Universitat Autònoma de Barcelona

Route optimization and fatigue management within the NBA air mobility

Thesis submitted for the degree on

Aeronautical Management

By

Victor Herrero Guerrero

Supervisor:

Sergi Manzano Teixidó

Escuela de Ingeniería

Sabadell, June 2026

The undersigned, Sergi Manzano, supervisor of the Final Degree Thesis, professor at the School of Engineering of UAB,

CERTIFIES:

That the work corresponding to this report has been carried out under their supervision by

Victor Herrero Guerrero

And for the record, signs this document in Sabadell, June of 2026

MANZANO TEIXIDO SERGI - 46417091D

Digitally signed by MANZANO TEIXIDO SERGI - 46417091D
Date: 2026.06.25 09:59:36 +02'00'

----------Signed:

Sergi Manzano

SUMMARY SHEET – ENGINEERING SCHOOL DEGREE PROJECT

Final degree project title: Route Optimization and Fatigue Management within the NBA Air Mobility
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Key words: • English: NBA, Fatigue, Schedule. • Castellano: NBA, Fatiga, Calendario. • Català: NBA, Fatiga, Calendari.
Summary of the Final Degree Project : • English: This project redefines professional basketball travel by adopting the rigorous safety architecture of the aviation industry. By classifying NBA teams as "flight crews," the league transitions from arbitrary scheduling to a scientifically validated Athletic Duty Period (ADP) based on FAA Part 117 regulations. This framework establishes legally mandated working limits and cumulative fatigue caps to protect the long-term health and performance of players and staff. The initiative is supported by a comprehensive educational program and a data-driven monitoring system, ensuring that all thirty franchises operate under standardized protocols designed to eliminate travel-related exhaustion and optimize on-court results. • Castellano: Este proyecto redefine los viajes del baloncesto profesional al adoptar la rigurosa arquitectura de seguridad de la industria aeronáutica. Al clasificar a los equipos de la NBA como "tripulaciones de vuelo", la liga pasa de una programación arbitraria a un Periodo de Servicio Atlético (ADP) científicamente validado, basado en la normativa FAA Parte 117. Este marco establece límites de trabajo y de fatiga acumulada legalmente obligatorios para proteger la salud y el rendimiento a largo plazo de jugadores y personal. La iniciativa cuenta con el respaldo de un programa educativo integral y un sistema de monitorización basado en datos, lo que garantiza que las treinta franquicias operen bajo protocolos estandarizados diseñados para

eliminar el agotamiento relacionado con los viajes y optimizar los resultados en la cancha.

• Català: Aquest projecte redefineix els viatges professionals de bàsquet adoptant la rigorosa arquitectura de seguretat de la indústria de l'aviació. En classificar els equips de l'NBA com a "tripulacions de vol", la lliga passa d'una programació arbitrària a un període de servei atlètic (ADP) validat científicament basat en les regulacions de la part 117 de la FAA. Aquest marc estableix límits de treball legalment obligatoris i límits de fatiga acumulada per protegir la salut i el rendiment a llarg termini dels jugadors i el personal. La iniciativa està recolzada per un programa educatiu integral i un sistema de monitorització basat en dades, que garanteix que les trenta franquícies operin sota protocols estandarditzats dissenyats per eliminar l'esgotament relacionat amb els viatges i optimitzar els resultats a la pista.

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The first and most important person that came to mind during all this project was my grandmother. Yes, we are really missing you, it was 11 years ago when I was 11 years old when you flew away. And you left an enormous emptiness in us. You could not even witness how I have developed my ambitions and hobbies both of them expressed in this little piece of work. You won't be there when I graduate, but I really hope wherever you are you are still watching from the distance, I'll be feeling you nearby as I have on every step of this path.

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1. INTRODUCTION

This project thesis proposes a critical analysis of the air mobility within the National Basketball Association (NBA), from both operational management and human factor perspective. Currently, the NBA operates an extremely tight and intense schedule composed of 82 games in a span of time below six months, resulting in a constant necessity of intracontinental travelling for all the thirty teams inside the league.

Unlike commercial aviation, where operating crew fatigue is strictly regulated to assure operational safety, the professional sports leagues tend to prioritize broadcasting schedules as well as arena availability, at the expense of a scarce and under-standardized mental and physical recovery for the athletes.

The context of this study lies in the intent of professionalizing air mobility management by conceptualizing a management framework that treats athletes well-being as rigorously as flight crews.

1.1. Context

The National Basketball Association has one of the most complex logistical challenges in professional sports, with thirty teams performing high-frequency air operations across four different time zones that divide the American territory.

Currently, the league's travelling model is decentralized, meaning each franchise manages its own charter flights, many of them using long-term agreements with major carriers, such as Delta Air Lines (Office of the Secretary of Transportation ,2024). This operational structure, combined with a dense 82-game regular-season schedule, results in severe physiological and physical stress for players and staff.

While commercial aviation is ruled by strict legal frameworks regarding crew rest and flight duty periods, NBA travel often involves late night flights and immediate departures after intense physical competition as showed by (NBA Performance [@nbaperformance], 2024). This creates a regulatory and health gap where the

athletes, who perform high-risk physical activities, are not protected by the same fatigue mitigation standards that ensure the safety of the pilots flying them.

1.2. Motivation

The motivation for this project emerges from the intersection of advanced aeronautical management and elite sports performance. As an aeronautical management student and an NBA fanatic, it is surprising to observe how such a profitable organization like the NBA manages such a complex flight network in a decentralized manner, often using rest protocols that would be not allowed under civil aviation laws.

The personal passion for basketball, combined with technical training in network planning and flight operations, drives the ambition to develop a technological solution. This solution does not aim to optimize operational costs nor league economical benefits, but to serve as a preventive measure against injuries derived from cumulative fatigue and circadian dysregulation, the same ones that forbid us to enjoy the sport and costs millions to the teams.

1.3. Objectives

General objective

To evaluate the impact of flight-related fatigue on NBA players by applying commercial aviation crew standards (FAA Part 117) (Federal Aviation Administration, 2012). and to develop an optimization model to mitigate health risks through efficient route planning.

Specific objectives

- To compare NBA travel schedules with the legal rest requirements for commercial flight crews (FAA Part 117), identifying "fatigue hotspots."

- To analyze a real-season case study (e.g., a Western Conference team) to quantify the exposure to the "Window of Circadian Low" (WOCL) and time zone shifts.

- To design the logic for a Python-based tool that re-orders flight itineraries to maximize recovery time and minimize night-time arrivals.

- To measure the potential reduction in "fatigue units" and flight hours between the current NBA schedule and the optimized proposal.

2. NBA INTRODUCTION

2.1. The NBA

The National Basketball Association (NBA) is much more than a professional sports organization, it has evolved into a multi-billion dollar enterprise that sits at the intersection of entertainment, fashion, and social care. At its core, the NBA is the main professional basketball league in North America, currently composed of 30 teams divided into two conferences, east and west. However, the "NBA" as a concept embodies the pinnacle of human athletic achievement and works as a primary vehicle for the globalization of American culture. It is an organization defined by "superstar power," where individual athletes are presented as global icons, often becoming more recognizable than the teams for which they play. This athlete-centric model is what separates the NBA from other major sports leagues, promoting a brand that is deeply personal, highly visible on social media, and intrinsically linked to the lifestyle and aspirations of its fans.

The foundation of the league dates back to June 6 1946, when it was established in New York City as the Basketball Association of America (BAA) (Basketball Australia, n.d.). The league was born from owners of major ice hockey arenas in the Northeastern and Midwestern United States and Canada, who were looking for a way to fill their arenas on nights when hockey games weren't being played . On August 3, 1949, the BAA merged with its rival, the National Basketball League

(NBL), and rebranded as the National Basketball Association. This merger was the key moment that unified the best talent in the country under one organisation. Over the decades, the league's foundation was further solidified by the 1976 merger with the American Basketball Association (ABA), which brought four legendary franchises as the Spurs, Nuggets, Pacers, and Nets, introducing at the time the three-point line, forever changing the dimension of the game (Staffo, Donald F, 1998).

Figure 1. *NBA logo.* (n.d.). Source: Logos-World.

Today, the NBA embodies a spirit of "progressive innovation". It was the first major sports league to embrace the digital age fully, using social media to distribute highlights and engage fans globally. Beyond the competition, the league embodies a commitment to social justice and economic mobility. Through the NBA Foundation and programs like NBA Cares (Chief Executives for Corporate Purpose, 2016), the league uses its massive platform to address racial inequality, community development and many more social concerns. This "modern NBA" is a blend of high-stakes competition and social responsibility, where the values of equality and freedom of expression are as much a part of the league's DNA as the basketball itself.



Figure 2. *NBA Cares initiative during community service activities.* (n.d.). Source: Gephardt Daily.

2.2. Travel history of the NBA

The history of NBA travel is a narrative of extreme contrast, moving from the unglamorous treks of the 1940s to the ultra-luxurious, scientifically managed air travel of the modern era. In the earliest years of the league (1946–1959), mobility was restricted by the limits of the American railway system. Teams primarily traveled by train, often sharing sleeper cars with regular commuters. Because travel was so slow, the league was forced to remain geographically concentrated in the Northeast and Midwest (Lowe, Z., 2012). Players frequently arrived at arenas minutes before tip-off, exhausted from 10-hour train rides , and it was not uncommon for legendary figures like George Mikan to sleep on wooden benches in train stations during layovers.



Figure 3. *Wilt Chamberlain traveling by train during the NBA era.* (n.d.). Source: Grantland.

As the league expanded geographically in the 1960s and 1970s , most notably with the Lakers moving to Los Angeles and the Warriors to San Francisco, the "Railway Era" gave way to the "Commercial Flight Era" (Simmons, B., 2015 May 22). However, this transition did not immediately lead to luxury. For over two decades, NBA players, including giants like Wilt Chamberlain and Kareem Abdul-Jabbar, flew on standard commercial airlines. These athletes, many of whom were well over seven feet tall, were forced to cram into coach seats designed for average-sized people. They waited in long security lines and dealt with frequent delays and cancellations just like the general public. This era was defined by "The Hustle,"

where teams would often play a game, rush to a commercial airport, wait for a 6:00 AM flight (Simmons, B., 2015 May 22), and play another game in a different city that same night.



Figure 4. *Michael Jordan traveling by bus during his NBA career.* (2020). Source: Men's Health.

The true revolution in NBA mobility began in the late 1980s, led by the Detroit "Bad Boys" Pistons. In 1987, the Pistons became the first team to regularly use a private charter plane, famously named "Roundball One." This changed the competitive landscape of the NBA forever. Owners realized that if players could sleep in a bed-like seat and receive physical therapy mid-flight, they would perform better on the court. By the 1990s and early 2000s, chartering became the league standard. Today, the NBA operates in a "Golden Era of Mobility". Most of the 30 teams utilize a dedicated fleet of customized aircraft provided by Delta Air Lines (Office of the Secretary of Transportation ,2024), such as the Boeing 757-200s which, explained further on this project, will be substituted by a fleet of Airbus A321 neo's (Boon, T., 2024). These are not standard planes, they are "flying locker rooms" featuring 180-degree lie-flat seats, high-speed satellite Wi-Fi, custom nutrition kitchens, and sophisticated lighting systems (McNulty, K., 2022) designed to sync with the players' circadian rhythms to minimize jet lag. Mobility is no longer just about transportation, it is a critical component of sports science and player recovery.



Figure 5. *Kobe Bryant aboard a plane with the NBA championship trophy.* (n.d.). Source: Lakers Nation / Andrew Bernstein.

2.3. Problematic: NBA's high volume of flights and the logistical grind

The competitive structure of the National Basketball Association is defined by a level of logistical density that is hardly similar to any other professional sports. A standard regular season requires athletes to compete in 82 games within a window of approximately 170 days. Not even taking into account post-season competition which is a direct continuation of the regular season, with less than a week of rest, for some teams, between the end of regular season and the beginning of playoffs. This forces a pace of roughly one game every two days. This compressed timeline is further complicated by specific scheduling stressors such as back-to-back games (Singh, M., Bird, S., Charest, J., Huyghe, T., & Calleja-Gonzalez, J., 2021), where teams play on two consecutive nights, and stretches where four games are played in only five days. These periods of high density serve as the primary drivers for an enormous volume of air travel. On average, an NBA team will fly between 42.000 and 51.000 miles in a single season (Herring, C., 2025). To put this in perspective, this is equivalent to navigating the globe twice or flying roughly two hundred and fifty miles (320 km) every single day for twenty-five consecutive weeks (Lowe, Z., 2012).

2017/2018 Likely Playoff Teams	Miles	Conference	Record (W/L)
Portland Trail Blazers	54,004	Western	49/33
Minnesota Timberwolves	52,401	Western	47/35
Oklahoma City Thunder	48,459	Western	48/34
Huston Rockets	48,194	Western	65/17
Miami Heat	47,775	Eastern	44/38
Utah Jazz	47,447	Western	48/34
New Orleans Pelicans	47,294	Western	48/34
Boston Celtics	47,215	Eastern	55/27
Golden State Warriors*	46,415	Western	58/24
San Antonio Spurs	46,258	Western	47/35
Milwaukee Bucks	43,194	Eastern	44/38
Philadelphia 76ers	40,751	Eastern	52/30
Washington Wizards	40,741	Eastern	43/39
Cleveland Cavaliers	38,303	Eastern	50/32
Toronto Raptors	36,457	Eastern	59/23
Indiana Pacers	35,520	Eastern	48/34
Average	**48,546**		

Adapted from Holmes.[27] *NBA champions. W/L = wins/losses.

Table 1. *Most miles traveled by playoff teams season 17/18.* (n.d.). Source: PMC / PubMed Central.

The complexity of this travel is not merely about distance but about the crossing of meridians and the times of flying. Teams frequently encounter up to 50 time-zone changes per season, which forces the biological clock to constantly attempt to resynchronize (Singh, M., Bird, S., Charest, J., Huyghe, T., & Calleja-Gonzalez, J., 2021). This is particularly problematic during eastward travel, which requires a phase advance of the internal clock that the human body finds significantly more difficult to manage than the phase delay associated with traveling west. Furthermore, the professional workday for an athlete on the road extends far into the early morning hours. Following the conclusion of a night game and the subsequent media and recovery obligations, teams often board private charters at midnight or later. This results in players arriving at their next destination and checking into hotels between three and four o'clock in the morning (NBA Performance [@nbaperformance], 2024). This routine creates a perpetual state of travel fatigue that is distinct from the acute symptoms of jet lag, representing a cumulative physiological burden that builds throughout the six-month season.



Figure 6. U.S. time zones and NBA team locations map. (n.d.). Source: Time Zones Map; AI-generated overlay.

In general it is observed that NBA travel habits are not adequate to athletes nor staff welfare. It is a requirement for such a level of competition to maintain a high level of readiness and healthcare, which are normally covered by professionals but directly influenced by logistics problems. While the league's revenue is driven by optimal television broadcasting slots (usually 7:00 PM or 8:00 PM local time), these slots force flight departures into the late-night hours, creating a permanent state of operational friction with the human biological clock. Night flights, unlimited working hours, not fixed schedule, this provokes an emotional and physical stress beared by athletes and staff just for the utmost exploitation of the competition

2.4. The mechanics of transmeridian desynchronosis

To maintain the elite level of performance required for professional basketball, athletes have specific biological demands that are often in direct conflict with the NBA's travel reality. The most critical of these is the maintenance of the circadian rhythm, a twenty-four-hour internal cycle regulated.The Window of Circadian Low (WOCL) is the cornerstone of this cycle. During this 2:00 AM to 6:00 AM window,

core body temperature reaches its daily minimum, and the brain's drive for sleep is at its maximum (Kumar, V. M., Mallick, H. N., Shrivastava, D., Bhatia, M., Gupta, R., & Gulia, K. K., 2026). For NBA players, this window is systematically violated. When a player is forced to be awake or traveling during the WOCL, they experience a massive spike in fatigue and a corresponding drop in cognitive and motor performance.

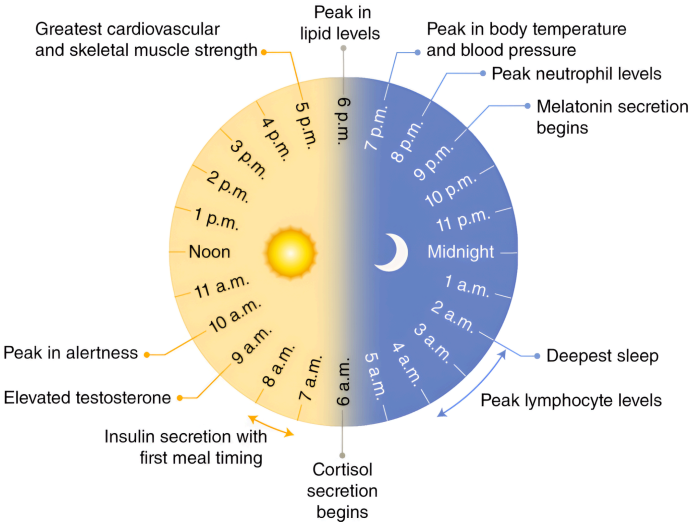

Figure 7. Window of Circadian Low (WOCL) diagram. (n.d.). Source: Sleep Solutions Health.

However, the late-night nature of the NBA schedule forces athletes into a state of jet lag, where their competition times and travel arrivals occur at suboptimal biological hours. Because games often finish late at night and travel occurs immediately after, the window for natural, consolidated sleep is frequently broken. This has led to the afternoon nap becoming a critical physiological intervention in NBA culture. Usually occurring around three o'clock in the afternoon on game days, these naps serve as a necessary recovery method to repay the sleep debt accumulated during travel and to prepare the body for the evening peak in physical performance. Research shows that muscle strength and reaction times naturally peak in the late afternoon and early evening when core body temperature is at its highest. When athletes are deprived of adequate rest and their circadian rhythms are misaligned, they are forced to compete during a biological "down" phase, which compromises their physical readiness and metabolic efficiency (Fowler, P., Duffield, R., & Vaile, J., 2014).

2.5. Impact of unfulfilled health needs on athletes

The intersection of extreme travel and the violation of the WOCL creates a state of both chronic physiological and physical stress that has measurable impacts on both health and performance. When an athlete consistently operates or travels during the Window of Circadian Low, they experience a "stress shock". These shocks manifest as decreased central nervous system drive, slower reaction times, and impaired muscle recruitment. In a high-speed sport like basketball, where split-second decisions and explosive movements are required, even a minor dip in neurological readiness can be catastrophic. Research into NBA game data shows a clear "away-game penalty," where teams traveling across time zones, especially those losing hours traveling West, suffer significant drops in shooting accuracy and defensive intensity. As shown in figure 8 winning percentage lowers when changing different time zones and more specifically, in figure 9 winning percentage decreases traveling westward since days prolong and athletes extend their absence of rest. Later on figure 10 we can see that depending on the home-away pattern winning percentage can also vary due to rest difference and home-court advantage.

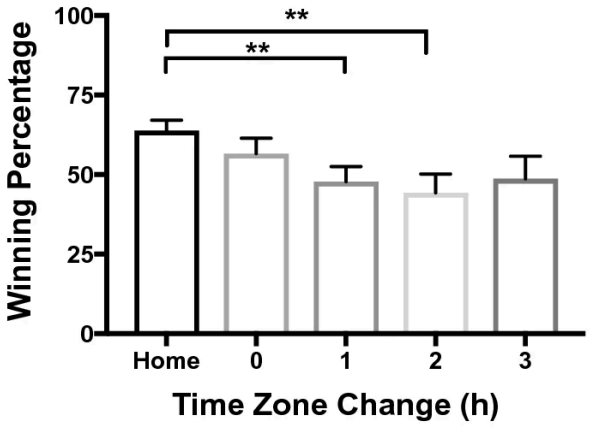

Figure 8. *Winning percentage by time zone change.* (2020). Source: McHill & Chinoy, *Scientific Reports*.

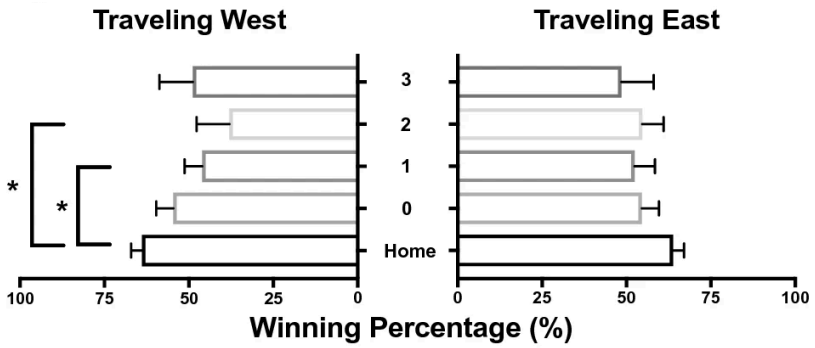

Figure 9. *Winning percentage when traveling west vs. traveling east.* (2020). Source: McHill & Chinoy, *Scientific Reports*.

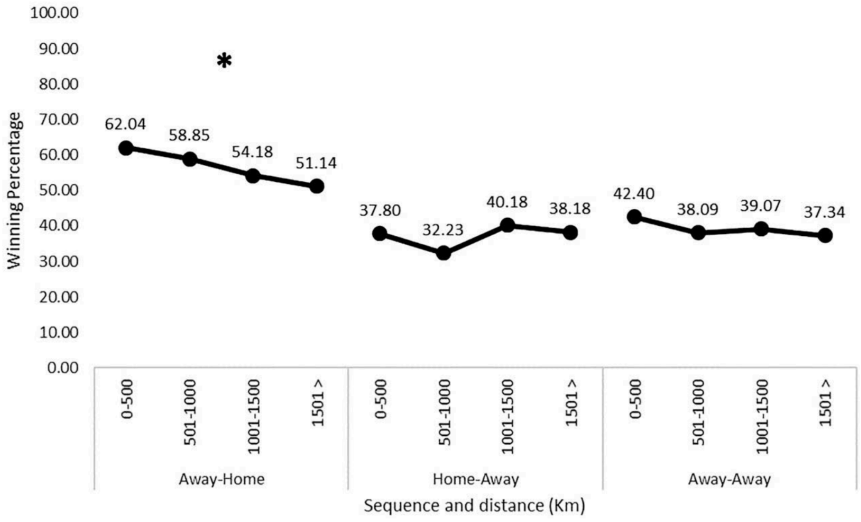

Figure 10. *Winning percentage based on the sequence and traveled distance of 2 consecutive games (*P = .038, r^2 = .044).* (2021). Source: Charest et al., Journal of Clinical Sleep Medicine.

The most dangerous impact, however, is the direct correlation to injury. Data indicates that when athletes are deprived of sleep or their circadian rhythms are misaligned, the risk of muscular or bone injuries increases by nearly double. This occurs because the body, stuck in a state of perpetual "jet lag", cannot effectively clear metabolic waste or repair the micro-trauma sustained during games. As a strategic response to these impacts, teams have adopted "load management" protocols (Youngmisuk, O., 2019). This is not a matter of laziness, but a scientific intervention designed to pull players out of the rotation when their "stress shock" levels indicate they are entering a high-injury-risk zone due to unfulfilled recovery

and WOCL disruption. By prioritizing these biological needs, teams aim to ensure that their most valuable assets remain available for the postseason, where the travel burden finally stabilizes.

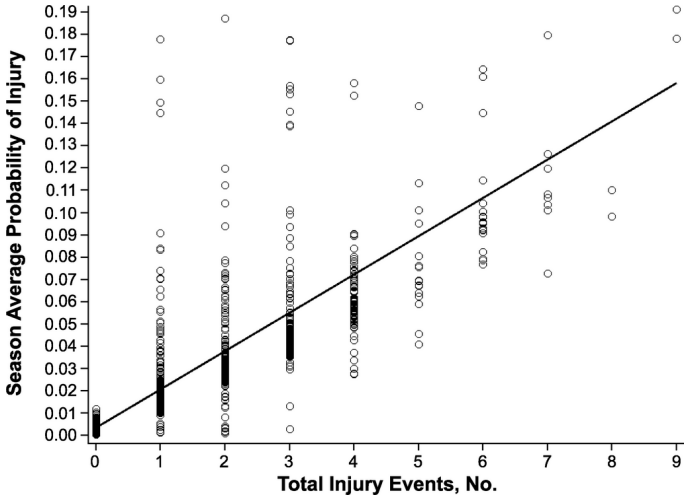

Figure 11. *Relationship between a player's average predicted probability of injury and total injury events in a given season.* (2018). Source: Lewis, *Journal of Athletic Training*.

Argumented by Rossi, A., Pappalardo, L. 2018:

> Accumulated minutes had the smallest relationship with injury risk, suggesting that restricting the number of minutes played may not be a useful method for preventing injuries for the average player. On the other hand, rest showed the strongest effect of all the variables studied. Simply not playing in back-to-back games can reduce the probability of an injury by almost 16% for the average player. Whereas the topic of player rest is becoming increasingly controversial for basketball fans and the media, the data support its utility in preventing injuries. (p 508)

2.6. Consciousness program regarding sleep and rest obligations

The final pillar of a modern approach to player health is the implementation of the NBA Performance Readiness and Biological Literacy Program (PRBL). This own initiative is designed as a sophisticated online curriculum that shifts the responsibility

of recovery from a passive suggestion to a professional obligation. The program is structured as a multi-module digital course that will provide athletes with the scientific literacy required to manage their bodies within the hard constraints of the eighty-two-game season. Rather than general health advice, the curriculum will focus on "applied chronobiology," specifically teaching players how to navigate the Window of Circadian Low (WOCL). Players learn to make informed decisions about "anchoring" their sleep and use light-exposure therapy to shift their internal clocks during transmeridian travel, effectively mitigating the "stress shocks" that lead to injury.

