

Issues in Space

G. S. Sachdeva

Crimes in Outer Space

Perspectives from Law and Justice

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G. S. Sachdeva
Professor Emeritus
Chandigarh University
Mohali, Punjab, India

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*Dedicated to
The Fraternity of Scholars in Space Law
who have helped me grow
in Academic Specialisation*

Preface

It was in August 2018 that I delivered guest lectures in space law at School of Law, SRM University, Chennai. The students and the faculty were fascinated with the subject and seemed enthused for LL.M. in air and space law. I was later invited to advocate for introduction of this course before an academic committee. But it so transpired that the authorities were keen to introduce a popular subject of criminology attached to space law. It seemed a case of strange bed-fellows.

Almost around the same time, there was a media report of an alleged criminal wrongdoing committed by the US astronaut in and from outer space. This was the first case of its kind and attracted attention. Further, commercial space travel and other activities of space exploitation involving human workforce were becoming technically feasible and economically viable. This excited my mind, and a concept was conceived resulting in this volume. Although started with the modest agenda, it has fairly comprehensive coverage of topics.

Humans are after all human and wherever they go, they tend to carry their inherited psyche and mental baggage from social grooming and learning experiences. Pugnacity, ego, and revenge are just the basic instincts. So, these would also accompany humans to the space domain and planetary habitations. And under stress or provocation, these may burst open, criminally. The criminals could be individuals individually, in joint conspiracies, or collective groups and could be accused based on the character and impact of space crimes. Classifying on causations, space crimes may be impulsive reaction, illegit business interest, national prestige, strategic compulsion, or just an ill-conceived action by a non-state entity or a mercenary.

With advancing technologies of Internet of Things, artificial intelligence, robotics, cyber, and directed energy weapons prone to dual-use, misuses and abuses are possible and likely. As a result, motivations for space crimes may also become different and diverse. Further, criminal acts with these technologies can be committed from any domain to cause damage in any other domain and still remain near-incognito and almost untraceable in investigation. Their potential for dysfunction, damage, or destruction can be limitless, even to the extent of causing an apocalypse or posing an existential threat to mankind. The dangers are real and valid while international space law is nebulous and porous on such crimes.

This book flags intertwined issues related to different kinds of crimes in outer space, analyses their motivations, causations and mens rea, confusion due to different nationality of the offender and the victim, the hassles of apprehension of the criminal, extradition as necessary or elected and trial by a competent court. Not all eventual decision may be easy or binary, and international law has its own frailties considering the attributes of state sovereignty and jurisdiction. This labyrinth surely needs markers for ease of way and speed in traction.

However, it needs a caveat that the alleged offender must be treated with due dignity and appropriate sensitivity. The accused may also not be punished solely on positive law but deserves social justice keeping margins of crime for lack of knowledge, inadvertence, or no-intention vis-à-vis the victim. Further, because of national sensitivities involved, such cases deserve to be settled or adjudicated with appropriate transparency, due promptness, solemn objectivity, and high legal acumen.

A few suggestions pertaining to treaty law, governance of space domain, and dispensation of social justice have been proffered in this book. Some solutions may need more consideration or modification, to which the author humbly submits. Believably, the actions recommended are time-consuming in negotiations or to muster consensus. Hence, a pro-active approach is recommended for timely action to position suitable legal mandates, with a reasonable visualisation of the future scenario and anticipated challenges. It is a humble call and hopes to be heard in the right quarters with a gentle nudge to the law fraternity, diplomatic corps, and the political masters for a concerted and synergistic effort.

It is rather otiose to faithfully acknowledge intellectual debt one incurs during the writing of the tome because one gradually becomes oblivious to it as the project progresses. Any such failing is mine and may be condoned. Be that as it may, I must acknowledge the contributions of Prof. Sandeepa Bhatt, Shri. Y. P. Madan, Shri. V. Gopala Krishna, and Dr. Manpreet Sethi at different times and in different connections. In their own way, they have helped to augment the content and have added to its authenticity. My profound thanks to each one of them and others unmentioned.

I owe grateful thanks to the publishers in the persona of Ms. Nupoor Singh, Ms. Jayarani Premkumar and Iyda Grac. The help, advice, and encouragement by the former have indeed been sterling and timely. As for the latter, I am grateful for good coordination and hastening up of the processes. And not to forget the unseen production staff who also deserve my gratitude for all their behind-the-scene efforts.

Last but not the least, I sincerely acknowledge gracious sacrifice of common time and companionship by my wife, Chan, during different stages of research, analysis, iteration, and revision. Truly, without her willing cooperation, constant support, and affectionate nudges, this project may not have been accomplished. My loving thanks to her.

Mohali, India
May 2023

Prof. (Dr.) G. S. Sachdeva

Prologue

A Few Narratives of Space Crimes

Media has recently reported a case of alleged criminal wrongdoing committed by a US astronaut in and from outer space. This is the first publicly reported case of its kind and raises many new issues for discussion and settlement. In this instance, the US astronaut, while tenured at the International Space Station (ISS), accessed a bank account of the spouse, in individual interest and for personal benefit, making non-official use of the privileged computer system of the ISS. The estranged spouse has alleged unauthorised access to the financial data in bank account, after revocation of authorisation, as an act on invasion of privacy and identity theft.¹ The matter was reported to the Inspector General of Investigations at NASA and also to the US Federal Trade Commissioner for inquiry.

