

TRADEMARK ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

ETAS ID: TM831118

SUBMISSION TYPE:	NEW ASSIGNMENT		
NATURE OF CONVEYANCE:	Intellectual Property Security Agreement		
CONVEYING PARTY DATA			
Name	Formerly	Execution Date	Entity Type
Astra Space, Inc.		08/04/2023	Corporation: DELAWARE
RECEIVING PARTY DATA			
Name:	High Trail Investments ON LLC		
Street Address:	C/O High Trail Capital, 80 River Street, Suite 4C		
City:	Hoboken		
State/Country:	NEW JERSEY		
Postal Code:	07030		
Entity Type:	Limited Liability Company: DELAWARE		
PROPERTY NUMBERS Total: 15			
Property Type	Number	Word Mark	
Serial Number:	97387150	ASTRA SPACECRAFT ENGINE	
Registration Number:	6708795	NEXT DAY SPACE	
Registration Number:	6708794	DAILY SPACE DELIVERY	
Registration Number:	6769489	IMPROVE LIFE ON EARTH FROM SPACE	
Registration Number:	6714766	NEXT HOUR AIR	
Registration Number:	6688204		
Registration Number:	6688206	ASTRA	
Registration Number:	6822363	ASTRA	
Registration Number:	5772557	ASTRA	
Registration Number:	5784623	ASTRA	
Registration Number:	5772560	ASTRA	
Registration Number:	5784627	ASTRA	
Registration Number:	6036145	ASTRALITE	
Registration Number:	6036144	ASTRALITE	
Registration Number:	7074754	ASTRA SPACECRAFT ENGINE	
CORRESPONDENCE DATA			
Fax Number:	2138918763		
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>			

OP \$390.00 97387150

Email: rhonda.deleon@lw.com
Correspondent Name: LATHAM & WATKINS LLP
Address Line 1: 355 SOUTH GRAND AVENUE
Address Line 4: LOS ANGELES, CALIFORNIA 90071-1560

ATTORNEY DOCKET NUMBER: 065377-0030

NAME OF SUBMITTER: Rhonda DeLeon

SIGNATURE: /RHONDA DELEON/

DATE SIGNED: 08/11/2023

Total Attachments: 23

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INTELLECTUAL PROPERTY SECURITY AGREEMENT

THIS INTELLECTUAL PROPERTY SECURITY AGREEMENT (as amended, restated, supplemented or otherwise modified from time to time, this “Agreement”) dated as of August 4, 2023 (the “Agreement Date”) among Astra Space, Inc., a Delaware corporation (the “Issuer”), each of the Subsidiaries of the Pledgor from time to time party hereto (collectively the “Subsidiary Grantors” and, together with the Issuer, the “Grantors”) and High Trail Investments ON LLC, a Delaware limited liability company, in its capacity as collateral agent for the benefit of the Holders (together with its successors and assigns in such capacity, the “Secured Party”).

WHEREAS, the Issuer has entered into that certain Securities Purchase Agreement, dated as of August 4, 2023 (as amended, restated, supplemented or otherwise modified from time to time, the “Securities Purchase Agreement”), with High Trail Investments ON LLC (the “Initial Holder”) and each other party thereto, pursuant to which, among other things, the Issuer will issue, and the Initial Holder will purchase, subject to the terms set forth therein, the Senior Secured Notes (as defined in the Securities Purchase Agreement);

WHEREAS, the Grantors have entered into that certain Security Agreement, dated as of August 4, 2023 (as amended, restated, supplemented or otherwise modified from time to time, the “Security Agreement”), with the Secured Party, pursuant to which the Grantors and other grantors thereunder granted to the Secured Party, for its benefit and the benefit of the Initial Holder and each Holder under and as defined in any Senior Secured Note (the “Holders”), a security interest in substantially all of the Grantors’ personal property; and

WHEREAS, it is covenant under the Security Agreement that the Grantors shall have executed and delivered this Agreement to the Secured Party for its benefit and the benefit of the Holders.

NOW, THEREFORE, in consideration of the premises and mutual covenants herein contained and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, each Grantor hereby agrees as follows:

Section 1. DEFINED TERMS; RULES OF CONSTRUCTION.

- (a) Capitalized terms used in this Agreement but not otherwise defined herein have the meanings given to them in the Security Agreement.
- (b) When used herein the following terms shall have the following meanings:

“PTO” means the United States Patent and Trademark Office and any successor office or agency.