The course extends beyond sleep into the realm of nutritional chronobiology, educating players on the timing of macronutrient intake relative to their circadian rhythms. For instance, players are taught that consuming high-calorie, heavy meals during the WOCL, a common occurrence during late-night post-game travel, can lead to metabolic disruption and impaired muscle repair. Instead, the program promotes a "nutritional periodization" strategy that aligns food intake with the evening peak in physical performance and the subsequent recovery windows. By mastering these biological needs, athletes transition from being passive participants in their schedule to active managers of their physiological readiness. This educational foundation is essential because, as research suggests, a player who is "biologically literate" is significantly more likely to adhere to the recovery protocols prescribed by team medical staff, thereby reducing the likelihood of fatigue-related performance decay.



Figure 12. *Joel Embiid eating during in-game nutritional preparation.* (n.d.). Source: YouTube.

To ensure the efficacy and professional standing of this program, the NBA would have to implement a "Performance Eligibility Title" (PET). This title would be a formal certification awarded to players upon the successful completion of the PRBL course and would be associated assessments. Unlike a one-time orientation, the PET would operate on a strict system of recency and revalidation. Because sports science and the league's logistical landscape are constantly evolving, the title would have a two-season expiration date. To maintain their "Active Roster Eligibility," players must complete a revalidation module every two years. This requirement ensures that veteran players remain updated on the latest recovery technologies and that the league maintains a high baseline of biological awareness across all franchises.

The revalidation process is not merely a formality but a prerequisite for league play, much like physical examinations or drug-testing compliance. If a player's PET expires, they are ineligible to suit up for games until the revalidation is complete. This system elevates sleep, rest, and nutrition to the same level of professional importance as tactical film study or weight training. By linking the "title" to playing eligibility, the NBA institutionalizes the science of recovery, ensuring that the limitations of the schedule are met with a standardized, scientifically backed defense. This proactive consciousness program serves as the ultimate strategic response to the inherent risks of the NBA's travel demands, transforming the way players perceive their biological needs from a luxury into a professional requirement for career longevity.

3. FAA LAWS AND ATHLETES AS FLIGHT CREW

This chapter establishes a regulatory bridge between the safety standards of commercial aviation and the physiological demands of the professional athletes. By treating the NBA team as a "flight crew," we can apply the precision of FAA Part 117 to mitigate the affected performance due to travel fatigue and circadian disruption.

3.1 FAA Part 117: Pilot working restrictions

The FAA Part 117 regulations provide the most scientifically advanced framework for fatigue management in aviation. For the NBA "flight crew," the following core limitations establish the baseline for operational safety and performance, drawing directly from the authoritative standards of 14 CFR Part 117 (Federal Aviation Administration, 2012).

3.1.1.Flight Duty Period (FDP) and Flight Time Limits (FTL)

The central pillar of these regulations is the Flight Duty Period (FDP), which is defined as the period beginning when a crew member reports for duty with the intention of conducting a flight and ending when the aircraft is parked and the debriefing done with no further intention of movement. Unlike simple flight hours, FDP includes all pre-flight duties, administrative work, and training(Federal Aviation Administration, 2012).

The maximum allowable FDP is strictly dictated by Table B, which adjusts limits based on the scheduled start time (using acclimated time) and the number of flight segments. For unaugmented operations, these limits are:

Scheduled time of start (acclimated time)	Maximum flight duty period (hours) for lineholders based on number of flight segments						
	1	2	3	4	5	6	7+
0000-0359	9	9	9	9	9	9	9
0400-0459	10	10	10	10	9	9	9
0500-0559	12	12	12	12	11.5	11	10.5
0600-0659	13	13	12	12	11.5	11	10.5
0700-1159	14	14	13	13	12.5	12	11.5
1200-1259	13	13	13	13	12.5	12	11.5
1300-1659	12	12	12	12	11.5	11	10.5
1700-2159	12	12	11	11	10	9	9
2200-2259	11	11	10	10	9	9	9
2300-2359	10	10	10	9	9	9	9

Table 2. *FAA Part 117 Table B.* (n.d.). Source: Electronic Code of Federal Regulations (eCFR).

- **Window of Circadian Low (0000–0359):** Limited to a maximum of 9 hours of duty, regardless of the number of segments, due to the extreme physiological strain of working during the body's natural period of maximum sleepiness.
- **Early Morning (0400–0459):** A maximum FDP of 10 hours.
- **Standard Morning (0500–0559):** A maximum FDP of 12 hours.
- **Peak Alertness Window (0700–1159):** Allows for a maximum of 14 hours for a single segment, dropping to 11.5 hours if seven or more segments are performed.
- **Transition Windows (1300–1659):** Capped at 12 hours for one to four segments to account for mid-day performance dips.
- **Evening Operations (1700–2159):** Capped at 12 hours for a single segment, dropping to 9 hours for seven or more segments.

In addition to duty time, Flight Time Limitations under Table A restrict the actual time spent at the controls. For unaugmented crews, a pilot cannot exceed 8 hours if reporting between 0000 and 0459, or 9 hours if reporting between 0500 and 1959 (Federal Aviation Administration, 2012).

3.1.2. Cumulative limitations and acclimation

To prevent long-term systemic fatigue, Part 117 imposes non-negotiable cumulative caps under section 117.23:

- **Total Flight Time:** Limited to 100 hours in any 672 consecutive hours (28 days) and 1,000 hours in any 365 consecutive calendar days.
- **Total Flight Duty Period:** Limited to 60 hours in any 168 consecutive hours (7 days) and 190 hours in any 672 consecutive hours.

Furthermore, the regulation recognizes the impact of "theater" changes. A theater is a geographical area where the departure and arrival points differ by no more than 60 degrees of longitude. A crew member is only considered acclimated once they have been in a theater for 72 hours or have received at least 36 consecutive hours free from duty. If a member is not acclimated, their maximum FDP is automatically reduced by 30 minutes (Federal Aviation Administration, 2012).

3.1.3. Rest and fitness for duty

Mandatory rest is the final safety net. Before any duty period, a member must have at least 30 consecutive hours free from duty within the past 168 hours. Immediately prior to a duty period, they must receive 10 consecutive hours of rest if working out of base or 12 hours if working at base, which must include a minimum of 8 uninterrupted hours of sleep opportunity or 10 hours accordingly. Under 117.5, every member must affirmatively state they are "fit for duty" and may not accept an assignment if they feel too fatigued to perform safely (Federal Aviation Administration, 2012).

3.2. NBA framework for players and staff

To optimize player welfare and maximize performance across an 82-game season, the NBA must adopt the Athletic Duty Period (ADP). This framework adapts the FAA's safety standards into a performance-driven legal framework. The primary benefit of this system is the elimination of "sleep debt" and the reduction of travel-related injuries.

3.2.1. The Athletic Duty Period (ADP) definitions

The ADP mirrors the FAA's FDP but is tailored to the stressors of professional basketball. It begins when a player reports to a facility for morning shoot-around, medical treatment, or team meetings and ends 30 minutes after the arrival at the team hotel or home. Crucially, following FAA logic, all Deadhead Transportation,defined as time spent in transit as a passenger, counts as 100% duty time and can never be categorized as rest (Federal Aviation Administration, 2012).

3.2.2. Proposed NBA duty limitations (based on table B)

- **Standard Game Day:** The maximum ADP is 12 hours (720 minutes). If a player reports at 10:00 AM, they must be released by 10:00 PM. Any overtime or delays that push the duty past this limit trigger a mandatory extension of

the subsequent rest period, which must remain no less than 10 hours (600 minutes) to ensure physiological recovery.

- **Transcontinental Travel Days (Crossing 2+ Time Zones):** To account for the metabolic cost of pressurized flight and "jet lag" accumulation, the ADP is reduced to 10 hours (600 minutes). In these instances, the system strictly monitors the time zone delta to prevent scheduling that ignores the biological impact of rapid transit.

- **Window of Circadian Low (WOCL) Arrival:** If a team's travel results in a hotel or home arrival between 02:00 and 06:00, their ADP for the following 24-hour block is strictly capped at 9 hours (540 minutes). This legally prohibits "midnight practices" or early-morning shoot-arounds after red-eye flights. Furthermore, any duty period that technically ends within this 01:00–06:00 window is flagged as a violation, as it compromises the mandatory 10-hour rest requirement (Federal Aviation Administration, 2012).

3.2.3. Cumulative performance caps

To avoid the systemic exhaustion that leads to "mid-season walls," the NBA will adopt cumulative limits based on 117.23, reinforced by strict algorithmic tracking (Federal Aviation Administration, 2012) :

- **Weekly ADP Cap:** No player or staff member may exceed 60 total duty hours (3,600 minutes) in any 168-hour window. This rolling window ensures that high-intensity weeks are balanced by immediate subsequent reductions in duty.

- **Monthly ADP Cap:** A maximum of 190 total duty hours (11,400 minutes) in any 672-hour window.

- **Consecutive Duty Limits:** To prevent burnout from sustained activity, no player may work more than 6 consecutive days without a designated rest period.

3.2.4. Staff protection and joint responsibility

The framework extends to coaching and training staff, who are subject to the same 60-hour weekly duty cap. This ensures that medical decisions and tactical strategies are not compromised by staff fatigue. Following the "Fitness for Duty" standard (117.5) (Federal Aviation Administration, 2012), players have the legal right to report "not fit" if they have not received the mandatory 10-hour rest period or 8-hour sleep opportunity. Franchises are legally barred from penalizing players who decline assignments due to documented biological exhaustion.

3.3 Legal and standardization educational program

As mandated by 117.9 (Federal Aviation Administration, 2012), every NBA franchise would be required to implement a Fatigue Education and Awareness Training (FEAT) program. This program is a legal prerequisite for a franchise to operate, moving the league from a culture of "grinding" to a culture of "scientific compliance". This would be something similar to airlines having their AOC (Air Operator Certificate)

3.3.1. The FEAT curriculum and requirements

Every franchise must develop an education program approved by the NBA Compliance Office. The program is designed to create a shared language of safety and performance across the organization.

- **Participants:** All players, coaches, general managers, and staff involved in scheduling or operational control must complete 6 hours of training annually.

- **Core Modules:**
  - **Circadian Physiology:** Detailed education on the Window of Circadian Low (WOCL) and how reaction times and muscle recovery drop during these periods.
  - **Fatigue Countermeasures:** Practical training on strategic napping, caffeine tapering, and the use of blue-light/red-light therapy during travel.
  - **Nutritional Timing:** Scheduling meals to assist in time-zone adjustment and metabolic stability.

- **Two-Year Update Cycle:** Programs must be updated every two years and resubmitted to the league to incorporate the latest advancements in sleep and sports science.

3.3.2. The Fatigue Risk Management System (FRMS)

Under 117.7 (Federal Aviation Administration, 2012), franchises would have to only operate outside of standard limits if they have an approved FRMS. This is a data-driven process used to continuously monitor and manage safety risks.

- **Biometric Monitoring:** Teams must use wearable technology to track "Sleep Opportunity" and "Readiness Scores."

- **Fatigue Reporting System:** A confidential portal allows players and staff to report excessive exhaustion without fear of reprisal.

- **Compliance Reporting:** Every duty period that exceeds limits by more than 30 minutes must be reported to the NBA Compliance Board within 10 days, including a description of the circumstances and corrective actions taken. This ensures that scheduling errors are identified and mitigated league-wide. The NBA would be entitled to conduct audits of the ADP's and procedures of every team.

3.4 Technical and hardware needs: The NBA A321neo fleet

Even though is still rumored, to ensure compliance with the mandatory rest standards, the NBA is moving toward a dedicated fleet of 13 VIP-configured Airbus A321neo aircraft. This transition is driven by player welfare data showing that NBA athletes spend more time flying than any other professional sports group (Boon, T., 2024**)**.

3.4.1. The Airbus A321neo: Technical advantages

The choice of the Airbus A321neo (New Engine Option), powered by Pratt & Whitney GTF engines, is a strategic decision to replace the idea of franchises having to deal with airlines and accomplishing equal air travel league-wide (Boon, T., 2024**)**.

- **Range:** With a range of up to 4,000 nautical miles (Airbus, 2025), the A321neo allows for non-stop transcontinental flights, eliminating the need for fuel stops that add "segments" and reduce the allowable duty period under Table B.

- **Cabin Altitude:** While standard jets operate at an 8,000 ft cabin altitude, the A321neo maintains a cabin altitude of less than 6,000 ft while cruising at 30,000 ft. This reduces the physiological strain on the body, improving heart rate variability and blood oxygen saturation (Airbus, 2025).

- **Active Humidification:** Integrated humidifiers maintain cabin moisture at 20-25% (Airbus, 2025). This is critical for preventing the dehydration that leads to muscle cramping and respiratory strain.



Figure 13. *Airbus A321 neo model.* (n.d.). Source: FlyRomans.

3.4.1.1. VIP interior configuration by Comlux

The interiors, completed by Comlux in Indianapolis (Boon, T., 2024**)**, are designed to function as Class 1 Rest Facilities as defined in part 117.3 (Federal Aviation Administration, 2012).

- **Capacity:** The aircraft is reconfigured from a 244 seat economy layout to a VIP layout of approximately 40–50 seats, accommodating the 18 player roster, coaching staff, and medical personnel (Boon, T., 2024**)**.



Figure 14. *Delta A321 neo first class configuration.* (n.d.). *Source: FromTheTrayTable.*

- **Lie-Flat Beds:** Every seat is a custom-designed lie-flat bed. Because the average NBA player stands at 6' 7" (2 meters), these beds are

significantly longer than standard commercial first-class seats to ensure full spinal extension.



Figure 15. *Nike design concept for NBA-themed aircraft livery.* (n.d.). Source: Corporate Jet Investor.

- **Circadian Lighting:** The cabin features customisable LED lighting that can simulate sunrise/sunset cycles based on the destination time zone, proactively adjusting the players' melatonin production before they land (McNulty, K., 2022).

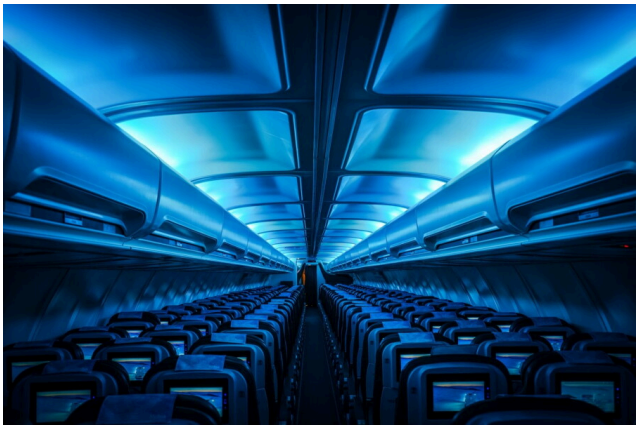

Figure 16. *Night lighting system in Airbus A321neo cabin.* (n.d.). Source: Starlux Airlines Media Center.

- **Cargo and Recovery:** The 1,826 cu ft cargo hold (Airbus, 2025) is designed to transport mobile medical suites, cold-immersion tubs, and

high-intensity training kits, allowing the aircraft to serve as a mobile training and recovery center.

By leasing these 13 aircraft through SMBC Aviation Capital and having them operated by Delta Air Lines (Boon, T., 2024**)**, the NBA ensures that every team, regardless of market size, has access to the same elite standard of recovery technology. This is the final piece of the puzzle that makes the legal mandates of Chapter 2 enforceable and effective.

4. TECHNICAL PROPOSALS

Under standard operational conditions, travel serves as a hidden physiological tax on the athlete's body. Rushing a roster of elite, high-mass athletes onto a pressurized, ultra-dry charter aircraft immediately following a high-intensity game introduces severe biological stressors. These include acute respiratory dehydration, systemic inflammation, and profound circadian disruption. When these travel stressors overlap with the body's natural sleep windows, the quality and architecture of human rest are systematically fractured (CTT Systems, 2023).

To eliminate this systemic "travel hangover" and protect the longevity of the league's human capital, this section introduces two comprehensive technical proposals. Rather than viewing transit as a passive blank space between games, these proposals treat the aircraft cabin and flight path as an active, highly engineered recovery device.

- The first proposal explores a Hardware System Solution: Active Cabin Humidification.

  This initiative directly targets the hostile microclimate of standard aircraft cabins by mechanically injecting controlled moisture into the air. By elevating relative humidity to optimal levels, this technology stabilizes the athlete's autonomic nervous system, suppresses sleep-disrupting micro-arousals, and protects baseline cellular hydration.

- The second proposal addresses a Logistical Strategy Solution: Circadian-Optimized Routing.

  This operational framework shifts flight scheduling parameters away from traditional shortest-path geographical tracking. Instead, it subordinates flight dispatch timing to human chronobiology, ensuring that transit windows never infringe upon the body's critical, deep-night recovery phases.

Together, these proposals establish a unified, scientifically validated environment where flight comfort is mathematically optimized, travel fatigue is neutralized, and athletic readiness is actively sustained.

4.1. Humidifying cabin to improve rest

4.1.1. Why humidity is needed in aircrafts

In standard commercial aviation operations, passenger cabin environments suffer from extreme dryness, with relative humidity (RH) routinely plunging below 10%, and frequently hovering between 2% and 5% on long-haul routes. This environmental anomaly is a direct consequence of the thermodynamic realities of high-altitude flight. Modern aircraft environmental control systems (ECS) continuously draw outside air from the engine compressor stages (bleed air) or dedicated air scoops. At typical cruising altitudes between 30,000 and 41,000 feet, the ambient atmospheric air is subjected to sub-zero temperatures (ranging from -40°C to -60°C). At these extreme temperatures, the air's moisture-holding capacity is practically non-existent, resulting in absolute humidity levels near zero. When this freezing, ultra-dry air is compressed, heated, and pumped into the passenger cabin, its relative humidity drops to levels drier than the Sahara Desert (CTT Systems, 2023).

From a physiological perspective, exposing elite athletic bodies to an environment with less than 10% RH for multiple hours triggers immediate and severe systemic degradation.

- **Impairment of the Mucociliary Escalator:** The human respiratory tract relies on a delicate layer of mucus and microscopic cilia (the mucociliary escalator) to trap foreign particles and pathogens. Ultra-dry air rapidly dehydrates this mucosal lining, causing the mucus to thicken and the cilia to become paralyzed. This leads to immediate upper respiratory airway irritation, throat inflammation, and a significant increase in vulnerability to airborne viral and bacterial infections, a critical risk factor for professional sports teams traveling continuously (CTT Systems, 2023).

- **Accelerated Transepidermal Water Loss (TEWL):** The human skin and exposed membranes act as a boundary layer. In an environment with an extreme moisture deficit, water molecules are aggressively pulled from the body via evaporation. This accelerated transepidermal water loss occurs passively and continuously without the athlete realizing it. A standard individual can lose up to several hundred milliliters of water during a multi-hour flight purely through respiration and cutaneous evaporation (CTT Systems, 2023).

- **Blood Viscosity and Cardiovascular Stress:** As passive dehydration strips water from the extracellular fluid compartment, plasma volume decreases. This directly leads to an increase in blood viscosity (hemoconcentration). Thicker blood obligates the cardiovascular system to work harder to maintain systemic oxygen delivery, lowering Heart Rate Variability (HRV) and elevating baseline resting heart rates (CTT Systems, 2023).

- **Ocular and Epithelial Distress:** The tear film protecting the cornea evaporates at an accelerated rate, causing ocular micro-abrasions, redness, and visual fatigue. Simultaneously, the skin loses its elasticity, creating localized physical discomfort that acts as a continuous somatic stressor, keeping the central nervous system in a heightened state of alertness (CTT Systems, 2023).

4.1.2. Humidity improves rest

Sustaining an actively managed microclimate with an optimized relative humidity of 20% to 25% inside an aircraft cabin acts as a powerful physiological countermeasure against travel-induced exhaustion. Air moisture is not merely a matter of comfort, it is a primary variables that dictates the quality, depth, and architecture of human sleep stages.

When the cabin air is enriched with moisture, the physiological mechanisms governing rest are optimized through several interconnected pathways (CTT Systems, 2023).

Suppression of Cortical Micro-Arousals: Sleep fragmentation frequently occurs due to subliminal somatosensory inputs. In a dry cabin, the brain is constantly bombarded with subtle distress signals: a parched throat, a dry cough, itchy skin, or burning eyelids. While these inputs might not fully wake an athlete, they trigger "micro-arousals", brief shifts from deep sleep to light sleep that tear apart the continuity of rest. Maintaining 20%+ RH eliminates these physical triggers, allowing the athlete to remain in undisturbed, consolidated sleep cycles (CTT Systems, 2023).

Prolongation of Stage 3 Slow-Wave Sleep (SWS): Stage 3 sleep, or deep delta sleep, is the holy grail of athletic recovery. It is during this stage that the pituitary gland releases massive surges of Human Growth Hormone (HGH) (Samuels, C. H., 2012). HGH is entirely responsible for cellular repair, muscular tissue reconstruction, protein synthesis, and the reduction of systemic inflammation caused by high-intensity physical exertion. By shifting the autonomic nervous system into a relaxed parasympathetic state via physical comfort, active humidification directly maximizes the time spent in SWS.

Optimization of Rapid Eye Movement (REM) Sleep Architecture: REM sleep is critical for cognitive restoration, motor skill consolidation, and tactical memory processing. Respiratory stability, unimpeded by dry, inflamed airways, ensures consistent blood oxygen saturation levels throughout the night. This stability prevents

transient nocturnal hypoxia, ensuring the brain can complete its full, natural sequence of REM cycles without interruption (Alhussain, M. H., Macdonald, I. A., & Taylor, J. A., 2021).

Because active humidification preserves plasma volume and prevents blood viscosity from spiking, athletes step off the aircraft without the systemic "hangover" associated with dehydration. This maintains healthy cellular hydration status, optimal joint lubrication, and normal metabolic function, dramatically shortening the recovery window required before returning to peak athletic performance.

4.1.3. Humidifying NBA aircrafts

To transform an NBA team's travel asset from an exhausting transit vehicle into an elite, mobile recovery device, franchises cannot rely on standard commercial charter configurations. Implementing an effective humidification strategy across a dedicated fleet requires specialized aerospace engineering and integration:

The selected fleet must be retrofitted with advanced, aviation-certified mechanical humidification systems (engineered by specialty completions entities such as Comlux). These systems utilize ultra-pure, treated water tanks to actively inject precise amounts of vaporized moisture into the main cabin air distribution ducts. Advanced closed-loop sensor arrays placed throughout the VIP cabin continuously sample the air, dynamically modulating water output to maintain a steady 20% to 25% RH, regardless of flight altitude or duration.

Active humidification becomes drastically more effective when paired with modern airframe technology, such as the Airbus A321neo (Airbus, 2025). Older aircraft families, such as the aging Boeing 757 fleets traditionally utilized in sports charters, cruise with a high cabin altitude of roughly 8,000 feet. This high altitude lowers barometric pressure and thins the air, which aggressively accelerates water evaporation from the human body. The A321neo features an advanced composite and metallic fuselage structure that allows the ECS to maintain a much lower cabin altitude, frequently below 6,000 feet while cruising at a true altitude of 30,000 feet.

This higher cabin pressure reduces physical stress on the lungs and works in perfect harmony with the active humidifiers to trap moisture within the athletic body (Airbus, 2025 July 15).

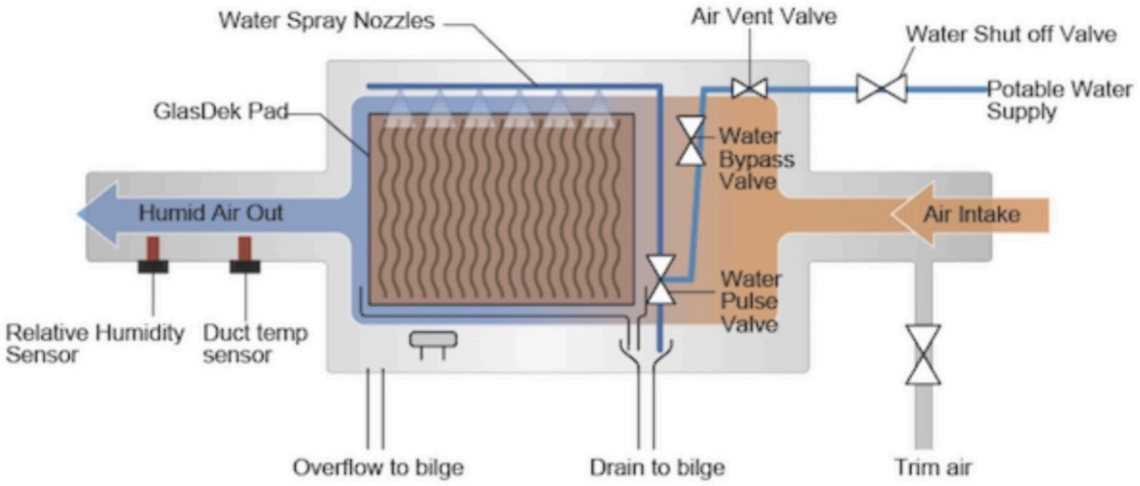

Figure 17. *Aircraft humidification system in commercial aviation.* (n.d.). Source: Aircraft Interiors International.

- **Corrosion Control and Structural Airframe Protection:**
  A primary reason commercial airlines avoid high cabin humidity is the severe risk of structural damage. Moisture in an aircraft cabin tends to pass through the insulation blankets, condensing on the freezing cold outer aluminum skin of the fuselage. Over time, this causes hidden structural corrosion and can short-circuit electrical routing (Niu, M. C. Y., 1999). To safely execute 25% humidity on an NBA fleet, the aircraft must be outfitted with advanced Zonal Drying Systems. These systems use lightweight desiccant rotors to actively extract moisture from the narrow crown space between the cabin ceiling and the outer aircraft skin. This protects the airframe's integrity while keeping the internal passenger envelope highly humidified for the athletes.

