
CRIMES IN SPACE

A Legal and Criminological Approach to Criminal Acts in Outer Space

by

Julian Hermida *

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I. Introduction

Long-term human endeavours in outer space play a significant role in the new space scenario that emerged with the end of the Cold War. The International Space Station is the most ambitious and transcendental project of human settlements in outer space. Due to a prolonged isolation and hostile space environment, it is expected that there will be a high rate of criminal and deviant conflicts in any long-term human presence in outer space, as has been corroborated in recent multi-culturally diverse space experiences. All these conflicts will have

* Assistant Professor, Dalhousie University, Ph.D. (UCC), LL.M. (McGill), DCL (McGill).

considerable legal, criminal justice and criminological implications.

First, this article briefly examines the approach adopted by the Agreement establishing the International Space Station¹ concerning criminal behavior as an example of criminal justice solutions in outer space. The experience obtained on the International Space Station may be extended to other outer space human settlements. Second, the article recounts a habitability experience that ended up in the commission of criminal acts. Then, it analyzes the major criminological theories to decide which one – if any – may be applicable to criminal and deviant behaviour in outer space. The guiding hypothesis of the article is that the unique characteristics of the space environment, together with the exceptional social factors of involved actors, demand new and specific theories to explain criminal behavior in outer space. Its ultimate goal is to provide an opportunity for further discussion of possible solutions to criminal problems in outer space.

II. The International Space Station

The International Space Station, located in low-earth orbit at an altitude of approximately 386 kilometers, constitutes the first permanent civil settlement of human beings in outer space.² With its multi-use character, it is expected to enhance the scientific, technological, and commercial use of outer space.³

The International Space Station emerged as a US project under the Ronald Reagan's administration⁴ –called Space Station Freedom– to maintain US power and leadership in outer space.⁵ Due to very high costs, the project was temporarily abandoned. With the end of the Cold War, concerned that Russian authorities might sell space related equipment to enemy States and terrorist organizations,⁶ the United States re-floated the space station project, hoping to place the Russian space program under tight control.⁷ Together with its European allies, Canada and Japan, soon joined by Russia, the US launched this new –and more

¹ *Agreement Among the Government of the USA, Governments of Member States of ESA, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design, Development, Operation, and Utilization of the Permanently Manned Civil Space Station*, Washington, 26 September 1988, 1998 U.S.T. Lexis 212 in reprinted in 4 United States Space Law: National & International Regulation, § II.A.22 (Jan. 1989) [hereinafter IGA].

² Andre Farand, "Space Station Cooperation: Legal Arrangements" in Gabriel Lafferandierie & Daphne Crowther (eds.) *Outlook on Space Law over the Next 30 years* (The Hague; London; Boston: Kluwer Law International, 1997) at 125.

³ Lara L. Manzione, "Multinational Investment in the Space Station: An Outer Space Model for International Cooperation?" (2002) 18 Am. U. Int'l L. Rev. 507 at 509.

⁴ Marcus Lindroos, "The Space Shuttle docks with the International Space Station", online: Encyclopedia Astronautica website <<http://www.astronautix.com/craft/intation.htm>> (date accessed: 16 August 2004).

⁵ IGA, *supra* note 1.

⁶ J. Ashe, III, "Space Station Alpha: International Shining Star or Legal Black Hole?" (1995) 9 Temp. Int'l & Comp. L.J. 333.

⁷ Marcia S. Smith, "Space Stations", online: Federation of American Scientists website <<http://www.fas.org/spp/civil/crs/93-017.htm>> (date accessed: 6 August 2004).

expensive- version of the original space station.⁸

The United States government reserved for itself a central role in the management and operation of the International Space Station,⁹ and jointly with Russia, provides the core components of the Station.¹⁰ The European member States and Japan are responsible for supplying relatively minor – but very expensive – components, whereas Canada's contribution is mainly in the robotics field, with the construction and operation of the Canadarm.¹¹

As originally designed, the International Space Station consists of several pressurized modules where a crew of seven astronauts can live and conduct scientific experiments.¹² When fully completed, it will have six labs, two habitation modules and two logistics modules in a total area of 110m across and 95m long.¹³ It will have a frame, labs and living areas, water and power systems and places to park space vehicles in various docking stations.¹⁴ Recent budget cuts and a change in US space policy have reduced the capability of the Station to accommodate only 6 astronauts.¹⁵

The IGA has been characterized as a kind of condominium, where partner States share the expenses of common services but retain control of their own individual modules.¹⁶ Utilization rights of these working and living modules are derived from the contribution of each partner.¹⁷

⁸ IGA, *supra* note 1 Brazil later joined the ISS. Online <<http://www.spacelawstation.com/spacestation.html#3>> (date accessed: 18 August 2004).

⁹ IGA, *supra* note 1, article 1.2. "The Partners will join their efforts, under the lead role of the United States for overall management and coordination, to create an integrated international Space Station." Article 7.2. "The United States, acting through NASA, and in accordance with the MOUs and implementing arrangements, shall be responsible for management of its own program, including its utilization activities. The United States, acting through NASA, and in accordance with the MOUs and implementing arrangements, shall also be responsible for: overall program management and coordination of the Space Station, except as otherwise provided in this Article and in the MOUs; overall system engineering and integration; establishment of overall safety requirements and plans; and overall planning for and coordination of the execution of the overall integrated operation of the Space Station."

¹⁰ IGA, *supra* note 1, article 1.2. "The United States and Russia, drawing on their extensive experience in human space flight, will produce elements which serve as the foundation for the international Space Station".

¹¹ IGA, *supra* note 1, article 1.2.

¹² <http://spaceflight.nasa.gov/station/eva/index.html> (date accessed: 4 March 2006).

¹³ Rochus Moenter, "The International Space Station: Legal Framework and Current Status" (1999) 64 J. Air L. & Com. 1033.

¹⁴ Lawrence S. DeLucas, "International Space Law" (1996) 38 Acta Astronautica 613.

¹⁵ MARK CARREAU, NASA, partners agree to finish space station Orbital base would house crew of 6 when completed
<http://www.chron.com/disp/story.mpl/space/2698340.html>

¹⁶ Amy Otchet, "Space Law Lifts Off for a New Odyssey", UNESCO Courier (1999), online: UNESCO website <http://www.unesco.org/courier/1999_06/uk/planete/txt1.htm> (date accessed: 18 August 2004).

¹⁷ IGA, *supra* note 1, article 9.