- (c) All Schedules, Addenda, Annexes and Exhibits hereto or expressly identified to this Agreement are incorporated herein by reference and taken together with this Agreement constitute but a single agreement. The words “herein”, “hereof” and “hereunder” or other words of similar import refer to this Agreement as a whole, including the Exhibits, Addenda, Annexes and Schedules thereto, as the same may be from time to time amended, modified, restated or supplemented, and not to any

particular section, subsection or clause contained in this Agreement. Wherever from the context it appears appropriate, each term stated in either the singular or plural shall include the singular and the plural, and pronouns stated in the masculine, feminine or neuter gender shall include the masculine, the feminine and the neuter. The term “or” is not exclusive. The term “including” (or any form thereof) shall not be limiting or exclusive. All references to statutes and related regulations shall include any amendments of same and any successor statutes and regulations. All references in this Agreement or in the Schedules, Addenda, Annexes and Exhibits to this Agreement to sections, schedules, disclosure schedules, exhibits, and attachments shall refer to the corresponding sections, schedules, disclosure schedules, exhibits and attachments of or to this Agreement. All references to any instruments or agreements, including references to any of this Agreement, the Security Agreement or the other Note Documents shall include any and all modifications or amendments thereto and any and all extensions or renewals thereof.

- (d) The parties acknowledge that each party and its counsel have reviewed this Agreement and that the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement or any amendments, schedules or exhibits thereto.

Section 2. GRANT OF SECURITY INTEREST IN INTELLECTUAL PROPERTY COLLATERAL. To secure the prompt payment and performance in full when due (whether at stated maturity, by acceleration or otherwise) of the Obligations, each Grantor hereby pledges and grants to the Secured Party (for its benefit and the ratable benefit of the Holders) a continuing security interest in and Lien upon all of such Grantor’s right, title and interest in, to and under the following, whether presently existing or hereafter created or acquired (collectively, the “Collateral”):

- (a) Trademarks to which it is a party, including those referred to on Schedule I hereto;
- (b) Patents to which it is a party, including those referred to on Schedule II hereto;
- (c) Copyrights to which it is a party, including those referred to on Schedule III hereto;
- (d) Renewals, reissues, continuations, continuations-in-part, reexaminations, divisions, or extensions of any of the foregoing;
- (e) Rights to sue, whether at law or in equity, third parties for past, present or future infringement, dilution, misappropriation, or other violation or impairment of rights in any Intellectual Property, including injury to the goodwill associated with any Trademark, and all causes of action for the same; and
- (f) All products and Proceeds of all or any of the foregoing, tort claims and all claims and other rights to payment including (i) insurance claims against third parties for loss of, damage to, or destruction of, the foregoing Collateral and (ii) payments due or to become due under licenses of any or all of the foregoing and Proceeds payable

under, or unearned premiums with respect to policies of insurance in whatever form; provided, however, that the Collateral shall not constitute a grant of a security interest in any trademark or service mark applications filed in and accepted by the PTO on the basis of such Grantor's intent to use such trademark or service mark, unless and until a statement of use or amendment to allege use is filed in and accepted by the PTO, in which event, such trademark or service mark shall automatically be included in the Collateral, or in any rights arising under any contracts, instruments, licenses or other documents as to which the grant of a security interest would violate or invalidate any such contract, instrument, license or other document or give any other party to such contract, instrument, license or other document the right to terminate its obligations thereunder.

Section 3. REPRESENTATIONS AND WARRANTIES.

Each Grantor represents and warrants to the Secured Party, in addition to the representations and warranties in the Security Agreement and the other Note Documents, that:

- (a) such Grantor has been, in all material respects (i) using statutory notice of registration in connection with its use of registered Trademarks, (ii) proper marking practices in connection with the use of Patents, and (iii) appropriate notice of copyright in connection with the publication of copyrighted material;
- (b) such Grantor has taken all actions it deems necessary in its reasonable business judgment to ensure that all licensees of Trademarks owned by such Grantor use consistent standards of quality as directed by such Grantor in connection with its licensed products and services; and

Section 4. COVENANTS. Each Grantor covenants and agrees with the Secured Party, from and after the date of this Agreement, and in addition to the covenants in the Security Agreement and the other Note Documents, that:

- (a) Such Grantor shall notify the Secured Party promptly if it knows that any application or registration relating to any material Intellectual Property owned by such Grantor has or may become abandoned, dedicated to the public, placed in the public domain or otherwise invalidated or unenforceable. Such Grantor shall further notify the Secured Party promptly of any adverse final determination or decision in any proceeding and the institution of any proceeding challenging such Grantor before the PTO, the United States Copyright Office, or any similar agency of the United States, any State, or other country or political subdivision thereof, any internet domain registry or other registry, or any court, regarding such Grantor's ownership of or right to use, register, keep and/or maintain any Intellectual Property. Such Grantor shall be free to prosecute and maintain its Intellectual Property in the ordinary course of business in a commercially reasonable manner, and, notwithstanding the foregoing, shall not be required to report preliminary or initial determinations, unless and until made final, by the PTO, the United States Copyright Office, or any similar agency of the United States, any State, or other country or political subdivision thereof, any internet domain registry or other

registry, or any court, regarding such Grantor's ownership of or right to use, register, keep and/or maintain any Intellectual Property;