Investigations have revealed that the complainant spouse, Summer Worden, had testified wrong statement relating to date of revocation of the authorisation from McClain relating to access to the data. For this false averment, Worden has now been charged on two counts of lying. Thus, the case has turned topsy-turvy, and the accuser has become the accused.² Worden has defended that it was a lapse of memory and an inadvertent inaccuracy, yet she has been found guilty on two counts. No news of a court trial has been reported, and it appears that the matter has been recalled by the Department of Defense for internal trial because both parties are military officers. Hence, disposal of the case may remain confidential till declassified.

Another case of crime in space relates to a hole detected, in August 2018, in the Soyuz module of Russia which had docked with the ISS in June 2018. It was observed by the US ground control that pressure in the space station was progressively falling and suspected a leak somewhere at the space station. On inspection, the crew found a hole in the Soyuz habitation module which had docked a couple of months back.

¹ “Astronaut accessed estranged spouse’s bank account in possible first criminal allegation from space”, a report from *New York Times*, August 23, 2019.

² Christina Zdanowicz, “NASA astronaut’s estranged wife charged with lying about claim that spouse improperly accessed account from space”, *CNN*, April 9, 2020.

The existence of a hole was an unexpected surprise for all yet was quickly sealed with gauze and epoxy adhesive by the Russian crew.

The US team suspected that the hole could have been, by mistake, drilled by a ground technician before the blast but remained unpatched. The Russian investigation revealed that the 2 mm hole was pierced with a drill by unsteady human hands after the docking. Further investigation pointed the needle of suspicion towards the US astronaut who had a psychological problem, while on-board ISS and allegedly wished to return home on Earth, earlier than scheduled. This supposition appears far-fetched and has been disputed by the US authorities. Her colleagues also assert for her medical fitness and stand by her impeccable professional conduct. Acrimonious statements have been exchanged between the two states, and Russia has now threatened criminal charges against the NASA astronaut but no positive evidence pinpoints the culprit.³ Nevertheless, the occurrence of the crime cannot be denied.

The third incident is a case of suspected negligence for activities in space. Russia wanted to upgrade its laboratory and other scientific capabilities at the ISS, and with this intent, *Nauka*, a multi-purpose module was docked to the downside of the ISS. After successful docking and proper latching onto the space station, the mission controllers of Roscosmos commenced performing some post-docking “reconfiguration” procedures as per the protocol.⁴ It was at this stage that, suddenly and inexplicably, the thruster jets of *Nauka* module restarted and the mishap began. This malfunction resulted in the entire space station to pitch out of its normal flight position compelling the US mission’s flight director to declare a “spacecraft emergency.”⁵

The actual occurrence was that the space station spun one-and-a-half revolutions, i.e. about 540 degrees, before coming to a stop upside down, relative to its original position. The space station also lost altitude during this unexpected and unplanned manoeuvre. “The space station then did a 180-degree forward flip to get back to its original orientation.”⁶ This was achieved by the flight teams on the ground at the Johnson Space Centre in Houston, by activating thrusters on another module of the orbiting platform in corrective action. *Nauka* engines were ultimately switched off. The ISS has fortunately returned to its original pitch without any major mishap.

At that moment, there were seven astronauts on-board and at risk though escape module was available in readiness. Early reports inform that due to this glitch, the station was actually out of control for about two minutes, while communication with all the seven members of the crew was lost or disrupted for several minutes.⁷ Further, a preliminary inspection of the ISS, post-mishap, reports that the space station has certainly suffered stress on the metallic structure and turtled some equipment. In the

³ Eric Berger, “Russia threatens criminal charges against a NASA astronaut”, *Ars technica*, November 30, 2021.

⁴ “Space Station did 540-degree flip, turned upside down: Mishap more serious than earlier reported”, *India Today*, August 3, 2021.

⁵ *India Today*, *ibid*, updated report.

⁶ *The New York Times*, August 3, 2021. Based on a statement by Zebulon Scoville, Flight Director at NASA’s Mission Control Centre in Houston.

⁷ Reporting and writing by Steve Gorman in Los Angeles and Polina Ivanova in Moscow. Editing by Mark Heinrich, Leslie Adler and Raju Gopalakrishnan for *News SCIENCE*.

beginning, NASA and Roscosmos underplayed the incident but gradually with more details trickling in, the ground mission control shudder to rethink of the happening.

Russian space agency maintains and expects us to believe that the incident was caused “due to a short-term software failure and a command was mistakenly implemented” to fire the thruster engines.⁸ This explication seems implausible for the impact sustained. Inadvertence is also possible, yet it would be naive to accept such a simplistic explanation for a goof-up of monumental dimension. In fact, who caused the malfunction, whether man or machine or software application, is still to be determined with precision and finality. More revelations may be expected, but when is doubtful.⁹ But God has been kind to save all so threatened by the mishap.

A Brief Discussion of Legal Issues

Be that as it may, the abovementioned narratives, still appear simple in jurisdiction and can be seized for trial in a domestic court. The McClain case, in particular, appears rather simple because complainant and respondent, both are US citizens and illegality, if any, occurred in the US quarters of the ISS or allegedly in the statements of the spouse on the Earth. Yet the factum of such a happening is a souring thought and an alarm bell for initiating remedial measures and institutionalised dispensation of justice. The other two cases are still incomplete in investigation and lack clinching evidence to initiate a proper judicial procedure against suspected perpetrators of the crimes.