In general, any partner State that provides Space Station user elements retains use of those elements, except that partners which provide infrastructure elements needed to operate and use the Space Station, such as Canada's Canadarm, receive in exchange a fixed share of the use of some user elements.¹⁸

Nearly twenty five percent of all astronauts sent into outer space since the beginning of the space age in 1957 have visited the ISS. Furthermore, it has attracted the first space tourists, including multimillionaire Dennis Tito.¹⁹ The ISS is also open for commercial utilization by private companies. Most of the ISS partners are actively encouraging private sector to utilize their modules in the ISS.²⁰ Under the terms of the Agreement, Partner States may invite third States to conduct experiments and carry out commercial activities in the ISS. This results in a mosaic of multiple social interactions and relations in outer space, with the possibility of deviant and criminal conduct.²¹

III. Criminal and Deviant Behavior in Outer Space

Both the United States and Russia have conducted a series of experiments in space and on earth aimed at testing human responses to isolation conditions in outer space.²² One of the most notorious examples is the test conducted by the Russian Institute of Biomedical Problems in 1998 and 1999.²³ In this experience, seven male astronauts of Russian and Japanese nationalities and a female Canadian astronaut –Judith Lapierre– spent 110 days aboard a replica of the Mir space station. Astronauts conducted various scientific experiments for different agencies and the Institute of Biomedical Problems analyzed the astronauts' adaptability to a space-like environment.²⁴

The experiment attracted international attention as several crimes were committed in the station. Two Russian astronauts reportedly committed battery, assault and attempted murder, and one of them – the Russian commander – sexually assaulted and harassed Judith Lapierre.²⁵

On several occasions during the 110-day experiment, Judith

¹⁸ IGA, *supra* note 1, article 9.1.

¹⁹ Alice Lagnado, "Space tourist returns from \$20-million trip to paradise" *The Vancouver Sun*. (May 7, 2001) at A.5.

²⁰ <http://www.spaceref.com/news/viewsr.html?pid=3692> (date accessed: 4 March 2006).

²¹ Marcia S. Smith, "Space Stations", online: Federation of American Scientists website <<http://www.fas.org/spp/civil/crs/93-017.htm>> (date accessed: 6 August 2004).

²² For an analysis of criminological and criminal justice issues in outer space see J. Hermida, *Norms governing launch services by NASA and commercial US private companies* (Ph.D. Thesis, Catholic University of Cordoba, 2000).

²³ 110-Day Isolation Ends in Sullen ... Isolation <http://www.themoscowtimes.com/stories/2000/03/30/003-full.html> (date accessed: 5 March 2005)

²⁴ "Experiment could have stopped, agency says: Unwanted sex advances by Russian were noted" *The Gazette* (Mar 26, 2000) at A.5.

²⁵ Catherine Ford, Culture of inequality plagues Russia, *Daily News* (14 April 2000) at 16.

Lapierre reported that she feared she would be sexually attacked.²⁶ However, Russian authorities did nothing to protect her, in part because they were interested in studying human reaction, including criminal and deviant behaviour, to isolation in outer space.²⁷ On New Year's Eve of 1999 after several weeks of living in isolation, the Russian commander – visibly drunk – violently kissed Judith Lapierre, who was then 32 years old, on the mouth twice, inappropriately touched her and attempted to have sex with her.²⁸ Previously, that same day, the Russian commander assaulted a Russian male astronaut.²⁹ A Japanese astronaut intervened to separate them and left the experiment soon afterwards because tensions as well as verbal and non verbal aggression made it impossible for him to continue.³⁰ At a later day, another Russian astronaut had to hide the knives in the station's kitchen because the same two Russian astronauts that had fought previously threatened to kill each other.³¹

These were not isolated incidents. Although kept highly confidential, similar deviant acts occurred in other outer space missions.³² Because of their nature and the attention they received in the media,³³ the 1999 incidents influenced the negotiations and drafting of the Code of Conduct for the International Space Station and shaped the criminal justice response for dealing with criminal incidents on the International Space Station.

IV. The International Space Station Approach to Criminal Jurisdiction

A. Criminal Jurisdiction

In view of the unique nature of the ISS and influenced by the events and experiences mentioned above, the partner States established clear rules for the exercise of criminal jurisdiction,³⁴ which deviates from the general jurisdiction regime established in the *Corpus Juris Spatialis*.³⁵

²⁶ Malcolm Gray, "A space dream sours" [17 April 2000] 113 (16) *Maclean's* at 26.

²⁷ *Ibid.*

²⁸ Graeme Hamilton, "Sex harassment claim hurts career: astronaut: 'I didn't play the game': Commander's kiss simply a New Year's greeting, Russians say" *National Post* (Apr 4, 2001) at A 11.

²⁹ "Experiment could have stopped, agency says: Unwanted sex advances by Russian were noted" *The Gazette* (Mar 26, 2000) at A.5.

³⁰ Joanne Laucius, "Women may be from Venus, but they can't go to Mars: Female space travellers increase 'probability of conflicts': Russian official" *The Ottawa Citizen* (Jun 10, 2001) at A.1.FRO.

³¹ *Ibid.*

³² Patrick D. Nolan & Marilyn Dudley-Rowley, "Effects of Organizational Structure on the Behavior and Performance of Polar and Space Work Teams" (2000) *American Sociological Association (ASA)*.

³³ Liz Jefferson, "Why do we ignore Lapierre's harassment?" *The Ottawa Citizen* (30 March 2000) at A.13.

³⁴ Stacy J. Ratner, "Establishing the Extraterrestrial: Criminal Jurisdiction and the International Space Station" (1999) 22 *B.C. Int'l & Comp. L. Rev.* 323.

³⁵ J. Hermida, *Norms Governing Launch Services by NASA and Commercial US Private Companies*, (Ph.D. Thesis, Catholic University of Cordoba, 2000).

The general principle governing jurisdiction, including criminal jurisdiction, in outer space provides that the State of registry exercises jurisdiction over the space objects recorded in its national space registry and the persons on board these objects, regardless of their nationality.³⁶ The Outer Space Treaty establishes that “a State on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body”.³⁷ The Registration Convention³⁸ elaborated upon this principle and established a system of national and international registration.³⁹ Thus, the registration of an object in the national registry secures jurisdiction, including criminal jurisdiction, and control over that object in outer space and its personnel.⁴⁰

The International Space Station agreement opted for the separate registration of each constituting component and therefore each partner must register as space objects the flight components which it provides.⁴¹ In the case of a joint endeavor, such as the ISS, the Registration Convention authorizes each participating State to reach an agreement with the rest of the participating States for the application of a certain area of the law of a State other than the State of registry.⁴² In the International Space Station Agreement, all partner States made use of this provision and agreed on a specific mechanism for the exercise of jurisdiction and control in the criminal law realm.⁴³

Thus, instead of resorting to the general principle of space law jurisdiction⁴⁴, Canada, the European partner States, Japan, Russia, and the United States have opted for a criminal jurisdiction system where the right to exercise criminal jurisdiction belongs, in principle, to the State of

³⁶ *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 27 January 1967, 610 U.N.T.S. 205, 18 U.S.T. 2410, T.I.A.S. No. 6347, 6 I.L.M. 386 [hereinafter *Outer Space Treaty*] (entered into force on 10 October 1967), Art. VIII.