- (b) Such Grantor shall (i) prosecute diligently any patent, trademark, or service mark applications pending as of the date hereof or hereafter if material to the operations of the business of such Grantor, (ii) preserve and maintain all rights in the Copyrights, Patents and Trademarks, to the extent material to the operations of the business of such Grantor and (iii) ensure that the Copyrights, Patents and Trademarks are and remain enforceable, to the extent material to the operations of the business of such Grantor. Any expenses incurred in connection with such Grantor's obligations under this Section 4(b) shall be borne by the Grantors. Except for any such items that such Grantor reasonably believes (using prudent industry customs and practices) are no longer necessary for the on-going operations of its business, such Grantor shall not abandon any material right to file a patent, trademark or service mark application, or abandon any pending patent, trademark or service mark application or any other Copyright, Patent or Trademark without the prior written consent of the Secured Party, which consent shall not be unreasonably withheld;
- (c) In the event that any Intellectual Property owned by or exclusively licensed to such Grantor is known by such Grantor to be infringed, diluted, misappropriated, or otherwise violated by a third party, such Grantor shall notify the Secured Party promptly after such Grantor learns thereof and, if such Intellectual Property is material to the conduct of such Grantor's business, such Grantor shall, subject to Grantor's reasonable business judgment, promptly take all commercially reasonable actions to protect and enforce its rights in such Intellectual Property and to recover all damages therefor, including, but not limited to, the initiation of a suit for injunctive relief and damages where reasonable and cost effective to do so (provided that such Grantor must initiate suit in all cases where the failure to do so could reasonably be expected to have a Material Adverse Effect) and shall take such other actions as are commercially reasonable to protect such Grantor's rights in such Intellectual Property;
- (d) Such Grantor shall use appropriate statutory notice of registration in connection with its use of registered Trademarks, proper marking practices in connection with the use of Patents, appropriate notice of copyright in connection with the publication of copyrighted materials, and other legends or markings applicable to other Intellectual Property;
- (e) Such Grantor shall use commercially reasonable efforts to maintain the level of the quality of products sold and services rendered under any Trademarks owned by such Grantor at a level at least consistent with the quality of such products and services as of the date hereof, and such Grantor shall use commercially reasonable efforts to adequately control the quality of goods and services offered by any licensees of its Trademarks;

- (f) Such Grantor shall take reasonable steps to protect the secrecy of all trade secrets material to its business;
- (g) To the knowledge of such Grantor, such Grantor's use of the Intellectual Property owned by such Grantor is not infringing upon or misappropriating, or otherwise violating, the Intellectual Property rights of any third party in any material respect; and
- (h) If such Grantor shall obtain ownership of or other right, title or interest in or to, any registered Copyrights, issued or applied-for Patents, registered or applied-for Trademarks, the provisions of this Agreement above shall automatically apply thereto and such Grantor shall promptly give to the Secured Party written notice thereof in accordance with Section 2(g) of the Security Agreement. Such Grantor hereby authorizes the Secured Party to modify this Agreement by amending Schedules I, II, and III hereto, as applicable, to include any Copyrights, Patents, and Trademarks that have been included in any updated Schedules III, V and/or VI to the Security Agreement pursuant to Section 2(g) of the Security Agreement, and to execute and deliver any supplement hereto (in form and substance reasonably satisfactory to the Secured Party) to evidence the Secured Party's lien on any such Patent, Trademark, or Copyright.

Section 5. SECURITY AGREEMENT. The security interests granted pursuant to this Agreement are granted in conjunction with the security interests granted by the Grantors to the Secured Party, for its benefit and the benefit of the Holders pursuant to the Security Agreement. Each Grantor hereby acknowledges and affirms that the rights and remedies of the Secured Party with respect to the Collateral made and granted herein are more fully set forth in the Security Agreement, the terms and provisions of which are incorporated by reference herein as if fully set forth herein. Any rights and remedies set forth herein are without prejudice to, and in addition to, those set forth in the Security Agreement. In the event any provisions contained herein expressly conflict with any provisions in the Security Agreement covering Intellectual Property, the provisions of the Security Agreement shall control.

Section 6. REINSTATEMENT. This Agreement shall remain in full force and effect and continue to be effective should any petition be filed by or against the Grantors for liquidation or reorganization, should any Grantor become insolvent or make an assignment for the benefit of any creditor or creditors or should a receiver or trustee be appointed for all or any significant part of any Grantor's assets, and shall continue to be effective or be reinstated, as the case may be, if at any time payment and performance of the Obligations, or any part thereof, is, pursuant to applicable law, rescinded or reduced in amount, or must otherwise be restored or returned by any obligee of the Obligations, whether as a "voidable preference", "fraudulent conveyance" or otherwise, all as though such payment or performance had not been made. In the event that any payment, or any part thereof, is rescinded, reduced, restored or returned, the Obligations shall be reinstated and deemed reduced only by such amount paid and not so rescinded, reduced, restored or returned.