Nevertheless, in the international milieu of outer space and celestial bodies, the discussed cases certainly open up new issues which will primarily depend upon the nationals involved as also the nature and character of space activity. Therefore, in future, with the advent of space tourism, commercial exploitation of celestial resources, industrial production of space-specific products, touristic resorts, and planetary habitats, possibly, far more serious and complicated crimes with multi-nationality scenarios may occur. These would confront us for a solution.

Thus, the major legal issues may pertain to jurisdiction over the accused, considerations for extradition between states with or without treaty, gathering of multi-sited evidence, competence of the court to seize the case, decision to apply which law and award of punishment on whose national legal codes: the accused or the victim. All these aspects may be viewed differently by the parties with varying perception of justice meted out. Some of these issues would need fresh explanation on crimes and adjudication through a new international agreement, new concepts of space jurisprudence, and a novel institutional solution for justice. It is proposed to consider in this book issues relating to these aspects and cognate matters in respect of crimes in space.

⁸ *India Today*, updated version of August 4, 2021.

⁹ *India Today*, *ibid*.

Further, given the diversity of space activities undertaken, the divergent interests of stakeholders (viz., states, public–private partnership entities, private corporations, space tourists, individual travellers, and planetary residents) may emerge in space with new traits, different behaviour, incongruent beliefs, and nuanced temperament than that exhibited on the Earth. Accordingly, the nature and complexion of crimes in space would be different and varied. Though the full range of space crimes may not be easy to visualise at present, these would certainly pose a lot of imponderables and uncertainties under the existing laws and jurisprudence. The scenario will present a peculiar predicament of a legal trilemma involving conflicts of jurisdiction over the criminal, variance in the applicable legal and procedural systems, and the incongruence in national criminal codes and punishments specified therein.

Hence, there is need to identify and mull over the lacunae in jurisdictional options and procedural application of relevant space law as also for the applicable subaltern laws. Even at the transnational level, divergences in codified laws are significant and revealing of different perceptions of crime and variations in prescribed sanctions. A small example will clarify this assertion. The crime of rape seems to have different connotations. In the Western liberal societies, rapes are minimal, while in eastern countries, rape of women is a more frequent occurrence. Though often kept under wraps, yet of late, such crimes have come to be openly reported with complaint for investigation to the police leading to a court trial of the criminal.¹⁰

Generally, the rape, in most countries is treated as a crime by man where the woman is deemed an innocent victim irrespective of her complicity, lack of caution, or absence of resistance. On the contrary, in Saudi Arabia, the rapist man is not an outright offender. It is the woman who is the culprit for having lost her chastity or besmirching marital fidelity and can be punished by stoning to death. Interestingly, in Russia, the women have a statutory right to even kill a rapist in an act of escape, obstruction, and self-defence. While in Israel, women are permitted to possess and carry guns for self-defence. Thus, cultural perceptions, imbibed values, societal norms, social schooling, and consequent variations in law come up in sharp relief in a comparative study that could be aptly applicable to space and celestial living.

Some Hints at Solution

The centrality of this problem of the future needs to be recognised and appreciated for appropriate solutions so that the plaintiff-victim can in an international milieu avoid juridical confrontation and navigate through the legal labyrinths of judicial procedures to approach the competent court and reconcile the divergent connotation of crime and quantum of punishment. Individual victims may not by themselves be able to easily reach the portals of competent judiciary for equity or justice. State

¹⁰ For example, in India, a woman is raped every six minutes. Refer Editorial Column, “She was walking home” in *Times of India*, (Chandigarh edition) March 13, 2021.

facilitation through diplomatic services may, at times, be necessary. The travails appear cumbrous, or perhaps, insurmountable. Hence, access to appropriate court needs to be simplified in procedures and the strict requirements of *onus probandi* be loosened. This will enable dispensation of justice more practical and speedier through the competent and accessible court and with shifted evidentiary burden on the defendant. The existing regime of space law fails in appropriateness and convenience of such solicitation.

In conclusion, the scenario so limned poses a new genre of problems and a different variety of challenges that caution us to look ahead for viable solutions. An eminently suitable option to bring about such changes in procedural rules, evidentiary mandates, and norms for due protection of the accused could be to negotiate a *specialis* treaty that may facilitate handling of specificities of crimes in space under international or native laws and in a designated institution for dispensation of justice. Perhaps, an analogous regime in Air Laws could be a good guide for learning and adaptation. This becomes important because the range of crimes could be wide and their gravity, in some cases, of catastrophic dimensions. At this juncture, it may not even be possible to imagine the entire gamut of space crimes of the future and their possible impact, including acts with artificial intelligence, deploying robots, cyber techniques, directed energy gadgets or Internet of Things (IoT) that can be perpetrated from outside the domain of space, in stealth and with anonymity leaving little trail of evidence.

On this intent and with due urgency, we need to look ahead in a pro-active approach, rather than face a reactive regret, for not establishing a timely international system or putting a holistic regime of parallel justice in place before the onslaught of space crimes. Thus, it does not solely remain national or political issue but an imperative that would necessitate a new and comprehensive treaty with enduring institutional changes, including the option for an exclusive edifice for trial and justice in space crimes. Further, because of national sensitivities involved in such criminal cases, these deserve to be settled or adjudicated with due promptness, solemn objectivity and high legal acumen, in this era of virtual and mass media reporting.

