



## 2012 Manfred Lachs Space Law Moot Court Competition

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INTERNATIONAL COURT OF JUSTICE

**SPECIAL AGREEMENT**

BETWEEN

THE REPUBLIC OF VERONA  
(APPLICANT)

AND

THE COMMONWEALTH OF MONTAGUE  
(RESPONDENT)

Jointly Notified to the Court

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COUR INTERNATIONALE DE JUSTICE

**COMPROMIS**

ENTRE

LA RÉPUBLIQUE POPULAIRE DE VERONA  
(REQUÉRANT)

ET

LE COMMONWEALTH DE MONTAGUE  
(RÉPONDANT)

Notifié Conjointement à la Cour



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### **Case concerning On-orbit Collision, Non-cooperative Satellite Removal, and Damages**

#### Statement of Agreed Facts:

1. The Republic of Verona suffers annual monsoon seasons causing the loss of many lives every year. During 2009 and 2010, to support efforts to mitigate the destructive effects of the monsoons, Verona orbited five Earth observation satellites, Juliet 1-5, to monitor weather conditions and obtain information needed by its civil defense forces.

2. The Juliet satellites are some of the largest earth observation satellites ever put into orbit, with in-orbit dimensions of 52 meters (170 feet) x 10 meters (33 feet) x 5 meters (16 feet), and a mass of 16220 kilograms, each. The satellites have been placed into slightly elliptical polar orbits, with a nominal mean altitude of 851 kilometers.

3. The Commonwealth of Montague, a small island nation, has orbited a 30-satellite Romeo remote sensing system. Each Romeo satellite employs sophisticated imaging capabilities and has a mass of 750 kilograms. The satellites have been placed in near-polar, circular, multi-planed constellation orbits, with a nominal mean altitude of 850 kilometers. The full Romeo constellation achieved full operational capability in mid 2007.

4. Montague contracts to obtain all of its space hardware and services from Tybalt Enterprises, an independent stockholder company under the laws of Montague. Under corresponding contractual arrangements, Tybalt Enterprises designed, built, and launched the Romeo system. Tybalt Enterprises continues to perform the system's daily maintenance and operations, and replenishes the constellation as each of the original satellites reach their end-of-life.

5. Verona and the State of Capulet are populous states having a 1000 kilometer contiguous shared border. In the early and mid-20th century they fought several border wars with great loss of life and considerable destruction on both sides.

6. While not allied by treaty, Montague and Capulet share close ties and trade relations, a common language, and integrated cultural and scientific institutions. Montague is interested in ensuring that Capulet and Verona continue their present peace, and also in offsetting and reducing its own expenditures on the Romeo system. Accordingly, Montague offers the Romeo capabilities to Capulet in support of those objectives, and Tybalt Enterprises is licensed by Montague to provide satellite services



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to Capulet. Capulet contracts with Tybalt Enterprises to use the Romeo system services to monitor Verona's global military operations.

7. In early January 2011, Verona lost control of the Juliet constellation. Despite troubleshooting, Verona was unable to determine the exact cause of the malfunction. It waited for the Juliet system to reset automatically without success. The "glitch" occurred shortly after Verona began to integrate a new software patch into the operating systems of the Juliet satellites.

8. Verona did not inform the international community of the problem as Verona hoped to fix it speedily. Verona considered the problem to be an internal security matter.

9. In mid January 2011, Montague's intelligence community detected the Juliet system anomaly. It also ascertained that Verona had lost the ability to control the satellites. The Montague government's conclusions regarding the Juliet system were immediately shared with Tybalt Enterprises, whose own analysts confirmed the conclusions. These conclusions were not disclosed to others due to Montague's desire, based on security concerns, not to reveal Montague intelligence capabilities to Verona or other states.

10. In early May 2011, a disabled Juliet-1 satellite collided with one of the Romeo satellites, specifically the Romeo-22, over the South Pole. The Othello Space Situational Awareness Sharing Center ("Othello Center") on the Isle of MacBeth, an independent State, had warned Tybalt Enterprises 72-hours in advance of the conjunction of orbits, but Tybalt Enterprise chose not to maneuver the Romeo-22 to avoid the Juliet-1. The Othello Center provides conjunction analysis, collision avoidance recommendations, and warnings to subscribing international space operators. The Othello Center's warning estimated with high probability that the conjunction was within 0.5 kilometer and less than 100 meters radial miss distance. The Othello Center suggested a collision avoidance maneuver that would have shortened the life of the Romeo-22 satellite by 10 percent.

11. Tybalt Enterprises did not maneuver the Romeo-22, in part, because its contract with Capulet substantially penalizes it financially for any shortened lifespan of satellites within the Romeo constellation. Also, while Tybalt Enterprises' orbital analysts concluded there was a risk of a collision, they believed the risk was much less than that suggested by the Othello Center. Tybalt Enterprises' analysts now believe that sun activity prior to the collision may have changed the orbits of the Romeo-22 and Juliet-1 and led to what was, for Tybalt Enterprises, an unexpected, low probability event.