Section 7. NOTICES. Whenever it is provided herein that any notice, demand, request, consent, approval, declaration or other communication shall or may be given to or served upon

any of the parties by any other party, or whenever any of the parties desires to give and serve upon any other party any communication with respect to this Agreement, each such notice, demand, request, consent, approval, declaration or other communication shall be in writing and shall be given in the manner, and deemed received, as provided for in the Security Agreement. The notice address for the Grantors is 1900 Skyhawk Street, Alameda, California 94501.

Section 8. TERMINATION OF THIS AGREEMENT. Subject to Section 6 hereof, this Agreement shall terminate upon the payment in full in cash of all Obligations (except for contingent indemnity claims for which no claim has been made).

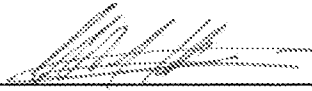
Section 9. GOVERNING LAW. THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED AND ENFORCED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NEW YORK APPLICABLE TO CONTRACTS MADE AND PERFORMED IN SUCH STATE, WITHOUT REGARD TO PRINCIPLES OF CONFLICTS OF LAW.

[Signature Pages Follow]

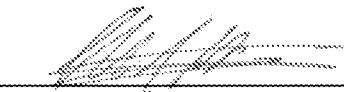
IN WITNESS WHEREOF, each Grantor has executed this Intellectual Property Security Agreement as of the date first written above.

GRANTORS:

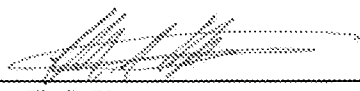
ASTRA SPACE, INC.:

By: 
Name: Chris Kemp
Title: Chief Executive Officer

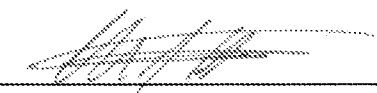
APOLLO FUSION, LLC

By: 
Name: Chris Kemp
Title: Chief Executive Officer

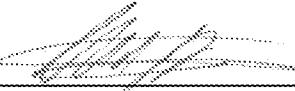
ASTRA EARTH OPERATIONS LLC

By: 
Name: Chris Kemp
Title: Chief Executive Officer

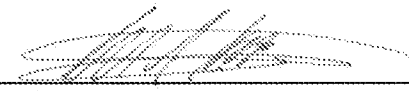
ASTRA SPACECRAFT ENGINES, INC.

By: 
Name: Chris Kemp
Title: Chief Executive Officer

ASTRA SPACE OPERATIONS, LLC

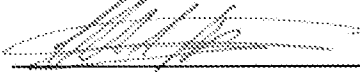
By: 
Name: Chris Kemp
Title: Chief Executive Officer

ASTRA SPACE PLATFORM HOLDINGS LLC

By: 
Name: Chris Kemp
Title: Chief Executive Officer

[Signature Page to Intellectual Property Security Agreement]

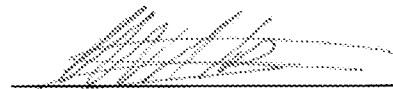
ASTRA SPACE PLATFORM SERVICES LLC

By:  _____

Name: Chris Kemp

Title: Chief Executive Officer

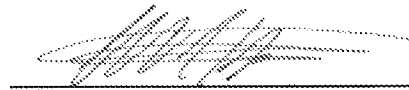
ASTRA SPACE TECHNOLOGIES HOLDINGS,
INC.

By:  _____

Name: Chris Kemp

Title: Chief Executive Officer

INDIGO SPACE, LLC

By:  _____

Name: Chris Kemp


Title: Chief Executive Officer

[Signature Page to Intellectual Property Security Agreement]

TRADEMARK
REEL: 008163 FRAME: 0499

ACCEPTED AND ACKNOWLEDGED BY
SECURED PARTY:

HIGH TRAIL INVESTMENTS ON LLC
as the Secured Party

By: 
Name: Eric Helenek
Title: Authorized Signatory

[Signature Page to Intellectual Property Security Agreement]

TRADEMARK
REEL: 008163 FRAME: 0500

SCHEDULE I

Trademarks

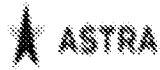
OWNER	REGISTRATION/ APPLICATION NUMBER	TRADEMARK
		
Astra Space, Inc.	SN: 97387150	
Astra Space, Inc.	SN: 97387150	ASTRA SPACECRAFT ENGINE
Astra Space, Inc.	SN: 97255838	ASTRA SPACE
Astra Space, Inc.	SN: 97255843	ASTRA EARTH OPERATIONS
Astra Space, Inc.	SN: 97255840	ASTRA
Astra Space Operations, LLC	SN: 97120166 RN: 6923955	MAKE SPACE FOR EVERYONE
Astra Space, Inc.	SN: 90502920	FROM ANYWHERE ON EARTH TO ANYWHERE IN SPACE
Astra Space, Inc.	SN: 90502932 RN: 6708795	NEXT DAY SPACE
Astra Space, Inc.	SN: 90502926 RN: 6708794	DAILY SPACE DELIVERY
Astra Space, Inc.	SN: 9055953 RN: 6769489	IMPROVE LIFE ON EARTH FROM SPACE
Astra Space, Inc.	SN: 90559538 RN: 6714766	NEXT HOUR AIR
Astra Space, Inc.	SN: 90562797	ASTRASPHERE