This book has been conceived and designed to be reasonably prescient of problems and challenges likely to be encountered in the outer space in the near future and to evolve solutions that may help regulate activities and facilitate governance of the space domain. It thus just shows the way forward for traction with pro-active attitude. In consequence, it is this prospective visualisation of crimes in space, their jurisdictional hassles, claims to extradition, procedural intricacies, and allied wrangles that lend this book a certain dignity of initiative for stirring consciousness about rule of law and humane justice in space domain. My motto, therefore, is to plan ahead because forethought often wins. And I also believe in the Biblical fable that Noah did not build the Ark when it was raining to flood the Earth in deluge. So, permit me to recommend suitable action as a policy imperative to pro-actively work in the right direction to reach the desired goal, well in time.

Therefore, let us put our heads together to find suitable answers and suss out viable options to this ominous challenge of the near future. Some solutions have been proffered in this book, but these are merely tentative proposals that are humbly submitted and are open to debate. An articulated consideration of these calls for

global dialogues, participative discussions, or a network platform of the fraternity of enthusiastic space jurists. More importantly, we need to garner legal consensus through constructive exchange of views, solicit political will to understand and act, and harness diplomatic acumen to achieve quick and effective results in a polarised world.

A wise refrain advises that you may not get the best option in a new solution but can certainly find, with an open mind, a new vision or dimension of the problem. Ergo, decision-makers in governments, politics, business, legal affairs, and other sectors of society have perforce to look ahead to control, master, and channelise the energy of evolution shaping the world of tomorrow, in satisfaction of incumbent human needs and metamorphosing allied social structuring rather than stall or retard their growth, traction, transformation, and discernible emergence. Humanity cannot wait for too long due to our inaction, laziness, or squabbles. The thrills of space tourism and the treasure of space resources are waiting for exploitation in cooperation, and the global community need not bicker about the modality of uses and benefits of appropriation. It should strive to shape an altruistic relationship of cooperation in appropriation, equitable regulatory provisions, transparent governance of space domain, and justice for crimes and disputes. That would usher in a shared future of accrued benefits from the outer space and celestial bodies for the common and collective good of all mankind. This volume is a humble contribution and a small step in that direction.

Abstract of Chapters

This book comprises twelve chapters apart from Prologue. Broadly, it covers the description and definition of anticipated crimes in outer space, narration of some near-crimes in space, possible conflicts of jurisdiction, likely wrangles of extradition, differences in legal procedures among nations, and the variance in national criminal codes which may hinder fair trial of the accused and dispensation of true justice to the victim. In order to create a holistic regime to impart objective, yet socially humane justice, there is need for a specific treaty devoted to the avowed purpose and dedicated institutional system of fair trial and dispute resolution.

Chapter 1 discusses the first media-reported crime in space that has been brought to the notice of the appropriate authorities, just short of litigation in court. The named offender being the US astronaut, then posted at the International Space Station, allegedly indulged in an irregular act of making unauthorised use of privileged network of NASA for breach of privacy and identity theft. An evaluation of the nature and subject of this crime, in the light of germane international instruments, reaches a conclusion that the instant case has no international implications on nationality or territoriality. Hence, there is no conflict of jurisdiction or variance in applicable law, and the competence of the US courts or federal authorities to decide on the case is validated.

In fact, the matter of criminal indiscretion by the alleged astronaut was reported by the complainant and referred to for consideration of the concerned federal authorities.

After due investigation, NASA has cleared McClain of the levelled charges, and on the contrary, the estranged spouse Summer Worden has been found guilty of lying on material aspects of the case before the federal agencies. However, a final decision on the trial of Worden in a civil court or an in-house action taken by military authorities has not yet been publicly announced and may remain confidential till declassified.

Along with the above case discussed in detail, two more cases of crimes have been briefly discussed to emphasise their occurrence and existence in the outer space. The second narration deals with a 2 mm hole detected in August 2018, in the Russian Soyuz spacecraft that had docked to the ISS. It has been categorically ruled out that the hole was not there before blast-off from the cosmodrome nor it is the result of a hit by a stray meteoroid. Investigation by the Russian authorities blames the US astronaut for causing this as a deliberate criminal act. This accusation has been vehemently denied by NASA. Anyway, the culprit has not been pinpointed on material evidence but merely suspected on conjectural assumptions. This may not be adequate for a judicial process. Nevertheless, the crime has occurred.

Another incident relates to a possible negligence in space which could be deemed as crime. In this case, events so happened that Russia wanted to upgrade its research laboratory at the ISS with a new multi-purpose module, *Nauka*. This module faced some glitches on the ground during its preparation and ultimately was launched in November 2021. It docked on the underside of the ISS, and the docking procedure was confirmed successful. After *Nauka* module had latched onto the space station and had well settled, the mission controllers in Moscow commenced performing some post-docking protocols and “reconfiguration” procedures.¹¹

It was then that suddenly the thruster jets of *Nauka* module restarted and the mishap began. This malfunction resulted in the entire station to pitch out of its normal flight position compelling the US mission director to declare a “spacecraft emergency.”¹² The actual occurrence was that the space station spun one-and-a-half revolutions, i.e. about 540 degrees, before coming to a stop upside down, relative to its original position. “The space station then did a 180-degree forward flip to get back to its original orientation”¹³ by activating thrusters on another module of the orbiting platform in corrective action. *Nauka* engines were ultimately switched off, and the space station stabilised. At that moment, there were seven astronauts on-board and at risk. Russian space agency maintains that the incident was caused “due to a short-term software failure and a command was mistakenly implemented” to fire the thruster engines. Human inadvertence coupled with lack of due diligence is possible, yet who caused the malfunction, whether man or machine, is still to be determined. Nevertheless, negligence in space activities would be a crime.