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12. Verona does not subscribe to the Othello Center services and did not receive its warning of the conjunction and potential for an on-orbit collision. Instead, Verona performs its own space situational awareness activities and monitors the Juliet constellation with an indigenously produced global surveillance network of military ground-based radar and optical tracking systems.

13. Although Tybalt Enterprises' orbital analysts had concluded there was acceptable risk associated with not maneuvering before the Juliet-1/Romeo-22 conjunction, the company still attempted to communicate with Verona to coordinate their conclusions. This attempt took place 48 hours before the collision. Verona did not acknowledge the communications. For security reasons, Verona does not share or discuss data produced by its military space surveillance network with third parties.

14. The Romeo-22 and Juliet-1 were both damaged by the collision, are uncontrollable, and cannot be returned to operational status. Shortly after the collision, the Othello Center issued a public report that concluded both satellites remained essentially intact after the collision and only one additional debris fragment larger than 10 cm was generated by the collision. It also concluded the Juliet-1 satellite and debris fragment remain in an orbit that poses continuing conjunction and collision hazards to the 29 remaining Romeo satellites, and to other satellite systems.

15. Given their size, the uncontrolled Juliet satellite constellation will pose conjunction and collision hazards to the Romeo constellation and to other space systems and objects. Without debris mitigation measures, like disposal at end-of-life and/or collision-avoidance maneuvers, there is high probability that one or more Juliet satellites will suffer a catastrophic collision sometime during the next 50 years. Unlike the unique May 2011 Romeo-Juliet collision, any future collisions involving the Juliet system would, with very high probability, generate thousands of pieces of orbital debris, with each piece presenting its own conjunction and collision hazards to the Romeo system and to other satellites and space objects.

16. Verona has launched and operated satellites other than those in the Juliet constellation. Its historical practice has been not to perform debris mitigation maneuvers at end-of-life because the maneuvers shorten each satellite's mission life. In addition, during the 2001-2010 decade, three Verona satellites in low-Earth orbit suffered catastrophic breakups after end-of-life. These events were caused by explosions in battery or propulsions systems, which Verona was unable to secure and make safe at end-of-life.



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17. In late May 2011, Tybalt Enterprises chief spacecraft engineer, Katherine Minola, briefed Montague's defense minister, Don Pedro, on the company's analysis of the Juliet constellation's conjunction, collision and other hazards. Its analysts concluded:

a. Verona was not attempting to recover the Juliet system.

b. Given the sophistication of Verona's indigenous satellite industry, and its long-standing practice and policy not to use non-Verona resources and capabilities in support of its space efforts, there was a high probability Verona could not recover the Juliet system.

c. There was a significant probability each Juliet satellite would suffer a catastrophic breakup caused by an explosion in either its battery or propulsion system, or both, since it is not expected they were properly secured when the system loss occurred. Such breakup events would pose conjunction and collision hazards.

d. With high probability, three or more operational Romeo satellites would encounter high-risk conjunctions with the Juliet constellation during each year for the foreseeable future. This conclusion was confirmed with the Othello Center.

e. With Verona unable to control the Juliet system, each conjunction would require that Tybalt Enterprises consider performing a Romeo satellite collision avoidance maneuver in order to reduce risks of a collision.

f. Maneuvers by the Romeo satellite constellation to reduce probabilities of collision associated with each Juliet conjunction will reduce each satellite's life and mission capability. To achieve reductions to very low probabilities of collision, the maneuver operations would reduce the maximum probable life of each Romeo satellite by more than 15 percent.

18. At the conclusion of her briefing, Minola offered Pedro two options. Montague could pay Tybalt Enterprises to either: (1) operate in the current environment and replenish the Romeo system with satellites at a much faster rate than planned, or (2) physically remove the Juliet system from orbit. Tybalt Enterprises had developed robotic technologies for its Escalus satellite system to service scientific satellites. Minola advised Pedro that the Escalus system could be modified to seize and remove each of the Juliet-1, 2, 3, 4 and 5 satellites from orbit.

19. Pedro told Minola he was not completely convinced that the Escalus robotic technologies could successfully remove the Juliet satellites from orbit. In response, Minola suggested Tybalt Enterprises be



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contracted to perform a technology demonstration. Pedro agreed. Immediately thereafter, Pedro personally briefed the press on Montague's plans to remove the Juliet satellites, and spoke of the need to protect its and all space-faring states' rights of access to outer space.

