Some of these identifications can be or become pretty esoteric. (One wag declared that professors are people who talk or write in someone else's sleep.) But with a few clues and a little practice, any student in an academic community can draw some picture of the various camps. We aim to provide some clues.

EXAMINATION OF "PREDATORS OR PLOWSHARES? ARMS CONTROL OF ROBOTIC WEAPONS": ROBERT SPARROW'S ARGUMENT-SYNTHESIS

As has been our practice, we will discuss a sample published essay before we walk you through the process of writing your own essay. The sample argument-synthesis is Robert Sparrow's "Predators or Plowshares? Arms Control of Robotic Weapons," an article that appeared in the Spring 2009 issue of *IEEP Technology and Society Magazine*, published by Fordham University Press. "IEEP" refers to the Institute for Ethics and Economics Policy at Fordham University.

The author is a Senior Lecturer in the School of Philosophy and Bioethics at Monash University in Victoria, Australia. He specializes in applied ethics and political philosophy and has published extensively on the ethics of robotics, artificial intelligence, military technology, nanotechnology, reproductive technology, and organ transplants. The topic of his article concerns the military use of robotic technology and the dangers of escalating its use in high-tech warfare. It is a topic of widespread "academic conversation" among robotic scientists, political scientists, military strategists, moral philosophers, and the general public.

With his background in technology and applied ethics, Robert Sparrow is well positioned to write an argument-synthesis on this topic. His title "Predators or Plowshares?" refers to the biblical passage "They shall beat their swords into plowshares" (Isaiah 2.4), and it substitutes the idea of robotic weapons as "predators" for the original term "swords." We have slightly abridged Sparrow's article for reasons of space.

Predators or Plowshares? Arms Control of Robotic Weapons

Robert Sparrow

With the development of the General Atomics MQ-1 Predator, robotic weapons came 1
of age. The operations of this Unmanned Aerial Vehicle (UAV) in Iraq, Afghanistan, Pakistan, and northern Africa in the last few years have given us a glimpse of the future of high-tech war [6], [14], [24]. It is a future in which thousands of miles separate those firing weapons from those whom they kill, in which joystick jockeys have replaced pilots and soldiers, and in which the psychological barriers to killing are greatly reduced by the

Sparrow, Robert. "Predators or Plowshares? Arms Control of Robotic Weapons." Portions reprinted with permission from *IEEE Technology and Society Magazine*. Fordham University, Spring 2009: 25–29. © 2009 IEEE. Web. 10 Oct. 2010.

distance between weapon operators and their targets. Perhaps more importantly, it is a future in which wars are more likely, in which decisions about when weapons are fired and who they are fired at are increasingly in the hands of machines, and in which the public has little knowledge of—or control over—what is being done in its name. Finally, it is a future that is likely to come about not because it represents a better, less destructive, way of fighting war but because the dynamics driving the development of unmanned weapon systems (UMS) are likely to dictate that they be used more and more often.

Now that we have had a glimpse of this future, it is time to begin thinking about whether—and how—we might avoid it by adopting an arms control regime designed to limit the development and deployment of robotic weapons. 2

Out of Harm's Way

Arguments for arms control are most important when there is a real temptation to develop the weapons they concern. From a military perspective at least, the advantages of UMS are myriad. Remotely piloted systems may help keep some human beings "out of harm's way" by distancing weapons operators from the theater of conflict [31]. They also greatly reduce the "fog of war" by making possible real-time surveillance of the battlespace, which in turn allows lethal force to be used in a more discriminating fashion. 3

In suggesting that there may be reasons to consider arms control of UMS, I am in no way denying the military utility of these systems nor even that they offer some prospect of rendering some aspects of armed conflict "more ethical." However, the danger I wish to highlight here is that each nation's unrestrained pursuit of these advantages may result in a situation in which every nation is worse off than they would have been if none had set off on this path. 4