- **Preservation of Elite Athletic Performance Capital:**
  For a roster whose average athlete stands at over 6 feet 6 inches and weighs 220 pounds, muscle belly density and joint capsule volume are immense. Dehydration in these large muscle masses leads directly to myofascial

tightness, a higher incidence of acute muscle strains, and reduced explosive power. Active cabin humidification acts as an invisible, continuous physical therapy treatment during flight, ensuring that players land with their muscles supple, joints lubricated, and systemic inflammatory markers controlled.

4.2. Optimal Routes to Ensure Rest

4.2.1. Primary routes vs. Comfortable routes

When managing the complex logistics of an 82-game seasonal calendar, flight dispatchers and team operations directors must evaluate flight path trajectories and departure times through two entirely separate, conflicting operational philosophies :

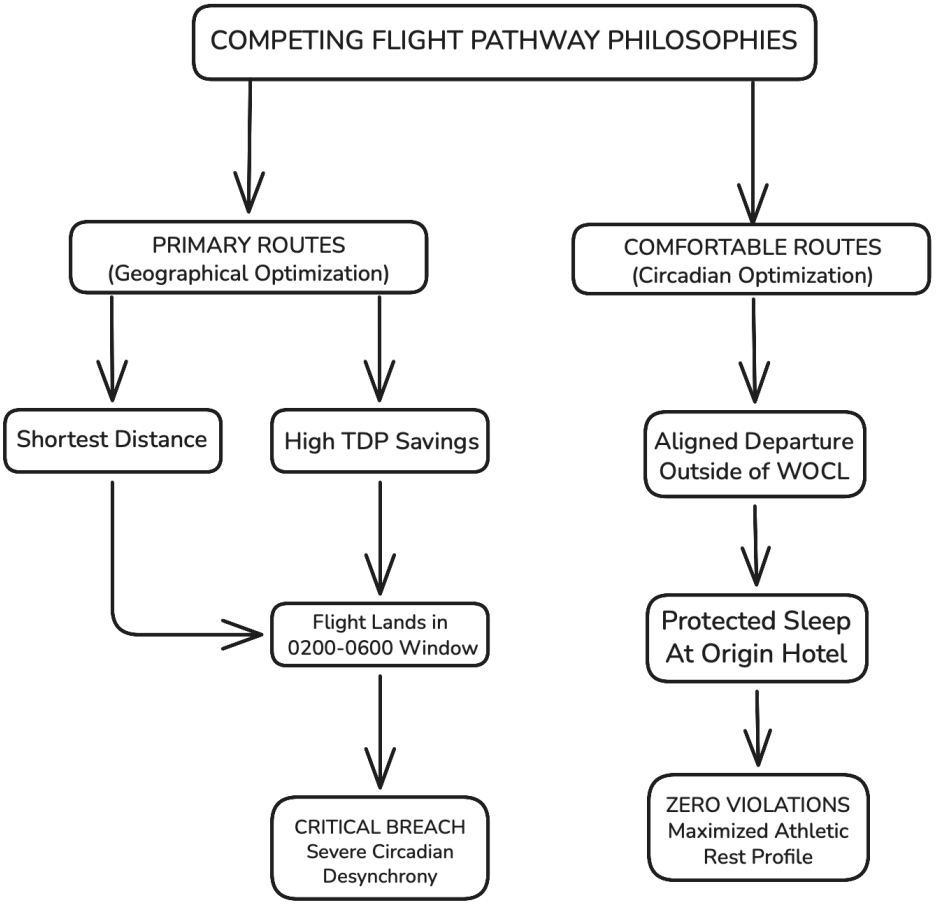

Figure 18. *Flight pathway philosophies framework.* (2026). Source: Own elaboration.

- **Primary routes (Geographically optimized):**

  This routing strategy is governed by pure spatial and economic efficiency. It utilizes advanced flight planning software to calculate the absolute shortest distance between the departure airport and the destination airport, typically utilizing Great-Circle tracks adjusted for prevailing high-altitude jet streams (Sampaio, J., Lago, C., & Gonçalves, B., 2019). The primary objective is to minimize fuel burn and reduce total Travel Duty Period (TDP) hours by getting the aircraft from Point A to Point B as fast as humanly possible.

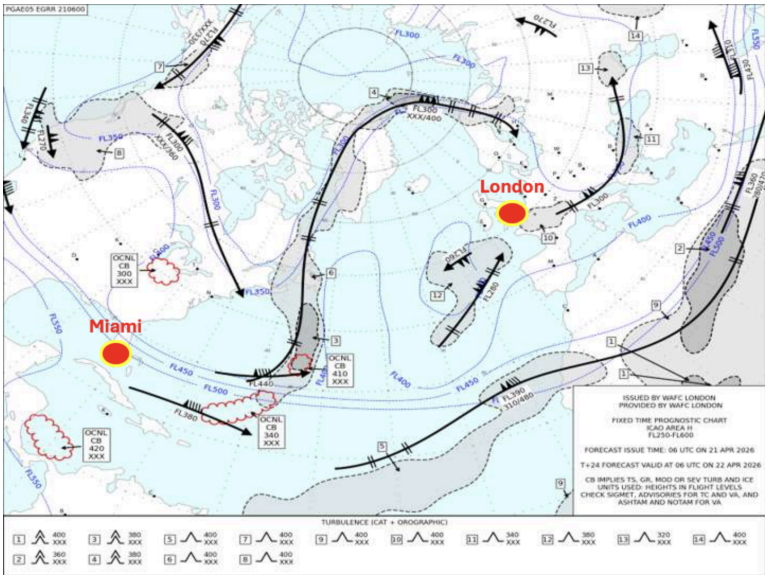

Figure 19. Wind forecast for Miami–London flight route. (n.d.). Source: National Weather Service Aviation Safety Graphics.

- **Comfortable routes (Circadian-optimized):**

  This routing strategy completely subordinates spatial efficiency to human chronobiology and sleep medicine. Instead of looking purely at a map, Comfortable Routing looks at the internal biological clocks of the passengers. It dynamically alters departure times, accepts longer ground-handling holds, and will intentionally select longer, less direct air routing if it means avoiding critical biological vulnerability windows, thereby ensuring the continuity of human sleep (Sampaio, J., Lago, C., & Gonçalves, B., 2019).

4.2.2. Positive and negative perspectives

Evaluating primary routes (The Shortest-Path logic)

- **The positive perspective (TDP compression):**
  The primary benefit of selecting a Primary Route is the direct reduction of time spent inside the aircraft. Even in a highly modified VIP cabin, an aircraft is still a confined, pressurized capsule characterized by continuous low-frequency engine vibrations, background white noise, and altered pressure. By utilizing the fastest, most direct air corridors, the team minimizes its total Travel Duty Period (TDP). This reduces the sheer physical wear-and-tear of flight, limits the duration of sitting, and theoretically gets the team to their destination city's ground infrastructure rapidly (Sampaio, J., Lago, C., & Gonçalves, B., 2019).

- **The negative perspective (The WOCL arrival disaster):**
  The critical flaw of Primary Routing is its complete blindness to human biological time. In an NBA context, away games typically conclude around 10:00 PM or 10:30 PM local time. If a team rushes to the airport to take a direct, high-speed 2.5 hour Primary Route crossing time zones westward, the flight will frequently land, and the team will check into their destination hotel, precisely between 02:00 AM and 06:00 AM.

This timeframe directly breaks the Window of Circadian Low (WOCL), the period during the 24 hour cycle when human core body temperature drops to its lowest, melatonin secretion peaks, and the brain enters its state of maximum sleepiness and vulnerability. Forcing an athlete to navigate airport, baggage claims, and hotel check-ins during the WOCL induces profound circadian desynchrony. It shatters the architecture of their remaining sleep window, spikes cortisol (stress hormone) levels, and leaves the athlete physically and mentally impaired for days (Smith, R. S., Efron, B., & Mah, C. D., 2010).

Evaluating comfortable routes (The Circadian-Aligned logic)

- **The positive perspective (Protected biological sleep):**
  Comfortable Routes treat the athlete's internal clock as an absolute restriction. Instead of flying immediately after a late-night game, a Comfortable Route strategy implements a Next-Morning Departure. The team is directed immediately from the arena to a local hotel in the game-origin city. This guarantees that the athletes are safely tucked into a stationary bed before the WOCL begins at 02:00 AM.

  The athletes complete a full, natural, uninterrupted 8-hour physiological night's rest free from the noise, altitude, and vibrations of flight. The flight is then scheduled to depart the following morning at 10:00 AM, entirely within the peak daytime alertness window. By aligning transit with the body's natural waking hours, travel fatigue is effectively neutralized, circadian rhythms remain synchronized, and the risk of soft-tissue injuries drops dramatically (Smith, R. S., Efron, B., & Mah, C. D., 2010).

- **The negative perspective (The compounded schedule crunch):**
  The operational drawback of the Comfortable Route is the significant expansion of the team's logistical footprint and the compression of their subsequent preparation window. Remaining overnight at the origin city requires booking additional hotel room blocks, coordinating late-night check-outs, and altering airport handling slots.

  More importantly, by utilizing the subsequent morning for travel, the team spends a massive block of daylight hours in transit. This creates a severe time crunch upon arrival at the destination city. The daylight hours that would normally be used for a comprehensive Game Duty Period (GDP), including critical on-court team practices, tactical video analysis sessions, extensive physical therapy treatments, and standard morning shootarounds, are entirely consumed by airport logistics and flight time. This can leave a head coach

with insufficient time to tactically prepare the team before the next game's tip-off.

5. DOMAIN-DRIVEN DESIGN (DDD) IN NBA COMPLIANCE

To manage the complexity of merging federal aviation regulations with the logistical problems inherent in a NBA season, this project uses the Domain-Driven Design (DDD) (DDD Crew, 2025). This approach shifts the focus of software development away from purely technical infrastructure and places it on the "domain", the specific set of rules, behaviors, and constraints that rule NBA travel and player welfare. By adopting DDD, the software acts as a direct reflection of the legal and physiological reality described in the FAA Part 117 standards. This ensures that the code, the user interface, and the decision-making processes of franchises are all aligned under a single logic, preventing the fragmentation of data and the misunderstanding of critical safety limits.

The implementation of DDD begins with the establishment of a "Language", a shared vocabulary that bridges the gap between software engineers, coaching staffs, and league compliance officers. In this system, terms such as the "Athletic Duty Period" (ADP), Game Duty Period (GDP) or Travel Duty Period (TDP), are the fundamental building blocks of the system (ArjanCodes, 2024). This linguistic synchronization ensures that when the audit tool identifies a violation, the nature of that breach is immediately understood by all stakeholders, allowing communication between the "technical engine" of the audit and the "human engine" of team management.

Strategic design within this domain is further achieved through the creation of "Bounded Contexts," which separates the system into manageable isolated areas of responsibility. For instance, the Regulatory Context acts as the definitive source of truth for FAA limits and Table B parameters, while the Scheduling Context focuses on the practical ingestion of the 82-game calendar. By keeping these areas separate, the system ensures that changes to one, such as a league-wide modification of the season length, do not corrupt the biological rules governing player rest. This separation allows the audit tool to function as a high-precision instrument,

cross-referencing individual duty events against the policy layer without the risk of logic being breached between unrelated departments.

On a tactical level, the system models the NBA environment through the use of Entities, Value Objects, and Aggregates. A "Team" or a "Season Schedule" is treated as an Entity with a unique identity that persists throughout the year, while specific data points like a "GPS Coordinate" or a "Duty Limit" are modeled as Value Objects, defined by their attributes rather than a unique ID. These components are groped by "Aggregates," such as the Audit Report, which serves as the root object for the user interface. When the audit tool runs, it treats the entire schedule as a unified unit of logic, ensuring that every calculation is legally defensible (ArjanCodes, 2024).

Ultimately, the goal of incorporating Domain-Driven Design is to create a living document of the league's compliance status. The code and the UI do not simply process data, they support a vision where player health is a non-negotiable legal requirement. The audit tool, through its flags and visualizations, provides a window into this domain, allowing franchises to simulate "what-if" scenarios and proactively adjust their mobility strategies. By anchoring the software in the rigorous philosophy of DDD, the project ensures that the transition of the NBA into a flight crew standard operation is supported by an architecture that is reliable.

5.1. Introduction and strategic vision

The primary objective of this software system is to build an automated, enterprise-grade auditing and compliance engine that treats professional sports travel with the precision of commercial aviation safety standards. By mapping the regulatory frameworks of 14 CFR Part 117 (Federal Aviation Administration, 2012) directly onto the itinerary of an 82 game NBA regular season, the software shifts the paradigm from subjective, coach driven "load management" to an objective, legally based framework of safety and optimal physiological recovery.

To build a codebase capable of scaling from simple verification to complex bio-mathematical optimization, the technical architecture utilizes Domain-Driven

Design (DDD). In complex logistical software, engineering teams frequently fall into the trap of the Anemic Domain Model, where business entities are treated as basic data-holding containers, and the business logic is scattered across detached utility scripts.

DDD strictly avoids this by ensuring that the actual rules of aviation safety and athletic rest are encapsulated inside the core objects themselves. This architecture completely decouples the deep, complex business rules from external infrastructure mechanisms, such as physical CSV file parsers, user interface rendering engines, and data analytics export engines.

5.2. Bounded context and the ubiquitous language.

In Domain-Driven Design, complex systems are broken down into logical boundaries where terms have a specific, non-ambiguous meaning (ArjanCodes, 2024). This system is entirely contained within the Audit Context.

Audit context
Ubiquitous language

- ADP (Athletic Duty Period) = Total daily continuous duty window
- GDP (Game Duty Period) = Pure sporting/athletic components
- TDP (Travel Duty Period) = Logistical/transit components
- Compliance Rules = Regulatory thresholds from rules.yaml
- Compliance Flags = Specific algorithmic infractions from flags.csv

Every software class, database entity, variable name, and technical conversation must rigidly adhere to the Ubiquitous Language defined below to bridge the gap between technical developers and sports performance stakeholders:

Athletic Duty Period (ADP): The overall continuous time window during which an athlete or staff member is under team operational control for a given day.

Game Duty Period (GDP): The total portion of an ADP dedicated exclusively to athletic, media, and physical preparation tasks.

Travel Duty Period (TDP): The total portion of an ADP dedicated to logistical movement, security clearances, and airborne transit.

Compliance Rule: A specific, parameterized regulatory constraint sourced from the system's rule matrix that cannot be breached.

Compliance Flag: A high-severity alert domain object instantiated dynamically when the operational data violates a specific ComplianceRule.

5.3. Domain structure: Value objects and entities.

The domain layers are cleanly separated into immutable descriptors (Value Objects) and identity-driven state-machines (Entities). This separation ensures safety, predictability, and highly maintainable business logic during algorithmic execution.

Value objects (Immutable Concepts)

Value Objects do not possess an internal database or operational ID. They are entirely defined by the equality of their attributes. If an attribute changes, an entirely new instance of the Value Object must be created (ArjanCodes, 2024).

a. ComplianceRule

Purpose: Models an unchangeable safety limitation read from the rules.yaml file.

Attributes: Code (String),team,period_id (String), period_type(String), related_period_ids (String), source_file (String), source_row (int) ,message (String), metadata (String)

Behavior: Contains the internal boolean checking logic .evaluaterules(periods: list[DutyPeriod], config: MonitorConfig) -> list[Flag) validate_rule_configs(config.rules) to determine infractions out-of-the-box.

b. ComplianceFlag

Purpose: The domain-level result representing a specific, audited scheduling failure. This flags are checked inside the same function that checks the rules.

c. TimeWindow

Purpose: Encapsulates a explicit start and end time to handle messy temporal calculations across midnight transitions.

Attributes: enabled (bool), params (dict[str, int]).

Behavior: Provides core mathematical methods such as ._rolling_adp(periods: list[DutyPeriod],rule: RuleConfig,) -> list[Flag]: days = rule.params["window_days"] limit = rule.params["limit_minutes"])

Entities (Identity-Driven concepts)

Team:

- **Technical Description:** The Team component represents an individual NBA franchise within the system. It possesses a permanent, unique conceptual identity (e.g., a three-letter UUID or franchise code like LAL or BOS) that remains completely unchanged throughout the entire execution lifecycle.

- **Domain Behavior:**

  While the team's identity is static, its internal state is dynamic. The Team entity acts as the primary container that holds and manages its respective season itineraries. In the context of the audit, the system queries individual teams to evaluate their specific exposure to travel strain and regulatory violations.

Schedule:

- **Technical Description:**

  The Schedule component is a complex entity that represents the chronological timeline of a specific team across the season. It is uniquely identified by its relationship to its parent Team and the specific competitive year.

- **Domain Behavior:**
  The Schedule is composed of a sequential chain of Athletic Duty Periods (ADPs), which are further divided into Game Duty Periods (GDP) for athletic events and Travel Duty Periods (TDP) for logistical transits. It is classified as an entity because it undergoes structural mutation: it is initialized as raw ingested data from the input CSV file, processed through the audit pipeline, and updated dynamically as ComplianceFlags are attached to its specific daily segments.

5.4. The agreggate root: Architecting the chronological Work Window.

A critical part of DDD is the Aggregate Pattern, which groups closely associated domain entities into a single cohesive unit to enforce strict business rules. Modifying a sub-component without validating the overall group would cause a corrupt application state (DDD Crew, 2025).

The Aggregate Root: AthleticDutyPeriod (ADP)
The AthleticDutyPeriod acts as the Aggregate Root for a team's single operational day. External code cannot access or modify the underlying travel times or practice times directly, all updates must go through the ADP interface.

The ADP aggregate contains and directly governs two deeply intertwined internal entities:

a. **GameDutyPeriod (GDP)**

This entity tracks the precise sequential list of all physical and technical requirements for the players.
InternalDataStructures:period_id, period_type, start, end, start_utc, end_utc, effective_start_utc, effective_end_utc, adp_minutes, buffer_pre_minutes, buffer_post_minutes, opponent, home_away, host_city, origin_city, destination_city, notes, source_file, source_row.
Operational Scope: Each GDP inside the ADP has a rigid TimeWindow.

b. TravelDutyPeriod (TDP)

This entity tracks the logistical and transport actions needed to position the team in the next game city. The TDP uses the same attributes as the GDP.

Operational Scope: Modeled exactly on the FAA's strict Deadhead Transportation guidelines: every single minute spent as a passenger in transit is calculated as active, exhausting duty time, never as rest. The TDP serves as the primary metric for quantifying the fatigue exposure of an NBA team during transit. Unlike traditional flight duration, which only measures time in the air, the TDP implemented in this study adopts a "Human Factors" approach, calculating the total operational burden placed on the team from the moment they initiate travel preparations until they reach their destination.

The calculation of the TDP follows a three-stage logic designed to mirror the operational rigor of commercial aviation safety standards:

Geodesic distance and block time modeling

The foundation of the TDP is the Great-Circle Distance between the team's origin and destination arenas. By calculating the shortest path between these coordinates, the model estimates the "Block Time", the time an aircraft spends from moving under its own power at the departure gate until it reaches the arrival gate. To ensure realism, the model differentiates between two flight profiles:

- **Standard Routes:** Applied to long-haul journeys, these account for standard cruise speeds and typical operational conditions.

- **Ultra-Short Routes:** Applied to distances below a specific threshold (250 miles), where the model adjusts for different climb and descent efficiencies, recognizing that the "flight" portion is significantly more fragmented for shorter city-pairs.

Incorporation of aeronautical performance penalties

A core innovation of this audit tool is the integration of a "Climb/Descent Penalty". Regardless of the flight length, the model acknowledges that every flight involves unavoidable ground-to-air transition phases where the crew and passengers are subjected to cabin pressure adjustments and operational checklists. By adding a constant duration to the flight time, the model captures the "hidden" fatigue costs that are often ignored in simple time-based scheduling but are mandatory in aeronautical fatigue management.

Taxi and ground handling buffer

The final component of the TDP is the Taxi Buffer. This variable accounts for the ground operations necessary to move the team between the aircraft and the terminal (FBO - Fixed Base Operator). Even if the flight is short, the operational "duty" does not cease until the team has fully deplaned and cleared the tarmac. This ensures that the TDP reflects a realistic End-to-End Operational Window.

Conceptually, the tool arrives at the total TDP using the following logic:

$$\text{TDP} = (\text{Flight Time derived from Distance}) + (\text{Standardized Transition Penalty}) + (\text{Ground Handling Buffer})$$

This methodology transforms the travel schedule into an Operational Load Metric. By calculating the TDP this way, the audit tool allows us to flag specific routes where the cumulative duty period is excessively long or shortens the team's recovery window. It provides a data-driven justification for why certain back-to-back schedules, even if they seem logistically "possible," are inherently flawed from a human-performance and safety-risk perspective.

Invariant (Strict rule of system integrity)

The primary responsibility of the AthleticDutyPeriod Aggregate Root is to defend its Invariant, a rule that must remain true at all times to maintain a mathematically valid state. The aggregate strictly enforces the following mathematical invariant:

$$\mathbf{ADP_{Total\ Duration} = \sum GDP_{Event\ Durations} + \sum TDP_{Transit\ Durations}}$$

If a user or an optimization algorithm attempts to append a 45-minute treatment session to the end of the GameDutyPeriod, the Aggregate Root automatically intercepts the command, shifts the overall boundary window of the AthleticDutyPeriod, and immediately re-evaluates if the newly extended window breaks the daily working limits defined by Table B of the FAA regulations.

5.5. Domain services: Executing the compliance audit engine.

In DDD, actions that represent core business logic but do not naturally belong inside a single entity or object of value are isolated into Domain Services. Domain Services are stateless, highly performant operations that coordinate multiple domain components.

Audit service

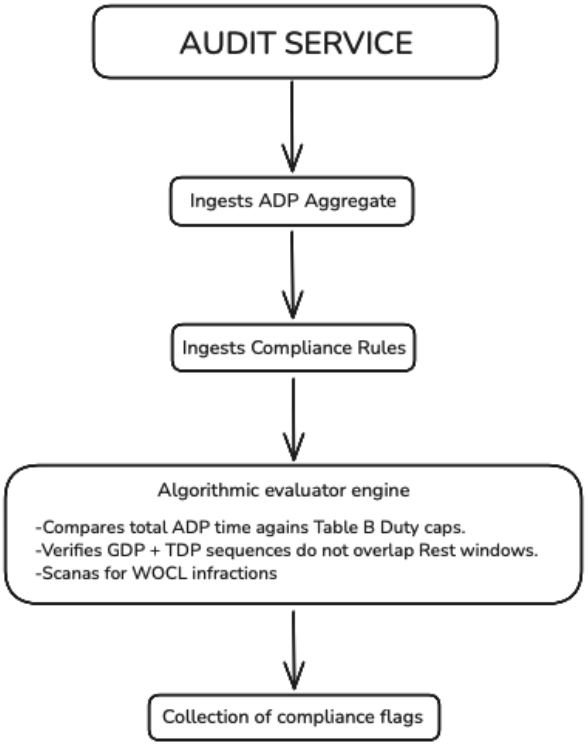

Figure 20. *Audit service operational pathway model.* (2026). Source: Own elaboration.

Algorithmic execution workflow:

1. The application layer passes an instance of an AthleticDutyPeriod aggregate and a collection of ComplianceRuleobjects to the AuditService.
2. The service executes an internal pipeline of checks:
    - It measures the overall duration of the AthleticDutyPeriod against the specific hourly limits allowed based on its exact starting hour.
    - It scans the timeline to ensure that the intersection of the TravelDutyPeriod and the deep-night hours does not violate the Window of Circadian Low (WOCL) boundaries.
3. If a threshold is crossed, the service instantiates a ComplianceFlag object embedded with the precise increase of the infraction (e.g., "ADP exceeded maximum allowed Table B limit by 74 minutes").
4. The service outputs these flags to be processed by the reporting infrastructure.

5.6. Application and infrastructure layers.

To keep the model clean and decoupled from technical systems, the codebase is structured around clear boundaries. The file parsing, user interface layout, and metric generation live strictly in the Infrastructure Layer, completely separated from the Domain Layer.

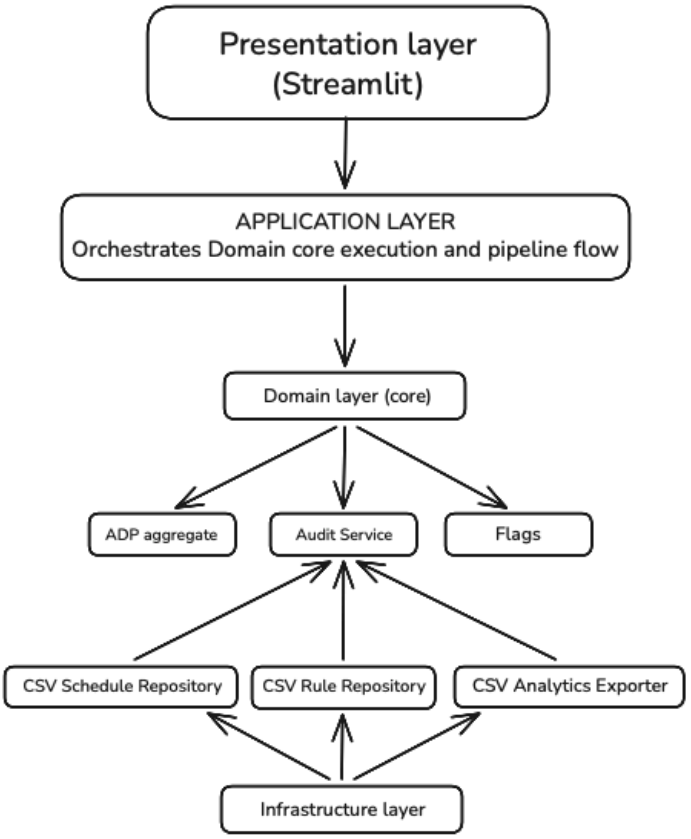

Figure 21. *Infrastructure system schematic.* (2026). Source: Own elaboration.