Chapter 2 provides description of some past near-crimes that have been committed in outer space or on the celestial bodies by the US government, national space agency,

¹¹ “Space Station did 540-degree flip, turned upside down: Mishap more serious than earlier reported”, *India Today*, August 3, 2021.

¹² *India Today*, *ibid*, updated report.

¹³ *The New York Times*, August 3, 2021. Based on a statement by Zebulon Scoville, Flight Director at NASA’s Mission Control Centre in Houston.

the astronauts, and a private enterprise, so euphoric and enthusiastic about their space operations. But most of these acts of misfeasance have not been properly investigated and pursued officially and authoritatively. In respect of serious indiscretions by astronauts, their misconduct, in a couple of incidents, bordered on defiance of the official controlling authority. For example, the “almost mutiny” by the crew of Apollo 7 mission could be termed rather serious in military lexicon but has been treated chivalrously and thus either condoned in consideration of their glorious achievements or has been mildly punished in non-conventional modalities.

This chapter also discusses similar acts of “mis-experiments” by the US state agency like the copper needles dipole experiment which has caused several lumps of millions of jumbled needles as debris in space. Scientific consultations, as urged in Article IX of the OST, could have possibly obviated this indiscretion. There is another instance of advertent negligence by the US private enterprise, Space X, in sending an “unsanitised” Tesla car in an experimental launch into outer space. This has been in negligence of COSPAR policy guidelines. Both incidents deserved remonstration and condemnation by other space-faring nations, but there was not even a murmur. This chapter is fairly illustrative of past cases of malfeasance by the US astronauts in space which have, technically, not been treated as crimes nor tried as offences for punishment.

Chapter 3, in a similar vein, considers acts of near-crimes by the Soviet Union and other space-faring states, their officially authorised agencies and astronauts. The activities discussed are those that seem to have misfired and could be construed as lack of due diligence or absence of appropriate international consultation, as mandated in OST.¹⁴ Objectively viewed, consideration of this topic of past near-crimes would not have been complete unless such, and similar acts of other space-faring nations, besides the USA, were similarly researched, narrated, and highlighted. Understandably, not much material on this subject in respect of space activities by the Russian Federation and other countries is available in the public domain. Yet an earnest effort has been made to hunt for information, even from sources that may not be too reliable. The information thus culled out has been collated to ensure completeness of the topic and to avoid an accusation of partisan bias in treatment of the subject.

Some relevant cases of the USSR space missions relate to their hasty decisions that huddled for bad planning of mission and consequently caused technology failures. Embarrassing fiascos, obviously, led to delayed reporting of their failed experiments and consequential deaths of certain cosmonauts, despite spectacular and pioneering successes. A couple of biographies of Russian cosmonauts have yielded some isolated facts and informational snippets, though officially unconfirmed. A couple of cases of Chinese misadventure like the ASAT test have been included in some detail. Another case of failed experiment included in this chapter relates to the ill-conceived *beresheet* research project by Israel that possibly has contaminated the surface of the Moon with hardy living organisms having life in centuries.

¹⁴ Article IX.

Chapter 4 provides a general discussion on terrestrial crimes and enunciates the ingredients of crimes, particularly the prominence of *mens rea* in accusations. This is a peculiar trait and mentality of humans while animals commit no crimes. In fact, crimes and humanity have travelled together, and, in a way, the first crime was committed by Adam in defying the Lord's command and caution. And on the Earth, the first actual crime was committed by Cain who murdered his brother Abel out of jealousy. The motivation, intention, or *mens rea* of the crime is clearly established in this legend from the scriptures.

Sociology of crimes is another subject briefly treated in the chapter alluding to theories from Boulding to Bandura. It collates research to discuss diverse hypotheses whether criminality is genetic like in criminal tribes or instinctive like possessiveness and pugnacity or comes through sympathetic learning from society or is compulsive and habitual to reflexively compel a criminal to recidivism. The chapter also traces the changing face of the types of crimes with "socio-techno-economic" evolution in society. For example, crimes of early humans related more to denial of urges, then the cause became possession and deprivation, with industrial development and growing prosperity thefts and sexual crimes increased, IT industry has caused invasion of privacy and space activities will usher a different genre of crimes of business discords, crass competition, interference in economic activity and piracy of intellectual property in space activities.

This chapter also familiarises with space crimes as an introduction to the topic. In this regard, it limns the reasons that create new, unexperienced conditions of mental pressure and thinking processes which accordingly change the causations of crimes in space, more so with long stay. And this must first be experienced to be properly appreciated. Ergo, some space crimes would deserve leniency or condonation due to specific influences of unaccustomed environment of the domain that, at times, induces unintended reflexes, throws up inexplicable responses, and causes lapses in judgment. Thus, such specificities can occur to the detriment of even usually good-natured humans in space.

Chapter 5 visualises in some detail the complexion and character of future crimes in outer space and analyses their relevance and implications arising out of novel environment and new space activities, sustainability of space domain as also the impact of crimes on the future of humanity. Another influence on persons living in multi-ethnic, culturally different, and legally variant societies in outer space could be derived from their background, grooming, and mindset. Incompatibility in living styles, misinterpretation of innocuous behaviour, and mental fixations can cause annoyance, frustration, and crimes.

