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25 November 2022

Online at <https://mpra.ub.uni-muenchen.de/115688/>
MPRA Paper No. 115688, posted 18 Dec 2022 08:52 UTC

Assessment of Space Junks — Organizational Origins, Current Status, and Economic Impacts

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Abstract

The research accesses waste management in the low-earth orbit and geosynchronous earth orbit. It identifies and acknowledges the primary organizational entities affiliated with the Communist Parties have been behind the waste generation. With the global mercantilist ambitions of the primary entities organizationally infiltrated the global market economy, the assessment is incorporated with strategic analysis on organizational behaviors and game theory in global political economy. Military-civil relations in the commercialization of outer space are discussed with the commons at stake in the space wastes. With some analysis on the existing solutions, the assessment proposes a fast-neutron-field induced method in quantitatively eliminating space debris smaller than 1 centimeter above the earth's atmospheric plasma. Political economy under current multilateral frameworks is discussed for the complexities of the issues. The assessment results with a) engineering solutions exist; b) loss of legitimacy of the United Nations system is one of the root problems; c) buyers' market exists for solutions without current resolutions in multilateral political economy.

Keywords: space debris, incentive analysis, orbital wastes, space wastes, spontaneous fission, irrational behavior economics, hegemonic legitimacy, celestial anarchy, value investment

JEL Codes: O220, O310, O330, P370, P520, Q540

Introduction

The psychological projections of militarist powers in outer space with the allegations of the Pentagon having deployed space-based weapons for militarist psychological controls date back to the USSR in the Cold War. However, the

dysfunctional anti-satellite weapon (ASAT) operations causing the real damages and threats started with the USSR capacities [1,2]. Questions of anarchy arise [3] with the United Nations Security Council nations' breach to the Outer Space Treaty (OST) with the Communist camp's continued ASAT weaponry operations [2], where the space commercialization market expresses as "tragedy of the commons" [4].

The transnational problems of environmental wastes have always had a higher weigh in military production proliferation [5,6], whereby civil industrial wastes create shorter terms of impact. The dysfunctioning of the multilateral solutions in polycentric frameworks [4,2] suggest more pragmatic assessments need to be in place, especially considering growing global militarism trends' impact on governance systems [7-9]. The research adopts incentive analysis on organizational behaviors [10] with an initial psychopathological assessment on the behaviors of PRC [11,12]. With the implication that PRC militarism is psychopathologically associated with the dictatorial groups' autocratic interests, multilateral solutions in polycentric frameworks [4] have no viable determination mechanism, especially with veto power at play in such frameworks. Moreover, with autocratic powers' financial needs, transference of criminal costs within such frameworks [13] only further burden the economic justice for civil societies globally [14,15].

With these factors taken into consideration, the article adapts an economic paradigm in outer space without the military-civil dichotomy. While criminal liabilities are evident in the current situations, questions of impunity are contingent with the reasons behind the dysfunctioning of multilateral and polycentric solutions, increasing the difficulties of risk analysis in the paradigmatic approach to waste management. With the current status of space debris, the risk analysis is replaced with benefit-cost analysis contingent to the behavioral economic approach [16]. In essence, such a replacement strategically shifts military

paradigm to marginal structural interests in counteractive measurements of the real economic crisis caused by the autocratic behaviors in the financial realm [15].

Methods

The first section of the method synthesizes the distribution of space debris, their potentials for damage on functioning satellites, pollution on the orbital resources such as the disruptions of the electromagnetic spectrum in orbital & signal mechanics, and structural interests for the general assembly in space commercialization. The second section of the method assesses the existing pragmatic solutions proposed with cost analysis from economy on earth, with other possible solutions regarding the game theories behind macroeconomic implications in the space junk waste management. With the militant paradigms generating space junks with a strategic asset occupation mindset in orbital resources, the final section of the method analyzes the military-civil relations with regard to space junk and debris management under current multilateral frameworks in security concerns.