A. Infrastructure repositories (Data ingestion)

The domain layer defines interface contracts (Ports) for loading data, but the technical implementation (Adapters) lives in the infrastructure layer:

- **CsvRuleRepository:** This component handles the input/output mechanics of reading the physical rules.yaml file from disk. It parses the rows, handles data type casting, maps string fields to appropriate Enums, and constructs the memory-safe collection of ComplianceRule objects.

- **CsvScheduleRepository:** This component opens and streams the schedule.csv dataset. It maps column structures representing games, flights, and travel segments into their respective domain representations, properly building out the nested GameDutyPeriod and TravelDutyPeriod models before assembling them inside the AthleticDutyPeriod aggregate root.

B. Presentation layer (The Streamlit user interface)

- Streamlit Web Engine: The interactive dashboard functions purely as a rendering client of the architecture. It triggers the application layer pipelines, fetches audited AthleticDutyPeriod collections for chosen teams, and parses the returned ComplianceFlag collections into intuitive, highly visual warning blocks on the user's web browser. The Streamlit code contains zero business logic or rule calculations, it is purely responsible for display.

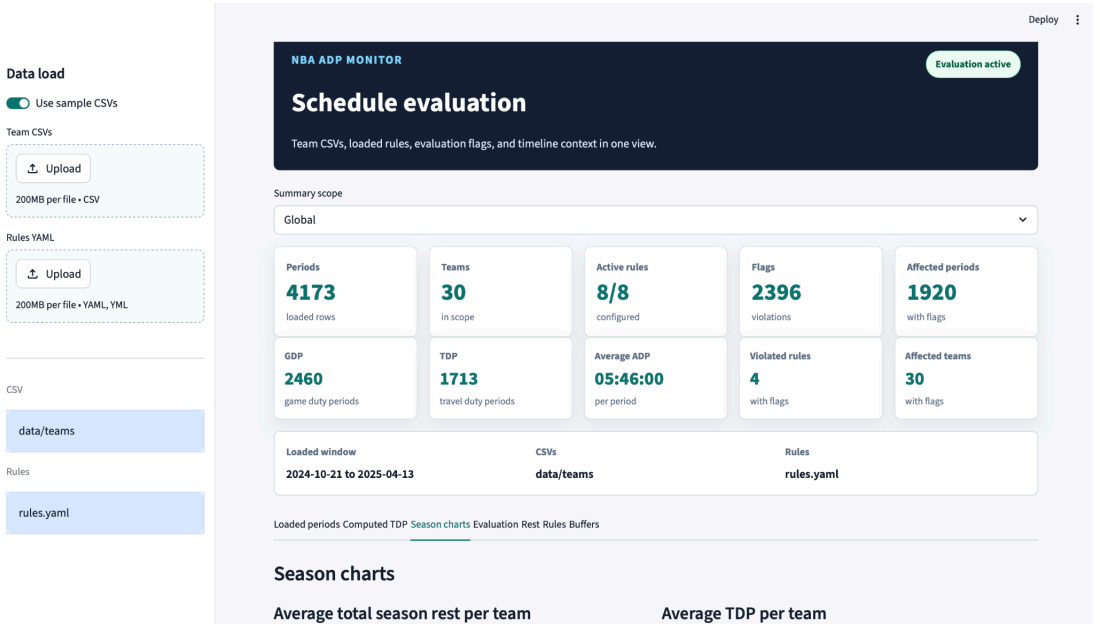

Figure 22. *Streamlit UI for NBA ADP monitoring system.* (2026). Source: Own elaboration.

C. Analytical infrastructure module (Statistical data export)

To address the analytical requirements of the project and evaluate season-wide trend lines, a dedicated component named CsvAnalyticsExporter is integrated into the infrastructure layer.

- **Execution profile:** Once the AuditService finishes processing a team's schedule, the application layer directs the CsvAnalyticsExporter to process the newly generated collection of ComplianceFlags.

- **Data layout:** This module flattens the rich, object-oriented structure of the domain flags into an optimized, highly uniform relational CSV format. The resulting output schema contains clean data fields tailored for direct ingestion into visualization packages.

- **Strategic value:** By outputting this clean, tabbed analytical text file, the system provides data and performance analysts with the exact metrics needed to generate statistical graphics. Users can construct trend graphs tracking the frequency of infractions over the course of the season, build comparative bar charts highlighting which franchises are exposed to high-fatigue schedules, and correlate rule violations directly with real-world player injury trends.

Analytical Output Schema=

{TeamID, Date, ADPTotalDuration, FlagType, RuleBreached, AverageMinutes}

- **Strategic value:** By outputting this clean, tabbed analytical text file, the system provides data scientists and performance analysts with the exact metrics needed to generate statistical graphics. Users can construct trend graphs tracking the frequency of infractions over the course of the season, build comparative bar charts highlighting which franchises are exposed to high-fatigue schedules, and correlate rule violations directly with real-world player injury trends.

6. ANALYSIS OF AUDIT RESULTS AND OPERATIONAL IMPACT

6.1. Introduction to the analytical framework

The objective of this chapter is to present and evaluate the outputs generated by the custom-developed audit tool, which assesses the intersection of NBA logistical schedules and commercial aviation fatigue standards. To ensure the credibility and clarity of the findings presented in this analysis, it is essential to establish the foundational parameters upon which these results are built:

- **Data provenance**: The empirical foundation for this study is derived from the official 2024-2025 NBA regular season game logs obtained from Basketball Reference (Sports Reference LLC, 2025). This dataset provides the precise temporal and geographic framework necessary to map the league's high-frequency travel demands.

- **Flight simulation methodology**: While game schedules are historically accurate, the flight trajectories utilized in this audit are modeled simulations. These flight paths were calculated based on real-world aeronautical flight times between game locations, then allocated according to a proposed optimized scheduling logic to simulate how teams should be managed under safer operational standards.

- **Visualization and reporting**: All graphical representations, comparative metrics, and performance indicators featured in this chapter have been synthesized directly from the audit tool’s processing engine. These visualizations serve as the primary evidence for evaluating the "fatigue penalty" and operational inefficiencies within the current league structure.

6.2. Scope of the analysis

By integrating the game-time accuracy of Basketball Reference with a synthetic, optimized flight-allocation model, this analysis highlights the discrepancy between

current travel practices and the fatigue-mitigation protocols outlined in earlier chapters. The following results provide a quantitative basis for identifying "Fatigue Hotspots" instances where the existing schedule forces travel cycles that exceed the safety thresholds observed in professional aviation. By analyzing these results, we aim to offer a scalable framework for future logistical planning in professional basketball.

6.3. Results analysis

6.3.1. Duty period season results

Season mileage by team:

The analysis of seasonal travel volume, as detailed in table 3, introduces the geographical and spatial dimension of professional sports logistics, exposing a massive disparity in total distance traveled across the league. Over the course of a 29-route baseline schedule, the total mileage is heavily skewed by a franchise's regional location, creating distinct operational realities based entirely on geography.

The data reveals that Pacific and Northwest franchises carry an enormous physical transit burden. The Portland Trail Blazers stand out as the most heavily traveled team in the league, accumulating 50,575.1 total miles with a staggering average of 1,744.0 miles per route. They are followed closely by a dense West Coast cluster including the Golden State Warriors (49,116.7 miles), Sacramento Kings (47,747.8 miles), LA Clippers (45,474.1 miles), and LA Lakers (45,314.6 miles).

Conversely, teams located within the dense geographical footprint of the Midwest and Central regions enjoy a massive travel reduction. The Indiana Pacers log the lowest seasonal travel volume in the dataset with 25,310.0 total miles, averaging just 872.8 miles per route, which is nearly half the total distance endured by Portland. Similarly compressed mileage figures are observed for the Memphis Grizzlies (25,574.6 miles), Chicago Bulls (25,773.4 miles), and Milwaukee Bucks (26,541.3 miles).

team	total_miles	avg_miles	route_count
POR	50575.1	1744	29
GSW	49116.7	1693.7	29
SAC	47747.8	1646.5	29
LAC	45474.1	1568.1	29
LAL	45314.6	1562.6	29
MIA	39596.8	1365.4	29
PHX	39062.1	1347	29
BOS	38368.2	1323	29
UTA	37272.2	1285.2	29
ORL	34922	1204.2	29
BKN	34077.7	1175.1	29
NYK	34067.8	1174.8	29
PHI	32686.4	1127.1	29
SAS	31946.3	1101.6	29
DEN	31410.7	1083.1	29
WAS	30895.5	1065.4	29
TOR	30586.9	1054.7	29
HOU	30366.8	1047.1	29
NOP	29728.5	1025.1	29
CHA	29013.6	1000.5	29
MIN	28757.5	991.6	29
DAL	28088.3	968.6	29
ATL	27777.3	957.8	29
CLE	27640.7	953.1	29
DET	27365.8	943.6	29
OKC	27088.5	934.1	29
MIL	26541.3	915.2	29
CHI	25773.4	888.7	29
MEM	25574.6	881.9	29
IND	25310	872.8	29

Table 3. *Table of miles traveled by team 24–25 season.* (2026). Source: Own elaboration.

Average TDP per team:

The analysis of the average Travel Duty Period (TDP) across all NBA franchises reveals a clear stratification in the operational workload inherent to the 2025 season schedule. With a league-wide mean average TDP of 2.58 hours, the data demonstrates that logistical burden is not distributed uniformly, ranging from a minimum of 2.3 hours to a peak of 3.0 hours. Franchises at the lower end of this spectrum, such as the Washington Wizards, Philadelphia 76ers, Detroit Pistons, and Cleveland Cavaliers, consistently maintain an average TDP of 2.3 hours, benefiting from more compact, efficient travel windows. Conversely, teams at the upper bound,

most notably the Portland Trail Blazers at 3.0 hours and the Los Angeles Lakers at 2.9 hours, are subject to significantly longer average operational duties per transit cycle.

This distribution highlights a systemic operational disparity, where the travel requirements imposed by the league schedule result in varying levels of duty time across the 30 teams. While the majority of franchises, such as the Atlanta Hawks and Brooklyn Nets, which operate near the league average of 2.5 hours, fluctuate within the 2.4 to 2.7-hour range, the divergence toward the 3.0-hour mark for specific teams underscores a heightened logistical load. By quantifying these average duty periods, the data confirms that the logistical demands are fundamentally unequal, as teams with higher TDPs are obligated to manage more extensive transit-related duties, thereby reducing the time available for recovery compared to their lower-TDP counterparts.

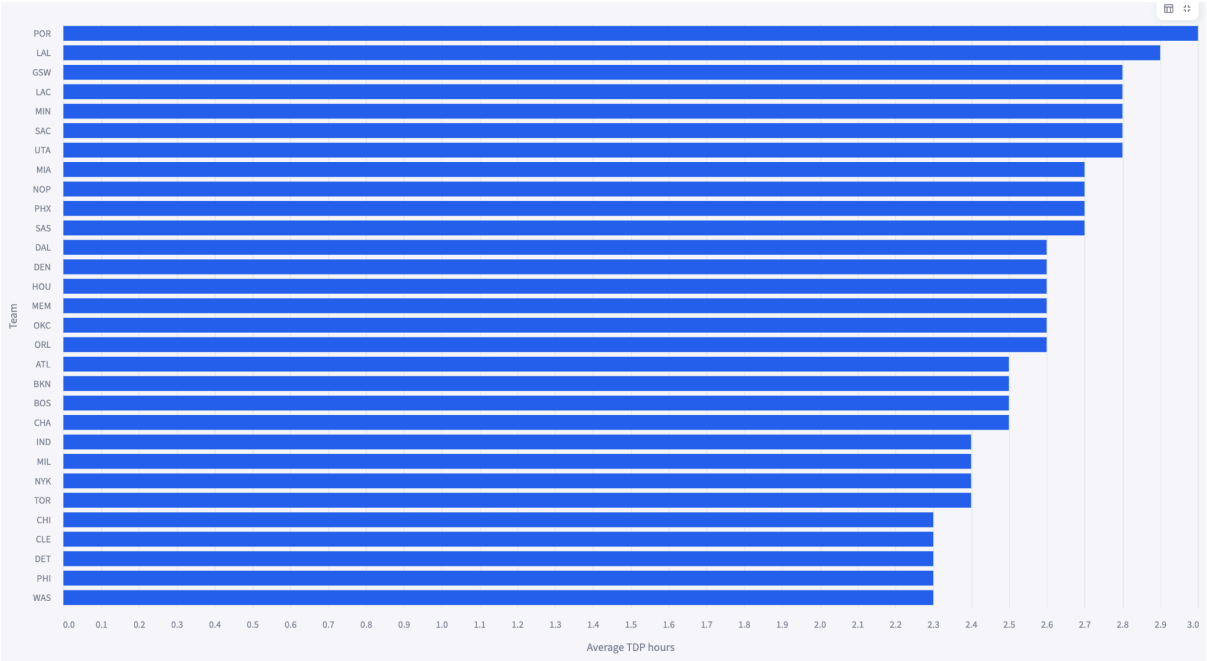

Figure 23. *Average Travel Duty Period hours by NBA team.* (2026). Source: Own elaboration.

Number of TDP per team:

The descriptive analysis of the Travel Duty Period (TDP) data reveals a significant operational trade-off within the NBA scheduling model, characterized by an inverse relationship between the frequency of travel events and the intensity of those duties. A statistical correlation of -0.595 indicates that teams forced to travel more frequently generally experience shorter average duty durations, while teams with fewer travel events face longer, more intensive duty periods.

This inverse trade-off creates two distinct logistical profiles for franchises. On one end of the spectrum, teams such as the Chicago Bulls and Cleveland Cavaliers operate under a "high-density, low-intensity" model, recording the league's highest frequency of 64 travel events but maintaining a highly efficient average duty period of 2.3 hours. Conversely, teams like the Los Angeles Lakers operate under a "low-density, high-intensity" model, recording fewer travel events (51) but facing a much higher average duty period of 2.9 hours.

This highlights that franchises are subject to different types of travel-related fatigue. High-frequency teams encounter the cumulative stress of repeated transitions and frequent disruptions to their physiological routines, whereas high-duty teams face the acute stress of longer transit durations, which increase the risk of encroaching upon the Window of Circadian Low (WOCL). Consequently, the data confirms that the logistical burden is not merely a matter of total travel time, but a complex interaction between the frequency and duration of duties that forces teams to navigate fundamentally different operational challenges throughout the season.

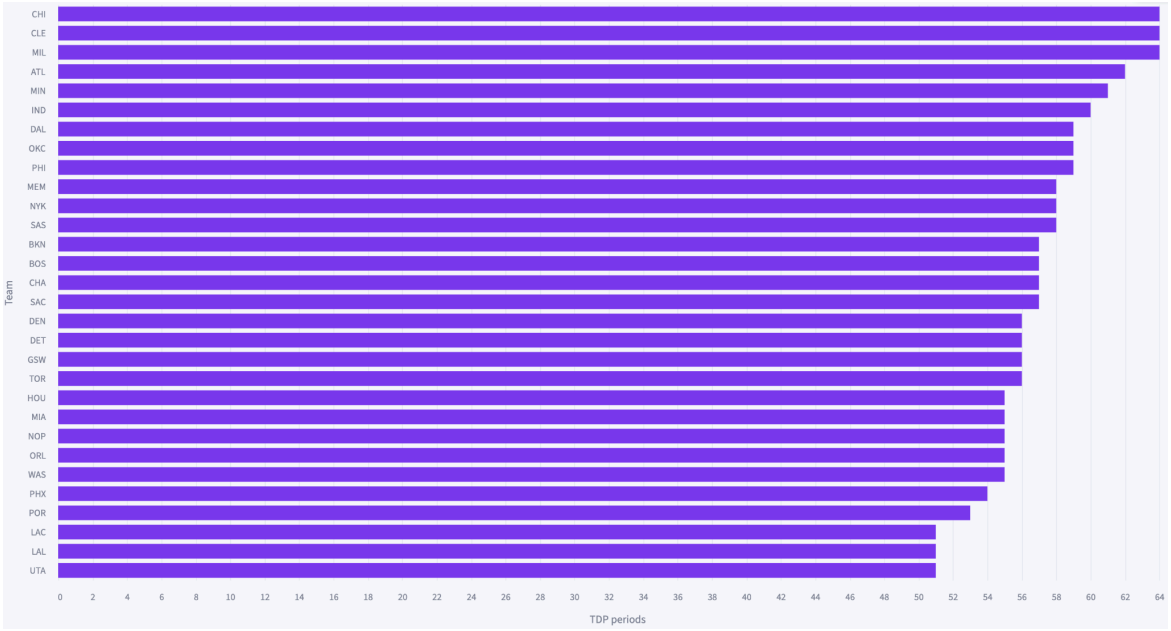

Figure 24. *Number of Travel Duty Periods by NBA team*. (2026). Source: Own elaboration.

Total free days per team:

The analysis of total free days per team reveals a significant variance in the amount of restorative time available to NBA franchises during the season. For the purposes of this study, a "free day" is defined as any day during the season that contains no scheduled duties, including games, travel, or other athletic obligations. With a league-wide mean of 44.6 free days, the data demonstrates that recovery time is not distributed equitably across the league, ranging from a minimum of 38 days to a maximum of 51 days.

This distribution highlights a clear stratification of recovery potential among franchises. Top-tier performers, such as the Los Angeles Clippers with 51 days, the Houston Rockets with 50 days, and the Utah Jazz with 49 days, benefit from the highest number of free days, positioning them at an advantage in terms of cumulative physiological recovery. Conversely, franchises like the Chicago Bulls, with 38 days, and the Milwaukee Bucks, with 39 days, operate under the most restricted schedules, possessing significantly fewer total days off compared to the league leaders.

This 13-day increase between the top and bottom performers indicates that the scheduling architecture imposes a disparate "rest endowment" on teams. While the league mandates an 82-game season for all, the total number of free days, a critical metric for metabolic and psychological recovery, fluctuates significantly. This suggests that the current scheduling framework does not provide an equivalent opportunity for franchises to manage player health and recovery across the season.

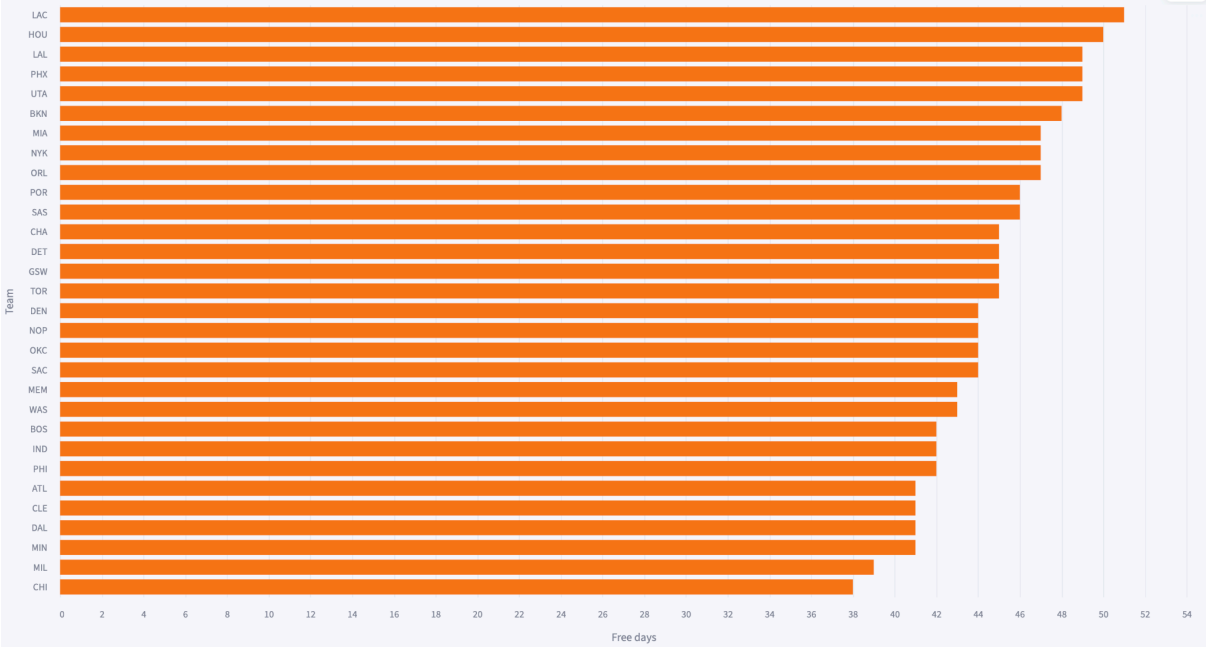

Figure 25. *Number of free days by NBA team*. (2026). Source: Own elaboration.

Maximum consecutive free days per team:

The analysis of the maximum consecutive free days per team, defined as the longest uninterrupted sequence of days without any scheduled duties, such as games or travel, demonstrates significant variance in restorative scheduling opportunities across the NBA. With a league-wide average of approximately 6.27 consecutive free days, the data illustrates that most franchises possess a limited window for sustained physiological and cognitive recovery.

The findings show a clear hierarchy in how these rest periods are structured, with the Toronto Raptors and Washington Wizards leading the league with a maximum sequence of 8 consecutive free days, providing them with the most significant opportunity for uninterrupted recovery. A large cluster of teams, including the Dallas

Mavericks, Brooklyn Nets, Houston Rockets, Denver Nuggets, Detroit Pistons, Utah Jazz, and New York Knicks, manage a maximum sequence of 7 consecutive free days.

Conversely, teams such as the Charlotte Hornets, Los Angeles Clippers, and Los Angeles Lakers face the most constrained restorative windows, with a maximum sequence of only 5 consecutive free days. This data underscores an inequality in the rest depth offered to different franchises, and while total free days are important, the ability to take a sustained break of seven or eight days compared to only five provides a different caliber of recuperation, which is crucial for managing long-term player fatigue and metabolic health throughout the 82-game season.

Importantly, this analysis confirms that the longest periods of consecutive free days for the majority of teams coincide directly with the NBA All-Star break, which occurred in mid-February 2025. The teams identified as having the highest number of consecutive free days experienced their breaks precisely within this timeframe, demonstrating that the most significant sequences of restorative time are not distributed naturally throughout the season, but are heavily concentrated around the league-mandated All-Star.

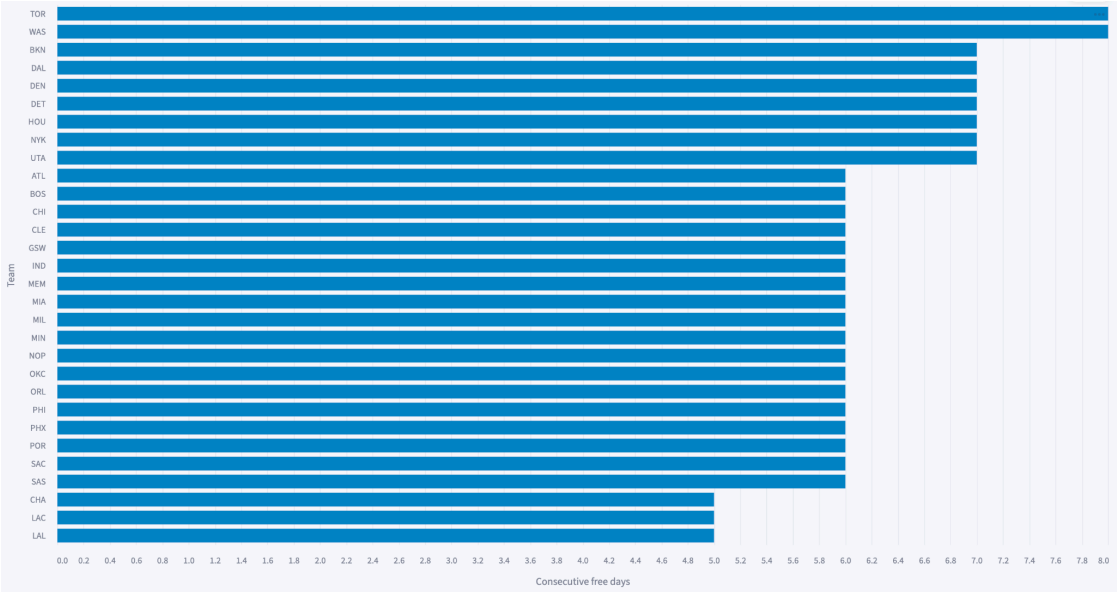

Figure 26. *Maximum number of consecutive free days by NBA team*. (2026). Source: Own elaboration.

Maximum consecutive days with ADP:

The analysis of the maximum consecutive days with Athletic Duty Periods (ADP), as presented in the corresponding figure 27, highlights a striking disparity in the continuous operational workload placed on players. In this context, consecutive ADP days represent the longest uninterrupted sequence of time during which a team is actively engaged in athletic duties, such as games, practices, or team activities, without a single full day of recovery. With a league-wide average of 26.23 days, the data reveals that these duty sequences are exceptionally prolonged, far exceeding typical recovery cycles.

The findings demonstrate a profound hierarchy in how these continuous duty periods are structured, with the Miami Heat experiencing an extreme maximum sequence of 52 consecutive days, a figure that is more than double the length of the shortest sequences found elsewhere in the league. Other teams also face significantly high continuous duty loads, such as the San Antonio Spurs with 38 days, the Milwaukee Bucks with 37 days, and the Charlotte Hornets with 36 days.