First category covers the traditional, physical crimes by individual humans in space domain like causing battery, injury, murder, rape, and their lower or higher cognates. The second category could be collective crimes of law and order or conspiracy or terrorism. The third category of crimes may relate to psychological pressure or mental torture like duress, insult, defamation, et al. The fourth category could comprise interference in economic activity, competitive aggressiveness, commercial disputes, offences of spying/copying of intellectual property researched in space, and similar wrangles of business jealousy.

Further, the possibility of human rights violations in offering shelter or ensuring evacuation of space tourists, space workers, or planetary residents from space in distress or emergencies or accidents has also been alluded to. Here, the provision applicable to astronauts in the Outer Space Treaty¹⁵ has been extended to and invoked for all types of personnel in outer space or on celestial bodies like workers, hospitality guests, or space emigres. The Moon Agreement reiterates this mandate.¹⁶ This aspect can seek support from International Humanitarian Law also because refusal or denial of such facility can be deemed as “torture.”

Capitalising on the option of the permissive use of ASATs for repeated activity of similar nature would adversely affect the sustainability of space environment for future operations. And allied to this would be violation of a prohibition under the Space Treaty (Article IX) on introducing earthly pollutants or contamination into outer space and celestial bodies or vice versa. This has started with *Beresheet* experiment by Israel or the launch of “unsanitised” Tesla car into space and may assume more importance as breaches escalate.

Chapter 6 delineates next class of space crimes which could be perpetrated through use of kinetic and non-kinetic technologies. Non-kinetic technologies cover digital applications and directed energy devices, for example, artificial intelligence, cyber-crimes, robot attacks, digital interference, lasers, particle blasting, micro-wave exposure, etc. The peculiarity of these crimes is that these can be committed in virtual anonymity and from any platform leaving little digital footprint. These can also be committed from any domain: Earth or airspace or outer space. Further, the offender need not be present at the site of crime and generally leaves no trail of forensic evidence. Another souring but tempting angle for such crimes may be of intrusion and indulgence by non-state actors for ideological fanaticism or political motivations and to cause a blitzkrieg. Probably, future scenario may be dominated by such crimes.

Another technology that can yield to attacks on satellites in outer space relates to kinetic-kill, anti-satellite weapons like ASAT missiles, but the problem with this category of weapons is that these are not banned when destroying own assets. And states have deployed these missiles for strategic ASAT tests or for destruction of defunct satellites containing secret equipment for espionage and sensitive data so collected and stored. The reasons may be valid for confidentiality, yet the acts are impeachable. The destruction of a satellite and disintegration of the missile do lead to creation of space debris that may take centuries to degrade and vanish, whereas their nuisance value in alerts and hazard quotient for collision is significant.

The directed energy technologies can be used for benign and peaceful purposes. For example, lasers can be used to extend the range of communication for deep-space probes or can be used to beam clean energy to the Earth with many advantages. Lasers can also be used to deflect or divert the orbit of small, mineral-rich asteroids for commercial exploitation and private appropriation, irrespective of whether it will be legal and lawful or not. But this technology is susceptible to dual-use and can

¹⁵ Article V.

¹⁶ Article 10.

be beamed on own or adversary satellite to render it operationally dysfunctional, temporarily or permanently, with no signs of apparent damage.

Therefore, the misuse or abuse of laser and similar technologies needs to be curbed and loopholes plugged with a *specialis* treaty. The author is conscious of the travails connected with treaty negotiations, yet the dreaded impact of contingent possibilities seeks attention for resolution through a “prohibitory” international treaty; and in tandem, supported by an institutional mechanism of governance to tackle breaches of treaty compliances. Additionally, states may have to take on responsibility for better regulation and supervision of activities and the captains of private enterprise to take on the duty for ethical business for peaceful purposes. The potential of serious mischief or intentional abuse with ominous consequences can be discounted or ignored only at our own peril.

Chapter 7 considers the dilemma of conflicting jurisdictional issues pertaining to territoriality of crimes and nationality of criminals and glitches in the trial due to evidentiary inadequacy. It highlights, at the international plane, the absence of a universal extradition treaty and the travails in obtaining custody of the accused and bringing one to book. Contrarily, the criminal enjoys state protections under nationality and law and can thus find escape routes, legal or political or even illegal. On the other hand, the aggrieved party struggles with unnecessary and dilatory hassles of jurisdictional nuances under international law for the possibility of extradition of the accused or effective trial in the state of domicile or the territory of arrest.

In fact, extradition is a bilateral issue between states based on mutual agreement, if any existing, or becomes a matter of political discretion or strategic posturing or nationality affiliations. To our dismay, there is no universal treaty or customary law on extradition of criminals based on certain specific criteria or established tenets with a caveat for in situ trial. A contrived solution has been experimented in aviation offences that is fairly successful.¹⁷ At the national level, however, it is easier to invoke the established principles of nationality of the criminal or territoriality of the crime or afford protection to a citizen and thus to find a competent court for suitable trial. Such cases with single nation involvement may be simpler and fewer but most space crimes are expected to be multinational in content and import.

