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A Historical Institutionalist Account of Galileo Satellite Navigation

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CHAPTER 1: THE GALILEO PUZZLE AND RESEARCH DESIGN

In outer space, duality is a defining characteristic of humanity's achievements. On the one hand, space has represented an area of great hope and idealism for decades. Scholars, artists, and policymakers alike viewed the stars as a unique place for human behavior above the petty squabbles on Earth. The many remarkable technical leaps and achievements, from placing the first objects in orbit to the first man walking on the moon, were almost always framed as collective accomplishments. These efforts were viewed by many as undertaken by states not for individual gain but for the species as a whole. The defining treaty signed by all current space powers, the Outer Space Treaty, is perhaps the seminal document outlining this idealistic perspective (Klinger 2021). In it, the treaty defines outer space as "the province of all mankind" (United Nations Office for Outer Space Affairs) and discusses outer space governance in grand, species-level terms. It was hoped in the 1960s that outer space would give mankind the chance to set aside its terrestrial flaws and create a better society in the stars.

However, the actual actions of states in outer space suggest otherwise. The reality of human efforts in outer space has always been deeply entwined with the most basic of national instincts. As Bowen so well illustrates in his 2023 text "Original Sin," outer space has been a militarized zone susceptible to the harsh realities of international competition since the very beginning of humanity's journey outside of the confines of Earth's atmosphere (Bowen, 2023). He demonstrates that outer space has always been inextricably linked with national security interests, and he further outlines that it was these considerations that primarily justified the enormous costs and efforts required for achievements in outer space. In short, Bowen convincingly outlines that humans' efforts in outer space have always been a discussion of power politics, even if the rhetoric of outer space has downplayed that reality.

This work brings the lens down to just one type of outer space technology: satellite navigation, which has quietly become ubiquitous in the daily lives of billions of civilians

(Canadian Space Agency, 2020). Yet, at the same time, it constitutes a critical element necessary for most modern military operations (Smithsonian, 2013) (GPS.gov, 2023) (US Air Force Recruiting, 2021). The military aspect of this reality is discussed regularly surrounding all satellite navigation systems, each of which can be located within the military establishment of the state responsible for their creation and maintenance. In some states, entire branches of their militaries consider it a primary mission to protect satellite navigation systems, such as the United States Space Force (US Air Force Recruiting, 2021).

Nevertheless, the story of satellite navigation in Europe becomes more peculiar and fascinating in many ways. As one of only four global satellite navigation systems, Europe's Galileo satellite navigation system constitutes an enormous investment in critical security infrastructure. Despite this, when the project is discussed, the emphasis almost inevitably is on Galileo as a civilian system controlled by a civilian supranational entity (European Union Agency for the Space Program, 2011; European Space Agency, 2016). This is in keeping with the first face of the duality of outer space technology, in which outer space projects are presented as vehicles for greater levels of international cooperation and the overcoming of base power interests. This is also in line with the understanding of the European Union and its predecessor organizations as civilian organizations with primarily civilian mandates.

However, the real story of Galileo is less idealistic than Europe likes to present it. Or, at least, it is idealistic in a different way. Relying on recently declassified and newly explored European archival documents, this work looks to resolve the puzzle generated by this apparent disconnect between civilian rhetoric and strategic reality that defined Europe's journey toward satellite navigation. This is achieved by highlighting the peculiarity of the institutional development of European states, defined by their participation in a broadly understood European Institution present since the end of the Second World War.

Before delving into the details of this puzzle, though, understanding why satellite navigation is so strategically important is vital. The strategic importance of satellite navigation is a surprisingly little-discussed reality outside of those who specialize in it or are directly involved in its use. This is likely another symptom of the civilian strategic duality surrounding outer space technology in the discourse. The first section of this chapter will attempt to rectify this disconnect. The chapter then follows with a discussion on this puzzle in

more detail and then concludes with a discussion on why current theoretical explanations do not resolve these puzzles as well as they should.

The Military Importance of Satellite Navigation

First, outlining why satellite navigation has such important military implications is crucial. Many discussions on satellite navigation tend to emphasize satnav's various civilian applications. These are numerous and influence the lives of billions of people every day, as mentioned previously. However, we need to understand that using satellite navigation for civilian purposes does not require a state to actually control a satellite navigation system and constellation. To enjoy the benefits of satellite navigation systems such as GPS, GLONASS, or Galileo, one simply needs a receiver capable of reading those systems' civilian signals. These are globally projected at all times and can be easily accessed with mass-produced equipment, such as those seen in most smartphones (Zangenehnejad & Gao, 2021). The use of the signals is also free and confers no revenue to the operating state or cost to the end user beyond the cost of the receiver itself (GPS.gov, 2023b). Most receivers in operation today, such as those found in smartphones, are capable of receiving civilian satellite navigation signals not just from GPS or Galileo but from all of the major satellite navigation systems at once (Zangenehnejad & Gao, 2021). This blanket strategy improves the resilience of such devices and allows them to get even more accurate location data than would be possible using one system. Given that reading such signals is free, there is no reason not to cast a wide net by using multiple systems. The vast majority of states accordingly operate under this logic and are more than content to let their civilian sectors rely on the systems that already exist for their civilian and industrial satellite navigation needs.

A state that does not possess such constellations only really runs into trouble when it needs such a system for its weapons and its military. This is a reality that multiple states have run into over the decades, most notably in the cases of India and China. China first found itself in such a predicament in the Taiwan Straits Crisis of 1996 (Chan, 2009), and India found itself in a similar predicament in the Kargil War of the early 2000s (Srivastava, 2014). In both cases, the US used its position as an operator of GPS to deny access to satellite navigation signals to these two states' respective militaries. This meant that China could not track its own missiles being launched over the Taiwan Strait, and India could not keep track

of its soldiers in the remote region where a conflict was taking place. Both events led directly to those states developing their own satellite navigation systems within the next two decades.

Such interference is possible because satellite navigation systems emit signals on multiple different wavelengths. Up until the year 2000, the US maintained a policy known as "selective availability" by which it could degrade civilian GPS signals in times of conflict. Though the policy has been rescinded, the US has stated that it intends to develop the capacity to degrade GPS signals on a regional basis instead of across the whole system (GPS.gov, 2013). This action was taken largely because GPS has become integral to civilian life globally. Degrading all civilian signals would be far too damaging for the US and its allies in all but the most extreme cases of international conflict.

For military use, all satellite navigation systems have dedicated channels with improved levels of resilience and accuracy. However, most critically, these signals have limited access through specialized receiver segments (Defense Advancement Staff, 2023). To access these signals, you need special receivers that are only produced for military use. This means that US military forces, for example, have access to the encrypted version of GPS signals through these receivers. These are given to soldiers, embedded in vehicles, or even integrated into smart weapons such as missiles.

Accordingly, when a state or supranational entity looks to develop an independent satellite navigation system, the benefits it enjoys are almost exclusively military and strategic. To enjoy civilian benefits, it is better to simply hitch a free ride off of the work and costs already borne by the states that have come before. This section will accordingly outline the specific military applications of satellite navigation systems in more detail and highlight just why they are so important for militaries.

The Military Applications of the Global Navigation Satellite System (GNSS)

The military applications of satellite navigation can be succinctly summarized in one statement: satellite navigation has made modern militaries more precise than at any other time in human history. A seminal work outlining this reality can be found in the 2002 work *Precision Revolution* (Rip & Hasik, 2002), written while this transition to satellite navigation dependence was taking place. Though much has of course changed since its writing in just

how precise satellite navigation-enabled technology has become, the transition from a pre-satellite navigation military environment to the current status quo was a remarkable one, and many of the core assessments of the text continue to hold twenty years later. The level of precision satellite navigation provided influences a host of different battlefield realities. These can be grouped into two main categories: precision in situational awareness and precision in the application of force. Precision in situational awareness includes improvements in being able to locate one's own forces on the battlefield and being able to better locate the enemy's. In force applications, smart weapons equipped with satellite navigation receivers can strike targets with a precision that was only dreamed of in the past. This section will accordingly explore these two broad categories and how satellite navigation has revolutionized these aspects of the modern battlefield.

Situational Awareness: Locating Oneself and the Enemy

> "The most dangerous thing on the battlefield is a second lieutenant with a compass and a map." US Marine Corps saying (Peckett, 2011).

This simple quotation outlines just how critical it is to locate oneself and one's targets on the battlefield. Soldiers who get lost in enemy territory have historically not had a high rate of survival. With the advent of long-range weapons, the need to orient oneself vis-à-vis the enemy has only become more critical in the last century. Very long gone are the days when most combat took place within the visual range of the hostile combatant, the norm for the vast bulk of military history. Simply knowing where one is in relation to the enemy is no easy feat, particularly when behind enemy lines. Satellite navigation has played a huge role in solving this issue. As previously mentioned, military signal receivers are embedded in essentially all modern military vehicles, from ships to aircraft to tanks and infantry transport vehicles. These receivers are capable of reading encrypted military satellite navigation signals on the system for which they are designed. For infantry, handheld satellite navigation receivers are carried with soldiers into combat. This allows both the user in battle to know where they are and the commander to locate their forces in real-time, even over great distances.

Land

Prior to satellite navigation, ground forces relied on visual cues, maps, and compasses to determine their location on the battlefield. Anecdotes about soldiers simply getting lost are plentiful, particularly when behind enemy lines in unfamiliar territory. In exceptionally hostile environments, such as jungles or deserts, this risk increases exponentially, along with the potential consequences. With the introduction of fast-moving armored vehicles in the twentieth century, the need to locate oneself quickly became even more critical for battlefield outcomes.

The introduction of satellite navigation into the scene has been a game changer. In the past, with very few roads and other landmarks, this necessitated stopping and processing one's location before moving forward on the battlefield. In fast-moving armored operations, for example, these halts could prove critical, giving the enemy precious time to prepare and ultimately defend themselves. Satellite navigation has also revolutionized the use of modern artillery, allowing for precise positioning relative to the enemy. In the past, artillery relied on visual cues and landmarks to help them locate strategic targets. With the advent of GPS, the mobility and accuracy of artillery over longer distances have improved enormously. Artillery can now be moved almost at will, and its orientation is immediately known as a result of satellite navigation tracking of these pieces. Artillery can then orient themselves to strike targets, knowing the precise distance required.

A representative example of the use of satellite navigation to its full effect in combat can be found in the First Gulf War, which took place in the early 1990s. The conflict pitted the GPS-armed US and coalition forces against Iraq with no such navigation capacity. The advantage was so profound that the conflict has since been referred to in some discussions as the first "space war." This was in reference to the fact that it was the first war where outer space assets proved definitive in the conflict's outcome. (Greenemeier, 2016).

The results of this disadvantage were devastating for the Iraqis. In the desert environment that characterized the conflict, traditional navigation methods using landmarks, road signs, and vegetation were not reliable owing to the absence of such features. GPS allowed the coalition forces to accurately navigate and maneuver their forces, essential for executing successful military operations in such challenging terrains (Greenemeier, 2016). Ironically, this made coalition forces better equipped to navigate the battlefield than the Iraqis, who should have enjoyed an advantage by virtue of fighting on familiar territory.

Additionally, GPS provided near-continuous positioning information, enabling coalition forces to operate effectively day and night, regardless of weather conditions or visibility. At the time of the conflict, the GPS system was not quite at full capacity, sporting only sixteen satellites (24 were required for the system to provide continuous global coverage) (Greenemeier, 2016). Despite this limitation, this coverage meant coalition forces had the ability to execute large operations even at night. This was a new reality in warfare enabled by GPS, in addition to advances in night vision capacities. The Iraqis, without access to satellite navigation, were accordingly relegated to daytime operations. This afforded the coalition forces a remarkable advantage because, while the Iraqis were forced into camp during the night, the US and its allies could continue to conduct large-scale operations.

The most famous battle of the conflict, emblematic of the US's superiority over Iraqi forces, was called the Battle of 73 Easting in February 1991. Though this battle was the most widely reported, the overall battle actually comprised three nights of conflict. This exchange pitted US-armored divisions against an even larger force of Iraqi armor. The battle became famous for a number of reasons, including illustrating the superiority of US tanks over Soviet models in Iraq's possession. However, its most notable feature was the famed "left hook" maneuver executed by US forces. In this maneuver, US forces were able to outflank the Iraqi armored positions, effectively encircling the larger force and thus destroying hundreds of Iraqi tanks in the process. Coalition losses were minimal (Newcott, 2021). The battle took place at night using night vision goggles and relied on GPS to provide situational awareness. Without GPS, this impressive feat would likely have been all but impossible. Constant communication, paired with navigation data and reporting, meant that US forces were capable of locating Iraqi positions with relative ease despite the featureless landscape and nighttime conditions. The Iraqis simply had no comparable counter and faced a crushing defeat.

A more recent example of the importance of the use of satellite navigation for situational awareness on the battlefield can be seen in Russia's invasion of Ukraine in 2022. Russia, equipped with satellite navigation through its GLONASS system, was expected to have the ability to use this advantage to great effect at the start of the conflict. As with many other aspects of Russia's military operation, though, it was unable to take full advantage of this apparent technological superiority. Though GLONASS is completely functional, Russia's military has been plagued by a lack of acceptable user segment receivers and electronic maps

(Peck, 2023). Despite this, Russia has successfully leveled the playing field from the navigation point of view by using dedicated jamming equipment since the start of the conflict (Howell, 2022a; Porter, 2023). The end result is that Russia has been unable to fully exert what should be a profound advantage in fighting against a satnav-disarmed opponent. This is much in keeping with many aspects of Russia's performance in the invasion since its start in the spring of 2022 and highlights how improper utilization of satellite navigation can result in suboptimal operational results.

Sea

Though the effects of satellite navigation on ground operations are profoundly important, at sea they are even more critical. The technology came into prominence decades before it was able to revolutionize conflict on land (Hodgden, 1984). The utility of satellite navigation at sea could be observed since the technology's inception in the late 1950s, a solid 40 years before its much more public debut on land during the First Gulf War.

Counterintuitively, satellite navigation as a technology was not initially developed for use by the US Air Force or NASA; instead, it was developed for the US Navy. During the late 1950s, the Navy was keen on developing nuclear missile submarines to add another prong to its nuclear triad (US Naval Institute, 2018). This was part of the top-secret Polaris project designed to develop nuclear missiles capable of launching from submarine platforms, no small feat at the time (US Naval Institute, 2018). Despite the successful development of the actual missiles for launch, the program still faced a profound problem. It was notoriously difficult to accurately locate nuclear submarines while they were underway, given the reliance on radio-based navigation systems at the time. Before such submarines were equipped with nuclear armaments, this problem was not quite so profound. However, when discussing the launch of nuclear missiles from submarine-based platforms, precision gained utmost importance. Being just a few kilometers off in calculating the launch location of a nuclear submarine could result in an enormous difference in the final arrival point of a missile and its nuclear payload. Given the destructive power of nuclear weapons, this lack of precision poses an unacceptable risk.

For modern navies, satellite navigation can now be considered critical to their good function. Naval vessels of all stripes rely on satellite navigation to locate themselves at sea

both during and outside of active combat operations (GPS.gov, 2019). Without satellite navigation, ships would be forced to rely on radio navigation techniques or more traditional celestial navigation, both of which have profound limitations in the modern military environment. Through satellite navigation, modern navies now have the ability to locate themselves and targets with a level of precision previously only dreamed of. This has, at least on paper, made naval assets far more valuable in both operations at sea and acting as support for operations on land. However, since the integration of the technology into military affairs, no large-scale naval engagements in conflicts have been necessary. Accordingly, there have been calls in the US Navy for better preparation for what the Naval Institute calls "Navigation Warfare" (Carrillo, 2022). This preparation involves being ready for situations where satellite navigation is denied to vessels. Satellite navigation capacities have become so integrated into modern naval strategy that they have been referred to as the US Navy's "Achilles heel" (Carrillo, 2022). This sort of discourse underscores just how ubiquitous satellite navigation technology has become for navies in their day-to-day operations.

Air and Space

Similar to the naval arena, air and spacecraft are particularly vulnerable to poor navigation information. Given that aircraft operate at great speeds and heights without the consistent ability to rely on landmarks for guidance in inclement conditions, the navigation issue has haunted air operations from the start. The previously mentioned work, *Precision Revolution* (Rip & Hasik, 2002), outlines how this need for precision could be rooted primarily in the needs of air forces. When air forces came fully into their own in the Second World War, a seemingly endless cycle of navigation problems emerged, followed by creative innovations designed to solve those problems, a history that Rip and Hasik outline excellently in their work (Rip & Hasik, 2002). However, it is relevant to note that the actual use of satellite navigation in aircraft was not really possible until the 1990s (Connor, 2017; Baker, 2020). Despite this relatively late introduction, satellite navigation completely revolutionized air operations.

Prior to the use of satellite navigation, aircraft relied on radio navigation to position themselves relative to their targets (Baker, 2020). The various forms of this system were relatively reliable. However, they suffered from a few main drawbacks. First, previous systems were reliant on good weather to function. Satellite navigation systems are practically

immune to weather considerations and allow pilots to navigate and operate in all weather conditions. Second, radio systems only allowed pilots to operate in areas where radio signals could be broadcast. Satellite navigation, by contrast, gives pilots coverage either globally in the case of a true GNSS or regionally in the area covered by a satellite navigation constellation. Additionally, satellite navigation is more precise and allows pilots to know their precise location at all times. When combined, it becomes clear that satellite navigation-equipped air forces enjoy profound benefits over adversaries lacking that capacity for their air operations.

Furthermore, as outer space becomes an increasingly important domain for military operations, satellite navigation is poised to play a central role. The US, Europe, and Russia each have plans to place satellite navigation constellations above the surface of the moon to support future settlements and operations. These are respectively the US's LunaNet program (Baird, 2021), Europe's Moonlight Initiative (ESA Editors, 2020), and a portion of Russia's broader Lunar Exploration Program (GPS World Staff, 2018). The same benefits that militaries enjoy on Earth (excluding those for navies) could be leveraged on the Moon's surface if the satellite navigation systems were placed in lunar orbit.

Application of Force: Unprecedented Precision

Smart Weapons

Though the advantages conferred by satellite navigation in situational awareness are profound across all different combat theaters, these advantages merely scratch the surface when it comes to the level of precision satellite navigation has given to modern military commanders. As satellite navigation receivers have miniaturized, they have been placed not only in military vehicles and into the hands of infantry but in the munitions themselves. Initially, this was limited to missiles, yet in recent decades, smart weapons have proliferated substantially. This means that not only can commanders know precisely where their forces are, but the very projectiles that soldiers fire can now effectively position themselves and the enemy autonomously. This section will explore how satellite navigation has become a key component of the use of these smart weapons in recent decades.

Guided Munitions

Precision-guided munitions actually cover various different types of semi-autonomous weapons. The key aspect of what makes a weapon truly precision-guided is actually a topic of some discussion. However, the best way to identify smart munitions versus their unguided counterparts is to compare them with “dumb” munitions. When compared with dumb munitions, guided projectiles have the ability to guide themselves to their targets after being fired, either autonomously or with human intervention. Dumb weapons, by contrast, do not.

As with the introduction of satellite navigation for land and air warfare, the development of satellite navigation-enabled smart weapons began in the 1990s. During that period, satellite navigation receivers became miniaturized enough to be placed on missiles, allowing for constant tracking of projectiles after they were fired. When combined with guidance systems, this allowed operators to fire missiles and adjust their course after firing. Discussions were already prevalent by 1996 (Frost & Lachow, 1996), outlining the risks and remarkable improvements that satellite navigation was making in the field of smart weapons. By that time, such receivers were prevalent enough to be in the hands of developing countries and non-state actors, provoking enough concern to warrant meetings in St. Petersburg between the US and Russia at the time (Frost & Lachow, 1996). The meeting of these two powers was relevant, as only GPS and GLONASS were in operation in 1996, and it highlighted just how important established military powers viewed the development.

Since the 1990s, these advancements have only proliferated more broadly and increased in precision. Precision-guided munitions are now present across all domains of modern battlefields. With increased resilience from ever-improving satellite navigation signals, this is a reality that is set to accelerate in the coming years, with more platforms being able to consistently rely on satellite navigation signals in combat. Additionally, the proliferation of satnav systems and advancements in receiver manufacturing in particular mean that smart weapons are becoming increasingly dispersed amongst national militaries. As it stands, all major military powers that operate satellite navigation systems employ smart weapons in some way, either through guided missiles, guided artillery shells, or guided bombs.

Summation of the Military Importance of Satellite Navigation

In summary, we can return to the previously stated fact: satellite navigation has made modern militaries more precise than at any other time in known human history. Satellite navigation has completely revolutionized situational awareness on the ground, at sea, and in the air, and is set to do so in outer space. It has also revolutionized the application of force, allowing for precision-guided munitions, drones, and other forms of smart weapons to proliferate on a global scale. Though this section of this chapter very much provides the reader with a bird's-eye view of satellite navigation's military applications and importance to modern militaries, it well establishes the fact that satellite navigation is a critical piece of military infrastructure across all major operational domains. This is fundamental to understanding the puzzle that will now be explored in the following section.

The Galileo Puzzle

The story of Galileo is a long one. Europe's broad satellite navigation development effort can be traced back to at least 1958 and can be rooted in no fewer than three institutional forums: the Western European Union (WEU), the European Space Agency (ESA) and its predecessor organizations, and the modern European Union and its predecessor organizations. Galileo has had a plethora of names, sources of financing, and a staggering number of different justifications throughout its multi-decade developmental history. The full story of Europe's satellite navigation project is still yet to be completely told, and this study looks to place itself as one step in that process. In the research undertaken for this study, it was noted that there are still multiple ESA and European Union documents related to Russia's involvement in Galileo's development that have prohibitive classification timelines. The latest observation is not set for declassification until 2046.

Regardless, a key aspect that has defined the public political discussion of the project has been that the European Satellite Navigation System would be accomplished for civilian purposes and remain under civilian control. According to the European Union, this is still the case. It is regularly touted that Galileo is "the only civilian-controlled global satellite navigation system" (EUSPA Contributors, 2023) in the world. The European Union presents this as a strength, distinguishing the system from its military-controlled alternatives (EUSPA Contributors, 2023).

This disconnect, though, presents us with some initial questions. First, if this is primarily a civilian project, why is it subject to such extensive classification in the documents behind its founding? Second, why are so many of those documents located in security institutions, namely, the WEU? Finally, at a more fundamental level, if civilian European users could already rely on GPS and GLONASS when they decided to pursue Galileo, what possible gain would the European Institution and its member states have in investing the impressive amount of time and resources necessary to simply duplicate these capacities?

The simple response to all these initial questions is that Galileo was and continues to be primarily motivated by security considerations. To address the final question, though, as to what gains Europe would have enjoyed, the answer is that there were few to none. Galileo, in the end, would turn out to be remarkably expensive and time-consuming, and at no point has the asset been able to generate civilian returns in the form of revenue. In the end, Galileo would find itself under the control of the European Union, which is responsible for its maintenance and costly upgrades as time passes.

This leads us to a more profound puzzle, though, from an international relations perspective. Namely, why would Europe's relatively powerful states be willing to entrust such a critical piece of military infrastructure to an international organization?

It is this puzzle that touches the core of the explanatory theory of international relations and will be the main subject of this work. It is well established across multiple theories that powerful states, from superpowers to regional middle powers, develop military capacities for their own security benefit. A key component required to enjoy that benefit is the necessity of maintaining control of their own military equipment and infrastructure. This is a right that nearly all states jealously protect. In the literature on arms cooperation, there are very few to no documented cases where jointly developed military assets are then shared by multiple states. In nearly all cases, such as the case of the Eurofighter or jointly developed European destroyers, ultimate control over the developed assets remains firmly under the command of national capitals.

Satellite navigation development and control globally fit in this expected pattern. Every state that has developed satellite navigation capacities has done so for their respective militaries, which have then maintained control of these constellations, even in cases where

the development process was cooperative. This reality stands across geographic location, power distribution, regime type, and, of course, the many different ideational motivators present in state behavior. Why, then, does it not hold in Europe? Why were France, Germany, Italy, and, at least before Brexit, the United Kingdom willing to allow control of such an important military asset to remain in the hands of a supranational organization?

The remainder of this work is dedicated to solving this puzzle. It is accordingly structured as follows: First, the second portion of this chapter will outline alternative explanations for this behavior and illustrate why these are not sufficient to explain European states' decisions to supranationalize satellite navigation. The second chapter will then outline the theory upon which this work will rest, namely historical institutionalism. It will also outline the formal research design. The third chapter will then address the current state of satellite navigation, touching on its key components, its basic function, and outlining the various systems controlled by states around the world. The third, fourth, and fifth chapters will address the case studies as outlined in the research design. The final chapter will then outline this work's conclusions and include some potential avenues for further exploration of this remarkable story.

Theoretical Framework and Research Design

In chapter two, the formal weaknesses of other international relations theoretical frameworks will be addressed in further detail. In this section, the theoretical framework of this study will be outlined, relying on a neo-institutionalist theory to get at the heart of that explanatory issue. The theory that was chosen to best address these problems is historical institutionalism, which allows for a wider understanding of the nature of institutions embedded in time. That theory will now be expounded upon in more detail, covering its key aspects and how it will be applied through the remainder of this work. This chapter then finishes with a formal research design reflective of this theoretical framework.

Historical Institutionalism in The Social Sciences

In keeping with Steinmo's (2008) assessment of the approach, historical institutionalism "is neither a specific theory nor a specific method." It is instead "best understood as an approach to studying politics and social change." In short, historical institutionalism is a broad

approach that takes time seriously. That is, it is a neo-institutionalist approach that emphasizes the importance of time and historical context in explaining phenomena in conjunction with institutions. In the cited chapter, and in keeping with his position as a key historical institutionalist scholar, Steinmo breaks the fourth wall in many ways, providing an excellent historical institutionalist account of historical institutionalism's place within the broader social sciences. In it, he traces its ancient origins back to the works of the political thinkers of Ancient Greece, outlining how historical methods paired with institutionalism have been a near-permanent fixture in the social sciences. This introduction will briefly hit the highlights of this account to contextualize the approach's place in the political sciences before moving on to the details of its core concepts and prescriptions. Like any good historical institutionalist work, it is fundamental to know the context in which something, even an academic theory, exists to properly understand its nature.

Historical institutionalism in its initial forms was the default approach in secular political thought for nothing short of millennia. Scholars have relied heavily on historical context, comparison, and the analysis of institutions in generating political insights from ancient times to the present. The tradition goes back at least as far as Plato's "Republic," in which Plato compares various institutional arrangements in ancient Greece. In it, he offers his assessment of the pros and cons of different systems based on differences he could observe in their institutional structures and the effects they generated, relying on historical examples to bolster his claims (Plato, 2013). In short, Plato's work represents something of a prototype for the historical institutionalism of the present.

The roots of the modern, more formalized version of historical institutionalism can be traced to Max Weber in the early twentieth century, specifically his seminal work "The Protestant Ethic and the Spirit of Capitalism" (Weber, 1905; 2017). In that work, Weber outlines how institutions, in this case, the Protestant religion in the form of Calvinism, contributed to the rise and permanence of capitalism. During Weber's period, formalized institutionalist insights were beginning to be applied regularly in practical political decision-making, a factor that would color the continued use of that method throughout the twentieth century and into the present. In the nineteenth and twentieth centuries, there was a particular emphasis on formal, written institutions in the creation of new states in the social sciences. Expertise was valued in the creation of fundamentally new societies rooted in new and innovative institutions across the Western world. These took the form of constitutions and the

written law codes of the new polities, usually following some form of revolution. The design and implementation of these institutions were considered paramount at least since the American and French revolutions and were viewed as tools of social stability or social change, depending on one's objectives. In keeping with the scientific spirit of the age, institutionalist scholars were regularly drafted into these various constitutions and legal design efforts across the globe throughout the nineteenth century up through the 1920s, with their expertise in institution design being of paramount importance.

The creation of the Weimar Republic in post-imperial Germany is perhaps the most notable of such efforts relevant to the development of historical institutionalism in the twentieth century. Acting as experts and using institutionalist insights, the expectation was to create a perfect democracy in Germany through the intellectual tools provided by the most modern social sciences at the time. Scholars were consulted in the creation of the Republic, a democracy designed to exist embedded in the most ambitious institutional project undertaken by that time in the form of the League of Nations. In many ways, the brainchild of scholar-President Woodrow Wilson (Cooper, 1982), the League of Nations represented a global effort at reshaping the institutions of international affairs themselves to prevent the power politics that caused the First World War. It was based heavily on the institutionalist insights of the time, which Wilson, as former President of Princeton University and noted political science academic, was thoroughly conscious of.

Of course, both the Weimar Republic and the League of Nations ended up being some of modern history's more spectacular political failures. Despite following the scientific methods of the political experts at the time, the Weimar Republic not only collapsed but was also followed by the rise of the Nazi state and the horrors that the regime unleashed. Blyth (2006) illustrates how this failure, in addition to the failures of the League of Nations to address German, Japanese, Italian, and Soviet aggression during the 1930s, destroyed most of the credibility that institutionalist theory enjoyed in the first part of the twentieth century. At the tail end of the Second World War, a conflict that these failures spawned, the academic world of political science found itself at an epistemic crossroad. Karl Lowenstein (1944) wrote in the American Political Science Review in 1944, a phrase that encapsulates the spirit of the time best. In it, he states that to overcome these past errors, comparative politics would have to become

> "a conscious instrument of social engineering" because "the discipline had a mission to fulfill in imparting our experience to other nations…integrating scientifically their institutions into a universal pattern of government." (Loewenstein, 1944)

When using the term "scientifically," Lowenstein refers to a more empirically driven, physics-like interpretation of the scientific method as opposed to the less directly measurable institutionalist methods of the past. In keeping with this academic call to arms and equipped with notable funding from organizations such as the National Science Foundation in the US (Steinmo, 2008), political science embarked on two distinct paths away from institutionalism. This was done in a bid to generate a more empirical form of political science that could have theoretically prevented or at least predicted the horrors of the decades from the 1920s to the end of the Second World War.

The first path involved a move away from the study of institutions toward the strict study of behavior. The idea was to study politics only to the extent that it was empirically measurable and bring political science closer to its brethren in the "hard" sciences. The idea was that to generate legitimate conclusions, political science needed to follow the scientific method in its purest form. This included the true falsifiability of conclusions and the ability to reproduce results. The order of the day was micro-analysis of data, including only empirically observable behavior such as voting and responses to surveys. Steinmo characterizes this strain as the search for a "periodic table of politics," which would ultimately allow political scientists to divide political behavior into all of its component parts and make predictions accordingly.

The second stream moved in the other direction and focused exclusively on grand theory. Such theories included the likes of mid-twentieth-century variations of Marxism, functionalism, and rational choice models looking to explain all political behavior within clear, universal theoretical frameworks. In keeping with the conclusions of Smelser et al. (1956) that all countries fundamentally face the same problems regardless of historical period, the logic was that similarly grand theoretical explanations could be found and ultimately generate useful solutions. Steinmo characterizes this stream as the search for a political "theory of everything" by which all political behavior could ultimately fit neatly within a universal theory. The embodying quotation for this mindset could be found in the 1970 work "The Logic of Comparative and Social Inquiry." This work states:

> "The pivotal assumption of this analysis is that social science research…should and can lead to general statements about social phenomena. This assumption implies that human behavior can be explained in terms of general laws established by observation." (Przeworski & Teune, 1970).

Despite these efforts and the many contributions these two streams provided, there remained scholars who questioned whether they were providing accurate pictures of social phenomena. These scholars continued with an emphasis on institutions and would ultimately coalesce around the Neo-institutionalist theory, of which historical institutionalism is a part. This occurred in the late 1970s and accelerated rapidly in the 1980s, in particular with the publication of "The New Institutionalism: Organizational Factors in Political Life" in 1984, which coined the name of the movement (March & Olsen, 1984).

Neo-institutionalism eventually diverged into three streams. These are sociological, rational choice, and historical institutionalism. Institutionalist works, as their name suggests, involve the study of institutions and their role in political phenomena. They treat institutions most simply as established rules that ultimately determine the manner in which subjects, be they states or individuals, make political decisions and accordingly cause political phenomena. The rules under institutionalist theory ultimately structure behavior so completely that they tend to determine outcomes. This puts the theory in contrast to the previously mentioned streams that prefer behavioral observation and grand theory, though it is important to note that institutionalist theory does not dismiss the insights of either of these streams out of hand. Instead, much theoretical space exists for such insights to be embedded within institutionalist explanatory pictures, usually as a form of supporting evidence or mechanisms. Neo-institutionalism can in many ways be considered something of a third way, as it is open to insights that look to emphasize the institutional context in which behavior can be observed or theoretically based insights can be generated.

Where the three streams of neo-institutionalism diverge is precisely how they understand the nature of the actors whose behavior is being structured. For rational-choice institutionalists, subjects are individualistic, rationally motivated beings looking to maximize their utility. They make self-interested strategic decisions to improve their specific position. Institutions in this stream frame this strategic game by providing rules that imply costs or benefits when violated or followed. Sociological institutionalists take a broader view of

actors, eschewing the assumption that individuals are particularly rational or self-interested. Instead, they understand humans as "satisfiers" (March & Olsen, 1989) and creatures of habit existing within frameworks that define norms of behavior. It is these norms of appropriateness that then determine the way that actors behave. Institutions provide these norms through rules and accordingly guide human behavior.

Historical institutionalism initially represented something of a middle ground between these two. It argued that whether one behaves in a manner in keeping with rational choice or sociological predictions is reliant on the individual themselves, the nature of the rules, and, fundamentally, the broader historical context in which the case occurs. In some cases, the subject may be acting according to rational choice predictions as a rational, individualistic utility maximizer. In others, they could be following norms of appropriateness. In most cases, historical institutionalism posited the likelihood of a combination. The way that one prefers either set of motivations according to historical institutionalists was quite simple: looking at the case's historical record without preference to either of these interpretations.

Despite this openness to such variables, in recent years, the theory has distinguished itself as a genuine third institutionalist way. It now has a methodological toolkit focused primarily on the direct influences time and history have on institutions and the subjects that exist in them. In the following section, the key concepts that underlie this framework will be explored in detail; hence, they will not be covered much here. Suffice it to say that historical institutionalism is open to the factors important to both rational choice and sociological institutionalism, yet at the same time it brings key variables related to the passage of time and context into the picture. It emphasizes the sequence of events and the institutional context in which decisions are taken as critical to explaining political phenomena. Regardless of the variables being looked at, the theory relies heavily on directly examining the historical record without bias toward any specific variables or grand theories, instead looking to fully describe the case in all its complexity, embracing thick description instead of avoiding it.

As its name implies, historical context is of critical importance to historical institutionalist works. Steinmo outlines three main reasons why history is significant in the study of social phenomena. He states that, historical institutionalism emphasizes the fact that a political event occurs within a historical context that has a direct influence on its nature. Gerschenkron's 1962 work, "Economic Backwardness in Historical Perspective," is an

example of this, where he convincingly establishes that industrialization processes are fundamentally different based on their position in the historical record. He illustrates that latecomers to industrialization do not enjoy the same opportunities for trial and error as early industrializers, and accordingly, they find themselves in fundamentally different contexts during that process. If such cases were considered together within a traditional quantitative analysis of industrialization processes, this key element to the picture would likely be excluded and present an inaccurate picture. The second reason Steinmo presents is that actors learn from experience as history progresses. Accordingly, history is critical to explaining certain events as, over time, the fundamental nature of those events adjusts based on the facts that actors' observed in the recent past. Finally, Steinmo states that expectations in the present are molded by the past. He cites the example of the American intervention in Iraq, in which he states that, contrary to explaining the case solely using variables such as power politics or culture, it is critical to understand US decision-makers in their historical context. Within living memory of the start of the Iraq War, the US had defeated Germany and Japan in the Second World War and reconstructed functioning democracies in the ashes of previously authoritarian regimes. Furthermore, just a decade earlier, the US had found itself victorious in its struggle with the Soviet Union. The decision-makers accordingly reasonably expected toppling the Hussein regime in Iraq and subsequently establishing democracy in its place to be a rather straightforward, even easy affair. If the case is analyzed without taking history seriously, this critical component of the process can easily be lost.

To summarize this introduction, historical institutionalism is, in many ways, the original form of secular social science. In its modern form, it exists as a branch of the neo-institutionalist school that came about as a reaction to the behavioralist and theoretical schools of the mid-twentieth century. It is an approach that takes history temporarily seriously as a variable yet is open to the insights of both rational choice and sociological institutionalism, where appropriate. Institutions vary widely across time and historical context and have a direct impact on political actors and the events they generate. Historical institutionalism determines causation in a straightforward manner within cases: it looks directly into the historical record attached to those cases with an openness to a host of possible motivations, eschewing a primary focus on both highly controlled quantitative methods and abstract grand theories of explanation.

Broad Concepts and Their Interactions: Paths, Critical Junctures, and Path Dependence

With the broad picture of historical institutionalism introduced, including its historical context within academic history, the approach's fundamental concepts will now be explored. This section begins by highlighting the basics of the concepts to illustrate how they work with one another. In the following section, critical junctures and path dependence will be broken down in further detail with an eye toward their actual application in the research design. This is done to lay the foundation for their ultimate operationalization in the research design itself, which completes this chapter.

In the last decade, historical institutionalism's methodological toolkit has grown substantially. The crystallization of the tradition has resulted in a focus primarily on the role of time itself in political events and outcomes. Though the theory is by no means closed to alternative variables in generating its conclusions, this theoretical focus temporarily adds what was previously a much-needed ontological consistency to the framework.

This brings us to one of the first key concepts in historical institutionalism: paths. Paths are fundamental when approaching a case with historical institutionalism. When using this approach, one understands the time and the development of institutions to follow paths. This implies a linear movement from the past into the future. The passage of time along these paths has a direct effect on the subjects being studied and the actions they take as the institutions they exist in either remain the same or change. For the vast majority of time, institutions are understood to remain relatively stable and resistant to change tied to these paths, hemmed in by existing arrangements. This stability, crystallized in well-established institutions and sets of rules, keeps actors along these set paths of behavior, making radical change unlikely. This conceptual foundation initially made historical institutionalism particularly subject to the critique that it could not explain change in political science. A theory that cannot account for change was contended to be of little practical utility apart from description.

This is where the concept of critical junctures comes in. The concept can be traced back to the earliest days of the development of historical institutionalism, though its ultimate integration into the language of the tradition would not come until later. In the 1993 work by Collier and Collier (Valenzuela et al., 1993) on Latin American regime change, they coined the term critical juncture, defining it as "a period of significant change, which typically

occurs in distinct ways in different countries (or in other units of analysis) and which is hypothesized to produce distinct legacies." This concept drew on previous comparative political studies that empirically illustrated the concept without explicitly coining any such term (Lipset & Rokkan, 1967; Rokkan et al., 1970). The introduction of critical junctures into historical institutionalism would provide the framework with a clear causal variable, distinguishing it more starkly from its sociological and rational choice counterparts.

Critical junctures can be understood as having the following key characteristics: First, critical junctures are periods in time. Capoccia (2016) highlights that these periods of time must necessarily be short in relation to the time that precedes and follows such a juncture. They also imply a period of permissiveness where change is possible. Finally, critical junctures imply the creation of distinct legacies that continue on after a critical juncture has finished. Critical junctures are accordingly bookmarked by two other, distinct paths of time that mark a critical juncture's start and finish.

It is these produced legacies that constitute perhaps the most defining concept in historical institutionalism. The term used to describe these legacies is path dependence. Like critical junctures, path dependence as a concept can be traced to other academic sources before its integration into historical institutionalism. The origins of path dependence can be found in the field of economics, specifically in the seminal works of David (1985) on the economics of keyboard structures and their peculiar QWERTY structure and Broadberry & Arthur (1996), who studied the role of path dependence in the economy more broadly. Path dependence states that once actors find themselves on a certain trajectory, it is unlikely that they will diverge from this path because of the increased costs of divergence. These periods of path dependence in historical institutionalism precede and follow the previously outlined permissive periods of critical junctures. Periods of path dependence, accordingly, last much longer and are considered the status quo of political behavior. This concept is key in explaining why actors persist in behavior even if, by objective metrics, that behavior is no longer functionally efficient in some cases.

In summation, historical institutionalism primarily understands the social world in terms of paths along a temporal plane. Any actor or phenomenon being studied inevitably finds itself somewhere along that path, embedded in an institutional web that determines whether change is possible or likely. In brief periods of possible change, known as critical

junctures, space for the agency of an actor is available to alter the path they are on. However, for the bulk of time, subjects find themselves located in periods of path dependence where established institutions railroad their behavior, substantially limiting their freedom to alter the political landscape or make divergent political decisions.

Critical Junctures and Path Dependence Broken Down

With the broad concepts defined and their relationships established, it is now useful to break down the state of the concepts in further detail within the literature. Much work has been done in the last decade to give greater conceptual precision and clarity to these concepts, though there is still much space for contestation and improvement of these methodological tools. This more recent effort in the literature has guided the operationalization of the variables in this project and ultimately played a notable role in the interpretation of the empirical data on which it rests.

Critical Junctures

As previously established, critical junctures are brief moments in time when subjects have a disproportionate amount of agency to affect the institutions that will then define the subsequent state of path dependence. In 2012, Soifer added some much-needed precision to the concept, which has helped this work operationalize critical junctures in its presented case studies. Soifer distinguishes two conditions that are present at critical junctures: permissive and productive conditions. Permissive conditions are necessary conditions that loosen the constraints on the agency of the subjects. Accordingly, the introduction and removal of such conditions coincide directly with the beginning and end of a period of critical juncture. Productive conditions are then factors that operate in the presence of permissive conditions that encourage that change to occur. Soifer illustrates this in his study of the adoption of a specific form of industrialization in Latin American economies in the mid-twentieth century. The conditions introduced in their work include permissive conditions in the form of the Great Depression and the Second World War. These events fundamentally altered the geopolitics and economics of the region, allowing space for change. Without these, it is unlikely that such a change would have been possible, making them necessary conditions. In conjunction, productive conditions existed in the form of economic nationalist ideas present in the region. These ideas accordingly acted as productive conditions, in conjunction with

others, that encouraged change. Finally, a mechanism was introduced in the form of specific political coalitions of elites and organized labor that exploited these conditions and enacted change. These actors recognized the permissive conditions and acted in response to productive conditions, establishing a new industrial model in Latin America. Without the mechanism, despite the presence of permissive and productive conditions, change could have been avoided. This understanding of critical junctures is accordingly reliant on this formula: necessary permissive conditions enable a critical juncture and mark its beginning and end. Supportive productive conditions then encourage change, and observable mechanisms are present to execute the change. This study is guided by this understanding of critical junctures, and when critical junctures are posited, they will be outlined using this format to allow for better comparability amongst the cases in this study and any future cases studied following a similar methodology.