Psychological Distance

The first and in some ways the most obvious reason for concern about the development of unmanned systems is the possibility that they will undercut warfighters' respect for human life by facilitating "killing at a distance" [41]. It is now possible for the operators of the Predator to fly an entire combat tour in Iraq or Afghanistan without ever leaving Nevada and to kill people they have only ever encountered as pixels on a computer screen. The geographic and psychological distance between the operators and those they target may make it signifycantly easier for them to make the decision to kill [39]. However, the force of this objection to the development of robotic weapons is greatly mitigated when we consider the nature of what the use of such weapons might replace. Shelling from a battleship miles offshore or conducting area bombing from a B-52 hardly involves much contact with, or respect for, the individuals one is killing. Our willingness to tolerate these forms of warfare suggests that concerns about "remote control killing" are not, in themselves, sufficient justification for arms control. 5

Increased Risk of War

A more powerful reason for considering arms control is the danger that the development of unmanned systems will dramatically reduce the threshold of conflict and will increase the risk of accidental war. At the strategic level, the development of robotic 6

weapons may lower the political costs of going to war by promoting the illusion that war can be fought without casualties [6], [16], [19]. It is clear that the possibility of removing American warfighters from the front line of combat is one of the main factors driving interest in UMS in the United States [7], [12], [16], [17], [18, p. 14], [23], [26], [31], [32], [34], [37].

In part, this goal reflects the morally admirable desire to save the lives of U.S. warfighters. However, it is difficult to avoid the suspicion that the desire to minimize the risks to U.S. personnel also stems in part from a perception that the American public has a low tolerance for casualties, which negatively impacts on the ability of the United States to project force abroad [5], [15], [20, p. 79], [26, p. 77]. If it becomes possible to project military power and engage an enemy in combat using a force consisting mainly of UMS, governments may be much more willing to go to war [5, p. 26], [27], [28]. UMS will also lower the threshold of conflict at the strategic level by decreasing the amount of time available to nations to determine whether an attack is imminent, or even under way, and also how to respond if it is. 7

Part of the U.S. military's interest in UMS, and especially UAVs and Unmanned Undersea Vehicles (UUVs), stems from the belief that it will eventually become possible to deploy unmanned systems for much longer periods and at a greater tempo of operations than manned systems [31]. By taking the human being out of the system, unmanned systems partially decouple the limits of the system from the limits of its operators. UAVs can be smaller, faster, fly higher (or lower), and conduct longer and more dangerous missions than manned systems [40]. For instance, because the operators of Predator and Global Hawk UAVs work in shifts, these systems are capable of near continuous operation and are limited only by the need to refuel and maintain the aircraft [10]. 8

Researchers in the United States are currently working on providing UAVs with the capacity to undergo in-flight refueling [9], [21] in order to further increase the range and extend the period of operations of these systems. Similarly, it is hoped that UUVs will eventually be capable of missions in shallower waters than manned submersibles [13]. 9

The development of long-range UMS capable of extended operations may make it possible for some states to maintain a permanent armed presence just outside the airspace and territorial waters of their potential enemies, in the form of "loitering" UMS. These forces might be capable of carrying out a devastating attack in a fashion that would allow their target very little time to respond. If an attack is suspected or seems imminent, there is a brief window of opportunity between possible contact and destruction available to determine whether one is under attack by UMS. This places states under significant pressure to mobilize their own forces, and increases the chance that war will occur in error. 10

The widespread use of UMS may also increase the amount of contact between opposing forces during peacetime and so further multiply the opportunities for an accident or incident to escalate to conflict. Thus one can envision that, in the future, not only will strategic rivals patrol the limits of each other's territories with squadrons of UAVs, Unmanned Surface Vehicles (USVs), and UUVs ready to attack at a moment's notice. But these systems may, in turn, be shadowed by further groups of systems poised to destroy them. In these circumstances, accidents or even mere uncertainty about the intentions of an enemy may trigger a full-scale conflict. Placing robots in 11

space is likely to greatly exacerbate these difficulties [1]. The risk of accidental war triggered by the activities of UMS is only likely to increase in the future because the logic of the development of unmanned systems clearly points to their eventual deployment in "fully autonomous" mode.