Chapter 8 highlights that substantive laws by themselves generally lack effective enforcement and need the help of procedural laws for dispensing justice. Therefore, this chapter deals with the cumbrous procedures to apprehend and bring the culprit to justice under international law. Even though national substantive laws or criminal codes are curt and precise on description of crimes and respective sanctions yet cannot walk on their own legs. Positive laws, by nature are lame, and it is the legal procedures that impart traction and enable justice to reach the delivery end. To enable the competent courts to seize appropriate jurisdiction for trial of the accused, legal procedures are necessary to arrest the culprit and investigation by enforcement agencies to facilitate judicial proceedings in order to provide due relief to the victim. This brings to focus the importance of procedural laws in apprehension of

¹⁷ The Hague Convention, 1970.

the offender, acceptance of extradition, determination of jurisdiction, facilitation of trial, and dispensation of justice.

To our disdain, these differ in different countries. Some countries proclaim that the accused is innocent till proved guilty and affords certain rights to liberty till condemned by conviction. Some others believe that the complainant is right and the defendant must carry the burden to validate innocence by disproving the levelled charges. Another couple of countries swear by their jury system which is projected as more sensitive, humane, and empathetic. And Islamic theo-laws and punishments are entirely different and strict. Be that as it may, each system has its own merits, yet each requires procedural framework for arriving at the truth and award of punishment, if found guilty. Further, judgments on economic disputes resulting in decrees would need execution, and this process till the end turns out no simpler either and needs its own chain of writ procedures to achieve finality and duly receive the ultimate benefit. At times, to reach the end can be hopelessly dilatory, frustratingly long, and beset with obstacles, which at times appear deterring and insurmountable.

Chapter 9 attempts a brief global review of divergent legal systems prevalent transnationally and their different approaches to arrive at justice. This becomes pertinent to our study as space societies, big or small, temporary or permanent, will tend to comprise multi-nationality, multi-ethnicity, and multi-cultural populations drawn from different countries having different legal systems for justice. For example, the UK, the USA,¹⁸ Australia, and few other countries follow the jury system where the judge, as moderator, elicits and sifts facts of the case and highlights legal nuances and leaves the jury to decide on the verdict, informally taking into consideration cultural background, social ethos, humane values, and reformist approaches.

Another judicial system followed in common law countries like the USA, India, and others is adversarial system for judicial decision to reach for justice. In this system, there are two parties to litigation, each trying to prove its point either in accusation or in defence and the accused is deemed innocent till proved guilty. The judge is the adjudicator who having heard the statements of the witnesses, scrutinised the presented documents, and listened to the arguments of the counsels of the respective parties, decides in the matter to issue a judicial verdict which is executed subject to legitimate appeals.

In a parallel, inquisitorial legal system, an inquisition, is read out to the defendant to bargain the pleas of defence. This trial system operates in France, Italy, and some other countries on the principle of inquisition. Here, the complainant raises an accusation that is to be defended by the other party to turn out “not guilty.” Thus, under this system, the accused is deemed guilty till proved innocent through defence arguments or valid rejection of complainant’s assertions or presentation of tenable counterarguments. In this system, major evidentiary burden rests on the defendant to prove its innocence.

Yet another pseudo-religious system of justice operates among the Muslims which is managed and dispensed by the *Kazi*. The legal codes of punishment and other judicial tenets are ordained in the Quran and are treated as Shariah which is binding

¹⁸ Jury system applies only in some states of the USA.

and obligatory on the community. Islamic countries like Saudi Arabia, other Middle East nations, and certain African countries faithfully follow this system to dispense justice. Even in India, this religio-judicial system operated and related to the Muslims, during the Mughal rule. This code and the legal system applicable to crimes and criminal investigative procedures were abolished through a common criminal code and with the establishment of secular criminal courts under the British rule. A lot more details are provided in this chapter.

Chapter 10 makes a gripping narrative that attempts to highlight a more intractable problem of divergent perceptions on crimes in respective codified laws of different countries, the varying element of gravity of the offence, and differentials in punishment for these. Study of penology becomes relevant here. The incongruence in values, beliefs, and practices is glaring. Space societies, of whatever kind or purpose, will tend to comprise multi-nationality, multi-ethnicity, and multi-cultural populations living in cramped spaces with limited comforts and little privacy. Such claustrophobic living conditions with incongruent beliefs, different attitudes, varied habits, and disagreeable behaviour patterns in spacecraft or on celestial bodies are bound to constitute an inconvenient predicament that would be, to say the least, pregnant with potential for disapprovals, disputes, and quarrels. A few illustrations will prove the above assertion and validate the need to focus on such divergences. The highlighted variations could be revealing, disparate, and disturbing.

For example, Americans are touchy on privacy and would not hesitate to take legal action for violation, even if their real estate property is innocently photographed, while in many other countries, there is no such inclination or law. Again, in the USA, motor vehicles operate with left-hand drive, while most other countries use the opposite, the right-hand drive vehicles, and follow the principle of “keep to the left.” And both sets of countries have different codified traffic laws. Another simple example may be that clothes spread out on balconies or even extended out beyond for drying after a wash may be a familiar sight in Singapore and some other eastern countries, yet in Dubai, it is a sort of offence that may attract enforcement action and hefty fines.