Path Dependence

Path dependence, though seemingly straightforward on its surface, is a contested concept within historical institutionalist literature. Though it is widely agreed that path dependence is a result of institutional constraints and reacts to critical junctures, the specific mechanisms that drive path dependence forward are still up for substantial debate. There are two main interpretations that can be distinguished by the level of intentionality implied by their understanding.

The first interpretation is that path dependence is a self-reinforcing process in which subjects have rational incentives to maintain the status quo. Pierson (2004) outlines this as a process "involving positive feedback" over time. In this interpretation, subjects within an institutional framework find themselves incentivized to remain embedded within frameworks as their benefits are reinforced and accordingly maintain a vested, rational (if not always conscious) interest in their preservation. The institution of capitalism provides an excellent example of this sort of interpretation of path dependence. In capitalism, the early winners in that system enjoy long-lasting, often multi-generational benefits. The longer successful actors exist within such arrangements, the less incentive they will have to change them as, over time, that institutional arrangement reinforces their benefits. In addition, as winners in the system, these actors have the ability to incrementally reinforce their position through small alterations in existing institutions that further reinforce path dependence. When faced with

alternatives that may be instrumentally more efficient overall, such subjects would naturally choose to maintain the status quo that works in their favor. Thus, path dependence is positively reinforced over time. Within this understanding, therefore, sequence is key. It is not merely the content of rule creation that matters, but also the order in which it occurs and the specific historical context in which that rule is created. The early winners, acting with a degree of either conscious or semi-conscious intentionality, will look to maintain their position of benefit and accordingly generate a path-dependent state. This specific interpretation of path dependence pairs particularly well with a more rational choice-flavored understanding of human nature, though it is important to note that the more unconscious preferences of sociological institutionalism still have a space in this interpretation. Actors can still generate positive feedback loops that reinforce path dependence unconsciously by acting in a manner in keeping with appropriateness as defined by their social class and position. This can easily be imagined without such subjects rationally calculating the utility of their options in a strictly self-interested manner, in line with a rational choice understanding of political behavior.

A second interpretation focuses instead on historical contingency. This interpretation, by contrast, considers path dependence to be something more akin to an accident than to an intentioned effort by entrenched stakeholders. Mahoney (2001) conceptualizes path dependence essentially as a state in which seemingly unrelated actions then determine seemingly unrelated phenomena in the more distant future. This is comparable to the Butterfly Effect, in which a small change in one state of a system could lead to significant differences in a later state (Chandler, 2020). In his work on Central America, for example, he outlines how a liberal-conservative split in the late nineteenth century in some Central American countries determined agricultural and state policies that followed much later. Where the split occurred, more authoritarian presidents responded to challenges in a similar manner, invoking harsh, more radical policies in their reactions. Where the split did not occur, there were more moderate policies taken when faced with similar problems. Essentially, this interpretation explains path dependence as occurring as a series of short-term actions and reactions that, over time, guide subjects and institutions along a period of path dependence with little to no conscious awareness. Single institutionally relevant events in the past, in this case, a late nineteenth-century liberal-conservative split, therefore exerted effects on policies without involving a clear link or awareness by the actors involved. This interpretation therefore heavily relies on the importance of sequence in its causal pictures and

understands critical junctures in a different manner than the initial interpretation. In this understanding of path dependence, critical junctures can be little more than small events that then generate enormous differences as time goes on, such as how a butterfly flapping its wings in Brazil can generate a tornado in Texas, as posited in Lorenz's illustration of the Butterfly Effect (American Physical Society Editors, 2003).

Both of these interpretations have their merits in explaining path dependence, and it is not within the scope of this study to address those too extensively. However, in this piece, path dependence has been understood based on the first interpretation of Europe's development of satellite navigation. Specific focus is accordingly placed on actors embedded within the European Institution and their potential motivations for keeping European states on their path to further integration since the end of the Second World War, both conscious and unconscious. This choice was made as the empirical research suggests that these actors were being guided by such notions quite explicitly as they attempted to create a new Europe through deliberate, incremental institutional choices at the European Institution level in response to some distinct critical junctures.

Summation of Historical Institutionalism in This Study

This section was designed to familiarize the reader with historical institutionalism and the approach taken by this piece in explaining European satellite navigation development. In it, the academic history of historical institutionalism is established, in which the approach's ancient origins are traced through its costly failures in the early twentieth century. Institutionalism's dormancy was highlighted in the mid-twentieth century as the academy focused on more behavioralist and grand theoretical approaches to the social sciences. The section then touched on its revival in the form of neo-institutionalism in the 1980s. It then concluded by outlining historical institutionalism's distinct stream within that broad tradition and finished by explaining the key concepts of historical institutionalism and how they interact in its theoretical framework.

With the broad concepts established, this section will outline how this study will work with the theory in practice. First, this work presents a strategy for working more seamlessly with both macro- and micro-political processes under historical institutionalism. It proposes a manner of linking broad macro-states of critical juncture and path dependence with more

granular political decisions. This is useful as it can allow scholars to bring in broader historical processes coherently when explaining microphenomena. With this method, mechanisms ought to be easier to isolate and observe where interactions between macro- and micro-processes interact. One ought to be able to observe, for instance, not merely that the Treaty of Lisbon has changed European state behavior, but precisely how and when that broad institutional arrangement exerted this causal change. This work is an exercise in this proposed method. Second, the concept of speed controls will be presented as another tool for refining the explanatory pictures that historical institutionalism can paint.

Interaction between Macro and Micro Processes

This work will undertake two streams of historical institutionalist analysis in parallel with one another. In each case study, the first section will address the macro-evolution of the state in question, and the second section will address the specific process involved in developing satellite navigation. With these two levels of analysis standing side by side, points of contact can be extrapolated, suggesting causality moving from the macro-institutional level to the micro-policymaking level. By using this method, a more complete picture encompassing both levels of analysis can be made to fully explain powerful European states' decision to supranationalize their efforts.

Introduced Concept: Speed Controls

With historical institutionalism's theoretical approach established and the broad strategy of the work outlined, it is now useful to address one of the major limitations that historical institutionalism, as an approach, faces. This is its inability to account for variations in change that occur during periods of path dependence within institutions. These periods do not quite arrive at the point of a critical juncture, yet merely labeling them as times subject to path dependence does not create a sufficient explanatory picture. It can be observed in almost any case that path dependence varies within the timeline being studied. At times, movement along a path can go quite quickly, while at others, stagnation can be the norm. This holds even though no true critical juncture capable of altering path dependence has occurred. Institutions can be observed still moving along the same paths toward some outcome, albeit at a different rate. When considering the broad story of the European Institution, for instance, there are periods where Europe makes rapid progress toward an objective and others where there is

notable stagnation. There is a theoretical temptation to simply label these periods of change as critical junctures; however, it is contended that doing so weakens the empirical validity of that concept, simultaneously not accounting for the picture in the best way possible. A critical juncture ought to be more strictly confined to times when the fundamental institutions themselves come into question, not merely a period when activity along a set path accelerates or decelerates.

It would be useful for the approach to include another factor for these adjustments in the rate at which subjects move in a state of path dependence. Therefore, this study proposes the concept of Speed Controls to fill this conceptual gap and enrich the insights gathered in case studies. Speed controls are proposed to cause actors to move more quickly or slowly along an institutional path toward the phenomenon in question. The two types of speed controls introduced here are accelerators that drive actors faster along a path and speed checks that cause them to stagnate.

To operationalize an accelerator, one should observe whether any external or internal changes appear in conditions that would encourage faster movement toward the phenomenon in question. These can include a wide variety of conditions, including external historical developments, notable changes in international conditions, changes in technology, or changes in governing coalitions. They can also include endogenous changes in conditions within institutions, such as minor rule changes, alterations in personnel, or any other change in condition that would make action toward the phenomena in question move along more quickly. By the same logic, to operationalize a speed check, one can look at similar data that would be conducive to inducing a period of stagnation.

The introduction of this concept is contended to be of great use in improving the toolkit for historical institutionalist scholars. First, it ought to allow for fuller explanatory pictures to be produced in case studies that capture more nuance in policy processes without undermining the theory's useful parsimony. More importantly, the introduction of these concepts can better solidify critical juncture's conceptual clarity by relegating the term to moments where true, fundamental institutional change has occurred and the stream of path dependence has been altered. The case studies presented here are accordingly undertaken to utilize these introduced concepts and provide the reader with an example of their use in practice. With these theoretical tools, the formal research design will now be elaborated.

Research Design

Question

The puzzle being addressed has two key components and accordingly spawns two separate questions.

1.) Why did relatively powerful European states choose to develop satellite navigation collectively?
2.) Why did relatively powerful European states then choose to assign control of satellite navigation infrastructure to a supranational authority?

Hypothesis

As there are two questions, there will be two hypotheses.

1.) European states chose to collectively develop satellite navigation because the European Institution altered the involved states' perceptions of their security mandate from a strictly national one to a more collective one tied to Europe. As the security mandate changed, this caused states' collective development of satellite navigation to become rational as the new community found itself in competition with other large powers in the system, most prominently the Soviet Union and the United States.
2.) European states chose to assign control of this collectively developed asset to the supranational European body for the same broad reason that they chose to collectively pursue it in the first place. Their embeddedness in the European project redefined the state's definitions of their security mandate, placing them in a state of path dependence. By assigning control of satellite navigation to the supranational organization, they could more efficiently compete with other large powers in the system at that higher level collectively, in this case, the United States, Russia, and a rising China.

Independent Variable

The independent variable in this study is the perceived security mandate of the state.

The state's security mandate comprises two elements: territoriality and individuals. Throughout all of history, states have had a mandate to govern and protect both lands and people and have codified this mandate in a multitude of institutional arrangements. It is hypothesized that as these mandates change and are codified in new institutional arrangements, the security behavior of the state changes accordingly to meet their new perceived responsibilities.

Dependent Variable

Considering the dual questions being addressed, we have two dependent variables. One is the policy decision to develop satellite navigation, and the second is the decision to assign its control to a supranational entity.

Operationalization

Independent Variable: The State's Security Mandate

The security mandate of the state is defined here as the territory and individuals over which the state believes that it has the right to exert legitimate force and which it has a responsibility to protect from external threats. Accordingly, to operationalize the security mandate of the state, two qualifications need to be considered. The first is the geographic qualification of that responsibility, and the second is the qualification of the individuals under the state's charge.

To determine the territorial element of the security mandate, we need to establish which precise territorial area the state believes it governs. This can be observed in many different sources, including the internal institutions of the state, the physical presence of the armed forces of that state, and the perception of the legitimacy of that state by other actors within the international system. Generally speaking, the more recent one finds oneself in time, the more explicit the mandate is in the form of codified law and constitutional arrangements.

To determine the individual element, one tends to look broadly in the same areas. The subjects over which the state believes it can exert legitimate force tend to be explicit in the form of constitutions and citizenship laws that define the subjects the security mandate of the state covers in modern times. However, it is important to also observe other factors that would indicate a perceived security mandate over individuals, such as the physical presence of the state's armed forces in a community. Other indicators could include an implied expectation of subjects to serve a state in some way, such as in the payment of taxes or service in the armed forces, even if those individuals are not explicitly citizens as understood in the modern context. This becomes particularly important when dealing with more historical cases, as explicit citizenship is a relatively modern concept.

In short, to observe the perceived security mandate of a state at a certain time, one can look at a myriad of factors, the most important of them being the institutions themselves that define territoriality and citizenship. However, it is also important to look at the actions of a state or decision-makers when operationalizing these mandates, particularly when they justify the use of their armed forces or the development of security assets. This secondary exploration becomes particularly important when institutions either do not exist or are ambiguous when defining such mandates.

Dependent Variable

The dependent variable's operationalization is quite straightforward. The dependent variable in the first question can be observed when the state chooses to pursue satellite navigation, and the second can be observed when it decides to assign control of that asset.

Case Selection

The selection of France, Italy, and India as cases for examining the European pursuit of the Galileo satellite navigation project is a strategic choice aimed at controlling key explanatory variables within international relations theory. Specifically, these cases help to isolate and analyze the influences of power dynamics and government type—two central factors in both realist and liberal institutionalist frameworks. By focusing on middle powers with similar governmental structures, this selection allows for a more focused comparison of why European states, particularly France and Italy, chose to cooperate on Galileo rather than

pursuing national initiatives independently or aligning solely with existing global systems like the U.S.-controlled GPS.

Differences in Power (Realist Explanations)

The concept of middle powers has been debated extensively since Giovanni Botero's seminal work in the late sixteenth century, which identified a category of states that are neither great powers nor minor states but possess significant regional influence (Botero & Bireley, 1589/2017). In this study, France, Italy, and India are considered middle powers during the period under examination, roughly from the mid-1950s to the 2000s. Middle powers are characterized by their capacity to influence regional affairs and their possession of significant, though not dominant, military capabilities (Mehmet, 2006).

Military Qualification

Middle powers typically maintain militaries that are robust enough to ensure regional security and exert influence but are not capable of unilateral global power projection. This military profile fits France, Italy, and India throughout the studied period. While France may have briefly straddled the line between a middle and a great power, particularly due to its nuclear capabilities and global reach in the early post-World War II era, by the 1960s, it had receded into a more regionally focused military role (Keohane, 1969) as it lost its previously world spanning empire. France's decline, particularly in military spending and overseas commitments, aligns it more closely with Italy and India, both of which have focused primarily on regional power projection and defense. The consistency of their middle-power status over time makes these cases particularly relevant for understanding the strategic choices made in relation to satellite navigation development.

Economic Qualification

Economically, these states also fit within the middle-power classification. The latter half of the twentieth century saw the relative economic decline of France and Italy compared to the rise of other global powers, while India emerged as a significant regional economy with an enormous population and resources to match. Despite these shifts, none of these states achieved the level of global economic dominance associated with great powers like the

United States, the Soviet Union/Russia, or China in more recent times. France and Italy, for instance, maintained substantial economic influence within Europe and certain parts of Africa, yet they did not either maintain in the case of France or attain in the case of Italy global economic hegemony (Knorr, 1975). India's growing economy similarly allowed it to assert regional influence without translating into global economic supremacy. The economic profiles of these states, therefore, reinforce their classification as middle powers and provide a basis for comparing their approaches to satellite navigation.

Government Type (Liberal Institutionalist Explanations)

The case selection also controls for government type, which is crucial for testing liberal institutionalist theories. France, Italy, and India have been stable democracies throughout the period under study, and each has been an active participant in the liberal international order. According to liberal theory, democracies are more likely to engage in cooperative arrangements, particularly within international institutions (Moravcsik, 1997). The democratic governance structures of these states, characterized by regular elections, competitive political landscapes, and active participation in international organizations like the United Nations, make them ideal for testing liberal institutionalist hypotheses regarding cooperation in global governance and security (Doyle, 1986).

The European Cases: France and Italy vs. Other European Options

France and Italy were selected as the primary European cases due to their consistent status as middle powers and their deep integration into the European project. Alternative European cases, such as Germany and the United Kingdom, present substantial challenges for comparative analysis. Germany, divided until the 1990s, had a unique security position as the frontline of the Cold War, heavily integrated into the U.S. security apparatus in the west and the Soviet security system in the east, making it an outlier in terms of independent national security decision-making (Hoffmann, 1966). This unique situation complicates the isolation of independent variables related to national security, rendering Germany less suitable for comparison.

The United Kingdom, on the other hand, was not a member of the European Union during the crucial initial phases of satellite navigation development. Its absence from the

European decision-making process in the early years of Galileo's development and its eventual exit from the European Union further diminish its suitability for comparison with France and Italy. The UK's late and often tepid engagement with the European project does not provide a consistent basis for comparison, as its national security policies were more aligned with transatlantic, rather than European, frameworks (Hill, 1993).

France and Italy, in contrast, represent two of the most committed members of the European integration process. Both nations had the capacity and, at least theoretically, the option to pursue independent satellite navigation systems but chose instead to collaborate within the European framework. This makes them ideal cases for examining why European states chose to pool resources and expertise in the Galileo project rather than pursuing national or transatlantic alternatives.

Conclusion of Case Selection

The selection of France, Italy, and India as cases for this study provides a robust framework for analyzing the strategic and institutional factors that influenced European cooperation on the Galileo satellite navigation project. By focusing on middle powers with stable democratic governance, this comparative analysis controls for key variables related to power dynamics and government type. The decision to exclude other European states like Germany and the United Kingdom is justified by their unique political and security contexts, which differ significantly from those of France and Italy. This case selection thus allows for a more precise examination of the factors that led European states to pursue the Galileo project as a cooperative venture within the framework of European integration.

Case Study Structure

The case studies here will accordingly have the following structure, standardized as best as possible to allow for useful comparison. Broadly speaking, they will be in keeping with the prescriptions outlined by George and Bennet (2005). However, as opposed to following a strict process-tracing method, the structure of these case studies will take a more narrative form.

In each case, the first step will be to outline the historical evolution of the state's security mandate. This will trace the evolution of that state from its last traditional governmental form, usually that of an imperial or feudal model, to its macro-institutional status upon its development of satellite navigation. In keeping with the operationalization of the security mandate, the relevant territorial and individual components of that mandate will be addressed separately over the relevant timelines. In the case of India, this includes the Mughal Period, the Colonial Period, and finally independent India. For France and Italy, which had no colonial period, this will instead cover the pre-national period, the nationalist period, and ultimately the internationalist/European period. The selection of these timelines coincides with the constitutional evolution of these states and their armed forces.

Next, a historical institutionalist analysis of their efforts to develop satellite navigation will be developed. This will include the critical junctures in that process, such as the foundation of a relevant national space agency. Following the critical junctures, the relevant state of path dependence related to satellite technology development will be elaborated.

Upon completion of a case study, there will accordingly be two sections: one outlining the broad institutional status of the relevant state and a second outlining the policymaking process. Both will use the concepts and language of historical institutionalism, allowing for comparison among the cases and outlining the relationship between the macro-institutional level and individual policymaking.

Upon completion of all three case studies, a comparison between the cases will be undertaken in the final section, and conclusions will be presented.

Data

The data that will be relied upon for these case studies, in keeping with the historical methods being applied here, is diverse. For the more historical sections outlining the traditional institutional frameworks, many insights will be presented from reviews within the literature based on the work of previous historians and political theorists.

However, as the timeline becomes more modern, primary sources will also be relied upon, including the historical and parliamentary archives of the states being observed. In the case of India, major sources include Indian parliamentary records of debates, records of the Indian space agency, and media reports on the actions of the state at the time. For the European cases, a mixture of archival data at the national and European levels was analyzed. For the establishment of institutional structures, treaties, constitutions, and government compositions will be considered when outlining the institutional timelines.

The institutional sources are diverse in these case studies in no small part because of the long timeline they cover. These include the WEU, the ESA, the European Union, and the many sub-institutions and committees relating to these larger organizations. For the representative case information from the Indian Space Research Organization (ISRO), the Indian Parliament, the Indian military, and other Indian state institutions are considered.

Some sources in this piece include internal minutes of meetings of experts and decision-makers in an area traditionally considered to be sensitive to state policy. Both security policy and outer space research and development have been and continue to be subject to extensive amounts of secrecy and government regulation. Therefore, it is important to note that, despite extensive declassification during the early decades of these processes, there are still expected to be holes in the full story. Where these appear, this work will not shy away from highlighting them and will do its best to fill in the blanks with reasonable inferences. Additional documents are being declassified over the next few years and decades that are likely to have relevance to this story. Of particular note is the role of Russia in the final stages of European satellite navigation development, a subject to which the European Union and its member states seem to be particularly sensitive. Documents related to this saga are not set to be open until the mid-2040s. Despite this, there is more than enough previously unexplored data to shed new light on these satellite navigation projects and the motivations of policymakers to pursue satellite navigation over the decades.

In addition to data gathered from formal institutional sources, this study will also maintain an openness to less formal institutional sources, in keeping with the work of Sven Steinmo et al. (2002). In that work, they outline the fact that “institutions” in historical institutionalism are not generally limited solely to formal rules but are also open to patterns of practice and even normative constraints on actors present in their societies. This will be of

particular importance when dealing with more historical cases and in the often nebulous sphere of European Union politics.

Expected Contribution

A Full Account of Satellite Navigation in Europe and India

Upon completion of these case studies, a full picture outlining the development of satellite navigation in each of these states will be provided. As of the time of writing, a full account expounding the strategic elements of Europe's satellite navigation story has not been produced, as previously mentioned, because all of the information is simply not available. This study hopes to represent a chapter in completing that story, one that will not be fully told until at least the 2040s. It is hoped that this work will also spur further study of the Galileo project, in particular the role of the WEU in its development.

Contribution to the Use of Historical Institutionalist Theory to Explain Policymaking

The unique structure of this dissertation, utilizing two streams of historical institutionalist analysis at two different levels of analysis within singular cases, ought to provide a template for further study of state policymaking, which looks to take time and institutions more seriously. It hopes to provide some much-needed structure and consistency in the application of historical context and institutional development at the macro level to observable political outcomes. The introduction of speed controls as an additional concept also looks to bolster the explanatory power of historical institutionalism when applied to specific policy decisions by states.

Insights on Supranational Institutions and the State

Finally, this work will also contribute to explaining the behavior of states in supranational contexts. Though the European Union is currently a unique entity, it is important to note that there are other proto-supranational organizations across the world in the form of MERCOSUR and the African Union. The work done on these states present in the European Institution could certainly be of interest in helping to predict the trajectories of other such

supranational projects in the coming decades, should they embark on paths toward further supranational integration.

CHAPTER 2: WEAKNESSES OF CURRENT THEORIES IN EXPLAINING THE CASE OF GALILEO

This chapter examines how some of the major theories in international relations fall short in explaining the Galileo satellite navigation project, in particular the behavior of the powerful European states. Of course, a novel in and of itself could likely be dedicated to even one of the major theories being touched on here, given the scope and diversity of theory within international relations scholarship. This, however, is not the purpose of this study. Accordingly, only the theories deemed to be most prevalent and applicable to this case have been chosen. These include realism, liberal institutionalism, and neo-functionalism. Furthermore, in this discussion, the focus has been narrowed to the most problematic assumptions or characteristics of the theory, which limit their explanatory power in dealing with the case of Galileo.

Realism

The realist tradition is perhaps least equipped to explain the Galileo project when considering its broadest assumptions. This statement is made with a strong caveat, namely that the realist tradition covers a truly staggering degree of diversity among its various theories. In the words of Smith (2018), “realism is not a monolithic theory of IR but rather a broad church ‘tradition’ that encompasses many different theoretical, methodological, epistemological, and ontological positions.” Some of the basic assumptions of realism hold that states pursue power and act as the key actors in international affairs. Realism focuses in particular on the importance of the pursuit of military power, undertaken for a variety of motives. The specific motives tend to coincide with the specific school of realism one is working under. These motives vary across the school and can be because of systemic pressure, in keeping with defensive interests (Waltz, 1979), or in line with an inherent drive toward power maximization seen in offensive realism (Mearsheimer, 2001). More recent versions, such as neoclassical realism, also open the door for ideational and domestically located intervening

variables to affect how states deal with the inherent systemic issue of power (Ripsman et al., 2016).

Accordingly, this discussion on realism does its best to focus solely on one problematic aspect of realism in explaining the specific case of Galileo. Realism fails to explain the Galileo case because of two of its foundational assumptions: the primacy of the state as the main actor in and institutional source of international relations phenomena and secondly the preponderance of states to prefer competition to cooperation regarding issues of national security.

Centrality of the State

If one were to consider Europe to be a sovereign state and its members to be constituent states in a sort of federal arrangement, realism would explain the decision to pursue Galileo very well and quite succinctly. The explanation would go as follows: Europe was looking to guarantee its own security and increase its power vis-à-vis potential rivals, namely, the US and the Soviet Union/Russia. Because of these power considerations, Europe built an alternative satellite navigation system to guarantee access to the technology in a time of conflict for its military and economic actors.

The evidence gathered in this work would fit well within this realistic explanatory picture. In the records surrounding the meetings held around satellite technology since the 1950s, European-level decision-makers consistently framed the issue in terms that would match well with the realist tradition. These decisions were primarily initiated in security institutions, most notably the WEU, and were then executed by civilian institutions to preserve a veneer of international legality, which was very important to the European states at the time. If one takes a more classical realist explanatory perspective, it can be observed that the acquisition of this technology was regularly framed as a competition between “Europe,” the Americans, and the Soviets/Russians depending on the decade and the specific institutional source of the records. The technology was discussed in terms of the power benefits satellite navigation development would provide to Europe and, accordingly, would fit in quite well with classical realist theory’s predictions. Were one to take the purely structural realist position and treat Europe as a state, the power differential between Europe and its rivals would naturally motivate Europe to take this action and balance against the

USSR and the US. From the neoclassical realist view, which mixes the two theories in many ways by adding intervening variables at the domestic level, the theory would also appear to explain the case of Galileo quite well. The power differential would act as primarily causal, and the space would be open to introducing other intervening variables based on the theoretical framework neoclassical realism provides.

Regardless, it is a central tenet of realism that states are the primary unit and actor in the international environment (Korab-Karpowicz, 2010). The previously outlined rationale does not hold because the European Institution[1], even in its current form as the European Union, is not formally a state. Not only is it not a state, but no agreement exists within realist theory on how to classify it. Despite the European Institution not being a state, it seems to have been reasoning like a state according to realist theory. This does not fit in well with any current iteration of realism and undermines a fundamental tenet in its understanding of international relations phenomena broadly. On top of this, the European Institution was apparently able to override expected state behavior from some of the more powerful states in the global system and directly influence international relations phenomena, an observation that realism would not predict to be possible.

The issue of how to deal with European Institutions has only become more pronounced for the realist school since the end of the Cold War. For example, notable offensive realist scholars predicted that the European project would accordingly stall as European states were again freed to compete more extensively with one another (Mearsheimer, 1990). This was a prediction that proved to be starkly misguided. Defensive realist scholars predicted that European states would attempt to increase their relative clout through the new organs of the European Institution as opposed to competing with one another as a result of the new security environment, in a clear break from traditional realist theory. Grieco posited a "neorealist voice opportunity hypothesis," in which

> "states—and especially relatively weak but still necessary partners—will seek to ensure that any cooperative arrangement they construct will include effective voice opportunities" (Grieco, 1996)

[1] From this point on in the discussion, when referring to the European Union, its predecessor organizations, or directly tied peripheral institutions such as the ESA, the umbrella term of "the European Institution" will be used as a catch-all. When a specific institution is referred to, it will be done for a specific purpose to refer to a specific event or account.

This was rightly assessed as not being consistent with core realist predictions and assumptions by later scholars (Legro & Moravcsik, 1999) and underscores just how difficult the European Institution's integration into realist theoretical models has been.

This difficulty stems from the fact that the realist school does not well represent just how entwined European states are within the European Institution. By firmly separating European states from the supranational organization theoretically, the theory does not well represent the fact that the lines between European states and the European Institution are often quite blurred, particularly following the signature of the Maastricht Treaty in the early 1990s, which granted Europe wide citizenship and a supranational currency. This makes allocating power gains and losses and even the more basic task of locating the most relevant decision-makers particularly difficult within the European context. Where realism would simply look at the institutions of the state to do so, the European Institution complicates all elements of that process.

Realism requires the state to be taken as a given and distinct institutional unit within a system to offer useful explanatory insights. Even by treating European states as independent actors being influenced by an external, intervening variable in the form of the European Institution, the reality that these actors are in many ways one and the same can easily be lost in the explanatory pictures the theory generates, as in the case of Mearsheimer's woefully misplaced predictions about Europe at the end of the Cold War. Mearsheimer's error was not in misusing realism. His error stemmed from using the theory correctly, illustrating the weaknesses in the theory itself.

Several works within European integration studies have advocated for the European Union to be treated as a de facto state actor following the signing of Maastricht (Rynning, 2005), though they are few. Such works have attempted to address the issue of sovereignty within the EU, a key factor for realist theorizing. Brack et al. (2019) provide a very useful overview of how the understanding of the sovereignty of the European Institution as a political entity has evolved in keeping with theories of European integration since Maastricht and, importantly, since the signing of the Lisbon Treaty in 2008. Their study also highlights the various fault lines of sovereignty and internal conflicts between the European Institution and its member states. Regardless of such contributions, these discussions have not fundamentally changed the discussion within the realist school with regard to the role of the

state and the precise nature of the European Institution within a realist theoretical framework. This is likely in part because the core assumptions of realist theory leave little space for such integration.

To bring this discussion from hypotheticals to the real world, it is useful to briefly observe a clear case where the decision to assign satellite navigation to a supranational organization directly harmed a state's national security and power projection, out of keeping with realist predictions.

When the United Kingdom decided to leave the European Union in 2016, it lost access to the PRS (military-grade signal) capacities of the Galileo system. The UK had invested 1.2 billion pounds in the development of Galileo and, upon leaving the EU, was abruptly forced to consider efforts to develop its own system (BBC, 2018). The British government dedicated 127 million dollars upon its exit from the Union to an 18-month study assessing a potential British Navigation Satellite System (Foust, 2021). The report concluded that the country would be looking into alternative "innovative" solutions to the issue (Foust, 2021), citing the costs. As of 2023, the UK has yet to find an acceptable solution to the problem and remains the only member of the UN Security Council without access to its own national (or supranational, in the case of France) global satellite navigation system. With global force deployments, the UK has accordingly found its strategic situation substantially complicated, with the British MP's characterizing Britain's security "at severe risk" as a result of it not controlling a satellite navigation constellation of its own (Cookson, 2022).

Realist theory would have expected this relatively powerful state, regularly considered to be in the top five most powerful states in the world, to have developed this technology and then maintained sovereign control of it at the state level. This would be precisely to prevent the sort of damage the UK has seen to its power projection capacity and ability to defend itself in the global system that losing access to satellite navigation has entailed. Its previous membership in the European Institution, though, apparently disrupted this expected realist behavior.

Overall, this makes exploring international relations phenomena within Europe a particularly difficult exercise for realist theorists. Many realist theorists have accordingly written off the European Union as something of an anomaly, with European cases acting as

divergent cases within an otherwise sound theoretical structure. This, though, is by no means the way to address the issue, in no small part because Europe represents 27 states, of which multiple are among the most powerful in the modern world.

Realism still has much to offer in explaining the behavior of European states and European Institutions, with some tweaked assumptions and a more rigorous assessment of political institutions. By understanding the European Institution as something more akin to a state, realist theory still holds, but at a higher level of collectivity. The specific contours of what constitutes an international actor are therefore an important next step for the theory to address cases such as the one seen in Galileo. This sort of work will only become more important for the realist school as the European Union continues to integrate and, whenever the African Union, Mercosur, and other supranational organizations begin to come into their own on the global stage.

This discussion on realist theory suggests that to better explain the story of Galileo, the strict division delineating the state as the main actor in international affairs is the root problem. Realist theory cannot well represent the fact that the European Institution and European member states blur the lines of what constitutes a state in realist theory, substantially limiting the ability of the theory to generate useful explanations for states within the European institutional context. Because of the peculiarity of the European Institution, we are therefore compelled to examine the core structure of the institutions that constitute the European States and the European Institution in conjunction with one another. In summation, no matter which school of realism one uses within the broader tradition, the case of Galileo presents a challenge to the realist understanding of international phenomena because of how it handles institutions. The institution of the European Union and its predecessor organizations present international relations scholars within the realist tradition with a problem by virtue of its supranational nature and the state's existence within those institutional arrangements.

Accordingly, this work posits that broader neo-institutionalist theories are better equipped to address the specific case of Galileo in addition to other cases where the European Institution clearly played a powerful role in policy decisions, at least currently. It does so with a strong caveat: if realist theory could better conceptualize the European Institution in line with a traditional state, the theory would likely be well poised to explain the case of Galileo

through traditional power politics simply taking place at a higher political level. However, until that theoretical work is done, reliance on institutionalist theories is a better path to generating useful explanatory pictures.

Competition and Cooperation within Realist Theory

The second main issue Realist theory has with explaining Galileo is perhaps the more problematic. Realist theory at its foundation posits that states operate in an anarchic international system where survival is the primary concern (Waltz, 1979). In this environment, states are seen as rational actors prioritizing their national interest, primarily through power maximization and security enhancement. The inherent assumption in realism is that states are inherently competitive, driven by the fear of losing their relative power position in the international system (Mearsheimer, 2001). This perspective makes realist theory particularly skeptical about the prospects for cooperation, especially in areas with significant military and strategic implications. Galileo, given its profound military importance, ought to be a case particularly senstiive to this assumption.

Accordingly the decision by European nations, particularly powerful ones, to cooperate on the Galileo satellite navigation system challenges the realist assumption of inherent state competition. Given its potential to enhance Europe's strategic autonomy collectively and not strictly at the national level, a realist interpretation would expect European states to either compete to control the system or rely on existing alliances, such as NATO, where the U.S. already provides satellite navigation through GPS. Instead, Europe opted for cooperation, pooling resources and expertise across multiple states to develop and deploy the Galileo system (Collins, 2004). On top of this resource pooling, the final decision to share control of the asset at the European level adds another layer of weakness in realist theory to explain this decision.

Accordingly while realism emphasizes the competitive nature of states, it does not adequately account for the strategic motivations that might drive states to cooperate, particularly when the cooperation serves to reduce dependence on an external power (Grieco, 1990). In the case of Galileo, it would appear European states recognized the strategic vulnerability in relying solely on the U.S.-controlled GPS, particularly given the potential for the U.S. to deny or

degrade service in times of crisis. By cooperating on Galileo, Europe aimed to ensure its strategic autonomy, reducing its dependence on the U.S. for critical military and civilian infrastructure. This collective action challenges the realist assumption that states only pursue individual rather than collective gains (Moravcsik, 1997).

In this case, realism also underestimates the role of international institutions and the trust they can engender between states. The European Union (EU), through its various institutional mechanisms, has created a framework where cooperation is not only possible but expected, even in areas of significant strategic importance (Keohane & Martin, 1995). The EU's ability to facilitate cooperation on Galileo suggests that institutional trust and the predictability it brings can override the competitive instincts that realism assumes are predominant in state behavior (Mattli, 1999).

Realism also doesn't effectively address this form of bandwagoning to balance against US dominance. While realism would predict that European states might bandwagon with the U.S. for the benefits of using GPS, the development of Galileo can also be seen as a balancing act against U.S. dominance in satellite navigation (Pape, 2005). However, rather than balancing through competition or military build-up, Europe chose to balance through technological and institutional cooperation. This reflects a nuanced understanding of power in the modern international system, particulalry in Europe, that realism appears to overlook. This cooperation can be seen as a form of soft balancing, where states use non-military means to counteract a dominant power, challenging the realist focus on military power as the primary tool of statecraft (Brooks & Wohlforth, 2008).

On top of this, realism's focus on security issues seem to have obscure dthe significant economic and commercial incentives that can often drive state behavior. Galileo was not just a military project, despite its profound military importance; it had substantial commercial implications, providing services that can compete with GPS in the global market (Böhme, 2004). The economic benefits of developing a European satellite navigation system, including job creation, technological advancement, and market share, provided additional incentives for cooperation that realism tends to downplay in favor of security concerns (Sandholtz, 1993). In addition, the location of these economic benefits within the state structure closely match areas where decisionmaking power can concentrate. That is, in the

defense and aerospace industry, two economic interest groups which tend to strongly influence national secuirty policies in many countries.

Existing Academic Support and Critiques of Realism

Several scholars have critiqued the realist inability to fully explain such instances of cooperation as observed in Galileo. Even as early as the 1970s, Keohane and Nye's work on complex interdependence suggests that states often cooperate in ways that transcend the zero-sum logic of realism, particularly when faced with issues that are not purely military (Keohane & Nye, 1977). Moreover, the concept of "security communities" proposed by Karl Deutsch suggests that regions like Europe, with high levels of integration and trust, can transcend the competitive dynamics predicted by realism (Deutsch et al., 1957).

Furthermore, institutionalist theorists, such as Robert Keohane, have argued that international institutions can alter state behavior by reducing transaction costs, providing information, and creating expectations of continued cooperation (Keohane, 1984). The EU's role in facilitating Galileo is a case in point where institutions have enabled cooperation that realism might not have predicted (Moravcsik, 1997).

In conclusion, while realist theory generally provides valuable insights into state behavior in an anarchic international system, it simply falls short in explaining the European cooperation on the Galileo satellite navigation system. This is because of realism’s strict focus on the state as the primary actor in international relations and its inability to accurately explain cooperation on security issues.

Liberal Institutionalism

The shift to institutional discussions naturally brings us to liberal institutionalism. Liberal institutionalism would apparently go further in explaining European states’ decision to collectively pursue satellite navigation than realist theory, given realism’s state-centric limitations. However, it still has some serious explanatory drawbacks in working with Galileo and cases of European security integration more broadly.

It is fundamental to again note that, similar to using the term "realist," "liberal" international relations theory constitutes a wide range of different sub-theories. Accordingly, this section looks to summarize, as succinctly as possible, liberal theory's core assumptions and their limitations in the case of Galileo. All liberal theories eschew the idea that state security concerns and power politics trump most other interests by default as a result of a fixed international system. In particular, liberal theory emphasizes liberal states' institutional structures and suggests an inherent nature tied to those structures that allow for increased levels of cooperation. This uniquely enables liberal states to cooperate rather than compete in the sense that realist theories would predict. Within liberal theory, similarly governed liberal states tend to work together through formal international institutions in conjunction with international law instruments. So far, so good in explaining the case of Galileo. Galileo was an initiative taken by just such institutions and would appear to be a case of international cooperation in a common project for common benefits.

Despite this, the liberal theory still cannot give us a full picture to explain European states' choice to pursue satellite navigation because of one key tendency within the liberal theory. This is the reality that liberal theory tends to underemphasize the role of power politics in explaining behavior, in particular, leaving little space for cases where competition primarily occurs between liberal states. This was a defining characteristic of the Galileo story, which framed competition between Europe and the liberal hegemon of the United States.

Under-Emphasis of Power Politics

One of liberal theory's weaknesses overall is the fact that it does not explain security-motivated behavior very well, particularly when taken against other liberal states. Accordingly, when trying to explain Galileo from a liberal perspective, the theory falls prey to this assumption from the start. The records indicate that the European Institution was reasoning on satellite navigation from a strong, security-motivated perspective. It was looking to increase its ability to compete on the global stage when it embarked on its journey toward satellite navigation. Liberal institutionalist theory, though, would explain the project in cooperative terms and as being primarily based on Europe's common liberal regime type following the end of the Second World War and shared gains.

A major issue that is evident is that the European states and the European Institution framed competition with the liberal US as a key motivating factor in their development of outer space technology and ultimately satellite navigation. By the same token, the US viewed Galileo in similar terms attempting to dampen the project substantially.

The United States initially expressed significant concerns about the European Union's Galileo satellite navigation project from the start. It viewed as a potential threat to the dominance of the U.S.-controlled Global Positioning System (GPS) (Politico, 2004; The American Presidency Project, 2004), despite the fact that such a development would come from its liberal allies. This led to a prolonged period of diplomatic negotiations between the EU and the U.S. as both sides sought to address these concerns (ScienceBusiness, 2016).

One of the key points of contention was the type of signal that Galileo would use, particularly the Public Regulated Service (PRS). This was partially a practical issue as the U.S. feared could overlap with the military signals used by GPS, thus compromising its effectiveness in critical situations (CORDIS, 2003). Accordingly, the U.S. advocated for signal adjustments to ensure that Galileo would not interfere with GPS, particularly in military contexts. After extensive negotiations, the EU agreed to modify the signal structure to mitigate these risks, which allowed for a more cooperative relationship between the two systems (Politico, 2004; The American Presidency Project, 2004).

However, it was clear that the technical issues were by no means the sole US concern. The U.S. through the course of negotiations attempted to secure a veto right over any future developments in the Galileo project, a move that was ultimately resisted by the EU (Politico, 2004), outlining the fact that the US wanted full control over any satellite navigation systems including those developed by its liberal allies. The final agreement reached in 2004 ensured that while the U.S. would not have a direct veto, there would be a framework for cooperation to ensure that both GPS and Galileo could operate without mutual interference (ScienceBusiness, 2016). The U.S. would finally relinquish the right to jam Galileo signals, marking another significant concession that allowed the project to move forward without further American obstruction (The American Presidency Project, 2004; CORDIS, 2003). The mere fact of this obstruction existing though suggests that liberal theory has clear limits when

it comes to issues of security, even amongst liberal states.

Despite these compromises, the U.S. continued to keep a close watch on Galileo's development, ensuring that the project did not pose a strategic challenge to its global satellite navigation dominance. The eventual cooperation agreement allowed Galileo to progress while maintaining the integrity and superiority of GPS in military applications (ScienceBusiness, 2016; CORDIS, 2003). Accordingly, we can clearly observe that strategic considerations, including worries about a loss of dominance by the United States, was present in the development of Galileo despite European states and the United States existing as the core of the liberal world order.

In internal European Union documents, the observation is more stark. In multiple instances, the liberal United States is lumped together with the Marxist-Leninist Soviet Union in internal European discussions as something of a competitor, something that liberal institutionalist theory would not expect. The liberal theory would expect the US and Europe to look more into cooperating on these issues than competing on them, again because of their inherent liberal institutional makeups and their shared presence in international organizations such as NATO and the United Nations. The evidence, though, presents a glaring absence of cooperation on these sensitive areas at either the UN or NATO level for European states. European policymakers outright complain in these documents that this lack of cooperation plagues decision-makers on both sides of the Atlantic. This would suggest that this competitive view was not only observed within the European context but also on the US side of the equation. When Europe asked to collaborate with the US on satellite technology through NATO, it was rebuffed. This was particularly the case when it came to assets critical to national security, such as launchers. The US displayed a willingness to work with individual European states on technology not directly related to security applications, such as in the case of Italy. However, when the US assisted Italy in placing a satellite in orbit, it insisted that this be done using American launchers from US territory. It would appear that the US, accordingly, was not interested in sharing such sensitive technology with its allies, liberal states, or otherwise. At the European level, this lack of willingness was even more stark, in contrast to the proscriptions of liberal institutionalist theory.

Besides this, Europe’s apparent willingness to then work with Russia and China, clearly illiberal states, in its development of Galileo in the late 1990s and early 2000s also

does not fit in well with liberal theory's predictions. Though the specific details of this cooperation are scant given Europe's likely diplomatically wise choice to classify the related documents, it was public knowledge at the time that China was set to invest substantial sums into the Galileo project (Carstens, 2003). The Galileo project was marked not primarily by objections from Europe's theoretical rivals but counterintuitively by its liberal ally, the United States (Sample, 2003). The issue of Galileo actually became so stark that the United States threatened to shoot down Galileo satellites in the case of war with a rival such as China. This was allegedly at a conference held in London on the issue, according to an unnamed European official citing leaked US Air Force documents (Global Research, 2004; Space Daily, 2004). The conflict over Galileo between Europe and the United States went on for no less than three years, with both sides citing national security concerns amongst one another despite being all liberal states within NATO. Liberal theory would not expect liberal states such as the US and its European allies to threaten one another with war as a result of a satellite navigation development project. Power dynamics clearly are better placed than liberalism to explain this sort of behavior, and liberal theory's lack of emphasis on these makes the theory poorly designed to explain the case of Galileo's development.

