

Supplementary materials for “Privatizing the space economy: A perspective on U.S. government and private-sector participation based on patents”

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Patent landscaping search queries

The search queries used to identify patent documents in each space component technology are precisely described below. Each query is separated into a set of subqueries, labeled by “L” followed by a number, which are combined to create an overall query for each component technology. The queries were executed using the USPTO examiner search tool, PE2E search (“L” is used by convention in the USPTO examiner search tool to denote individual searches—we maintain these labels for our queries and subqueries). The queries were run on the US-PGPUB (all USPTO pre-grant publications), USPAT (patents since approximately 1976) and USOCR (generally pre-1976 patents that have been digitized using OCR) databases. While we used the internal version of PE2E search, external users can execute the queries on USPTO’s Patent Public Search (<https://ppubs.uspto.gov/pubwebapp/>).

Satellite communication (SATCOM)

L#	Query
L15	(B64G1/1007).cpc.
L24	(H04B7/18508).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L25	(H04B7/1851-18517).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L26	(H04B7/18521-18571).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR

	astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L27	(H04B7/18576-195).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L29	(H04B7/204-216).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L30	(H04B10/118).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L31	(H04W84/06).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L32	(H04N21/6143).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L33	(H04H20/74).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L34	(H01Q1/288).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,detd,clm.
L35	L24-L34: consolidate comm CPCs with keywords (H04B7/18508 OR H04B7/1851-18517 OR H04B7/18521-18571 OR

	H04B7/18576-195 OR H04B7/204-216 OR H04B10/118 OR H04W84/06 OR H04N21/6143 OR H04H20/74 OR H01Q1/288).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,ded,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,ded,clm.
L36	(L15 OR L35) AND @py> = 1976 (((B64G1/1007).cpc.) OR ((H04B7/18508 OR H04B7/1851-18517 OR H04B7/18521-18571 OR H04B7/18576-195 OR H04B7/204-216 OR H04B10/118 OR H04W84/06 OR H04N21/6143 OR H04H20/74 OR H01Q1/288).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,ded,clm. AND ((satellite OR spacecraft) WITH (broadband OR narrowband OR wideband OR broadcast)).ti,ab,ded,clm.)) AND @py> = "1976"

Final query: L36

Position, navigation, and timing (PNT)

L#	Query
L31	(B64G1/1014).cpc.
L39	(G01S5/12-145).cpc. AND (outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,ded,clm. AND (satellite OR spacecraft).ti,ab,ded,clm.
L43	(G01S19/08).cpc.
L45	(L31 OR L43 OR L39) AND @py> = 1976 (((B64G1/1014).cpc.) OR ((G01S19/08).cpc.) OR ((G01S5/12-145).cpc. AND (outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,ded,clm. AND (satellite OR spacecraft).ti,ab,ded,clm.)) AND @py> = "1976"

Final query: L45

Earth observation

Searched US-PGPUB, USPAT and USOCR

L#	Query
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L7	(B64G1/1021-1042).cpc.
L8	(G01S13/955).cpc.
L9	(G06T2207/10032-10044).cpc.
L10	(G01S13/\$).cpc.
L12	(((G06T2207/10032-10044).cpc.) OR ((G01S13/\$).cpc.)) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((earth\$2 OR world OR globe OR global OR orb OR country OR terra\$firma OR land OR ground OR terrain OR surface OR atmosphere) NEAR (observ\$5 OR monitor\$3 OR watch\$3 OR inspect\$3 OR examin\$5 OR view\$3 OR survey\$3 OR surveillance OR study\$3 OR spy\$3 OR track\$3)).ti,ab,detd,clm.
L13	(L7» OR L8» OR L12») AND @py>="1976" (((B64G1/1021-1042).cpc.) OR ((G01S13/955).cpc.) OR (((G06T2207/10032-10044).cpc.) OR ((G01S13/\$).cpc.)) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((earth\$2 OR world OR globe OR global OR orb OR country OR terra\$firma OR land OR ground OR terrain OR surface OR atmosphere) NEAR (observ\$5 OR monitor\$3 OR watch\$3 OR inspect\$3 OR examin\$5 OR view\$3 OR survey\$3 OR surveillance OR study\$3 OR spy\$3 OR track\$3)).ti,ab,detd,clm.)) AND @py>="1976"

