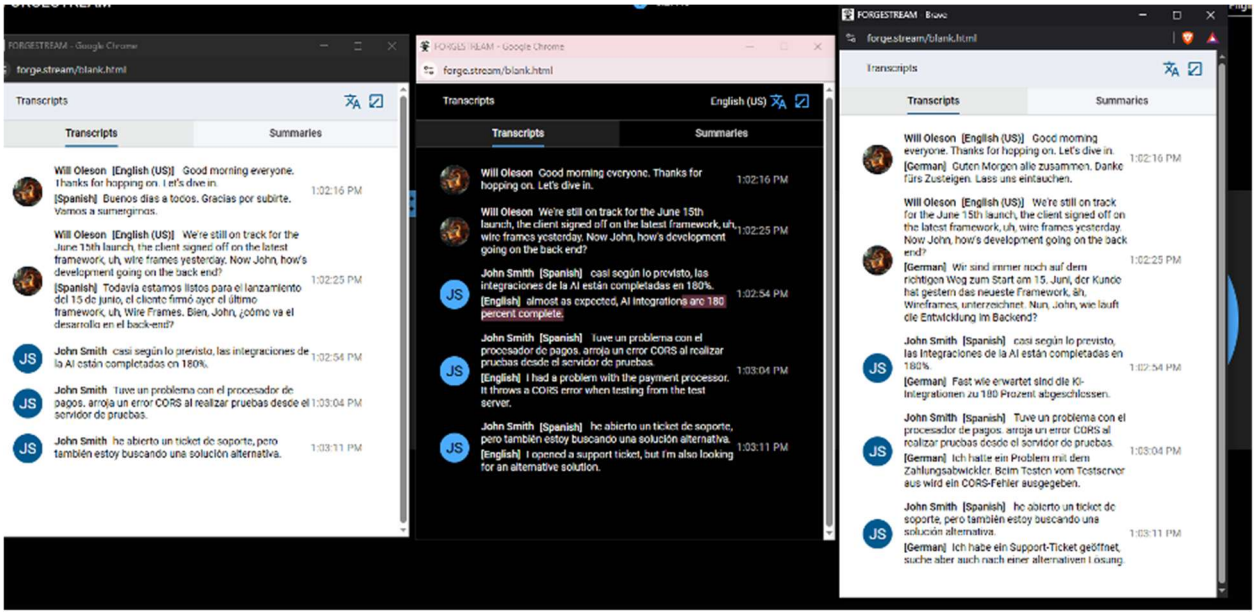

Fig 5.1: ForgeStream translation by user preference

At 20 countries and counting in the JCO global cohort the language barriers have been mounting. Each nation has tried admirably to execute their roles in English even when they may not have the technical vocabulary they need to do so. This presents a difficult expectation on partner nations and has impacted the JCO's ability to include some interested nations with haste. Following the soul of their mission, the JCO set out to build a capability that would allow each operator, leader and participant to be part of the JCO in the language of their choosing. ForgeStream provides each participant with the ability to select which language they would like to see written and, in the future, hear spoken during the meeting. As can be seen in the above image: The user on the left has selected to receive all their text in Spanish, the middle user English and the right-side user German. This ensures that each team member can speak and write in the language they are most familiar with and reduces the chance for unfortunate misinterpretations. As JCO continues to grow, their utilization of applications like ForgeStream will help perpetuate their tenants of trust and equity across the global community.

In an ongoing effort the JCO has strived to incorporate its various tools so that data, messages and notification are shared across the lot. As part of this group, ForgeStream has been built with integration at its heart. It boasts connections to DRAGON Army applications like the Mission Management Board [2] and 3rd party applications like MatterMost and Clickup. ForgeStream's interactions with the MMB serve to highlight ongoing tasking and progress of event analysis as an overlay of the video stream within a meeting. The DRAGON Army hosted MatterMost channels are served alongside the native ForgeStream chat capability to provide a bridge from one tool to another to ease the movement of information. The JCO developed "crew scheduler", built in ClickUp, is also available through ForgeStream to support the Site leads as they staff each shift. These integrations demonstrate that ForgeStream can partner with homegrown and commercial software to augment the user experience with other applications that they use on a daily basis.

The JCO utilizes a "Follow the Sun" shift rotation across three regions to enable each region to contribute during their relative normal work hours. This consistent cycle creates pinch points for information exchange during a short routine referred to as "shift hand off / shift roll up". ForgeStream offers context summary generation for each shift to reinforce the hand off ritual with supplementary details. These summaries can be distilled into Roll Over notes to aid the Site Leaders in distributing the key information gathered throughout a shift and posting it in Forgestream as a notification for users as they enter the meeting. In addition to supporting the transition between teams this capability allows a mid-shift team member to receive a short summary of what has transpired in a meeting prior to their arrival.