Constructivism

Constructivist theory, with its emphasis on the role of ideas, norms, and identity in shaping state behavior, would on the surface appear far better positioned to explain the case of Galileo. Unlike realist or liberal theories, which focus more on material power or institutional dynamics, constructivism argues that the social construction of reality—through shared norms, identities, and beliefs—plays a crucial role in shaping state actions and interactions (Wendt, 1999). The creation of the European Union as one such reality should provide a strong force in explaining Galileo. However, constructivist theory too faces several notable limitations when applied to the case of European cooperation on the Galileo satellite navigation system. These limitations stem from constructivism's potential overemphasis on ideational factors at the expense of material and strategic considerations, as well as its difficulty in accounting for power dynamics, economic interests, and technological constraints. In short, by filling the gaps left over by liberal institutionalism and realism, it has a tendency to gloss over those very important variables to too great of an extent. These will

now be addressed more extensively.

Overemphasis on Norms and Identity at the Expense of Material Factors

One of the central tenets of constructivist theory is the importance of shared norms and identity in guiding state behavior. Constructivists argue that states are not only driven by material interests but also by the desire to conform to shared norms and to construct collective identities (Checkel, 1998). In the context of the European Union, the idea of a shared European identity and the norm of cooperation are indeed significant factors. The Galileo project can be seen as part of the broader European endeavor to assert its identity on the global stage, reflecting a collective vision of technological independence and strategic autonomy (Risse, 2000) and can be considered to have been driven by that endeavor.

However, this strict focus on norms and identity can quickly lead to an oversimplification of the complex motivations behind the Galileo project. While shared European identity and norms of cooperation are clearly important, constituting a necessary condition even, they do not fully account for the pragmatic considerations that drove European states to cooperate. For instance, the desire for strategic autonomy, the need to reduce dependence on the U.S.-controlled GPS, and the pursuit of economic benefits were critical factors in the decision to develop Galileo (Saurin, 1998), as captured in realist and liberal explanations. Constructivism, by emphasizing the ideational aspects, underplays these material and strategic considerations, which were pivotal in shaping the project. While norms and identity are important, they must be considered alongside other factors to fully understand state behavior, in particular complex behaviour spanning decades as seen in Galileo.

Difficulty in Explaining Power Dynamics

Another significant limitation of constructivist theory in explaining the Galileo project is its difficulty in accounting for power dynamics and strategic rivalries. Constructivism tends to focus on how shared ideas and social interactions shape state behavior, often downplaying the role of power and material interests (Barnett, 2008). In the case of Galileo, however, power dynamics were central. As previously mentioned, the U.S.'s initial opposition to the project,

driven by concerns over potential interference with its GPS system and the broader implications for American strategic dominance, underscores the importance of power in international relations (Politico, 2004; The American Presidency Project, 2004).

Constructivist theory struggles to explain why, despite shared norms of transatlantic cooperation, the U.S. viewed Galileo as a strategic threat in much the same way liberal theory does. The U.S.'s concerns were rooted in the potential for Galileo to challenge its global hegemony in satellite navigation, particularly in military contexts. This reflects a power struggle that constructivism underappreciates. By focusing on ideational factors, constructivism overlooks the material power considerations that were critical in the U.S.-EU negotiations over Galileo (Barnett, 2008). This limitation points to the need for a more nuanced understanding of how power dynamics interact with ideational factors in shaping state behavior.

Challenges in Addressing Economic Interests

Constructivist theory's emphasis on ideational factors also limits its ability to fully account for the economic motivations behind state actions. While constructivism offers valuable insights into how norms and identities shape state preferences, it often inadequately addresses the economic incentives that drive state behavior as well. The Galileo project, while influenced by norms of European cooperation and identity, was also driven by significant economic interests located in particularly powerful lobbying groups. These included the desire to create a competitive alternative to GPS in the global market, the potential for job creation, and the economic benefits of technological innovation (Saurin, 1998).

Limited Focus on Technological and Institutional Constraints

Another area where constructivist theory falls short is in addressing the technical and institutional challenges that influence state behavior. Constructivism tends to focus on how ideas and social interactions shape state actions, often overlooking the material and institutional constraints that can impact the feasibility and direction of state projects (Saurin, 1998) and those social interactions themselves. In the case of Galileo, the project faced numerous technical difficulties and required significant institutional coordination within the EU and with external partners like the U.S. (CORDIS, 2003).

The technical challenges included the need to develop a reliable and competitive satellite navigation system, while institutional challenges involved securing the necessary funding and coordinating efforts among multiple EU member states (CORDIS, 2003). Constructivism's focus on ideational factors tends to underappreciate these material and institutional realities which act as very strong checks on those social and ideational interactions. For instance, the delays and difficulties in reaching consensus among EU member states regarding the project's funding and leadership highlight the importance of institutional factors that constructivist theory might not fully address (CORDIS, 2003). This limitation underscores the need to consider the role of technology and institutions alongside ideas in explaining state behavior and strengthens the case for institutionalist theoretical explanations more broadly.

Conclusion

While constructivist theory provides valuable insights into the role of norms, identity, and ideas in shaping state behavior, it has notable limitations when applied to the case of European cooperation on the Galileo satellite navigation system. These limitations include an overemphasis on ideational factors at the expense of material and strategic considerations, difficulty in accounting for power dynamics and economic interests, and a limited focus on technological and institutional constraints. A more comprehensive understanding of the Galileo project requires integrating constructivist insights with other theoretical perspectives that address these material and strategic dimensions of international relations. Most importantly, constructivist theory doesn’t well account for institutional and material checks on social interactions and behaviour. This makes institutional theories better placed to explain cases such as Galileo which are defined just as heavily by ideational factors as they are clear material, strategic, and institutional ones.

Collected Comments on Alternative Theories

This section was designed to address, as succinctly as possible, the main theoretical alternatives to the one that this study will use to explain the development of Galileo by Europe’s major powers. It underlines that realism is limited because of its strict understanding of the centrality of the state and its inability to well explain cooperative behaviour on security issues. It also addresses why liberalism is unable to well explain the

issue as it, oppositely, doesn't well address competition amongst like-minded liberal states. Finally, it explored how constructivism doesn't well address either material or institutional checks on ideational factors or social interactions. In short, all three are limited because they suffer from inherent weaknesses in explaining security-related phenomena such as Galileo in that they too strongly emphasize singular variables in what is a complex social phenomena. In response, the theoretical foundation of this study will rely on an alternative, broader neo-institutionalist theory in the form of historical institutionalism that attempts to capture all of these factors as they are expressed in institutional arrangments. This theory was chosen because it is broad enough to allow for a wide diversity of motivations intimately tied to institutional arrangements over decades and allows for material, strategic, and ideational factors to find their appropriate role in the explanation of the case.

CHAPTER 3: OVERVIEW OF CURRENT SYSTEMS

This chapter will provide a broad view of current satellite navigation systems. It will do so by first explaining satellite navigation systems' standard components and functions. It then follows by providing a more in-depth breakdown of existing systems, noting the status and locations of their most important assets. This section is designed to give the reader the broad strokes of satellite navigation systems as best as possible, outlining their most important components without getting too lost in the details. Once it is established how these systems function and the status as well as the location of existing systems are outlined, it ought to be easier to understand how states reason with regard to these systems from a strategic perspective. From this foundation, further discussions in this work will flow more naturally in what is an often under-discussed piece of strategic infrastructure.

How Does Satellite Navigation Actually Work?

Satellite navigation systems, in the simplest terms, rely first on a network of satellites orbiting the Earth. These satellites communicate with stations and receivers on the ground, sending and receiving signals on specific wavelengths that are reserved for those specific systems. Satellites transmit signals containing timing information and orbital parameters from outer space, which are then received by satellite navigation receivers on the ground. These devices measure the time it takes for signals to travel from multiple satellites to the receiver. The receiver can then calculate its distance from each satellite by comparing these time differences. The receiver determines its precise position on the Earth's surface using this distance information, along with a method known as triangulation calculations (Federal Aviation Administration, 2023).

Triangulation is a mathematical technique to determine the precise location of a receiver on the Earth's surface. It involves measuring the distances between the receiver and multiple satellites to triangulate the receiver's position and works based on the principle of intersecting circles. Each satellite in the network broadcasts its precise location and the time at which the signal was transmitted (NASA Jet Propulsion Laboratory Editors, 2023). The receiver receives these signals and measures the time it takes for them to reach its location. As the signals travel at the speed of

light, the receiver can calculate the distance to each satellite by multiplying the signal travel time by the speed of light. This distance is measured as a radius from each satellite, creating a sphere around each satellite's location. The receiver, therefore, needs to find the intersection point of these spheres to determine its position. By overlapping the spheres, the receiver can identify the common points where the distances from the receiver to each satellite are equal to the calculated distances based on the signal travel time (GISGeography, 2019).

In practical terms, trilateration involves solving a system of equations to find the exact coordinates of the receiver's position based on the distances measured from multiple satellites. These equations use the known locations of the satellites as reference points and the measured distances as constraints. The more satellites the receiver can receive signals from, the more accurate the trilateration calculation becomes. In satellite navigation systems, a minimum of four satellites is required to determine both the receiver's position and altitude. Additional satellites improve the accuracy and precision of the calculated position and provide systems with greater coverage (Zahradnik, 2019).

Segments of Modern GNSS Systems

To accomplish this task, satellite navigation systems require three main segments. These are commonly referred to as the space, ground, and user (or receiver) segments. (Pandey et al., 2021). The space segment transmits the signals, the receiver segments receive the signals, and the ground segments control and monitor the entire situation. These different segments will now be explored in greater detail in this order.

Space Segment

The space-based elements of satellite navigation systems comprise the actual satellites in addition to their support equipment. The satellite itself is the most crucial component of the space segment. Satellites used in satellite navigation are launched from dedicated launch facilities on the ground into various orbital levels. Normally, satellite navigation can be found either in the medium Earth orbit or in the geostationary Earth orbit. These orbits are roughly 20,000 km above the Earth's surface and 35,000 km above the surface, respectively. These are notably higher than the low Earth orbit, which covers a distance ranging from 160 to 2000 km above the surface. The high orbit is

fundamental for the sort of large-scale coverage these systems are designed to provide. They do so by allowing satellites to emit signals over larger portions of the Earth's surface.

Satnav satellites are equipped with various components that enable them to function. Notable components include atomic clocks that ensure accurate timekeeping for calculating signal delays and antennas that facilitate communication between satellites and user receivers on Earth. They also consist of a command and data handling system that receives and processes commands, manages data, and controls satellite operations. Guidance and stabilization systems monitor and adjust the satellite's position and orientation. Solar arrays generate electrical power, while thermal control systems regulate temperature. Transponders play a vital role in signal reception and transmission. Together, these components ensure the effective functioning of satellite navigation systems (Federal Aviation Administration, 2023). Overall, they represent an impressive set of sensitive components requiring a substantial level of technical expertise. Of particular note is the receiver segment. The necessity of miniaturizing these components for use in modern systems can often present a notable challenge to states looking to develop independent satellite navigation systems. It is in part a result of the complexity of these many components that so few states have access to these systems, despite the technology being quite an old one by modern tech standards.

In addition to their complexity, satellites require launches to get into orbit. Launch capacity is something that is jealously guarded by capable states (and now some corporations) and requires a substantial level of technical and financial investment. Launch capacity also has latent strategic implications, as the technology required to launch a satellite into orbit is the same as that required to launch a missile. For decades, this reality meant that technology sharing of such capacities was quite limited, even amongst close allies.

Ground Segment

The ground segment, though certainly the less glamorous one in the whole satellite navigation system, comprises various critical pieces of infrastructure for the good functioning of satellite navigation systems. Most importantly, the ground segment of satnav systems generally includes at least one master control station. This station can issue commands and control the satellite constellation from the ground. This is also where satellites' precise locations are calculated. The master control station also monitors satellite status and is capable of repositioning satellites in orbit if necessary.

In addition to the master control station, global navigation systems require monitor stations placed across notable geographical distances. These track the satellites as they pass overhead and collect relevant data on both the objects and other relevant details, such as atmospheric data, which could interfere with satellite services. Furthermore, most systems also contain a system of ground antennas separate from the master control station that can relay commands to the satellites regardless of their position over the Earth in relation to the master control (Navipedia Editors, 2011).

This means that satellite navigation systems require a notable network of ground-based assets to function. These systems tend to span huge distances, often on a global scale where possible, such as in the cases of the US's GPS system or Europe's Galileo system. This has presented something of a check on less prevalent powers interested in developing satellite navigation. It also implies a degree of reliance on a powerful network of allies to set up such a system, a fact that aspiring great powers have had to contend with since the technology's invention.

Receiver (User) Segment

The final segment is also on the ground yet is worthy of particular attention. The receiver is a vital component of satellite navigation systems, enabling accurate determination of position, velocity, and time. It is the portion of the system that can receive and process signals from the satellites in orbit to determine its location. By capturing and processing these signals from navigation satellites, the receiver calculates its location using the previously discussed technique of trilateration. Advanced algorithms mitigate errors and ensure reliable signal reception using semiconductors within the system. These receivers are integrated into devices like smartphones and cars on the civilian side of the equation and offer seamless access to navigation services. The performance of the receiver directly impacts the effectiveness of satellite navigation systems and is thus fundamental for their good functioning (Grewal et al., 2020; Petropoulos & Srivastava, 2021).

The receiver segment of satellite navigation systems has seen remarkable and rapid development in recent decades. From bulky, large bricks with little battery life in the 1990s, satellite receivers for civilians have been miniaturized and improved enormously. This has allowed their remarkable proliferation into the everyday functioning of huge chunks of modern technology. Interestingly, militaries still tend to use handheld satellite navigation receivers, which are quite large by comparison. These devices, despite their seemingly unwieldy nature, are equipped to

receive encrypted and more precise military-grade satellite navigation signals. These larger receivers have a handful of advantages that make them particularly useful to militaries, though (Lucio, 2022). These include increased signal power, more resistance to spoofing, enhanced security, and field programmability in the event of changes in satellite navigation systems. They are also simply more resistant to negative conditions in the field, such as exposure to the elements or contact with the enemy.

Existing Satellite Navigation Systems

With the basic function and components of satellite navigation established, this section will now explore the current systems in play on the world stage. The US, Russia, the European Union, China, Japan, and India all control satellite navigation constellations. This section will now describe these systems, following the previously outlined segments. Accordingly, each established system will be explored first by its space segment, then by its ground segment, and will finally conclude with the user/receiver segment. In most cases, sufficient information was accessible to describe these systems. This was in large part because the United Nations Office of Outer Space Affairs prompted satellite navigation operating states to provide progress reports on existing satellite navigation systems in late 2022. Accordingly, all major players in navigation systems provided reports in October 2022 outlining the status of their systems to some degree. Despite this, it is important to note that states vary in their willingness to share information. Some system descriptions are accordingly limited by the degree of openness on the part of the controlling state, and thus some information is missing, in particular with regard to the locations and specific functions of ground segment stations in states such as Russia, India, and China. The decision by these states to maintain a degree of secrecy around such facilities is somewhat predictable, given the strategic nature of such facilities.

United States: GPS (NAVSTAR)

Space Segment

The US's Global Positioning System (GPS) is controlled by the US military through the United States Space Force. It, along with Europe's Galileo, is the easiest system to describe, given the willingness of the US and Europe to provide information publicly. The GPS, as of 2023, maintains 31 satellites in a healthy, medium Earth orbit. They can be found in six equally spaced orbital

planes, each containing four slots occupied by satellites. This is designed to give full coverage across the Earth's surface. Of these, 24 are required to be active 95 percent of the time to ensure acceptable levels of functionality (GPS.gov, 2023). Six of these are the third-generation Block 3A satellites, the most modern navigation satellites currently available and in operation. The remaining twenty-six are all Block 2 satellites developed from 1997 through 2016. Fourteen of these are from before 2009, and twelve were launched between 2010 and 2016. All Block 2 satellites are set to be replaced in the coming years. The most up-to-date information on the operational status of these satellites can be accessed at the US government's Navigation Center website at the following link: https://www.navcen.uscg.gov/gps-constellation. Given the number of satellites, this status changes regularly and ought to be consulted if one is looking for the most up-to-date information at the time of reading. The newest, third generation of satellites is designed to provide the same level of service that GPS currently provides while being smaller and more lightweight. They are also designed to be more resilient, with modernized anti-jamming capacities to ensure continued service in the event of a conflict with a near-peer adversary. This reflects an increasing US acceptance that the GPS would be a likely target in such a conflict and is part of a broader military strategy designed to increase the resilience of the GPS (Monacelli, 2021).

Ground Segment

The GPS ground segment boasts an impressive network of tracking stations, master control stations, and monitoring sites. The master control station of the GPS is located in Schriever, Colorado, with an alternative station located in Vandenberg, California. It also maintains three other important control stations: Ascension Island in the South Atlantic, Kwajalein Atoll in the Pacific Ocean, and Diego Garcia in the Indian Ocean. Across the globe, GPS's ground segment also comprises various monitoring stations, ground antennae, and tracking stations on every continent, excluding Antarctica. This wide network helps give GPS a remarkable level of precision. Similarly, it also means that the system is reliant on a vast network of international allies and goodwill for its continued good function.

Receiver (User) Segment

The US military has several types of GPS receivers for different purposes and applications. The encrypted military GPS signals are known as M-code. These are designed to be more resistant to

jamming and interference than civilian GPS signals. Military GPS receivers can receive and process both military and civilian GPS signals.

One of the main GPS receivers used by the US military is the Defense Advanced GPS Receiver (DAGR). The DAGR is a handheld GPS receiver that provides accurate position, navigation, and timing information to military personnel. It is designed to operate in challenging environments and has enhanced security features to protect against spoofing and jamming. Somewhat larger than a modern smartphone, the system has been in use since the early 2000s. (BAE Systems, 2023) It is set to be replaced by the DAPS system, a more robust and resilient device (Brading, 2019). Testing for its eventual use began in 2021 (Inside GNSS Editors, 2021b), and the system was accepted by the US military as a replacement in January 2022 (Cozzens, 2022a). The DAPS system is therefore set to replace the DAGR model in the coming years, with the first units seeing service in the middle of 2022.

The US military also uses other types of GPS receivers, such as the Precision Lightweight GPS Receiver (PLGR), the Enhanced PLGR (EPLGR), and the Joint Precision Approach and Landing System (JPALS) GPS receiver. These receivers are used for more specific military applications, such as artillery targeting, aircraft navigation, and precision landing, and can be found in various types of military hardware.

Russia: GLONASS

Following the collapse of the USSR, Russia's GLONASS satellite navigation system faced significant challenges and experienced a decline in its capacity and coverage. However, in 2001, the restoration and improvement of GLONASS became a top government priority. This, accordingly, led to increased funding and efforts to revitalize the system. Substantial progress has been made since then, with full coverage of Russia's territory achieved by 2010. This was quickly followed by the restoration of a full orbital constellation of 24 satellites in 2011, enabling global coverage (SkyBrary Aviation, 2023).

Space Segment

As of 2010, GLONASS had accordingly gone from the edge of the operational abyss to fielding 18 functioning satellites. Given Russia's enormous size and distinct geography, full coverage of the territory requires no fewer than this number. As previously mentioned, in 2011, the system was fully operational with 24 satellites and global coverage (ESA Editors, 2011b). This was the first time since the fall of the USSR that a state had provided a viable, global satellite navigation alternative to the US system. Throughout GLONASS's history, Russia has developed three distinct generations of satellites. These are referred to as GLONASS, GLONASS-M, and GLONASS-K, respectively. As of 2023, the system relies primarily on GLONASS-M second-generation satellites, of which 27 are currently operational in medium Earth orbit. These can be found in three orbital planes at about 19000 km above the surface, 1000 km closer to Earth than those of the GPS (ESA Editors, 2011a). Russia is in the process of replacing these with GLONASS-K third-generation versions (GLONASS Editors, n.d.; Inside GNSS Editors, 2021a), with its first launch taking place in 2022 (Gray, 2022). These new satellites have a variety of improvements from the previous version, which do not need to be explored in depth here. What is important to understand is that these new satellites are more resilient and offer a relatively minimal improvement in precision. Regardless, Russia's continued investment and improvements to GLONASS indicate that Russia's dedication to the system is ongoing. Whether or not it will be able to continue to do so is an open question, as sanctions from Russia's military actions in Ukraine have begun to quite severely limit its ability to import the advanced equipment needed to maintain these satellites (Khrutov & Dobrinyin, 2022).

Ground Segment

The ground segment of the Russian GlONASS system, unlike its GPS counterpart, is almost entirely located within the borders of Russia and portions of the former Soviet Union, with the lion's share of the system finding itself within Russia's enormous territory. This has presented something of a weakness to the system, as there are moments in the orbits of the satellites where monitoring becomes more difficult. The system control center is located in Mendeleevo, near Moscow. The central clock that determines the system time scale and synchronizes the atomic clocks on the satellites is also located in Mendeleevo, and the various other tracking and monitoring stations can be found across Russia. Referred to as regional control stations, these can be found east of the Urals in Krasnoyarsk, Ekaterinburg, and Novosibirsk. As of 2023, the bulk of Russia's ground segment can still be found within Russian territory.

However, since as early as 2009, Russia has made efforts to expand the presence of the GLONASS system's ground segment globally (Inside GNSS Editors, 2009). It established its first correction station in the Western Hemisphere in Brazil at the University of Brasilia in 2013 (GPS World Staff, 2013). Russia has made a specific push to place stations in Latin America in particular, in part because of geographic utility and also as a result of the relative willingness of Latin American governments to work with the Russians in this field.

Russia has, accordingly, found a notable level of success in these efforts. Following its first station in Brazil, Russia has since placed multiple other stations across Brazilian territory. (Universidad de Navarra Blog Staff, n.d.). In Nicaragua, Russia was able to place a GLONASS station in the Nicaraguan capital in 2017 (Sanchez, 2017). Perhaps most remarkably, though, in 2021, Russia was able to reach an agreement with the Mexican government to place GLONASS monitoring stations in Mexican territory (Mexican Space Agency, 2021). This was followed in 2021 by another agreement with Argentina to the same effect (Marquez, 2021). In 2022, Russia was able to come to an agreement with the government of Venezuela to set up another monitoring post as well (Pelcastre, 2022).

In addition to Latin America, Russia has objectives to expand these stations into Africa and Asia. In 2017, Russia was able to set up a station in South Africa (TASS News Agency Contributors, 2017) and has been in negotiations across the continent for further station construction projects (Space in Africa, 2019). In 2018, it set up a similar station in India (Kumar, 2018). Russia has been in negotiations in both regions to further improve its coverage and presence. GLONASS stations outside the former Soviet territory can now be found on a global scale, with more planned stations to be built in various countries. This flurry of construction represents a significant push by Russia to expand GLONASS's reliability and underlines Russia's broader ambitions to expand its strategic footprint across the globe. This improved corrective ability has improved GLONASS's accuracy and overall improved its ability to deliver accurate navigation on a global scale.

Receiver (User) Segment

As with GPS, Russia maintains encrypted signals with its GLONASS system for military use. The Russian military has access to the encrypted military signals of the GLONASS system, which are also designed to be more resistant to jamming and interference than civilian signals. However, it is

important to note that information is relatively scarce on the specific extent of these receiver elements.

Overall, the prevalence of GLONASS receivers is not as extensive in the Russian military as in the US military. This is likely in part a result of Russian military doctrine, which assumes that once a conflict begins, satellite navigation will no longer be available for use by either itself or its enemy. Russian forces are known to have extensive jamming and spoofing abilities to counter satellite navigation systems. Accordingly, Russia has backup, land-based LORAN systems for navigation, which are located in Russia and can be used on a regional basis (Cozzens, 2022b). LORAN systems are older systems that rely on radio waves and transmitters and are designed to function over a more specific geographic region. As a state that is primarily focused on regional power projection, this position would seem quite reasonable. However, for powers looking for navigation capacity on a global scale, such as the US, China, and European states, there are no current alternatives to providing reliable navigation on a global scale like satellite navigation systems.

China: BeiDou

The BeiDou Satellite Navigation System is the Chinese global satnav system. BeiDou was initially established as a regional system following the Taiwan Strait Crisis of 1996. China's decision to develop BeiDou was directly tied to a moment in that crisis when, because of GPS disruption, China lost track of its ballistic missiles fired over the Taiwan Strait (Millner et al., 2022). BeiDou has since expanded its coverage to offer global services, a mark of China's increased global power projection capacity and industrial emergence. BeiDou delivers signals in different frequency bands for both positioning and communication purposes, an innovative variation compared to other satellite navigation systems. Unlike Russia's GLONASS system, the BeiDou system is all but guaranteed to continue to progress in its technical capacities and modernization as China continues to rise. The BeiDou system is also particularly unique as it maintains a two-way communication ability with receiver segments. This means that BeiDou is effectively a two-way system, unique to the GNSS systems analyzed here. Users can therefore find their location, and the BeiDou system can read their location simultaneously (Xie, 2020). This has raised a host of security-related red flags in the West and increased the strategic utility of the system substantially for the Chinese

government. This section, like the previous two, will now explore the BeiDou system's various segments.

Space Segment

The space segment of the BeiDou satellite navigation system consists of a constellation of satellites deployed in various orbits. The current configuration of the BeiDou space segment includes a total of 45 satellites (Yang, 2023). This constellation comprises five geostationary orbit satellites and 30 non-geostationary orbit satellites, a testament to BeiDou's evolution from a regional to a global satellite navigation system. The geostationary satellites are placed to always remain above Chinese territory. Among the non-geostationary orbit satellites, there are three inclined geosynchronous orbit satellites and 27 medium Earth orbit satellites (BeiDou Navigation System Web Editors, 2023). The larger size of the constellation compared to other systems described here is in part tied to the fact that BeiDou also serves as a communications satellite system, capable of emitting and receiving both navigation and communication signals.

The space segment of BeiDou is set to continue to grow, with three backup satellite launches expected in 2023 (CGTN, 2023). China also plans to further integrate the BeiDou system with emerging technologies, such as 5G, a testament to the reality that it intends the BeiDou system to serve more purposes than mere navigation. This packaging of multiple types of satellite technology into a single constellation marks a distinct alternative to all other systems discussed in this section, as the alternatives are purpose-built solely for navigation. China, through BeiDou, is aiming to have a "single, integrated national spatial and temporal system" by 2035 (CGTN, 2023). This is an innovative and distinct manner of providing satellite navigation in the field and is likely to be a noteworthy case to watch in the coming years.

Ground Segment

In keeping with BeiDou's more expansive purposes, it also has a larger and more diverse ground segment. Not only does it maintain the tracking, corrections, and master control centers required for the functioning of its navigation portion, but it also has various stations dedicated to its messaging and communications functions (BeiDou Navigation System Web Editors, 2023). The ground segment of the BeiDou system is particularly difficult to establish with certainty, as the Chinese government is characteristically reserved about releasing such information publicly. Even

the master control station's location is not publicly available, though it is of course expected to be located somewhere within Chinese territory. It is known that the BeiDou system maintains at least one master control station and at least 30 monitoring stations (ESA Editors, 2023a; Penn State Department of Geography, n.d.).

It is also difficult to determine the location of Chinese stations abroad. However, since at least 2018, China has been expanding the system as a part of its wider Space Silk Road (Jakhar, 2018) as a portion of its broader Belt and Road infrastructure expansion project. Chinese media claims that the system had over 1.1 billion users as of 2022 in 120 countries, a remarkable number for such a relatively new system (Yekai, 2022). A global network of ground stations is required to achieve this sort of coverage. States participating in the project across Central Asia and Africa have reportedly been willing to participate in hosting BeiDou stations, though information on the specific states and locations is rather difficult to acquire. The first officially announced BeiDou station abroad was opened in Belarus in 2022, though it is likely others have already been put in place in other areas previously (Lopez, 2022).

Receiver (User) Segment

Like GPS and GLONASS, China also builds receivers capable of decrypting encrypted BDS signals for exclusive military use. The Chinese military accordingly has access to the encrypted military signals of the BDS system, known as the B1C and B2a signals, which are designed to be more resistant to jamming and interference than the civilian signals through these receivers (Millner et al., 2022).

Though the specific receivers used by the Chinese military are not public information, it can be inferred that, like the US and Russia, the Chinese military has dedicated receivers capable of receiving military-grade signals to use for both infantry and vehicles throughout its military. These receivers are also likely integrated into Chinese smart weaponry, such as guided missiles and drones, to provide accurate location services and targeting capabilities.

Another noteworthy aspect of the BeiDou receiver segment that blurs the line between security and civilian applications lies in its previously mentioned ability to also act as a two-way communicator. As previously outlined, the BeiDou system has the ability to both inform at the user

level and receive signals sent back to the space segment. This means that the BeiDou itself has the ability to locate and accordingly track receivers on the ground. This capacity is primarily seen in the civilian sector at present and carries with it clear security implications that have been a source of alarm in the United States and the West in particular.

Europe: Galileo

Europe's Galileo system is unique amongst satellite navigation systems, a reality that this study will explore in detail in subsequent chapters. Here, though, it can be observed that Galileo is the only satellite navigation system not controlled by the military of a sponsoring state. Its conceptualization and development began within the organs of what would eventually become the European Union, were later transferred to the civilian ESA, and eventually were "supranationalized" by the European Union in the mid-2000s. The European Commission is currently the owner and operator of the Galileo system and only allows EU member states to access the system's secure signals for security purposes, known as the Public Regulated Service, or PRS. This makes the Galileo system globally unique as a piece of security infrastructure fully under the control not of a state but of a supranational organization.

Space Segment

The Galileo constellation consists of 30 satellites placed in medium Earth orbit (ESA Editors, 2023b). The satellites are distributed across three equally spaced orbital planes, with ten satellites in each plane (ESA Web Editors, n.d.). The orbital planes are inclined at an angle to the equator, which improves their accuracy (ESA Web Editors, n.d.). Each satellite in the Galileo constellation is identical in design, performance, and fuel load. The active constellation includes 24 satellites, with six spare satellites that can replace any failed satellite in the same plane. The spare satellites ensure continuous operation and provide redundancy. The Galileo satellites orbit at an altitude of 23,222 kilometers, the highest of the systems observed in this section. Their current status can be checked at the following link at all times: https://www.gsc-europa.eu/system-service-status/constellation-information.

As of 2023, these satellites are all part of the first fully operational generation of satellites. Plans to modernize the Galileo Second Generation satellites (G2) were underway as early as the

2020s (ESA Web Editors, 2022; ESA Web Editors, 2020). These second-generation satellites will be developed by Airbus and Thales Alenia Space, with the first satellite likely to be launched in 2024 (Amos, 2021).

These satellites, like most other second-generation navigation satellites, will improve various aspects of navigation technology and enjoy increased resilience. Most notably, Galileo will be the first system to include the Open Service Navigation Message Authentication service, a system designed to double-check the authenticity of transmitted information. This will help the system prevent spoofing in a time of conflict for civilian users (Airbus, 2021). This also has direct implications for the encrypted signals on the Public Regulated Service for secure use of Galileo in improving signal security as well (Rügamer et al., 2020). Furthermore, these second-generation satellites will improve all aspects of navigation and increase accuracy even further.

Ground Segment

The ground segment of Galileo represents a truly impressive network of stations around the globe. There are two master control centers, one in Fucino, Italy, and the other in Oberpfaffenhofen, Germany (ESA Web Editors, 2018). In addition, it has transmitting and receiving stations placed all across the globe, relying heavily on the various island possessions of European states to achieve global coverage. Examples of such stations can be found on Jan Mayen Island (Norway), Noumea (France), and Kerguelen (France), just to name a few. Galileo even maintains one such station at Troll Base (Norway) in Norwegian-controlled Antarctica.

Additionally, the Galileo system is rather unique as it relies on overseas possessions for launch facilities. The main launch facility used by Galileo is in French Guiana. (European Space Agency, 2021). The reasons why French Guiana is ideal for a satellite launch location are numerous; however, its primary utility as a spaceport is tied to its equatorial location. This allows for the harnessing of Earth's rotational velocity to assist payloads in achieving orbits. This, in turn, lowers fuel requirements and extends the life of the satellite payloads (New Space Economy Contributors, 2023). Moreover, it provides much-needed local employment in an otherwise economically depressed region of French territory (ESA Web Editors, 2016).

Overall, Europe, through Galileo, is the only satellite system that can boast of having the entire global network of ground stations within its sovereign territory. However, it is important to note that this situation relies heavily on overseas possessions of European powers, a reality that carries with it inherent risks as local independence movements ebb and flow throughout the years.

Receiver (User) Segment

The receiver segment of Galileo, like the other satellite navigation systems outlined here, is designed to have dedicated receivers for the receipt of encrypted military-grade signals. In the case of Galileo, this system of signals is referred to as the Public Regulated Service (ESA Editors, 2020). Currently, European member states wishing to use the PRS for military purposes do so on an individual basis. However, the European Union has also taken a series of actions at the supranational level to further integrate European militaries and improve their cohesion. One such example includes actions taken through the permanent structured cooperation (PESCO) mechanism. One project, the European Radar Navigation Solution, is designed specifically to "promote the development of EU military positioning, navigation, and timing (PNT) capabilities and future cooperation taking advantage of Galileo and the public regulated service" (PESCO Editors, 2023). Europe is currently in the process of developing dedicated and standardized military receiver segments for Galileo through the GEODE program (Galileo for European Defence). This program covers the full spectrum of receiver segments and is designed for land, sea, air, and even outer space use. The primary focus of the program is to provide European countries with a high-quality, single platform to use Galileo in militaries, which is set to be completed by 2026 (Cozzens, 2021).

India: NavIC

The Indian satellite navigation system must first be distinguished from those previously explored by noting a major difference in its scope. The system is a regional navigation system, not a global navigation system (GNSS). Its formal name is the Indian Regional Navigation Satellite System (IRNSS). However, it is more commonly referred to as NavIC. This stands for Navigation with Indian Constellation and also closely relates to the word "nāvik" in Hindi, meaning navigator or sailor. As of mid-2023, NavIC covered the entirety of the Indian subcontinent and extended for roughly 1500 km from the Indian border in all directions. India's Space Research Organization,

though, is working on several initiatives to improve the quality of the system, increase coverage, and improve India's ability to manufacture the many components required for this system. The system's strategic utility, though, is still quite limited in large part because of the need to develop workable components, particularly in the user segment. Despite this, the objective is to eventually develop the system into a full, global navigation system on par with GPS, Galileo, or GLONASS (Economic Times India, 2022). Despite this regional distinction, the system works in the same manner as other satellite navigation systems and could be considered comparable to other systems mentioned in this chapter at earlier stages in their respective developments.

Space Segment

Compared to the larger systems previously explored, India's satellite navigation system has a smaller space segment by virtue of its less extensive coverage area. As of mid-2023, the constellation consisted of nine active satellites, with the most recent launch taking place in May 2023. Interestingly, the satellites within the Indian constellation are divided by their orbital paths. Four of the satellites in the constellation are located in geostationary orbits (including the system's newest one), and the remaining can be found in geosynchronous orbits. The satellites in geostationary orbit are positioned in sync with the Earth's rotation, meaning that they always remain in a seemingly "fixed" position in the sky relative to the surface. Similar satellites were discussed earlier in China's BeiDou system, which for a time was similarly tasked solely with providing navigation services over Chinese territory. These satellites are placed above the Indian Subcontinent to guarantee uninterrupted coverage of Indian territory. These satellites can all be found in medium Earth orbit at a distance of about 35,000 km above the Earth's surface.

The NavIC system's space component is going through a phase of modernization. As of mid-2023, the system is in the process of augmenting the system to increase coverage and improve the system's reliability through a new generation of satellites (NDTV Editors, 2022). The first of these satellites was launched in May 2023. Currently, there are plans to launch at least 12 more satellites soon (Bhardwaj, 2022). The space segment is a relatively well-developed portion of the NavIC system overall. India's long-established space industry and research institutions have allowed it to develop the space component of the NavIC system to an advanced level.

Ground Segment

The ground segment of the Indian system is entirely located in India. The exact locations of all the monitoring stations are not readily available; however, the Indian government did outline to the United Nations that it maintains a master control center and various other ground stations across the Indian territory (Indian Government, 2023). The Indian government's report to the United Nations Office for Outer Space Affairs highlights the precise stations without listing their locations. These include two navigation centers, seventeen one-way ranging stations, five two-way ranging stations, two network timing centers, and two spacecraft control centers (Reddy, 2022). As with some other states in this list, the specific locations and functions of these sites are likely considered to be strategically sensitive and are not generally available to the broader public.

What is noteworthy about India's ground segment are its current plans to expand the broader ground segment of its satellite systems outside India's borders. As of 2023, India has established plans to build a ground station in Vietnam (Kumar, 2021) and is in discussions with France regarding the construction of a ground station in French Guiana (Kumar, 2023). India has also expressed plans to expand into its wider region, with stations in Bhutan, Nepal, the Maldives, Bangladesh, and Sri Lanka (Kumar, 2019). It is worth noting, though, that these stations are not all explicitly dedicated to satellite navigation but to broader satellite capacities. These sorts of stations can therefore be of use not only for navigation but also for telecommunications and other various satellite-related services. In the event that India does follow through with plans to make the NavIC system a true GNSS, it is likely that they will look to place stations globally to bolster the system and increase its effectiveness.

Receiver (User) Segment

In 2020, it was announced that an independently developed user segment chip would be developed for use in smartphones and other similar civilian devices (Chandrashekhar, 2020). In addition, in the spring of 2023, an Indian company, Elena Geo Systems, developed a NavIC-capable chip that can power more advanced navigation systems tied to the NavIC system. This locally developed technology was publicly showcased to the Indian military in April 2023 at an event where the founder of the company formally and ceremonially handed one of the chips to the Chief of the Indian Defense Staff, General Anil Chauhan (Peri, 2023). The implication of this event is that the Indian military was likely reliant on foreign chips to power the user segments of NavIC-capable technology, even for its military. However, confirmation of this information was not readily

available at the time of writing this report. This is a substantial possibility, given the relative complexity and technical skills required to develop the receiver segments. Perhaps somewhat counterintuitively, it is the development of these seemingly peripheral components that can often be the most complicated in advanced space systems because of the requirement of such receivers to accomplish advanced tasks while simultaneously remaining small enough to be of a useful size. The company has stated that it is planning on making 10,000 such chips in the first batch of chips and is looking to provide the Indian military with 200 NavIC receivers through another Indian company, Bharat Electronics Limited, in the near future. (The Defence Times, 2023; Elena Geo Systems, 2023; Peri, 2023). This move would substantially increase the utility of the NavIC system for both the Indian civilian industry and the Indian military by improving the system's resilience during any potential future conflicts, allowing India to develop such components domestically if faced with shortages or sanctions.

Japan: QZSS

The Japanese system is formally called the Quasi-Zenith Satellite System and is commonly abbreviated as QZSS. It is unique in this list of systems as it was not designed strictly with the purpose of sovereign control in mind, at least formally. The system was developed as a complementary system to enhance the American GPS over Japan and across the broader Pacific, in keeping with Japan's unique security status as a demilitarized state dedicated solely to self-defense. QZSS is accordingly a relatively small system, boasting just four satellites in active service as of mid-2023. However, this is set to change somewhat dramatically in the near future. In May 2023, Japan announced its intention to greatly expand the system from just four to eleven satellites, dramatically increasing the system's coverage (Kawahara, 2023). Even more fundamentally, the upgraded system is destined to be capable of functioning independently of American GPS, if necessary, with some navigation insiders declaring Japan had effectively "declared its independence" (Goward, 2023) from the GPS. This more sovereigntist approach is in keeping with the broader trend in Japan toward a more independent foreign policy with less of a taboo toward military affairs (Chellaney, 2023; Kelly & Murakami, 2022). It is also more in line with standard state behavior when it comes to satellite navigation capabilities.

Space Segment

As previously mentioned, the current Japanese QZSS system only sports four satellites. Somewhat comparable to the Indian system, these satellites are in orbits designed to give coverage over Japan

and the Pacific region. These four satellites are in an elliptical, geosynchronous orbit, which results in them remaining over the broader Pacific region. At least one of the satellites is over Japan at all times as a result of this arrangement. As this system is designed merely to augment GPS, these satellites increase the availability of GPS, particularly in Japan's highly urbanized environments. Prior to the QZSS system, Japan's enormous cities tended to create GPS dead zones in dense urban environments as a result of interference with GPS signals on the street level.

As previously mentioned, the QZSS system is set on a path toward a remarkable degree of modernization and expansion in the coming years. The system will be expanding from these four augmentation satellites into a true regional navigation system of eleven satellites independent of the GPS. The projected system was originally posited to consist of seven satellites but has since been expanded to eleven. It is expected to be comparable to the Indian system as it will cover the entirety of Japan's territory in addition to a certain perimeter around the archipelago. Interestingly, this expansion is being supported by the US. In January 2023, the US Space Force delivered multiple payloads to Japan to assist in the expansion of the QZSS system (Saines, 2023), and the country has yet to raise any objections to Japan's move toward increased navigational independence. In June 2023, the US ambassador to Japan visited one such site to underline the US's willingness to cooperate with Japan in this new endeavor (Sodders, 2023).

Ground Segment

The ground segment of this augmentation system spans the Pacific and is more readily accessible than other systems. Japan maintains monitoring stations on Japanese territory in Okinawa, Sarobetsu, Koganei, and Ogasawara. In addition, it maintains stations abroad in India, the US island possession of Guam, Australia, Thailand, and the US state of Hawaii (GPSBeam Editors, 2021). It also maintains two master control stations, one in Hitachi-Ota and another in Kobe, both in Japanese territory. The system boasts an impressive thirty stations spread across the Asia-Pacific region (Numata, 2022). This gives the Japanese system a strong foundation upon which to build its larger system, which will likely require more monitoring stations.

User Segment

The user segment of the current Japanese system is in keeping with the reality that QZSS is designed to augment GPS, not provide an alternative. Accordingly, Japanese military receivers are likely comparable to civilian receivers as they can receive both GPS and QZSS signals, though this information is not readily available. However, what is important to note is that the QZSS system does indeed use a specific signal unique to this system's L1S signal (Trimble Geospatial, 2023). This means that receivers can theoretically be equipped to solely receive this unique Japanese wavelength, if necessary, though it is neither documented nor likely that the Japanese military is currently doing so. This does, however, lay the foundation for the Japanese system to eventually focus on unique Japanese navigation signals in the future, were this to become Japanese policy as the system expands. Japan's robust technology sector at present is more than equipped to manufacture such parts, and the Japanese high-tech components industry is extensively involved in the production of similar receivers in the civilian sector for similar satellite navigation user segments. The Japanese government includes an extensive list of manufactured receivers that are capable of receiving QZSS codes in the civilian sector on its website (Government of Japan, 2023).