Current Quantification

For the barriers to entry in technology and knowledge intensive activities in outer space, the generation of space debris and space junks mainly distribute in low-earth-orbit (LEO) and geosynchronous earth orbit (GEO). The space wastes range from defunct satellites to space debris smaller than 1 centimeter [10,2], and debris cluster into clouds in 1-kilogram mass range [17]. The debris have larger potentials of being carried out of original orbits by the solar wind and atmospheric electromagnetic dipoles with cascade effect [2]. **Table 1** summarizes the information on numerical estimates of relevant wastes [2,17], with only few

traceable with the United Nations Office for Outer Space Affairs (UNOOSA) in the multilateral framework [10].

Source	Size	Numbers	Cause
Air Force Space Command (AFSPC)	s >10 cm	~ 19,950	Explosion
AFSPC	10 cm > s > 1 cm	> 300,000	Explosion
European Space Agency (ESA)	10 cm > s > 1 cm	> 900,000	Incremental
AFSPC	s < 1 cm	several million	Explosion
ESA	1 cm > s > 1 mm	> 330 million	Incremental
UNOOSA	s >10 cm	309	Deorbit / disposal
United States (US)	s >10 cm	700	Collision
US	s <10 cm	Thousands	Collision
ESA	First-sized	> 700	Collision
US and China	Marble-sized	3	Collision
NASA	s > 1 cm	> 150,000	Explosion
...

Table 1 An incomplete summary of information on space debris and junks.

Given the nature of the issues, developed countries' strategic management would be raising the technological bars beyond the LEO and GEO [18], leaving the criminal liabilities of OST to territorial airspace and military politics [2]. However, the costs for debris tracking in orbital designs only increase while GEO's values for communication satellites still remain. The accumulative effects of space junk and space debris impacts include: a) decreased orbital integrity of satellites due to changes in electromagnetic fields above the LEO; b) increased interference patterns to airspace vehicles and communication; c) decreased signal integrity and efficacy in both military and civil settings; d) exponentially increased depreciation rate of space assets in LEO and GEO; e) increased costs for new designs and

manufacturing in outer space utilities; f) increasing risks of further debris generation by collision or debris-caused explosion on energy tanks deployed in satellites [2,17].

Consistent with the organizational behaviors driving the causes of space debris, the economic incentive bargaining in the politicization of criminal liabilities were leveraged against just resolutions with the cost-benefit minimization of developed countries [2]. With the global mercantilist incentives behind the LEO and GEO by powers such as PRC [19], the decrease in marginal power and financial gains with the costs generated by the criminal behaviors has not directed its behaviors to constructive approaches but rather the increasing power grips for deducing interests from global economy by reactionary cold war mentality from the collapse of USSR [20]. With the geopolitical interests marginalization on relevant countries in the general assembly and the economic necessities in waste management and mitigation in LEO and GEO, practical benefits exist for solutions in market economy frameworks: a) the demand for LEO and GEO cleansing exists with uncertainties in the buyer market and the buyer market's implications of currency in financial and capital management; b) the buyer market creates policy incentives for appropriate governments adhering to the OST with the multilateral framework where the weaponization potential of space debris may pool bidding contracts [16,4]; c) the aggregation of relevant activities will increase the developing countries' technological developments and knowledge base in outer space activities and space management, and for developing countries with less bargaining powers in the UN system, the "check and balance" doctrine applies with multilateralism in decisions in global market economy; d) balanced competition in LEO and GEO may lead to more rigorous policy formation in the UN Security Council and General Assembly with the latter more coordinated in the democratic spirit and the former in strategic importance; e) market solutions may further

scrutinize the geopolitical games of supply chains and the monetary realm's role therein.

Pragmatism in Political Economy

The management of wastes in outer space does not fare well enough if new wastes are generated on earth from relevant activities, especially considering the conservation of energy and limited resources on earth. Few solutions exist so far and existing solutions either focus on recycling of waste materials or balancing electromagnetic fields in orbital planes [17]. For the nature of the LEO and GEO slightly above the earth's electromagnetic fields, discrete technologies adapt similar approaches in magnetism with combination of physical solutions to plasma-resistant materials made up of the space debris and junks [21]. Albeit pragmatically viable and discrete, the efficacy of electromagnetic method of gathering debris smaller than 1 centimeter is questionable, and risks of further spreading and accelerating the "particulate matters" to satellites with engine tanks, creating further explosions. Is there a way to resonate spontaneous fission on the "particulate matters" above the earth's plasma fields, or generating a field that can effectively activate the materials' nuclear targeting direction to a collector?