Conversely, franchises like the Phoenix Suns, Los Angeles Clippers, and Golden State Warriors encounter the most truncated duty sequences, with a maximum of 17 consecutive days. This massive 35-day increase between the teams with the highest and lowest consecutive duty periods indicates a fundamental inequality in the scheduling burden, and while total free days provide a broad view of rest, the capacity for sustained recovery is compromised for teams that must navigate these extended sequences of continuous athletic obligation.

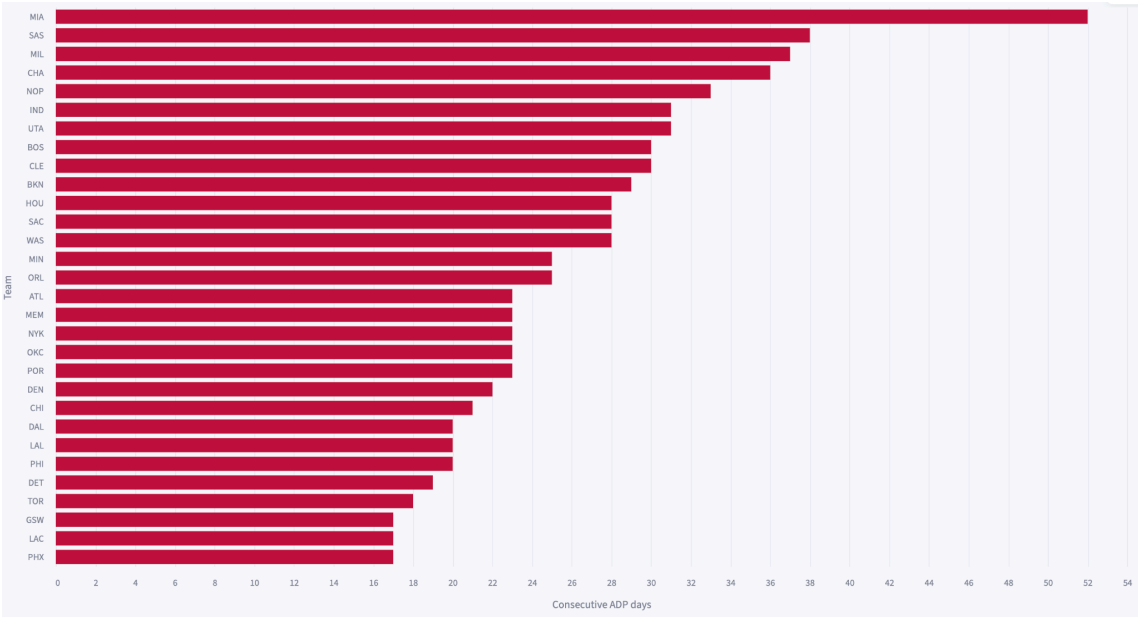

Figure 27. *Maximum number of consecutive days with Athletic Duty Period (ADP) by NBA team*. (2026). Source: Own elaboration.

Repeated GDP finish time:

The analysis of Game Duty Period (GDP) finish times, as shown in the provided table and figure 28, demonstrates a highly centralized broadcast structure within the NBA, with a clear focus on specific evening time slots. By aggregating the finish counts across all franchises, it is evident that the 21:00 time bucket is the primary anchor for game conclusions, accounting for 1,136 total instances. The 21:30 time bucket follows as the secondary focal point with 638 instances, confirming that a substantial majority of the league's game conclusions are concentrated between 21:00 and 22:00.

This concentration highlights the strategic importance of primetime television windows, where the scheduling of game finishes is optimized to capture maximum viewership during these evening hours. However, a direct operational consequence of this broadcast-driven finish time is the prevalence of late-night travel. Because the majority of games conclude well into the evening, teams are frequently forced to engage in travel duty periods immediately following the game, leading to late-night or early-morning flight departures. This scheduling model prioritizes broadcast reach,

but it simultaneously imposes a significant logistical burden on teams by necessitating frequent, late-night transit that further disrupts player recovery cycles.

By framing these broadcast-induced travel requirements as a central operational constraint, it becomes clear that current scheduling protocols prioritize revenue over recovery. Consequently, an optimization model is essential to navigate these unavoidable broadcast constraints by identifying the most efficient travel rest protocols possible within those strict parameters.

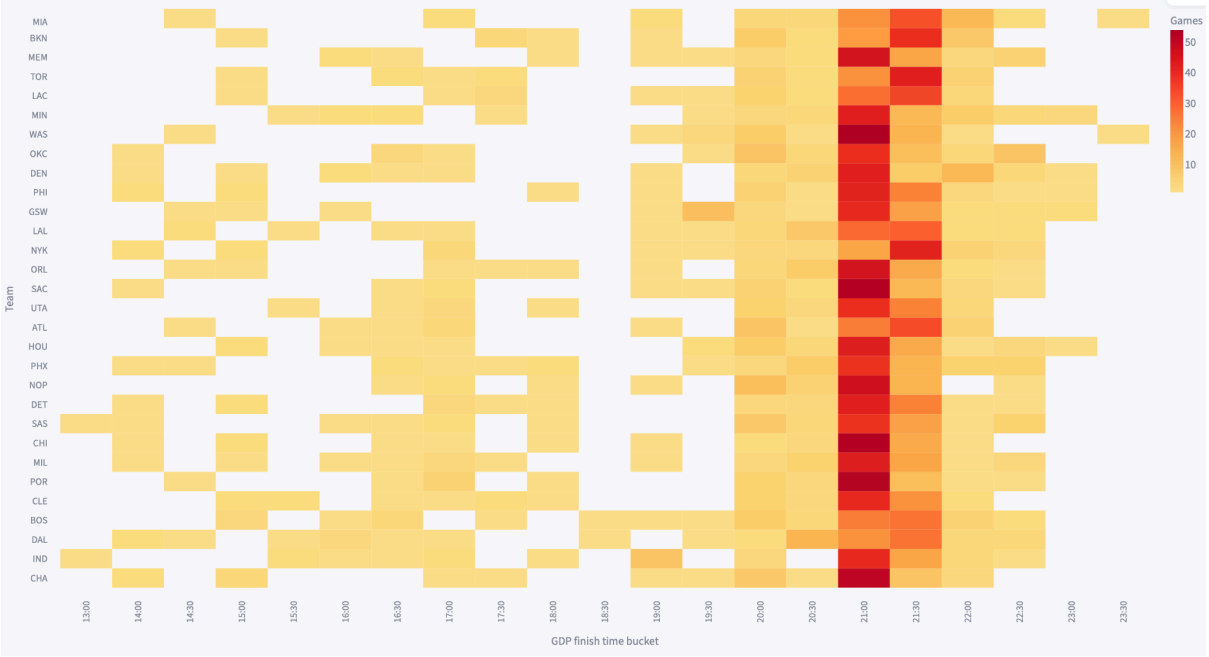

Figure 28. *Heatmap of most repeated Game Duty Period finish times by NBA team*. (2026). Source: Own elaboration.

Number of games: home vs away

The analysis of home and away game distribution, as detailed in the provided table and illustrated in the provided figure, reveals that while the league maintains perfect aggregate parity, with exactly 1,230 home games and 1,230 away games played across the season, individual franchise schedules occasionally deviate from an even 41-41 split.

The data shows that the vast majority of teams are scheduled for a balanced 41 home and 41 away games. However, four franchises experience a slight imbalance

in their seasonal travel requirements, as both the Atlanta Hawks and Dallas Mavericks are scheduled for 42 away games and 40 home games, while both the Milwaukee Bucks and Oklahoma City Thunder are scheduled for 40 away games and 42 home games.

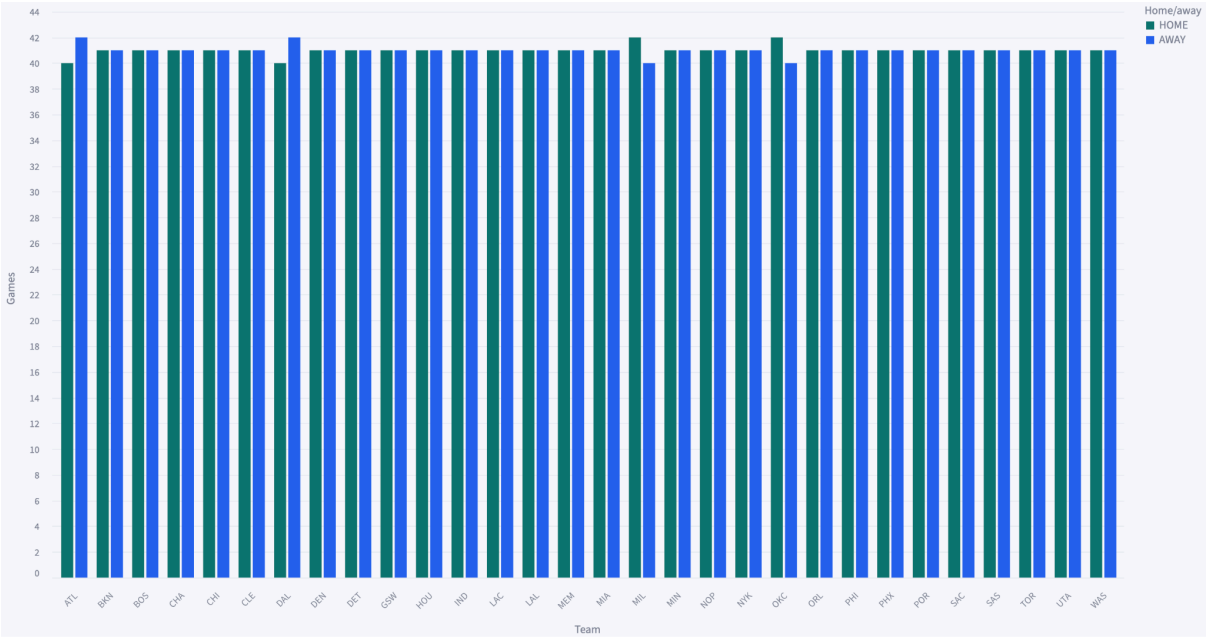

Figure 29. *Home vs away games distribution by NBA team*. (2026). Source: Own elaboration.

6.3.2. Rest season results

Average total season rest per team:

The data presented in figure 30, illustrates the average seasonal rest per team, a critical metric for assessing the physiological sustainability of the NBA schedule. Unlike cumulative metrics, the average rest per team provides a direct comparison of the recovery burden placed on each roster across the 82-game season.

The analysis reveals a distinct 'recovery hierarchy' among franchises. Teams such as the Los Angeles Lakers (averaging 25.5 hours per interval) and the Los Angeles Clippers demonstrate significantly higher recovery buffers compared to teams at the lower end of the spectrum. From an aeronautical management perspective, this variance represents an 'Operational Recovery Gap'. While the league provides a

standardized schedule of games, it fails to account for the differential impact of travel-related fatigue, which disproportionately affects franchises based on their geographic location.

This discrepancy suggests that the current scheduling framework is not optimized for human performance. An average rest period variation of several hours between teams is not merely a logistical detail, it is a substantive difference in the 'physiological downtime' available for metabolic recovery and circadian realignment. Consequently, teams with lower average rest hours are subjected to a more frequent intersection with their Window of Circadian Low (WOCL), thereby increasing the risk of cumulative fatigue, reduced neuromuscular response, and long-term injury. These results validate the need for a dynamic, fatigue-aware scheduling model that prioritizes the normalization of rest averages across all franchises to ensure equitable competitive conditions and player longevity."



Figure 30. *Average total season rest by NBA team*. (2026). Source: Own elaboration.

Monthly rest per team:

The analysis of median rest hours per month, as detailed in the provided table and illustrated in the provided figure, provides a comprehensive view of how restorative time fluctuates across the different phases of the regular season. Looking at the league-wide averages, the median rest hours remain consistently low throughout the year, hovering around 17 to 18 hours, before dropping to a seasonal low of 16.28 hours in April 2025 as the regular season reaches its competitive climax.

The data reveals significant variations between individual franchises and specific months, demonstrating that certain periods offer vastly different recovery opportunities. December 2024 shows the highest overall average median rest (18.20 hours) and features extreme positive outliers, where certain teams achieve a peak median of up to 30.97 hours. Similarly, February 2025 exhibits isolated peaks of high recovery time reaching up to 30.86 hours, driven primarily by the strategic insertion of the league-mandated All-Star hiatus.

Conversely, intense competitive blocks and dense game routing heavily suppress recovery metrics. April 2025 stands out as the most restrictive period of the season, showing both the lowest mean median rest and a narrow distribution where a large cluster of teams drops to the baseline minimum of 14.0 hours. This systemic compression of rest hours across the league directly supports the need for your travel rest optimization model, proving that as the scheduling density intensifies toward the end of the season, automated logistical interventions are crucial to protect player health and metabolic recovery.

The granular breakdown of monthly median rest hours highlights several franchises experiencing extreme scheduling advantages or disadvantages over the course of the season. On the negative end of the spectrum, the Cleveland Cavaliers stand out as the most heavily burdened team in the league. Across the seven-month span, they sustain a seasonal mean median rest of just 15.03 hours, frequently hitting the absolute minimum threshold of 14.0 hours for multiple consecutive months. The Milwaukee Bucks follow closely with a similarly compressed seasonal mean of 15.65

hours, indicating a highly intensive scheduling sequence that consistently limits their players' recovery windows.

Conversely, the Utah Jazz emerge as the most positively highlighted franchise regarding scheduling relief. They enjoy a league-high seasonal average of 20.80 median rest hours, driven by a substantial peak of 30.86 hours in February 2025 and a strong opening month of 27.98 hours in October 2024. The Toronto Raptors also showcase a significant positive outlier, recording the highest single-month metric in the entire dataset with 30.97 median rest hours in December 2024, bringing their overall seasonal average to a comfortable 19.54 hours.

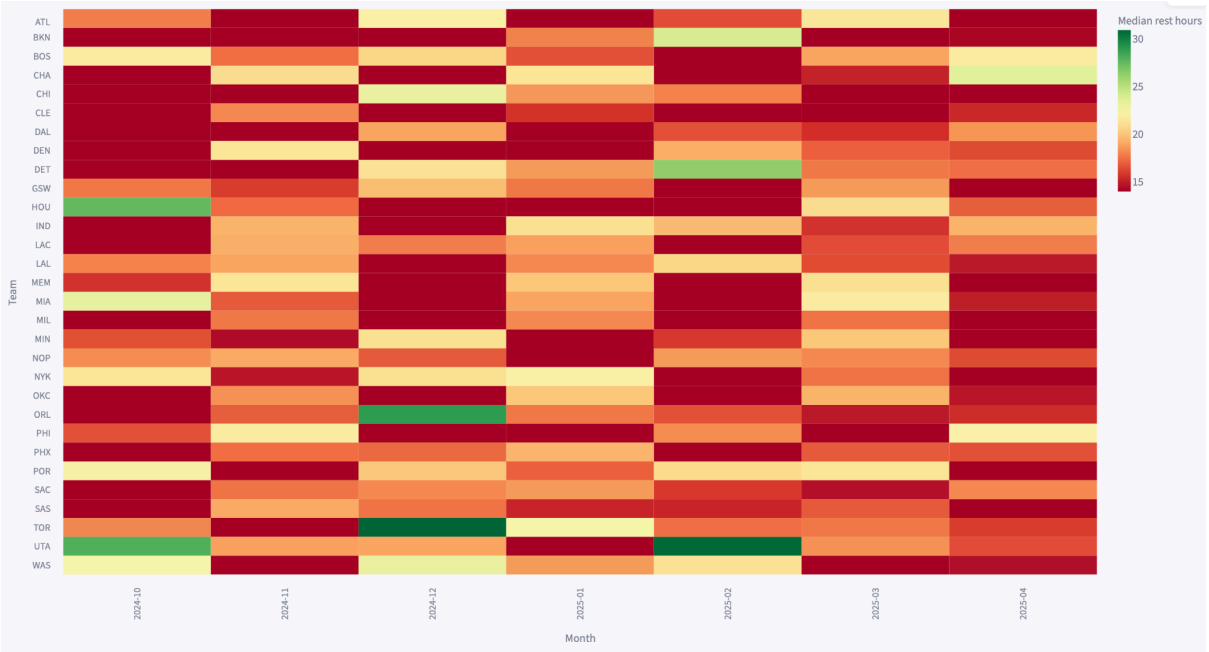

Figure 31. *Heatmap of monthly rest distribution by NBA team*. (2026). Source: Own elaboration.

Team risk:

The analysis of team logistical risk, as detailed in the provided table and illustrated in the provided figure, shifts the focus to acute scheduling strain by evaluating the frequency of rest intervals falling strictly under the 12-hour threshold. This metric serves as a critical indicator of physiological jeopardy, identifying instances where transit and scheduling density compress a team's recovery window below the minimum time required for basic metabolic and sleep restoration.

The data exposes a tiered distribution of risk across the league, with several franchises experiencing severe operational exposure. The highest risk tier is occupied by the Miami Heat, Toronto Raptors, and Washington Wizards, each recording a league-high 6 instances of rest intervals under 12 hours. Immediately following them is a secondary high-risk cluster consisting of the Charlotte Hornets, Houston Rockets, Oklahoma City Thunder, Philadelphia 76ers, and Phoenix Suns, all of which navigate 5 critical sub-12-hour rest windows over the course of the schedule.

In contrast, the bottom of the distribution reveals franchises that have managed to maintain a much lower exposure to these high-strain operational windows. The Golden State Warriors, Memphis Grizzlies, and Minnesota Timberwolves exhibit the lowest scheduling risk in the league, with each franchise recording only a single instance of a rest interval falling under 12 hours. This stark disparity across teams emphasizes that while baseline rest averages might appear uniform, the distribution of high-risk scheduling peaks is highly unequal, providing a direct, data-driven mandate for your travel rest optimization model to target and smooth out these critical operational vulnerabilities.

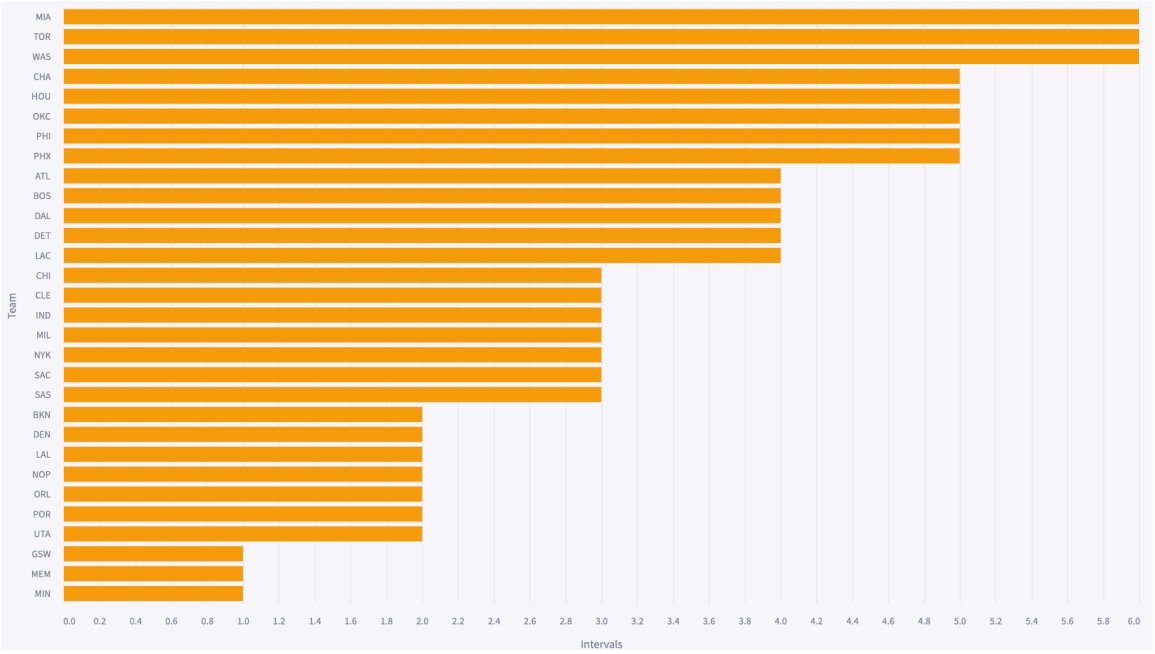

Figure 32. *Risk index by NBA team*. (2026). Source: Own elaboration.

Rest distribution:

The analysis of effective rest distribution across the regular season, as detailed in the provided table and illustrated in the provided figure, reveals highly distinct operational patterns and regulatory constraints that dictate team recovery timelines. The distribution is dominated by an exceptional, sharp peak at exactly 14.0 hours, which records 1,696 individual instances. This heavy concentration reflects the strict application of standard league protocols, where teams are systematically released or cleared into a baseline rest period that frequently hits this specific 14-hour operational anchor before their next scheduled athletic obligation.

Beyond this primary baseline, the data demonstrates clear secondary clusters that outline the natural rhythm of a team's travel and game rotation. A prominent grouping emerges between 21 and 25 hours of rest, representing standard single-day gaps between consecutive game days, with sub-peaks at 22 and 23 hours reflecting standard overnight transitions. Another noticeable cluster appears around the 41-to-45-hour mark, capturing the extended recovery windows provided by multi-day breaks between games where teams are granted a full intermediate calendar day without an athletic duty period.

The high-risk areas of the schedule are visualized on the far left of the distribution, where rest durations drop below critical thresholds. The dataset documents 101 acute instances classified under severe operational strain where the effective rest falls strictly under 10 hours. These critical intervals are highly concentrated between 0 and 3 hours of rest, showcasing extreme scheduling scenarios where sequential travel or immediate administrative requirements leave practically zero time for physical restoration, underlining the precise systemic anomalies that an automated travel rest optimization model must actively identify and mitigate.



Figure 33. *Rest distribution for all the teams*. (2026). Source: Own elaboration.

Calendar stress windows:

The analysis of calendar stress windows, as in the provided table, identifies specific high-strain periods where severe rest compression is concentrated throughout the season. By tracking intervals falling under the 10-hour and 12-hour recovery thresholds across individual months, the data reveals that logistical stress is not distributed evenly, but rather spikes during specific phases of the competitive calendar.

November 2024 stands out as the most logistically punishing month of the schedule, accumulating a league-wide total of 17 acute stress intervals. This peak is spearheaded by the Atlanta Hawks and Detroit Pistons, both of which navigate a maximum of 3 critical sub-10-hour rest windows within this single 30-day block. March 2025 emerges as the secondary focal point of calendar stress, generating 15 severe rest violations across the league. This late-season surge impacts a wide array of franchises simultaneously, with teams like Dallas, Phoenix, Philadelphia, Toronto, and Washington all subjected to 2 severe stress intervals as travel schedules intensify down the stretch.

The data also highlights exceptional compounding strain on specific franchises across the entire seasonal timeline. The Washington Wizards exhibit a particularly troubling trend of recurring exposure, recording 2 critical stress windows in November 2024, 2 in January 2025, and another 2 in March 2025. This systemic repetition of acute fatigue events demonstrates that certain team schedules suffer from persistent, multi-month logistical flaws. Pinpointing these specific calendar stress windows provides your travel rest optimization model with the precise temporal targets required to redistribute travel burdens and alleviate critical fatigue accumulation when teams are most vulnerable.

team	month	interval_count	under_10h_count	under_12h_count
ATL	2024-11	29	3	3
DET	2024-11	30	3	3
HOU	2024-11	24	2	2
SAS	2024-11	22	2	2
CHA	2024-12	22	2	2
CHA	2025-02	22	2	2
DAL	2025-03	28	2	2
LAL	2025-03	27	2	2
MIA	2024-12	22	2	2
MIA	2025-02	21	2	2
MIL	2024-12	24	2	2
OKC	2025-03	27	2	2
PHI	2025-03	29	2	2
PHX	2024-11	22	2	2
PHX	2025-03	25	2	2
TOR	2024-12	20	2	2
TOR	2025-03	27	2	2
WAS	2024-11	25	2	2
WAS	2025-01	29	2	2
WAS	2025-03	28	2	2
HOU	2024-10	6	1	1
ATL	2024-12	21	1	1
BKN	2024-11	25	1	1
BKN	2024-12	22	1	1
BOS	2024-11	24	1	1
BOS	2024-12	20	1	1
BOS	2025-02	22	1	1
BOS	2025-03	23	1	1
CHA	2024-11	26	1	1
CHI	2024-10	10	1	1

Table 4. *Table of calendar stress windows by month and team.* (2026). Source: Own elaboration.

GDP to TDP transition:

The structural compression identified between consecutive duty blocks underscores why mapping these narrow windows provides critical diagnostic value for the model. While the software architecture processes these entries as sequential data points within the same integrated Athletic Duty Period (ADP) workflow, isolating them explicitly in the analysis exposes the absolute scarcity of physical time that players endure between the conclusion of a game and the immediate commencement of a flight.

When factoring in the strict operational buffers required by the league, where a Game Duty Period (GDP) extends 1 hour past the final buzzer for mandatory media commitments, medical checks, and post-game treatments, and a Travel Duty Period (TDP) requires players to report 1 hour and 30 minutes prior to flight departure, a recorded rest interval of 0 to 23 minutes between blocks represents a severe structural deficit. In practice, this combined 2-hour and 30-minute operational window completely eclipses the recorded transition time detailed in the table. This means that the physical tasks of showering, completing immediate physical therapy, and exiting the arena do not merely precede the flight; they actively collide with the mandatory check-in, security clearance, and boarding timeline for the team's charter.