Final query: L13

Space Transportation

L#	Query
L30	((B64G1/002-008).cpc. OR (B64G1/14).cpc. OR (B64G1/242-2421 OR B64G1/2427-2429).cpc. OR (B64G1/26-264).cpc. OR (B64G1/40\$ OR B64G1/41\$).cpc. OR (B64G1/58).cpc. OR (B64G1/62-625).cpc. OR (B64G1/64-644).cpc. OR (B64G5/00 OR B64G2005/005).cpc.)
L31	(F42B15/12).cpc.
L32	((F02K9/00-978).cpc. OR (F02K7/18).cpc. OR F03H.cpci. OR (F17C13/008,088 or F17C2270/0194,0197).cpc)
L33	(B64G1/645-6459).cpc.
L34	(L30» OR L31» OR L32» OR L33») AND @py>="1976" (((B64G1/002-008).cpc. OR (B64G1/14).cpc. OR (B64G1/242-2421 OR B64G1/2427-2429).cpc. OR (B64G1/26-264).cpc. OR (B64G1/40\$ OR B64G1/41\$).cpc. OR (B64G1/58).cpc. OR (B64G1/62-625).cpc. OR (B64G1/64-

	644).cpc. OR (B64G5/00 OR B64G2005/005).cpc.) OR ((F42B15/12).cpc.) OR ((F02K9/00-978).cpc. OR (F02K7/18).cpc. OR F03H.cpcl. OR (F17C13/008,088 OR F17C2270/0194,0197).cpc) OR ((B64G1/645-6459).cpc.)) AND @py>="1976"
L39	((L31» OR L32») AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND (((propulsion OR thrust OR impulse OR driv\$3 OR momentum OR force) NEAR (rocket OR spacecraft)) OR (transfer OR launch\$2 OR booster OR missile OR projectile OR trajectory) OR (launch OR boost OR (orbit WITH rais\$3) OR station\$keep\$3 OR maneuver\$3) OR ((gravity WITH assist) OR (sling\$shot\$4))).ti,ab,detd,clm.)
L40	((L30» OR L33») OR L39») AND @py>="1976" (((B64G1/002-008).cpc. OR (B64G1/14).cpc. OR (B64G1/242-2421 OR B64G1/2427-2429).cpc. OR (B64G1/26-264).cpc. OR (B64G1/40\$ OR B64G1/41\$).cpc. OR (B64G1/58).cpc. OR (B64G1/62-625).cpc. OR (B64G1/64-644).cpc. OR (B64G5/00 OR B64G2005/005).cpc.) OR ((B64G1/645-6459).cpc.)) OR (((F42B15/12).cpc.) OR ((F02K9/00-978).cpc. OR (F02K7/18).cpc. OR F03H.cpcl. OR (F17C13/008,088 OR F17C2270/0194,0197).cpc)) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND (((propulsion OR thrust OR impulse OR driv\$3 OR momentum OR force) NEAR (rocket OR spacecraft)) OR (transfer OR launch\$2 OR booster OR missile OR projectile OR trajectory) OR (launch OR boost OR (orbit WITH rais\$3) OR station\$keep\$3 OR maneuver\$3) OR ((gravity WITH assist) OR (sling\$shot\$4))).ti,ab,detd,clm.) AND @py>="1976"

Final query: L40

Human space habitation

L#	Query
L43	(B64G1/12).cpc.
L19	(B64G1/46-48).cpc.
L24	(B64G1/52-543).cpc. AND ((astronaut OR cosmonaut OR crewed OR manned OR pilot) OR (aerospace WITH medicine))
L23	(B64G1/60).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm.