Even though LASER-enabled fission is possible in outer space [22], the cost of using LASER technologies in further contaminating outer space thermonuclear environment is too high a stake [23]. If "precision strike" were to be viable, the quantities of the "particulate matters" would increase too much economic costs and each "failed strike" would pose immense threat to planetary security. With the nature of the earth's internal electromagnetism and plasma edge in the orbital planes, quantitative fast neutron field generation to materials with isotopes approximately below 200 is a viable solution [24], and the conceptualization is seen in **figure 1**. The conceptual design is analogous to cancer therapy enlarged to

a spatial context. Due to the design's interference patterns generated, the method can only be used in areas distant to functional satellites.

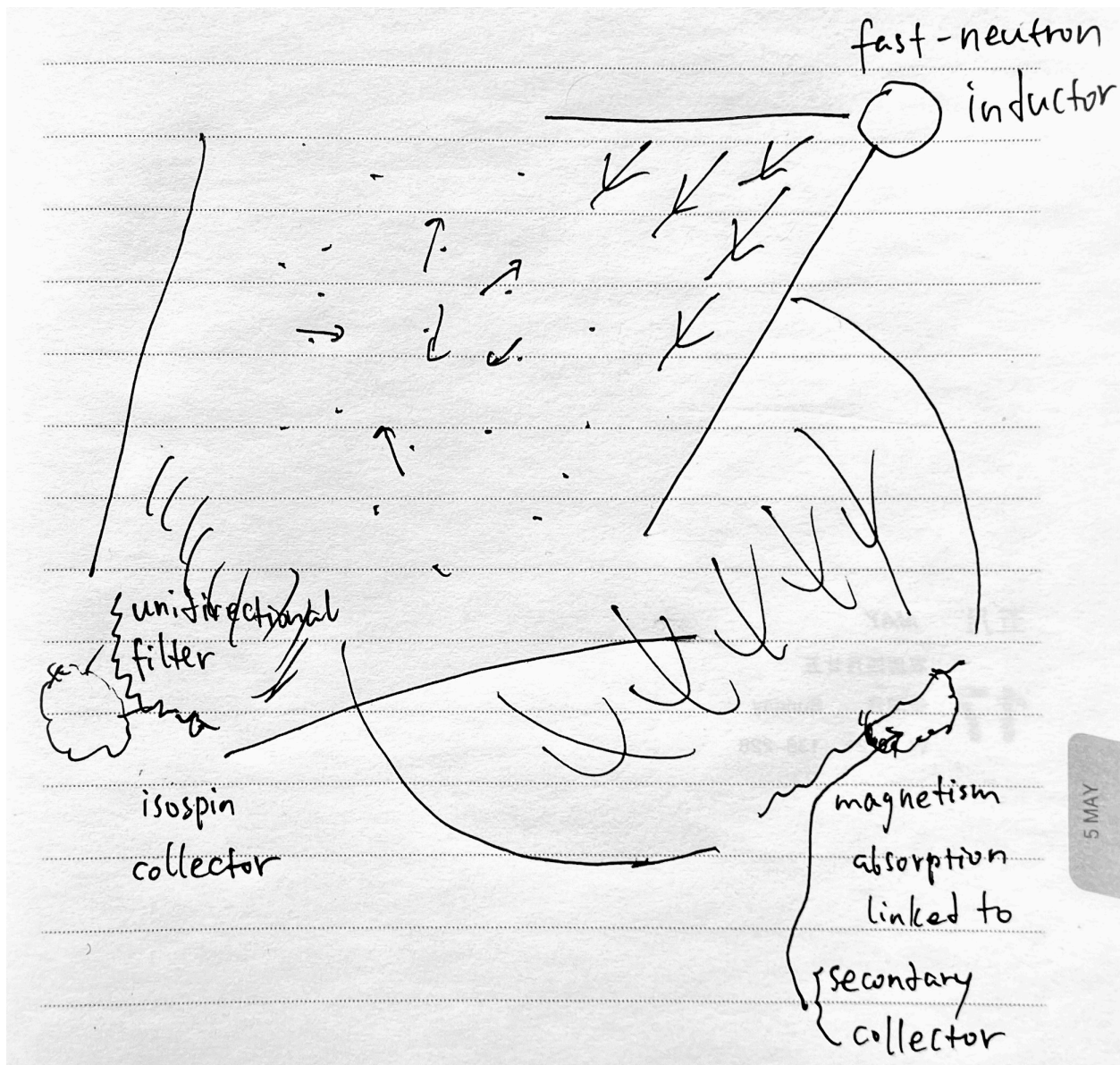


Figure 1 Fast-neutron fission induction conceptualization.

Even though space waste cleaning serves a common good in outer space developments, considering the historic [in]justice with territorial politics played at outer space development with other transgressions such as human rights and territorial pollutions, the political economic frameworks for solutions ought not to benefit the original perpetrators' finance, consistent to national security [6] and

prevention of degradation. Paying lip service for technological access has been a long-term organizational behavior of the Communist Party of China (CPC), including its access to nuclear weapons with USSR intelligence [25,26]. Patent rights are territorial in nature, and New York Convention only extends the territoriality [3]. This means that capital quantification in the indisputable international disputes is rendered ineffective with power politics. The yielding to impunity on oil prices [27] further corroborates with the vulnerabilities of the politics played at the economic and financial realms [13,15]. The dilemma is currently reached at providing “the economic means to remove space debris”, “the legal measures to mandate its elimination and mitigation”, and establishing “data-sharing responsibilities necessary to effectively monitor the threat throughout the international community” [2] or “violating the sovereignty restrictions in the OST” must be involved [3].

Territorial Margins and Hegemonic Power