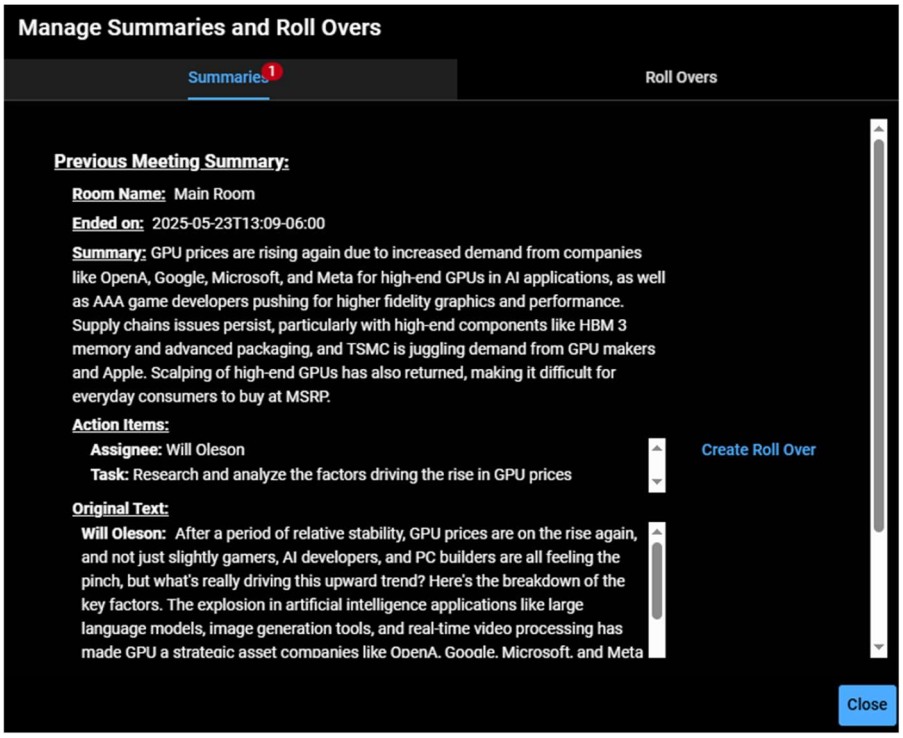

Fig 5.2: ForgeStream AI driven summary

ForgeSteam has been tailored to support the JCO though its core features are equally valuable to a global audience. The Team behind ForgeSteam, KT Software Technologies, is rapidly developing additional features to deepen the translation capabilities of their application. In the near future they plan to release audio translations so that each meeting participant can be heard in their own voice speaking to participants in the language of their selection. This will add a personal touch to communication across the language barrier and overcome the lack of personality in impersonal synthetic speech options. The ForgeStream developers will be pursuing text in image translation, gesture capture and sentiment monitoring as upcoming features to support clearer communication in an international workplace.

As the JCO community grows and more countries, cultures and languages look to participate in the space event monitoring mission, tools like ForgeStream will need to be at the forefront to support accurate and precise communication. Persistent meetings, AI supported job aids, personal translation services and integration opportunities make ForgeStream a good fit for the JCO's mission.

6. CONCLUSION

The diversity of tools, from off-the-shelf to bespoke, underscores a broader lesson: no single solution will ever be sufficient. The JCO's mix-and-match model ensures resilience and flexibility, allowing the community to rapidly respond to shifting operational needs and emerging geopolitical complexities. This modularity is a superpower, especially in an environment where technology, policy, and threat landscapes evolve in parallel.

While challenges remain, particularly around global time zone coordination, data prioritization, and continued integration with emerging technologies, what has already been accomplished lays a solid foundation for exponential growth. The CCC not only connects individuals and institutions but also establishes an environment that encourages psychological safety, fosters knowledge sharing, and supports agile iteration. By enabling psychologically safe and collaborative environments, the JCO's communication infrastructure supports healthy scaling, minimizes friction across cultural and temporal divides, and ensures continuity of mission focus. Challenges ahead include ensuring

equitable tool access across all nations, standardizing training across time zones, and enhancing the speed at which new features are operationalized. Yet these are signs of growth, not weakness. Addressing them will further reinforce the coalition's cohesion and reinforce the CCC as a living, responsive infrastructure.

Looking forward, the path is clear. As more nations join and as the complexity of space events continues to grow, so too will the importance of robust and flexible communication channels. By continuing to iterate on these tools and by nurturing a global culture of transparency, responsiveness, and innovation, the JCO can maintain its leadership in commercial space operations while enabling a more secure and unified approach to space situational

The Common Communication Channel is not simply a technical framework; it is the heartbeat of global cooperation in space. And with the right investments, the right tools, and the right mindset, it will carry the JCO community confidently into the next chapter of space collaboration.

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