³⁷ *Ibid.*, Art. VIII.

³⁸ *Convention on Registration of Objects Launched Into Outer Space*, 14 January 1975, 1023 U.N.T.S. 15, 28 U.S.T. 695, T.I.A.S. No. 8480, 14 I.L.M. 43 [hereinafter *Registration Convention*] (entered into force on 15 September 1976).

³⁹ A. A. Cocca, “Registration of Space Objects”, in N. Jasentuliyana & R.S.K. Lee eds., *Manual on Space Law* (New York: Oceana, 1979) at 180.

⁴⁰ M. A. Ferrer, *Derecho Espacial* (Buenos Aires: Plus Ultra, 1979) at 282.

⁴¹ IGA, *supra* note 1, Art. 5. European States further delegated this responsibility to the European Space Agency.

⁴² *Registration Convention*, *supra* note 42, Art. II.2 “Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII of the Treaty on principles governing the activities of States in the exploration and use of outer space, including the moon and other celestial bodies, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.”

⁴³ J. Hermida, “Space Registry” (1996) 24 *International Business Lawyer* at 383.

⁴⁴ J. Hermida, *Legal Basis for a National Space Legislation* (Dordrecht, Boston, and London: Kluwer Academic Publishers, 2004) at 61.

nationality of the perpetrator.⁴⁵ This reflects a very traditional approach to criminal jurisdiction under international law.⁴⁶ Thus, a partner State may exercise criminal jurisdiction over personnel who are their own nationals irrespective of where the perpetrator is located, i.e., in its own module or in another partner's module.⁴⁷ Thus, for example, if a Canadian astronaut commits a crime in a US module, Canada and not the United States will have primary criminal jurisdiction over the Canadian astronaut.

The IGA has also adopted –albeit in a limited fashion– the doctrine of passive personality.⁴⁸ Thus, in case of misconduct on orbit that: (a) affects the life or safety of a national of another partner State or (b) occurs in or on or causes damage to the flight element of another Partner State, the partner State whose national is the alleged perpetrator has the original –but not entirely exclusive– right to exercise criminal jurisdiction.⁴⁹ If it decides to exercise it, then it preempts the right of the affected State. The only possibility that the affected state may exercise criminal jurisdiction in an exclusive way is if the State of nationality of the perpetrator fails to provide assurances that it will submit the case to its competent authorities for the purpose of prosecution.⁵⁰ This shows a mistrust among the partner States of the judicial system of their partners in this joint venture.

Additionally, the IGA does not specify how concurrent jurisdiction will be exercised. Under international law, there are several instances of concurrent criminal jurisdiction involving two or more States. Since there is no customary international law governing conflicts that may arise between States regarding concurrent jurisdiction, in general, these issues are regulated by treaty law.⁵¹ For example, in the area of offenses committed by US forces stationed abroad, a specific treaty regulates which State has priority in the exercise of criminal jurisdiction.⁵² This is not the case in the IGA, so in the event of the commission of one of the crimes that may be subject to criminal jurisdiction there are no norms which specify how to resolve potential conflicts arising from the concurrent criminal jurisdiction.

B. Code of Conduct

⁴⁵ Stacy J. Ratner, "Establishing the Extraterrestrial: Criminal Jurisdiction and the International Space Station" (1999) 22 B.C. Int'l & Comp. L. Rev. 323.

⁴⁶ Covey T. Oliver et al., *Cases and Materials on the International Legal System* 4th ed. (Westbury, N.Y.: Foundation Press, 1995), at 165.

⁴⁷ IGA, *supra* note 1, article 22.1.

⁴⁸ Andrew J. Young, *Law and Policy in the Space Stations' Era* (Dordrecht, Boston: Nijhoff, 1989) at 152-53.

⁴⁹ IGA, *supra* note 1, article 22.2.

⁵⁰ *Ibid.*, article 22.2(2).

⁵¹ Mark R. Ruppert, "Criminal Jurisdiction over Environmental Offenses Committed Overseas: How to Maximize and When to Say No" (1996) 40 A.F. L. Rev. 1.

⁵² Agreement between the Parties to the North Atlantic Treaty regarding the Status of Their Forces, June 19, 1951, 4 U.S.T. 1792, 199 U.N.T.S. 67, article II.

The International Space Station Agreement's provisions on criminal jurisdiction have been complemented by a Code of Conduct.⁵³ ISS crewmembers are subject to additional requirements, such as the ISS Flight Rules, disciplinary policy, and requirements imposed by their Cooperating Agency or those relating to the space launch vehicle transporting an ISS crewmember.⁵⁴

The Code of Conduct for the International Space Station crew⁵⁵ established a clear chain of command on-orbit; a clear relationship between ground and on-orbit management and a management hierarchy.⁵⁶ It sets forth the standards of conduct applicable to all ISS crewmembers during preflight, on-orbit, and post-flight activities.

The general rule of conduct is that ISS crewmembers must maintain a harmonious and cohesive relationship among themselves and an appropriate level of mutual confidence and respect through an interactive, participative, and relationship-oriented approach, which duly takes into account the international and multicultural nature of the crew and mission.⁵⁷ Furthermore, no ISS crewmember may give undue preferential treatment to any person or entity in the performance of ISS activities and may not adversely affect the confidence of the public in the integrity of any ISS partner.⁵⁸

The ISS Commander is the leader of the crew and is responsible for forming the individual ISS crewmembers into a single, integrated team.⁵⁹ During on-orbit operations the ISS Commander is responsible for the accomplishment of the mission program for ensuring the safety of crewmembers and the protection of the ISS equipment.⁶⁰ During all phases of on-orbit activity, the ISS commander has the authority to use any reasonable and necessary means to fulfill his or her responsibilities. The State partners interpreted that this includes the use of proportional physical force or restraint to ensure the immediate safety of the crew Members.⁶¹

⁵³ Article 11 of the IGA, *supra* note 1, provides that each partner in exercising its right to provide ISS crew must ensure that its crew members observe a Code of Conduct for the maintenance of order and conduct of crew activities in or on the Space Station.

⁵⁴ Each ISS crewmember has a right to know about such additional requirements. ISS crewmembers will also abide by the rules of the institution hosting the training, and by standards and requirements defined by the Multilateral Crew Operations Panel (MCOP), the Multilateral Space Medicine Board (MSMB) and the Multilateral Medical Operations Panel (MMOP).