Cultural differences and living etiquette equating to strict norms require that Muslim women need to wear a certain type of head scarf (hijab) or a face covering (burqa) in public; and exclusive quarters for them is a customary injunction. Another illustration of varying views can be those relating to rape. It is a crime, generally committed by males that inflicts violation of body-personal, denies freedom of choice, causes degradation of human dignity, and infuses a feeling of defilement in women who are normally assumed as innocent victims to the commission of crime. Whereas in Saudi Arabia, it is deemed as a crime committed by a woman for losing her chastity or compromising her fidelity and may accordingly attract a punishment of stoning to death. These aspects are amply illustrated in this chapter and proved by country-wise comparison and highlighting anomalous differences.

Chapter 11 appraises the discussion contained in earlier chapters and brings in sharp relief that the challenge of space crimes is multi-dimensional in impact and international in context. It also evaluates the efficacy of the existing corpus of space law and hints at evolving space jurisprudence to confront the formidable problems

and proffers solutions to the future incumbencies. Arguably, Outer Space Treaty is excellent as a fundamental *grundnorm*, enshrines enduring tenets and laudable principles, and may best be left intact and undisturbed. However, it appears set in the era of its creation with limited vision for the fast-paced traction of “techno-commercial-politico-economic” developments of the future. Thus, the OST has little resilience or content to grapple with incumbent difficulties and looming challenges.

In a way, the treaty seems to lack inherent flexibility and bears systemic inadequacies to handle ensuing posers, emerging contingencies, technological advancements and novel challenges of commercialisation, privatisation, weaponization, planetary habitations, and sustainability of space environment. It seems that the collective corpus of Space Treaty and cognate international instruments have reached a sharp bend to effectively handle upcoming challenges. The existing space legal regimen and space jurisprudence need to acknowledge and accept necessity of circumstances, yield to essentiality of purpose, and accordingly create sufficiency of germane law to minimise breach of its provisions and handle new crimes, all in the best interests of humanity.

The fast-advancing space technology and its applications are prodding for expansion and diversification of activities in the space domain, for which the existing corpus of space law falls woefully short to efficiently handle new issues, new tasks, newer ventures, and unfamiliar challenges. Revision of existing law is one option but may not help and will only cause more confusion in text and interpretation. Therefore, a call for a *nouveau lex specialis* is loud and clear. Further, stakeholders and investors would not like to wait indefinitely in uncertainty, nor benefits to and for welfare of humanity can be stalled for too long on legal inadequacies of moribund treaties. Hence, space law fraternity may rise and move fast with purpose. At the same time, with progressively expanding common responsibilities like commercial contracts for mining or lease of Astro-realty for infrastructure or management of space debris in the space domain, there appears a need for a dedicated and competent institutional set-up for professional governance under the aegis of the United Nations. Else, defiance and crimes will become the new normal in outer space domain.

Space crimes will yet be another genre of peculiar character; more so in future, with artificial intelligence, virtual internet, cyber technology, robot slaves, and digital applications that may adversely impact the functional safety of orbiting satellites breach operational security of other space activities or disturb law and order in planetary societies, to mention just a few. In the process, this chapter limns a tentative definition of space crimes. With the onslaught of such patent criminal misadventures, not to mention the likelihood of terrorism making persistent inroads, the chaos will become prominent and disorder near-insurmountable within the existing legal ecosystem and, as yet, evolving jurisprudence of outer space.

Considering that human nature has an innate tendency to rebel against impositions, controls, and authority, so also to react to one’s dislikes, distastes, and disagreements, human reactions, at times, may turn violent and result in crimes. Therefore, maintenance of public order, policing duties, and enforcement of law would be exacting tasks fraught with misperception. Same way, the imponderables of jurisdictional conflicts and procedural wrangles along with divergent understanding of law codes

and legal systems, in an international scenario, would tend to pose serious problems in perception and acceptance. Therefore, an honourable dispensation that exudes an image and impression about fairness and transparency of judicial process and appropriateness of punishment should appear right to both parties to the crime, the culprit, and the victim, who remain in search of justice.

Under the circumstances, the chapter titled. Some conclusions make a bold proposal for a holistic solution, wrapped up from all ends, in a *lex specialis*, a treaty. It is further suggested to adopt an independent institutional set-up to resolve all issues of conflicting jurisdiction, varying criminal codes, unmatched legal procedures, and allied judicial imponderables. The vision is to effectively handle contemporary problems as well as those anticipatable in the near future. Please permit me to reiterate that the suggested proposals are tentative and open to debate for corrections as also fine-tuning with amendments. It is possible that one may not view the best option in the proffered solutions but gazing eyes and open mind may give a new vision to the problem for better answers.

It is also conceded that negotiations to craft, refine, and approve of the offered suggestions will take a long time to reach consensus due to political intransigencies and diplomatic tussles. Experience tells us that evolution of law is generally slow, jerky, and noisy. Ergo, the approach here is pro-active so that a viable and credible system is put in place, in time, before exigencies crop up to clamour for specific answers with immediacy. *Non-liquet* is not a desirable answer. Therefore, wisdom lies in being forewarned of the incumbent challenges as to be fore-armed with appropriate solutions, well before the problems stare us in the face.

This volume is partly like a textbook of fundamental truths offering didactic treatment on the topics like jurisdictional disputes and procedural wrangles. A part is narration that relates to variations in law codes and legal systems; a part is collation of history of near-crimes committed in the past and some accounts gathered from not too reliable and authentic sources which nonetheless make an interesting reading for information and research. Of course, apparently, false narratives have been assiduously avoided. And lastly, a couple of chapters like Appraisal and Conclusion involve personal cogitation, thought processes, and solutions evolved by the author.

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