12 Despite the insistence of military spokespeople that autonomous robots will never be allowed to kill human beings [16], there are significant reasons to doubt that this promise will be kept. The satellite links and other communications infrastructure necessary to operate UAVs remotely are an obvious weak point in the operations of these systems and are consequently a predictable target for the enemy's countermeasures. Those systems that can continue to operate in the absence of these links have obvious military advantages. Indeed, systems that do not involve a human operator may possess advantages even where the robustness of communications is not at issue. The limits of the human nervous system serve as a constraint on the capacities of manned systems. In a limited range of domains at least, computers are capable of assessing a situation and making a decision faster and more accurately than human beings [2, pp. 6–7].

13 As the technology involved in robotic weapons improves, eventually we will reach a point where whenever a manned and an unmanned weapon system go into combat against each other, the odds will strongly favor the unmanned system [1], [5]. Once this point is reached, warring nations will have to field autonomous weapons systems or accept a severe military disadvantage. This prospect also establishes a significant incentive for advanced industrial powers to work towards the development of systems capable of reliable combat operations in the absence of a human operator.

14 Once autonomous weapons systems come into use then the decision about whether or not to open fire in a particular situation will be in the hands of machines. The risk will then exist of an accidental war being triggered by the decisions of one or more autonomous weapon systems. . . .

Motivation for Controls

15 In one important regard, it is probably too early to expect these arguments for arms control to have much impact. The U.S. currently enjoys such an overwhelming superiority in arms and military technology—including robotic weapons—compared to any of its potential enemies that it has little incentive to enter into negotiations about the capacities of its weapon systems. However, this superiority may well be challenged over the next two or three decades, especially in the area of unmanned systems, which may be easier to develop and manufacture using commercial off-the-shelf components than other weapon systems. China, for instance, has a vigorous UAV development program. Russia also has a significant capacity to design, manufacture, and operate UAVs. It is also possible that the technology and experience required to manufacture and field UMS will disperse as a result of the flourishing arms trade in systems manufactured by Britain, Israel, Europe, and other states. It would therefore be unwise to conclude that the U.S. will always maintain the commanding lead in the area of unmanned systems technology that it currently possesses. If another nation should become capable of flying a Predator-type UAV around the skies of North America or loitering a UUV in the waters offshore of the continental U.S., then the issues I have

raised here will suddenly become as urgent for U.S. policy makers as they are likely to be for other nations well before that time. There is now a growing literature on the ethics of unmanned weapon systems.

Much of this literature is critical, highlighting the many difficult issues these systems—and especially autonomous weapon systems—raise. However, most of these discussions settle for calling for more ethical debate rather than arms control. I hope that by explicitly making the case for arms control in this context I can encourage other participants in the debate to clarify whether they have the courage of their convictions. Without arms control of robotic weapons, the future I outlined at the outset of this piece seems inevitable. With a concerted effort to achieve arms control, there is perhaps a small chance that we will be able to overcome the military logic that would hand over the fighting of war to robots in favor of the human need for peace and security. 16

References

[1] T. K. Adams, "Future warfare and the decline of human decision-making," *Parameters: U.S. Army War College Quart.*, pp. 57–71, Wint. 2001–2002.

[2] R. C. Arkin, *Governing Lethal Behavior: Embedding Ethics in a Hybrid Deliberative/Reactive Robot Architecture*, Mobile Robot Laboratory, College of Computing, Georgia Institute of Technology, Atlanta, GA, 2007.

[5] C. Beal, "Briefing: Autonomous weapons systems—Brave new world," *Jane's Defence Weekly*, vol. 33, no. 6, pp. 22–26, 2000.

[6] B. Bender, "Attacking Iraq, from a Nev. Computer," *Boston Globe*, p. A6, Apr. 3, 2005.

[7] R. Boland, "Developing reasoning robots for today and tomorrow," *Signal*, vol. 61, no. 6, pp. 43–46, 2007.

[9] R. Braybrook, "Drones: Complete guide, *Armada Int.*, vol. 31, no. 3, pp. 1–36, 2007.