⁵⁵ *Code of Conduct for the International Space Station Crew* - 14 CFR Part 1214 (Federal Register: December 21, 2000 Vol. 65, No. 246) [hereinafter Code of Conduct].

⁵⁶ *Ibid.*, I.B.

⁵⁷ *Ibid.*, II.B.

⁵⁸ *Ibid.*

⁵⁹ *Ibid.*, III.A.1.

⁶⁰ *Ibid.*, III.A.2.

⁶¹ A. Farand, "The Code of Conduct for International Space Station Crews ESA", online: Space Ref website <<http://www.spaceref.com/news/viewnews.html?id=343>> (date accessed: 3 March 2006).

The treatment of criminal behavior in the International Space Station does not provide for the prevention of criminal behavior in outer space. Its emphasis is on the repression of criminal acts by referring - in most cases- the perpetrator to the State of his/her nationality for prosecution. It also ignores the needs of victims of crimes in outer space and is oblivious to gender issues related to crimes in space.

C. Criminological Explanations of Crime and Criminal Behavior on the ISS

The criminology literature has been prolifically probing the causes of why people commit crimes.⁶² Criminological theories are as diverse as their proponents and practically every criminology author's thought has been elevated to independent theory status, partly because of criminology's lack of a common and unifying theoretical thread.⁶³ However, all criminology theories have one distinctive common factor - they have all been conceived to examine criminality on earth and not in outer space.

For the purpose of analyzing whether one of these theories applies to the commission of crimes in the International Space Station, we have created a typology of the most representative theories of crime. Each type in the typology is tied to a different group of theories that explains the occurrence of crime under similar postulates and from a common angle, even if their proponents have hotly debated and criticized the other theories included here in the same type.

Each type of the selected criminological theories has greatly influenced criminological thought and has shaped different criminal justice systems in the world.⁶⁴ This is so because these theories have been

⁶² Edwin H. Sutherland and Donald R. Cressey, *Principles of Criminology* (Philadelphia: Lippincott 1966); Richard Quinney, *Criminology* (Boston: Little, Brown, 1979); Robert K. Merton, "Social Structure and Anomie" (1938) 3 *American Sociological Review* 672; Travis Hirschi, *Causes of Delinquency* (Berkeley: University of California Press, 1969); Edwin Lemert, *Social Pathology: A Systematic Approach to the Theory of Sociopathic Behavior* (New York: McGraw-Hill, 1951); Willem Bongers, *Criminality and Economic Conditions* (Boston: Little, Brown, and Company, 1916); Richard Quinney, *Class, State, and Crime: On the Theory and Practice of Criminal Justice* (New York: D. McKay Co., 1977); Clifford R. Shaw and Henry D. McKay, *Juvenile Delinquency and Urban Areas: A Study of Rates of Delinquency in Relation to Differential Characteristics of Local Communities in American Cities* (Chicago: University of Chicago Press, 1969); Émile Durkheim, *The Rules of Sociological Method* (New York: Free Press, 1966); Cesare Beccaria, *On Crimes and Punishments* (Indianapolis: Hackett Pub. Co., c1986); Cesare Lombroso, *Criminal Man, According to the Classification of Cesare Lombroso* (Montclair, N.J.: Patterson Smith, 1972); Thorsten Sellin, *Culture Conflict and Crime. A Report of the Subcommittee on Delinquency of the Committee on Personality and Culture* (New York: Social Science Research Council, 1938); Mark Colvin, *Crime and Coercion: An Integrated Theory of Chronic Criminality* (New York: St. Martin's Press, 2000).

⁶³ Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 1.

⁶⁴ Kenneth W. Simons, "Rethinking Mental States" (1992) 72 *B.U.L. Rev.* 463, 503. Thus, for example, it is common to find partially utilitarian justifications emphasizing the deterrent value of legal sanctions, which are retributive in their justification of the content of the prohibition.

dominant at different times without winning the ultimate debate on the true causes of criminality and have all attracted the attention of different criminal lawmakers and societies.⁶⁵

The types are titled: (i) individual explanations; (ii) sociological explanations; and (iii) critical explanations. The typology can be usefully applied to the study of whether current criminological thought can explain the causes of criminal and deviant behavior in outer space. The typology is descriptive and does not in itself assess the value of the theories in a context other than the International Space Station or outer space. The analysis of the criminological theories is done exclusively with respect to their applicability to criminal behavior in outer space. Some of these theories, such as Lombroso's Positivist School of Criminology, have been condemned by the majority of criminologists for their lack of accuracy.⁶⁶ Others have been widely criticized for their discriminatory effects, such as the Concentric theory, which links criminality to marginalized neighborhoods. Without ignoring these facts, the analysis of all major theories within each typology will be done with the exclusive purpose of assessing whether one or more of these theories -if any- can be used to explain the occurrence of crimes in outer space.

1. The Individual Explanations

Individual explanations of crime focus exclusively on the offender. The main theories are classical school,⁶⁷ positivist school⁶⁸ and psychological schools.⁶⁹ The major tenet of the classical school -based on utilitarian social philosophy - is that criminals have control over their behavior, they choose to commit crimes and they can be deterred by the threat of punishment.⁷⁰ Relying on Hobbes' philosophical works, classical criminology holds that people act in a rational manner, and that they choose those actions that provide the greatest pleasure and the least pain.⁷¹ Thus, criminal behavior occurs when an offender decides to risk violating the law after considering the potential value of the criminal enterprise and the potentiality of being apprehended, as well as the severity and swiftness of the punishment.⁷² Classical theorists' views on

⁶⁵ Joshua Dressler, *Understanding Criminal Law* 3rd. ed. (New York: Lexis Nexis, 2001) at 22.

⁶⁶ Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 16.

⁶⁷ Cesare Beccaria, *On Crimes and Punishments* (Indianapolis: Hackett Pub. Co., c1986).

⁶⁸ Cesare Lombroso, *Criminal Man, According to the Classification of Cesare Lombroso* (Montclair, N.J.: Patterson Smith, 1972).

⁶⁹ William Healy, *The Individual Delinquent; A Text-book of Diagnosis and Prognosis for All Concerned in Understanding Offenders* (Boston Little, Brown, 1915).

⁷⁰ Classical school theorists view crimes as both offense-specific, i.e., offenders will react selectively to the characteristics of the particular offense, and offender-specific, i.e., each criminal makes decisions.

⁷¹ Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 17.