Astra Space, Inc. SN: 90562806
RN: 6688204



Astra Space, Inc. SN: 90563014
RN: 6688206

ASTRA and Design



Astra Space, Inc. SN: 90563011
RN: 6822363

ASTRA and Design



Astra Space, Inc. RN: 5772557
SN: 87654434

ASTRA

Astra Space, Inc. RN: 5784623
SN: 87654425

ASTRA

Astra Space, Inc. RN: 5772560
SN: 87661227

ASTRA and Design



Astra Space, Inc. RN: 5784627
SN: 87661227

ASTRA and Design



Astra Space, Inc. RN: 6036145
SN: 88215980

ASTRALITE and Design

Astra Space, Inc. RN: 6036144
SN: 88215926

ASTRALITE

Astra Space, Inc. RN: 7074754 ASTRA SPACECRAFT ENGINE and Design
 SN: 97387150

ASTRA SPACECRAFT ENGINE

Apollo Fusion, LLC RN: 6234146 APOLLO FUSION
 SN: 87613783




Apollo Fusion, LLC RN: 6080515 APOLLO
 SN: 87613734

Applications:

OWNER	APPLICATION NUMBER	TRADEMARK
Astra Space, Inc.	SN: 90502920	FROM ANYWHERE ON EARTH TO ANYWHERE IN SPACE ¹
Astra Space, Inc.	SN: 90562797	ASTRASPHERE ²















OTHER TRADEMARKS:










Registrations:

OWNER	REGISTRATION NUMBER	COUNTRY/STATE	TRADEMARK
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO Australia	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO Brazil	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO Canada	

¹ Application has been abandoned.

² Application has been abandoned.

Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO China	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO EU	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO France	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO Israel (Subsequent Designation)	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO India	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO Japan	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO New Zealand	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO Switzerland	
Astra Space, Inc.	WIPO International Registration No. 1612810	WIPO UK	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO Australia	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO Brazil	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO Canada	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO China	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO EU	

Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO France	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO Israel (Subsequent Designation)	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO India	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO Japan	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO Switzerland	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO New Zealand	
Astra Space, Inc.	WIPO International Registration No. 1612824	WIPO UK	
Astra Space, Inc.	Registration No. 02216724	Taiwan	
Astra Space, Inc.	Registration No. 02216725	Taiwan	
Astra Space Operations, LLC	Registration No. 97120166 Trademark No. 2236280	Australia	MAKE SPACE FOR EVERYONE
Astra Space Operations, Inc. ³	Reg. No. UK00003733134	UK	MAKE SPACE FOR EVERYONE

³ On June 23, 2023, Astra Space Operations, Inc. filed Articles of Conversion with the Delaware Secretary of State, converting from a corporation into a limited liability company, named Astra Space Operations, LLC. As of the Agreement Date, the registered holder of these intellectual property registrations has not yet been changed to reflect the conversion, however the appropriate intellectual property authorities have been notified.

Astra Space Operations, Inc. ³	Reg. No. 018622283	EU	MAKE SPACE FOR EVERYONE
Apollo Fusion, LLC	WIPO International Registration No. 1442561	Russia	APOLLO FUSION
Apollo Fusion, LLC	WIPO International Registration No. 1442561	India	APOLLO FUSION
Apollo Fusion, LLC	WIPO International Registration No. 1442561	South Korea	APOLLO FUSION
Apollo Fusion, LLC	AN: 917873099	UK	APOLLO FUSION
Apollo Fusion, LLC	AN: 915793474	UK	APOLLO FUSION
Apollo Fusion, LLC	RN: 015793474 AN: 015793474	EU	APOLLO FUSION
Apollo Fusion, LLC	RN: 017873099 AN: 017873099	EU	APOLLO FUSION

Applications:

OWNER	APPLICATION NUMBER	COUNTRY/STATE	TRADEMARK
Astra Space Operations, Inc. ³	Application No. 2021-159809	Japan	MAKE SPACE FOR EVERYONE
Astra Space, Inc.	Application No. 349824	Israel	ASTRA (word mark)

SCHEDULE II

Patents

Registrations:

OWNER	REGISTRATION/ APPLICATION NUMBER	DESCRIPTION
Astra Space Operations, LLC	8,956,123	SMALL SCALE HIGH SPEED TURBOMACHINERY
Astra Space Operations, LLC	10,006,291	SMALL SCALE HIGH SPEED TURBOMACHINERY

Applications:

OWNER	APPLICATION NUMBER	COUNTRY/STATE	DESCRIPTION
Astra Space, Inc.	PCT/US2022/072572	PCT	DISTRIBUTED PROCESSING IN A SATELLITE NETWORK BASED ON SATELLITE CHARACTERISTICS

SCHEDULE III

Copyrights

Unregistered Copyrights:

<u>OWNER</u>	<u>COPYRIGHT</u>	<u>DESCRIPTION</u>
Astra Space, Inc.	astra (*)	Primary repository for all on-rocket embedded software and firmware. Flight Control Systems / GNC
Astra Space, Inc.	gnc (*)	GNC Development Environment
Astra Space, Inc.	rocket-configuration	Store rocket configuration parameters used by the GNC software
Astra Space, Inc.	nanopb (*)	Protocol Buffers for Embedded Systems
Astra Space, Inc.	hadley (*)	Plant models for our upper stage engine
Astra Space, Inc.	Astraptp	Astra implementation of Precision Time Protocol
Astra Space, Inc.	fcs-integration-testing	A repository for aggregating flight software builds and running full integration tests on them. Mostly mocket runs.
Astra Space, Inc.	c10-telemetry-extractor	Software to extract Astra CCSDS telemetry frames from an IRIG Chapter 10 file.
Astra Space, Inc.	fsch_test_tools	ACE state machines and other tools intended for testing flight control system hardware.
Astra Space, Inc.	launcher (*)	Launcher Simulink model
Astra Space, Inc.	gnc-depreciated	Simulink GNC code
Astra Space, Inc.	vivado (*)	Xilinx Vivado programmable logic devices projects and tooling.
Astra Space, Inc.	telem	This repo contains the telemetry configuration for each flight
Astra Space, Inc.	hardware (*)	Storage of Altium files and other hardware designs
Astra Space, Inc.	astra_rad (*)	Radio repository for internal link development and associated resources, including tests, prototypes, benchmarks and shared encoding libraries
Astra Space, Inc.	gps-atp	This project contains the GPS ATP tool developed by Radio Systems
Astra Space, Inc.	radio-city	Linux kernel and distribution for the radio computer.

Astra Space, Inc.	radio-ground	Ground side software for Radio Systems projects.
Astra Space, Inc.	rf-test	Test software for Radio Systems group
Astra Space, Inc.	radio-denizens	Astra software processes and tools that run on the radio computer.
Astra Space, Inc.	radio-control	Application run from flight computer to query and set various options for the TIMTER Multi-mode Digital Telemetry Transmitter.
Astra Space, Inc.	star_tracker_tester	Software suite to test the star tracker
Astra Space, Inc.	beckhoff (*)	Project for all code pertaining to Launcher Team's Beckhoff PLCs
Astra Space, Inc.	stage_separation (*)	Calculations for stage separation
Astra Space, Inc.	astra-propulsion-analysis (*)	This is a repository of python tools which allow propulsion teams to analyze data. It is primarily used for hot fire analysis but other tools (Valves, TVCs, ESCs ATP) will also use the tools.
Astra Space, Inc.	astra-propulsion-analysis-r-3-archive	This is a repository of python tools which allow propulsion teams to analyze data. It is primarily used for hot fire analysis but other tools (Valves, TVCs, ESCs ATP) will also use the tools. (Archived after Rocket 3)
Astra Space, Inc.	cahts-development	Computer Assisted History Taking Systems for Rocket4
Astra Space, Inc.	Enginedatareduction	Engine Data Reduction Code: Code to format, analyze, and plot engine data captured during engine testing.
Astra Space, Inc.	ase_solenoid_valve_qual (*)	Astra Spacecraft Engine solenoid valve qualification
Astra Space, Inc.	console (*)	Primary UI for Launch and Test Control
Astra Space, Inc.	Stand	Anisble playbooks for deploying Test Stands and LSSMs
Astra Space, Inc.	fuel-hydraulic-stand1	A template repository to add dummy devices and machines when building a new stand.
Astra Space, Inc.	Helmet	A tool for normalizing configuration deployments to Test Stands and LSSMs
Astra Space, Inc.	astra-tv	UI for viewing internal Wowza video streams
Astra Space, Inc.	pace-lss	Playwright tests for PACE digital procedures
Astra Space, Inc.	gps-simulator (*)	GPS Simulation for Launch System Simulator