Summation

Overall, there are four global satellite navigation systems operated by the most important political power holders in the international system: the US, China, Russia, and the European Union with its member states. These global systems can each find their origins within the military apparatus of their respective states or organizations, with the notable exception of Galileo, which will the main focus of this study. Its origins lie in a supranational military organization, the WEU, a fact that this work is the first to explore in depth. In addition to these global systems, two regional systems of satellite navigation were also explored in the cases of India and Japan. In the case of India, the system covers the Indian subcontinent and 1500 km in every direction from Indian territory. In the Japanese case, the system is designed solely to augment the American GPS and does not constitute a truly independent satellite navigation system, though the country has announced plans in 2023 to expand the system into a truly independent entity.

With the broad state of satellite navigation systems established, the following chapters will now explore in depth the cases of India and Europe, exploring, in particular, the peculiar path European states followed in their development and eventual deployment of this critical piece of modern security infrastructure.

CHAPTER 4
REPRESENTATIVE CASE STUDY: INDIA

On August 15, 1947, India ceremonially lowered the Union Jack for the last time. In its place, India raised the tricolor above the Red Fort in Delhi. The moment, captured in archival footage, shows the flag hoisted, and at the same moment, a rainbow spread across the sky. This event was considered, at the time, a sign of good fortune for the newborn republic (Pandey, 2020). The raising of that flag clearly demonstrated that India had achieved independence from British rule, a status it held for almost four centuries. The achievement of independence marked a significant event not only in India but in the millennia-spanning history of the whole of South Asia.

However, India's newfound freedom also meant the stark realities of being an independent state on the international stage had to be faced. This fundamental change in institutional structure meant that India alone was responsible for providing its national defense and protecting its sovereignty. India's situation throughout the remainder of the twentieth century was one in which security risks, differences in power, and domestic struggles for state integrity in the face of these challenges were prevalent. These are challenges that are common to all states, and the institutional solution is remarkably standardized. These challenges were addressed by India in large part by a dedicated and highly bureaucratized military institution that would be familiar to all states existing into the present. The institution is so ubiquitous in international relations that it is often assumed when addressing questions.

Regardless of its ubiquity, this institutional reality is a relatively recent affair. The story of India's armed forces as an institution did not begin with independence and most certainly did not take the form of a highly bureaucratized and standardized modern military. The evolution of India's armed forces followed a path that was quite common for all states, transitioning from a personalized, dynastic institution characterized by personal service and loyalty to that of a colonial territory, and finally to the one familiar with modern states. As a result of this transition, a fundamental critical juncture occurred with Indian independence

that would set the state on a path of institutional path dependence that continues to the present. This can be best observed in the nature of its current security mandate.

This case study outlines this broad evolution first. In keeping with the research design, it is posited that changes in the perceived security mandate of the armed forces are what ultimately caused India to behave in the manner in question, with that perceived security mandate relating directly to India's statehood. This differs fundamentally from European states from the very start. Once this broad institutional precondition is established, smaller critical junctures and states of path dependence will then be analyzed in India's process of satellite navigation development, within the broader institutional state of path dependence tied to Indian statehood.

With this full picture, this case study will precisely outline what caused India to assign control of satellite navigation to the Indian state, as opposed to maintaining the asset under private control or assigning it to a supranational body. This case is considered representative of modern state behavior and contrasts with the European cases that first find themselves in a different supranational institutional context and, by extension, experienced very different, smaller critical junctures and states of path dependence through their development of Galileo.

Therefore, the broad institutional development of the armed forces security mandate in India will first be established. This covers the independent Mughal Empire, British rule, and ultimately the modern Indian state. Each of these core institutional transitions occurred at critical junctures and was followed by broad, constitutional states of path dependence. Once this broader evolution is established, the study will bring the lens down to the development of satellite navigation in India within its modern state context. It will provide a timeline outlining the critical junctures in that process, covering both the permissive and productive conditions that can be observed. It will then outline the mechanisms that drove actors in those moments of critical juncture, where those can be observed. In addition, it will outline the presence of any speed controls that can be clearly seen to have altered the rate at which subsequent states of path dependence occurred.

Taken in its entirety, this account will fully explain why India chose to develop satellite navigation and assign control of the asset to national authorities. It will outline how the broad, macro-level institutional structure of the state relates directly to the micro-

processes that resulted in satellite navigation. This should then provide the reader with the fullest institutionalist explanation as to why states make security decisions.

In this section, we will focus on the evolution of the Indian state's security mandate at the broad institutional level. As mentioned in the research design, the state's security mandate is defined dually as consisting of the territory and individuals over which it legitimately believes it has the right to govern. Over time, this mandate has taken many different forms, particularly in its legitimization. However, over the past four centuries, every polity on Earth has undergone a similar evolution, formalizing state institutions and rights in increasingly standardized forms, mirroring European institutional structures developed in the seventeenth century. The evolution of the Indian state's security mandate reflects this broad trend. Over the timeline explored here, the Indian polity underwent three major institutional evolutions, coinciding with three particularly stark critical junctures. The first critical juncture occurred with the decline of the Mughal Empire in favor of the British East India Corporation, marked by a series of wars in the late eighteenth century. The second coincided with the Sepoy Rebellion, and the third was tied to the end of the Second World War. Each of these critical junctures spawned clear periods of strong institutional path dependence, which fundamentally determined the security mandate of the Indian polity. The final of these, that of the end of the Second World War, generated the state of national path dependence that can be observed through the present.

During the different periods of path dependence, these critical junctures spawned the state's security mandate, consisting of the territory and the individuals the state governed, and evolved accordingly. The remainder of this section explains how the security mandate evolved over these centuries, eventually resulting in the modern Republic of India, complete with its standard, modern national security mandate. With this established, the broad institutional state of path dependence in which Indian decision-makers chose to pursue satellite navigation will be established and ready for comparison with the European cases that will follow.

The Personalized State: India Prior to the East India Company

As stated previously, the first major critical juncture in this process occurred in the late eighteenth century, with a series of wars between the Mughal Empire and the British East

India Company. This section will establish what the security mandate in India looked like prior to that initial critical juncture, outlining the traditional and personalized nature of the Mughal Empire prior to the imposition of European-style institutions in the subcontinent. This institutional state is comparable to those observed globally prior to large-scale European imperialism and also coincides well institutionally with the nature of most European states prior to the Renaissance and later the Enlightenment.

Territorial Mandate in the Traditional State

Babur, a Central Asian ruler who claimed descent from Timur and Genghis Khan, founded the Mughal Empire by emulating Mongol conquests of the previous centuries. At its height, the Empire's extent unquestionably covered vast lands stretching east to west from the Indus River Basin to the highlands of Assam and Bangladesh and from north to south from Kashmir to the Deccan Plateau in South India. It was this illustrious ancestry that justified Mughal rule over such a vast collection of entirely foreign people who broadly neither shared their linguistic, religious, or cultural heritage. (Ali, 1978; Habib & Habib, 1987; Sood, 2021).

The territorial mandate in many ways reflected this highly personalized form of state. The Empire's frontiers often aligned with natural boundaries such as rivers, mountain ranges, and woodlands, lending a basic geographical logic to the dominion's contours. However, without modern maps or notions of territoriality tied to objective borders on a geographically defined Earth, these borders took on a distinct, personalized nature compared to modern states. In traditional dynastic systems such as the Mughal Empire, the territorial confines of states differed most clearly in their "objective" formality tied to scientific methods of measurement (Düring & Stek, 2018). Territoriality was very much tied to the practical ability of the ruler to exert their will in certain geographical spaces. It was not until European notions of territoriality, defined by scientifically delineating physical spaces through highly formal borders, that this concept would be introduced in India and the bulk of the globe. Accordingly, historical borders were subject to various practices and were defined by a degree of nuance and flexibility simply not present in modern international relations (Diener & Hagen, 2012). This was the case in the Mughal Empire prior to the first critical juncture discussed here.

This had a profound impact on the territorial mandate of the armed forces of the Mughal Empire. Without these rationalistic notions of territoriality, the Mughal Empire understood the territorial limits of its empire more through administrative reach and practical military control. Where the Mughal armed forces could practically exert authority, this was the territory the empire governed.

An example of the practical effects this reality had on Mughal policymaking can be observed in their construction of fortifications and garrisoned towns. Such constructions, of course, served a practical role as bulwarks against enemies in some cases. However, they also crystallized and represented Mughal authority across these vast expanses. Such fortifications provided highly visible symbols of sovereign power and helped define territorial limits. This use of fortifications, such as this symbol of territorial control, was practiced extensively throughout the ancient world, even when the practical necessity of defending a region was not present (Sánchez, 2017).

The governance of Mughal territories was accordingly executed through a highly centralized bureaucratic system in which the military played a critical role. The military acted not only as soldiers but also as administrators, tax collectors, and local police forces throughout the areas where they could exert authority (Moosvi, 1981). Referred to as the Mansabdari system, this blended administrative-military structure ultimately became the backbone of the Mughal state. In this system, the mansabdars, a class of military officers who also acted as administrators, were granted jagirs (revenue assignments) and were responsible for maintaining a certain quota of armed forces. These jagirs coincided with territorial notions of provinces but, more importantly, rested primarily on population centers and people groups. Mansabdars were responsible for maintaining both military efficiency and social order within their assigned territories, which the emperor's court determined based on the rank and duties of the mansabdar. Therefore, the territorial mandate of the Mughal Empire was ultimately tied to the area where these Mansabdars could effectively accomplish this task, more so than in an objectively delineated territorial unit complete with modern notions of borders.

This marks a sharp distinction from the role of the armed forces in modern states that is important to note. The modern state perceives a need to preserve fixed territorial delineations defined by rationalistic notions. This remains true universally, regardless of whether people live in the involved areas or if there are relevant economic resources to be

exploited. Modern borders are very much an ideational construct, grounded in Enlightenment notions of reason that were simply not present in the Mughal Empire.

To provide a practical example, we can examine the conflict between India and China in the Himalayas. This is a conflict in which both states contest the precise drawing of a border (International Crisis Group, 2023) in the remote heights of the Himalayas. As a result of this disagreement, India and China have fought multiple wars and continue to have border clashes as that conflict simmers. The entire nature of these conflicts centers on establishing physical control along a mentally constructed line. Such a notion, in which soldiers would be fighting over such a line in such a remote region, would have been anathema to the Mughal Empire, whose focus would have been far more on controlling population centers in economically viable areas ripe for taxation. This is not because the mountains or the decision-makers themselves have changed, but because the perceived mandate of the armed forces in those countries has. This has thus had a clear effect on the policymaking of the states and their militaries.

Therefore, we can observe that the Mughal Empire and other traditional empires understood their territorial mandates in a quite different manner than states do today, prior to the first critical juncture explored in this case. These were defined more by symbolic control through fortifications and practical control through the physical presence of the state's armed forces. This distinction gets to the heart of the issue being explored here, namely, that changes in the perceived security mandate of a state can fundamentally alter its security behavior and decisions.

Subject Mandate in the Traditional State

In addition to the territorial nature of the security mandate, the armed forces of a state hold authority over and owe responsibilities to the individuals who are subjects of the state. This section now explores how the Mughal Empire determined the individuals the armed forces held obligations and rights over, outlining the individual mandate as that state understood it prior to the first critical juncture.

Determining the subjects of the Mughal Empire, much like determining its territorial dimensions, involved a complex interplay of legal, administrative, and cultural systems.

Broadly speaking, though, it can be said that one was a Mughal subject if one had a clear role in what was a complex system of vassalage and allegiance. Essentially, subjecthood was formally grounded in personal ties as opposed to ethnicity or geographic location.

As the foundation of the state, the Mughals incorporated many local and regional rulers into their administrative system through a complex hierarchy of vassalage and allegiance, ultimately deriving from the emperor himself. Reflecting the dynastic nature of the empire, these ties included marriage alliances, the ceremonial granting of titles, and promises of military support in both directions. Those local leaders and nobles who accepted Mughal suzerainty through this method were therefore self-confirming their status as subjects of the Mughal Empire. This form of self-confirmation as a subject was a critical element in determining the individual mandate of the Mughal state and who it did and did not rule. It is also important to note that agency in this system ultimately only existed within the higher rungs of the dynastic system. The vast majority of the people had no say in determining their allegiances and became subjects of the Empire essentially by extension. If the local noble ruling over a village of peasants swore allegiance to the Mughal emperor, the peasants in that village became de facto Mughal subjects. This first method was by far the clearest way to determine subjecthood to the Mughal Empire and clearly determined the mandate of its armed forces. Any individual sworn to the emperor or bound to one of his vassals was under the mandate of Mughal forces. This meant that those forces had a right to enforce Mughal laws against these subjects and an obligation to protect them from outside harm.

This system was substantially formalized under Akbar the Great, the grandson of Babur. The previously mentioned Mansabdari system, in addition to helping delineate territory, stands out as a unique way that the Mughals determined subjecthood as well. The name of the system ultimately derives from the word “mansab,” which means a number assigned to a man. What this meant in practice was that all individuals within the ruling classes were assigned numbers that coincided with their rank and, by extension, their degree of responsibility within the imperial structure. Therefore, if one had a mansab or a number, then one was without a doubt a subject of the Mughal emperor following the reign of Akbar. This system relied heavily on well-founded census data. The Mughals conducted detailed population censuses, which were pioneering for their time. Emperor Akbar initiated these large-scale censuses covering a vast part of the Empire, which included detailed accounts of demographics, occupations, and resources. This census helped the Empire assess taxes and

also identify the subjects of the Empire and assign them Mansabs. This system was unique at the time (Ali, 1978) and offers something of a preview of modern citizenship, characterized by censuses and the numbering of citizens in modern societies.

Therefore, any individual who found themselves tied to the emperor through these bonds of vassalage would have been under the security mandate of the Mughal armed forces. Given the nebulous nature of ancient borders established earlier, one's status as a subject was held regardless of one's precise territorial location. In some distinct ways, it was more akin to a verbal contract in modern times. Mughal armies had the right to enforce the emperor's will and the obligation to defend those individuals from foreign threats.

Insights on the Pre-European Period

The armed forces of the Mughal Empire had territorial and subject mandates that differed significantly from those of modern states prior to the first institutional critical juncture in this analysis. This institutional framework directly impacted their military's role in society and institutional structure.

During the Mughal era, the primary purpose of the army was to conquer new territories, establish control over subjects, and act as symbols of the emperor's authority. They also played critical roles within the imperial bureaucracy, collecting taxes and dispensing justice. These mandates resulted in a distinct structure of the Mughal military defined by the Mansabdar system and in a different policymaking process than those that followed it.

In the following sections, we will address how the victories of the British India Company in the late eighteenth century generated an institutionally critical juncture in India. The actions taken during that period would completely redefine the institutional structure of the state in India, establishing new European notions of the security mandate of the armed forces as defined by strict territoriality and clear subjecthood status for individuals.

First Critical Juncture: British East India Company Victory in the Carnatic Wars, 1756–1765

The first critical juncture in the evolution of the Indian state after the Mughal Empire occurred in the late eighteenth century. This critical juncture was the period covering the

Carnatic Wars and their related peace settlements, a conflict in which the British East India Company was totally victorious, institutionalized in the Treaty of Allahabad, which gave Britain practical control over the whole of the Indian subcontinent. As outlined previously, critical junctures consist of permissive conditions, productive conditions, and rational incentives. These will now be explored in that order in the context of the Carnatic Wars to establish this conflict as a true critical juncture in the development of the Indian state.

Permissive Conditions

As defined in Chapter 2, permissive conditions are necessary conditions that loosen the constraints on the agency of the subjects. The introduction of these conditions generally coincides with the start and end of a critical juncture. The Carnatic Wars resulted in a significant loosening of constraints on the actions of the British East India Company as a result of that conflict. Therefore, the clear permissive condition that was present was the removal of constraints on military action in India agianst France and its Indian allies. This was a condition that was present during the Carnatic Wars and ended along with them.

Institutionally speaking, therefore, the outbreak of the 7 Years' War in Europe meant that British and French forces globally were now institutionally permitted to engage in hostilities with one another. The Carnatic Wars were accordingly one portion of that global conflict that took place on the Indian subcontinent. This war between Britain and France loosened the institutional constraints on the Company that previously prevented it from waging an unrestrained war on native Indian polities. Prior to the conflict, the state of peace in India meant that, despite the British East India Company having nominal institutional rights to govern the entirety of the Indian Subcontinent established in its charters (UK National Archives, 1600; 1661), it practically was not able to do so. With the introduction of this permissive condition in the form of the war with France, the British East India Company gained the institutional right to conquer all French possessions in the Indian subcontinent in addition to any French-allied Indian polities. The end of the war was then marked by a shift back to peace under new institutional conditions, embodied in the Treaty of Allahabad signed in 1765. Upon the signature of that treaty, agents in the British East India Company no longer had the ability to engage in hostilities with France or its Indian allies. Accordingly, the state of war that existed between Britain and France presented a clear institutionally permissive condition that would indicate the presence of a critical juncture.

Productive conditions

As defined previously, productive conditions are factors that operate in the presence of permissive conditions that encourage that change to occur.

Three key productive conditions were present in the Carnatic Wars that fueled this critical juncture. The first was the relative decline of the Mughal Empire; the second was the British East India Company's massive expansion of its military forces; and the third was British victory on other fronts during the Seven Years War. These three conditions acting together provided strong productive conditions, which precipitated this critical juncture, resulting in the Treaty of Allahabad.

First, the Mughal Empire, previously dominant, had begun to decline precipitously following a string of bad rulers, violent succession crises, and various other economic issues by the time of the conflict (Leonard, 1979). Practically speaking, this meant that the hundreds of local nobles they governed through their familial and patronage ties began to act more or less independently, no longer bound by the Mughal state. Their territorial control, founded on such ties, had practically dissolved and opened the door for European powers to fill that gap. This meant that, instead of merely putting in play British and French territorial possessions in the conflict, huge swathes of Indian territory were also up for grabs. This presents a very potent productive condition that ultimately would influence the actions of agents during the critical juncture.

Second, the armed forces of the British East India Company swelled enormously during the Carnatic Wars. So enormously, in fact, that during the conflict, the armed forces of the company actually dwarfed those of the British Army, despite official Royal forces being engaged in combat in Europe as part of the same conflict. It was this military might that allowed for British East India Company victories at the battles of Plassey (1757), Wandiwash (1760), and Buxar (1764), which directly resulted in British total victory in India during the Carnatic Wars and therefore also acted as a strong productive condition during this critical juncture.

Finally, British victories globally in the Seven Years' War present another important productive condition. The effects of this can be seen in the negotiation process that resulted in the Treaty of Allahabad. During the Seven Years' War, the British enjoyed victories not only in India but also in North America, the Caribbean, and off the seas of Europe. Taken together, this put the British in a dominant position in those negotiations and did not leave France with much ability to contest Britain's taking of the entirety of India within the Treaty.

Rational Incentives

Finally, the rational incentives that were present for Company leadership were quite blatant during this period. Rationally speaking, they had the ability to increase their material and institutional power in a very direct and measurable way, in keeping with the institutional mandate given to them by the Company Charter. Rationally speaking, agents were heavily incentivized to maximize their gains in India by as much as possible to increase not only the wealth and power of Britain but also themselves personally in the form of greater dividends and political influence.

Resultant Institutional Change

Taken together, the primary permissive condition of warfare first removed restrictions on military engagement between Britain and France in India. This condition allowed agents to then take action that otherwise was not present in the previous period of path dependence. When combined with the three productive conditions named and the inherent rational incentives outlined, the Carnatic Wars precipitated remarkable institutional change in India in the form of the Treaty of Allahabad of 1765. In that treaty, the Mughal Emperor ceremonially gave the British East India Company the right to govern and tax a vast territory in the richest part of India, Bengal (National Army Museum, 2023), thus providing a local Indian institutional justification for the Company's control in the area. This institutional change set the stage for the Company and ultimately the British to dominate the subcontinent. Moreover, this change meant France would be relegated from that point forward to a very minimal role in the subcontinent, clinging only to a handful of coastal possessions, such as Pondicherry, which it would cling to until the 1950s. Following that treaty, a new state of path dependence with regard to the Indian state and its security mandate can be observed. This will now be outlined.

Resulting Path Dependence on the Security Mandate

As stated in the theoretical section, this work accepts the interpretation of path dependence as a self-reinforcing state where embedded actors have rational incentives to maintain the status quo. Accordingly, the analysis of the security mandate will take a specific focus on the rational incentives of actors to maintain the institutional status quo related to the security mandate.

Following the institutional change that took place at the critical juncture of the Carnatic Wars, embodied in the Treaty of Allahabad, India entered into a state of clear path dependence following 1765. Broadly speaking, this path dependence centered on the British East India Company's dominance of the subcontinent and the relegation of the Mughal Empire to a subservient position in India. The most powerful actors in the system following this critical juncture shifted clearly from the Mughal imperial aristocracy to European members of the East India Company. Accordingly, European notions of the security mandate would become dominant in India and set the stage for the development of the Indian state. The remainder of this section will outline precisely what this form of path dependence looked like, highlighting how the mandates were understood during this period.

Territorial Mandate

European and, by extension, the British East India Company's concepts of territorial control differed significantly from how the Mughal Empire had understood it prior to the critical juncture. The first major distinction is the foundational purpose of territorial control. European colonization in this period in particular was driven by mercantile interests and backed by military conquest, as opposed to the other way around. Indian states, such as the Mughal Empire explored previously, were established through dynastic succession and wars of conquest. Such empires were driven by traditionally imperialistic motivations of expanding the domain of the Empire, thereby increasing taxation and one's military forces for further conquest. Therefore, the very purpose of the state brought to India by the Europeans was fundamentally different in purpose from anything previously seen on the subcontinent (Abraham, 2020).

This institutional difference in the purpose of the state provided strong incentives for East India Company leaders to support this form of territoriality for one clear reason. Precisely demarcated territories were far more effective for administrative and economic exploitation than the existing systems in India. As a corporate actor whose existence relied on running a profitable enterprise, such increases in efficiency were necessary for the Company's growth and continued existence. The East India Company accordingly introduced a far more scientific and rigidly defined concept of territoriality that did not exist in the same form in India before colonization (Nandakishwor Singh, 2017) to better reap the benefits of their conquests. It was this rational incentive that would drive path dependence following the Treaty of Allahabad for close to a century. The remainder of this chapter will explore in more detail precisely how this different territorial mandate manifested itself.

By looking more closely at the Treaty of Allahabad, one can observe how the views on this territorial mandate differed prior to and following the critical juncture of the Carnatic Wars. In the treaty, the Mughal emperor awarded the company the right to collect tax revenue in the provinces of Bengal, Bihar, and Orissa under their Diwani system of taxation. This meant that the Company, at least according to Mughal institutions, enjoyed status as a subject of the Mughal emperor. Therefore, the treaty in many ways merged both views of territoriality tied to explicit geographic regions and the more nebulous personal patronage rights of Mughal nobility critical to the Mughal concept of the state and of the local peoples the Company was now governing. This meant that both the British territorial concept of state power and the local, more traditional view of such mandates were satisfied, justifying the territorial mandate of the company under both institutional structures and setting up a structure for stable path dependence.

In keeping with its new status and interpretation of territoriality, the Company began shortly after this development to create modern maps of these newfound territories through an effort referred to as the Survey of India. To highlight the persistence of this path dependence, the Survey of India still exists today as part of the Indian government and is still responsible for mapping the territory of the modern state. The Indian government claims the Survey to be the oldest continuously active scientific organization in the world (Indian Department of Science and Technology, 2023). This effort began in 1767, two years following the critical juncture, and produced the first modern map of India by 1783 with clearly delineated territorial domains. The foundation of this new institution and its

continuance in its presence provide us with strong evidence that the institution of territoriality post-1765 existed within a state of path dependence quite distinct from that which preceded that critical juncture.

From this point forward, the East India Company steadily expanded its territorial control, mapping it along the way. Eventually, the Company supplanted the Mughal Empire entirely in authority by virtue of its power. By the end of the eighteenth century, the East India Company was spending half of its revenue on its enormous military, at that point dwarfing even the military of England itself. At one point, the Company had 250,000 soldiers in its employ, primarily recruited from Indian territories (Cartwright, 2023). By the mid-1800s, the East India Company had practical control of the entirety of the subcontinent. This steady military expansion is reflective of a state of path dependence related to the Company's institutional need to protect and expand its territorial mandate across the continent. This behavior can be directly tied to the critical juncture and exhibits a consistency that would exist for nearly a century, covering a period from 1765 to 1857, when another critical juncture can be observed.

In short, it can be observed that following the critical juncture of the Carnatic Wars, the new dominant actors in India, in the form of the East India Company, had a clear rational incentive to Europeanize the concept of territoriality in the subcontinent. Prior to their ascent under the Mughal Empire, territoriality was based on patronage and personalized ties, which were characterized by a far more nebulous state. Following the Carnatic Wars, the basic notion of territoriality was substantially characterized instead by a more formally rationalized state with objectively defined territorial delineations. In keeping with this change, the nature of the military changed substantially, reflecting the new state of path dependence, and the dominant actors gained incentives to maintain the state of path dependence, which the Treaty of Allahabad set in motion.

Individual Mandate

The individual mandate in India would also change following the critical juncture of the Carnatic Wars, prompted first by the Treaty of Allahabad. As outlined previously, the individual mandate under the Mughal Empire was characterized by bonds of patronage and traditional systems. Following the Carnatic Wars, these bonds and concepts were formally

transferred by the emperor to the East India Company. However, the British would alter these relationships between subjects and the Company-State in short order.

Much like with the territorial mandate, the main incentive for rationalizing the Individual Mandate of the state was to more efficiently exploit the East India Company's territories in India. Upon gaining practical control of the subcontinent within the first decades, the British attempted to do so with the Permanent Settlement of 1793. This act formalized and rationalized the relationship between the Company and its newfound subjects, with settlement primarily aimed at fixing the immediate issue of effective revenue generation through taxation. It established the manner in which local landowners in Bengal, Bihar, and Orissa would be responsible for collecting and paying taxes to the British, a right nominally granted to them by the previously mentioned Treaty of Allahabad. This Permanent Settlement legally recognized the local landowners as the legal proprietors of land, giving them the rights to the land in exchange for a fixed payment to the British government. The system aimed to provide a stable revenue source for the Company and to encourage agricultural improvement by giving these landowners more security of tenure. As opposed to being based on a system of vassalage, this was a system of jurisprudence more comparable to those seen in modern states. It was this act that laid the foundation for the state of path dependence that would follow, defining the Indian polity in terms of Western-style jurisprudence as opposed to the traditional Mughal system prior to the critical juncture of the Carnatic Wars.

The settlement also clearly delineated who was and who was not a subject of the Company, tied solely to the location of their land and their status as landowners, not to personal allegiances to a king or emperor. Accordingly, some scholars have deemed this act to be the start of the first truly modern British state in India, complete with territoriality and subjecthood defined under European rationalistic terms (Roy, 2023). On its surface, such an institutional change would appear indicative of a critical juncture. However, this study would contend that this was instead a speed control, as it did not fundamentally change the policy course taken during the Carnatic Wars. With the Carnatic Wars and the introduction of British dominance, that critical juncture set the Indian polity on a path toward a Western-style state. The introduction of the Permanent Settlement merely accelerated that process along this defined path dependence, constituting a speed control.

During this state of path dependence, the armed forces of the Company were therefore more responsible for the protection and advancement of the interests of different groups than in the period prior to the Carnatic Wars. First, the armed forces were responsible for the English shareholders of the British East India Company. This included advancing and protecting their interests in India. However, with the act of Permanent Settlement, this meant they were also responsible for protecting the claims of the local landowners in India. In conjunction with the expansion seen during the Carnatic Wars, this meant that the need for an extensive army and fleet remained. In addition to protecting company interests from challenges from French piracy, following the critical juncture, the armed forces of the East India Company also had to govern vast territories in India, including suppressing rebellions. In this state of path dependence, they did so not out of ceremonial obligation to an emperor but out of a rationalistic and rather dry contractual obligation to the Company. Accordingly, following the Act of Permanent Settlement, the ruling elite in India at the East India Company had clear rational incentives to further the state of path dependence related to that act for the subsequent decades.

Second Critical Juncture: The Sepoy Rebellion of 1857–1858

Permissive Conditions

In this case, comparable to the first critical juncture, the necessary condition that loosed constraints on agency behavior was directly tied to armed conflict. It was a large rebellion of native Indian soldiers that opened the institutional door for a major change in the middle of the nineteenth century. This rebellion has multiple names, the two primary being the Sepoy Rebellion of 1857 and the more nationalistic First Indian War of Independence.

The origins of the conflict were many and directly tied to the state of path dependence India found itself prior to the conflict. From the end of the Carnatic Wars until the middle of the nineteenth century, the British had undertaken many efforts as per the state of path dependence to both exploit and westernize their Indian territories. On the point of exploitation, the formalized system of taxation introduced during the Permanent Settlement resulted in particularly high taxes on Indian landowners. Moreover, under the governorship of Lord Dalhousie immediately preceding the rebellion, the ability to confiscate land was given

to the Company. Such confiscations alienated local landowners enormously and bred resentment (Yājñika & Sheth, 2005).

However, it was efforts to westernize India, particularly from a religious perspective, that would be most problematic for Britain's Indian subjects. Though missionary activity had been encouraged in East India Company territory since at least as early as 1813 (British Parliament, 1813), Christianization efforts were substantially expanded under the governorship of Lord Dalhousie. The most direct effort also occurred in 1856 with the passage of the Hindu Widows' Remarriage Act of that year. Indian custom at the time was that widows were not allowed to remarry following the deaths of their husbands. The Hindu Widows' Remarriage Act altered this situation by providing men who married widows with certain protections on inheritance (Sarkar & Sarkar, 2008). The act was viewed at the time as an affront to native practice and played a major role in driving the rebellion. Peculiarly, these religious tensions would come to a head with the introduction of a new British rifle as a standard issue for Indian Sepoy soldiers. The Enfield Rifle of 1857 used greased cartridges that required soldiers to bite open with their mouths. These cartridges were greased with pig and cow fat, a fact that would ultimately be discovered by Indian Sepoy soldiers. This deeply offended both Muslim and Hindu religious sensibilities (Blake, 2023) and provided the spark that set off the Sepoy Rebellion.

It is difficult to overstate the scale of this conflict in terms of colonial rebellions. Though the British were ultimately able to subdue the rebellion, the conflict lasted for two years and resulted in hundreds of thousands of deaths. Though estimates are rough, sources suggest that over 800,000 Indians would die fighting for both sides of the conflict because of the social upheaval the rebellion caused. Of these, 6,000 out of the mere 40,000 Europeans present in India were also killed in the fighting (Peers, 2013, p. 64).

This rebellion immediately opened up a critical juncture for the British polity in India. Both Company officials and the British government were appropriately traumatized by the scale and nature of the rebellion in what was at the time by far the most important British colony. Decision-makers were accordingly forced to reconsider the institutional structure upon which Indian colonization had been undertaken and did so accordingly. This period of reconsideration therefore provided the permissive conditions required for fundamental reform in India and allowed for a critical juncture.

Productive Conditions

There were three key productive conditions present at the time of the Sepoy Rebellion, which allowed for the fundamental reform of Britain's Indian territories. First, and perhaps most importantly, by 1858, the British Empire was undisputedly the most powerful state in the world. Unlike when British colonial activity began in India, which occurred when Britain's position was far weaker, the state, by 1858, had the ability to directly govern India without the need for corporate outsourcing.

Second, the British Parliament at the time was already increasingly unhappy with Company rule in India for various reasons. Most prominently, the rise of prominent liberals who objected to Company rule in India existed before the rebellion. Such parliamentarians included William Wilberforce, Charles Fox, and Lord Macaulay, all outspoken critics of Company rule in India as exploitative and unjust. These thinkers all called for greater parliamentary oversight of Company activities in India.

Finally, the broader British public at this point had begun to oppose Company rule in India. By the middle of the nineteenth century, the British public was increasingly far more literate and politically engaged than it had been at any point prior. Part of this engagement centered around the British East India Company, in particular relating to reports of corruption, mismanagement, and humanitarian atrocities undertaken in India by the Company. By the time of the Sepoy Rebellion, this public discourse would prove to be a powerful productive condition of the critical juncture.

Rational Incentives

The rational incentives behind the critical juncture relate most directly to the first productive condition. By the time of the Sepoy Rebellion, the British state realized that it could better protect its interests in Asia by nationalizing the East India Company. By taking direct control of the colony, the state would have a more explicit ability to utilize Indian territory for taxation and manpower without any intervention from the East India Company.

Resultant Institutional Change

During this critical juncture, Parliament would pass the Government of India Act of 1858. This act would fundamentally alter the Indian polity, abolishing the East India Company and introducing direct British rule in the form of the British Raj. This meant that, as opposed to Company troops, British soldiers would be serving directly in India, beholden to London. This included native Sepoy troops previously in the employ of the Company. Consequently, the Indian polity found itself in a new state of path dependence regarding the security mandate of its armed forces, matching its new political ruling elite. The East Company leadership was replaced with rule from London, which would again alter the rational incentives that would drive the subsequent path dependence. This state of path dependence would continue until independence from Britain and the introduction of the modern Indian state less than a century later.

Resultant Path Dependence on the Security Mandate

With the removal of the corporate leadership of the East India Company in India as a result of the Company's dissolution, the new British elite in India was directly tied to the British state. Accordingly, the rational incentives driving path dependence related to the security mandate changed substantially. These will now be explored.

Territorial Mandate

As previously mentioned, following the critical juncture, Company rule was completely dissolved in India. Along with it, the Mughal Empire was also formally abolished in favor of the imperial rule of the British Crown. The British Raj was established, with the British Crown and government officially declaring sovereignty over all of what would eventually become India and Pakistan. Unlike under corporate leadership, this meant that the political elite in India was a far more purely political set of rulers. Their rational incentives were not so exclusively focused on economic exploitation but were instead more strategic in nature. At the time, the British government was particularly concerned about the challenge to its rule in India by Russia in what was referred to as The Great Game. This reflected the status of the new leadership in India, not as corporate decision-makers but as members of an elite within a global imperial context. Accordingly, the delineation of territory was critical to protecting that territory from hostile powers. It was at this point, in response to these different incentives, that the notion of a modern, European-style territorial mandate delineated by geographic boundaries was complete and institutionalized in the entirety of the subcontinent.

The territorial mandate of the British Raj was fully delineated and standardized by 1909, with the inclusion of modern, precise maps of the territory (Simpson, 2021).

Individual Mandate

The Government Act of 1858 formalized the relationship between the people of India and the British state during this period of path dependence. Much like with the issue of territoriality, this change reflected the fact that India was to be ruled by a true state and not by a corporation. The enforcement of the rights and the government of British subjects in India became far more important than merely maximizing the profits to be gained from those subjects once Britain's government took control.

To accomplish this, British rule in India was divided into two different forms, consisting of either direct rule or rule through what was referred to as the Princely States. Within the Princely States, local rulers had much more control over the day-to-day governance of the peoples and lands under their charge and maintained a more traditional model of government. However, those residing in British-administered territories were considered British subjects. Those in princely states were instead recognized as British-protected persons. British subjects in India had the rights and obligations of such status, including the ability to hold a British Indian passport and receive consular protection when traveling, despite the fact that the United Kingdom treated them as aliens within the Home Islands, prohibiting immigration to the British metropole (Chandrasekhar, 1945; UK Parliament, 1858). Interestingly, though, immigration rights to other parts of the Empire were allowed. Consequently, a substantial Indian diaspora still exists in many Commonwealth countries, such as South Africa and Australia, with roots in nineteenth-century immigration as a result of this altered subjecthood status (The Economist, 2023).

During this period of path dependence, for the first time in history, all individuals living in the Indian subcontinent were unified through common citizenship under British rule. This status transcended ethnic, religious, and feudal ties. Outside the princely states, Indians were no longer formally subject to the traditional forms of governance that were observed under the Mughal Empire and instead had a status more comparable to that of a modern citizen or subject.

The dissolution of the company and the declaration of Indians as British subjects immediately integrated the military apparatus of the continent into the wider imperial British military structure. The armed forces of the British Raj no longer owed allegiance to a company but ultimately to the British Crown. This change altered the nature of their responsibilities and their mandate over the individuals in their charge. Instead of being primarily responsible for company members and the promotion of their mercantile interests, the armies of the British Raj were responsible for protecting the rights of all British subjects, both in India and in the rest of the Empire. Consequently, the armies of the British Raj, primarily made up of Indians, were deployed in all corners of the British Empire for various duties. This reflected the globalized interests and rational incentives of the British elite in maintaining this style of rule in India. By granting Indians British subjecthood, they also assumed responsibilities to defend the wider British Empire. The result was that huge numbers of Indians fought in the First and Second World Wars, as Indian subjects were obligated to fight in Britain's European conflicts.

However, despite these actions being taken to reinforce the strength of the global British elite, such actions would lay the seeds for the critical juncture that would undermine it. Like in other British colonies and dominions, a sense of distinct national identity was solidified and brought home following the service of Indian soldiers in the two world wars. This ultimately led to the modern Indian Republic gaining independence in 1947 and would be the nail in the coffin of Britain's Empire in India, generating a new critical juncture that would again redefine the political elite in the subcontinent.

Third Critical Juncture: Indian Independence

Permissive Conditions

The two permissive conditions that allowed for Indian independence were, first, the Indian nationalist movement and, just as importantly, British weakness following the Second World War.

The existence of an Indian nationalist movement can be traced back at least to the Sepoy Rebellion. However, it was to intensify substantially at the start of the twentieth century, particularly following Indian participation in the First World War. As in other

Commonwealth states such as Canada, Australia, and South Africa, Indian national identity was substantially reinforced by service during the First World War. By the end of the Second World War, the movement had reached its full strength. The institutionalized and mobilized desire of a substantial portion of the Indian people for their own state was a key permissive condition that allowed for the critical juncture.

The second permissive condition was Britain's overall weakness following the Second World War. Despite coming out victorious from the conflict, Britain's ability to maintain its global empire was permanently hampered. This overall weakness came in all forms: financially, militarily, and ideologically. Financially, the British state was practically bankrupt following the war, owing enormous debts to the United States for the aid it provided during the conflict. Militarily, Britain had substantially scaled back its military following the peace. Additionally, the willingness of Britain's imperial territories to continue serving in the British imperial structure had frayed substantially, sapping away at its available manpower and resources. However, it was ideological shifts that were likely the greatest cause of Britain's weakness following the Second World War. Externally, the world had united to fight against imperial revanchism from Germany, Japan, and Italy. This conflict witnessed the rise of the anti-imperial United States and the communist Soviet Union as the two superpowers, both of which were ideologically opposed to imperialism in its European form. Internally, the British public and imperial subjects also shifted notably in their perceptions of the Empire. Taken together, the overall weakness of Britain provided a key permissive condition for the critical juncture that would result in Indian independence.

Productive Conditions

At least in part as a result of British reconsideration of the purpose of the Empire, the Labour government won the election of 1947. This brought Clement Attlee to power, providing the first Labour government in x years. Part of the party's platform was granting Indian independence. This political position was reflective of the British promises of independence that had been made in exchange for their support in the war.

Moreover, political repression and taxes in India had become unsustainable for the population. The repressive Rowlatt Act's enactment in 1919, which extended wartime emergency measures across the subcontinent, ultimately led to substantial violence and

political unrest. This drove individuals to resent the British Raj and support the nationalist alternative. This reinforced the previously outlined permissive condition, notably over the decades preceding the Second World War.

Rational Incentives

Rational incentives existed on both sides of the equation. Indian nationalists wanted independence for all the expected reasons. Freedom for their people, the personal ambition of the movement's leaders, and the notion that people should be allowed to govern themselves were just some of these incentives for Indian nationalists to choose independence.

More interestingly, though, Britain's labour government had some rational incentives for giving up India. These were primarily ideological and next economic. The Labour Party at the time opposed colonialism from an ethical perspective. In addition, the party had promised extensive social reforms and programs following the war. To do so, they would need a sustainable budget. India, at the time, was running a loss for Britain's government.

Resultant Institutional Change

The resultant institutional change at this critical juncture was the independence of India and the establishment of a constitutional republic. This completely redefined the Indian elite, removing the British elite and replacing them with Indian political actors.

With the introduction of a written constitution upon independence, India firmly placed itself in the camp of modern constitutional states, where the government's rights and obligations were explicit. This makes outlining the territorial and human mandates of the Indian state a more straightforward affair than in historical models, as the constitution clearly delineates the military's mandate. In the case of the Indian Constitution, the two mandates discussed here coincide with the first two parts of the document. Part One is titled "The Union and its Territory," and Part Two is titled simply "Citizenship." Later in the constitution and subsequent acts, specific articles outline the military's mandate inside and outside Indian territory. Accordingly, the next two sections will address the territorial and human mandates of the Indian armed forces in keeping with these two main parts of India's constitution.

Territorial Mandate

India's constitution reflects the colonial concept of geographically delineating fixed borders where the armed forces can operate. This is the standard model for all current states and reflects the more efficient nature of that institutional model for the good function of states. The constitution addresses territorial issues in its first part, Articles 1 to 4 (Indian Legislative Department, 2022). These articles detail the composition of the Indian Union and its territory. Article 1 defines India as a union of states and clarifies that the federation is not the result of any agreement among the constituent states, providing some institutional echoes back to the old Mughal system where sovereignty was contractual. It also explicitly establishes that no state has the right to secede from the Union by extension. The terms "Union of India" and "Territory of India" are defined, with the latter including states, union territories, and any territories that the government may acquire in the future (India & National Law University, Delhi, 2012).

Subsequent sections of the Constitution establish civil and military control over the use of the armed force, depending on the circumstances. Part Eighteen, titled "Emergency Provisions," is of particular note. The constitution differentiates between the powers for military use to defend the state from external threats and the maintenance of law and order. The Indian Union and state governments, respectively, are conferred with these two powers. During a national emergency, stipulated in Article 352 (Indian Legislative Department, 2022), or a regional emergency, outlined in Article 356 (Indian Legislative Department, 2022), the Union is empowered to deploy armed forces within the territory of India, which is clearly defined. The Union also has a special responsibility under Article 355 (Indian Legislative Department, 2022) to maintain civil government and may use armed forces to support it within the territory of the Union. This gives the armed forces of India the right to intervene within the territories of the state in the case of rebellion or civil unrest. Practically, this means that the armed forces of the state of India are firmly placed at the federal level and cannot be co-opted by local territorial units within the federation. The armed forces, therefore, have a mandate that covers the whole of the Indian territory, regardless of local state divisions. The Indian Parliament enacted a set of statutory provisions that define the operational and regulatory framework of the military forces in India in great detail. These provisions include the Army Act of 1950, the Air Force Act of 1950, and the Navy Act of 1957. However, they are all rooted in the core constitutional provisions that define the territorial mandate; therefore, they do not need to be expounded upon here.