⁷² Thus, deterrence becomes the central purpose for punishment, which is conceived as a tool and not an end in itself. To help prevent crime, punishment - and adjudication- should be swift, severe and certain. A severe punishment, however, is only that which is severe enough -but not more so- to outweigh the personal benefits derived from crime

the causes of crime are premised on the notion that human beings have free will and that their actions are guided by hedonism, i.e., the maximization of pleasure and the minimization of pain.⁷³

Crewmembers and visitors on the International Space Station, as well as in any other space vehicle or platform in outer space, are continually monitored. Their actions are followed by NASA's headquarters in Houston, Texas.⁷⁴ Non-American crewmembers are also continuously monitored by their own agencies. Astronauts actions are covered by network and cable television and NASA TV provides live ISS mission coverage on a daily basis.⁷⁵ So, the deterrent effect of all these actions is very high. In fact, it is higher than any criminal justice deterrent measure that has been implemented on earth. Incarceration, which is one of the extreme measures of deterrence, does not generally imply a permanent monitoring of the inmates' actions.⁷⁶ Other deterrence devices, such as the controversial closed circuit television cameras installed in public places only provide a limited control of the persons' actions, i.e., cameras are usually located only in strategic places and they do not generally monitor the totality of the space and all persons that enter this space on a permanent and continuing basis.⁷⁷ Thus, at this time, deterrence in outer space is high and essentially permanent.

As discussed above, the partner States have devised a criminal justice system, based on the nationality of the offender, where crimes may be tried by the State of nationality of the perpetrator and in some cases by the affected partner State. Thus, the criminal jurisdiction regime, coupled with permanent supervision of all crewmembers, clearly establishes [a?]certain and severe threat of punishment. Hence, because criminal acts do occur in outer space, resort to the postulates of classical school of criminology are not helpful to explain criminality in outer space.

Explanations of crime by the positive and psychological schools are also ineffective. Positivist - biological explanations derive from Lombroso's infamous studies of cadavers of executed criminals.⁷⁸

commission. Paul J. Hofer & Mark H. Allenbaugh, "The Reason Behind the Rules: Finding and Using the Philosophy of the Federal Sentencing Guidelines" (2003) 40 Am. Crim. L. Rev. 19 at 60; Michael H. Marcus, "Comments on the Model Penal Code: Sentencing Preliminary Draft No. 1" (2003) 30 Am. J. Crim. L. 135.

⁷³ Sandra Walklate, *Understanding Criminology: Current Theoretical Debates* (Buckingham and Philadelphia: Open University Press, 2003) at 16.

⁷⁴ Lyndon B. Johnson Center, <<http://www.spaceref.com/shuttle/newsref/sts-jsc.html#sts-jsc-mcc>> accessed August 20, 2004.

⁷⁵ http://www.nasa.gov/multimedia/nasatv/MM_NTV_Schedule.html

⁷⁶ Katherine S. Williams & Craig Johnstone, "The Politics of the Selective Gaze: Closed Circuit Television and the Policing of Public Space" (2000) 34 Crime, Law and Social Change 183.

⁷⁷ Nicholas Fyfe, "The Maximum Surveillance Society: The Rise of CCTV" (2002) 26 International Journal of Urban and Regional Research 428.

⁷⁸ Cesare Lombroso, *Criminal Man, According to the Classification of Cesare Lombroso* (Montclair, N.J.: Patterson Smith, 1972).

Criminological positivism is a reaction against classical theorists' notion of the rational individual who chooses to commit a crime to experience pleasure. Lombroso's main thesis is that serious offenders have inherited criminal traits. He held that crime is the result of biological differences "between criminals and normal individuals"⁷⁹. Based on Charles Darwin's evolutionary theory, Lombroso argued that criminals are not as developed as non criminals. Because of this lack of complete evolution, these abnormal individuals engage in a life of crime.⁸⁰ Thus, for Lombroso, criminals are born as such, they have inherited physical problems that lead them to the commission of crimes. Psychological explanations of crime consider criminal acts as psychopathologies, i.e., the individual's unconscious leads to personality deviation, which in turn leads him to commit criminal acts.⁸¹ Strongly influenced by Freudian ideas, psychological explanations of crime revolve around the notions that criminality may result from an overactive superego that seeks punishment as a means to relieve guilt or a weak or defective ego that may not control the impulses of the id, which leads to an unrestrained id and thus to delinquency.⁸² The psychological and psychoanalytical perspectives have broadened to include other ideas that foster people to commit crimes. These ideas, which range from Piaget-inspired notions of moral development,⁸³ information processing and low intelligence, all focus on the delinquent's defective mind as the main reason for criminality.⁸⁴

Astronauts are subject to a very rigorous recruitment process where they are evaluated from medical and psychological standpoints.⁸⁵ Thus, for example, applicants to NASA must meet basic physical and psychological conditions and are thoroughly screened as part of their recruitment.⁸⁶ This careful and competitive process only selects highly qualified individuals for human space programs.⁸⁷ Furthermore, medical and psychological conditions of candidate astronauts are evaluated annually and only those that can satisfactorily pass these evaluations

⁷⁹ Gina Lombroso Ferrero, "The Criminal Man" in Francis T. Cullen & Robert Agnew (eds.) *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 23.

⁸⁰ Cesare Lombroso, *Criminal man, according to the classification of Cesare Lombroso* (Montclair, N.J.: Patterson Smith, 1972).

⁸¹ William Healy, *The Individual Delinquent; A Text-Book of Diagnosis and Prognosis for All Concerned in Understanding Offenders* (Boston Little, Brown 1915) at 1.

⁸² August Aichhorn, *Wayward Youth* (New York, Viking Press 1966) 1.

⁸³ Jean Piaget, *The Moral Judgement of the Child* (Glencoe: Free Press 1948).

⁸⁴ Leonard D. Savitz & Norman Johnston (eds.), *Contemporary Criminology* (New York: Wiley, 1982).

⁸⁵ For an analysis of personality testing data from final stage applicants to the NASA astronaut program, see D. M. Musson, G.M. Sandal & R. L. Helmreich, "Personality characteristics and trait clusters in final stage astronaut selection" (2004) *Aviat Space Environ Med.* 75(4) at 342.

⁸⁶ Henry S. F. Cooper, Jr., "The Loneliness of the Long-Duration Astronaut" (1996) 11(2) *Air & Space/Smithsonian* 36.

⁸⁷ E. V. Khrunov, I. F. Chekirda, & I. A. Kolosov, "Astronaut training in airplane laboratories under weightless conditions, in preparation for work activity in outer space" (1971) 17(5) *Voprosy Psichologii* 30.

may maintain flight status.⁸⁸ Similarly, in Canada astronauts are selected on the basis of their medical and psychological aptitude. Furthermore, Canadian recruitment norms specify that candidates must have the ability to perform in a group setting and that they should possess superior personality traits in order to effectively deal with the unique aspects of human spaceflight.⁸⁹ In all cases, candidates with a previous criminal record are automatically disqualified from the recruitment process.⁹⁰

Since the recruitment and training programs are so demanding and place such an enormous emphasis on physical and mental conditions by keeping those that show criminogenic characteristics or proclivity to commit crimes out of the recruiting process, criminality in space may not be explained in terms of biological or psychological criminological theories.