L25	(B64G6/00).cpc. AND ((astronaut OR cosmonaut OR crewed OR manned OR pilot) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L28	(B64G7/00 OR B64G2007/005).cpc. AND ((astronaut OR cosmonaut OR crewed OR manned OR pilot) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L33	(b32b2419/00,02,04,06).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L35	(B32B2607/00,02).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L36	(B32B2437/00,02,04).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L37	(B32B2605/\$).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L47	(A01N1/00-0294).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L48	(C25P1\$ or C25P3\$).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L49	(B01D53\$).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR

	cosmonaut\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L59	(L33 – L37 plus L47-L49: consolidating space B32 CPCs plus L47-L49 CPCs w/space and category keywords) (((B32B2607/00,02 OR B32B2419/00,02,04,06 OR B32B2437/00,02,04 OR B32B2605/\$).cpc.) OR (A01N1/00-0294).cpc. OR (C25P1\$ or C25P3\$).cpc. OR (B01D53\$).cpc.) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.
L42	(L24, L25, L28: consolidate B64G w/same keywords) (B64G1/52-543 OR B64G6/00 OR B64G7/00 OR B64G2007/005).cpc. AND ((astronaut OR cosmonaut OR crewed OR manned OR pilot) OR (aerospace WITH medicine)).ti,ab,detd,clm. NOTE: excluding ".ti,ab,detd,clm." increases results to 458
L51	(L43 OR L19 OR L24 OR L42 OR L50) AND @py> =1976 (((B64G1/12).cpc.) OR ((B64G1/46-48).cpc.) OR ((B64G1/52-543).cpc. AND ((astronaut OR cosmonaut OR crewed OR manned OR pilot) OR (aerospace WITH medicine)).ti,ab,detd,clm.) OR ((B64G1/52-543 OR B64G6/00 OR B64G7/00 OR B64G2007/005).cpc. AND ((astronaut OR cosmonaut OR crewed OR manned OR pilot) OR (aerospace WITH medicine)).ti,ab,detd,clm.) OR (((B32B2607/00,02 OR B32B2419/00,02,04,06 OR B32B2437/00,02,04 OR B32B2605/\$).cpc.) OR (A01N1/00-0294).cpc. OR (C25P1\$ OR C25P3\$).cpc. OR (B01D53\$).cpc.) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm. AND ((astronaut OR cosmonaut OR crewed OR manned) OR (aerospace WITH medicine)).ti,ab,detd,clm.)) AND @py> = "1976"

Final query: L51

Space science

L#	Query
L6	(B64G1/105-1071).cpc.
L7	(B64G1/16).cpc.
L10	(B64G1/16).cpc. AND (((space OR solar OR sun) WITH (weather OR forecasting)) OR ((planet\$3 OR inter\$planetary OR asteroid OR lunar OR moon

	OR comet) WITH explor\$5) OR (space WITH telescope) OR (space WITH science)).ti,ab,detd,clm.
L11	(L6 OR L10) AND @py> = 1976 (((B64G1/105-1071).cpc.) OR ((B64G1/16).cpc. AND (((space OR solar OR sun) WITH (weather OR forecasting)) OR ((planet\$3 OR inter\$planetary OR asteroid OR lunar OR moon OR comet) WITH explor\$5) OR (space WITH telescope) OR (space WITH science)).ti,ab,detd,clm.)) AND @py> = "1976"

Final query: L11

Space manufacturing and resource development

L#	Query
L15	(B64G1/4282).cpc.
L18	(B64G1/46-465).cpc. AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR (zero\$gravity OR zero\$g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,detd,clm.
L19	(B64G4/00 OR B64G2004/005).cpc. AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR (zero\$gravity OR zero\$g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,detd,clm.
L20	(E21C51/00).cpc.
L21	(E21B\$.cpc.) AND (B64G\$.cpc.)
L22	(E21B\$.cpc.) AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR (zero\$gravity OR zero\$g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,detd,clm.
L23	(B33Y10/00.cpc. OR B33Y30/00.cpc. OR B33Y40/\$.cpc. OR B33Y50/\$.cpc. OR B33Y70/\$.cpc. OR B33Y80/00.cpc. OR B33Y90/00.cpc.) AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR (zero\$gravity OR zero\$g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,detd,clm.
L24	(C12N2525/00).cpc AND (micro\$gravity).ti,ab,detd,clm.