For the franchises facing the tightest constraints, such as Detroit and Chicago at exactly 00:00:00 of recorded rest, or Sacramento and Toronto at under 5 minutes, the schedule enforces a continuous, unbuffered transition from high-intensity athletic output directly into an aircraft cabin. By explicitly evaluating these specific handoffs within the document, the analysis moves beyond treating rest as a static, daily average and instead uncovers the hidden, acute stress points where metabolic recovery is completely compromised by immediate transit demands.

team	current_date	rest_hhmmss	origin_city	destination_city
OKC	2025-04-09	00:23:00	Oklahoma City	Phoenix
PHI	2024-12-21	00:23:00	Philadelphia	Cleveland
CLE	2024-11-02	00:22:00	Cleveland	Milwaukee
CLE	2025-03-28	00:22:00	Cleveland	Detroit
GSW	2025-01-23	00:22:00	Sacramento	San Francisco
WAS	2024-11-10	00:22:00	Orlando	Houston
NOP	2024-12-01	00:21:00	New York	Atlanta
SAS	2024-11-06	00:21:00	Houston	San Antonio
DAL	2025-01-22	00:19:00	Dallas	Oklahoma City
HOU	2024-10-26	00:19:00	Houston	San Antonio
MEM	2025-03-09	00:19:00	New Orleans	Memphis
NYK	2024-11-13	00:17:00	Philadelphia	New York
DET	2024-11-13	00:15:00	Detroit	Milwaukee
MIA	2025-02-23	00:15:00	Milwaukee	Atlanta
ORL	2024-12-04	00:15:00	New York	Philadelphia
PHX	2024-11-12	00:14:00	Salt Lake City	Sacramento
BOS	2025-02-25	00:13:00	Toronto	Detroit
OKC	2025-03-02	00:11:00	San Antonio	Oklahoma City
TOR	2024-11-16	00:11:00	Toronto	Boston
CHA	2024-12-20	00:10:00	Washington	Philadelphia
DAL	2024-11-24	00:10:00	Miami	Atlanta
LAL	2025-03-13	00:10:00	Milwaukee	Denver
ATL	2024-11-03	00:09:00	New Orleans	Atlanta
MIL	2024-12-21	00:09:00	Cleveland	Milwaukee
DEN	2025-03-23	00:06:00	Houston	Denver
TOR	2025-02-11	00:03:00	Philadelphia	Toronto
SAC	2025-03-09	00:02:00	Los Angeles	Sacramento
MIA	2025-01-07	00:01:00	Sacramento	San Francisco
CHI	2024-11-17	00:00:00	Chicago	Detroit
DET	2024-10-26	00:00:00	Cleveland	Detroit

Table 5. *Time between end of GDP and beginning of TDP.* (2026). Source: Own elaboration.

6.4. Data analysis conclusions

6.4.1. Disconnexion between spatial volume and temporal compression

The inclusion of seasonal mileage data yields a profound, induced insight that completely redefines how logistical strain must be measured, total travel volume does not directly correlate with acute rest compression. Geographically, West Coast franchises like the Portland Trail Blazers and Golden State Warriors endure an immense spatial burden, flying nearly double the total distance of central franchises like Indiana or Milwaukee. However, when cross-referencing this with our previous metrics on critical rest exposure, we discover a striking paradox.

The Golden State Warriors carry the second-highest travel burden in the league at 49,116.7 miles, yet they maintain an exceptionally stable rest profile, registering only a single instance where a rest interval dropped below the critical 12-hour threshold. Meanwhile, the Miami Heat log roughly 11,000 fewer miles than Portland, yet they are tied for the absolute highest logistical risk tier in the league, enduring 6 distinct sub-12-hour rest violations. Even more starkly, the Cleveland Cavaliers fly a near-minimum 27,640.7 total miles, yet they sustain the most compressed seasonal rest environment in the entire dataset, averaging a league-low 15.03 median rest hours across the seven-month span.

This proves that long-distance travel is a predictable product of geography that can be managed with structured, long-haul recovery protocols. The true physiological jeopardy is caused by scheduling density and rapid turnaround sequences, which frequently plague Eastern and Central conference teams due to their tight clustering of opponent cities. A short 400-mile flight can be far more destructive to an athlete's metabolic recovery than a 2,000-mile cross-country flight if the short flight is positioned inside a back-to-back window with zero operational buffer.

6.4.2. The illusion of average rest vs. acute operational strain

A macro-level evaluation of the regular season schedule initially suggests a highly stable, uniform environment regarding player recovery. Across the seven-month competitive timeline, the league-wide median rest hours hover consistently within a tight corridor of 17 to 18 hours. From an administrative perspective, this baseline implies an equitable distribution of scheduling burdens. However, this uniformity is entirely superficial, macro-level averages actively mask extreme, acute operational strain experienced at the franchise and calendar level.

When a team is subjected to a compressed 14-hour rest threshold month after month, the deficit ceases to be a minor administrative variance. Instead, it becomes a compounding physiological stressor that permanently compromises player recovery and performance equity long before the postseason begins. Franchises operate in entirely different recovery worlds based on scheduling clusters, meaning

that an automated, responsive logistical model is a strict necessity to balance out these hidden operational disparities.

6.4.3. Temporal bottlenecks and the multi-month fatigue

When shifting the analytical lens to the seasonal calendar, the data exposes specific temporal bottlenecks where logistical risk heavily intensifies. The regular season does not present a linear accumulation of fatigue, rather, it operates as a series of high-stress operational waves that overload team logistics during distinct calendar windows.

November 2024 and March 2025 emerge as the primary operational stress points of the competitive cycle. November represents an immediate, high-density shock to the athletic travel lifecycle, accumulating a league-wide total of 17 acute stress intervals where rest is compressed under the critical thresholds. March 2025 introduces a secondary, late-season wave of calendar stress, generating 15 severe rest violations across the league. This late-season compression is highly problematic because it occurs when players have already logged four months of intensive physical output.

The data also highlights critical compounding strain on specific teams across multiple months. The Washington Wizards exhibit a highly troubling pattern of recurring exposure, recording 2 critical stress windows in November 2024, 2 in January 2025, and another 2 in March 2025. This structural repetition demonstrates that certain schedules suffer from persistent, multi-month flaws, creating an environment where a player's metabolic recovery never fully catches up.

6.4.4. Scarcity of time: Micro-transitions and the buffer overlap

The most critical exposure point identified in this research lies within the micro-transitions connecting consecutive duty blocks, specifically the handoff between a Game Duty Period (GDP) and a Travel Duty Period (TDP). While a software architecture or automated database handles these entries as sequential data points within the same integrated Athletic Duty Period (ADP) workflow,

evaluating them in isolation exposes an absolute scarcity of uncommitted physical time left for the athletes.

The data compiled in table 5 indicates that the recorded rest data represents the exact turnaround window remaining between the conclusion of the GDP buffer and the commencement of the TDP buffer. A Game Duty Period (GDP) includes a strict 1-hour buffer following the final buzzer to accommodate media commitments, medical evaluations, and immediate post-game treatments. Conversely, a Travel Duty Period (TDP) initiates a mandatory 1-hour and 30-minute pre-flight reporting buffer to manage charter boarding, security protocols, and flight logistics.

Consequently, the rest intervals of 0 to 23 minutes documented in the dataset represent the entirety of the unstructured free time left between the formal end of post-game duties and the formal start of pre-flight travel requirements. For franchises facing the tightest constraints, such as Detroit and Chicago at exactly 0 of recorded rest, there is no gap whatsoever. The precise minute the 1-hour post-game GDP buffer concludes, the 1.5-hour pre-flight travel reporting window immediately begins.

This tight interlock of scheduling boundaries enforces a continuous transition where players must immediately pivot from post-game obligations straight into pre-flight logistics, completely eliminating any realistic window for physical decompression or normal nutritional sequencing before entering a pressurized aircraft cabin.

6.4.5. The Regulatory anchor

The macro-level distribution of effective rest hours across the entire season underscores how completely team schedules are governed by rigid administrative baselines. The single most striking characteristic of the rest distribution dataset is an exceptional, sharp peak at exactly 14.0 hours, recording an overwhelming 1,696 individual instances. This massive statistical concentration represents a rigid regulatory anchor.

This peak reflects a standardized league operational protocol where teams are systematically released or cleared into a baseline rest window that hits this precise 14-hour mark before their next scheduled athletic obligation. The absolute dominance of the 14-hour anchor demonstrates that professional basketball logistics operates right at its regulatory limits. Rather than building scheduling margins that adapt to travel distance, time-zone crossings, or accumulated mileage, logistics routines default to the minimum allowable recovery window. This complete reliance on a legal baseline proves that the current scheduling framework prioritizes maximizing broadcast and competitive dates over protecting player physiology.

6.4.6. Induced principles and actionable guidelines for models

By synthesizing the conclusions drawn from the mileage distributions, monthly variances, team-specific risk tiers, calendar stress windows, and micro-transition deficits, we can establish five foundational principles to guide automated travel rest optimization model:

6.4.6.1. The Risk-tier prioritization mandate

Optimization algorithms must stop using average monthly or seasonal rest metrics to evaluate schedule health, and they must not look at total mileage as the sole indicator of strain. The model must prioritize smoothing out acute, short-duration rest deficits, such as sub-12-hour and sub-10-hour windows, over minimizing seasonal mileage. Protecting a team from a cluster of back-to-back short hops yields higher physiological protection than trying to shorten a long-haul flight.

6.4.6.2. Automated transition buffer gaps

The system must actively treat the uncommitted rest window between the GDP buffer conclusion and the TDP buffer commencement as a vital safety threshold within the integrated ADP workflow. Any transition where this remaining unallocated time drops below a safe operational margin, such as a minimum target of 30 to 45 minutes, must automatically trigger an alert. The algorithm should resolve this by

dynamically sliding flight departure times forward, ensuring the two formal duty buffers do not compress the player's personal transition window to zero.

6.4.6.3. Temporal smoothing in peak density blocks

The optimization engine must apply heightened restrictions during known high-density calendar windows, specifically November and March, regardless of whether a team has low or high seasonal mileage. During these high-stress months, the model should restrict the formatting of sequential away games, enforcing mandatory overnight stays post-game rather than permitting immediate late-night travel, thereby preventing compounding multi-month fatigue lifecycles.

6.4.6.4. Geographically scaled rest thresholds

Because the dataset demonstrates that teams frequently default to a rigid 14-hour regulatory rest baseline, the model should introduce an adaptive rest calculation. This calculation must scale the minimum required rest interval based on both flight duration and cumulative seasonal mileage. For high-mileage teams like Portland or Golden State, the 14-hour minimum must automatically scale up to an 18- or 20-hour protective threshold during long-haul segments, overriding the standard league baseline.

6.4.6.5. Operational interlock separation

The application must include a dedicated predictive module designed to flag high-risk handoffs where the pre-flight travel duty buffer commences almost instantly after the game duty buffer ends. When the model identifies zero- or single-digit free transition windows, such as the critical instances documented for Chicago, Detroit, and Sacramento, it must automatically mandate a logistical separation. This is achieved by either routing travel to the following morning or delaying charter departure times, ensuring that athletes have adequate unstructured time to decompress physically before boarding an aircraft.

6.4.7. Final closing remarks

In conclusion, this comprehensive analysis demonstrates that the logistics of modern elite athletics have outgrown traditional scheduling methods. The current framework, bound by rigid commercial demands, geographical realities, and superficial statistical averages, frequently subjects players to extreme, unbuffered operational strain that directly threatens their physical health and competitive longevity.

By exposing the paradox between raw mileage and temporal compression, hidden calendar bottlenecks, severe micro-transition deficits, and a systemic reliance on minimum legal rest limits, this research moves beyond descriptive statistics to provide an actionable architecture. Implementing these five induced optimization principles within an automated travel rest model allows professional sports logistics to move away from reactive scheduling. Instead, it can establish a proactive, data-driven framework that protects player physiology, preserves long-term athletic performance, and sets a new operational standard for aeronautical management in elite sports.

7. CONCLUSIONS

7.1. Global synthesis and fulfillment of objectives

The core ambition of this thesis was to bridge a historical gap between advanced aeronautical management and elite sports logistics. By shifting the paradigm of professional sports scheduling away from purely commercial, broadcast-driven, and financial considerations, this project sought to introduce a systemic, safety-first architecture modeled after commercial aviation frameworks.

Reviewing the initial research design, the general and specific objectives outlined in Chapter 1 have been systematically achieved:

- Establishment of a regulatory analogy: The project successfully cross-referenced the demanding operational lifestyle of elite athletes with the

strict regulatory framework of civil aviation. Classifying an NBA team as a "flight crew" allowed for the direct, logical adaptation of Federal Aviation Administration (FAA) Part 117 safety standards to professional sports travel.

- Operationalization of metrics: The traditional, vague concepts of "travel fatigue" and "rest days" were successfully replaced with measurable, legally precise operational boundaries: the Athletic Duty Period (ADP), the Game Duty Period (GDP), and the Travel Duty Period (TDP).

- Development of an auditing architecture: Through the implementation of a specialized Python and Streamlit software framework, this research moved past theoretical assumptions to execute a complete historical audit of an active regular-season schedule. This tool proved that abstract aviation safety concepts can be practically coded into automated sports scheduling workflows.

Ultimately, the project demonstrates that the extreme logistical strain experienced by professional sports franchises is not an unchangeable geographical reality, but rather a structural flaw born from decentralized, unbuffered scheduling practices.

7.2. Interdisciplinary contribution: Aviation safety culture in elite sports

The primary academic contribution of this thesis lies in its interdisciplinary synergy. For decades, aeronautical management has refined human factors engineering, Crew Resource Management (CRM), and Fatigue Risk Management Systems (FRMS) to eliminate human error and physiological exhaustion in ultra-high-stakes environments. Conversely, elite sports management has traditionally viewed travel as an unalterable logistical baseline, relying almost entirely on reactive, post-travel medical recovery (e.g., cryotherapy, advanced nutrition, sleep tracking) to patch over the physiological damage caused by erratic transit schedules.

This research introduces a fundamental philosophy shift: preventive structural optimization must take precedence over reactive physiological recovery.

By framing the athlete's schedule as a continuous series of regulated duty blocks, this thesis introduces a standardized safety culture to sports logistics. It proves that aeronautical network planning tools can protect multi-million-dollar human assets, minimize injury risks caused by cumulative metabolic strain, and preserve competitive equity across a professional sports league.

7.3. Project limitations

To maintain academic rigor, several data and operational limitations inherent to the scope of this project must be explicitly recognized:

- **Static vs. Dynamic flight telemetry:** The operational audit relied on planned regular-season schedules and API-derived flight durations. In real-world operations, charter flight networks are highly dynamic, frequently subject to air traffic control (ATC) holds, severe weather delays, de-icing protocols, and late-night gate constraints that compress recovery windows even further than documented.

- **Lack of direct physiological correlation:** While the software architecture successfully identified severe temporal compression and structural bottlenecks, the study did not cross-reference these operational duty periods with direct biometric streams (e.g., heart-rate variability, cortisol levels, polysomnography sleep architecture tracking) from individual athletes.

- **Homogeneity of the crew model:** The framework treats all members of a franchise as a unified flight crew operating under identical duty constraints. In reality, a team consists of distinct sub-units, star players logging heavy on-court minutes, bench players with lower physical loads, coaching staffs, and support personnel, each experiencing vastly different physical tolls within the same ADP.

- **Regulatory inelasticity:** The adapted model applies a rigid baseline across all time zones and travel directions, whereas human sleep physiology is highly

sensitive to the direction of transit (i.e., phase delays experienced when flying westward versus phase advances when flying eastward).

7.4. Future lines of investigation

The limitations of this study provide clear, highly actionable pathways for future research at the intersection of aeronautical management and sports science:

7.4.1. Integration of Real-Time biometric wearable data

Future iterations of this framework should interface directly with team-wide biometric tracking systems. Cross-referencing structural ADP data with real-time sleep stage tracking, internal body temperature variations, and metabolic markers would allow researchers to mathematically quantify the exact physiological cost of a sub-12-hour rest compression versus a standard 18-hour recovery block.

7.4.2. Machine Learning engines for dynamic, mid-season rerouting

While this thesis establishes optimization principles for pre-season schedule creation, future work should focus on building a predictive, reactive machine learning engine. If a team experiences an unexpected operational disruption, such as a double-overtime game or an air traffic delay, the algorithm should dynamically recalculate the remaining seasonal fatigue lifecycle and automatically recommend real-time logistical changes, such as sliding a morning charter flight forward or enforcing a late-night hotel stay.

7.4.3. Directional and circadian variance modeling

Future research should refine the optimization engine by incorporating mathematical weights for transmeridian desynchronosis (jet lag). The algorithm should dynamically expand mandatory rest thresholds when a team travels eastward across multiple time zones, acknowledging the greater physiological difficulty of sleep phase advancement compared to westward travel.

7.4.4. Holistic structural extension to support staff

Finally, the "flight crew" classification should be expanded to encompass coaching staffs, athletic trainers, and equipment managers. These individuals arrive at arenas hours before players, depart long after post-game treatments conclude, and manage complex equipment logistics under severe time constraints. Expanding the ADP framework to include support staff is critical for establishing a true, organization-wide safety and performance culture.

7.5. Final closing remarks

The air mobility demands of modern professional sports have fundamentally outgrown the legacy management frameworks that govern them. Operating a decentralized, continent-spanning flight network without standardized, systemic rest buffers creates a hidden but continuous physical deficit that undermines athlete health, devalues the entertainment product on the court, and introduces unnecessary operational risks.

This thesis demonstrates that the tools required to solve this crisis already exist within the architecture of modern aeronautical management. By transitioning from a culture of reactive recovery to one of proactive, structural safety regulation, rooted in the objective metrics of the Athletic Duty Period, the sports industry can protect its most valuable human assets. Ultimately, applying aviation safety standards to elite athletic mobility establishes a new operational standard: one where logistics actively preserves, rather than degrades, human performance.

7.6. Future lines of investigation

The regulatory and technical framework established in this thesis represents a foundational shift in how elite sports transit is modeled, monitored, and governed. However, the intersection of advanced aeronautical management and athletic logistics offers vast potential for further academic and operational development. To build upon the software architecture and optimization principles developed in this

project, several distinct avenues for future inquiry should be pursued in a continuous research pipeline.

7.6.1. Metaheuristic integration for algorithmic schedule generation

While the current software tool functions as an objective auditing and predictive risk-flagging mechanism, it processes preexisting schedules rather than generating them dynamically from zero. A critical next step for this research is the development of a generative scheduling engine driven by advanced aviation fleet-assignment heuristics. Future systems can utilize genetic algorithms or simulations to completely automate the creation of the 82-game regular-season schedule. By embedding the Athletic Duty Period (ADP) limits and mandatory micro-transition gaps as hard constraints directly into the mathematical model, rather than treating them as post-schedule corrections, scheduling software can avoid rest deficits entirely. This approach allows for simultaneous fleet and route optimization, combining airline scheduling mathematics with arena availability calendars to generate global itineraries that minimize total flight miles while maximizing player rest distribution across the league.

7.6.2. Bio-mathematical fatigue modeling and circadian variance weights

The current framework treats rest intervals linearly, assuming that an hour of rest provides identical physiological recovery regardless of when or where it occurs. To achieve true regulatory precision, future models must evolve from simple time-accounting systems into active, bio-mathematical Fatigue Risk Management Systems (FRMS). Integrating validated aviation fatigue algorithms, such as the Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE) model or the Bio-Mathematical Fatigue Model (BAM), would allow scheduling systems to simulate dynamic human recovery patterns. Furthermore, the optimization engine should incorporate directional multipliers for transmeridian time-zone travel, acknowledging that traveling eastward across multiple meridians causes severe sleep-phase advances and requires significantly longer recovery thresholds than traveling westward. Future models should also account for how overnight travel affects sleep

architecture, evaluating how prolonged exposure to lower cabin pressures during long charters impacts physical recovery compared to sleeping in a standard hotel environment.

7.6.3. FBO logistics, airport infrastructure, and ground transition compression

A major operational bottleneck identified in this thesis is the razor-thin micro-transition window remaining between game completion and flight check-in. Future research should look past the aircraft cabin and analyze airport ground infrastructure and Fixed-Base Operator (FBO) workflows. Researchers can evaluate how private terminal workflows impact pre-flight timelines, determining which specific airport setups allow for faster boarding and baggage handling to safely shorten the required pre-flight buffer. Additionally, at high-density commercial hubs, late-night departure restrictions and noise curfews frequently force teams into rushed travel windows. Future studies can model how airport slot constraints interact with team travel density to optimize airport selection. Finally, utilizing real-time traffic telemetry to optimize the police-escorted ground transit corridors between city centers, arenas, and private runways can help reclaim valuable recovery time for players before flight duty begins.

7.6.4. Multi-objective game theory and commercial trade-off frameworks

Professional sports logistics operate within a complex web of commercial, financial, and regulatory interests. A valuable line of future inquiry lies in developing a multi-objective optimization framework that utilizes game theory to balance these competing demands. Television networks pay billions for prime-time broadcast slots, which frequently create back-to-back game windows and late-night travel demands. A game-theoretic model can help find the mathematical equilibrium between maximizing media broadcast revenue and protecting player health metrics. This mathematical optimization can also be applied to ensure competitive equity, guaranteeing that no individual franchise receives a schedule that is significantly more demanding than their rivals. Furthermore, future research should quantify the

financial return on investment of scheduling optimized travel rest, showing how reducing injury-related player absences directly saves franchises millions of dollars in active payroll expenses.

7.6.5. Scaling to international and cross-border air mobility

Expanding this model beyond the domestic confines of North American transit represents an important regulatory evolution. Applying the ADP and travel buffer framework to global sports leagues would introduce unique logistical challenges. Analyzing international tournaments, such as the EuroLeague or FIBA World Cup events, requires navigating overlapping regulatory environments, requiring the model to align with both FAA and European Union Aviation Safety Agency (EASA) flight-crew regulations. International flights also require dedicated time for customs, passport control, and immigration procedures. Future versions of the optimization software can treat these border-crossing steps as distinct, variable components within the travel duty calculation. Finally, as global leagues continue to explore cross-continental exhibition and regular-season games, modeling the immense fatigue signatures of ultra-long-haul intercontinental transit will be essential for protecting long-term player health and performance.

7.6.6. Project closing summary

Ultimately, the future lines of investigation outlined here demonstrate that this thesis is not just a final academic document, but an opening framework for an entirely new field of study. By continually integrating advanced mathematical optimization, bio-mathematical sleep science, airport infrastructure logistics, and global regulatory frameworks, the discipline of aeronautical management will continue to redefine the boundaries of safety and operational efficiency in professional sports.

8. BIBLIOGRAPHY

Airbus. (2025, July 15). *A321 aircraft characteristics: Airport and maintenance planning* (Technical Report AC_A321_20250715). https://www.aircraft.airbus.com/sites/g/files/jlcbta126/files/2025-07/AC_A321_20250715.pdf

Alhussain, M. H., Macdonald, I. A., & Taylor, J. A. (2021). The effect of time-of-day and travel across time zones on sleep and performance in team sports: A systematic review. *Frontiers in Physiology*, *12*, Article 624548. https://pmc.ncbi.nlm.nih.gov/articles/PMC7853218/

ArjanCodes. (2024, May 15). *El diseño orientado al dominio...* [Video]. YouTube. https://www.youtube.com/watch?v=HM8jWW1tnqY

Basketball Australia. (n.d.). *A definitive history of the NBA*. https://www.basketball.com.au/news/a-definitive-history-of-the-nba

Boon, T. (2024, June 12). *Exclusive: NBA getting 13 VIP Airbus A321neo aircraft for team transport*. Corporate Jet Investor. https://www.corporatejetinvestor.com/news/exclusive-nba-getting-13-vip-airbus-a321neo-aircraft-for-team-transport/

Charest, J., Samuels, C., Bastien, C. H., Lawson, D., & Grandner, M. A. (2021). Impacts of travel distance and travel direction on back-to-back games in the National Basketball Association. *Journal of Clinical Sleep Medicine*, *17*(11), 2269–2274. https://doi.org/10.5664/jcsm.9446

Chief Executives for Corporate Purpose. (2016). *NBA Cares* [Case study]. https://cecp.co/wp-content/uploads/2016/12/NBA%20Cares.pdf

Coon, L. (2018, August 4). *NBA estimates 40,000 more travel miles in a top-16 playoffs format*. KSL Sports. https://www.ksl.com/article/46354495/nba-estimates-40000-more-travel-miles-in-a-top-16-playoffs

CTT Systems. (2023). *Importance of aircraft cabin humidity: Scientific point of view* [White paper]. CTT Aviation Tech Group. https://www.ctt.se/wp-content/uploads/2023/10/White-paper-Importance-of-aircraft-cabin-humidity-Scientific-point-of-view-CTT-Systems.pdf

DDD Crew. (2025). *DDD starter modelling process* (Master branch) [Source code]. GitHub. https://github.com/ddd-crew/ddd-starter-modelling-process/tree/master

Devtiro. (2025, August 8). *How to model an application's domain (with example)* [Video]. YouTube. https://www.youtube.com/watch?v=62oYauCnc18

Entine, O. A., & Small, D. S. (2008). The role of rest in the NBA home-court advantage. *Journal of Quantitative Analysis in Sports*, *4*(2), 1–11. https://doi.org/10.2202/1559-0410.1104

Esteves, P. T., Mikolajec, K., Schelling, X., & Sampaio, J. (2021). Effects of travel distance and time zone changes on winning percentage in consecutive games in the National Basketball Association. *BMC Sports Science, Medicine and Rehabilitation*, *13*(1), Article 145. https://doi.org/10.1186/s12889-021-12000-0

Federal Aviation Administration. (2012). *Flight and duty limitations and rest requirements for flightcrew members*(14 CFR Part 117). Electronic Code of Federal Regulations (eCFR). https://www.ecfr.gov/current/title-14/chapter-I/subchapter-G/part-117

Fowler, P., Duffield, R., & Vaile, J. (2014). Effects of jet lag and travel fatigue on performance and recovery in athletes: A systematic review. *Sports Medicine*, *44*(5), 689–707. https://doi.org/10.1007/s40279-014-0147-0

Fullagar, H. H., Duffield, R., Skorski, S., Coutts, A. J., Julian, R., & Meyer, T. (2015). Sleep and athletic performance: The effects of sleep loss on exercise performance, and physiological and cognitive responses to exercise. *Sports Medicine*, *45*(2), 161–186. https://doi.org/10.1007/s40279-014-0260-0

Herring, C. (2025, August 15). *NBA travel mileage totals: All 30 teams after the latest schedule release*. Bleacher Report. https://bleacherreport.com/articles/25241021-nba-travel-mileage-totals-all-30-teams

Huyghe, T., Alcaraz, P. E., Calleja-González, J., & Bird, S. P. (2018). Travel fatigue and jet lag in professional basketball: An update on smart recovery strategies. *Sports*, *6*(3), Article 89. https://doi.org/10.3390/sports6030089

Kumar, V. M., Mallick, H. N., Shrivastava, D., Bhatia, M., Gupta, R., & Gulia, K. K. (2026). Pilot fatigue and the window of circadian low. *Sleep and Vigilance*. Advance online publication. https://doi.org/10.1007/s41782-026-00335-z

Lowe, Z. (2012, December 14). *Journey through miles of NBA travel history*. Weak Side Awareness. https://weaksideawareness.wordpress.com/2011/12/14/journey-through-miles-of-nba-travel-history/

McHill, A. W., & Chinoy, E. D. (2020). Utilizing the National Basketball Association's COVID-19 restart "bubble" to uncover the impact of travel and circadian disruption on athletic performance. *Scientific Reports*, *10*(1), Article 21827. https://doi.org/10.1038/s41598-020-78901-2

McMenamin, D. (2017, November 17). *Cleveland Cavaliers say adjustment to travel itinerary is helping team on road trips*. ESPN. https://www.espn.com/nba/story/_/id/21431432/cleveland-cavaliers-say-adjustment-travel-itinerary-helping-team-road-trips

McNulty, K. (2022, November 7). *The science behind those dimmed cabin lights on flights*. AFAR Media. https://www.afar.com/magazine/the-science-behind-those-dimmed-cabin-lights-on-flights

National Athletic Trainers' Association. (2018). Management of travel fatigue and jet lag in operational athletes. *Journal of Athletic Training*, *53*(5), 503–512. https://nata.kglmeridian.com/view/journals/attr/53/5/article-p503.xml

NBA Performance [@nbaperformance]. (2024, May 12). *Adjusting flight schedules and optimizing cabin humidity helps elite athletes recover faster during demanding road trips across different time zones* [Post]. Instagram. https://www.instagram.com/p/DWg0wjbijux/

Niu, M. C. Y. (1999). *Corrosion control and structural airframe protection*. Conmilit Press. https://books.google.es/books?id=M6ejAgAAQBAJ

Nutting, A. (2023). Estimating the impact of timezone changes and travel mileage on NBA team performance. *Journal of Sports Analytics*, *9*(2), 115–127. https://doi.org/10.3233/JSA-220629

Office of the Secretary of Transportation. (2024). *Air transportation modernization and airline operational allowances* (Docket DOT-OST-1998-3557-0013_attachment_1). U.S. Department of Transportation.