[10] A. Butler, "Global Hawk UAV supports border ops in Iraq," *Aviation Week & Space Technology*, vol. 166, no. 11, p. 56, 2007.

[12] R. E. (Col.) Chapman, "Unmanned combat aerial vehicles: Dawn of a new age?," *Aerospace Power J.*, vol. 16, no. 2, pp. 60–73, 2002.

[13] Department of the Navy, *The Navy Unmanned Undersea Vehicle (UUV) Master Plan*, 2004; <http://www.navy.mil/navydata/technology/uuvmp.pdf>.

[14] S. B. Donnelly, "Long-distance warriors," *Time*, Dec. 4, 2005.

[15] C. J. Dunlap, Jr., "Technology: Recomplicating moral life for the nation's defenders," *Parameters: U.S. Army War College Quart.*, pp. 24–53, Autm. 1999.

[16] S. Featherstone, "The coming robot army," *Harper's*, pp. 43–52, Feb. 2007.

[17] M. Fielding, "Robotics in future land warfare," *Australian Army J.*, vol. 3, no. 2, pp. 1–10, 2006.

[18] S. Graham, "America's robot army", *New Statesman*, vol. 135, no. 4796, pp. 12–15, 2006.

[19] H. Gulam, and S.W. Lee, "Uninhabited combat aerial vehicles and the law of armed conflict," *Australian Army J.*, vol. 3, no. 2, pp. 1–14, 2006.

[20] J. A. Harley, "Information, technology, and center of gravity," *Naval War College Rev.*, vol. 50, no. 1, pp. 66–87, 1997.

[21] H. Hutchinson, "Advances in self-control," *Mechanical Engineering*, vol. 128, no. 12, pp. 20, 2006.

[22] Jane's Intelligence Digest, "U.S. ties with Pakistan under strain," *Jane's Intelligence Dig.*, June 23, 2006.

[23] S. Kainikara, "UCAVs probable lynchpins of future air warfare," *Asia-Pacific Defence Reporter*, vol. 28, no. 6, pp. 42–45, 2002.
[24] R.D. Kaplan, "Hunting the Taliban in Las Vegas," *Atlantic Monthly*, Aug. 4, 2006.
[25] A. J. Lazarski, "Legal implications of the uninhabited combat aerial vehicle," *Air and Space Power J.*, vol. 16, no. 2, pp. 74–83, 2002.
[26] W. Legien, C-J. Andersson, and G. Hansen, "UUV and USV: Which 'unmanned' for what task?" *Naval Forces*, vol. 27, no. 3, pp. 44–51, 2006.
[27] P. Marks, "Robot infantry get ready for the battlefield", *New Scientist*, vol. 191, no. 2570, p. 28, 2006.
[28] P. Marks, "Armchair warfare," *New Scientist*, vol. 192, no. 2575, p. 24, 2006.
[29] T. Moss, "Airshow China: Chinese companies unveil latest UAV designs," *Jane's Defence Weekly*, Nov. 7, 2008.
[30] J. Mustin, "Future employment of unmanned aerial vehicles," *Air and Space Power J.*, vol. 16, no. 2, pp. 86–97, 2002.
[31] Office of the Under Secretary of Defense, *Joint Robotics Program Master Plan FY2005: Out front in harm's way*. Washington DC: Office of the Undersecretary of Defense (AT&L), Defense Systems/Land Warfare and Munitions, 2005.
[32] G. I. Peterson, "Unmanned vehicles: Changing the way to look at the battlespace," *Naval Forces*, vol. 26, no. 4, pp. 29–38, 2005.
[33] D. Richardson, "U.S. increasing armed UAV use in Southwest Asia, reports suggest," *Jane's Missiles and Rockets*, Nov. 3, 2008.
[34] R. Scarborough, "Special report: Unmanned warfare," *Washington Times*, May 8, 2005.
[37] J. Sherman, "The drone wars," *Bull. Atomic Scientists*, pp. 28–37, 2005.
[39] R. Sparrow, "Building a better WarBot: Ethical issues in the design of unmanned systems for military applications," *Science and Engineering Ethics*, 2009, to be published.
[40] J. M. Sullivan, "Evolution or revolution? The rise of UAVs," *IEEE Technology & Society Mag.*, vol. 25, no. 3, pp. 43–49, Fall 2006. [41] D.L. Ulin, "When robots do the killing," *Los Angeles Times*, Jan. 30, 2005.