2. The Sociological Explanations

Sociological explanations tend to explain criminality in terms of the social environment of the offenders. Such explanations lie outside the individual. The emphasis is on external factors which may trigger off criminogenic social conditions. The immediate social environment is primarily responsible for criminality in society.⁹¹ Major social factors causing criminality include broken families, poor parenting, low quality educational experiences, delinquent peer relations, poverty, lack of equal economic opportunity and inadequate sharing in values implicit in the dominant culture, among others. Some of the theories which follow this approach include social disorganization, control, strain, cultural deviance, labeling and social learning, among many others.

Social disorganization theories, such as the concentric zone theory developed by the Chicago School⁹², focus on the characteristics of the geographical areas where people live and link criminality to the composition of urban cities. For example, Shaw and McKay's theory states that transition zones in major cities are inhabited by immigrants from foreign countries and other States of the Union.⁹³ Because of

⁸⁸ *Astronaut Career Model - Briefing Book*, version 1.0. (June 15, 2001)] Canadian Space Agency, available at http://www.space.gc.ca/asc/pdf/Astronaut_Career_Model.pdf (date accessed: 6 March, 2006).

⁸⁹ Since astronauts are expected to be role models they are selected on the basis of their moral standards.

⁹⁰ "How to Become an Astronaut", online: Space.com <http://www.space.com/teachspace/module_astronaut_0900/become_astronaut_0900.html> (date accessed: August 20, 2004).

⁹¹ Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 9.

⁹² Scholars associated with the University of Chicago in the 1920's became interested in socially disorganized Chicago neighbourhoods where criminal values and traditions replaced conventional ones and were transmitted from one generation to the next. Freda Adler Gerhard O.W. Mueller, William S. Laufer, *Criminology and the criminal justice system*, 5th ed. (Boston: McGraw-Hill, 2004) at 129.

⁹³ Clifford R. Shaw and Henry D. McKay, *Juvenile Delinquency and Urban Areas; A Study of*

constant population changes, permanent poverty conditions and high heterogeneity, institutions of social control, such as the family, commercial establishments and schools, break down and can no longer carry out their expected functions,⁹⁴ thus fostering the upsurge of crime. Furthermore, these areas with a high concentration of delinquency tend to perpetuate its criminality by the transmission of delinquent values through successive generations.⁹⁵

Travis Hirschi's social control theory has focused on why people do not commit crimes.⁹⁶ For Hirschi everyone has the potential to become a criminal but most people refrain from committing criminal acts as they are controlled by their bonds to conventional society.⁹⁷ When the social bonds that individuals have to parents, peers, and important social institutions, such as the school or the workplace are strong, they fear that their potential criminal activity may jeopardize their relative position in society and thus they refuse to run the risk of losing meaningful social relationships, careers, and opportunities. Crime occurs when the forces that bind people to society are weakened or broken.⁹⁸

Merton's strain theory holds that crime is a function of the conflict between cultural goals, purposes and interests that people have and the means they can use to legally obtain them.⁹⁹ While cultural goals are the same for all, the ability to achieve these goals is dependent on the socioeconomic position that each individual enjoys in society. Informed by Durkheim's functionalism,¹⁰⁰ Merton's theory identifies the conditions which do not permit those in the lower classes to attain cultural and social goals, such as prestige, monetary success or middle class status. For Merton, lower classes receive an inferior education, lower values, they lack valuable social connections, and may face discrimination in the job marketplace.¹⁰¹ So, lower class individuals feel anger, frustration and

Rates of Delinquency in Relation to Differential Characteristics of Local Communities in American Cities (Chicago: University of Chicago Press, 1969) at 164.

⁹⁴ Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 96.

⁹⁵ Clifford R. Shaw and Henry D. McKay, *Juvenile Delinquency and Urban Areas; A Study of Rates of Delinquency in Relation to Differential Characteristics of Local Communities in American Cities* (Chicago: University of Chicago Press, 1969) at 164.

⁹⁶ Travis Hirschi, *Causes of Delinquency* (Berkeley: University of California Press, 1969) at 164.

⁹⁷ Hirschi identifies four elements of the bond to conventional society. These are: (i) attachment, i.e., sensitivity to the opinion of others which permits the internalization of conventional norms, (ii) commitment, i.e., fear of risking important interests, (iii) involvement, i.e., lack of opportunities to engage in criminal behavior due to heavy involvement in conventional activities, (iv) belief, i.e., assent to conventional society's value system. Travis Hirschi, *Causes of Delinquency* (Berkeley: University of California Press, 1969) at 164.

⁹⁸ Hirschi, *ibid.*

⁹⁹ Robert K. Merton, "Social Structure and Anomie" (1938) 3 *American Sociological Review* 672.

¹⁰⁰ Emile Durkheim, *Suicide* (New York: The Free Press, 1951) at 209.

¹⁰¹ Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 172.

resentment which is referred to as strain.¹⁰² Sometimes, these people resort to alternative means of attaining society's cultural goals, such as the commission of crimes.¹⁰³

The major tenet of cultural deviance theory is that conformity to the prevailing cultural norms of lower class society causes crime. Lower class subculture has a unique set of values and beliefs,¹⁰⁴ which are invariably in conflict with conventional social norms.¹⁰⁵ Criminality is an expression of conformity to lower class subcultural values.¹⁰⁶ Members of the working class commit crimes as they respond to the cultural norms of their own class in an effort to deal with problems of social -middle class- adjustment.¹⁰⁷

For Social learning theory, particularly Differential Association theory, criminal behaviour is learned in interaction with intimate others, like family and friends¹⁰⁸. As a result of this interaction, people learn techniques of committing crimes and definitions, such as motives, drives, rationalizations, and attitudes. A person resorts to criminal activity when he has received an excess of definitions, favorable to the commission of crimes over those unfavorable to the violation of laws.¹⁰⁹ In other words, criminal behaviour emerges when one is exposed to more anti social-messages than pro-social messages.

Labeling theory emphasizes that people become criminals when important members of society label them as such and they accept and assume those labels as part of their personal identity.¹¹⁰ As exemplified by Lemert, this takes place "when a person begins to employ his deviant behavior or a role based upon it as a means of defense, attack, or adjustment to the overt and covert problems created by the consequent societal reaction to him."¹¹¹ Labeling theory is not concerned with why people originally engage in acts that result in their being labeled -primary deviance. Its concern is with criminal career formation and with the effects of labeling -the creation of a stigma and the effect on self-

¹⁰² Robert K. Merton, "Social Structure and Anomie" (1938) 3 American Sociological Review 672.