This firm, modern concept of clearly delineated boundaries has resulted in India having quite a few border conflicts that exist to this day. Although boundary disputes with Bangladesh and Sri Lanka have been resolved, tensions with other neighbors, such as China, Pakistan, and Nepal, persist. The un-demarcated boundaries with these countries, along with historical conflicts, have led to serious tensions that have flared up over the decades since Indian independence. The Line of Control (LOC) with Pakistan and China, in particular, continues to be a point of contention, as mentioned earlier, and they experience frequent incidents of cross-border firing and violations of international boundaries (Curtis & Grossman, 2023). These conflicts and the military behavior that precipitates them can be directly and unquestionably traced to the institutional evolution of territoriality outlined here.

The territorial mandate of India, therefore, is comparable to that of most modern states, where the territorial delineation of the state is explicit and grounded in geographically determined borders. The political elite within India, as in other states, are rationally interested in maintaining this system because of the inherent efficiency of scientifically determined borders. They also have an interest in maintaining this system, as clearly delineated national borders allow them to avoid contestations about their authority within those territorial spaces. Accordingly, territoriality in this manner exists in a path-dependent form in most states where the rational incentives of the elite positively reinforce this status quo.

Subject Mandate

As mentioned before, India's subject mandate reflects its constitutional nature and leaves no room for doubt about who is under the mandate of the state and its armed forces. The Indian Constitution's Part II (Articles 5–11) addresses the determination of Indian citizenship. According to Article 5, citizenship is based on domicile and birthplace, or the birthplace of parents, as well as five years of residence in India before the commencement of the Constitution. Article 6 provides citizenship rights to individuals migrating from Pakistan based on their or their ancestors' birth in India, as defined by the Government of India Act, 1935, and residency or registration requirements. These provisions were further regulated by the Citizenship Act of 1955, as empowered by Article 11. Any individual meeting these criteria is an Indian citizen and, therefore, subject to the mandate of the armed forces of the Indian state. Additionally, any individual present on Indian territory would also be subject to

Indian law, barring intervention from that individual's state of citizenship. This reflects a fundamental shift from the traditional Mughal model and embodies the concept of a unified Indian status and citizenship introduced during the colonial period.

Modern states typically have this type of citizenship structure, which can be observed globally. Much like the territorial mandate, the rational incentives are tied to the inherent efficiency of such models. Having a state with clearly defined citizenship allows for more effective governance of individuals and leaves little room for doubt as to the rights and responsibilities of the subjects of the state. The national elite has clear interests in maintaining this status, as it allows them to more efficiently govern and reap the benefits entailed by having clearly defined citizens under their sovereignty.

Consolidated Insights and Summation

In this section, we can observe the critical junctures and path dependence that led to the foundation of the Indian state. This pattern could be replicated for the majority of states across the globe, moving from traditional structures to Europeanized colonial structures, ultimately to independence and statehood.

In the following chapters, this process will be undertaken again with the states of France and Italy. However, instead of finishing with a third critical juncture, in both of those cases, a fourth occurred with the foundation of the European Institution. This fundamentally altered the subsequent path dependence by redefining the rational incentives of the elite within Europe.

The following section will now explore how India would go on to develop satellite navigation over the second part of the twentieth century in keeping with its path-dependent state following the critical juncture of Indian independence.

Indian Security Mandate under Nationalism

Following the critical juncture of Indian independence, India's security mandate entered a new state of path dependence, unlike that which preceded it. This state of path dependence was institutionally well defined by India's constitution, establishing the territorial and

individual responsibilities of the Indian military clearly. This state of path dependence meant that India broadly needed to develop its armed forces to contend with other powers. This section will outline how this mandate manifested itself at the micro-institutional level in the form of satellite navigation. In keeping with this study's understanding of historical institutionalism, this section will illustrate how the broad institutional trends at the foundational level of the Indian state directly influenced the individual actions taken by the state. The actions taken by India, namely, developing satellite navigation for national use by its military, are standard across all cases of satellite navigation development outside Europe.

First Critical Juncture: Launch of Sputnik 1957

The launch of Sputnik in 1957 was a shock to the world. It would act as a wake-up call for major powers, illustrating the strategic importance of space technology. The period following its launch would provide the first critical juncture for India in its development of satellite navigation technology and for most other major powers. It was during the critical juncture spawned by the launch of Sputnik that a host of countries, India included, chose to establish their own space research and development programs. It is important to note, however, that it was not the actual Sputnik satellite that provided this wake-up call. Instead, it was the rocket technology behind its launch (McDougall, 1980). The technology behind the launchers capable of placing Sputnik into orbit was the same that was required to launch rockets from one continent to another. The same launch vehicles that could launch satellites could, in theory, also be used in the delivery of nuclear warheads. The resulting gap between Soviet capacities and those of other major powers would act as a critical juncture, spawning institutional reforms that would generate a state of path dependence for various states in outer space research, India included. This section will now break down precisely why the launch of Sputnik was such a critical juncture in the case of India's satellite technology development.

Permissive Conditions

The permissive condition that allowed for the critical juncture to occur in the late 1950s was a power disparity between the Soviet Union and other major (or aspirational) powers in the international system. With the launch of Sputnik, even the United States found itself in a state of relative weakness in missile launcher capacity vis-à-vis the Soviet Union. With this state of

relative weakness, space was opened for notable institutional change relating to outer space technology.

Productive Conditions

With the permissive condition present, within the Indian case also existed a series of productive conditions that would drive Indian policymakers into a critical juncture. First, India's governing establishment, run by Indian nationalists, was looking to establish India as a great power. Second, India had the resources to invest in strategic technology. Finally, India's state of rivalry with its neighbors would motivate it to prioritize gaining a strategic advantage over its virtually perpetual rivals in Pakistan and India.

India was primarily governed at the time by the Indian National Congress. This was the political party that directly descended from the Indian Independence Movement. Many of its key platforms are accordingly related to the establishment of an Indian state strong enough to independently act as a major player on the world stage. This core governing philosophy of India's government would act as a productive condition motivating India to act, following the launch of Sputnik, to bring India up to par with other major powers in the international system.

Second, India had the resources to develop satellite technology. This is considered from a purely totalistic lens. In the late 1950s, India was wracked with poverty and was severely underdeveloped when compared to Western states or the Communist bloc. However, in total, India had the resources, know-how, and technology-sharing opportunities to develop satellite technology, which was to become a priority. This productive condition is important to note, as not all states had such capacities in the years following the critical juncture, with such an ability limited to the middle powers.

Third, India's endemic rivalries with its neighbors would act as a productive condition for generating the critical juncture. By the early 1960s, India had already been involved in two major wars with its neighbors. The first was the First Kashmir War, fought with Pakistan in the immediate aftermath of the partition of the British Raj. The second was fought in 1962 with China over disputed territories in India's north. This was a particularly brutal affair characterized by high mountain fighting and enormous losses on both sides of the conflict.

These wars generated a state of rivalry with India's neighbors, which continues into the present. Such rivalries would act as productive conditions, driving India to look for any opportunity to gain a military edge over them. With the launch of Sputnik and the resultant presence of this permissive condition, an opportunity existed for India to gain such an advantage in both missile technology and the nascent field of outer space strategic assets.

Resultant Institutional Change

The result of institutional change could be seen in the establishment of various national institutions dedicated to the development of outer space technology in India. In 1962, five years following the launch of Sputnik, the Indian National Committee for Space Research (INCOSPAR) was founded. This would be the precursor to the Indian Space Research Organization (ISRO), which exists today. Following the critical juncture spawned by Sputnik, India would find itself in a state of path dependence related to satellite technology development. The resultant policy decisions that would ultimately lead to the development of Indian satellite navigation would occur as a result of this state of path dependence, which has existed since the late 1950s and continues through the present. The critical juncture outlined here and the resultant path dependence are directly reflective of the broader Indian institutional path dependence outlined in the previous section. They reflect the previously outlined rational incentives tied to the national elite. By expanding space and missile research institutions, these elites then enjoyed incentives to continue along that path as this work increased national power. The following section will outline the key events of the process under the state of path dependence generated by the critical juncture of Sputnik.

1962: Establishment of the Indian National Committee for Space Research (INCOSPAR), Precursor to the Indian Space Research Organization (ISRO)

In 1962, India founded the Indian National Committee for Space Research (INCOSPAR). This was nominally for purposes of national development focused on civilian industry and outer space research, a fact that was heavily stressed both at the time and later. However, it is far more likely that this was a strategic decision reflective of India's security mandate. The first piece of evidence supporting this claim can be observed in the decision of Jawaharlal Nehru, the nationalistic Prime Minister of India at the time, to place INCOSPAR's control under the Department of Atomic Energy. During the 1960s, the Department of Atomic Energy (DAE) in India was primarily responsible for the research and development of

nuclear energy for both civil and military applications. These applications included power generation, broad atomic research, and, critically, nuclear weapons development (Sarkar, 2022). The development of launchers, be they for satellites or nuclear missiles, would clearly be a shared competence between the fields of nuclear weapons and outer space technological development. The Indian space research program was, therefore, likely placed under the jurisdiction of the DAE during its early years because it was defined by this dual purpose of serving both civilian national development objectives and the improvement of India's military position and technology. This institutional decision also had the added benefit of providing a veneer of justification when asking for international aid. It is, of course, far easier to request technology sharing when the nominal purpose of such sharing is for civilian purposes and not the development of weapons.

To add to the notion of INCOSPAR being founded, in large part, in response to security considerations, for the first decade of its existence, INCOSPAR focused significantly on the development and testing of sounding rockets. Sounding rockets, also used nominally for scientific purposes, are a type of rocket designed to perform scientific experiments during their sub-orbital flight. The primary purpose of these rockets is usually to "sound" or take measurements of the upper atmospheric conditions and space environment. However, the technology underlying their propulsion and guidance systems is fundamentally similar to that used in ballistic missiles. The same basic rocket technology that enables a sounding rocket to lift a scientific payload to high altitudes can also be adapted to deliver weapons payloads over long distances, much like the systems used to launch Sputnik, though on a smaller scale. Many early-sounding rockets were actually modified intercontinental ballistic missiles (ICBMs). INCOSPAR's heavy focus on such efforts as opposed to other forms of outer space research strongly suggests that the motivation behind their development contained a strong strategic element.

It has also been suggested in other scholarship that India did not emphasize the strategic nature of such activities to secure critical technical assistance from the likes of both the United States and the Soviet Union (Narloch, 2021). This was overall a very successful strategy on India's part, as it was able to garner the participation of technicians from both superpowers throughout the 1960s, with all parties enjoying a veneer of legitimacy in being able to claim such efforts for civilian and scientific purposes. This assistance was a large element in enabling India to develop a missile capacity with little scrutiny or complaint from

the more developed world, both in the West and in the Soviet bloc (Nolan, 1991). It has also been posited that this strategy was taken to bolster India's official position that such programs were civilian in nature in accordance with international law (Nolan, 1991).

Such behavior would strongly suggest that India, at the time, had entered a state of path dependence related to its outer space technology efforts in relation to Sputnik. The establishment of institutional organs tasked with specific purposes within states is one of the strongest indicators that a state of path dependence has been reached. Another equally important indicator is the assignment of actual manpower and resources to such institutions. This suggests that the institution is more than mere bureaucratic window dressing. The Indian state dedicated x amount of funds to the organization, marking x percent of its national budget despite the state suffering endemic levels of poverty and underdevelopment. When taken together, it can be confidently asserted that India has entered a state of path dependence where opportunities to develop space technology to bolster India's strategic position would be taken in earnest following the launch of Sputnik.

1971 Speed Control: The Indo-Pakistan War

As previously outlined, speed controls are periods characterized by events within path dependence that either speed up or slow down the course of an actor in a path-dependent direction. In 1971, one such speed control occurred in India's process of satellite navigation development. In that year, India again fought another war with Pakistan, known as the Indo-Pakistan War of 1971 or the Bangladesh Liberation War. This war was the result of the Bangladesh Liberation Movement in East Pakistan and escalated substantially after India's intervention in the conflict. The war ended with the unconditional surrender of the Pakistani forces in East Pakistan and led to the creation of the independent nation of Bangladesh. It also prompted the Indian government to redouble its efforts to further modernize the Indian military, including in the realm of its missile technology and outer space research.

Just one year following the war, the Indian Space Research Organization (ISRO), the successor organization to INCOSPAR, was removed from the Department of Atomic Energy and placed in the newly formed Indian Department of Space (Marwah, 1977). This action was taken as a result of Indian perceptions of a de facto US, Pakistani, and Chinese alliance based on actions taken by those states during the previous conflict (Misty, 1998). As India

was already in a state of path dependence related to its satellite technology development, this event should be understood as a speed control that drove India to move more quickly along this path. This institutional restructuring was defined by stringent, mandated timelines for achieving specified technological and application-oriented goals.

After India's first nuclear device detonation in 1974, ISRO's head disclosed to a parliamentary body that India was capable of producing medium-range missiles using indigenously developed solid propulsion and guidance technologies (Misty, 1998). This claim was made despite India not maintaining that ability at the time, yet it clearly demonstrates that the speed with which India was interested in developing such technology had increased rapidly. The intensification of ISRO activities in conjunction with the nuclear test served to politically assert India's self-reliance in constructing a nuclear arsenal and a dependable delivery mechanism, likely deemed necessary as a result of the 1971 war. India's first successful independent launch of a satellite eventually took place on July 18, 1980, when India placed a Rohini satellite into low-earth orbit. The SLV-3 project marked India's true entry into space vehicle technology as an independent power no longer reliant on Soviet or American assistance. Over the following two decades, developments would occur along these lines, including further refinements of India's missile technology and its satellite launch capacity with various projects of both a civilian and military nature, and no particularly noteworthy speed controls were observed in the process.

1999 Speed Control: The Kargil War

In 1999, another war with Pakistan would again supercharge India's efforts along its path toward satellite technology, focusing on satellite navigation in particular. This was because in 1999, India would fully realize both the importance of satellite navigation as a military asset and India's position of dependency on US systems for that capacity. Some details of the war are important to illustrate precisely why the conflict sped up India's efforts.

The Kargil War, fought between India and Pakistan from May to July 1999, was a significant conflict that occurred in the Kargil district of Ladakh (formerly Jammu and Kashmir) and along the Line of Control (LoC). The war was triggered by the infiltration of Pakistani troops, disguised as Kashmiri militants, into strategic positions on the Indian side of the LoC (Brittanica, 2023b). Pakistan initially attributed the fighting to Kashmiri insurgents;

however, evidence and subsequent admissions revealed the direct involvement of Pakistani paramilitary forces. In 2006, Pervez Musharraf, who was the army chief during the Kargil War and later became Pakistan's President, mentioned in his memoir "In the Line of Fire" (Musharraf, 2008) that the Kargil operations were a significant achievement for the Pakistan Army, claimed the operations as a success, and stated that five battalions of the Pakistani army, approximately 5,000 troops, had participated in the combat alongside the mujahideen groups. The Pakistani military would later officially admit its role in 2010 (The Telegraph India, 2010). From the start, therefore, the war was defined by poor information on India's side and a deliberate strategy by Pakistan to obscure its efforts. This aspect of the conflict would make reliance on satellite navigation even more important as Indian troops found themselves fighting against a hidden enemy in remote regions.

It was the objective of the Indian armed forces to recapture positions along the Line of Control (LoC) lost in the initial assault. The war was characterized by high-altitude warfare in mountainous terrain, posing significant logistical challenges (Mavoy, 2009). The terrain of the Kargil sector was extremely challenging, with peaks having steep gradients that were difficult even for trained mountaineers. This complex terrain heavily favored the now-defending Pakistani forces and made it hard to estimate the duration of the operation at the time (Anand, 1999). India was therefore faced with the daunting prospect of fighting a war in such remote conditions, defined by a lack of logistical capacity and limited information on the day-to-day conduct of the war.

This laid the foundation for the most important aspect of this war for the discussion of this case. Realizing the inherent difficulties the war entailed, one of the first actions taken by the Indian military was to seek GPS data for the region from the United States. However, the United States denied access to this data for India (Rana, 2022; Srivastava, 2014). To add to the significance of this denial, the Indian Army had only a year earlier acquired space-based radio navigation technology from the US. The denial of GPS data by the US significantly affected Indian military operations. Indian forces, with their brand new space-based radio navigation technology, found themselves at a disadvantage with Pakistani troops entrenched in the high and rugged Himalayan mountains. The lack of GPS data made it far more difficult for the Indian armed forces to accurately locate and engage enemy positions, leading to notable operational challenges and likely far heavier losses.

The conflict would eventually conclude not as a result of an outright victory but with diplomatic intervention, notably by U.S. President Bill Clinton. The US pressured Pakistan to withdraw its troops from Kargil, which was ultimately successful. The final outcome was the withdrawal of Pakistani forces from Indian positions along the LoC, reinforcing the status quo but with heightened tensions between the two nations. India's inability to win the war outright shook India's military establishment and would prove fateful in India ultimately developing satellite navigation. Faced with the prospect of military parity with Pakistan, another accelerating speed control in the process was generated that would directly result in the development of an independent satellite navigation system. Almost immediately following the war, the Indian Army began to move away from any dependence it had on the US GPS and accelerated substantial efforts to develop its own system. These efforts were undertaken along the same path dependence that spawned in 1957, characterized by India's efforts to generate military advantages with satellite technology, and relied entirely on advancements that had been made in previous decades in technologies such as satellites, launchers, and related ground-based infrastructure.

The following sections will outline the key stages of the decision to develop satellite navigation, outlining the actual decision to do so and the steps in that process. All the following events occurred following the same state of path dependence, accelerated by the second speed control produced by the 1999 Kargil War.

August 2001: The Indian Space Research Organization Proposes NAVIC

The Indian government officially proposed developing a satellite navigation system in August 2001. The announcement took the form of a memorandum of understanding produced between ISRO and the Air Authority of India. At the time this information was reported, ISRO officials were awaiting funding for the project from the Finance Ministry (Times of India, 2001). Despite the project seemingly being at such an early stage, detailed plans were in place to determine how and when the project was to be executed.

At the time, ISRO's public view was that this decision was being made to assist aircraft with navigation. This was a view that officials frequently voiced when dealing with the public and can be seen in various histories of satellite navigation systems. In the words of the chairman of the Indian Aviation Authority at the time,

> "The decision to embrace a satellite system is in tune with our attempts to modernize the existing air traffic system. Making use of the most high-tech navigation technology worldwide, the satellite system to be installed in our country with the assistance of the ISRO currently finds a place at the airports of the US and Russia" (Times of India, 2001b).

This is a position that officials expressed to the press on multiple occasions throughout the first year of the project's development, focusing exclusively on the use of satellite navigation for civilian air travel (Times of India, 2001c; 2001d). The final memorandum of understanding reflected this position, stating

> "Civil aviation is all set to become safer and trustworthier as India joins the elite league of countries to work on satellite navigation technology for civilian aircraft… By deploying special communication satellites in geostationary orbit to augment the services of GPS, space scientists are striving toward making domestic flights safer" (Times of India, 2001c).

The fact that this decision came just a year following the US's denial of GPS data during the Kargil War is never mentioned to the public throughout the process of its approval, though later research would establish that this project was indeed undertaken for primarily military purposes to reduce dependence on GPS (Rana, 2022; The Economic Times, 2018; Sourabh, 2023). This strategy is quite common with outer space assets across the board and can also be observed in European cases, with economic and civilian justifications being extensively used in the public positions of states to justify similar projects.

2003–2004: India Tests International Perception

In 2003, India began to explore collaborative options for the development of satellite navigation. This decision would be in keeping with India's historical policy of "playing the field" when it comes to international cooperation to garner technical and financial support in its development of important security infrastructure. This policy could be observed at various stages along this state of path dependence with India willingly working with both the Soviet and Western governments to bolster its technological capacities in satellite and missile technology. India's first efforts to garner international cooperation to bolster its satellite navigation efforts actually crossed paths with Europe's Galileo satellite navigation project, seeing India offer 300 million US dollars to participate in the European effort in October

2003 (Times of India, 2003). During this somewhat peculiar phase of the Galileo project, which will be explored in the European case studies, Europe briefly opened the project to extra-European investment, much to the alarm of more security-minded European states like France. Ultimately, India would cease any participation in the project completely in 2006, citing security concerns because of the participation of China and an increasingly explicit openness from Europe about the military uses of the project (Deshpande, 2006).

By June 2004, ISRO was in negotiations with the US-based corporation Raytheon to build the ground segment of its satellite navigation system (Times of India, 2004). This deal was eventually signed in November 2004 and allowed Raytheon to help India build the ground stations and to design specialized, augmented receivers capable of receiving signals from Indian navigation satellites (Raytheon Corporate Communications, 2004). In Raytheon's statement, generic aircraft are referred to as the users of these receivers, though such a system would also be of clear military utility more broadly. ISRO also opened negotiations with Boeing in June 2004 to assist with the construction of the space segment of the system, including the satellites themselves (BBC, 2004). By October of that year, the Indian government had begun discussions on adding an outer space defense element officially to the armed forces by designating a section of the Indian Air Force to act as a Space Force as well as responsible for military activities in outer space (Pandit, 2004). This policy decision was likely in direct response to India's efforts at building its satellite navigation constellation, given the subsequent need to fully exploit and defend that infrastructure in times of conflict. By November 2004, however, India still had not signed any deal with Boeing for assistance in constructing the space segment of its system.

At the end of that month, ISRO then met with Putin and tentatively agreed on a pact that would allow India to participate in GLONASS's reconstruction, including launching Russian satellites from India (Hebbar, 2004). This agreement was then signed very shortly afterwards between ISRO's chairman and the director of Russia's space agency on December 3, 2004, securing Russian and Indian collaboration on satellite development (Times of India, 2004b). Practically speaking, this meant that India had secured a deal with the US to assist it in building its ground segment and with Russia in constructing its space segment, including its satellites. This put India in a useful strategic position in which it could preserve its autonomy while developing the asset. Were either power to violate India's sovereignty, India always maintained the option to switch to the other. Therefore, both the US and Russia were

incentivized to maintain the status quo, that is, Indian autonomy in the development of the asset. This mirrored similar occurrences during the Cold War, when India used a similar strategy.

2004–Present

Over the period from 2004 to the present, India then worked on building the system within this paradigm. The initial projections expected the system to be operational by 2011; however, delays ultimately meant that the system was not fully functional until 2018 (Kumar, 2018). As of 2023, India maintains NavIC under the control of ISRO, which is under the Department of Space, a state organ that reports directly to the Prime Minister. Practically speaking, this means that the NavIC system is under complete control of the Indian state and is used regularly by India's military when needed. In that time, India has developed its local industry to the point where it can now manufacture its own satellites, ground components, and receivers. According to the head of the ISRO in 2022, India currently holds ambitions to expand NavIC into a global system comparable to that of GPS, Galileo, GLONASS, and China's BeiDou system (Press Trust of India, 2022). The broader state of path dependence characterized by India's efforts to use satellite technology to garner military benefit is therefore continuing and should be expected to do so for the foreseeable future, barring any major institutional alterations of the Indian state or military.

Indian Case Insights

This case study covered India's rationale for developing nationally controlled satellite navigation technology for use by its military. In the first section, it provided a broad, macro-level institutional timeline outlining how the Indian state came into being in its modern form and how the mandate of the armed forces of the state evolved over that institutional timeline. It outlined three major critical junctures institutionally outlining India's evolution from a traditional state to a modern one, illustrating how the security mandate evolved accordingly.

In the second section, the lens was brought down to the micro-level of policymaking on Indian satellite navigation. The section outlines that, despite existing within a macro-level state of path dependence characterized by Indian statehood, smaller institutional processes

occur within that state constantly. The process of Indian satellite navigation was defined by a critical juncture that occurred with the launch of Sputnik in 1957, which set India on a course toward outer space asset development for its strategic gain. From 1957 to the early 2000s, two speed controls coincided with wars with Pakistan that would drive India to accelerate its travel along this course, ultimately resulting in the development of satellite navigation. Its control was then assigned to the Indian state, in keeping with the broad institutional path India was on as defined by its modern statehood.

We can accordingly observe that the security mandate is tied to the core institutional nature of the state, which caused India to develop satellite navigation nationally at a macro-level. The institutional nature of India's armed forces and its related responsibilities tied to territoriality and to an institutionally defined citizenry can clearly be seen to have caused India to behave in this way. Were this to change, we would expect fundamentally different behavior, as will be observed in the European cases. In addition, at the micro level, we can also observe how the launch of Sputnik and the two-speed controls caused India to take ground-level decisions within that broad institutional state of path dependence. This case study outlines how different states of path dependence at different levels of analysis can directly interact with one another. Once the European cases are added to the comparison in the following chapters, further insights can be generated on how this interaction occurs in different macro-level institutional contexts.

This provides an initial answer to the first question posed in this work, outlining how the evolution of the state's security mandate can directly influence the policy decision to develop satellite navigation, this study's first dependent variable. India's nature as a state forced it to do so to fulfill its security mandate broadly. Then, more proximately, individual events and critical junctures occurred within that broad security mandate, which resulted in the development of satellite navigation. This initial in-case comparison also provides a response to the second question, which is to assign control of satellite navigation infrastructure. As India existed within a nationalistic path-dependent state, it had little choice but to assign control of that asset to the state itself.

It can therefore be asserted within the Indian case that the evolution of the security mandate tied to the nature of the state's institutional arrangements can have clear and demonstrable effects on security behavior at the macro level. Because of the remarkable level

of institutional standardization in the modern state, this is an insight that can be generalized globally. Other states' actions on satellite navigation, in particular those of the US, Russia, Japan, and prospective states such as Nigeria and Brazil, bear this out. This strongly reinforces broader neo-institutionalist theory, which suggests that it is ultimately the nature of institutions that truly determines broader state behavior, more so than immediate material or ideational factors that are filtered by those institutions.

More interestingly, however, it can also be outlined by the case that, despite existing in broad states of path dependence, micro-level critical junctures and states of path dependence can have more immediate proximate effects on state policy at the micro level. Despite being a middle power under a national state of path dependence at the same time as India, Brazil, for example, did not choose to develop satellite navigation. This happened despite the fact that Brazil was confronted with the same event as Sputnik and had a comparable level of capacity to India. This suggests that this method is particularly useful in explaining exceptions to the more generalized theories posited by many major international relations schools. Such schools would suggest that states behave following easily generalizable patterns and rules based on elements such as power (realism) or broad institutional structure (liberal theory), which on the whole are generally valid. However, both are rife with exceptions that have begged for explanation. Utilizing historical institutionalism in this manner can help provide a structured and clear method of explaining such exceptions more thoroughly.

In the next section, France and Italy will be explored in a similar manner to the representative case of India presented here. In it, we will observe to what extent their membership in the European Union precipitated a change in the security mandate of those states that then affected their choices to jointly develop satellite navigation and ultimately assign its control to the European Union as opposed to national capitals. Therefore, these cases will highlight how variation at the macro-institutional level can have direct and demonstrable impacts on the micro-level of policymaking related to even the most fundamental issues of state sovereignty and security.

CHAPTER 5
CASE STUDY: FRANCE

In the evolution of the modern European state, France holds an outsized role. As in the Indian case, the first section of this case study will trace the evolution of the security mandate of the French armed forces from its last traditional institutional structure up through the time when France decided to pursue satellite navigation. In keeping with the research design, the territorial and individual elements of that mandate will be explored in full.

Once the broad institutional security mandate has been established and contextualized, the next section will bring the lens down to satellite navigation within that context. It will explore how France's decision to develop Galileo stemmed from changes at the macro-institutional level that then interacted with micro-level critical junctures that were occurring in the world system.

As in the case of India, the security mandate of the French armed forces has evolved remarkably quickly over the last three centuries. This development was marked by a series of similar critical junctures and states of path dependence, moving from a personalized state under a monarch into a modern constitutional republic. However, unlike India, an additional critical juncture occurred with French participation in the European project in the latter half of the twentieth and first part of the twenty-first centuries, resulting in a different security mandate at the time that France developed satellite navigation. This section will outline this institutional evolution before proceeding to a micro-level analysis of the French development of satellite navigation capacities for its military in that context.

The Personalized State: The Medieval Period Prior to 1648

As in the case of India, during the medieval period, the territorial and individual mandates of the armed forces differed greatly from those observed today. It is noteworthy, though, that these differences in many ways mirrored one another and shared a remarkable degree of similarity, despite the profound differences observed in geography, culture, and historical conditions. The state of path dependence that existed during this period was one that spanned

a vast timeline, spawning from the critical juncture that was the fall of the Western Roman Empire. States and their security mandates were characterized during this state of path dependence by the highly personalized feudal system, one in which the mandate of the military rested almost exclusively with the people of both the monarch and local nobles (Bloch, 1961). This section will outline the specificities of this system in the French case.

Territorial Mandate in the Personalized State

The territorial delineation of the French kingdom was a highly nebulous entity throughout the entirety of the medieval period (Hallam & West, 2020). Nominally speaking, the King of France ruled an area defined by clear geographic boundaries: the Pyrenees in the south, the Alps in the southeast, and the Rhine in the east, with the remainder of the state confined by the sea. In practice, though, the actual territory of the Kingdom of France existed in a state of more or less constant flux, responding to shifts in power amongst various nobles. As in the case of the Mughal Empire, territoriality was more often reflective not of objective delineation rooted in geography but instead of the practical reach of the royal army and the personal connections of the ruling dynasty through marriage and feudal allegiances. Practical control of the French king in his nominal territories was accordingly minimal, severely limiting the territorial mandate of the royal armed forces. In the case of medieval France, the directly controlled royal domain primarily included areas around Paris, Orléans, and Sens (Hallam & West, 2020). Large portions of the remainder of the state of France were practically controlled by feudal lords. Despite formally owing homage to the French king, these powerful nobles were largely autonomous. The King of France's direct control was therefore limited, and his influence over these territories varied significantly (Duby, 1992).

This form of territorial sovereignty had a clear effect on the security mandate of royal forces at the time. Though the French king nominally enjoyed control over these vassals' territory, he did not have the right to station royal forces in those areas without their express permission. This distinction between lands personally held by the king and those held in homage by other lords made the notion of a unified French kingdom more of a legal fiction in the early Middle Ages than a practical reality. Accordingly, the territorial mandate of the armed forces within the medieval French state was, in practice, if not in name, completely tied to the person of the relevant region to whom the specific soldiers owed allegiance, more so than a centralized French state. The king's autonomous vassals maintained their own

armed forces, in parallel with the royalist army, and enjoyed their own individual mandates over the lands of their respective nobles. These vassals at certain points became so powerful that they became rulers in and of themselves, as witnessed most famously in the case of William the Conqueror—who was initially a Norman Duke—and his conquest of England in the eleventh century (Carpenter, 2003, p. 91). Accordingly, the feudal system, particularly up to the twelfth century, involved a complex set of political rights and obligations between lords and vassals, with many local lords taking control of lands and appropriating various administrative, fiscal, and judicial rights for themselves. (Bloch & Manyon, 1989). The territorial nature of the state directly reacted to changes in these rights and obligations. The territorial mandate of the armed forces was therefore not tied to strictly delineated boundaries but instead to the ability and desires of aristocratic individuals to exert force over certain areas.

Individual Mandate of the Personalized State

When it comes to the individual mandate in medieval France, the situation again, in many ways, mirrors that observed in the Indian case. However, the two differed notably in the extent of the rights of those local nobles and rulers. French nobles during the medieval period enjoyed a greater degree of autonomy than their Mughal counterparts, a fact that was reflected in the individual mandate of the armed forces of the French king and state.

As previously mentioned in the discussion on territoriality, the French king was nominally sovereign over the various dukes and counts that were under his reign. In practice, though, the French King had practically no control over these vassals from a military perspective. French vassals were required to contribute soldiers and pay homage to the French king, yet they still had practically complete control over their personal domains, including the individuals living on them. This right was rooted in the system of seigneuralism, the name referring to the distinctly French feudal system of privilege by which nobles had rights over peasants and serfs (Wickham, 2009, p. 515). By extension, this meant that for the vast bulk of the French population, some 90 percent (Bourin-Derruau, 2014, p. 75) were subject to the will of the armed forces of their immediate and local nobles under serfdom and would have rarely come into contact with the royal French forces of the central government.

Some examples of the rights nobles and their personalized militaries enjoyed over their subjects can be observed in historical records. French serfs were required to pay crushing taxes over much of the medieval period to their local nobles, the king, and the church, such taxes reaching their zenith toward the end of the ancien régime. One such example can be observed in a record of what the local peasants owed to their local bishop at a time when famine was a regular concern. The peasants of the small town were required to provide their lord with 100 setters of barley, 28 setters of wheat, 880 bottles of olive oil, 18 chickens, four pounds of beeswax, four partridges, and a single rabbit. The villages reportedly commented on the fact, stating that "the Lord treats us like slaves; we are incredibly poor because we do not enjoy his same privileges" (Desan, 2023).

It was accordingly the role of the armed forces in French society over the medieval period to enforce rights and press claims of aristocratic nobles. This was necessary whenever they were challenged, either by external actors or the subjects themselves. Their responsibility, like in the Mughal Empire, was not to the serfs or an objective state but to their respective nobles and their will for the bulk of this period.

Insights from the French Medieval Period

Overall, it is clear that the security mandate of the armed forces in France during the medieval period was reminiscent of those observed in the representative case of India. It was highly personalized and in the hands of dynastically justified rulers at various levels. Furthermore, as in the case of India, territoriality in particular was not objectively defined by scientific measures during the medieval period in France. Instead, territoriality tended to reflect more on the practical ability of the armed forces to exert control over individuals living in certain areas. This meant that borders were nebulous institutions that ebbed and flowed with the personal power of nobles in the area. With regards to the subject mandate, in both systems, local rulers enjoyed a staggering degree of control over their peasants, more so than the centralized state.

The First Critical Juncture: Thirty Years' War and the Peace of Westphalia

France, and along with it, Europe, would diverge from the Mughal Empire and the rest of the world during the seventeenth century. From 1618 to 1648, the European continent was

wracked by one of the most violent wars in its already noteworthily bloody history. It was, at its time, the most violent bloodletting in European history, with roughly eight million casualties at a time when populations were far lower than they are in the present. Population reductions in Germany amounted to 50 percent in some areas (Landers, 2005). France found itself at the heart of this conflict. This war and the peace that it would generate constituted a critical juncture in the development of the French state. This section will now explore in more detail precisely why and how it constitutes a critical juncture and will then follow by outlining its effects on the security mandate of the French state (McKeogh, 2002; Barnard, 1965; Whaley, 2011).

Permissive Conditions

Permissive conditions are conditions that open up freedom of agency for actors who find themselves in a period of critical juncture. The period of the Thirty Years' War and the subsequent Peace of Westphalia was one that was riddled with permissive conditions allowing rulers to redefine institutional arrangements (Farr, 2005).

The first permissive condition was that of the Protestant Reformation. Prior to this critical juncture, the Catholic Church had practically enjoyed total spiritual and intellectual control over the continent of Europe. All systems of political legitimacy are rooted in the Catholic Church. Even the most powerful political figures were nominally only allowed to rule at the behest of the Church, and the tool of excommunication was a powerful one that the Papacy could wield, reflecting this authority. The Thirty Years' War began as a result of secular rulers challenging the Catholic Church's spiritual and temporal mandate. For the first time since the decision of the Roman Empire to adopt Christianity, European rulers who embraced various protestant faiths had the agency to justify their rule based on spiritual and intellectual concepts that were not beholden to the Church in Rome (Spitz, 2016; Ciappara, 2007; Kalsbeek, 2008). For Catholic rulers, this critical challenge to Church authority was also one that practically opened up much space for them to exert agency of their own within their realms. This was an opportunity taken by France, seeing France actually fight on the side of the Protestants despite remaining a Catholic state. This broad weakening of Church authority would constitute a key permissive condition defining this critical juncture that opened the ability of European states to redefine the nature of government on the continent.

The second permissive condition was that of the rise of European global empires. By the early seventeenth century, European states had practically carved up the bulk of the Americas. The Spanish and Portuguese Empires were at their zenith. whereas the French, English, and Dutch states were heavily involved in colonial activity across the globe. This resulted in European states enjoying unprecedented power rooted in technological advancements and material resources. In most cases, this newfound wealth and power concentrated itself at the highest levels of European political structures. This change substantially weakened many lower noble houses as centralized monarchies increased their wealth and power (Lawson, 2021; Muthu, 2012). This provided those monarchs with a high degree of agency to enact institutional change, which would constitute a fundamental permissive condition at this critical juncture. For its part, France boasted a small albeit notable colonial empire in North America with colonies in what would eventually become Quebec, the Louisiana Territory, and the Caribbean that gave its key decision-makers more resources to enact institutional change in their favor (Adams, 1994).

Productive Conditions

The productive conditions that would increase the agency of actors at this time spawn directly from the two permissive conditions. As a result of the Protestant Reformation and the increased wealth of centralized states, intellectual flowering occurred at this time despite the brutality of war. This increased intellectual curiosity and openness meant that, if agents wished, new ideas were in no short supply for creating new political governing structures. The presence of this new intellectual freedom and the ideas that it created increased the agency of the decision-makers involved by giving them new concepts to work with to establish new institutions following the Thirty Years' War. This productive condition would help reinforce the status of this period as a critical juncture in French state development (Huff, 2011; Levi, 2002; Fix, 1987).

Rational Incentives

The rational incentives for European rulers to enact fundamental institutional change during this time were many. Awash with wealth from their colonial empires and loosened from the control of the Church, monarchs would have naturally wished to maximize their personal power and security as much as possible. In the chaos of the Thirty Years' War, rationally

speaking, they would have had strong interests in institutionalizing these changes in the final peace. This was something that they did in earnest (Mayer, 1982; Rotberg et al., 1988).

Resultant Institutional Change

The resultant institutional change is commonly understood as a watershed moment not only in the fields of international relations and international law but in European history as a whole. The Peace of Westphalia institutionalized the state system, which defines the foundations of politics in the world through to the present. Notions of strict territoriality and rights, not just of rulers but of states per se, were first institutionalized in this peace treaty. These changes would set Europe and France on a state of path dependence that would last for centuries to follow (Farr, 2005).

Resultant Territorial Mandate

It was in the Treaty of Westphalia that modern notions of territoriality and statehood were first formally institutionalized in Europe. Despite the plethora of alterations and re-interpretations that have followed in the centuries since, the Treaty stands as the foundational text upon which those institutions exist in the present. The Treaty of Westphalia institutionalized the principle of state sovereignty, explicitly recognizing the right of rulers to govern their territories without external interference. Critically, this right was posited to stand regardless of the relative weakness of these sovereign states.

This fundamentally redefined the notion of territoriality in Europe, formally divorcing it from personal military strength as the primary justification to rule over a territory. The territories of states, once established, could not be legally challenged without well-defined justifications. Simple might was not one such justification to violate the territory of another state from this point forward. Though in practice this notion was often and regularly violated, either outright or through truly flimsy justifications for conquest, the state of path dependence existing for territoriality in Europe following the critical juncture of the Treaty of Westphalia was markedly different from the status quo that preceded it (Parker, 2015).

With this new concept of territoriality, the importance of clearly defining one's territories became paramount. It was no longer enough to merely control an area militarily to

legitimize one's rule in the international community. States needed to justify their right to land through legal avenues and nominally objective criteria. In response to this shift, states began actively attempting to consolidate their territories and engage in what would later be referred to as state-building activities (Abramson et al., 2022). In the decades following the Treaty, France absorbed various peripheral territories, such as the French Compte and Alsace areas, which had previously been contested for centuries. The immediate objective of the French state at that time was to create a *prè carrè,* or straight dividing line, for their heavily contested border with what was then the southern Netherlands controlled by the Duchy of Burgundy (Cross & Luard, 1988). First, Alsace was integrated into France, starting with the Treaty of Westphalia in 1648. Reflecting this new state of path dependence, France then formally annexed the Franche-Comté after the Franco-Spanish War with the Treaty of Nijmegen in 1678. This provided it with a rationalized and strongly advantageous border in its north, a fact that was reflective of this new state's need for firm and advantageous borders (Onnekink, 2018). Further territories along this border were then annexed later in the seventeenth century, being fully completed with the Treaty of Ryswick in 1697 (Wright, 2006). The key fact that can be observed here is that annexations were not merely justified through French conquest but through treaties based on concepts introduced by Westphalia. These conquests were well delineated and institutionalized as a result of mutually agreed-upon treaties that the broader community of European states recognized as legitimate. This suggests that, in contrast to the medieval period prior to the critical juncture, European states existed in a new state of path dependence related to the security mandate related to territoriality.

The implications of this for European and, therefore, French armed forces were profound. With clearly defined, rationalized borders, the mandate of militaries transitioned from one primarily engaging in constant territorial expansion and feudal disputes to one focusing on border defense and national security. The responsibility of the French army changed to defending legally justified territorial units or expanding the territory of the state in a controlled, focused manner. This meant militaries became overall more oriented toward defending these existing borders and spent a great deal of energy developing strategies and fortifications along borders primarily to deter or repel invasions from neighbors. In the previously mentioned treaties, a clear common thread is a perceived need on both sides to enjoy advantageous defensive positions where extensive fortifications could be constructed. This change in the notion of territoriality fundamentally changed the nature of military

institutions themselves and, in many ways, set the stage for the modern mass armies of the present.

Subject Mandate

Unlike the territorial mandate, the subject mandate of the French state did not change substantially with the Peace of Westphalia. That treaty was very much designed by European sovereigns for European sovereigns. The feudal system at the time was still very much in full force, and the people of France still mostly existed within the previously outlined system of seigneuralism. That is, the armed forces were still beholden to the will of aristocrats, most notably now the King as the French state centralized. Their mandate was to protect the king's territorial possessions and to prevent threats to their sovereignty, whether from outside the realm or from within it, by its own subjects. Therefore, little evidence exists for a change in the nature of the subject mandate following the Treaty of Westphalia (Farr, 2005).

Second Critical Juncture: The French Revolution

Permissive Conditions

Permissive conditions are conditions that open up freedom of agency for actors in a period of critical juncture. The nature of the French Revolution's total rewriting of the politics of France would allow for a truly wide variety of permissive conditions to be explored. However, it is more useful to consolidate them into one simple condition.

The consolidated permissive condition present during the period of the French Revolution was the total and complete abolition of royal absolutism and all that it entailed. This resulted from the complete dismantlement of the ancien regime and introduced a plethora of new actors, concepts, and influences into the political process. Consequently, decision-makers were empowered with an unprecedented degree of agency to alter the institutions that composed the French state, an activity that they undertook in earnest (Lemay, 1992).