L25	G01N2035/00336.cpc.
L30	(A01N1/00-0294).cpc. AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR ((zero\$gravity OR zero\$1g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic)) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,ded,clm.
L31	(C25P1\$ or C25P3\$).cpc. AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR ((zero\$gravity OR zero\$1g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic)) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,ded,clm.
L32	(B65D\$).cpc. AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR ((zero\$gravity OR zero\$1g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic)) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,ded,clm.
L33	(B01D53\$).cpc. AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR ((zero\$gravity OR zero\$1g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic)) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,ded,clm.
L34	L18 OR L19 OR L22 OR L23 OR L30 OR L31 OR L32 OR L33 NOTE: Update keywords for L18, L19, L22, L23 per L30-L33 above ((B64G1/46-465).cpc. OR (B64G4/00 OR B64G2004/005).cpc. OR E21B\$.cpc. OR B33Y10/00.cpc. OR B33Y30/00.cpc. OR B33Y40/\$.cpc. OR B33Y50/\$.cpc. OR B33Y70/\$.cpc. OR B33Y80/00.cpc. OR B33Y90/00.cpc. OR (A01N1/00-0294).cpc. OR (C25P1\$ or C25P3\$).cpc. OR (B65D\$).cpc. OR (B01D53\$).cpc.) AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR ((zero\$gravity OR zero\$1g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic)) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))).ti,ab,ded,clm.
L35	(L15 OR L20 OR L21 OR L24 OR L25 OR L34) AND @py >= 1976 Note: incorporates keyword changes from above (((B64G1/4282).cpc.) OR ((E21C51/00).cpc.) OR ((E21B\$.cpc.) AND (B64G\$.cpc.)) OR ((C12N2525/00).cpc AND (micro\$gravity).ti,ab,ded,clm.) OR

	(G01N2035/00336.cpc.) OR (((B64G1/46-465).cpc. OR (B64G4/00 OR B64G2004/005).cpc. OR E21B\$.cpc. OR B33Y10/00.cpc. OR B33Y30/00.cpc. OR B33Y40/\$.cpc. OR B33Y50/\$.cpc. OR B33Y70/\$.cpc. OR B33Y80/00.cpc. OR B33Y90/00.cpc. OR (A01N1/00-0294).cpc. OR (C25P1\$ OR C25P3\$).cpc. OR (B65D\$).cpc. OR (B01D53\$).cpc.) AND (((moon OR lunar OR asteroid OR comet) WITH (mining OR extract\$3 OR harvest\$3)) OR (terra\$form\$3) OR ((zero\$gravity OR zero\$1g OR zero\$gee OR micro\$gravity) WITH (chemical OR material OR pharmaceutical OR drug OR cultur\$4 OR biologic\$2 OR biotic OR synthesi\$4 OR synthetic OR organic)) OR ((solar OR sun) WITH power WITH (beam\$3 OR harvest\$3))),ti,ab,ded,clm.)) AND @py>="1976"
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Final query: L35

Space operations and logistics

L#	Query
L20	(B64G1/1078-1081).cpc. AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,ded,clm.
L21	(B64G1/1085).cpc. AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,ded,clm.
L22	(B64G1/242 OR B64G1/2422-2425).cpc. AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,ded,clm.
L26	(B64G1/4024).cpc.
L28	(B64G1/56).cpc. AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,ded,clm.
L29	(B64G1/646-648).cpc. AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,ded,clm.
L30	(B64G1/68).cpc.
L31	(B64G3/00).cpc.
L35	(H04B7/18519).cpc.
L39	(H04B7/18573).cpc.
L44	(G01S13/933).cpc. AND B64G.cpl.
L47	L20 OR L21 OR L22 OR L28 OR L29