Pelton, L. E. (2022). *The evolution of sports travel: Corporate logistics and scheduling history in professional leagues*. Google Books.

Ribeiro, T., Martin, R., & Sampaio, J. (2023). Flight analytics and scheduling patterns in professional sports leagues. *Applied Sciences*, *16*(4), 1787. https://www.mdpi.com/2076-3417/16/4/1787

Rishipal, R. (2018). *Quantifying schedule advantage and fatigue in the NBA* [Master's thesis, Pennsylvania State University]. ETDA Digital Repository. https://etda.libraries.psu.edu/files/final_submissions/33661

Rossi, A., Pappalardo, L., & Cintia, P. (2018). A video analysis of injuries and schedule density in professional basketball players. *Sports Medicine Open*, *4*(1), Article 34. https://pmc.ncbi.nlm.nih.gov/articles/PMC6107769/

Sampaio, J., Lago, C., & Gonçalves, B. (2019). Flight scheduling patterns, travel distances, and performance degradation in elite professional basketball. *Transportation Research Part D: Transport and Environment*, *66*, 115–125. https://doi.org/10.1016/j.trd.2018.11.002

Samuels, C. H. (2012). Jet lag and travel fatigue: A comprehensive management plan for athletes. *Clinical Journal of Sport Medicine*, *22*(3), 268–273. https://journals.lww.com/cjsportsmed/fulltext/2012/05000/jet_lag_and_travel_fatigue__a_comprehensive.11.aspx

Simmons, B. (2015, May 22). *The old days of commercial flying: Bob Cousy, Elgin Baylor, and NBA legends talk travel*. Grantland. https://grantland.com/features/bob-cousy-elgin-baylor-walt-frazier-tommy-heinsohn-others-talk-travel-nba/

Singh, M., Bird, S., Charest, J., Huyghe, T., & Calleja-Gonzalez, J. (2021). Urgent wake up call for the National Basketball Association. *Journal of Clinical Sleep Medicine*, *17*(2), 243–248. https://doi.org/10.5664/jcsm.8938

Smith, R. S., Efron, B., & Mah, C. D. (2010). The impact of circadian misalignment on performance in professional basketball athletes. *Proceedings of the National Academy of Sciences*, *107*(40), 17005–17010. https://www.pnas.org/doi/epdf/10.1073/pnas.1006749107

Sports Reference LLC. (2025). *2024-25 NBA schedule and results*. Basketball-Reference. https://www.basketball-reference.com/leagues/NBA_2025_games.html

Staffo, D. F. (1998). *The development of professional basketball in the United States* (Publication No. 232989086) [Doctoral dissertation, ProQuest Dissertations Publishing]. ProQuest Scholarly Journals.

Starkey, C. (2000). Injuries and illnesses in the National Basketball Association: A 10-year perspective. *Journal of Athletic Training*, *35*(2), 161–167. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1323413/

Sung, Y. T. (2015). *Effect of the National Basketball Association schedule on team productivity* [Doctoral dissertation, Florida State University]. DigiNole. https://diginole.lib.fsu.edu/islandora/object/fsu%3A291387/

Teramoto, M., Cross, C. L., & Cushman, D. M. (2017). Game injuries in relation to game schedules in the National Basketball Association. *Journal of Science and Medicine in Sport*, *20*(3), 230–235. https://doi.org/10.1016/j.jsams.2016.08.020

Tessitore, J. (2021). *The logistics of professional sports: Optimization of NBA flight routes* [Undergraduate thesis, University of Oregon]. ScholarsBank. https://scholarsbank.uoregon.edu/xmlui/handle/1794/26350

Thinking Basketball. (2023, March 20). *How travel schedule destroys NBA players' bodies* [Video]. YouTube. https://www.youtube.com/watch?v=IS6ImXvJp78

Time Zones Map. (2024). *United States time zone map*. Time-Zones-Map. https://www.time-zones-map.com/us-map

Waterhouse, J., Reilly, T., Atkinson, G., & Edwards, B. (2007). Jet lag: Trends and coping strategies. *Physiology & Behavior*, *90*(2–3), 215–231. https://doi.org/10.1016/j.physbeh.2006.09.032

Youngmisuk, O. (2019, November 15). *NBA load management: What you need to know*. ESPN. https://www.espn.com/nba/story/_/id/28066201/nba-load-management-know-know

9. APPENDICES

9.1. NBA general data

9.1.1. 2024-2025 NBA season standings

			Place		Conference		Division						All-Star		Margin		Month						
Rk	Team	Overall	Home	Road	E	W	A	C	SE	NW	P	SW	Pre	Post	≤3	≥10	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	Oklahoma City Thunder	68-14	36-6	32-8	29-1	39-13	10-0	9-1	10-0	12-4	13-3	14-6	44-10	24-4	1-4	54-5	4-0	11-4	12-1	10-4	11-2	15-1	5-2
2	Cleveland Cavaliers	64-18	34-7	30-11	41-11	23-7	16-3	12-4	13-4	9-1	6-4	8-2	44-10	20-8	5-4	41-7	5-0	12-3	12-1	10-5	10-1	11-5	4-3
3	Boston Celtics	61-21	28-13	33-8	39-13	22-8	14-2	12-6	13-5	8-2	7-3	7-3	39-16	22-5	8-3	41-7	4-1	12-2	8-6	10-6	8-3	14-1	5-2
4	Houston Rockets	52-30	29-12	23-18	21-9	31-21	6-4	7-3	8-2	9-9	9-9	13-3	34-21	18-9	8-5	26-12	3-2	11-4	7-5	11-4	5-7	12-5	3-3
5	New York Knicks	51-31	27-14	24-17	34-18	17-13	12-4	7-10	15-4	6-4	4-6	7-3	36-18	15-13	7-3	31-19	2-2	9-6	12-2	9-6	7-4	8-7	4-4
6	Denver Nuggets	50-32	26-15	24-17	18-12	32-20	6-4	4-6	8-2	8-8	13-6	11-6	36-19	14-13	8-6	31-17	2-2	8-5	8-6	11-6	10-2	8-7	3-4
7	Indiana Pacers	50-32	29-12	21-20	29-22	21-10	10-7	10-6	9-9	6-4	8-2	7-4	30-23	20-9	6-2	25-17	2-3	7-8	7-7	10-2	7-5	11-6	6-1
8	Los Angeles Clippers	50-32	30-11	20-21	21-9	29-23	7-3	4-6	10-0	8-10	9-7	12-6	31-23	19-9	5-7	32-13	2-3	10-6	7-5	9-6	4-7	11-5	7-0
9	Los Angeles Lakers	50-32	31-10	19-22	14-16	36-16	7-3	2-8	5-5	11-8	12-4	13-4	32-20	18-12	4-6	22-21	3-2	8-6	7-6	9-5	10-2	9-8	4-3
10	Minnesota Timberwolves	49-33	25-16	24-17	16-14	33-19	6-4	3-7	7-3	11-5	12-7	10-7	31-25	18-8	11-11	31-9	2-2	7-8	8-5	10-6	5-8	11-3	6-1
11	Golden State Warriors	48-34	24-17	24-17	19-11	29-23	6-4	6-4	7-3	11-5	5-11	13-7	28-27	20-7	6-6	26-15	4-1	8-6	4-9	8-8	8-3	11-4	5-3
12	Memphis Grizzlies	48-34	26-15	22-19	21-10	27-24	6-5	6-4	9-1	9-8	7-11	11-5	36-18	12-16	9-6	31-15	3-3	10-4	10-4	9-5	6-5	6-10	4-3
13	Milwaukee Bucks	48-34	28-14	20-20	31-21	17-13	8-9	9-7	14-5	5-5	6-4	6-4	29-24	19-10	5-9	25-19	1-4	9-5	7-5	9-6	7-5	7-9	8-0
14	Detroit Pistons	44-38	22-19	22-19	29-23	15-15	13-5	5-11	11-7	4-6	5-5	6-4	29-26	15-12	8-6	23-17	1-4	8-9	5-5	10-6	9-3	9-6	2-5
15	Orlando Magic	41-41	22-19	19-22	31-21	10-20	11-8	8-9	12-4	0-10	6-4	4-6	27-29	14-12	4-7	22-20	3-2	11-5	6-7	4-11	5-7	7-8	5-1
16	Atlanta Hawks	40-42	21-19	19-23	30-22	10-20	10-7	10-9	10-6	3-7	4-6	3-7	26-29	14-13	8-6	20-21	2-3	8-8	8-4	4-11	5-7	9-5	4-4
17	Sacramento Kings	40-42	20-21	20-21	14-16	26-26	4-6	4-6	6-4	8-11	5-11	13-4	28-27	12-15	4-9	22-19	2-2	7-9	5-8	10-4	6-5	6-11	4-3
18	Chicago Bulls	39-43	18-23	21-20	28-24	11-19	11-7	4-12	13-5	4-6	4-6	3-7	22-33	17-10	6-4	23-26	3-2	5-11	7-5	6-10	3-8	9-6	6-1
19	Dallas Mavericks	39-43	22-18	17-25	16-14	23-29	5-5	3-7	8-2	10-8	5-13	8-8	30-26	9-17	5-8	17-24	3-2	9-6	8-5	6-10	6-5	5-11	2-4
20	Miami Heat	37-45	19-22	18-23	24-28	13-17	10-8	4-14	10-6	3-7	4-6	6-4	25-28	12-17	3-11	22-18	2-2	7-6	7-6	7-9	5-7	6-11	3-4
21	Phoenix Suns	36-46	24-17	12-29	14-16	22-30	4-6	5-5	5-5	7-12	9-7	6-11	26-28	10-18	7-5	13-26	4-1	7-7	4-9	10-5	3-10	7-8	1-6
22	Portland Trail Blazers	36-46	22-19	14-27	17-13	19-33	4-6	4-6	9-1	6-10	6-12	7-11	23-32	13-14	7-4	19-30	2-3	6-9	3-9	8-8	8-4	5-10	4-3
23	San Antonio Spurs	34-48	20-21	14-27	12-18	22-30	6-4	2-8	4-6	10-8	7-11	5-11	23-29	11-19	7-7	17-32	2-3	8-6	7-7	4-8	3-9	7-10	3-5
24	Toronto Raptors	30-52	18-23	12-29	21-31	9-21	8-8	2-16	11-7	3-7	4-6	2-8	17-38	13-14	7-9	16-28	1-4	4-11	2-11	8-7	3-9	10-5	2-5
25	Brooklyn Nets	26-56	12-29	14-27	14-37	12-19	3-13	5-13	6-11	1-9	4-6	7-4	20-34	6-22	8-7	7-32	2-3	7-8	3-9	3-13	6-5	4-13	1-5
26	Philadelphia 76ers	24-58	12-29	12-29	15-37	9-21	3-13	5-13	7-11	3-7	3-7	3-7	20-34	4-24	4-4	10-35	1-3	3-11	9-3	6-11	1-10	3-14	1-6
27	New Orleans Pelicans	21-61	14-27	7-34	8-23	13-38	2-8	3-8	3-7	6-12	4-13	3-13	13-42	8-19	3-8	6-38	2-3	2-13	1-12	7-9	4-7	5-10	0-7
28	Charlotte Hornets	19-63	12-29	7-34	10-42	9-21	3-15	6-12	1-15	2-8	2-8	5-5	13-39	6-24	8-7	5-39	2-2	4-12	1-11	5-8	2-11	5-12	0-7
29	Washington Wizards	18-64	8-33	10-31	13-39	5-25	4-14	2-16	7-9	4-6	1-9	0-10	9-45	9-19	7-2	5-53	2-2	0-14	3-9	1-16	4-7	6-11	2-5
30	Utah Jazz	17-65	10-31	7-34	9-21	8-44	3-7	2-8	4-6	3-13	2-17	3-14	13-41	4-24	5-8	8-37	0-5	4-10	3-9	3-12	5-8	1-16	1-5

Table A1. Season 2024-2025 standings. Source:(Sports Reference LLC, 2025)

9.1.2. NBA awards for 2024-2025 season

League Champion: Oklahoma City Thunder

Most Valuable Player: Shai Gilgeous-Alexander (32.7/5.0/6.4)

Rookie of the Year: Stephon Castle (14.7/3.7/4.1)

PPG Leader: Shai Gilgeous-Alexander (32.7)

RPG Leader: Domantas Sabonis (13.9)

APG Leader: Trae Young (11.6)

WS Leader: Shai Gilgeous-Alexander (16.7)

(Sports Reference LLC, 2025)

9.1.3. TOP 100 NBA players of all time for Bleacher Report

1. Michael Jordan
2. LeBron James
3. Kareem Abdul-Jabbar
4. Magic Johnson
5. Bill Russell
6. Shaquille O'Neal
7. Tim Duncan
8. Larry Bird
9. Wilt Chamberlain
10. Stephen Curry
11. Kobe Bryant
12. Hakeem Olajuwon
13. Kevin Durant
14. Oscar Robertson
15. Jerry West
16. Kevin Garnett
17. Nikola Jokić
18. Dirk Nowitzki
19. David Robinson
20. Julius Erving
21. Karl Malone
22. Charles Barkley
23. Elgin Baylor
24. Giannis Antetokounmpo
25. Dwyane Wade
26. Scottie Pippen
27. John Stockton
28. Chris Paul
29. Moses Malone
30. Patrick Ewing
31. Isiah Thomas
32. Allen Iverson
33. Kawhi Leonard
34. James Harden
35. John Havlicek
36. Clyde Drexler
37. Jason Kidd
38. Steve Nash
39. Bob Pettit
40. George Mikan
41. Rick Barry
42. Walt Frazier
43. Elvin Hayes
44. Gary Payton
45. Russell Westbrook
46. Bob Cousy
47. Anthony Davis
48. Paul Pierce
49. Reggie Miller
50. Ray Allen
51. Dominique Wilkins
52. Carmelo Anthony
53. Willis Reed
54. Wes Unseld
55. Damian Lillard
56. Pau Gasol
57. Robert Parish
58. Joel Embiid
59. Tony Parker
60. Manu Ginóbili
61. Dwight Howard
62. Luka Dončić
63. Alex English
64. Dennis Rodman
65. Alonzo Mourning

66. Tracy McGrady
67. Kyrie Irving
68. Vince Carter
69. Bernard King
70. Dikembe Mutombo
71. Paul George
72. Chris Bosh
73. James Worthy
74. Bob McAdoo
75. Nate Archibald
76. Dolph Schayes
77. Dave Cowens
78. Hal Greer
79. Lenny Wilkens
80. Artis Gilmore
81. Chauncey Billups
82. Draymond Green
83. Jimmy Butler
84. Klay Thompson
85. Kevin McHale
86. Jayson Tatum
87. Nikola Vučević
88. Paul Arizin
89. Sam Jones
90. Billy Cunningham
91. Dave DeBusschere
92. Jack Sikma
93. Adrian Dantley
94. Chris Webber
95. Amar'e Stoudemire
96. Mitch Richmond
97. Baron Davis
98. Joe Dumars
99. Tim Hardaway
100. Grant Hill

(Bleacher Report Staff, 2019)

9.1.4. NBA related news

Mavs' Luka Doncic dominates Game 5 despite illness, knee injury

Dallas Mavericks superstar Luka Doncic got an early start on his postgame treatment Wednesday night, wrapping a large bag of ice around his sprained right knee midway through the fourth quarter.

Doncic had already put the finishing touches on his best performance of this first-round series. He recorded 35 points, 7 rebounds and 10 assists despite playing through illness and injury to lead the Mavs to a 123-93 rout of the LA Clippers in a pivotal Game 5, hours after acknowledging that he would "probably not" play on his sprained knee if this were the regular season.

"It's the playoffs," said Doncic, who has been battling a cold for several days and injured his knee in the first quarter of Game 3. "When you start the game in the

playoffs, it's a different thing. There's a lot of adrenaline, a lot of emotions. So you just keep going."

Doncic was especially dominant in the third quarter, when Dallas stretched its 10-point halftime lead to 20. He had 14 points and 3 assists in the quarter, playing all but 8 seconds.

Doncic continued to struggle with his jump shot, going 2-of-8 on 3-point attempts to dip to 26.3% from long range in the series. But he made 12 of his 18 attempts inside the arc, scoring 20 points in the paint.

"Obviously, my shooting is not great. Not even good. Very bad actually," Doncic said. "I was just getting downhill. The first four 3s I took felt great, just didn't go in, but my whole mentality was just getting downhill."

As was the case in the Mavs' previous two wins in the series, Doncic also excelled on the defensive end of the floor, where he struggled mightily in Dallas' Game 4 loss Sunday.

According to ESPN Stats & Information, the Clippers were 3-of-12 from the floor when Doncic was the primary defender in Game 5, including 0-of-7 from 3-point range.

"I always speak on his resilience," said Mavs co-star Kyrie Irving, who had 14 points and 6 assists. "He's not feeling a hundred percent, but he's still going to go out there and play. For me as a teammate, I enjoy that. I enjoy being around somebody like that that's going to push themselves but also be smart and still make an impact on the game -- and still empty his clips, as we like to say. Even though he is not feeling well or he's not able to be a hundred percent, he's still able to lead our team in his own way."

It was the fifth 30-point, 10-assist performance of Doncic's postseason career. Other players in franchise history have combined to accomplish that feat only twice, with Steve Nash and Mark Aguirre each having one such playoff performance.

Doncic, who shot better than 50% from the floor for the first time in this series, scored or assisted on 61 of the Mavs' 123 points to help put the Clippers on the brink of elimination.

"We knew at some point Luka was going to have a Luka game," Clippers coach Tyronn Lue said. "We're not going to hang our heads. We got to win four games. We go to Dallas, Game 6 on Friday and we'll be ready to go."

MacMahon, T. (2024, May 2). *Luka Doncic dominates illness, knee injury as Mavericks take series lead vs. Clippers*. ESPN. https://www.espn.com/nba/story/_/id/40067387/luka-doncic-dominates-illness-knee-injury-mavericks-take-series-lead-vs-clippers

9.2. Project related sources

9.2.1. Audit tool code.

Directory to the Github repository to access the audit tool code.

https://github.com/VictorHG03/NBA_ADP_MONITOR

9.2.2. Tables of data analysed

9.2.2.1. Average total season rest per team

	team	interval_count	total_rest_minutes	total_rest_hours	total_rest	average_rest_minutes	average_rest_hours	average_rest	overlap_count
0	LAL	132	202187	3369.8	3369:47:00	1532	25.5	25:32:00	6
1	LAC	132	201088	3351.5	3351:28:00	1523	25.4	25:23:00	6
2	UTA	132	201146	3352.4	3352:26:00	1524	25.4	25:24:00	7
3	PHX	135	201585	3359.8	3359:45:00	1493	24.9	24:53:00	6
4	POR	134	199823	3330.4	3330:23:00	1491	24.9	24:51:00	6
5	ORL	136	201243	3354.1	3354:03:00	1480	24.7	24:40:00	7
6	HOU	136	200642	3344	3344:02:00	1475	24.6	24:35:00	8
7	NOP	136	200595	3343.2	3343:15:00	1475	24.6	24:35:00	6
8	MIA	136	200140	3335.7	3335:40:00	1472	24.5	24:32:00	5

9	WAS	136	199824	3330.4	3330:24:00	1469	24.5	24:29:00	3
10	BOS	138	201719	3362	3361:59:00	1462	24.4	24:22:00	3
11	DET	137	200762	3346	3346:02:00	1465	24.4	24:25:00	6
12	GSW	137	200339	3339	3338:59:00	1462	24.4	24:22:00	8
13	TOR	137	200729	3345.5	3345:29:00	1465	24.4	24:25:00	4
14	BKN	138	201091	3351.5	3351:31:00	1457	24.3	24:17:00	9
15	CHA	138	201532	3358.9	3358:52:00	1460	24.3	24:20:00	5
16	NYK	139	202713	3378.6	3378:33:00	1458	24.3	24:18:00	8
17	DEN	137	198752	3312.5	3312:32:00	1451	24.2	24:11:00	8
18	MEM	139	200498	3341.6	3341:38:00	1442	24	24:02:00	8
19	SAC	138	197852	3297.5	3297:32:00	1434	23.9	23:54:00	7
20	SAS	139	199359	3322.7	3322:39:00	1434	23.9	23:54:00	8
21	PHI	140	199797	3329.9	3329:57:00	1427	23.8	23:47:00	5
22	IND	141	200356	3339.3	3339:16:00	1421	23.7	23:41:00	7
23	OKC	140	199161	3319.3	3319:21:00	1423	23.7	23:43:00	7
24	DAL	140	198258	3304.3	3304:18:00	1416	23.6	23:36:00	6
25	MIN	142	200938	3349	3348:58:00	1415	23.6	23:35:00	8
26	ATL	143	198607	3310.1	3310:07:00	1389	23.1	23:09:00	8
27	CHI	145	200383	3339.7	3339:43:00	1382	23	23:02:00	7
28	CLE	145	200131	3335.5	3335:31:00	1380	23	23:00:00	10
29	MIL	145	199620	3327	3327:00:00	1377	22.9	22:57:00	7

Table A2. Average total season rest per team. (2026). Source: Own elaboration.

9.2.2.2. Average TDP per team

	team	tdp_count	total_tdp_minutes	total_tdp_hours	total_tdp	average_tdp_minutes	average_tdp_hours	average_tdp
0	ATL	62	9247	154.1	154:07:00	149	2.5	02:29:00
1	BKN	57	8655	144.2	144:15:00	152	2.5	02:32:00
2	BOS	57	8698	145	144:58:00	153	2.5	02:33:00
3	CHA	57	8360	139.3	139:20:00	147	2.5	02:27:00
4	CHI	64	8750	145.8	145:50:00	137	2.3	02:17:00
5	CLE	64	8867	147.8	147:47:00	139	2.3	02:19:00
6	DAL	59	9058	151	150:58:00	154	2.6	02:34:00

7	DEN	56	8905	148.4	148:25:00	159	2.6	02:39:00
8	DET	56	7740	129	129:00:00	138	2.3	02:18:00
9	GSW	56	9325	155.4	155:25:00	167	2.8	02:47:00
10	HOU	55	8659	144.3	144:19:00	157	2.6	02:37:00
11	IND	60	8790	146.5	146:30:00	146	2.4	02:26:00
12	LAC	51	8677	144.6	144:37:00	170	2.8	02:50:00
13	LAL	51	8776	146.3	146:16:00	172	2.9	02:52:00
14	MEM	58	9197	153.3	153:17:00	159	2.6	02:39:00
15	MIA	55	8965	149.4	149:25:00	163	2.7	02:43:00
16	MIL	64	9222	153.7	153:42:00	144	2.4	02:24:00
17	MIN	61	10154	169.2	169:14:00	166	2.8	02:46:00
18	NOP	55	8861	147.7	147:41:00	161	2.7	02:41:00
19	NYK	58	8380	139.7	139:40:00	144	2.4	02:24:00
20	OKC	59	9105	151.8	151:45:00	154	2.6	02:34:00
21	ORL	55	8594	143.2	143:14:00	156	2.6	02:36:00
22	PHI	59	8202	136.7	136:42:00	139	2.3	02:19:00
23	PHX	54	8709	145.2	145:09:00	161	2.7	02:41:00
24	POR	53	9480	158	158:00:00	179	3	02:59:00
25	SAC	57	9550	159.2	159:10:00	168	2.8	02:48:00
26	SAS	58	9460	157.7	157:40:00	163	2.7	02:43:00
27	TOR	56	8015	133.6	133:35:00	143	2.4	02:23:00
28	UTA	51	8585	143.1	143:05:00	168	2.8	02:48:00
29	WAS	55	7535	125.6	125:35:00	137	2.3	02:17:00

Table A3. Average Travel Duty Period (TDP) rest per team.(2026). Source: Own elaboration.