Astra Space, Inc.	Astrapb	Internal protobuf definitions for all of Astra
Astra Space, Inc.	testmeta (*)	Python library for querying and creating metadata for Tests
Astra Space, Inc.	grafana-plugin-socket-streaming	Data source to Grafana to follow real time data on a stand (from the Plasma websocket)
Astra Space, Inc.	database	Hub / Testmeta database definitions and migrations
Astra Space, Inc.	Holodeck	Virtual Stand Configuration Repository
Astra Space, Inc.	ace (*)	State machine management service for test and launch. This launches the rocket and supports all tests
Astra Space, Inc.	kinesis (*)	AWS Kinesis consumers and producers for streaming launch and test data
Astra Space, Inc.	spacesuit (*)	Runner to communicate to the ASE PPU's using the 'SPACESUIT' python API.
Astra Space, Inc.	scpi	Boilerplate project to illustrate how to create new runners
Astra Space, Inc.	keysight_daq_runner	This is a quick one off runner to communicate with a Keysight DAQ990A for PPU-Stand-1
Astra Space, Inc.	nicpp (*)	NiCpp is a command line app to publish raw data from NI C-rio/Pxie to Zmq in the protobuf format.
Astra Space, Inc.	zero (*)	ZeroMQ based proxy service for Control Platform stack
Astra Space, Inc.	pulpo2	Common libraries for Control Platform stack
Astra Space, Inc.	Cloud	Terraform configurations and scripts to bootstrap Control Platform's cloud stack
Astra Space, Inc.	mocket-telem	Service for streaming telemetry from our hardware in the loop
Astra Space, Inc.	binlog (*)	Services relating to uploading, proxying and replaying telemetry data from our binlog format
Astra Space, Inc.	plasma (*)	This is a UI to visualize incoming protobufs
Astra Space, Inc.	base-images	Source code for TSS docker based images
Astra Space, Inc.	replicator	Tool to automate the provisioning process for new stands.
Astra Space, Inc.	launch-ops-machines (*)	Source of truth for ACE state machines on launch infrastructure
Astra Space, Inc.	cereal	This is a runner to communicate with the generic Serial devices. The PSerial runner is geared towards our own inhouse power systems.
Astra Space, Inc.	prop_analyzer	A service to automatically publish prop data

Astra Space, Inc.	nicpp-highspeed-runner (*)	This project is a runner to get high speed data from a crio or a pxie.
Astra Space, Inc.	ni	National Instruments code
Astra Space, Inc.	orion-yard	Orion yard management
Astra Space, Inc.	controller	This code talks to the astra controllers
Astra Space, Inc.	ionovac	This is a runner to communicate with the Leybold Ionovac Sensors
Astra Space, Inc.	pulpo (*)	Common libraries for Control Platform stack
Astra Space, Inc.	Timecore	This is a service that will be running to sync the cameras we have on site
Astra Space, Inc.	Pserial	General purpose runner for the Power Systems Serial boards that uses a query plan to query and command N serial devices through ACE
Astra Space, Inc.	yamms	K8S yaml normalization, fetching, diffing
Astra Space, Inc.	sginfluxwriter	Pull data from JKIs PXIe software to influx for use in grafana
Astra Space, Inc.	web_monolith	Centralized services for managing engine configurations and sequences, etc.
Astra Space, Inc.	umbilical (*)	The umbilical splitter and radio splitter are designed to read off UDP and begin publishing raw SDU data the rest of the system via zmq
Astra Space, Inc.	Radio	Ground side software for Radio Systems projects.
Astra Space, Inc.	Streamcheck	A small app to check video streams across the company, created for launch.
Astra Space, Inc.	snmp-runner	SNMP runner
Astra Space, Inc.	fixture_cm	Launch System Simulator SW/HW fixture configuration
Astra Space, Inc.	odoo-frepple	Odoo addon providing 2-way integration with frePPLe advanced planning.
Astra Space, Inc.	odoo (*)	Astra custom addons for Odoo
Astra Space, Inc.	mfg-etl (*)	Manufacturing 2.0: batch and streaming pipelines for Ion, Odoo, Teamcenter, and more...
Astra Space, Inc.	telemetry-etl (*)	Test/launch telemetry ETL process to ingest launch / test data to data lake
Astra Space, Inc.	outlandish (*)	Dask ETL Functions for Datalake

Astra Space, Inc.	mfg-client (*)	Python client for accessing data from Astra manufacturing systems. Currently supports Confluence and Ion.
Astra Space, Inc.	test-telemetry-client	Client Code For Getting Test Telemetry Data
Astra Space, Inc.	ase-postanalysis (*)	This project enables post-analysis scripts automation for the ASE propulsion team
Astra Space, Inc.	ase-pipeline (*)	MLRun project to ingest telemetry from ASE stands to the datalake 1.0 structure.
Astra Space, Inc.	datalake (*)	This is a Python Library for accessing the datalake for data analysis and validation activities.
Astra Space, Inc.	odp-api (*)	This is a REST service allowing applications like Hub to query content in the datalake.
Astra Space, Inc.	odp_common (*)	Common python libraries for Data Platform
Astra Space, Inc.	ase-spectra-pipeline	This project ingests ASE test logs that are in frequency domain (a.k.a spectra) into the datalake.
Astra Space, Inc.	ursa-major-pipeline	This project ingests Ursa Major test logs into the datalake.
Astra Space, Inc.	datalake-validation	Validation tools for the Astra DataLake.
Astra Space, Inc.	castle-jki-pipeline	MLRun project to ingest telemetry from Castle stands to the datalake 1.0 structure.
Astra Space, Inc.	castle-postanalysis	This project enables post-analysis scripts automation for the Apollo propulsion team
Astra Space, Inc.	perf-verifications-pipeline	Pipeline Code for Performance Verifications
Astra Space, Inc.	influxdb-tsm	Convert InfluxDB TSM files to Parquet files.
Astra Space, Inc.	perf-verifications-library	This is the library for the performance verification framework.
Astra Space, Inc.	influxdb-archive	Dump InfluxDB archives to data lake
Astra Space, Inc.	influxdb-etl	ETL InfluxDB to data lake
Astra Space, Inc.	event-marker-definitions (*)	Configurations used by the Event Marker tool
Astra Space, Inc.	ase-s3-watcher	Pushes ASE test data to S3 for staging ETL to data lake
Astra Space, Inc.	ase-on-orbit-analysis (*)	This repository contains the script to process ad hoc ASE on-orbit data (specifically TLE and engine burn logs) and to generate the analysis artifact for relating engine burns with altitude changes