Productive Conditions

In conjunction with the permissive condition, the widespread dissemination of Enlightenment ideas acted as a critical productive condition during this critical juncture. These ideas, championed by philosophers like Voltaire, Rousseau, and Montesquieu, criticized absolute monarchy and promoted democratic ideals and individual rights. As these Enlightenment philosophies permeated French society, they fueled a broader revolutionary spirit in decision-makers and the rest of the population. These ideas guided the actions and thoughts of these newly empowered decision-makers. The interplay of these conditions was pivotal and provided a textbook example of a productive condition at a critical juncture: while the fall of the ancien régime opened the door for change, it was the active engagement with Enlightenment thinking that directed the course and nature of the revolution and generated a new institutional state of path dependence (LiuYichun, 2020).

Rational Incentives

French decision-makers were motivated by several rational incentives in the presence of the previously outlined conditions. With the fall of the ancien régime and the subsequent influence of Enlightenment ideas, a variety of rational interests were present, motivating actors to behave in a certain manner.

Primary among these was the explicit desire to establish a new political order, necessitated by the power vacuum created by the collapse of the monarchy. Maintaining public order amidst the chaos of rapid societal change was crucial, as evidenced by measures taken during the Reign of Terror and the ultimate rise of Napoleon Bonaparte. As with all critical junctures, personal power and influence also remained significant incentives, reflecting the opportunity for new leaders to rise in the absence of traditional hierarchies. In addition, defending the nation against external monarchist threats required rallying nationalistic sentiments, consolidating internal support, and providing a strong rational incentive for certain political choices. Finally, the desire to implement Enlightenment ideals into practical governance, such as by promoting secularism and establishing merit-based systems, was a pivotal incentive guiding the revolutionary leadership. These rational incentives were critical in navigating the complexities of this transformative period and in shaping the trajectory of the French Revolution (Wintrobe, 2004).

Resultant Institutional Change

The resultant institutional change in the security mandate of the French state was profound. During this critical juncture as well, the implementation of written codes of government (constitutions) made the precise location of the government's rights and responsibilities a far more straightforward affair than in more traditional governmental structures. Accordingly, from this point forward, the location of the territorial and subject mandates of the state will predominantly be explicitly defined in constitutional frameworks.

Territorial Mandate

The first French Constitution was actually established prior to the execution of the King during France's brief period as a constitutional monarchy at the start of the French Revolution. That first constitution explicitly addressed the territorial mandate of the French armed forces within French territory, a first in European history and only preceded globally by the constitution of the United States signed in 1787 (Valensise, 1988).

Title 4 of the first Constitution of 1791 enumerates precisely the nature and role of the military of the French state. In the document, it is referred to as the "public force," reflecting the new nature of the military as beholden to the people and not strictly to the King. This public force is defined clearly in Section 2 of the document as consisting of the land, sea, and internal police forces of the French state. The Constitution's first line states the purpose of the French military: "The public force is instituted to defend the state against enemies from abroad and to assure the maintenance of order and the execution of the laws within." It is clear in this first line that territoriality was key to this understanding (Damrosch, 2003).

What is most notable about this Constitution and the territorial mandate that it created is the manner in which it splits the armed forces of France institutionally into two entities, one to deal with external threats within the territory and another to deal with threats within French territory. This constitution reinforces just how important delineated territorial states had become. The duality of the French armed forces in regard to their responsibilities within and outside of these delineated territories can be observed in Section 3 of the document relating to the establishment of the National Guard. It states that this entity was "neither a military body nor an institution within the state; they are the citizens themselves, summoned to the service of the public force." Of course, the National Guard was indeed an institution,

despite the document stating the contrary. The National Guard was a military force consisting of active citizens with elected officers whose role was to maintain the internal security of the French state, fulfilling that side of the dual purpose with regard to the territorial mandate. Threats to the French state from abroad were handled by the royal military under the jurisdiction of the French king under this first constitution, as stated in Section 7. That section states, “All branches of the public force employed for the security of the state against enemies from abroad shall act under the orders of the King.” This reality emphasizes just how critical territoriality had become in the activity of the French Armed Forces following this critical juncture, seeing the state establish two separate institutions within the armed forces to deal with internal and external threats tied to rationally defined borders. It accordingly became the mandate of the French military to protect the French state delineated by its national borders (Lyons, 1994).

With the execution of Louis XVI in 1793 and the ensuing Reign of Terror and its related instability, the French state began to reassess the Constitution of 1791. The duality of the French armed forces in its role in the internal and external security of the state had proven to be a rather ineffective institutional arrangement. By 1799, France was at war with essentially the entirety of Europe, and its military was at a breaking point. Domestically, the National Guard had been used as a tool of unprecedented oppression against individuals deemed enemies of the revolution. Accordingly, in 1799, France introduced a new constitution to address these issues, again redefining the territorial mandate.

In its first article and section, the French Constitution of 1799 addresses the territoriality of the French state. It states, “The French Republic is one and indivisible. Its European territory is divided into departments and communal districts” (Constitution de l'An VIII; France, 1799). This is the first time that the territorial mandate of a modern European state has been fixed by a constitutional mandate. By stating that the French state is territorially indivisible and rationalizing its internal divisions, this constitution institutionalized the notions of territoriality that have been discussed at length thus far. In addition, France again re-adjusted the role of its armed forces within and outside of that territory in this document. This new mandate is addressed in Title 4 of the Constitution, sections 47 and 48. Section 47 states:

> "The government provides for the internal security and the external defence of the state; it distributes the land and sea forces and controls their direction." (Constitution de l'An VIII; France, 1799).

This marks a return to a centralized, singular armed force. However, this force was now sworn to the French government in the form of the office of First Consul, not to the person of the king. In Section 48, the Constitution then addresses the role of the National Guard. It changes its status from an organ of the masses to one beholden directly to the public administration and therefore the state. In short, this Constitution established an inviolable, geographically defined, and constitutionally rooted French state. It then consolidated the armed forces of France and made them beholden to the government and not the person of a monarch. It also gave the armed forces a clear mandate to protect that government from internal and external threats under the government's direction. Under this constitution, despite Napoleon declaring himself hereditary emperor five years later and promulgating a new constitution relating to that fact, the territorial mandate in France remained remarkably consistent through the rest of the nineteenth century and into the twentieth century, strongly reinforcing the claim that the territorial mandate had entered a new state of path dependence (Lyons, 1994).

One can observe how this constitutionally defined territorial mandate directly affected the behavior of the French military during the Napoleonic Wars following the French Revolution. In that period, the French military under Napoleon conquered practically the whole of Europe with no credible military threats to oppose him outside the United Kingdom and Russia. However, France did not outright annex these many territories, as would have been expected in the past. Even at the height of French expansionism, the actual annexations and divisions of territory into French departments were relatively small compared to France's overall conquests. Despite exerting practical control over the whole of Europe, the French state only officially annexed the North and Central portions of Italy, Belgium, the Netherlands, parts of the Rhineland, Catalonia, Slovenia, and Croatia. Though, of course, this marked an enormous expansion compared to the modern borders of France today, in the rest of Europe, such as Spain, Prussia, Austria, and the Kingdom of the Two Sicilies, the French instead installed puppet regimes, beholden to constitutions of their own, that were friendly to French interests. These regimes were constitutionally beholden to the people who lived in those territories and did not constitute direct territories of the French state. Though not

necessarily a critical distinction from a military perspective, as those puppet governments behaved in French interests militarily and institutionally speaking, this foreign policy behavior is indicative of a fundamentally different understanding of territoriality in this new state of path dependence. States were constitutionally established and beholden to their people, not merely to the person of a hereditary monarch. This is formally held despite their relative military strength as well (Bell, 2018; Grab, 2003a).

After Napoleon's final defeat, the borders of the French state were defined in painstaking detail by the Congress of Vienna. The resulting settlement indicates that the institution of clearly defined territorial states on the European continent was fully established and that the state of path dependence had been entered into in full. Despite Napoleon's defeat and a series of three constitutions designed to reinstate the French monarchy, the core territorial institution known as the French state became a permanent fixture of European politics. Its European borders were not to change substantially from this point on until the present day.

Constitutionally speaking, the territorial inviolability of the French state was reinforced in subsequent constitutions during this state of path dependence, notably seen again in 1848 in its first section of the document. Also of interest is Article 51, which states that the French President "cannot cede any portion of the territory" (France, 1848) of France. This article marks the establishment of the territory of France as an inviolable concept separate from the will of the political establishment of the state itself. Moreover, in this constitution, one can also observe the full institutionalization, not just of the inviolable territoriality of the French state, but of constitutional recognition of the inviolability of other European states. In Article 5 of the document, it states that the French Republic

> "…respects the nationality of foreign states, as it causes its own to be respected. It undertakes no wars with a view to conquest and never employs its power against the liberty of any people." (France, 1848)

With this provision, the French government made the inviolability of the boundaries of other states a key component of the mandate of its armed forces. In addition, this Constitution addresses the institutionally sticky issue of the status of France's colonial possessions, which at that time had not been addressed within the Constitution. In Article

109, the 1848 Constitution established that Algeria and the French colonies were also considered to be inviolable French territory. This was an institutional choice that would have profound implications for events in the middle part of the twentieth century, when the inviolability of state territories came head-to-head with notions of decolonization following the Second World War. The 1848 Constitution is a key piece of evidence suggesting that the notions of territoriality established at the critical juncture of the French Revolution established a state of path dependence that would be dominant not only in France but more widely in Europe and the rest of the world (Konarski, 2019).

Throughout the remainder of the nineteenth and early twentieth centuries, the territorial mandate of the French armed forces would remain consistent through the end of the Second World War, prior to the introduction of the European Institution. The military's new role, unified in service to the French state, which shifted between Republicanism and monarchy on multiple occasions, was in large part to preserve the inviolable geographic confines of that state. This included the state's colonial territories following the Constitution of 1848.

Therefore, the French Revolution represented a clear institutional break with the past and established the centrality of fixed borders as a key component of modern states. This was a notion that would ultimately be established in France's many colonial possessions in Africa, Southeast Asia, and the rest of the world, ultimately planting the seeds of the French Empire's ultimate dissolution. It was the role of the French armed forces to maintain order within the territories of France, respecting the rights of the individuals who lived there and followed French law. This evolution of the mandate the French armed forces had over individuals within the territories of France will now be explored in the following section.

Subject Mandate

The subject mandate of the French armed forces changed completely because of the French Revolution. The institutional nature of this change can also be observed directly as it evolved with the French constitution, often in parallel with the evolution of the territorial mandate discussed in depth previously. In the First Constitution of 1791, the subject mandate is discussed at length. In Articles 2 and 3, the French constitution defined the nature of citizenship as being divided into two different categories. The first, active citizenship,

required that an individual be male, 25 years of age or older, pay taxes, and have lived in France for at least a year. Passive citizenship included all other individuals, including women, children, and the economically destitute (Filipiak & Kowalczyk, 2020; Meadows, 2013).

As outlined previously, this mandate took on a distinct nature during the period of the Constitution of 1791 as a result of the peculiar "non-institution" of the National Guard. Constitutionally speaking, both active and passive citizens were not subject to the will of the Royal French Army. This army was solely responsible for protecting the state from outside threats. Being the only armed forces beholden to the king in that arrangement, this meant that the French were not under the mandate of the armed forces of the French king, and he enjoyed no right to act against them. Instead, it was the National Guard, nominally consisting of the people themselves, that had that right. Formally, this was hoped to act as a check on state power against the people. However, as the reign of terror would show, this arrangement quickly devolved into a form of authoritarianism and oppression previously unseen in French history. This status lasted for eight years prior to its reformation in the Constitution of 1799. Regardless, this first constitution redefined the nature of the subject mandate of the armed forces in France, completely changing the role of the French military in relation to the people of France (Lanza, 2001; Shusterman, 2019).

The main objective of the Constitution of 1799 was to maintain the gains of the revolution while providing a more stable and functional political system for the state. As discussed previously, the first article of that constitution established the territorial inviolability of the French Republic. The second established the subject mandate in no uncertain terms. It stated, "Every man born and residing in France, fully twenty-one years of age, who has caused his name to be inscribed upon the civic register of his communal district and has since lived for one year upon the soil of the Republic, is a French citizen." It then proceeds to outline how citizenship can be gained as a foreigner or lost through economic destitution or treason. Importantly, in the final section titled "General Provisions," this constitution also includes a long list of restrictions against the armed forces of the National Guard in its actions against French citizens. Some notable provisions include the inviolability of a French citizen's home and various provisions illustrating the times when the National Guard could be used against a French citizen. Importantly, for the mandate of the armed forces, it states in Article 84 that "the public force is essentially obedient; no armed body can deliberate." This article establishes in no uncertain terms that the mandate of the French

armed forces over its subjects cannot be adjusted by its own will, a key provision in limiting its mandate over French citizens. It also strongly separated the notion of citizenship from the institution of the armed forces (Lyons, 1994).

These core elements of this constitution would hold throughout the Napoleonic era and the remainder of the nineteenth century, despite a spat of three constitutions imposed during the Bourbon restoration designed to undermine the revolution. This indicates a state of powerful path dependence relating to the subject mandate of the French Armed Forces. By establishing the Constitution of 1848, the subject mandate of the French armed forces was fully consolidated and observable. In Articles 7 and 8, the Constitution establishes the duties that the French armed forces hold to citizens and the obligations that those citizens have to the state and armed forces. This is the first time in French history that this reciprocity can be observed. It states that the mandate of the French armed forces was to "protect the citizen in his person, his family, his religion, his prosperity, and his labor, and to bring within the reach of all that education, which is necessary to every man." This marks an enormous change from the ancien régime existing before the critical juncture and has continued in this form through to the present (Konarski, 2019).

As in the case of the territorial mandate following 1848, it can be confidently asserted that the subject mandate of the French armed forces had entered a new state of path dependence. This is one defined constitutionally as involving an obligation of the French armed forces to protect French citizens and to act in their interests in accordance with the state and the law. The mandate of the French armed forces, therefore, only extends to clearly defined French citizens, the precise definition of which has, of course, changed in substance from 1848 to 1945. Over that time, the rights to full, active French citizenship were progressively expanded to women, minorities, and the economically unfortunate. Regardless, the core relationship between the armed forces and French citizens remained in a state of strong path dependence, institutionally made explicit in constitutional law.

Third Critical Juncture: The Second World War

The Second World War represents another pivotal moment in the historical trajectory of the French state relating to its security mandate. This epochal conflict forced a comprehensive reassessment and transformation of the military structures in France. The swift defeat of

France in 1940, followed by the occupation and eventual liberation of France, exposed significant vulnerabilities and necessitated a radical overhaul of military strategy and structure from a practical perspective. Additionally, the war instigated a profound shift in national security priorities. Furthermore, it significantly altered civil-military relations, challenged the traditional roles of the armed forces in colonial territories, and led to France's integration into new international security frameworks. This complex array of changes underscores the Second World War's status as a critical juncture in the evolution of the French state's security mandate, marking a decisive turning point that reshaped its approach to national and international security in the subsequent decades. The resultant path dependence would play a large role in France's actions related to satellite technology and its ultimate decision to supranationalize the asset. The following will now outline the related conditions that reinforce the status of the conflict as a true critical juncture.

Permissive Conditions

The permissive conditions present during the Second World War were more numerous than in previous sections, reflecting the added complexity of more modern politics. For the purposes of this work, they can be consolidated into four conditions.

The first was France's rapid military defeat and occupation. The swift defeat of France by Nazi Germany in 1940 and the subsequent occupation were crucial permissive conditions that gave French decision-makers in the post-war period a broad mandate for institutional change. France's stark defeat exposed critical weaknesses in France's military strategy, command structure, and preparedness, thereby creating a context in which comprehensive military reform became necessary.

The second, relating to the first, was the fall of the Third Republic and the establishment of the Vichy regime. This represented a total political and institutional breakdown. This collapse created a vacuum in governance and called into question the existing military hierarchy and its loyalty to the state, thereby permitting a reevaluation of the security mandate.

The final permissive condition of this critical juncture was of the Allied Forces' liberation of France. The liberation of France by democratic Allied forces was a fundamental

permissive condition that brought liberated France into the Western system of alliances as opposed to those of what would eventually constitute the Warsaw Pact. This was therefore a permissive condition for the reintegration of France into the Western international security community vs. the Eastern, and it would act as a key permissive condition in France's subsequent institutional state of path dependence.

Productive Conditions

The productive conditions present during this critical juncture were also numerous and will be necessarily consolidated. The first productive condition to be addressed is the introduction of Cold War dynamics to the global system. Immediately following the Second World War, France was faced with the geopolitical tensions of the Cold War and the need to counter the Soviet threat. This led to a fundamental reorientation of France's military strategy toward collective deterrence, with the development of nuclear capabilities guiding its political decisions substantially during this critical juncture.

The second would be the introduction of post-war reconstruction policies in the United States and Western European states. The comprehensive post-war reconstruction efforts, including the Marshall Plan and the Monnet Plan, acted as productive conditions during the critical juncture as they provided the necessary economic resources and political stability following the chaos of the Second World War. This enabled the reconstruction and reinterpretation of the French military's security mandate.

The third productive condition was decolonization conflicts. Military engagements in the process of decolonization, such as in Indo-China and Algeria, were productive conditions that significantly influenced the evolution of France's security mandate, both territorially and in relation to subjecthood. These conflicts led to a full reevaluation of the role of the French military outside Metropolitan France, which would ultimately be reflected in the subsequent path dependence of the twentieth century.

The final productive condition worth addressing is the introduction of the notion of European solidarity to prevent future wars in Europe. Perhaps the most significant outcome of this new focus on European solidarity was the rapid reconciliation between France and Germany. This reconciliation was critical in establishing a stable and peaceful Europe and

would directly influence France's security policy, profoundly moving from viewing Germany as a historical adversary to a partner in ensuring continental peace. The idea of European solidarity also fostered a shift from traditional, nationalistic military postures toward collective security frameworks. This was a significant departure from the pre-war emphasis on individual national defense to a more integrated approach, recognizing that European security was interdependent, leading to French participation in various European collective security institutions. France's involvement in these organizations was underpinned by the idea that a united Europe could better prevent future conflicts, leading to a reorientation of its military alliances and commitments.

Rational Incentives

Like with productive conditions, French decision-makers were guided by a large number of rational incentives that significantly influenced the evolution of France's security mandate. Only the most important will be addressed here.

The first, and perhaps most influential on French policy during the critical juncture, was an incentive to restore national sovereignty and French pride following the humiliating military defeat and occupation. To achieve this, French decision-makers would have had a strong rational incentive to rebuild a strong and capable military force that could defend French interests and prevent future occupations (Fontanela & Hébert, 1997; Lellouche, 1993).

The second, in relation to the first, was an incentive for French decision-makers to maintain French international influence and status. In the new global order, France sought to maintain its status as a major world power through any means necessary. This entailed rational incentives to participate actively in international alliances and organizations, such as the United Nations and NATO, and to play a leading role in European integration efforts (Gordon, 1993).

The third rational incentive for French decision-makers traumatized by the Second World War was the prevention of future conflicts in Europe. The devastation of the two world wars in the early part of the twentieth century, which would have both been in living memory for the vast majority of the decision-makers at the time, fostered a strong rational incentive to

prevent future conflicts in Europe. This incentive led to support for initiatives promoting European integration and solidarity, recognizing that collective security and cooperation were essential for lasting peace and avoiding the repetition of such horrors in the future (Meadows, 2013).

Resultant Institutional Changes

The resultant institutional changes can be observed within the constitutions of the French State and in the treaty documents that were established during the critical juncture. This is reflective of the next stage in the broader constitutional evolution of states, which now exist in extensive international systems underpinned by complex treaties. Accordingly, the next sections will explore how precisely the territorial and subject mandates changed following the critical juncture, outlining the state of path dependence. In a break from previous sections, this section will organize the analysis based first on the relevant constitutional provisions within the French state. It will then analyze the treaty obligations that the state adopted relevant to that mandate. This choice was made for clarity and to provide a complete picture of the French security mandate in a far more interconnected international system than anything existing prior to it.

Territorial Mandate

Constitutional

In the period of path dependence following the Second World War, France had two constitutions. For the most part, both the constitutions of 1946 and 1958 established a territorial mandate comparable to those of the nineteenth century. Both emphasize that the borders of France are rationally defined and inviolable under the protection of its military. The military, therefore, had and continues to have a mandate to protect French territory from external and internal threats. However, both Constitutions introduced institutional frameworks that differed substantially in the manner in which territoriality was understood, particularly with regards to newly established international institutions and in relation to France’s restored colonial possessions.

The first clear evolution of the territorial mandate of France can already be seen in the Preamble of the Constitution of 1946. In it, France states outright that "on condition of reciprocal terms, France shall accept the limitations of sovereignty necessary to the organization and defense of peace." Fundamentally, this does not state peace solely for France but instead refers to peace for the whole international community. This short statement marks an enormous change regarding how the territorial mandate of the French armed forces would be understood in this new state of path dependence. This statement implied that the French military no longer had a territorial mandate that was strictly bound by the confines of France and its colonies. Instead, the constitution institutionally liberated French forces to act in conjunction with other states and international institutions to organize and defend peace globally. Fundamentally, it also states that such actions can still occur even if they limit the absolute sovereignty of the French Republic, reflecting French participation in new international organizations with their own security mandates (Deener, 1953; Cooper, 2014).

The precise issue of the French state's relationship with these international institutions is addressed in further detail in Title 4 of the 1946 Constitution, with the most relevant article relating to the territorial nature of the security mandate being Article 27. In it, the Constitution states, "Treaties relative to international organization…and those that modify French domestic laws, as well as those that call for the cession, exchange, or addition of territories, shall not become final until duly ratified by a legislative act. No cession, no exchange, and no addition of territory shall be valid without the consent of the populations concerned." Although this apparently reinforces the sovereignty of the French state over its territory, it also marks a stark departure from previous constitutions that only emphasized the inviolability of France's territory. This article opened the legal avenue for the alteration of France's territory through the approval of the French National Assembly and of the people who would be affected by such a territorial change. This created an institutional circumstance where the territorial mandate of the French armed forces could be altered through the agreement of the French government with international organizations or with other countries, something that would not have been possible under previous Constitutions such as that of 1848. This alteration was likely reflective of the new European Institution, which at the time held hopes of federation.

Taken in conjunction, these two articles of the French Constitution of 1946 fundamentally altered the strict, absolute sovereignty notion of an inviolable French state, defined by a fixed territory. Resting on these institutional provisions, France's armed forces now had a mandate that could supersede the national confines of France. They could be assigned to "organize and defend" peace globally, regardless of territoriality. This was an institutional fact that would substantially affect its national security policymaking over subsequent decades and be of critical importance when discussing the Europeanization of France's territorial mandate in its pursuit of satellite navigation.

The French Constitution was changed again in 1958; however, with regard to the territorial mandate of France's armed forces, little changed in the core notions of defending the territory of France. That Constitution focused more on internal issues of government, empowering the office of the French President vis-à-vis the French Parliament. The notable articles on France's role in international institutions, namely Title 4, were not changed. However, on the issue of France's colonial territories, this treaty would prove far more important. The issue of France's restored colonies and the nature of the armed forces mandate over those territories will now be addressed in more detail in relation to both the Constitutions of 1946 and 1958.

In the final years of the Second World War, the French armed forces were able to recover much of their former colonial empire from the Germans and the Japanese. After the war, French territory was restored to its pre-war borders in their entirety, including its colonial possessions. As explored previously, these possessions were considered to be the sovereign territory of France in its previous constitutional arrangements, starting with the Constitution of 1848.

In these two constitutions, the French attempted, through various arrangements, to create a system by which their colonial territories would remain under the sovereign control of Metropolitan France. Both constitutions understood the French colonial possessions and overseas territories as existing within the territorial mandate of their armed forces. However, France was faced with the simple reality that the people under their control were no longer interested in living in French territory. To incentivize the people living in those territories to remain under French sovereignty, both constitutions offered various concessions in their governance, designed to provide more autonomy for French colonial possessions. For the

purposes of this study, it is sufficient to state that both Constitutions understood French overseas possessions as under the same territorial mandate of the French armed forces as the French metropole. This was an arrangement, though, that would not last as decolonization reached its height, ultimately witnessing France lose control of all of its major colonial possessions by the end of the 1960s, despite institutionally attempting to maintain the previous status quo.

International Institutions: NATO, the UN Security Council, and Europe

As outlined previously, the French constitution fundamentally altered the territorial mandate of the French armed forces. No longer was their sole mandate to protect and preserve inviolable French territory, but they also had a mandate to "organize and promote" global peace and security in conjunction with other states. This meant that to fully outline the resultant institutional change in the French security mandate, international organizations in which the French military takes part must also be considered. The primary institutions that enable such cooperation include the UN Security Council, NATO, and what will be referred to here broadly as the European Institution. This choice is done for clarity, as the precursor organizations to the European Union were many and changed names various times over the decades covered here, despite all being unified under the broad umbrella of guaranteeing European security and promoting further European integration. When necessary, the specific organ will be referred to by its name to distinguish it, or more precisely, in reference to specific documents or treaties.

United Nations Security Council

The UN Security Council was the first international organization France joined that altered its territorial mandate. France was a founding member of that organization, signing its charter in 1945, and holds one of the five permanent seats at the security council, empowered with a veto. In Chapter 5 of the UN Charter, France's obligations under the treaty as a permanent security council member are made clear and enumerated extensively. The most relevant provision for its territorial mandate can be seen in Article 24. In that article, the Charter states that France and the other members hold "primary responsibility for the maintenance of international peace and security, and agree that in carrying out its duties under this responsibility, the Security Council acts on their behalf." This means that the territorial

mandate of French forces is a global one in its responsibility to the UN when UN security agrees that there is a threat to world peace necessary for intervention. This marks an enormous institutional change when compared to France's previous treaty arrangements prior to the UN. This institutional arrangement has resulted in French forces participating in military operations across the globe, far away from its national territory and in areas not strictly tied to its immediate national interests.

NATO

Four years later, in 1949, France would also be a founding member of the North Atlantic Treaty Alliance, or NATO. This agreement marked an even more substantial alteration to the territorial mandate of the French armed forces than the UN, particularly given the UN's notorious inability to exercise security council powers in a meaningful capacity. Under Article 5 of NATO, France's armed force's territorial mandate de facto extends to all other NATO member states when faced with an external attack. It states that "an armed attack against one or more (NATO parties) in Europe or North America shall be considered an attack against them all." Under the NATO agreement, this does not extend France's territorial mandate within the national boundaries of other NATO member states. However, it does mean that it holds an obligation to protect all these members' external borders. Despite France's departure from the NATO command structure in 1966, France has maintained this territorial mandate for its armed forces since its signing by maintaining its collective security obligations. France re-entered NATO's command structure in 2009 and remains in it through to the present.

The European Institution

In 1951, France joined the European Coal and Steel Community. In most literature, this date marks the accession of France to the broader European Institution. However, this work would propose that France's actual participation in the European project began in 1948 with its signing of the less discussed Treaty of Brussels. This reality underscores the fact that European integration has been undertaken in two streams, one primarily economic and one centered on security issues. Both can be traced back to their respective treaties, both of which saw France as a founding signatory. France's territorial security mandate has evolved with these two institutions over the decades as well. Accordingly, this section will first treat the

security stream and then the economy, as both would influence France's territorial security mandate. This section will cover the state of path dependence existing relating to the European Institution prior to the final critical juncture that occurred in 1991 with the Treaty of Maastricht, which established the modern European Union of today.

Security

The Treaty of Brussels, signed by Belgium, France, Luxembourg, the Netherlands, and the United Kingdom, was a collective security treaty. It provided in Article 5 a collective defense clause against any aggression against its members and established the Western Union Defense Organisation. The signing of this treaty expanded the mandate of the armed forces of France to cover not only its own territory but those of the other signatories, giving it an obligation to protect all of them from external attack. In 1954, a more robust iteration of the treaty would be signed in the form of the Modified Brussels Treaty, critically including West Germany as a signatory. The organisation of collective European defense would also be renamed the more succinct WEU, an organization that would exist throughout the twentieth century.

Over subsequent decades, the WEU would play a role in a variety of European collective security initiatives, including the development of satellite navigation. Members of the French armed forces and government were, as one would expect, a ubiquitous presence in these discussions and efforts, given France's constitutional mandate and its status as the most powerful military actor on the continent following the Second World War. The WEU existed until its absorption into the European Union in the 1990s and early 2000s, following the final critical juncture in this work. Throughout the existence of this organization, the French military had an institutionally rooted obligation to protect the other states of Western Europe from attack on top of its obligations under NATO. This acted as another clear departure from its early modern territorial mandate, which only covered France's national territory.

Despite European security issues nominally being handled by the WEU, the economic stream of European integration still had critical implications for the territorial mandate of European armed forces, particularly with regard to the use of military resources. The Treaty of Paris of 1951 had direct relevance to France's armed forces' territorial mandate in just such an indirect way.

Civilian

In contrast to the characterization of the European Coal and Steel Community by some current EU scholars, the main role of this organization was not to promote the economic development of the European continent per se. It was, at its heart, like the Treaty of Brussels before it, designed primarily to prevent further war in Europe. It is merely intended to use civilian means, namely economic integration, as the tool to do so. In the Treaty of Paris of 1951, the first line of the document sums this objective up quite succinctly: "considering that world peace may be safeguarded only by creative efforts equal to the dangers that menace it." "… (The signatories) resolve to substitute for historic rivalries a fusion of their essential interests; to establish, by creating an economic community, the foundation of a broad and independent community among people long divided by bloody conflicts; and to lay the bases of institutions capable of giving direction to their future common destiny." "…have decided to create a European Coal and Steel Community."

The choice of the treaty to govern coal and steel lay in the fact that these two resources were the building blocks for war economies at the time. By removing state sovereign control over these resources, the treaty intended to make war between nations an impossibility, reflecting the incentives and conditions established during the critical juncture of the Second World War. With France's accession to this treaty, the state was giving up the territorial mandate of its armed forces to access the materials necessary for its function without the tacit approval of France's European neighbors. This included resources present on French territory and would last throughout the twentieth century. The economic stream of European institutions would not directly deal with issues of territoriality related to security issues until the Treaty of Maastricht in 1992, which will be addressed in the final critical juncture.

Subject

Subject Mandate

In parallel to the redefinition of the territorial mandate of the French armed forces in the post-war world, France also markedly changed the subject mandate of its armed forces over this

time period. However, this change was not nearly as extensive as the changes in the territorial mandate. This is because the previously outlined alterations in the French armed forces' territorial mandate were primarily relegated to external defense and not the direct governance of French citizens. In short, the French constitution established clearly that any individual living in France was subject to the will of the French government regardless of gender, race, or belief. This means that the French military and police have an obligation to protect and a right to enforce the law against French citizens. With France's participation in the previously outlined defense agreements and international organizations, France's armed forces assumed a mandate to protect the citizens of other states from external threats. However, they did not gain a right to enforce French law against those citizens, nor did they have direct constitutional ties to the citizens of other states. It was not until the final critical juncture and the signing of the Maastricht Treaty, which introduced the notion of European citizenship, that this mandate would change substantially.

Fifth Critical Juncture: The End of the Cold War and the Treaty of Maastricht

The end of the Cold War and the subsequent signing of the Treaty of Maastricht represent a critical juncture in the evolution of the French security mandate, particularly concerning territoriality and the protection of subjects of the French state, owing to several transformative changes. Overall, the removal of the Soviet threat and the introduction of new security challenges would constitute a critical juncture, redefining French security policy into a new state of path dependence. This new state directly resulted in the Galileo project and France's ultimate supranationalization of satellite navigation. The conditions constituting this critical juncture will now be explored.

Permissive Conditions

The most fundamental permissive condition was, as one could expect, the collapse of the Soviet Union. The disintegration of the USSR and its security network and the consequent end of the Cold War eliminated the primary existential threat that had defined European and global security dynamics following the Second World War. This collapse created another vacuum and a need for new security paradigms, forcing France to rethink the security mandate of its armed forces.

The second permissive condition was the immediate emergence of new security threats, such as ethnic conflicts in the Balkans, international terrorism, and nuclear proliferation. These new challenges highlighted the limitations of traditional military approaches present in the previous state of path dependence. These evolving threats created the necessary conditions for France to adapt its security mandate to address a broader range of challenges.

The third permissive condition was the relatively advanced state of European integration and well-established European stability. By the time of the end of the Cold War, the progression of European integration had reached a relatively advanced stage as a result of continued cooperation in the previous state of path dependence. This permissive condition created a context for deeper cooperation in foreign and security policy among European nations by the early 1990s. This decades-long push for a more united and stable Europe allowed France to pursue a security mandate that extended beyond its national borders to those of its European neighbors, with whom it had enjoyed decades of peace and cooperation.

Productive Conditions

The productive conditions present during this critical juncture were, as in the case of the post-war period, numerous. This section will, accordingly, only touch on the most important.

The first productive condition relates to changes in economic and industrial considerations within the European defense industry. The defense industry's evolution, including the development of the European defense industrial base that had begun in earnest during the 1970s and 1980s, influenced France's overall military procurement and research and development. Collaborative projects like the Eurofighter Typhoon and the development of the European defense market were productive conditions that affected France's decisions taken during this critical juncture related to the institutional redefinition of its security mandate.

The second productive condition relates to the public and political discourse on national security in this period. Domestic public and political discourse around national security, defense priorities, and France's role in the world actively shaped policy decisions. With the fall of the Soviet Union, the period was defined by a renewed optimism and

reinforcement of belief in multilateralism and the superiority of the Western system of international governance. The desire for a strong national defense, coupled with this commitment to European integration and multilateralism, would act as a strong productive condition for France's redefinition of its security mandate in the early 1990s.

Rational Incentives

The rational incentives present during this critical juncture are relatively consistent with similar rational incentives in previous critical junctures. For example, following the Second World War, French decision-makers first had a rational interest in maintaining French national security in a changing global context. With the dissolution of the Soviet Union and the shifting global power dynamics, a primary rational incentive was to reassess and ensure France's national security in this rapidly changing international environment.

Moreover, similar to the incentives seen following the Second World War, France's decision-makers would have been keen on preserving France's role and influence on the international stage. Given the complete loss of French colonial possessions, which occurred during the middle of the twentieth century, this incentive would have been particularly strong for French decision-makers who had experienced what was seen in France as an enormous reduction of stature internationally.

Finally, economic considerations were also paramount incentives during this period. Post-Cold War, an opportunity to optimize defense spending emerged in light of the "peace dividend," which European states took full advantage of. Resultant rational incentives included balancing military expenditure with other pressing economic needs, such as social welfare and economic development.

Resultant Institutional Change

The resulting institutional change that resulted from this critical juncture can be observed in the Treaty of Maastricht of 1992. Unlike at previous critical junctures, there were no changes to the French domestic constitution. This is reflective of the degree of European integration and the increasing importance of the European Institution that had been achieved by 1992 during the previous state of path dependence. With the signing of the Treaty of Maastricht

and the establishment of the unified European Union, the previously outlined two streams of integration relating to security and economic issues began to institutionally meld. It is following this critical juncture that the European Union can be observed beginning to act as a de facto security actor with its own separate, territorial, and subject mandate. It was this merger and France's resultant security mandate that would ultimately lead to the Galileo project and France's decision to supranationalize its satellite navigation capacities.

Territorial Mandate

Direct reference to changes in the territorial mandate of the member states and the nascent European Union is not made within the Maastricht Treaty. This is likely a result of the implied and accepted territorial confines of the European Union reflecting the territories of the institutions' member states.

Despite its lack of explicit reference, however, the notion of the European Union as a singular territorial unit can be seen by implication. The clearest implication of this understanding of the EU can be observed in Article 8c, which addresses the consular rights of European citizens. Specifically, Article 8c states that every citizen of the Union shall be entitled to protection by the diplomatic or consular authorities of any Member State in the territory of a third country where the Member State of which the citizen is a national is not represented. This implies that the external borders of the European Union are taken into consideration when it comes to providing protection to its citizens in third countries and, accordingly, establishes the notion that the European Union exists as a distinct territorial unit.

From this, there is an implied territorial security mandate related to the European Union. The Treaty of Maastricht addresses this with the Common European Foreign and Security Policy. This can be observed in Article 5 of the Treaty, which is entirely dedicated to the subject. The Treaty of Maastricht established that European Union states were expected to behave with a common purpose and develop common security policies regardless of their national interests. It states this in no uncertain terms in Article J.1. 4 which states:

> "The Member States shall support the Union's external and security policy actively and unreservedly in a spirit of loyalty and mutual solidarity. They shall refrain from any action that is contrary to the interests of the Union or likely to impair its effectiveness as a cohesive force in

> international relations. The Council shall ensure that these principles are complied with." (Treaty of Maastricht, 1992)

The document then continues, stating

> "The common foreign and security policy shall encompass all matters related to the security of the Union. This includes the potential establishment of a common defense policy that could eventually lead to a common defense."

It then designates the WEU, which continued to exist for roughly two decades following the establishment of the European Union, as the institutional arena where such policies should be made.

This critical juncture reshaped the territorial mandate of EU members, including France, at a fundamental constitutional level. With the establishment of the European Union and this common foreign and security policy, France assumed not only a mandate to defend other members from external threats, as it had throughout the twentieth century, but to actively make policies aligned with the European Union and its members in keeping with the Common European Foreign and Security Policy. The practical result of such a policy was the assumption by the French state of the responsibility to defend the territory of the European Union as constituted by its member states under the guidance of European policymakers.

This institutional state of path dependence was further reinforced by the Treaty of Lisbon in 2008, which reiterated heavily the notion that European members armed forces had territorial mandates not only within their own countries but also responsibilities to other members. This was covered extensively in Article 11, outlining the nature in which the CFSP would be created and enforced. Overall, the article reinforces the notions established at the critical juncture and suggests that the European Union and its member states were in a state of path dependence.

Subject Mandate

Though the change of the territorial mandate was important following the critical juncture, it was in the realm of citizenship and the resultant security mandate that the effects of the

critical juncture could be most felt. An entire section of the Maastricht Treaty, Part Two, titled "Citizenship of the Union," relates to this issue. In it, the related articles detail the establishment of Union citizenship, the rights and duties of Union citizens, the right to move and reside freely within the territory of the Member States, the right to vote and stand as a candidate in certain elections, and the right to diplomatic or consular protection in a third country where the Member State of which the citizen is a national is not represented as mentioned previously.

The establishment of citizenship for European citizens fundamentally redefined the security mandate of the French Armed Forces. In particular, the requirement to provide diplomatic and consular protection in a third country outside the EU meant, by extension, that the French armed forces held an obligation to protect the rights of other EU nationals abroad. This treaty, therefore, placed obligations on the French military to protect the rights of the nationals of over twenty other states under the European Union. The path dependence that would follow would reflect this fundamental structural change.

Collected Insights and Summation

In this section, we can observe how the security mandate of the French state evolved from the ancien régime to that of a supranational member state in just a few centuries. Unlike in the Indian case, we can see clearly that the security mandate present at the time when France pursued satellite navigation differed greatly from that of a normal state. In the post-World War era following the third critical juncture, it can be observed that France's security mandate has already ceased to be limited by the territorial or constitutional confines of France itself. By structuring its constitutional model in a certain manner and through its ascension to various international bodies, France assumed a security mandate that included not only its own state but those of its neighbors. Then, following the end of the Cold War and the signing of the Treaty of Maastricht, another critical juncture altered this state of path dependence into a more explicitly European direction. With the establishment of the European Union, France entered a state of path dependence that would be defined by a security mandate covering the territories of all European member states and their citizens. Additionally, the European Union would have the ability to directly create a policy that would affect France's choices in the form of the Common Foreign and Security Policy. In the following section, we will explore how this altered security mandate profoundly affected

France's security behavior in its pursuit of satellite technology across the twentieth century and, ultimately, its decision to supranationalize its satellite navigation capacity in the form of Galileo.

French Satnav Development

Following the critical juncture of the Second World War, the previous section demonstrated how France's security mandate became internationalized through its participation in various international organizations and as a result of its new constitutional structures. These included the UN Security Council, NATO, and the European Institution. The state of path dependence that existed institutionally from 1946 to 1992 saw France make a security policy designed to preserve France's position globally while reinforcing the collective ability of the Western powers to counter the existential threat posed by the Soviet Union. From 1992 forward, with the second critical juncture of the end of the Cold War and the signing of the Maastricht Treaty, the new state of path dependence saw France integrate far more heavily into a collective European supra-state in the form of the European Union.

This section will outline how these macro-level institutional states manifested at the policymaking level in French efforts to develop satellite navigation throughout the latter half of the twentieth and the beginning of the twenty-first centuries. In keeping with this study's understanding of historical institutionalism, this section will illustrate the manner in which the broad institutional trends at the foundational level of the French state directly influenced the policymaking decisions of France. It will do so by analyzing the process of satellite navigation development and breaking it down into its various, smaller-scale critical junctures and resultant states of path dependence in the creation of French satellite navigation.

First Critical Juncture: German Rocket Development During World War Two

In keeping with the first institutional critical juncture and resultant path dependence, France's decision to undertake satellite technology navigation stems directly from the events of the Second World War. Following that particularly traumatic conflict for France, the state immediately began to rebuild its armed forces with the clear objective of preserving its status as both a European and relevant global power, in keeping with a national understanding of the state's security mandate.

A key component of this renewal lay in developing French versions of the rocket technology developed and used by the Germans during the Second World War. To establish the conditions, it is primarily important to provide some key elements of the context of German rocket development efforts in the Second World War.

In the later stages of the war, Germany's predicament facing the Soviets in the East, the Americans across the Atlantic, and the British just off continental shores had exhausted the German industrial capacity. The Germans attempted to counter this with increasingly sophisticated rockets. They viewed such technology as the solution to their increasingly lacking bombing efforts over the United Kingdom in the face of stiff aerial resistance and an increasing American presence on the island. The Germans viewed rockets as the solution to the vast Atlantic that separated their forces from the industrial might of the United States. Referred to as Project Amerika, led by Wernher von Braun, the Germans hoped to develop rockets capable of reaching the United States. It was hoped that the missile would allow Germany to bomb New York and other American cities on a vast scale, inflicting at least psychological damage to the state and demonstrating that the war could indeed be brought to its shores. The A9/A10 was conceived as a two-stage rocket, with the A9 as the first stage and the A10 as the second stage. Initially planned to be radio-guided, it was later changed to a piloted craft. Actual testing of the rockets took place in February 1945 in the twilight of the war, proving the concept (Albala, 2014; Becklake, 2006).