¹⁰³ Other alternative means include addiction to alcohol and drugs. Merton, *ibid.*

¹⁰⁴ These include trouble, toughness, smartness, excitement, fatalism and autonomy. Sandra J. Bell, *Young Offenders and Juvenile Justice: A century After the Fact* 2d. ed. (Scarborough: Thomson Nelson, 2003) at 158.

¹⁰⁵ Thorsten Sellin, *Culture Conflict and Crime. A report of the Subcommittee on Delinquency of the Committee on Personality and Culture* (New York: Social Science Research Council, 1938) at 63.

¹⁰⁶ Albert Cohen, *Delinquent Boys: The Culture of the Gang* (New York: Free Press, 1955) at 25.

¹⁰⁷ Thorsten Sellin, *Culture Conflict and Crime. A report of the Subcommittee on Delinquency of the Committee on Personality and Culture* (New York: Social Science Research Council, 1938) at 63.

¹⁰⁸ Edwin H. Sutherland and Donald R. Cressey, *Principles of Criminology* (Philadelphia: Lippincott 1966) at 5.

¹⁰⁹ *Ibid.*

¹¹⁰ *Ibid.*

¹¹¹ Edwin Lemert, *Social Pathology: A Systematic Approach to the Theory of Sociopathic Behavior* (New York: McGraw-Hill, 1951) at 75.

image.¹¹²

Astronauts, including expedition and visiting crewmembers are recruited from middle or upper class families, who live in affluent neighborhoods. As a way of illustration, Canadian astronaut Julie Payette came from a middle class Montreal family. She finished her high school studies in Wales, worked for the Canadian affiliate of a multinational company and studied in two of the most respected universities in Canada.¹¹³ Likewise, US astronaut Peter Jeff Wisoff attended prestigious US universities and worked as a researcher in a top university.¹¹⁴ None of the astronauts in any space program has ever come from a poor immigrant family who does not speak the language of the majority and who has no access to social institutions, such as the school or the middle-class job market.¹¹⁵ Thus, social disorganization theories, with their emphasis on the transition zone as the main focus of criminality, and strain theories, which focus on the lower class' impossibility to attain common goals, may not account for criminality in space. Equally inapplicable is cultural deviance theory -which links the commission of crimes to conformity with lower class subcultural values- as no astronaut has been raised in a lower class culture.

Astronauts receive a high degree of social prestige from media attention. They are considered role models¹¹⁶ and during the early stages of the space age they were regarded as true national heroes.¹¹⁷ Furthermore, they are very well remunerated,¹¹⁸ they frequently appear before the media, give interviews, talk to students and act as role models for youths.¹¹⁹ Additionally, only astronauts with a strong support network of family and friends are recruited.¹²⁰ Therefore, it is easy to see that all astronauts have strong bonds with socio-economic governing

¹¹² Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 295.

¹¹³ <http://www.jsc.nasa.gov/Bios/htmlbios/payette.html> (date accessed: 5 March 2006)

¹¹⁴ National Aeronautics and Space Administration, Biographical Data: Peter J.K. "Jeff" Wisoff, online NASA website <<http://www.jsc.nasa.gov/Bios/htmlbios/wisoff.html>> (date accessed August 7, 2004).

¹¹⁵ Some astronauts, such as Fernando Caldeiro, who came from Buenos Aires, Argentina, or Michael E. Lopez-Alegria, who came from Madrid, Spain, were originally immigrants, but their families were of middle to upper class origin and fit the social profile of other astronauts of non immigrant origin. National Aeronautics and Space Administration, Biographical Data: Fernando (Frank) Caldeiro, online NASA website <<http://www.jsc.nasa.gov/Bios/htmlbios/caldeiro.html>> (date accessed: August 7, 2004).

¹¹⁶ Astronaut Career Model - Briefing Book section 4.1.3.6, version 1.0. (June 15, 2001), Canadian Space Agency, available at http://www.space.gc.ca/asc/pdf/Astronaut_Career_Model.pdf (date accessed: 6 March, 2006)

¹¹⁷ J. Hermida, *Commercial Space Law: International, National and Contractual Aspects* (Buenos Aires: Ediciones Depalma, 1997) at 6.

¹¹⁸ In the United States salaries for civilian astronaut candidates are based on the Federal Government's General Schedule pay scales for grades GS-11 through GS-14, and are set in accordance with each individual's academic achievements and experience.

¹¹⁹ Astronaut Career Model - Briefing Book, version 1.0. (June 15, 2001). Canadian Space Agency, available at http://www.space.gc.ca/asc/pdf/Astronaut_Career_Model.pdf (date accessed: 6 March, 2006).

¹²⁰ *Ibid.*

orders, which presumably they will not intend risking. Hence, control theory cannot account for outer space criminality. Similarly inapplicable is social learning theory –which holds that criminality is a function of individual socialization– as astronauts do not interact with criminal offenders and may not have before they were recruited.

Since part of the recruitment process also consists of analyzing whether candidates have had a prior criminal record and those with even minimal criminal antecedents are automatically disqualified, labeling theory does not help either in understanding the occurrence of crimes in outer space.

3. Critical Explanations

Critical theories tend to attribute criminality to the capitalist system. Its major tenet is that capitalism creates criminal behavior. It has a distinct political view of crime. For these theories, the ruling class uses the law and criminal justice system to advance its economic and social purposes,¹²¹ with criminal laws being viewed as the product of the upper classes. Accordingly, capitalism is the root cause of criminal behavior because the human needs of the poor are ignored.¹²²

Critical criminology also focuses on the crimes of the dominant class. These crimes have been attributed to egoistic sentiments and a need to maintain and advance one's socioeconomic position at any cost. Upper class crimes may involve violations of basic human rights, the adoption of anticompetitive measures and the manipulation of the legal system in pursuit of socioeconomic advantages, among others.

As indicated before, crimes committed by astronauts living in outer space resemble crimes generally attributed to lower, oppressed classes rather than the crimes that critical criminology attributes to the dominant elite, to which astronauts clearly belong. Thus, for example, the examined experiences show that astronauts may engage in sexual assault, battery, and even attempted murder rather than in typical white collar crime.¹²³ Obviously, critical criminology also fails to explain eventual criminal behavior in outer space.

V. Conclusions

The current ISS Agreement's approach to criminal behavior is based on a criminal law regime which authorizes the State of nationality to try its own national offenders. This approach is inadequate to satisfactorily resolve the variety of behavioral problems expected to

¹²¹ Karl Marx, "Population, Crime and Pauperism" in Karl Marx & Friedrich Engels, *Ireland and the Irish Question* (Moscow, Progress Publishers 1971) at 92.