Albeit behavioral economics may calculate rational behaviors [16], celestial anarchy is driven majorly by irrational behaviors, or rational ones that is not in the ethical rational behavior frameworks [11]. The key multilateral dysfunction and literalism divides lie with the territorial margin rationales of regional powers [26] and the hegemonic extension frameworks of the United Nations system. This means that the loss of legitimacy of the UN system is integral to the celestial anarchy at play. Autocratic powers’ relative utility is contradictory to the hegemonic paradigm of responsible power. The awareness and consciousness building in the civil society in democratization further decrease the autocratic utility with the latter using realpolitik approaches to economy & finance for obedience tests against deterrence [12], underlying the militarization of economy and economics, and marginal delegitimization of the liberal international UN system. The nominal bargaining power of the illicit regimes further feeds to the

marginal power lusts sustaining the destructive behaviors in the multilateral frameworks of the global economy. This means that “violating sovereignty restrictions in the OST” is not undesirable with dysfunctioning multipolarity [3], where a set of rational players with discrete developmental models has the incentive sooner or later than the anticipated catastrophe [16,2]. This implies that the polycentric solution of be an inverted mirroring of the dysfunctional hierarchies [4]. This *status quo* at play did not prevent further and more severe harms from happening [23].

Rationalizing irrational players is not a one-way game and the negative sum result becomes of the premise for further analysis. The autocratic utilities are inversely correlated to liberation of the fundamental freedom in the spirit of human rights, and the proliferation of such utilities in the international realm further risks of majority mob in democratic countries by financially empowered Spillover Effect of population flows [28,29]. Racism and ethnic problems may partially arise and be intensified by such a trend, furthering the democratic degradation in the multilateral frameworks [12]. The spilled over population, despite of the income sourced, brings liable currencies to democratic economies with no incentives other than consumption. The financial gain in immigration policy designs becomes of real economic loss through currency dynamics. Furthermore, data manipulation and using fake identities to put the high CPC officials’ kids in élite universities globally is not a rare phenomenon, and the cycle in counterpart powers is more intrusive to the topics in outer space development itself whereby they often return with high stake-shares in companies such as Tencent Holdings. The digitized territorial games further derogate regional human security and human rights [30] with territorialized Ponzi schemes. This means that without blocking the territorial Ponzi scheme incentives in the multilateral frameworks, this line of derogation will continue.