By the end of the war, the Germans had yet to develop a deployable model of such rockets. Regardless, German rocket technology was quite sophisticated, with the famed V2 (also known as A4) missile seeing use rather extensively over the British Isles. These rockets provoked a particular form of terror as their speed, altitude, and unmanned nature meant that there were no viable defenses against such weapons, though they were of course not capable of changing the balance of the war.

However, their efforts had captured the imaginations of Allied militaries and governments. The Chief of the US Army Air Corps, the precursor to the US Air Force, General Hap Arnold, encapsulated the sensation at the time, stating in 1943:

> "Someday, not too distant, there can come streaking out of somewhere—we will not be able to hear it; it will come so fast—some kind of gadget with an explosive so powerful that one projectile will be able to wipe out completely this city of Washington…That attack will be met by machines guided not by human brains but by devices conjured up by human brains" (Lutes et al., 2011, p. 98).

This spark in interest made Wenger von Braun and his team some of the prime targets of Operation Paperclip, the mission of the United States to capture and take to America hundreds of German scientists familiar with rocket technology. France, in keeping with its state of path dependence following the Second World War, had no intention of being left behind in the race for rockets.

Permissive Conditions

The first permissive condition that defined this critical juncture for France was simply witnessing firsthand the German use of rockets during the Second World War. Unlike in India, for instance, France directly observed Germany's advancements in rocket technology, particularly the development and deployment of the V-2 rocket. Many of these rockets were launched from French territory, manned, of course, by occupying German rocket crews. This direct observation demonstrated the potential military and strategic capabilities of rocket technology, highlighting its importance for national defense and technological prowess and allowing for a critical juncture to occur at the time.

The second permissive condition was the availability of German scientists and technology. Following the war, as in the case of the Americans, there was an opportunity to acquire knowledge and expertise from German scientists who had worked on the Nazi rocket program. Though France was unable to capture nearly as many German scientists as the US or the Soviet Union, it was able to capture some, in addition to a few rocket prototypes. Most notably, France recruited roughly 30 German rocket scientists who had worked at the V2 research hub at Peenemünde (Reuter, 2000, p. 179). This transfer of knowledge was a significant permissive condition, providing France with a foundation upon which to build its own rocket technology program.

Productive Conditions

The most important productive conditions related to this critical juncture are French participation in technology exchanges with other Western Allies and high levels of government funding and interest in rocket technology. The first, collaboration with allies and international partners, enabled France to benefit from the efforts of its World War Two allies in the same domain, making it a relevant productive condition. These international partnerships helped France acquire additional insights and resources necessary for advancing its rocket technology program.

The second, high levels of government funding and interest, was also important as a productive condition. This investment provided the financial resources required to undertake sophisticated rocketry projects, supporting the development of technology, facilities, and human capital. This was available to France, as it was a wealthy country that also enjoyed substantial financing from the US to rebuild its economy following the Second World War.

Rational Incentives

Most importantly, national security and defense would have been one of the primary rational incentives to develop rocket technology in the minds of French decision-makers during this critical juncture. Witnessing the impact of German rocket technology during the war, particularly the V-2 rockets, highlighted the strategic importance of possessing similar capabilities for defense and deterrence. This was also necessary to counterbalance the technological advancements of the Soviet Union, which had also captured large numbers of German rocket scientists and brought them into its service. France, accordingly, felt a strong need to have comparable capabilities in rocketry and space technology to preserve its national security at the time.

Another important rational incentive for France at the critical juncture is also related to the reinforcement of French geopolitical influence and prestige following its occupation by German forces. As explored in the institutional section, overall, this was an important rational incentive for French decision-makers at the time. Developing rocket technology would have been an effective means to assert France’s status and influence on the global stage as a great power. In the post-war period, especially, technological prowess in advanced fields like rocketry and aerospace was a potent symbol of national power and prestige that French decision-makers would have certainly been incentivized to control.

Resultant Institutional Path Dependence

The resultant institutions from this critical juncture that embodied the new state of path dependence covered multiple areas of French policy. First, there were dedicated divisions and efforts within the French military committed to rocket research following the Second World War. Furthermore, attempts were made to coordinate the French defense industry and academic space for rocket research and production. However, most explicitly and relevant to the research effort here, France established a research institute dedicated solely to rocket research and design in 1946. This was the "Laboratoire de Recherches Balistiques et Aérodynamiques" (or LRBA). The establishment of this organization is the strongest indicator of a new state of path dependence existing following the critical juncture spawned by French interaction with German rocket technology following the Second World War. However, its strictly national focus does not coincide well with the broad institutional state of France following the Second World War, namely, its embeddedness in international security organizations. In particular, cooperation was lacking at the NATO level throughout the first decade of this international development. This deficiency will now be addressed to complete the picture and explain why France chose to nationally develop this technology as opposed to fully cooperating with its partners.

NATO's Absence

In NATO's earliest days, discussions on missile and satellite technology at the alliance level were a secondary priority for the broader organization. In now-declassified documents, it can be seen that, for instance, in 1950, NATO felt that guided missiles were not of primary importance. The documents state explicitly:

> "The demands of other high-priority projects may limit the availability of such items as gyros, servos, electronic equipment, and technical personnel to be allotted in the immediate future to the development and production of guided missiles." (North Atlantic Treaty Organization, 1950, p. 21)

The paper then continues by outlining in detail its projections for Soviet development of similar technology, projecting that they would not be able to meaningfully deploy missile

technology until the late 1950s. This would imply that NATO decision-makers thought that the Soviets were far behind them in any potential rocket developments.

However, if one takes a more cynical lens on the issue, the case could also be made that NATO, overwhelmingly dominated by the US in the immediate post-war period, was not willing to assist its members in the development of such advanced technology collectively. This stands in contrast to the other capacities listed in the document, such as anti-tank weaponry, ammunition, and other forms of low-tech equipment that NATO was more than willing to collaborate on. This perspective is reinforced by the fact that, despite NATO's apparent indifference to guided missiles, its great power members in the US, France, and the UK were each nationally developing missile technology at pace and developing enormous resources to do so. This suggests that the security mandate at NATO was not being perceived as fully alliance-wide at the time and was more reflective of the nationalist security mandate present before the Second World War.

Accordingly, following this initial critical juncture, French efforts in the realm of rocketry were national in nature, and cooperation with international organizations was very limited. From 1946 to 1957, France was able to develop the key components for rocket technology. The most notable achievement was the development of the "Veronique" sounding rocket, which would eventually make up part of the larger family of French "Vé" sounding rockets. It was developed in the early 1950s and was one of the first French rockets to reach the edge of outer space. These rockets were primarily used for scientific research, including upper-atmosphere studies and microgravity experiments. However, as in the case of India, such rockets had demonstrable military potential when combined with warheads carrying explosive payloads, both nuclear and conventional.

Second Critical Juncture: Sputnik, 1957

Sputnik, though, would change France's course. As outlined in the case of India, initially the importance of Sputnik's launch was not as much in the satellite that entered orbit but instead in the missile that carried it. The launch of Sputnik meant that the Soviet Union had developed ICMBs comparable to those the Germans had dreamt up just over a decade earlier. As in the case of India, France immediately found itself vulnerable. However, unlike India, it took a very different path to develop satellite technology. It is by following this critical

juncture that we can first begin to see how the institutional nature of France, as a member of international security organizations, begins to have a direct, demonstrable effect on its rocket and satellite technology development policy choices. Instead of simply focusing its efforts nationally following Sputnik, France immediately began to lean heavily on the various institutional organizations of which it was a part in developing its institutional reaction. The conditions that defined this critical juncture will now be outlined.

Permissive Conditions

The first and most prevalent permissive condition was related to the proof of concept Sputnik provided. As the first artificial Earth satellite, Sputnik primarily demonstrated the feasibility of using a rocket to launch a payload into orbit. This created the first necessary permissive condition for France to pursue similar technological advancements.

The second permissive condition for the resultant institutional choice to internationally collaborate was the increased establishment of international organizations. By 1957, NATO and the Cold War were both well-established realities and were expected to be a semi-permanent fixture of the international system. Additionally, the introduction of the broad European Institution, most notably consisting of the WEU covering security issues and the European Community covering economic development, changed the institutional landscape prior to the launch of Sputnik. The WEU had been founded in 1954 and had already held three annual assemblies discussing European security. This altered institutional landscape meant that a permissive condition was now present to allow France to develop satellite and rocket technology collectively.

Third, by 1957, European states had substantially recovered from the immediate aftermath of the war through the Marshal and Monet plans. At this point, European states would have collectively been far more prepared to operate with one another to address issues such as Sputnik.

Productive Conditions

Some productive conditions that characterized this critical juncture existed peripheral to the core national security considerations of France at the time.

The first of which would have been perceived economic benefits from investing in satellites and aerospace more generally. By 1957, France had a burgeoning aerospace industry and was beginning to see potential in satellite technology for telecommunications, weather forecasting, and later, for satellite navigation systems. Collaborating with European partners was considered a way to share the financial burden of this research and development, which at the time was a notable cost. Once economic considerations such as the profitability of dual-use technology entered the picture, the need to minimize costs would have encouraged France to pursue collaborative efforts with other like-minded states.

The second was the existence of newly established European-level research groups such as the European Organization for Nuclear Research, or CERN. This was founded in 1954 and would have certainly provided decision-makers with a productive condition in the sense that they could observe previous efforts of collaboration on large-scale projects in the recent past.

A final productive condition present during this critical juncture was a relative lack of resources between European states, the United States, and the Soviet Union. Throughout the archival work of this study, this is a theme that emerges frequently in discussions advocating for outer space research efforts in Europe. Accordingly, it was likely a productive condition for encouraging France to pursue collective efforts to develop its satellite technology.

Resultant Institutional Change

As stated previously, the critical juncture of the launch of Sputnik generated a new state of path dependence for French satellite technology development that was characterized by cooperative endeavors, especially at the European level. This section will explore the resultant institutional changes that took place in the three main institutional sources of French policymaking at the time: their national government, the NATO alliance, and the European Institution.

National

At the national level, the French government established its national space agency, the Centre National d'Études Spatiales (CNES), on December 19, 1961. It was founded primarily to establish France as a relevant player in outer space technology. At the time, that centered on the development of satellites and the related infrastructure required to place them into orbit, such as launchers and ground facilities.

It was at the national level, through CNES, that France developed its first satellite. The Astérix satellite, launched in 1965, made France the third country in the world to launch its own satellite independently, following the Soviet Union and the United States. France was able to do so using the Diamant rocket series, launchers that guaranteed France and, by extension, Europe independent access to space. The development of these rockets was a critical achievement for CNES and European space capabilities (Turner, 1999). Under the CNES, France also established the Kourou Spaceport in the French Guiana Space Centre (Centre Spatial Guyanais, CSG). This spaceport would later become a major global site for satellite launches because of its advantageous location near the equator, and it remains Europe's spaceport to the present.

It is critical to note that despite these achievements taking place through CNES, throughout this entire process, extensive collaboration was occurring between France and its fellow members within the European Institution, most notably in the WEU. It was actually at the WEU level that the first extensive analysis of outer space's potential role in warfare was undertaken with the extensive participation of French military officials. It was that forum in the late 1950s where France laid the groundwork for the ultimate establishment of its national efforts. At the NATO level, cooperation was much less forthcoming, a fact that will now be explored in more detail (Schake et al., 1999).

NATO

It would appear that France first sought to address the issue posed by the launch of Sputnik through NATO forums. Following the launch of Sputnik, NATO almost immediately held a meeting of its Military Committee, the minutes of which have since been declassified. In this initial meeting, representatives from all NATO members discussed behind closed doors how to respond to Sputnik. Issues related to all elements of satellite development, from launchers to the satellites themselves, were discussed.

In the minutes, the Belgian delegation took a particularly active role. The delegation posed questions as to whether the Sputnik satellite could be used as an "observation post" to spy on NATO positions. However, the most relevant aspect of this meeting lay in the apparent tensions at NATO, seemingly placing the US in one camp and the rest of the allies in another. The statement by the Italian representative is particularly prescient with regard to the openness amongst the allies on sensitive topics related to satellite and missile technology. The Italian representative stated that he and other representatives were very often "in the dark regarding the subjects to be discussed" and complained that they often

> "…did not know more…(about satellite technology) than that which could be derived from the American press." (North Atlantic Military Committee, 1957, p. 7)

Throughout the discussion, the Belgian representative took the lead in complaining about this apparent lack of openness within the Military Committee of NATO.

All the allies apparently agreed except, notably, the United States. The US's contribution to the discourse was perhaps most revealing when it stated, seemingly unprovoked, that any information produced on such sensitive topics

> "…could only be taken as the combined view of the NATO standing committee, not as the view of any one nation." (North Atlantic Military Committee, 1957, p. 3)

The US also offered various times to, perhaps, allow allied representatives to visit the US Strategic Air Command to allay their concerns over Sputnik. Despite their presence at this meeting, the French notably offered no commentary whatsoever, perhaps representative of their rather tense relationship with the organization by 1957. The document suggests that at the time there were very real fractures in cooperation on sensitive technology, such as that related to satellites and their launchers, with fault lines existing between the US and the rest of NATO's members. In this context, it would appear that France did not consider developing satellite technology under this institutional framework to be a worthwhile endeavor. It would instead focus its cooperative efforts within the European Institution.

European Institution

During the critical juncture, France instead chose to work within the European Institution to achieve its goals in satellite technology development. Interestingly, in keeping with the two streams of European integration, one can observe two states of institutional path dependence that resulted at the European level. Within the records of the European Union going back to this critical juncture, one can observe a clear state of path dependence of institutional development of a military nature and another of a civilian nature, both tasked with developing satellite and other outer space technology. Formally, these streams were institutionally separate, a fact that is reflective of the dual-use nature of such technology. However, in practice, they interacted extensively. The result is a single state of path dependence toward satellite navigation consisting of two parts.

The civilian stream is embodied in the efforts of the ESA and its predecessor organizations, whereas the military stream can be observed within the WEU. Each stream justifies the need for such research accordingly, either citing civilian or military needs for its projects. However, the simple fact is that the projects were more often than not one and the same, such as, for example, the development of satellite launcher technology or the subject of this work, satellite navigation. This result is particularly interesting as it helps to untangle the often contradictory positions taken by Europe as to the true nature of its outer space research efforts, with many officials and organizations claiming such efforts to be either purely civilian or strategic in nature.

The institutional evidence would suggest instead that the answer is simply both, albeit with a direct relationship and a singular practical objective. In all instances of technology development, from the earliest satellite launches through to satellite navigation, it can be observed that the military stream provides recommendations and the nominally civilian stream executes the research. Accordingly, when outlining the resultant institutional change here, each stream will be taken separately first, starting with the military stream and finishing with the civilian stream. This strategy will be repeated following the later critical junctures, as this pattern holds throughout the various states of path dependence that led to satellite navigation. This section rests on original sources researched at the European Historical Archives in Florence, the archive that has collected all the historical records from all of the European Union’s predecessor organizations. In keeping with the terminology of this work,

this archive represents the collection of the historical records of the European Institution as a whole.

Military

As outlined extensively, satellite technology got its start as military technology and has direct military uses. In the case of Europe, this was no different. The reaction to the critical juncture was undertaken by France and other Western European Member States almost immediately. Sputnik was launched on October 4, 1957, and within that month, the WEU called its third assembly since the organization's founding in 1954. Notably, this meeting occurred prior to the meetings at NATO, which would not occur until November.

The WEU's role in this process is of particular interest to this research and the history of European space efforts more broadly because of a broader consensus in European integration studies that the WEU was little more than a defunct organization from the founding of NATO up through the mid-1980s (University of Pittsburg, 2023; Brittanica, 2023; Duke, 1996). However, this study suggests that, on satellite and outer space military technology at least, this would not seem to be the case at all. The organization was present and active at every major stage in the development of outer space technology following the launch of Sputnik, offering recommendations that were then executed by nominally civilian European institutions in short order.

In the discussions during the previously mentioned assembly, Rapporteur Fen took the lead in providing recommendations on how to respond to the critical juncture. In his presentation, he embodied the strategic insecurity that was felt by European states in response to Sputnik in no uncertain terms, stating:

"In the last few months, developments have taken place, which fill us all with great anxiety. The Russian intercontinental ballistic missile has both literally and figuratively appeared in the heavens, and for a number of days, a Russian artificial moon has been circling our planet at an unimaginable speed…Undoubtedly, the situation has changed in so far as the Russians are now in a position, at least as soon as their missile is brought into use, to threaten any part of the American continent, which until now was problematic." (Assembly of the Western European Union, 1957, p. 50)

He then goes on to lament the inability of Europe to address the issue previously, complaining about reports made as early as 1955 suggesting that the Soviet Union was in the process of developing launchers capable of placing satellites, and by extension ICBM's, into orbit. Lamenting in particular about the satellite, Fen stated

> "The results obtained from the signals given off by this horrid little ball, which the Russians alone can understand, will be of great importance for the future development of their intercontinental missiles." (Assembly of the Western European Union, n.d., 1957, p. 136)

The discussions that followed by the national representatives in this first session were spirited and varied, notably in the scale of alarm that was felt at the time, ranging from deep concern to approval in some cases of Russian actions. Regardless, in recommendations produced by the WEU in this session, it was suggested to member governments that they ought to, in light of Sputnik,

> "…consider what further steps may be practicable to achieve the fullest possible exchange of information and cooperation in the production and development of guided missiles and countermeasures." (Assembly of the Western European Union, 1957, p. 52)

This recommendation marks Europe's first collective effort to respond to the critical juncture and develop satellites and, more broadly, outer space technology. Namely, launchers in the form of guided missiles.

Over the next three years, satellites and military technology will not be discussed at the WEU. However, in 1960, it came back in earnest. At that point, the WEU, following a French proposal, was advocating the position that Europe should attempt to negotiate arms control agreements when it comes to satellites equipped with nuclear weapons. This was the concern at the time for the use of satellites with experts predicting that nuclear weapon-equipped satellites, resting in orbit, could be used to precisely strike targets on the ground with unmatched speed.

By 1961, though, a change in tone can be observed in one of the key reports produced on the military side of the European Institution in satellite development. During the 7th Assembly of the Western European Union, it can be clearly observed that at the European level, a state of path dependence existed in response to Sputnik, which would be

characterized by a collective effort to develop European satellite technology and capacities. This can be observed in the report produced by French Colonel Bourgoin, which is titled "Space war or space co-operation? The European Point of View."

Though the entirety of the document is worth reading if one wishes to know broadly about the strategic side of European outer space research and development, some excerpts will be included to support the notion that Europe, and by extension, France, had entered a new state of path dependence with regard to collective satellite development in response to the critical juncture.

The report actually starts in much the same way as this study, referencing the start of "the war in space" as the beginning

> "The war of space began when the Germans, in an attempt to destroy Britain, used Y2 missiles, though equipped only with conventional warheads." (Assembly of the Western European Union, 1961, p. 123)

The report continues to outline how control over outer space would have existential implications for the powers that could achieve it. The French colonel then states in no uncertain terms that Europe collectively ought to meet the challenge posed by the two superpowers in the following statement:

> "Europe cannot remain passive and indifferent, a mere spectator, in face of the disturbing rise in power of the two great countries, which at present are alone able to finance the research and development of space vehicles…taken individually, the countries of Europe do not seem to have sufficient resources available; there seems to be nothing to prevent them from achieving in any field everything the others are achieving if they are prepared to place the interests of the whole before certain short-term national interests. Provided they pool their financial and technical resources, they are easily capable of playing a leading role in this struggle and consequently could advantageously build up fully efficient defence forces to meet every eventuality." (Assembly of the Western European Union, 1961, p. 123–124)

The rapporteur then proceeds to outline in detail the technical reasons for this case and make its recommendations. In these recommendations, he first suggests negotiations for disarmament with the Soviet Union. However, for the first time in the WEU, the rapporteur then made recommendations that Europe collectively develop the capacities needed to match

the capacities of both the Soviet Union and, interestingly, the United States. Also of particular note for this research design, the Colonel specifically refers to satellite navigation as one such capacity in need of development, marking the first time that a specific application of satellite technology is mentioned in the full record.

As previously outlined, it was in the year of this report that France founded its outer space research institution. The next year, in 1962, the same was to occur at the European level, with the first Europe-wide outer space research organization founded by the European Launcher Development Organization (ELDO). Throughout the remainder of the 1960s and 1970s, the record at the WEU related to satellite development was primarily technical in nature, outlining specific capacities required in response to the challenges of the moment. However, starting in 1961, France and Europe entered a state of path dependence, which would result in collective satellite technology development from that point forward.

Civilian

Following the flurry of activity in the military sphere, we can observe an institutional state of path dependence on the civilian side of the institutions as well. The first document relating to the critical juncture on this side dates to 1959, two years after discussions of Sputnik began in the military stream. A simple, six-page report produced by Italian Prof. E. Amaldi was produced in that year titled “Space Research in Europe.” This was a document that was circulated among European scientists at the time and addressed Europe’s, and by extension, France’s, situation in outer space generally. It first outlines an issue of resources perceived on the continent of Europe, stating:

> “So far, the Soviet Union and the United States of America are the only countries to have been able to mobilize human and financial resources for important activities in this field. Other countries of lesser financial, industrial, and organizational potential, even though possessing the finest scientific traditions, are bound to find it very difficult to establish themselves in this field. It might seem, therefore, as if this type of research were destined to remain a monopoly of the United States and the Soviet Union, and if, in particular, all the countries of Europe would have to remain mere spectators of the grand endeavors to the east and west of our continent.” (Amaldi, 1959, p. 3)

He then continues by positing a collective solution, stating

> "However, an international organization pooling the resources of, say, ten European countries might well be able to tackle the problem and enable the scientists of Europe to make a valuable contribution to the exploration and study of outer space. The creation of such a European Organization is essential and urgent if we are not to have a situation twenty years hence where there is an unbridgeable gap, both on the scientific and on the technological and industrial plane, between the countries capable of launching vehicles through interplanetary space and those incapable of doing so." (Emphasis in the original) (Amaldi, 1959, p. 3)

Also within that document, it is important to note that Prof. Amaldi insists that these sorts of efforts should be divorced from military considerations and notions of secrecy. This was a common view held at the time, particularly in scientific circles, which were alarmed at the prospect of the use of outer space for military purposes. This view would remain persistent within the civilian institutional stream of path dependence and can be observed throughout the process of European satellite technology development.

Following this text, a conference was held in Geneva in 1960, which would result in the Meryin agreement, the first step in developing what would eventually become the European Space Agency (ESA). This agreement was defined as being civilian and cooperative in nature and, as the ESA would claim, is the foundation upon which the civilian nature of Europe's space efforts rests (European Space Agency, 2019). As previously mentioned, the European Launcher Development Organization (ELDO) was first founded in 1962 and was followed by the European Space Research Organization in 1964. The first was tasked with developing launchers (with clear and immediate military applications), and the second was tasked with developing related technology for outer space missions, such as the satellites themselves. The ESA would eventually be founded in 1975, consolidating these two organizations into one agency.

Accordingly, on the civilian side, we can see that a separate stream of records with apparently separate motivations existed in the same process of path dependence that developed following the critical juncture of Sputnik. However, based on the nature of the work, especially focusing initially on launchers, which could also be used for nuclear missiles, there is strong evidence that the military stream was at least influencing this nominally civilian stream to a large degree. Regardless, it can be confidently stated that a state of path dependence existed in response to the critical juncture of Sputnik, in which France was attempting to respond at the European level to the critical juncture that was

formally civilian in nature, even though the projects they were working on also had key military implications across the board. These projects would last decades, and over the 1960s, 70s, and 80s, Europe would collectively develop the necessary technology to launch and maintain satellites in orbit. France, for its part, would take full advantage of this process and play a central role in many of these efforts.

Third Critical Juncture: The Gulf War

Over the period from 1961 to the Gulf War in 1990, French efforts in outer space were in a clear state of path dependence, defined by parallel development at the national level and collective development at the European level with regard to satellite and outer space technological development. This was reflective of the previously outlined institutional changes that occurred in France at the same time with the signing of the Maastricht Treaty and the increased integration of France into the European Institution. Despite fundamental institutional changes occurring in the formation of the European Union, we can still observe dedicated military institutions such as the WEU taking the lead with recommendations, followed by civilian organizations executing the actual research and development of the asset. In 1990, a critical juncture would occur as a result of the United States deploying satellite technology in the Gulf War, with devastating results for Iraqi forces. From this critical juncture, France, and following the institutional critical juncture brought on by the Maastricht Treaty, the nascent European Union, would enter a new state of path dependence with regard to satellite navigation. This would be one that would see the solely collective, European-level development of a major space asset take place for the first time.

Permissive Conditions

The first permissive condition at this critical juncture was the technological demonstration of the asset itself. The US use of GPS during the Gulf War demonstrated the effectiveness of satellite navigation in military operations, showcasing the potential of satellite navigation technology for various applications. (David, 1995).

The second, which relates directly to the first, was the fact that the Gulf War laid bare just how total European states' reliance on US satellite systems had become by this point. The Gulf War highlighted the dependence on US satellite systems like GPS not only overall and

in the civilian realm but in the actual execution of a military conflict (Weiss, 2021). This made clear the need for an independent European system for strategic and operational autonomy for decision-makers and would have acted as a permissive condition for strong institutional change.

Productive Conditions

Also at this time, two important productive conditions also played a role outside the military sphere, which would have also coincided with the critical juncture spawned by the war.

The first productive condition was that the use of GPS by US forces brought much attention to the previously under-discussed system, even within civilian circles. Following the use of GPS in that conflict, there was much discourse as to the civilian applications of such technology, which occurred in both the US and Europe (Weiss, 2021). European leaders in both politics and business would have likely been in part driven to act out institutional change at this critical juncture, making this a productive condition for a European-wide initiative.

The second was the level of development of the technology reached by the time of the Gulf War. Prior to the Gulf War, despite the US having developed satellite navigation way back in the 1960s, improvements in antenna and receiver design in particular meant that actually using satellite navigation technology had become much more accessible for both military and civilian users than in the past (David, 1995). This reality would then act as a strong productive condition to encourage European states and the nascent European Union to impart institutional change in their satellite navigation development process.

Rational Incentives

The rational incentives present in this situation were also quite straightforward. The rational incentives for France and Europe to participate in this collective effort were to maximize the potential military and economic benefits that GPS provided. In the context established previously by the institutional critical juncture of Maastricht, coinciding closely with the Gulf War, France would have had a rational incentive to change its policies in support of a wider Europe in which it was a part.

Resultant Institutional Path Dependence

The resultant institutional path dependence that followed the Gulf War can again be observed following these two streams, both military and civilian, acting at the European level. What is noteworthy is that the relationship seems to be the same as that observed in the previous critical juncture, again witnessing the WEU taking an active role in setting priorities with the nascent European Union and the ESA executing those priorities in short order. Accordingly, we will again separate these forms of path dependence into military and civilian streams.

Military

In May 1990, the WEU held an extraordinary session with regards to the fall of the Berlin Wall in November 1989. Though the bulk of that document discussed how to respond to events in Eastern Europe, a somewhat buried element of the recommendations produced by that session included the suggestion that Europe set up an observation satellite agency. (Assembly of the Western European Union, 1990, p. 18)

The logic behind this development would be to develop European systems of satellites that could be used to verify occurrences in the Soviet Union, which, despite the fall of the Berlin Wall, was still holding onto its territories in the East. This notion of creating European-wide satellite constellations would be the first suggestion of such an effort seen to this point in the WEU. This notion would be reiterated to a greater extent in the 36th session of that same year, with more extensive discussions about setting up such a system taking place during those proceedings (Assembly of the Western European Union, 1990).

However, it was following the Gulf War that we first observed at the WEU the recognition of the importance of satellite navigation and the first suggestion that Europe develop such a system for itself. In the explanatory memorandum produced by Sir Dudley Smith for this session, there is included a set of observations titled “the Lessons of the Gulf War.” Within that, he dedicates an entire section titled “The Vital Role of Satellites.” In it, he outlines for European military decision-makers exactly how NAVSTAR gave the US a substantial advantage over its Iraqi foes (Assembly of the Western European Union, 1991, p.

271). Most presciently, though, he cautioned European decision-makers against complacency in light of this fact, stating

> "It needs no explanation that modern armed forces would lose much of their effectiveness if they were to operate without varied support from a vast range of different military spacecraft. Even if many national armed forces consider military satellites to be an exotic and unaffordable luxury, these have now proved to be an indispensable factor in modern warfare, saving literally thousands of lives. The European armed forces would do well not to ignore this practical lesson." (Assembly of the Western European Union, 1991, p. 271)

He then proceeds to posit a solution, stating

> "If, understandably, each of them individually is unable to obtain the financial means necessary for such expensive systems, they should at least seriously consider the possibility of procuring a military satellite system in a cooperative effort." (Assembly of the Western European Union, 1991, p. 271)

This is the first documented discussion of the creation of a joint European constellation for a GNSS system located in the records at the European Institution, and, importantly, they were also found again in the military stream of path dependence. This reinforces the notion that it was the military institutions that reacted first to the critical juncture and would eventually set both themselves and the civilian side of the European Institution on new states of path dependence that would eventually result in Galileo. From this report forward, various other reports produced at the WEU suggest the creation of European satellite capacities for communication, observation, and navigation throughout the 1990s, strongly suggesting that the institutions had entered a new state of path dependence in reaction to the Gulf War.

However, it was, as in the case of the start of Europe's journey toward collective outer space capacities, the civilian institutional stream that would actually develop the technology and systems suggested by the European security institutions. This was a process that would formally begin in 1994 in the newly formed European Union.

Civilian

By 1994, Europe had developed a strategy for developing a GNSS system (Kramer, 2002). In that strategy, the European Union emphasized the nominally civilian nature of the project greatly, reminiscent of the manner in which the Indian government did the same with its GNSS development efforts. The resulting timeline outlining the steps taken strongly suggests that a new state of path dependence had been entered following the suggestions of the WEU in response to the critical juncture of the Gulf War.

The official decision to pursue Galileo began with the EU Transport Ministers' endorsement of the program on March 29, 1999 (Kramer, 2002). Subsequently, in 2000, the EU commenced discussions and studies focusing on the legal and institutional frameworks necessary for Galileo's operation, including considerations for a proposed public-private partnership (PPP), which was the original plan to cover the project's funding (Brocklebank et al., 2000).

Two years later, Galileo entered its development phase in 2002, aiming for operational readiness by 2012 (Giegerich, 2007). The official go-ahead for this stage of the project was given in May 2003, setting in motion plans for the first satellite launch by 2005 and signal transmission by June 2006 at the latest (Feller, 2003). A pivotal moment occurred on December 28, 2005, with the successful launch of the first Galileo satellite, signifying a transition from planning to tangible implementation (Zielinski, 2006).

Throughout 2006, discussions were held to address compatibility and interoperability with existing systems like GPS and GLONASS, along with deliberation on technical specifications, funding, and operational strategies (Ashkenazi, 2000). This year marked the culmination of a series of simmering concerns with the project, ranging from strategic objections by the United States to severe funding problems. The US was concerned that Galileo, as a public-private partnership, could be used by adversaries, such as China, in the event of a war between the two powers. Despite European assurances to the contrary, the PPP nature of the project likely left this option as a theoretical possibility. However, more direly for the project, investor confidence in the eventual profitability of the GNSS system was no longer present. Accordingly, in 2007, European governments, through the European Union, stepped in to fund the project exclusively with public money. The decision to move away from a PPP model to full public funding meant that the European Union would enjoy sole control over the constellation. Consequently, an additional €2.4 billion of public money was

agreed upon by European transport ministers to ensure the continuation and success of the Galileo project (Swarup, 2007). This meant that the financial and organizational responsibility of the project was left entirely to the public sector, namely, the supranational entity of the European Union.

From a technical perspective, the ultimate deployment of the first two Galileo in-orbit validation satellites took place in October 2011 and marked a significant milestone. These satellites began continuous signal transmission in early 2012, laying the groundwork for subsequent developmental phases (Hackel et al., 2014). As of 2018, the Galileo system was nearing completion, with the launch of additional satellites moving it toward full operational capability by 2020 (Cefalo et al., 2018). Finally, in 2019, Galileo's potential for high-accuracy precise point positioning was evaluated, demonstrating significant improvements in performance and indicating its readiness for high-accuracy applications (Katsigianni et al., 2019). As of 2023, the system is fully functional and under the control of the European Union. The system can be used by both civilian actors and military actors, so long as those military actors are either within the European Union or are European Union security entities in and of themselves, such as Frontex.

French Case Insights

This case study covered France's rationale for developing supranationally controlled satellite navigation technology for use by its military and its civilian sector. In the first section, it provided a broad, macro-level institutional timeline outlining how the French state came into being in its modern form and how the mandate of the armed forces of the state evolved over that institutional timeline. Unlike the case of India, which saw its final stage being that of a modern state, in France, there were extra-major critical junctures institutionally following the Second World War. Unlike India, France became deeply embedded in international organizations such as the UN Security Council, NATO, and, most importantly, the European Institution.

In the second section, the lens was brought down to the micro-level of policymaking relating to French satellite technology development, ultimately resulting in satellite navigation. In it, the section outlines the smaller institutional processes occurring within the broader institutional context. The process by which French satellite navigation developed was

defined by a series of critical junctures that began with the French experience vs. the Germans' use of missiles in the Second World War. This set it on a national state of path dependence that would change at the second critical juncture, the launch of Sputnik in 1957. That set France on a course toward outer space asset development, both national and within the confines of the European Institution. From 1957 to 1990, France continued in this state of path dependence with few major changes.

In 1990, though, France was faced with a series of critical junctures on both the macro- and micro-level. At the macro-level, France found itself at the end of the Cold War and party to the Treaty of Maastricht, which would establish the European Union and fundamentally change France's security mandate. At the micro-level, the Gulf War also occurred, illustrating the importance of satellite navigation for modern militaries. Taken together, France then developed satellite navigation at the prodding of the WEU within the context of the newly formed European Union.

It can therefore be asserted within the French case that the evolution of the security mandate tied to the nature of the state's institutional arrangements had clear and demonstrable effects on security behavior at the micro-level. As France became further embedded within the European Institution following various critical junctures, its security behavior began to diverge further from that of a nation-state. This reinforces neo-institutionalist theory, which suggests that it is ultimately the nature of institutions that truly determines broader state behavior, rather than immediate material or ideational factors that are filtered by those institutions.

In the next chapter, Italy will be addressed similarly. In the Italian case, it will be to what extent their membership in the European Union precipitated a change in the security mandate of Italy when compared to France or India, addressing whether the French case was unique or if these insights are generalizable to other middle powers existing in a state of path dependence within the European Institution.

CHAPTER 6
CASE STUDY: ITALY

In stark contrast to France or India, Italy's institutional path was rather unique prior to its integration into the European Institution. Italy, as opposed to France or India, evolved from a collection of disparate city-states to a unified nation in the latter half of the nineteenth century. It also spent a pair of decades as a hyper-expansionist fascist state.

Italy's transition to nationhood would prove elusive well into the nineteenth century, despite the Italian precursor being undoubtedly more institutionally modern than either France or the Indian precursor states. Prior to Italian unification in 1860, the geographic area of the Italian peninsula consisted of a mosaic of independent and diverse states with distinct histories, governments, cultures, and languages.

This case study will, in keeping with the previous, focus primarily on the process outlining the evolution of Italy from a traditional political structure to that of a modern state. Because of the variance of Italy's various precursor states, the governments of which included republics, duchies, constitutional monarchies, Austrian provinces, and even a theocracy in the form of the Papal States, this case study will take into account the case of Italy as a whole in its analysis. This is comparable to the strategy taken in the case of India, where the geographic area is considered a collective. Therefore, the focus will lie primarily on exploring Italy's institutional framework before and after the Risorgimento, considering Italy as a theoretical whole despite not existing prior to its unification.

Throughout this case study, as in the previous cases, the security mandate's territorial and individual nature will be explored in Italy prior to and after the Risorgimento. It will then explore modern Italy's security mandate established in its current form, as in the previous cases, following the Second World War. As in the case of France, this will include Italy's institutional evolution as a key and founding member of NATO and the European Institution.

Pre-Risorgimento: Peninsula Divided

The start of Italy's institutional story differs in large part because of the sophistication and diversity of the Italian precursor states that existed prior to the unified Italian state. The Italian peninsula, with its millennia-spanning political history tied to the Roman Empire, already had well-established notions of territoriality and citizenship (Mori, 2019), and with it, a rather standardized security mandate for the related armed forces. As mentioned in the introduction, the states that preceded Italy had a host of sophisticated governments with relatively clearly defined territorial and individual mandates. The critical institutional evolution of the security mandate of Italy accordingly happened later, almost solely in the form of unification (Greppi, 2020). This is because, as opposed to redefining the core notions of statehood themselves, the Risorgimento merely raised the collectivity level of the mandate (Patriarca & Riall, 2012). Essentially, Italian states already existed centuries prior to Italian unification with sophisticated systems of assigning the territorial and individual mandates of the armed forces. The Risorgimento merely collectivized them and brought the security mandate to cover more territory and citizens (Tintori, 2011; Forlenza & Thomassen, 2017).

However, this diversity cannot merely be glossed over. In Italy, prior to unification, it must be noted that there were duchies that were governed in much the same manner as the French state, characterized by the personalization of the state in its ruler and without such advanced systems for assigning these mandates. These included important states, such as the Duchy of Savoy, the Duchy of Milan, the Grand Duchy of Tuscany, and the Kingdom of the Two Sicilies (Grab, 2003b). Accordingly, when reading this section, it is important to remember that these peculiar institutional arrangements, upon which this section will focus, existed alongside these systems. Over time, it is also relevant to note that these hereditary, personalized states were occasionally ruled under different systems, most notably in the case of Tuscany and Milan, which each enjoyed Republican periods at differing intervals. For all intents and purposes, these systems can be understood as comparable to the French system, where militaries owed allegiance to the person of the monarch and to the territory he or she could practically control. Accordingly, they will not be explored in further detail, as one can simply refer to the French system of feudalism to have a sufficient notion of what the security mandate entailed in this period.

Those that were not of this personalized nature, though, were remarkably modern for their times. These notably include the various republics that were present in Italy prior to

unification, most notably the Republics of Venice, Genoa, Lucca, Florence (prior to the rise of the Medici), Pisa, Siena, and Bologna (Skinner, 2002). It was primarily from these systems that the nation of Italy would ultimately inherit its security mandate. These systems had fundamentally different security mandates when compared to their personalized counterparts, which will now be explored in further detail.

The Territorial Mandate of the Italian City States

The non-personalized Italian city-states during the Middle Ages and Renaissance differed substantially in their territorial mandate compared to the previously outlined Indian and French cases. They were defined by far more clearly delineated territorial units, distinguished by their well-defined and often fortified boundaries, typically marked by city walls and markers (Jones, 1997). The governance structures of the Italian city-states, their small size, and their notable wealth allowed for well-guarded and established borders within Italy. Their economic and military strength derived from trade and banking allowed these city-states to invest significantly in defensive structures. Moreover, the strong sense of civic pride and distinct cultural identity within each city-state further emphasized the importance of clearly delineated territorial boundaries, a fact that will be explored in more detail in the section on the individual mandate (Vigneswaran, 2007). Italian city-states accordingly placed a higher emphasis on and had greater capability for maintaining well-defined territorial borders, which would be reflected in the rights and responsibilities of their militaries.

The military organization of Italian Republican city-states accordingly was marked by several key features that distinguish them from their contemporaries. Leadership and allegiance were typically vested in chief magistrates, known as podestà, who were granted supreme power over the citizens. These were not hereditary positions, institutionally. This structure meant that the soldiers owed their allegiance to these magistrates and, by extension, to the communes that elected them, representing a significant shift from traditional feudal lordship and hereditary rule (Skinner, 1991). The composition of these military forces primarily included citizens of the republics, differing from the feudal systems where armies often consisted of vassals and mercenaries (Paoletti, 2007). Their primary purpose was accordingly more similar to those more familiar with modern states. This meant the military was primarily focused on defending the city-state's autonomy and territorial integrity against external and internal threats (Jones, 1965). Over time, some city-states began employing

mercenaries because of the inadequacy of citizen militias against professional soldiers and the rising costs of maintaining effective military forces (Leeson & Piano, 2021). This extensive use of mercenaries, whose allegiance was purely contractual, reflected very well the distinct institutional nature of the Italian city-states, where the security mandate was located in the state per se as opposed to the person of a monarch.

In short, the territoriality of Italian city states was a more fixed institution prior to unification than in the previous case studies outlined. This was reflective of the states' small size and highly developed institutional nature, paired with very clearly defined notions of citizenship tied to civic heritage. Accordingly, the individual mandate will now be explored in the Italian city-states during this period.

Individual Mandate Within the Italian City States

The individual mandate within Italian city-states was already understood in terms of citizenship during the medieval and post-Renaissance periods in Italy. In these city-states, citizenship was typically acquired based on residency, property ownership, tax payment, and military service. A citizen was required to have lived in the town for a certain period, often between five and ten years, and to own or rent property there. Participation in military service was also a crucial aspect of citizenship, aligning with one's economic status (Racine, 2009). Upon being recognized as citizens after swearing an oath, individuals were entitled to participate in the popular assembly, responsible for electing magistrates, and making significant political decisions. This citizenship privilege was fundamentally a right, entailing liabilities like taxation and military service but also providing a sense of belonging and emotional attachment to the urban patria, or fatherland (Kirshner, 1973). The cultural significance of citizenship in these republics also reflected an emotional attachment to the city-state, which was both a legal and cultural identity (Tian et al., 2010).

The individual mandate, therefore, could be understood as rather similar to the constitutional structures established in France following the French Revolution or in India following the establishment of the British Raj. Within the Italian city-states, complex notions of citizenship existed for centuries prior to their imposition globally. This accordingly generated a security mandate that was similar to that seen in modern constitutional states. Individuals who held citizenship would have been subject to the rules of the state and would

have also participated in the creation of those rules. Accordingly, the military existed to serve the interests of the broader public rather than a single individual.

Consolidated Summation and Insights

It can accordingly be observed that the Italian city-states not under personalized hereditary rule enjoyed security mandates comparable to those of France following the French Revolution or India following the establishment of the British Raj. Therefore, their militaries were rather rationalized and tied to state institutions that could be comparable to modern-style constitutional states. However, they were very small and disunited throughout this period. Accordingly, the first critical juncture occurred in Italy following unification. That critical juncture will now be explored in depth, followed by the new state of path dependence.

Critical Juncture: Italian Unification

With Italian unification, the disparate Italian institutional structures were unified under one system. That system held elements of both the hereditary Italian states by establishing a singular monarchy under the Savoys and elements of the Republics, notably the establishment of constitutionally grounded democracy. With unification, therefore, the mandate of the armed forces in Italy did not undergo a deep, fundamental change in its content. They did, however, undergo changes in their extent, both geographically and in the number of citizens for which they were responsible. Accordingly, this section will now outline the precise composition of the critical juncture of Italian unification and will then proceed to explore precisely what state of path dependence it precipitated.