¹²² Francis T. Cullen & Robert Agnew, *Criminological Theory: Past to Present: Essential Readings* (Los Angeles: Roxbury Pub. Co., 1999) at 334.

¹²³ Edwin H. Sutherland, "White Collar Criminality" (1940) 5(1) *American Sociological Review* at 2.

occur¹²⁴ as it is premised on a repressive approach which does not take into account the unique needs of victims of crimes in outer space and which does not address or propose specific solutions to prevent the occurrence of criminal behavior in outer space.

The inadequacy of the adopted criminal justice solution stems from the lack of understanding of the nature and causes of criminality in outer space. None of the existing theoretical views can explain the commission of crimes in outer space. So, until modern criminology comes up with a thorough understanding of the causes of crime in outer space, the criminal justice system will lack the necessary theoretical tools to design a criminal justice approach to effectively deal with the problem.

Specific explanations of crime in outer space will have to take into account the special characteristics of the outer space environment, particularly its hostility to human habitability, the conditions of isolation,¹²⁵ and emotional stress brought on by the monotony, confined space, sense of danger and anxiety invariably present in all manned space missions.¹²⁶ A theory of criminality in space will also have to take into account the psychological¹²⁷ and biological¹²⁸ effects that prolonged deprivation of their natural habitat causes to astronauts, the physiological changes in the human body induced by a microgravity environment,¹²⁹ as well as the consequences of a lack of contact with

¹²⁴ Some authors have advocated for the creation of a specific international treaty to govern all manned space missions and settlements. Carl Q. Christol, *Space Law: Past, Present, and Future* (Deventer; Boston: Kluwer Law and Taxation Publishers, 1991) at 200. Ashe, III, "Space Station Alpha: International Shining Star or Legal Black Hole?" (1995) 9 *Temp. Int'l & Comp. L.J.* 362. Ashe argues that a space treaty governing inhabited space stations or a WSO could provide a legal framework and forum upon which current and future partners of Alpha could base their course of action. A treaty may alleviate some of the international political pressures the current Partners face. The debate between developed and developing nations could be partially diffused if a treaty guaranteed specific rights (e.g., access rights to Alpha) to developing, non-space faring nations. A treaty could ensure that the space station will benefit all countries by enhancing such activities as telecommunications, weather forecasting, natural resource exploitation, environmental protection, crop and livestock disease control, air traffic control, navigation, maritime and land rescue operations, secure transmissions from satellites (e.g., copyright protection) and the limitation of damage from accidental or natural disasters involving radioactive materials."

¹²⁵ The Canadian Astronaut Office justified the criminal behavior on the fact that people exposed to extreme conditions are prone to commit crimes. "Experiment Could Have Stopped, Agency Says: Unwanted Sex Advances by Russian Were Noted" *The Gazette* (26 March 2000) at A.5.

¹²⁶ Alexei Arkhipovich Leonov & Vladimir Ivanovich Lebedev, "On the Problem of Psychological Compatibility in Interplanetary Flight" (1972) 26 *Voprosy filosofii* at 14.

¹²⁷ Joseph F. Kubis & Edward J. McLaughlin, (1967) 30(2) "Psychological Aspects of Space Flight" *Transactions of the New York Academy of Sciences* at 320.

¹²⁸ D. R. Hamilton, D. Gloss D. "Cases in Space Medicine" (2004) 75(3) *Aviat Space Environ Med.* at 288.

¹²⁹ These changes include cardiovascular degeneration, bone decalcification, decreased plasma volume, blood flow, lymphocyte and eosinophil levels, altered hormonal and electrolyte levels, muscle atrophy, decreased blood cell mass, increased immunoglobulin A and M levels, and a decrease in the amount of microsomal P-450 and the activity of some of its dependent enzymes. A. Graebe, E. L. Schuck, P. Lensing, L. Putcha & H. Derendorf, "Physiological, Pharmacokinetic, and Pharmacodynamic Changes in Space" (2004) 44(8) *J*

other chemical elements which surrounds people on earth.¹³⁰

Social relations are also dramatically different in outer space. An individual only interacts with a handful of selected persons in an artificial social context under permanent and close scrutiny. Astronauts also suffer from lack of contacts with family and friends. Social relations in outer space have unique characteristics that result in very different social interactions from those on earth. In addition, these adverse conditions are compounded by the possible co-existence of different national cultures on long-term space missions.¹³¹

Power relationships aboard human habitat in space are also extraordinary. While all astronauts belong to a privileged class, their power relationships in space may cause anxiety and stress. These relations do not have to do with possession or lack of possession of material resources or with coercive disciplinary methods. Rather, anxiety derived from power relationships in outer space missions have to do with on ground versus in orbit conflicts,¹³² with a very rigid and unmodifiable chain of command and a complete lack of freedom to deviate from a carefully planned course of action.¹³³

All these exceptional factors of life and social relations in outer space missions and settlements should be thoroughly explored in order to come up with a deeper understanding of the causes of criminality in outer space.¹³⁴ Only then it will be possible to engage in the drafting of legal rules to govern criminal behavior on spacecraft, space stations and human settlements in orbit. As wisely observed by an author, the "consequences of poor social planning for space missions can be as severe as those of poor engineering."¹³⁵

Clin Pharmacol at 837.

¹³⁰ Richard J. Bord & Robert E. O'Connor, "Risk Communication, Knowledge, and Attitudes: Explaining Reactions to a Technology Perceived as Risky" (1990) 10 Risk Analysis at 499.

¹³¹ D. J. Kealey, "Research on Intercultural Effectiveness and Its Relevance to Multicultural Crews in Space" (2004) 75(7 Suppl) Aviat Space Environ Med. at C58-64.

¹³² Studies have found that that both crewmembers and mission control personnel displaced unpleasant emotions to monitoring personnel outside of their group. N. Kanas, "Group interactions during space missions" (2004) 75(7 Suppl) Aviat Space Environ Med. at C3-5.

¹³³ Henry S. F. Cooper, Jr., "The Loneliness of the Long-Duration Astronaut" (1996) 11(2) Air & Space/Smithsonian at 36.

¹³⁴ Additionally, the different effects of long term and short term missions on human behavior must also be taken into account. Similarly, a comprehensive theory on space criminality has to explore the effects of intense and permanent control, scrutiny and supervision of all aspects of astronauts' activities, including professional and non professional activities.

¹³⁵ T. Stephen Cheston, "The Psychology of Orbital Human Factors" online: NASA website <<http://www.jsc.nasa.gov/er/seh/psychology.html>> (date accessed: August 16, 2004).