Robert Sparrow evidently joined the academic conversation about robotic technology shortly after newspaper and magazine journalism began to report on the expansion of its use during the American army's counterinsurgency in Iraq. As the first three sources cited in "Predators or Plowshares?" indicate, the *Boston Globe*, *Time*, and *Atlantic Monthly* all published articles on this topic in 2005–06. Appearing in 2009, "Predators or Plowshares?" draws upon subsequent publications that examine the political and strategic use of this technology, as well as upon publications that question the technology's ethical implications and moral consequences. Sparrow rejects the enthusiasm with which many greet its advances, and he asks where the advances might lead. The answer points to a future in which wars will be easier to conduct and hence more likely to occur, and in which the remoteness of combatants from their victims can weaken cognitive and emotional restraints against lethal outcomes. Sparrow then argues that we should design an arms control program that will limit the expansion and use of robotic weaponry.

Before Sparrow makes his argument, he informs his readers about the ongoing conversation. His opening paragraphs (1) familiarize readers with the issue by recounting the dynamics propelling the use of robotic weaponry in Iraq, Afghanistan, Pakistan, and elsewhere; (2) explain that he is responding to the vision of a dark future that will result from this turn of events; and (3) state his claim that "it is time to begin thinking about whether—and how—we might avoid [this future] by adopting an arms control regime

designed to limit the development and deployment of robotic weapons" (paragraph 2). Sparrow is telling his readers, "This is what people are talking about. This is what they are saying. Here is why they are wrong. And here is why my proposal makes better sense." His reason for entering this conversation is to set readers straight. He wants them to see the situation as he sees it. Similarly, your goal as the writer of an argument-synthesis essay is to give your readers a better understanding of an issue that should interest them as much as you.

Sparrow's first move is to clarify the facts. Pointing out that popular newspapers and magazines have portrayed military uses of robotic weaponry in uplifting and future-oriented terms, Sparrow speculates that the distance between trigger and target will dissolve "psychological barriers to killing." He offers three general reasons to support his claim:

- Decisions about deployment will increasingly be left to robotic machines.
- Civilians will have little knowledge about what is happening.
- Dynamics motivating the scientific advancement of these machines imply that they will figure more and more prominently in military combat.

The remainder of the article develops and substantiates several particular, carefully researched reasons with evidence obtained from a wide range of sources recorded in the list of References. They include sources that report upon technological advances from a scientific and military point of view:

- *Parameters: U.S. Army War College Quarterly*
- *Aerospace Power Journal*
- *The Navy Unmanned Undersea Vehicle (UUV) Master Plan*
- *Air and Space Power Journal*
- *New Scientist*
- *Joint Robotics Program Master Plan*
- *Bulletin of Atomic Scientists*

And they include sources that report on ethical considerations from a political, philosophical, and moral point of view:

- *Governing Lethal Behavior*
- *Harper's*
- *New Statesman*
- *Science and Engineering Ethics*

All told, "Predators or Plowshares?" lists thirty-four sources. It is worth pointing out that Sparrow's format of documentation differs from ones that your professors will most likely expect you to use. We discuss the formats most commonly assigned in college courses, the MLA (humanities) and APA (sciences and social sciences) documentation styles, in Chapter 8 and in the Appendix. Here it is sufficient to note that in his section titled "References," Sparrow assigns a number to each of his sources, which he lists alphabetically according to the author's last name. In the body of his text, Sparrow