Permissive Conditions

The first key permissive condition was a desire for Italian conservative elites to reorganize political power in the region. This was a response to the unrest in Italy embodied by various revolutions following the Napoleonic Wars in the Peninsula. In particular, the events of the 1821 Revolution left a lasting impression on the Savoyard royal family and influenced their actions during the Risorgimento. The success of the Neapolitan revolution in 1848 also spurred other rebellions throughout the Italian peninsula, further setting the stage for the Risorgimento. This desire to reorganize power into a nation-state structure would prove to be

fundamental in the ultimate state of path dependence, which would follow the critical juncture of the Risorgimento.

The second permissive condition was that the shared cultural memory present on the Italian Peninsula would also allow policymakers to make fundamental changes during the critical juncture. This cultural memory, deeply rooted in the Italian consciousness, would ultimately act as a powerful symbol and influence the country's subsequent state of path dependence well into the twentieth century. Forlenza and Thomassen (2017) elaborate on Jan Assmann's concept of cultural memory, discussing how the Risorgimento was crucial during key moments in twentieth-century Italian politics, such as the 1911 anniversary of unification, its portrayal during fascism, and its appropriation by various political forces post-World War Two. The Risorgimento's symbolic value in Italian politics persisted, impacting Italy's path to modernity and national identity.

Productive Conditions

There were various productive conditions present during this critical juncture. However, the most notable of these was a parallel set of conditions related to industrialization and economic development in Italy. This period was marked by heightened technological innovation and production, reflecting Italy's broader reintegration into modern European civilization. These advancements, referred to as an "Economic Risorgimento" were also a permissive condition behind the political risorgimento, demonstrating the integral role of science and technology in the nation's development (Lacaita, 2016).

Rational Incentives

The first rational incentive present for the political elite in Italy was an opportunity for political legitimization and modernization. The Piedmontese political elite, for instance, exemplified by figures like Cesare Balbo, sought to support and legitimize the constitutional regime introduced by King Charles Albert following the revolutions of 1848. This effort was part of a broader strategy to modernize the state and integrate aristocratic liberalism within the contemporary European political context. Balbo and his colleagues aimed to balance centralization, the importance of a social elite in defending freedom, and equalization, aligning their political thought with that of European liberals like Guizot, Chateaubriand,

Burke, and Tocqueville. This modernizing agenda was viewed as necessary for the political and social advancement of Italy within Europe and, by extension, the preservation of the Italian aristocracy's position of power (Isabella, 2013).

The second incentive centered around economic and social considerations. After unification, the ruling classes in Italy implemented measures to overcome the challenges and resistance they faced, setting the stage for industrial development. These measures created the cultural conditions necessary for this growth, underlining the role of governance in the country's economic development. The elites recognized that institutional change was crucial for fostering economic growth and industrialization, which were essential for Italy's national strength and stability (Silvestri, 2016). This national strength, in the heart of nineteenth-century Europe, was fundamental for the Italian elite to maintain its position of power in Italy.

Resultant Institutional Path Dependence

Following the critical juncture, the resultant path dependence in Italy was formalized in a constitution. In 1861, the Italian parliament officially bestowed political legitimacy on the rule of Vittorio Emanuele II, unifying the disparate Italian states under a single sovereign and state. This consolidation would prove to be a complex process at the critical juncture that involved military campaigns, various diplomatic maneuvers with Italy's neighbors, and popular uprisings.

The first Italian constitution was the Statuto Albertino, or the Albertine Statute. It was promulgated on March 4, 1848, by King Charles Albert of Sardinia, following the revolution of that year. Initially applicable to the Kingdom of Sardinia, the Statuto Albertino was applied to the whole of unified Italy following the Risorgimento. It was a fundamental law that outlined the framework of governance, including the powers of the monarchy, the rights of citizens, and the structure of the legislative body. Italy's related unified statehood would have distinct influences on the security mandate of Italy.

Territorial Mandate

The new territoriality of the Italian state was the most immediate result of the critical juncture of the Risorgimento. The unification ultimately brought together territories from the Alpine regions in the north to the islands of Sicily and Sardinia, creating a geographically diverse nation-state (Kimlenka, 2023; Di Vita et al., 2017). However, the state was faced with multiple issues regarding its perceived territoriality.

This new state faced challenges in achieving cohesive national unity, as many regions, particularly in the south, struggled with economic and social disparities. The geographic unification of Italy represented accordingly not just a political achievement but also the beginning of an ongoing process to integrate these varied regions into a cohesive national identity (Atella et al., 2011).

This made the Italian army, originally an extension of the Piedmontese army that oversaw unification, take on a key role in integrating the newly unified territories into a cohesive political unit. It acted as the unifying force and the melting pot of the state, helping to bring together various regions into a cohesive national entity (Paoletti, 2007).

In addition, following 1861, Italy was not content with its territorial confines. Institutionally, Italy viewed itself as a state that was an extension of a population group. This meant that, regardless of the territorial confines of the moment, Italy was institutionally interested in gaining new territories where Italians were living. Italy also had an interest in establishing a colonial empire to mark its place as a European great power. This meant that the military's territorial mandate resulted in it playing a key role in pursuing Italy's territorial claims and expansionist aims, especially in the context of irredentist aspirations and colonial ambitions. These activities were instrumental in completing the national unification process and achieving Italy's foreign policy objectives throughout the nineteenth and twentieth centuries (Wilcox, 2021).

Individual Mandate

Following the Risorgimento, there was a state of path dependence defined by a state-led policy of political education and national acculturation, as encapsulated by D'Azeglio's famous remark, "Having made Italy, we need to make the Italians" (Bellamy et al., 2006). The focus during this stage of path dependence was on building a sense of national belonging

and citizenship that transcended regional identities, which was crucial for the political and social consolidation of the new nation (Bellamy et al., 2006). Again, the military would fill this role, acting as an institutional melting pot to unify the various peoples of Italy into a cohesive unit.

In addition, the Italian state viewed itself again not only as sovereign over the territory it controlled following the Risorgimento but also as sovereign over Italians living in other territories. Accordingly, it fought a series of wars of territorial unification. Accordingly, the individual mandate of the Italian armed forces was viewed as extraterritorial, tied to where Italians were living. This would ultimately lead Italy into the second critical juncture outlined here, namely, the rise of Italy's fascist regime.

Second Critical Juncture: Italy's Fascist Period

The Fascist period in Italy, led by Benito Mussolini from 1922 to 1943, presents us with the second critical juncture in the development of the modern Italian state and its attached security mandate. This era was characterized by a radical shift from liberal democracy to a totalitarian regime and profoundly altered Italy's political, social, and territorial landscapes. This led to a relatively brief period of path dependence defined by the regime's aggressive pursuit of territorial expansion. These were driven by imperial ambitions and nationalist ideologies and reshaped Italy's international relations and internal dynamics during this period. Despite its short timeframe, fascism had an enormous impact on Italian society, economy, and culture. It also played a large role in redefining national identity and statehood.

Permissive Conditions

The first and most important permissive condition that allowed for the rise of fascism to act as a critical juncture was its profound degree of centralization of power and subsequent oppression of opposing views. The regime utilized existing institutions to influence judges, prosecutors, and other key figures. The establishment of the Special Tribunal for Crimes Against the State in 1926, for example, exemplified the institutional centralization of power and the use of repressive measures to enforce fascist policies (Klinkhammer, 2010).

This permissive condition was a rather all-encompassing one. With state power firmly in the hands of Mussolini and the totalitarian nature of the regime, institutional change could be embraced with little practical resistance. Accordingly, this permissive condition allowed for radical changes in Italy's state of path dependence with regard to its military's security mandate.

Productive Conditions

The first productive condition was successful fascist cultural and ideological indoctrination. The Fascist regime actively engaged in cultural and ideological indoctrination through various means, including the control of cultural institutions and media. This was a critical factor in consolidating its power and, by extension, implementing institutional changes. This made it a highly productive condition during this critical juncture (Berezin, 1991).

The Fascist regime was also capable of fundamentally altering the Italian economy. The Fascist regime sought the economic system, and with it Italian society, by introducing an alternative corporative economy. It was successful in doing so. This departure from liberal economic policies and the introduction of a more regulated and planned economy were significant in allowing leaders to reshape Italy's institutional framework (Cinquini, 2007).

Rational Incentives

The rational incentives for the Fascist leadership in redrawing the Italian institutional structure were primarily centered around power maximization both domestically and abroad. By re-drawing the basic institutional foundations of Italian society, these decision-makers believed they would be able to reinforce their position. This was fundamental for the regime's future survival and would provide a strong incentive to alter institutional frameworks.

Resultant Path Dependence

The resultant path dependence was, for the two decades of Fascist rule, remarkably divergent from that which preceded it. Moving from a democratic constitutional monarchy to a fascist-dominated monarchy completely altered the security mandate of the armed forces. It

was characterized by a rampant expansionist nature tied to fascist notions of restoring the lost Roman Empire.

Territorial Mandate

Territorially, Mussolini believed that Italy should restore the Roman Empire (Bosworth, 2002). Institutionally speaking, this would mean that Italy viewed the territorial mandate of its armed forces in continental terms (Blinkhorn, 2006). In addition to the borders of the Roman Empire, Mussolini was also of the belief that Italy should maintain a colonial empire, especially in Africa. This would mean that the territory would also expand, at least into Africa, according to Italy in this state of path dependence (Bosworth, 2006).

In execution, we can observe Italy's military responding accordingly. Italy attacked Ethiopia, Albania, and the Balkans in wars of expansion (De Felice, 1988). Once enveloped in the Second World War, Italy would then undertake campaigns in North Africa against British possessions in the region (Knox, 1999). This behavior illustrates how, under fascism, the territorial mandate of the Italian armed forces was highly expansionist and had global ambitions (Blinkhorn, 2006).

Individual Mandate

The individual mandate of the armed forces of Italy, shaped by the state's path dependence, was distinctly continental in its scope and influence (Blinkhorn, 2006). This mandate, an extension of Italy's territorial ambitions, granted the armed forces the authority to govern individuals within the conquered territories. The regime's fascist ideology intensified the severity of governance, leading to particularly brutal administration in areas under Italian occupation (De Felice, 1988). Given the regime's ideological leanings and historical context, it is plausible that the Italian armed forces would have exercised draconian levels of authority over the people in these conquered regions (Bosworth, 2006).

Accordingly, the critical juncture of the rise of fascism significantly influenced the state's objectives and the ultimate security mandate of Italy's armed forces. During this state of path dependence, the primary goals of the Italian state were expansionism, assimilation of conquered territories, and establishing the superiority of the Italian people over those they

conquered (Knox, 1999). This expansionist ideology was not only a political doctrine but also a driving force behind the military's actions and strategies. The military, as an instrument of the state, was thus not just a defensive entity but an active participant in the realization of these expansionist ambitions (Bosworth, 2002). This alignment of military objectives with the fascist regime's goals led to a transformation in the behavior of the Italian armed forces, as they became a key tool in advancing the state's aggressive territorial and ideological ambitions (Blinkhorn, 2006).

The Second World War

This state of path dependence, though, would come to a stark halt with Italy's loss in the Second World War. Italy, on the losing side of the conflict, entered a critical juncture perhaps even starker than that observed in the case of France. The fascist regime was not only removed but the constitutional state of path dependence that followed was designed to prevent such a critical juncture from ever occurring again in the Italian state. The conditions that were present that defied the critical juncture were accordingly as follows:

Permissive Conditions

The most important permissive condition was tied to the Allied occupation. The Allied occupation, particularly by the United States and Britain, brought significant foreign influence to Italy's post-war reconstruction that would allow decision-makers to make democratic reforms during the critical juncture. This condition was critical, extending to political, economic, and military aspects, and would shape Italy's path toward a Western-aligned democracy (Nuti, 2002).

Productive Conditions

The first productive work lay in economic reconstruction and the Marshall Plan. The devastation wrought by the war left Italy with severe economic challenges that would have hampered its ability to alter its institutions in a democratic state of path dependence. The Marshall Plan and other forms of economic aid played a crucial role in Italy's economic recovery, influencing its economic policies and integration into the Western economic system

(Cottino-Jones, 2010). This economic aid enabled decision-makers to make decisions that otherwise would not have been possible.

The second productive condition lay in Italy's complete political and cultural reevaluation following the war. Italy's defeat and the collapse of Fascism led to a profound reevaluation of its political and cultural identity, which would act during the critical juncture to support institutional change. This period saw the birth of a new democratic ethos as the country grappled with the legacy of fascism and the need for a new direction (Escolar, 2019).

Finally, the presence of a high degree of social unrest and the need for stability would act as another productive condition. The immediate post-war period in Italy was marked by social unrest and political instability. This environment created a permissive condition for significant institutional reforms aimed at stabilizing the country and addressing social and economic grievances (Forlenza, 2012).

Rational Incentives

The clearest rational incentive that drove the Italian state to adopt a fundamentally different institutional structure following the war against law in the fact of the Allied occupation. The simple reality was that had Italy not adopted democratic institutions, Allied forces would have likely imposed such a system regardless. Accordingly, for those who were interested in maintaining any power in the post-war Italian system, embracing democratic ideals was a necessary prerequisite.

Resultant Institutional Change

The result of this critical juncture was that Italy found itself on a starkly different institutional path in the post-war period. Equipped with a new, democratic constitution and having abolished its monarchy, Italy would adopt a radically different position than it had under fascist path dependence. In addition, as part of the Western bloc, Italy would also find itself playing a foundational role in many of the same organizations explored previously in the case of France. This included NATO, the United Nations, and the European Institution. As the nature of those organizations has already been handled at length in the French case, this case will solely focus on Italy's precise position in these organizations where it differed.

Accordingly, this section will be less in-depth than it was in the French case study. When observing the institutional state of Italy's path dependence during this time period, one ought to assume that Italy was in much the same position as France in most regards. That is, it also had a security mandate for other NATO states and as a member within the European Institution.

Territorial Mandate

As well established in the case of France, Italy assumed an extra-territorial mandate when it signed onto NATO and the European Institution. This is embodied in Article 11 of the Italian Constitution of 1948, which states

> "Italy rejects war as an instrument of aggression against the freedom of other peoples and as a means for the settlement of international disputes. Italy agrees, on conditions of equality with other states, to the limitations of sovereignty that may be necessary to a world order ensuring peace and justice among the nations. Italy promotes and encourages international organizations furthering such ends."

This article stands in stark contrast to the previous state of path dependence under fascism, characterized by Italian aggression and territorial conquests. It also outlines Italy's choice to give up sovereignty to participate in the previously outlined international organizations. This meant that Italy, upon adoption of this constitution, was, as in the case of France, fully embedded within these international institutions and would accordingly have a fundamentally altered security mandate for its armed forces. Essentially, Italy's territorial mandate at this stage was the same as France's, except for Italy's more explicit renunciation of war as a tool of diplomacy. No such provision existed in the French postwar constitution.

Individual Mandate

Comparable to France, Italy's constitution also outlines which citizens the Italian military holds responsibility for. Citizenship is defined in much the same manner as in the French constitution, and the Italian military holds obligations to those individuals. In addition, Italy also maintains a mandate to protect citizens of other members of NATO in the event of armed conflict with an adversary.

End of the Cold War and Maastricht

At the end of the Cold War and with the signing of the Maastricht Treaty, Italy found itself at a critical juncture comparable to France and responded in a similar manner. It also entered a new state of path dependence, precisely the same as that of France, by signing the Maastricht Treaty. This signature meant that Italian citizens were also European citizens and that Italy formally assumed obligations to protect European Union member states from aggression. Accordingly, this section will not rehash this information. When going through the timeline of satellite navigation development in the Italian case, therefore, references will be made to the same institutional state that France found itself in at the end of the Cold War and as a result of its membership within the European Union. This state would be replicable for all signatories to Maastricht and would apply accordingly.

Consolidated Insights and Summation

In this section, we can observe how the security mandate of the Italian state evolved from a collection of fragmented states to a unified nation-state and to an expansionist fascist power. As in the case of France, though, Italy would ultimately end up as a supranational member state embedded heavily in international institutions. This meant that, as in the French case and divergent from the representative case, we can observe that the security mandate present at the time when Italy pursued satellite navigation differed greatly from that of a normal state. In the post-World War era following the third critical juncture, it can be observed that Italy's security mandate ceased to be limited by the territorial or constitutional confines of Italy itself, in keeping with other European states.

By structuring its constitutional model in a similar manner to France and through its ascension to various international bodies, Italy assumed a security mandate that included not only its own state but those of its neighbors. Then, following the end of the Cold War and the signing of the Treaty of Maastricht, Italy again moved more explicitly in the European direction in parallel with its fellow members. With the establishment of the European Union, Italy entered a state of path dependence, which would be defined by a security mandate covering the territories of all European member states and their citizens. In addition, as in the

previous case, the European Union would have the ability to directly create policies that would affect Italy's choices in the form of the Common Foreign and Security Policy.

In the following section, we will explore how this altered security mandate affected Italy's security behavior in its pursuit of satellite technology across the twentieth century. We will then observe how, despite Italy's unique institutional history that diverges from France's, it would behave in the same peculiar manner as France in its decision to adopt Galileo for its military's satellite navigation needs.

Italian Satellite Navigation Development

Unlike in the case of France, following the end of the Second World War, Italy was not consumed with a need to reinforce its perception on the world stage as a great power. Unlike in the case of France, Italy was keen in the post-war period to put its recent international misadventures firmly in the past. It had been ravaged by years of conflict on its territory and a particularly brutal German occupation in the north (Di Scala, 1998). Following its loss in the conflict, Italy was stripped of the few colonies it had in Libya and Somalia and was obligated to reform its society from the ground up (Ginsborg, 1990). As mentioned in the previous section, the state eschewed war as a tool of diplomacy and focused inward on adjusting to the new, democratic state of path dependence it found itself in after fascism (Gilbert, 1995).

Accordingly, Italy was not working on missile technology during the first decade following the Second World War. Instead, the country was focused almost entirely on rebuilding its economy and integrating itself into NATO, the European Institution, and the United Nations. These were endeavors in which it found much success, witnessing the Italian economic miracle and, for the first time, truly securing a place amongst the major powers in the West (Cafagna, 1989). However, this period of relative isolation would not last long for Italy, which found itself on the frontlines of the Cold War throughout the remainder of the twentieth century. As in the representative case, Italy would run into a critical juncture in its development of satellite navigation with the launch of Sputnik (Pellegrino, 2002).

First Critical Juncture: Sputnik

As outlined twice previously, Sputnik would prove to be a critical juncture for the whole world because of what the launch meant in terms of nuclear weapons development in the Soviet Union. It also outlined the viability of artificial satellites, which held with them the promise of a wide range of military applications. Italy, like India and France, was forced, with the launch of Sputnik, to reassess its military situation and respond to the critical juncture accordingly. The conditions that defined the launch of Sputnik as a critical juncture for Italy will now be explored without repeating those outlined in the previous cases. Accordingly, only conditions specific to the Italian case will be outlined.

Permissive Conditions

In permissive conditions, for Italy, all the previously mentioned conditions were present. That is, proof of concept, the presence of well-established international institutions, and the relative recovery of the wider European continent economically. In the Italian case, in particular, by 1957, the Italian economy was at the heart of the Italian Economic Miracle, a situation that placed the state firmly in a globally relevant economic position.

Productive Conditions

In the case of productive conditions, Italy again mirrors the French case. There were perceived economic benefits of investment, established European-level research groups to look to as previous examples for cooperation, and Italy, as part of Europe, found itself woefully outmatched by both the US and the Soviet Union in terms of resources.

However, in the case of Italy, another productive condition was present. Italy at this time was disproportionately endowed with domestically produced engineers and scientists who would be able to contribute extensively to satellite and launcher development. This was a result of a long tradition of engineering and aeronautics that had been present in the country since at least the end of the nineteenth century (Paoloni, 2015). Accordingly, when Sputnik was launched, Italy was uniquely positioned to respond to the critical juncture without the need for captured German scientists, as in the cases of France, the US, or the USSR (Pellegrino, 2002).

Resultant Institutional Change

As in the case of France, Italy responded in a very similar manner at the critical juncture with regard to its institutional response. It used all the avenues at its disposal at the time, working on the national and international levels. Furthermore, as in the case of France, Italy found the bulk of its success at the European level, facing a lack of willingness at NATO to share sensitive technology on the part of the United States. However, it is relevant to note that Italy was particularly successful working with the United States at the bilateral level, seeing the country place the third satellite in orbit following the USSR and the United States, but, importantly, without using its own launchers.

National Level

As mentioned in the productive conditions, Italy was abnormally endowed with competent rocket scientists at the critical juncture. Accordingly, the state was able to almost immediately begin to respond to the critical juncture at the national level using these scientists. Immediately following Sputnik, Italy began to look for national solutions to the discrepancy in technology. These efforts were led by Professor Luigi Broglio and would eventually be referred to as the San Marco programme whose purpose was the development of satellite technology for Italy (Mariani, 2015). The program was formalized in 1961 following approval by Prime Minister Fanfarri, who agreed with the academic's assessment of Italy's need to domestically develop satellite technology. Unlike France, Italy expressed an immediate willingness to cooperate bilaterally with any party willing to assist in its project. This meant that the San Marco Programme would actually represent a bilateral effort between Italy and NASA to develop satellite technology outside the bounds of any international institution such as NATO (National Aeronautics and Space Administration, 2009).

The United States was more than eager to assist Italy in providing key technology for its efforts under this framework. This was most notable in the field of launchers. Importantly, these agreements were made with the expectation that the United States would maintain control over the technology and would essentially allow Italy to use those assets. The US did not assist Italy in developing, for instance, Italian launchers for domestic production and use. The result of this cooperation was the fact that, technically, Italy became the third state to operate a satellite in orbit, following the US and USSR. However, it did so using American launchers, which launched the satellite from an American missile base in the United States.

Interestingly, Italy's national efforts would remain under this primarily academically-led and relatively decentralized institutional structure for decades. Unlike in the representative case of France, Italy would not find a dedicated national outer space research institution during this initial period. The reasons behind this are not clear; however, Italy's distinct institutional solution to the issue seems to have fulfilled its objectives in response to Sputnik and placed it within a distinct state of path dependence.

NATO

Italy's experience attempting to work at the NATO level was comparable to that of France. That is, it found little success or willingness through NATO to collaborate on satellite or missile technology. As previously outlined in the French case, the Italian delegation would openly lament that it had little more information on these subjects than that which could be gleaned through the American press. This suggests that Italy, like France, was thoroughly disillusioned with NATO as an avenue for such collaboration during this time period. Accordingly, little evidence could be found suggesting Italy would find itself in a state of path dependence characterized by NATO cooperation during this period. As previously outlined, it would seem Italy instead chose to collaborate bilaterally with the US where possible, distinguishing itself from the French, who displayed no such interest.

European Institution

Again, without rehashing the same information, Italy followed the French case from the start when it came to collaboration within the European Institution. Italy participated on both sides of the European efforts, both economically and militarily. Italy was abundantly willing and was an active partner at the European level along both streams when it came to outer space research following the critical juncture. Italy was present at all of the meetings discussed previously in the French case and participated actively in those discussions as well. There is accordingly strong evidence that Italy viewed the European solution as the best option for it to develop independent capacities at the European level vis- à-vis the United States and Soviet Union.

Italy's specific involvement saw the country playing a crucial role in European space activities. The Italian industry's approach to space, including the development of scientific research and the enthusiastic involvement of Europe's most advanced industry, marked a significant phase in European space history and saw Italy make remarkable contributions (Marri, 1987). This reflected the previously mentioned status of Italy, which has both an advanced engineering industry overall and excellent scientists. Italy notably contributed substantially to the development of satellite communications at the European level, seeing Italy play a major role in high-frequency satellite communication systems. The Alphasat experiment, a collaboration with the ESA, for example, marked a significant effort to investigate the atmospheric effects on radio waves at high frequencies and develop fade-mitigation techniques for modern satellite communication systems (Codispoti et al., 2018). Many similar experiments and efforts could be observed within the European Institution that witnessed Italy play a central role throughout this state of path dependence.

Overall, it can be stated confidently that Italy primarily entered a state of path dependence characterized by efforts at the European level under the European umbrella following its initial national efforts during the early 1960s, comparable to France and fundamentally divergent from India and, by extension, other states at the time.

The Gulf War

As in the French case, by the early 1990s, Italy was well embedded within the European Institution when it came to its efforts in outer space development. It was embedded in both streams, defined by the ESA from a civilian perspective and the WEU for security-related efforts. Italy played a central role in both efforts along the lines of France, taking a leading role in both. As another signatory to Maastricht and accordingly a member of the European Union, by the 1990s, this state of path dependence had been reinforced greatly at an institutional level. Accordingly, when Italy was faced with the critical juncture of the Gulf War, we can see it responded in practically the same manner as France at the same juncture. Again, when outlining the conditions, this section will only add information that is relevant to the specific Italian case.

Permissive Conditions

The permissive conditions definitive of the Gulf War mirror those observed in the French case. That is, the demonstration of the US use of GPS in warfare and the relative incapacity of European states in comparison spurred Italy and other European states to respond and change their state of path dependence.

Productive Conditions

The productive conditions were also again mirrored. A great deal of attention was brought to GPS as a technology, paired with the relative level of development of the technology. The fact that GPS had fully come into its own was viewed by Italy at the time just as it was by other states.

Rational Incentives

Again, the rational incentives for Italy were also paired directly with those of France. Italy saw an opportunity and a need to develop this new technology to maximize its security and to enjoy the benefits that the development of such a system would imply for its developed and advanced space industry at this point.

Resultant Path Dependence

Again, as in the French case, the resultant institutional path dependence that followed the Gulf War can be observed following these two streams, both military and civilian, with Italy acting at the European level. The discussions and efforts undertaken by Italy took place in parallel with those of the French, always at the European level at this stage. Accordingly, outlining the efforts again would be superfluous as both states were now participating together in the same institutions and with the same objectives. By the end of the Gulf War, Italy and France were no longer attempting to develop national alternatives for systems such as satellite navigation and were in sync. The efforts following this critical juncture would ultimately see the European Union, and by extension, Italy, develop Galileo satellite navigation for use by its military.

Italian Case Insights

This case study covered Italy's rationale for developing and accepting supranational control for its satellite navigation needs. In the first section, this case covered Italy's unique macro-level institutional timeline, outlining how the mandate of the armed forces of the state evolved over that institutional timeline. Italy's path was distinct from both previous cases, defined by a level of institutional advancement that was steps ahead of both the other cases yet defined by a remarkable degree of disunity within the Italian Peninsula. Following unification, Italy finally entered a state of standard national institutional path dependence in the late nineteenth century, which was interrupted by 20 years of hyper-expansionist fascist path dependence. This was interrupted by Italy's loss in the Second World War, which then saw Italy become deeply embedded in international organizations such as the UN Security Council, NATO, and, most importantly, the European Institution. This marked it as the representative case of India and put it in a parallel state of path dependence with France at the macro-institutional level.

In the second section, the micro-level was analyzed in relation to Italy's process of satellite technology development. Italian satellite navigation development was, as in the other cases, defined by a series of critical junctures. Like the representative case, Italy's path began following the launch of Sputnik, in contrast to France's, which began immediately following the Second World War. Sputnik set Italy on a national state of path dependence in conjunction with collaborative efforts. Italy was in a distinct state of path dependence in its willingness to accept bilateral cooperation from the United States, in contrast to the French case. However, these efforts would only last for a few years in the late 1950s and early 1960s. Following this brief deviation, Italy then entered the same state of path dependence as France, in which its outer space research efforts would take place at the European level following civilian and military institutional paths. These were formally separate yet interacted in distinct ways, seeing as the security path set the agenda and the civilian execution.

By the 1990s, Italy, like France, also faced a series of critical junctures on both the institutional and policymaking levels. These were the end of the Cold War and the Treaty of Maastricht at the institutional level. At the policymaking level, the US's successful deployment of GPS during the Gulf War was definitive. Italy, mirroring France and under the

institutional umbrella of the European Union, then developed satellite navigation at the prodding of the WEU within the context of the newly formed European Union.

The Italian case has accordingly revealed that mirroring the French case, the evolution of the Italian security mandate tied to the nature of the state's institutional arrangements had clear and demonstrable effects on security behavior at the micro-level. This was particularly stark in the case of Italy, given just how rapid and intense this shift was. Italy moved from a hyper-expansionist, fascist state to one that would define its foreign policy through international cooperation practically overnight in an institutional time frame. As in the case of France, as Italy became further embedded within the European institution following various critical junctures, its security behavior began to diverge further from that of a nation-state. This insight further reinforces neo-institutionalist theory, which posits that it is ultimately the nature of institutions that truly determines broader state behavior, more so than immediate material or ideational factors that are filtered by those institutions. In the case of Italy, this is particularly strong given just how stark the institutional evolution was following the Second World War. The same Italian state that in 1942 was looking to restore the Roman Empire and conquer large parts of the world was, by 1948, an eager and full participant in a collaborative and international system defined by a strictly defensive foreign policy.

Italy provides this study with another example of a middle power in Europe that, despite a very different institutional path prior to its embeddedness in the European Institution, would fall in parallel with the rest of the European states in its development of satellite technology. This suggests that the strength of such membership is causally potent and can override various other causal variables, such as strict material considerations or ideational factors. This will now be expounded upon in the final section, which will outline the conclusions of this work.

CHAPTER 7: COMPARISON AND INSIGHTS

Back in the first chapter of this study, a straightforward puzzle was presented. It was:

> "Why would Europe's relatively powerful states be willing to entrust satellite navigation, such a critical piece of military infrastructure, to an international organization?"

Upon completion of these case studies, we already have some pretty distinct answers. However, before getting into the final conclusions, this chapter will formally compare the cases. First, as outlined in the research design, this comparison will rely on the standardized methods used in the case study execution.

Accordingly, each section will be compared separately first. The first, macro-level institutional section will be compared among the three cases, outlining relevant similarities and differences. Then, the second policymaking section will be compared, observing for relevant similarities and differences. Then, conclusions will be generated at the end of this chapter relating to the main questions and hypotheses outlined in the research design.

Macro-Institutional Level: Europe vs. the Rest

At the macro-institutional level, we can observe variations in all three cases when it comes to their historical context and states of institutional path dependence prior to their establishment as modern states.

In India, the representative case, we could observe how India developed from a traditional, imperial model into a modern state through a process of centuries-long colonization under British rule. This is representative of the bulk of nations in the world as a result of the totality of European imperialism following Europe's conquest of the Americas. The majority of states in the global system would be able to share this institutional evolution involving the dismantling of traditional structures at the hands of European empires and the subsequent replacement of those structures for standardized state models familiar to the present. In addition, we observed that, upon independence, India did not become embedded in international institutions such as NATO, the European Institution, or any other

supranational equivalent, such as, for example, the Warsaw Pact. This made India an institutionally "pure" state following its independence in 1948.

The security mandate in the Indian case evolved accordingly, eventually becoming standardized in a constitutional model that clearly defines its territorial and individual delineations. Within the Indian case, we could observe the fact that India's territoriality is rationalized and fixed by its constitution. Its citizenship is as well, with clear delineations as to precisely which individuals find themselves under the mandate of the modern Indian state. India's security mandate is comparable to the vast majority of all other states in this manner, with remarkably similar structures observable across the globe. Again, this is because of the institutional dominance of the European model in previous centuries, which standardized institutional structures into the form of the nation-state globally. Consequently, India, at the time that it decided to develop satellite navigation, had a security mandate that would be recognizable by the bulk of modern states, defined by a strictly defined territoriality and an individual mandate.

In the French case, the evolution of the French state was observed to evolve from the personalized state under the ancien régime to a true nation-state following the French Revolution and, critically, to its ultimate stage as a core member of the European Institution. It is here that we can first observe divergence at the macro-institutional level when compared to the representative case. It was at this stage that France's security would also change accordingly, removing its status as a "pure" state.

The security mandate in France evolved along the same path as the representative case initially. It went from a personalized state to one defined by strict territoriality and individual mandates. This mandate in the French case was particularly easy to observe given France's propensity to rewrite its constitutions throughout the French Revolution and through the latter half of the nineteenth and early part of the twentieth centuries. In France's current constitution, we could observe that the security mandate was no longer strictly tied to the territoriality of France or solely for French citizens. Instead, France explicitly took on a security mandate that was extra-national in nature, first in assuming responsibility at the level of the UN Security Council, secondly in its participation in NATO, and, finally and most importantly, through its adoption of the Maastricht Treaty, which grants European citizenship to all French citizens. It also obligated France to assume a security mandate for other

European member states and their citizens, specifically in cases where such citizens cannot access consular assistance in third-party countries.

In the Italian case, we observed an even more unique institutional evolution. Italy went from a decentralized concept to a unified state to a hyper-nationalist and expansionist fascist power for roughly two decades. Despite its uniqueness, however, following the critical juncture of the Second World War, Italy would fall into a remarkably standardized pattern along with its European neighbors. That is the same institutional state as France, defined by Italy's membership in NATO and the European Institution, seeing Italy fundamentally alter its security mandate.

Italy's security mandate evolved in parallel to the French case. Throughout the case, we could observe how Italy also assumed extra-national responsibilities for its military in the form of NATO and the European institution, which was particularly supercharged with the adoption of the Maastricht Treaty.

Policymaking Level: National Satnav vs. Galileo

In the case of India, at the policymaking level, we can observe India behaving precisely as realist theory would expect it. India developed satellite navigation on its own, leveraging bilateral cooperation where possible with the United States and Russia. However, this cooperation was only undertaken with the precondition that India would ultimately have control over the technology and resultant assets that were developed. Accordingly, India developed satellite navigation nationally and assigned its control to the Indian state.

This pattern can be observed with mild variation across all other cases of satellite navigation development. Even in the case of Japan, characterized by its peculiar state as a nominally disarmed state dependent on the US for its security, it can be observed that the state has begun a process of developing nationally controlled satellite navigation independent of its primary benefactor. Similar patterns can be observed in the cases of the US and Russia and nascent efforts in the cases of Brazil and Nigeria. In all these cases, the development of satellite navigation was a national effort to increase national competitiveness. This is in keeping with the structure of the modern state, which prefers such behavior.

In the French case, we can observe the evolution within the case. For the first decades following the Second World War, the French attempted to develop missile technology, and by extension, satellite technology, independently. It opened the door for cooperation within the bounds of NATO, which was rebuffed during the early 1950s, and France responded by attempting to go at it alone. This was an effort that was moderately successful, developing many of the necessary constituent technologies required for satellite technology, most notably launchers and missiles. With the critical juncture of Sputnik, however, we could observe France enter a different, more cooperative state of path dependence at the European level.

This mirrors Italy's experience perfectly, excluding the initial efforts at national development. However, it is relevant to observe in the Italian case that Italy also had a brief period of national efforts in the early 1960s in collaboration with the United States, efforts that quickly fell to the wayside in favor of collective European efforts.

By the 1990s, following the critical juncture of the Gulf War, we could observe just how divergent the European cases had become when compared to their representative counterparts. When faced with the US's use of satellite navigation on the battlefield, the Europeans immediately addressed the issue within the European Union, displaying a remarkable lack of national efforts in parallel. It was in this institutional framework that France, Italy, and 20 other European states would ultimately develop satellite navigation. This fact highlights just how integrated and powerful the state of path dependence in European states was five decades after the founding of the European Institution.

Questions and Assessment of Hypotheses

To present the final conclusions of this study, we will now return to the research design. Primarily, two questions were posed at the start of this work. They were as follows:

1.) Why did relatively powerful European states choose to develop satellite navigation collectively?
2.) Why did relatively powerful European states then choose to assign control of satellite navigation infrastructure to a supranational authority?

To answer the first question, we can state with confidence that France and Italy chose to develop satellite navigation collectively because they found themselves in a state of strong path dependence as a result of the critical junctures that institutionally bound them into the European Union. This process began after the Second World War and was heavily reinforced in the early 1990s with the signing of the Maastricht Treaty. By extension, we can also conclude that the other powerful European states, such as Germany and the United Kingdom, chose to follow this path for similar reasons. To address the second, we can use the same response. Naturally, as these states were developing this asset together to solve a collective problem, namely, extraterritorial security mandates covering the territory and citizenry of the European Union, control of that asset at the supranational level was the natural extension.

Assessment of the Hypotheses

In short, the two hypotheses that were presented match well with the conclusions observed. This is in keeping with the expectations of historical institutionalism and accordingly reinforces its understanding of such phenomena. The hypotheses were as follows for reference:

1.) European states chose to collectively develop satellite navigation because the European Institution altered the involved states' perceptions of their security mandate from a strictly national one to a more collective one tied to Europe. As the security mandate changed, this caused the states' collective development of satellite navigation to become rational as the new community found itself in competition with other large powers in the system, most prominently the Soviet Union and the United States.
2.) European states chose to assign control of this collectively developed asset to the supranational European body for the same broad reason that they chose to collectively pursue it in the first place. Their embeddedness in the European project redefined the state's definitions of their security mandate, placing them in a state of path dependence. By assigning control of satellite navigation to the supranational organization, they could more efficiently compete with other large powers in the system at that higher level of collectivity, in this case with the powers being the United States, Russia, and a rising China.

Contributions

The contributions of this work cover both the empirical and the theoretical. Each will accordingly be addressed in the following:

Empirical Contribution

Empirically, this piece contributes both to the historical record and to explain a specific international relations phenomenon.

Its historical contributions lie in consolidating the Indian story of satellite navigation development, tracing its roots back to the beginning of India's development of outer space technology. In addition, this work contributes more substantially to the history of satellite technology development in Europe. The sources explored for this work, particularly those in the late 1950s and 1960s in addition to those in the 1990s, which have only recently been declassified, paint a more complete and concise historical picture of the true nature and execution of the Galileo project. They go a long way in contradicting the official stance of the European Union that Galileo and its outer space research efforts, more broadly, were undertaken primarily for peaceful, civilian purposes. The historical record strongly suggests a pattern in which security-minded European institutions, most notably the often-forgotten WEU, proposed projects that were then executed by civilian institutions with civilian motivations and justifications. This suggests a degree of coordination and strategic thinking, which the European Institution is usually not given credit for. It also suggests that, despite its nominally economic nature, the European Institution has since its inception held a strong security element to its decision-making, particularly in this sector.

With regards to international relations phenomena, we can observe that France and Italy chose to develop satellite navigation collectively, eschewing their immediate national considerations in favor of collaborative efforts. This is divergent behavior that seems to be directly rooted neither in material considerations nor ideological similarity shared by common liberal institutional structures, but instead because of embeddedness in a supranational project per se. The European Institution and the constitutions of both states, which prefer international solutions to national solutions to such problems, were clearly able to alter Italian and French behavior away from the representative of India and, with it, the commonly held proscriptions of international relations theory.

Theoretical Contribution

From these empirical contributions, some important theoretical insights can be generated. In keeping with the alternative explanations section outlined at the start of this work, this section will outline how this work can contribute to the various theoretical streams of discussion within international relations. This is reflective of the diversity present in the field and is far more useful than attempting to make broad generalizations either for or against any particular theoretical understanding. Accordingly, it will address realism, liberalism, and neo-functionalism and, finally, will outline what it has contributed to historical institutionalism.

Realism

As outlined previously, realism's main weakness in explaining this case, and by extension, much other European behavior, is that it requires too firm an understanding of the state and its centrality to international relations phenomena. This problem comes from two directions: first, in its oversimplification and generalization of the state's nature across historical and institutional contexts, and second, in the conclusions that it then entails.

This work can improve the discussions in realism as we can observe states clearly acting in realist manners but at different levels of collectivity. This can be observed in multiple areas throughout this work once the institutions themselves are made explicit. In this discussion, the level of collectivity is key, tied to the security mandate. In the case of India, we could observe that, with British unification, previously disparate Indian states began to act with a unified security policy. This could be observed again in the Italian case during the 1860s.

Most importantly, however, we can observe this again at the European level, tied to European institutions. The behavior is, for all intents and purposes, the same. We can observe an increase in the security mandate to a higher level of territorial and individual collectivity, which was then reflected in policymaking. Therefore, it would likely be more useful for realist theory to eschew its insistence on strictly defining the nation-state and its centrality and instead understand polities in terms of their security mandates. Taking this interpretation, for instance, would have prevented Mearsheimer's errors, as explored earlier in his prediction that European states would undermine Europe in the 1990s. It is more empirically useful to

consider the European institution and, in modern terms, the European Union as a de facto state when it comes to some security efforts, even if it and its member states do not wish to assume that label. With this simple re-assessment of institutions, realism would be far better placed to explain this sort of behavior and would in large part go toward explaining even the matter at hand, characterized by a collective Europe that found itself in competition with the United States and the Soviet Union, and ultimately Russia, in the field of satellite navigation.

Liberal Theory

This study's contribution to liberal theory centers on liberal theory's emphasis on the specificities of liberal government in explaining international cooperation. This work would suggest that having a liberal regime type does not necessarily result in cooperation among powers. If anything, this work suggests the contrary, seeing competition between liberal European states and the liberal United States take a central role in motivating Europe to ultimately develop Galileo.

Neo-Functionalist Theory

Similarly, this work can contribute to neo-functionalist theory as it can bring the lens out of economic cooperation into the realm of security cooperation, an area that neo-functionalist theory generally does not address to a great extent. By analyzing more such collaborative efforts within the security sphere, the neo-functionalist theory could likely offer even more convincing arguments, as economic cooperation is overall a far easier area for states to work together in than security. By analyzing the insights in this work, neo-functionalist theorists could further bolster their claims that "cooperation begets cooperation" at the European level, even in areas that are particularly sensitive, such as security.

Historical Institutionalist Theory

Finally, this work contributes to historical institutionalist theory in a few key ways.

First, it outlines one way of handling a weakness in the theory tied to explaining policymaking with macro-level institutional analysis. By taking both forms of observation and executing them in parallel, more coherent observations can be made that allow for the

observation of contact points where mechanisms can be observed more directly. Having both the institutional timeline at the foundational level of the state and the timeline of policymaking can leverage historical institutionalism's conceptual clarity in a manner that previous works have lacked.

Second, this work introduces the concept of speed controls, defined as accelerators and speed checks, which add another tool to the kit of historical institutionalist theory. This concept, observed in the representative case tied to India's various wars with Pakistan, is useful in bridging the conceptual gap between true critical junctures and path dependence. Introducing this concept can allow scholars to label moments that clearly had a causal effect on a policy but which did not constitute a fundamental institutional change along a state of path dependence.

Finally, this work contributes to historical institutionalism simply by outlining that it provides scholars with a very useful theoretical tool when faced with cases that do not fit in well with the traditional explanatory theories in international relations. By getting to the heart of the concepts, namely, the precise nature of the institutions of the state, notable contributions can be made to explaining seemingly divergent cases such as the one that this dissertation addressed.

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