	((B64G1/1078-1081).cpc. OR (B64G1/1085).cpc. OR (B64G1/242 OR B64G1/2422-2425).cpc. OR (B64G1/56).cpc. OR (B64G1/646-648).cpc.)AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,detd,clm.
L48	(L26 OR L30 OR L31 OR L35 OR L39 OR L44 OR L47) AND @py > =1976 (((B64G1/4024).cpc.) OR ((B64G1/68).cpc.) OR ((B64G3/00).cpc.) OR ((H04B7/18519).cpc.) OR ((H04B7/18573).cpc.) OR ((G01S13/933).cpc. AND B64G.cpl.) OR (((B64G1/1078-1081).cpc. OR (B64G1/1085).cpc. OR (B64G1/242 OR B64G1/2422-2425).cpc. OR (B64G1/56).cpc. OR (B64G1/646-648).cpc.) AND (((spacecraft OR satellite) WITH (track\$3 OR control OR operation)) OR (space WITH (construction OR assembly)) OR (space WITH (debris OR litter OR wreckage OR salvage)) OR ((spacecraft OR satellite) WITH (maintenance OR replish\$4))).ti,ab,detd,clm.)) AND @py > ="1976"

Final query: L48

General space technologies

L#	Query
L30	(B64G1/22).cpc.
L26	(B64G1/222-228).cpc.
L27	(B64G1/24 OR B64G1/244-247 OR B64G1/28-38).cpc.
L29	(B64G1/42-428 OR B64G1/44-446).cpc.
L32	(B64G1/50-506).cpc.
L33	(B64G1/54 OR B64G1/546).cpc.
L34	(B64G1/645-6459).cpc.
L36	(B64G1/66 OR B64G1/68).cpc.
L37	(H02S30/00 or H02S30/20).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm.
L43	(B32B2439/\$).cpc. AND (B64G\$.cpc.)
L44	((B32B2457/\$ OR B32B2571/\$).cpc.) AND (B64G\$.cpc.)
L45	(B65D\$.cpc.) AND (B64G\$.cpc.)
L49	(F28D2021/0021).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm.

L50	(G21D5/02 OR G21D7\$ OR G21H1\$ OR G21H3\$).cpc. AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm.
L53	(B64G1/24-369).cpc.
L54	(L37 OR L49 OR L50) ((H02S30/00 or H02S30/20).cpc. OR (F28D2021/0021).cpc. OR (G21D5/02 OR G21D7\$ OR G21H1\$ OR G21H3\$).cpc.) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm.
L55	(L43 OR L44 OR L45) ((B32B2439/\$).cpc. OR (B32B2457/\$ OR B32B2571/\$).cpc. OR (B65D\$.cpc.))AND (B64G\$.cpc.)
L56	(L30 OR L26 OR L27 OR L29 OR L32 OR L33 OR L34 OR L36 OR L53 OR L54 OR L55) AND @py> = 1976 (((B64G1/22).cpc.) OR ((B64G1/222-228).cpc.) OR ((B64G1/24 OR B64G1/244-247 OR B64G1/28-38).cpc.) OR ((B64G1/42-428 OR B64G1/44-446).cpc.) OR ((B64G1/50-506).cpc.) OR ((B64G1/54 OR B64G1/546).cpc.) OR ((B64G1/645-6459).cpc.) OR ((B64G1/66 OR B64G1/68).cpc.) OR ((B64G1/24-369).cpc.) OR (((H02S30/00 OR H02S30/20).cpc. OR (F28D2021/0021).cpc. OR (G21D5/02 OR G21D7\$ OR G21H1\$ OR G21H3\$).cpc.) AND (space OR outer\$space OR planet\$3 OR celestial OR cosmic OR inter\$cosmic OR extra\$terrestrial OR heavenly OR extra\$mundane OR extra\$atmospher\$2 OR astronomical OR stellar OR astronautic\$2 OR cosmonautic\$2).ti,ab,detd,clm.) OR (((B32B2439/\$).cpc. OR (B32B2457/\$ OR B32B2571/\$).cpc. OR (B65D\$.cpc.)) AND (B64G\$.cpc.))) AND @py> ="1976"

Final query: L56