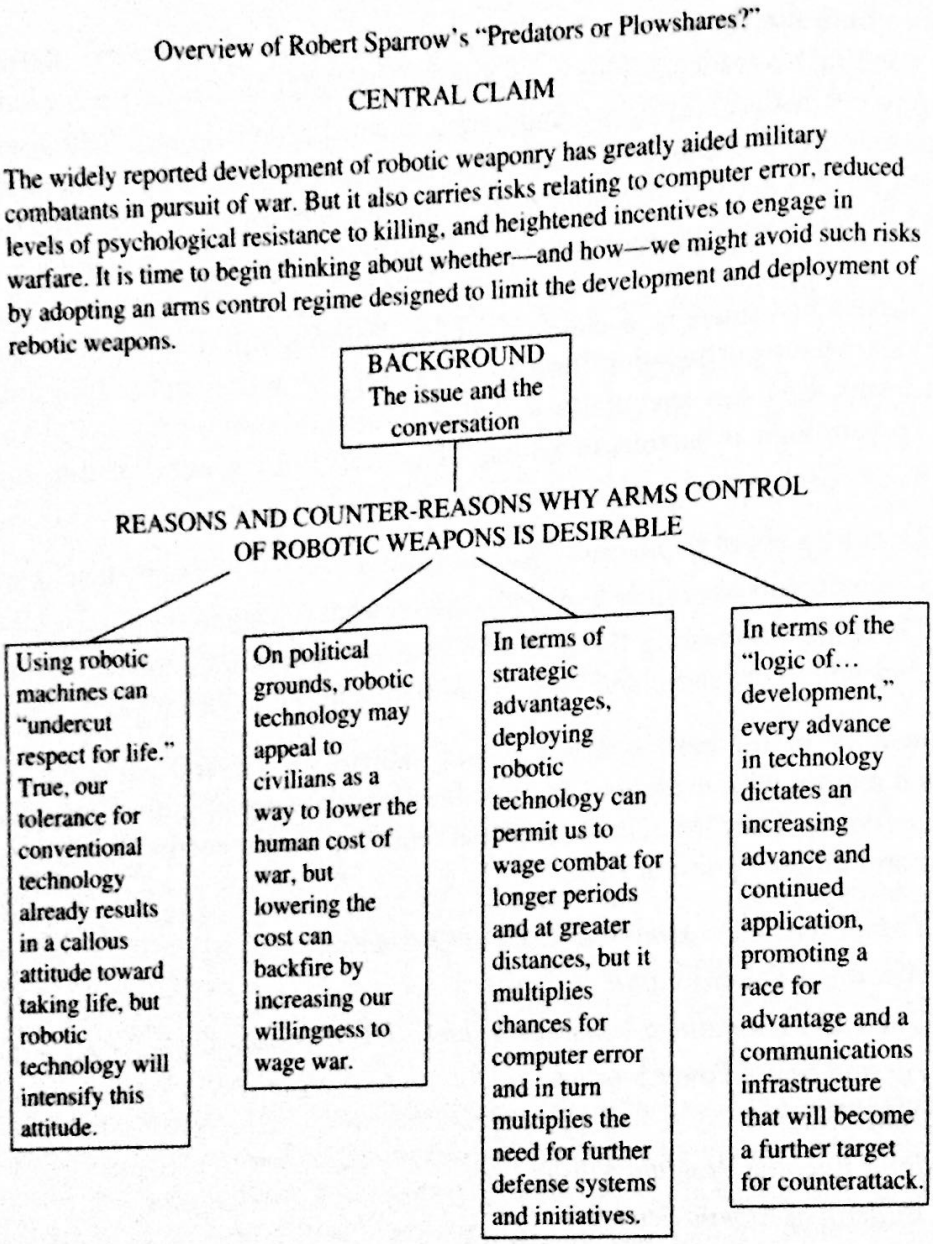

Figure 7–1

uses these numbers to direct the reader to specific titles in place of conventional footnotes. Many journals and publication houses have developed their own "house styles" to record an author's sources, and this article from the *IEEE Technology and Society Magazine* offers a case in point.