Astra Space, Inc.	event-marker-pipeline	Pipeline Code for the Event Marking Tool
Astra Space, Inc.	event marker (*)	Event Marking Tool for Populating the Feature Store with events generated from timeseries data from tests
Astra Space, Inc.	workflow-test-ingest	Service to convert binlog files to parquet to upload to s3
Astra Space, Inc.	castle-uploader	This project provides a script to copy log files from a remote machine and upload them to a configured or specified upload location in S3
Astra Space, Inc.	castle-pipeline	Ingest low-resolution data from Castle's InfluxDB
Astra Space, Inc.	aftu-pipeline	Autonomous Flight Termination Unit. Ingest data from AFTU
Astra Space, Inc.	hub-downloads-migration	ITAR compliant solution that enables Hub users to securely download files in the Astra Data Lake via the Hub UI.
Astra Space, Inc.	aftu-client	AFTU Data Lake Client
Astra Space, Inc.	datalake-admin	Admin tools for the datalake
Astra Space, Inc.	channel mapper	UI tools for Editing Channel Maps
Astra Space, Inc.	hub-client	Lightweight python client for Hub
Astra Space, Inc.	chiron-etl	ETL Scripts and Supporting Libraries for Chiron
Astra Space, Inc.	pipeline-utils	Utilities for developing and deploying ETL code to Iguazio.
Astra Space, Inc.	untrunc	Tool for "fixing" truncated video files
Astra Space, Inc.	telemetry_kinesis	Kinesis Telemetry Ingest to Tier0
Astra Space, Inc.	eve	Experimental Video Extraction.
Astra Space, Inc.	hub (*)	Primary UI for Astra, including Data Visualization tools, Engine Configurations and Sequences, Test Metadata, etc.
Astra Space, Inc.	ion-python-sdk	Client library for integration with ION's API using graphql based queries.
Astra Space, Inc.	ion-workflows	Workflows for handling inbound/outbound ION events through AstraOS.
Astra Space, Inc.	teamcenter-to-odoo-prosumer	Argo workflows/Events to handle Part or BOM change (new/update) events from Team Center and sync the data over to Odoo

Astra Space, Inc.	workflow-common	A set of common utilities (helper containers, notifiers, etc.) to help with constructing Hera powered Argo Workflows
Astra Space, Inc.	hilq (*)	A queue for HITLs. HILQ accepts HIL jobs and serially attempts to run them via Argo
Astra Space, Inc.	ls_wf	ls_wf aka Launch System Workflows is a python project for launch system argo workflows
Astra Space, Inc.	wf_helpers	wf_helpers aka Workflow Helpers is a python library with helper functions and cli commands
Astra Space, Inc.	releases	This repository will eventually be the source of truth for launch system release manifests
Astra Space, Inc.	hub-db-cdc	Performs CDC capture of the Hub Database (postgresql-13) and emits them as JSON blobs to Kafka topics
Astra Space, Inc.	terminus (*)	Terminus handles event sourcing and production for data flowing through the platform services event bus (Kafka).
Astra Space, Inc.	opl_kafka	Wrapper library for Confluent Python
Astra Space, Inc.	opl-infra	Infrastructure terraform and tools for Astra OS Platform
Astra Space, Inc.	topic-provisioner	Creates/Provisions Kafka topics via Gitlab
Astra Space, Inc.	Platformpb	Protobuf definitions for Platform Services
Astra Space, Inc.	mango (*)	API to reliably create/save/load the correct Config & Sequences for Astra launches
Astra Space, Inc.	opl_api	Rest API for Astra OS Platform Services
Astra Space, Inc.	opl_common	Common libraries for Platform Services
Astra Space, Inc.	webhook-service	Houses various endpoints for external facing webhooks to various vendors Astra subscribes to (eg: Workday, etc.)
Astra Space, Inc.	teamcenter-python-sdk	SDK for interacting with TeamCenter's SOAP APIs
Astra Space, Inc.	stand-producer	Stand-Producer is a service deployed on stands that consumes events from stand's zmq, wraps in envelope, and produce to OPL event bus
Astra Space, Inc.	opl-auth	OPL Authentication middleware for use with Azure Identity Platform
Astra Space, Inc.	opl-e2e	End 2 End tests for Terminus/Pano/Webhooks.