Whereby outer space is a projective sphere of planes from a state-centric notion of military-civil relations, the CPC contentions of military monopolization leave no room for a civil-military relation both in inter-state and international affairs [9,31]. With military capitals in some of the insurance companies in mainland China and prior reforms for judicial independence [32], the dictatorial downturn with the party-commissioned China Banking and Insurance Regulatory Commission became the core element in the “mismatches between individual and collective expectations and interpretations of operational experiences may influence civil-military relations” [31]. This means that separating the party power over the military without the military interfering in democratization processes is fundamental for PRC, with a key issue on the funding sources of the Chinese military in the conflict of interest in a separation of power doctrine. With energy politics at the central game of Russia and CPC, energy preservation technologies are crucial both for the purposes of waste management solutions and dissecting the developed nations’ reliance on powers resting upon raw material and resource monopolization through territorial controls. The CPC’s dictatorial strategies targeted at organizational decoupling [31] with power over currency, which enabled the *coup d’état* [32], especially that the People’s Liberation Army (PLA) does not have an élite tradition such as European militaries and American establishment. The composition of the PLA mainly out of poor families with commanding lines from the CPC members has deeply influenced the Chinese military culture to a comparatively populist one with operational functions. This also explains the technological tendencies in military applications of the PLA with fascist and neoNazi tendencies. This explains the humanitarian necessities of the USA’s strategic defense for Taiwan. From a military sociology perspective, British and European air forces have more incentives in dealing with the space wastes in LEO

and GEO than American military, whereby Europe is currently caught in the Black Sea geopolitics with ongoing Russian war against Ukraine.

Results

Reorganized from the potential buyers' market to solutions, enhancing military liabilities to human rights transgressions in the spirit of Geneva Conventions are the necessary procedures for the economic revival needed to make room for buyer incentives. The positive-sum game creates a competitive model between autocratic powers and military liabilities for instigated crimes conducted by the commands behind impunity. The growing trends of drones in precision strikes are contingent to the analysis with humanitarian necessities, but does not guarantee regional military leaders favoring democratization and independence from politics. The spherical contraction of European and British military focus means there won't be an effective buyer's market in a decade projection, and technological developments for the solutions won't have a good market valuation albeit with high initial investment necessities. The commercialization of outer space could already have been a compromise from the Pentagon for financial purposes in military spendings in mitigating economic risks related to outer space management. This opportunity is then only left for value investments.

Current costs for space waste monitoring have been mainly incurred on space administration agencies in Europe and the USA, including the allied air forces. Value investments in incorporated companies may minimize the political economic risks while favorable policies can be negotiated for with the appropriate frameworks in military-civil relations. The commercial values of technologies developed may not have maximizable effects in mass industrialization, but the political leverage for democratization nations remain depending on the security and risk assessments of the military and intelligence complex. Another profit

model resides with the USA Space Command in solution developments for a supplier orientated business model similar to the brand targeting of RAND Corporation. Technological development and market restrictions may apply depending on the Congress' policies.

Existing technological solutions focus on electric engineering above the earth's natural plasma and electromagnetic momenta, whereby fast-neutron-field induced spontaneous fission is theorized for more effective solutions on clustered space debris smaller than 1 centimeter in diameter. Operational solutions may incentivize political solutions for effective actions in mitigating the anticipated threats in the orbital planes, with benefits to multilateral diplomacy. Such entrepreneurship is positive sum for the private sector given the taxes will be incurred anyways for the monitoring of space wastes. A private-sector takeover on the monitoring responsibilities will also empower the space commercialization enterprise in information access and human resources management for venture capitals.

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