Sparrow's references to sources perform a double function. The hallmark of a strong argument is the writer's acknowledgment of alternative views. In this article, the author's sources serve to document military applications of robotic technology in recent warfare and to raise moral and political questions about its ethical use. These sources consequently register competing claims about the desirability and undesirability of assigning lethal tasks to computerized machines. On the one hand, robotic machines help to protect our armed forces and alleviate the stress of their operations. On the other,

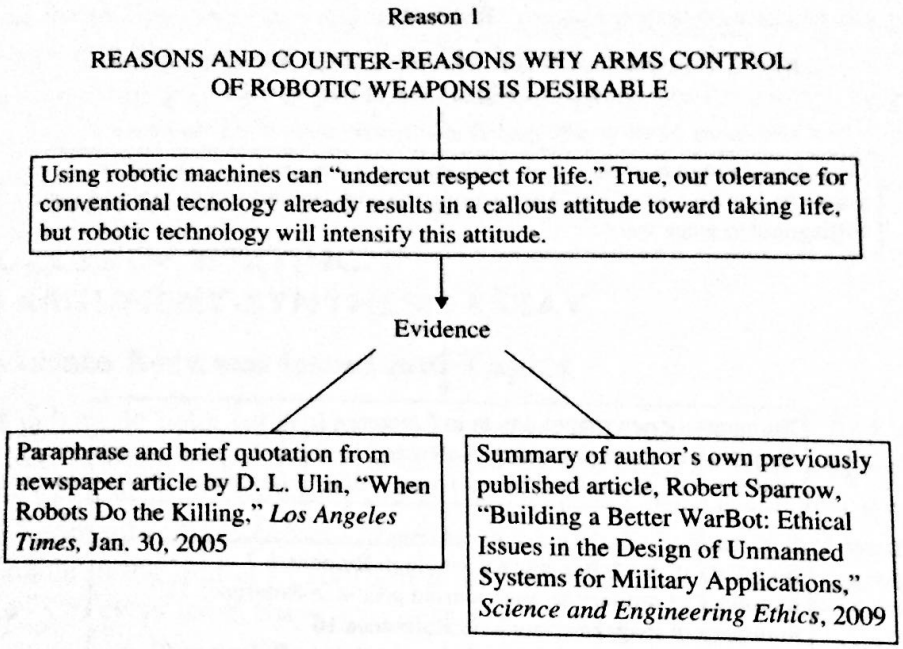

Figure 7–2

the possibilities of computer error increase chances of unintended devastation, the loss of human life, and an escalation of military conflict.

For example, in paragraph 3, Sparrow acknowledges the advantages of robotic technology in reducing the "'fog of war.'" In paragraph 4, he goes on to counter this view by arguing that "each nation's unrestrained pursuit of these advantages may result in a situation in which every nation is worse off than they would have been if none had set off on this path." In paragraph 5 he begins to enumerate specific reasons why this is so, in some cases qualifying his reasons with alternative arguments and competing claims. Here he argues that using robotic machines can "undercut warfighters' respect for human life," but he also points out that our tolerance for conventional technology already fosters a callous attitude toward life. In paragraph 6 he argues that on political grounds, robotic technology may appeal to civilians as a way to lower the human cost of war, but he also points out that lowering this cost can backfire by increasing our willingness to wage war. Similarly in paragraphs 8 through 11, Sparrow examines the strategic advantages and moral disadvantages of deploying robotic technology. Finally, in paragraphs 12 through 14, he examines the "logic of the development" whereby every advance in technology dictates an increasing use of that technology despite diminishing returns. Once technology advances, history shows that people use it willy-nilly for better or for worse. Consequently, Sparrow argues, we must institute responsible controls when using the new robotic technology.

In Figures 7–1, 7–2, and 7–3, we provide graphic overviews of Sparrow's argument. Study these maps. They are good templates for an argument-synthesis essay. Figure 7–1 depicts Sparrow's claim, his presentation of background information, and the four chief reasons he uses to support the claim. In Figures 7–2 and 7–3, we flesh out two of these reasons by displaying the evidence he incorporates from the source texts.