20. In June 2011, Montague issued a diplomatic demarche to Verona, contending that the Juliet system posed an immediate threat to Montague's and other satellite systems, and demanding Verona take steps to mitigate the threat. Concurrently, Montague's foreign minister, Caesar Brutus, convened a press conference to describe the demarche and its reasoning. If Verona failed to act as demanded, Brutus stated Montague would exercise its right to protect its national interests and take steps to defend its space systems. Verona did not respond to the demarche or to the Pedro and Brutus press briefings.

21. In October 2011, Tybalt Enterprises launched the Escalus-1 satellite, which grabbed and then successfully de-orbited the Juliet-2 in a manner which caused the Juliet-2 to burn up in the atmosphere. The de-orbit operation was concluded two weeks after the Escalus-1 launch.

22. Immediately after the Juliet-2 de-orbit, Verona's minister of information, Desdemona Lago, held a press conference in which she announced that Verona was endeavoring to resolve issues associated with the lost control and its engineers had concluded there was a "good chance" that they could recover the Juliet system and continue to operate the satellites for their important Earth observation mission. Lago protested that the Juliet-2 removal from orbit had been effected without Verona's consent. Normally very secretive about its military and space activities, Lago acknowledged Verona had not revealed its Juliet problems and recovery operations because of "significant" state security concerns.

23. Lago stated that Verona's laboratory tests had established that software issues had left the Juliet system vulnerable to an environmental upset if there was "an electrostatic discharge of a particular energy within the satellite." Citing security concerns, she declined to offer further details on the vulnerability or its cause. Lago explained that Verona's engineers had encountered difficulties in completing their analysis, but were now very close to resolving all of the Juliet control issues. Despite repeated queries, Lago refused to offer any confirming evidence to support her statements. She refused to confirm whether the resolving technologies and software solutions had been successfully tested or validated. Montague and Tybalt Enterprises rejected Lago's statements as deceptive and untrue.



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24. In mid-December, 2011, Verona contracted with Benedick Systems, an international software consulting company, to support its Juliet constellation recovery efforts. Shortly thereafter, in late January 2012, Lago announced that Verona had achieved positive control of the Juliet-3, -4, and -5 satellites. Benedick had found the solution to the control problems that had eluded Verona's engineers.

25. In February 2012, Verona suffered extensive flooding caused by an unexpected severe monsoonal storm. Without advance warning from the Juliet-1 and -2 satellites, Verona was unable to timely mobilize its civil defense forces, prepare its population to secure property along its coast, and evacuate its people to safety in order to escape the storm's effects. Five thousand Verona citizens and several hundred international visitors perished during the storms and associated flooding. Many thousands were injured, and thirty thousand homes and businesses destroyed. The flooding also damaged the large Beatrice chemical plant in Verona, and the damage to the facility was amplified by inadequate warning of the monsoonal storm. Beatrice is leaking deadly toxins into Verona's coastal waters, and the toxins are damaging Verona's fisheries.

26. Analysis reveals that had both the Juliet-1 and -2 satellites remained operational, there is a high probability that the entire Juliet constellation would have provided sufficient warning data for Verona to timely prepare its population for the flooding, secure its levies and property, evacuate the population at risk, and safeguard the Beatrice plant. With the Juliet-1 destroyed, had the Juliet-2 remained operational, there is a significant probability Verona could have adequately prepared for the storm given the reduction in the constellation's capability.

27. Verona registered the Juliet system pursuant to the Registration Convention. Montague has not registered the Romeo system and did not register the Escalus-1 mission that seized the Juliet-2.

28. Recognizing that events are escalating, Verona and Montague have agreed to submit their dispute for binding resolution by the International Court of Justice. Before the Court:

- a. Verona asks the Court to declare that:
  - 1) Montague is liable to Verona for the damage done to the Juliet-1 in its collision with the Romeo-22.
  - 2) Montague is liable to Verona for the loss of the Juliet-2 satellite as it was unlawfully removed from orbit.



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- 3) Montague is liable for the deaths, terrestrial property loss, and environmental poisoning suffered in Verona during the 2012 monsoonal storm.
- b. Montague asks the Court to declare that:
- 1) Verona is liable to Montague for the damage done to the Romeo-22 in its collision with the Juliet-1.
  - 2) Montague is not liable for the loss of the Juliet-2 satellite. Verona is under a duty to take actions to preserve the space environment by minimizing the potential threat to the use of outer space by arranging for the de-orbit of satellites in its Juliet system at the end-of-life, and by securing each satellite's battery and propulsion system to substantially reduce risks of explosion at end-of-life.
  - 3) Montague is not liable for the deaths, terrestrial property loss, and environmental poisoning suffered in Verona during the 2012 monsoonal storm.

29. Verona and Montague are parties to the Outer Space Treaty, the Return and Rescue Agreement, the Liability Convention, and Registration Convention and the ITU Convention. Verona is a party to the Vienna Convention on the Law of Treaties. Montague has only signed the Vienna Convention. Both are members of the United Nations.