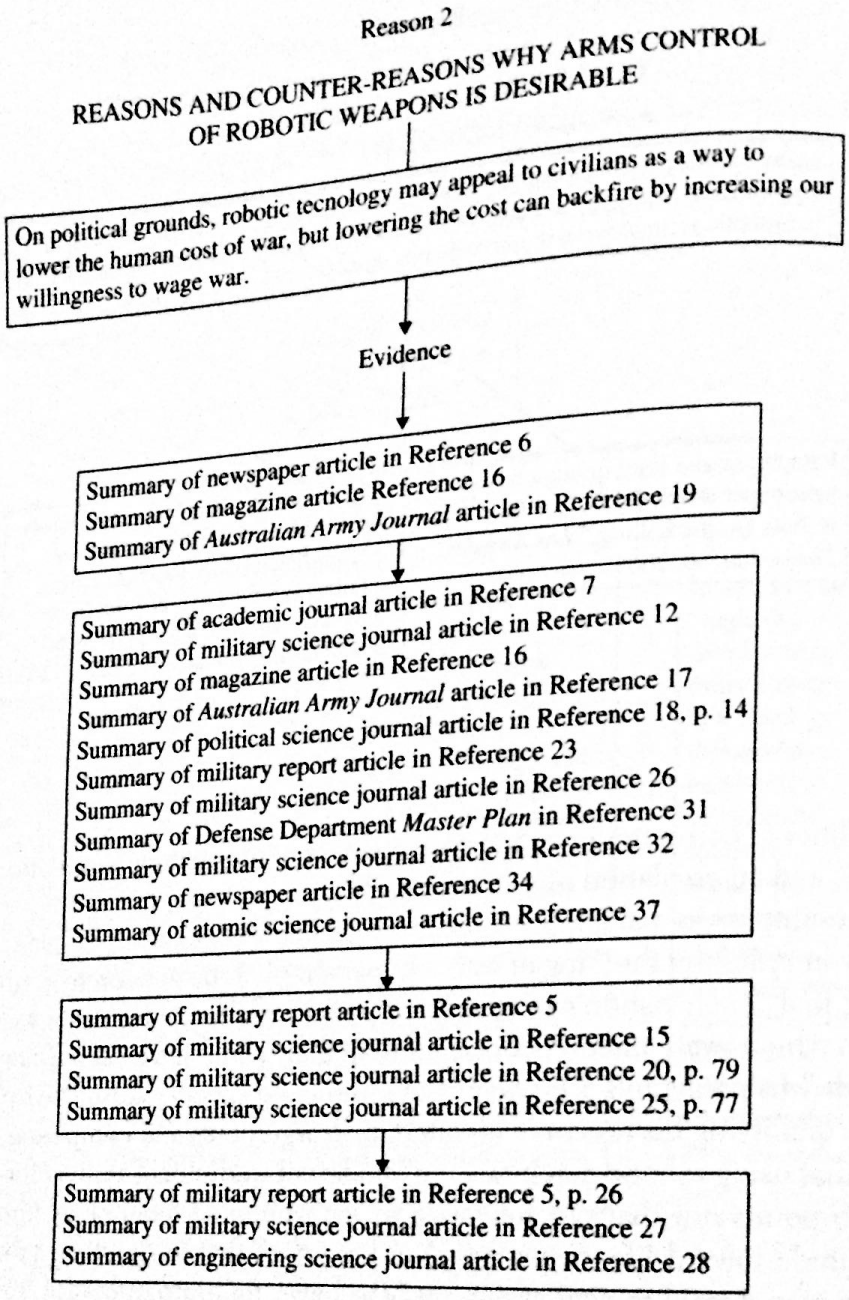

Figure 7–3

EXERCISE 7.1

- Review paragraphs 8–14 of Robert Sparrow's argument in "Predators or Plowshares?" Then break into small groups. Assign one of the following subsets of reasons to each group:
  - Robotic technology will make it possible to deploy unmanned weapons for longer periods and at a greater tempo of operations so as to conduct more dangerous missions than manned systems (paragraph 9)
  - Robotic systems multiply the need for further defense systems that aim to destroy or protect them, escalating the logic that demands further development (paragraphs 11–12).
  - The logic of development increasingly places decision-making in the control of robotic machines, promoting chances for computer error and for a competitive race in advancement among military nations (paragraph 13).