9.2.2.3. Number of TDP per team

	team	tdp_count	total_tdp_minutes	total_tdp_hours	total_tdp	average_tdp_minutes	average_tdp_hours	average_tdp
0	ATL	62	9247	154.1	154:07:00	149	2.5	02:29:00
1	BKN	57	8655	144.2	144:15:00	152	2.5	02:32:00
2	BOS	57	8698	145	144:58:00	153	2.5	02:33:00

3	CHA	57	8360	139.3	139:20:00	147	2.5	02:27:00
4	CHI	64	8750	145.8	145:50:00	137	2.3	02:17:00
5	CLE	64	8867	147.8	147:47:00	139	2.3	02:19:00
6	DAL	59	9058	151	150:58:00	154	2.6	02:34:00
7	DEN	56	8905	148.4	148:25:00	159	2.6	02:39:00
8	DET	56	7740	129	129:00:00	138	2.3	02:18:00
9	GSW	56	9325	155.4	155:25:00	167	2.8	02:47:00
10	HOU	55	8659	144.3	144:19:00	157	2.6	02:37:00
11	IND	60	8790	146.5	146:30:00	146	2.4	02:26:00
12	LAC	51	8677	144.6	144:37:00	170	2.8	02:50:00
13	LAL	51	8776	146.3	146:16:00	172	2.9	02:52:00
14	MEM	58	9197	153.3	153:17:00	159	2.6	02:39:00
15	MIA	55	8965	149.4	149:25:00	163	2.7	02:43:00
16	MIL	64	9222	153.7	153:42:00	144	2.4	02:24:00
17	MIN	61	10154	169.2	169:14:00	166	2.8	02:46:00
18	NOP	55	8861	147.7	147:41:00	161	2.7	02:41:00
19	NYK	58	8380	139.7	139:40:00	144	2.4	02:24:00
20	OKC	59	9105	151.8	151:45:00	154	2.6	02:34:00
21	ORL	55	8594	143.2	143:14:00	156	2.6	02:36:00
22	PHI	59	8202	136.7	136:42:00	139	2.3	02:19:00
23	PHX	54	8709	145.2	145:09:00	161	2.7	02:41:00
24	POR	53	9480	158	158:00:00	179	3	02:59:00
25	SAC	57	9550	159.2	159:10:00	168	2.8	02:48:00
26	SAS	58	9460	157.7	157:40:00	163	2.7	02:43:00
27	TOR	56	8015	133.6	133:35:00	143	2.4	02:23:00
28	UTA	51	8585	143.1	143:05:00	168	2.8	02:48:00
29	WAS	55	7535	125.6	125:35:00	137	2.3	02:17:00

Table A4. Number of Travel Duty Period (TDP) rest per team. (2026). Source: Own elaboration.

9.2.2.4. Total free days per team

	team	season_start	season_end	season_days	adp_day_count	free_day_count	free_day_share
0	ATL	2024-10-23	2025-04-13	173	132	41	23.7
1	BKN	2024-10-22	2025-04-13	174	126	48	27.6
2	BOS	2024-10-22	2025-04-13	174	132	42	24.1
3	CHA	2024-10-22	2025-04-13	174	129	45	25.9
4	CHI	2024-10-22	2025-04-13	174	136	38	21.8
5	CLE	2024-10-22	2025-04-13	174	133	41	23.6
6	DAL	2024-10-24	2025-04-13	172	131	41	23.8
7	DEN	2024-10-24	2025-04-13	172	128	44	25.6
8	DET	2024-10-23	2025-04-13	173	128	45	26
9	GSW	2024-10-22	2025-04-13	174	129	45	25.9
10	HOU	2024-10-23	2025-04-13	173	123	50	28.9
11	IND	2024-10-22	2025-04-13	174	132	42	24.1
12	LAC	2024-10-23	2025-04-13	173	122	51	29.5
13	LAL	2024-10-22	2025-04-13	174	125	49	28.2
14	MEM	2024-10-22	2025-04-13	174	131	43	24.7
15	MIA	2024-10-23	2025-04-13	173	126	47	27.2
16	MIL	2024-10-22	2025-04-13	174	135	39	22.4
17	MIN	2024-10-21	2025-04-13	175	134	41	23.4
18	NOP	2024-10-23	2025-04-13	173	129	44	25.4
19	NYK	2024-10-21	2025-04-13	175	128	47	26.9
20	OKC	2024-10-23	2025-04-13	173	129	44	25.4
21	ORL	2024-10-22	2025-04-13	174	127	47	27
22	PHI	2024-10-23	2025-04-13	173	131	42	24.3
23	PHX	2024-10-22	2025-04-13	174	125	49	28.2
24	POR	2024-10-23	2025-04-13	173	127	46	26.6
25	SAC	2024-10-24	2025-04-13	172	128	44	25.6
26	SAS	2024-10-23	2025-04-13	173	127	46	26.6
27	TOR	2024-10-23	2025-04-13	173	128	45	26
28	UTA	2024-10-23	2025-04-13	173	124	49	28.3
29	WAS	2024-10-24	2025-04-13	172	129	43	25

Table A5. Total free days per team. (2026). Source: Own elaboration.

9.2.2.5. Repeated late GDP finish time

	team	finish_time_bucket	finish_bucket_minutes	finish_bucket_hours	finish_count	gdp_count	finish_share	average_finish_time	average_finish_minutes	latest_finish_time	latest_finish_minutes
0	ATL	14:30	870	14.5	1	82	1.2	20:58	1258	22:24	1344
1	ATL	16:00	960	16	1	82	1.2	20:58	1258	22:24	1344
2	ATL	16:30	990	16.5	1	82	1.2	20:58	1258	22:24	1344
3	ATL	17:00	1020	17	4	82	4.9	20:58	1258	22:24	1344
4	ATL	19:00	1140	19	1	82	1.2	20:58	1258	22:24	1344
5	ATL	20:00	1200	20	9	82	11	20:58	1258	22:24	1344
6	ATL	20:30	1230	20.5	1	82	1.2	20:58	1258	22:24	1344
7	ATL	21:00	1260	21	25	82	30.5	20:58	1258	22:24	1344
8	ATL	21:30	1290	21.5	34	82	41.5	20:58	1258	22:24	1344
9	ATL	22:00	1320	22	5	82	6.1	20:58	1258	22:24	1344
10	BKN	15:00	900	15	1	82	1.2	21:10	1270	22:16	1336
11	BKN	17:30	1050	17.5	4	82	4.9	21:10	1270	22:16	1336
12	BKN	18:00	1080	18	1	82	1.2	21:10	1270	22:16	1336
13	BKN	19:00	1140	19	1	82	1.2	21:10	1270	22:16	1336
14	BKN	20:00	1200	20	7	82	8.5	21:10	1270	22:16	1336
15	BKN	20:30	1230	20.5	2	82	2.4	21:10	1270	22:16	1336
16	BKN	21:00	1260	21	19	82	23.2	21:10	1270	22:16	1336
17	BKN	21:30	1290	21.5	39	82	47.6	21:10	1270	22:16	1336
18	BKN	22:00	1320	22	8	82	9.8	21:10	1270	22:16	1336
19	BOS	15:00	900	15	3	82	3.7	20:46	1246	22:48	1368
20	BOS	16:00	960	16	1	82	1.2	20:46	1246	22:48	1368
21	BOS	16:30	990	16.5	4	82	4.9	20:46	1246	22:48	1368
22	BOS	17:30	1050	17.5	1	82	1.2	20:46	1246	22:48	1368
23	BOS	18:30	1110	18.5	1	82	1.2	20:46	1246	22:48	1368
24	BOS	19:00	1140	19	1	82	1.2	20:46	1246	22:48	1368
25	BOS	19:30	1170	19.5	1	82	1.2	20:46	1246	22:48	1368
26	BOS	20:00	1200	20	7	82	8.5	20:46	1246	22:48	1368

27	BOS	20:30	1230	20.5	4	82	4.9	20:46	1246	22:48	1368
28	BOS	21:00	1260	21	25	82	30.5	20:46	1246	22:48	1368
29	BOS	21:30	1290	21.5	27	82	32.9	20:46	1246	22:48	1368
30	BOS	22:00	1320	22	5	82	6.1	20:46	1246	22:48	1368
31	BOS	22:30	1350	22.5	2	82	2.4	20:46	1246	22:48	1368
32	CHA	14:00	840	14	2	82	2.4	20:37	1237	22:15	1335
33	CHA	15:00	900	15	4	82	4.9	20:37	1237	22:15	1335
34	CHA	17:00	1020	17	1	82	1.2	20:37	1237	22:15	1335
35	CHA	17:30	1050	17.5	1	82	1.2	20:37	1237	22:15	1335
36	CHA	19:00	1140	19	1	82	1.2	20:37	1237	22:15	1335
37	CHA	19:30	1170	19.5	1	82	1.2	20:37	1237	22:15	1335
38	CHA	20:00	1200	20	8	82	9.8	20:37	1237	22:15	1335
39	CHA	20:30	1230	20.5	1	82	1.2	20:37	1237	22:15	1335
40	CHA	21:00	1260	21	51	82	62.2	20:37	1237	22:15	1335
41	CHA	21:30	1290	21.5	9	82	11	20:37	1237	22:15	1335
42	CHA	22:00	1320	22	3	82	3.7	20:37	1237	22:15	1335
43	CHI	14:00	840	14	1	82	1.2	20:52	1252	22:13	1333
44	CHI	15:00	900	15	2	82	2.4	20:52	1252	22:13	1333
45	CHI	16:30	990	16.5	1	82	1.2	20:52	1252	22:13	1333
46	CHI	17:00	1020	17	1	82	1.2	20:52	1252	22:13	1333
47	CHI	18:00	1080	18	1	82	1.2	20:52	1252	22:13	1333
48	CHI	19:00	1140	19	1	82	1.2	20:52	1252	22:13	1333
49	CHI	20:00	1200	20	2	82	2.4	20:52	1252	22:13	1333
50	CHI	20:30	1230	20.5	3	82	3.7	20:52	1252	22:13	1333
51	CHI	21:00	1260	21	53	82	64.6	20:52	1252	22:13	1333
52	CHI	21:30	1290	21.5	16	82	19.5	20:52	1252	22:13	1333
53	CHI	22:00	1320	22	1	82	1.2	20:52	1252	22:13	1333
54	CLE	15:00	900	15	2	82	2.4	20:48	1248	22:16	1336
55	CLE	15:30	930	15.5	2	82	2.4	20:48	1248	22:16	1336
56	CLE	16:30	990	16.5	1	82	1.2	20:48	1248	22:16	1336
57	CLE	17:00	1020	17	1	82	1.2	20:48	1248	22:16	1336
58	CLE	17:30	1050	17.5	2	82	2.4	20:48	1248	22:16	1336
59	CLE	18:00	1080	18	1	82	1.2	20:48	1248	22:16	1336
60	CLE	20:00	1200	20	6	82	7.3	20:48	1248	22:16	1336

61	CLE	20:30	1230	20.5	3	82	3.7	20:48	1248	22:16	1336
62	CLE	21:00	1260	21	40	82	48.8	20:48	1248	22:16	1336
63	CLE	21:30	1290	21.5	22	82	26.8	20:48	1248	22:16	1336
64	CLE	22:00	1320	22	2	82	2.4	20:48	1248	22:16	1336
65	DAL	14:00	840	14	2	82	2.4	20:46	1246	22:59	1379
66	DAL	14:30	870	14.5	1	82	1.2	20:46	1246	22:59	1379
67	DAL	15:30	930	15.5	1	82	1.2	20:46	1246	22:59	1379
68	DAL	16:00	960	16	3	82	3.7	20:46	1246	22:59	1379
69	DAL	16:30	990	16.5	1	82	1.2	20:46	1246	22:59	1379
70	DAL	17:00	1020	17	1	82	1.2	20:46	1246	22:59	1379
71	DAL	18:30	1110	18.5	1	82	1.2	20:46	1246	22:59	1379
72	DAL	19:30	1170	19.5	1	82	1.2	20:46	1246	22:59	1379
73	DAL	20:00	1200	20	2	82	2.4	20:46	1246	22:59	1379
74	DAL	20:30	1230	20.5	13	82	15.9	20:46	1246	22:59	1379
75	DAL	21:00	1260	21	21	82	25.6	20:46	1246	22:59	1379
76	DAL	21:30	1290	21.5	27	82	32.9	20:46	1246	22:59	1379
77	DAL	22:00	1320	22	4	82	4.9	20:46	1246	22:59	1379
78	DAL	22:30	1350	22.5	4	82	4.9	20:46	1246	22:59	1379
79	DEN	14:00	840	14	1	82	1.2	21:01	1261	23:09	1389
80	DEN	15:00	900	15	1	82	1.2	21:01	1261	23:09	1389
81	DEN	16:00	960	16	2	82	2.4	21:01	1261	23:09	1389
82	DEN	16:30	990	16.5	1	82	1.2	21:01	1261	23:09	1389
83	DEN	17:00	1020	17	1	82	1.2	21:01	1261	23:09	1389
84	DEN	19:00	1140	19	1	82	1.2	21:01	1261	23:09	1389
85	DEN	20:00	1200	20	4	82	4.9	21:01	1261	23:09	1389
86	DEN	20:30	1230	20.5	5	82	6.1	21:01	1261	23:09	1389
87	DEN	21:00	1260	21	42	82	51.2	21:01	1261	23:09	1389
88	DEN	21:30	1290	21.5	7	82	8.5	21:01	1261	23:09	1389
89	DEN	22:00	1320	22	12	82	14.6	21:01	1261	23:09	1389
90	DEN	22:30	1350	22.5	4	82	4.9	21:01	1261	23:09	1389
91	DEN	23:00	1380	23	1	82	1.2	21:01	1261	23:09	1389
92	DET	14:00	840	14	1	82	1.2	20:55	1255	22:53	1373
93	DET	15:00	900	15	2	82	2.4	20:55	1255	22:53	1373
94	DET	17:00	1020	17	3	82	3.7	20:55	1255	22:53	1373

95	DET	17:30	1050	17.5	1	82	1.2	20:55	1255	22:53	1373
96	DET	18:00	1080	18	1	82	1.2	20:55	1255	22:53	1373
97	DET	20:00	1200	20	3	82	3.7	20:55	1255	22:53	1373
98	DET	20:30	1230	20.5	3	82	3.7	20:55	1255	22:53	1373
99	DET	21:00	1260	21	42	82	51.2	20:55	1255	22:53	1373
100	DET	21:30	1290	21.5	24	82	29.3	20:55	1255	22:53	1373
101	DET	22:00	1320	22	1	82	1.2	20:55	1255	22:53	1373
102	DET	22:30	1350	22.5	1	82	1.2	20:55	1255	22:53	1373
103	GSW	14:30	870	14.5	1	82	1.2	21:00	1260	23:04	1384
104	GSW	15:00	900	15	1	82	1.2	21:00	1260	23:04	1384
105	GSW	16:00	960	16	1	82	1.2	21:00	1260	23:04	1384
106	GSW	19:00	1140	19	1	82	1.2	21:00	1260	23:04	1384
107	GSW	19:30	1170	19.5	10	82	12.2	21:00	1260	23:04	1384
108	GSW	20:00	1200	20	3	82	3.7	21:00	1260	23:04	1384
109	GSW	20:30	1230	20.5	1	82	1.2	21:00	1260	23:04	1384
110	GSW	21:00	1260	21	40	82	48.8	21:00	1260	23:04	1384
111	GSW	21:30	1290	21.5	18	82	22	21:00	1260	23:04	1384
112	GSW	22:00	1320	22	2	82	2.4	21:00	1260	23:04	1384
113	GSW	22:30	1350	22.5	2	82	2.4	21:00	1260	23:04	1384
114	GSW	23:00	1380	23	2	82	2.4	21:00	1260	23:04	1384
115	HOU	15:00	900	15	2	82	2.4	20:58	1258	23:03	1383
116	HOU	16:00	960	16	1	82	1.2	20:58	1258	23:03	1383
117	HOU	16:30	990	16.5	1	82	1.2	20:58	1258	23:03	1383
118	HOU	17:00	1020	17	1	82	1.2	20:58	1258	23:03	1383
119	HOU	19:30	1170	19.5	2	82	2.4	20:58	1258	23:03	1383
120	HOU	20:00	1200	20	7	82	8.5	20:58	1258	23:03	1383
121	HOU	20:30	1230	20.5	4	82	4.9	20:58	1258	23:03	1383
122	HOU	21:00	1260	21	43	82	52.4	20:58	1258	23:03	1383
123	HOU	21:30	1290	21.5	16	82	19.5	20:58	1258	23:03	1383
124	HOU	22:00	1320	22	1	82	1.2	20:58	1258	23:03	1383
125	HOU	22:30	1350	22.5	3	82	3.7	20:58	1258	23:03	1383
126	HOU	23:00	1380	23	1	82	1.2	20:58	1258	23:03	1383
127	IND	13:00	780	13	1	82	1.2	20:39	1239	22:57	1377
128	IND	15:30	930	15.5	2	82	2.4	20:39	1239	22:57	1377

129	IND	16:00	960	16	1	82	1.2	20:39	1239	22:57	1377
130	IND	16:30	990	16.5	1	82	1.2	20:39	1239	22:57	1377
131	IND	17:00	1020	17	2	82	2.4	20:39	1239	22:57	1377
132	IND	18:00	1080	18	1	82	1.2	20:39	1239	22:57	1377
133	IND	19:00	1140	19	9	82	11	20:39	1239	22:57	1377
134	IND	20:00	1200	20	3	82	3.7	20:39	1239	22:57	1377
135	IND	21:00	1260	21	40	82	48.8	20:39	1239	22:57	1377
136	IND	21:30	1290	21.5	17	82	20.7	20:39	1239	22:57	1377
137	IND	22:00	1320	22	4	82	4.9	20:39	1239	22:57	1377
138	IND	22:30	1350	22.5	1	82	1.2	20:39	1239	22:57	1377
139	LAC	15:00	900	15	1	82	1.2	21:07	1267	22:26	1346
140	LAC	17:00	1020	17	1	82	1.2	21:07	1267	22:26	1346
141	LAC	17:30	1050	17.5	3	82	3.7	21:07	1267	22:26	1346
142	LAC	19:00	1140	19	1	82	1.2	21:07	1267	22:26	1346
143	LAC	19:30	1170	19.5	1	82	1.2	21:07	1267	22:26	1346
144	LAC	20:00	1200	20	6	82	7.3	21:07	1267	22:26	1346
145	LAC	20:30	1230	20.5	2	82	2.4	21:07	1267	22:26	1346
146	LAC	21:00	1260	21	28	82	34.1	21:07	1267	22:26	1346
147	LAC	21:30	1290	21.5	35	82	42.7	21:07	1267	22:26	1346
148	LAC	22:00	1320	22	4	82	4.9	21:07	1267	22:26	1346
149	LAL	14:30	870	14.5	2	82	2.4	21:00	1260	22:48	1368
150	LAL	15:30	930	15.5	1	82	1.2	21:00	1260	22:48	1368
151	LAL	16:30	990	16.5	1	82	1.2	21:00	1260	22:48	1368
152	LAL	17:00	1020	17	1	82	1.2	21:00	1260	22:48	1368
153	LAL	19:00	1140	19	1	82	1.2	21:00	1260	22:48	1368
154	LAL	19:30	1170	19.5	1	82	1.2	21:00	1260	22:48	1368
155	LAL	20:00	1200	20	4	82	4.9	21:00	1260	22:48	1368
156	LAL	20:30	1230	20.5	8	82	9.8	21:00	1260	22:48	1368
157	LAL	21:00	1260	21	29	82	35.4	21:00	1260	22:48	1368
158	LAL	21:30	1290	21.5	30	82	36.6	21:00	1260	22:48	1368
159	LAL	22:00	1320	22	2	82	2.4	21:00	1260	22:48	1368
160	LAL	22:30	1350	22.5	2	82	2.4	21:00	1260	22:48	1368
161	MEM	16:00	960	16	2	82	2.4	21:10	1270	22:59	1379
162	MEM	16:30	990	16.5	1	82	1.2	21:10	1270	22:59	1379

163	MEM	18:00	1080	18	1	82	1.2	21:10	1270	22:59	1379
164	MEM	19:00	1140	19	1	82	1.2	21:10	1270	22:59	1379
165	MEM	19:30	1170	19.5	1	82	1.2	21:10	1270	22:59	1379
166	MEM	20:00	1200	20	3	82	3.7	21:10	1270	22:59	1379
167	MEM	20:30	1230	20.5	2	82	2.4	21:10	1270	22:59	1379
168	MEM	21:00	1260	21	46	82	56.1	21:10	1270	22:59	1379
169	MEM	21:30	1290	21.5	17	82	20.7	21:10	1270	22:59	1379
170	MEM	22:00	1320	22	3	82	3.7	21:10	1270	22:59	1379
171	MEM	22:30	1350	22.5	5	82	6.1	21:10	1270	22:59	1379
172	MIA	14:30	870	14.5	1	82	1.2	21:18	1278	23:46	1426
173	MIA	17:00	1020	17	2	82	2.4	21:18	1278	23:46	1426
174	MIA	19:00	1140	19	2	82	2.4	21:18	1278	23:46	1426
175	MIA	20:00	1200	20	4	82	4.9	21:18	1278	23:46	1426
176	MIA	20:30	1230	20.5	4	82	4.9	21:18	1278	23:46	1426
177	MIA	21:00	1260	21	21	82	25.6	21:18	1278	23:46	1426
178	MIA	21:30	1290	21.5	33	82	40.2	21:18	1278	23:46	1426
179	MIA	22:00	1320	22	12	82	14.6	21:18	1278	23:46	1426
180	MIA	22:30	1350	22.5	2	82	2.4	21:18	1278	23:46	1426
181	MIA	23:30	1410	23.5	1	82	1.2	21:18	1278	23:46	1426
182	MIL	14:00	840	14	1	82	1.2	20:51	1251	22:40	1360
183	MIL	15:00	900	15	1	82	1.2	20:51	1251	22:40	1360
184	MIL	16:00	960	16	1	82	1.2	20:51	1251	22:40	1360
185	MIL	16:30	990	16.5	1	82	1.2	20:51	1251	22:40	1360
186	MIL	17:00	1020	17	3	82	3.7	20:51	1251	22:40	1360
187	MIL	17:30	1050	17.5	1	82	1.2	20:51	1251	22:40	1360
188	MIL	19:00	1140	19	1	82	1.2	20:51	1251	22:40	1360
189	MIL	20:00	1200	20	3	82	3.7	20:51	1251	22:40	1360
190	MIL	20:30	1230	20.5	6	82	7.3	20:51	1251	22:40	1360
191	MIL	21:00	1260	21	43	82	52.4	20:51	1251	22:40	1360
192	MIL	21:30	1290	21.5	17	82	20.7	20:51	1251	22:40	1360
193	MIL	22:00	1320	22	1	82	1.2	20:51	1251	22:40	1360
194	MIL	22:30	1350	22.5	3	82	3.7	20:51	1251	22:40	1360
195	MIN	15:30	930	15.5	1	82	1.2	21:07	1267	23:09	1389
196	MIN	16:00	960	16	2	82	2.4	21:07	1267	23:09	1389

197	MIN	16:30	990	16.5	2	82	2.4	21:07	1267	23:09	1389
198	MIN	17:30	1050	17.5	1	82	1.2	21:07	1267	23:09	1389
199	MIN	19:30	1170	19.5	1	82	1.2	21:07	1267	23:09	1389
200	MIN	20:00	1200	20	3	82	3.7	21:07	1267	23:09	1389
201	MIN	20:30	1230	20.5	4	82	4.9	21:07	1267	23:09	1389
202	MIN	21:00	1260	21	42	82	51.2	21:07	1267	23:09	1389
203	MIN	21:30	1290	21.5	12	82	14.6	21:07	1267	23:09	1389
204	MIN	22:00	1320	22	7	82	8.5	21:07	1267	23:09	1389
205	MIN	22:30	1350	22.5	4	82	4.9	21:07	1267	23:09	1389
206	MIN	23:00	1380	23	3	82	3.7	21:07	1267	23:09	1389
207	NOP	16:30	990	16.5	1	82	1.2	20:56	1256	22:37	1357
208	NOP	17:00	1020	17	2	82	2.4	20:56	1256	22:37	1357
209	NOP	18:00	1080	18	1	82	1.2	20:56	1256	22:37	1357
210	NOP	19:00	1140	19	1	82	1.2	20:56	1256	22:37	1357
211	NOP	20:00	1200	20	11	82	13.4	20:56	1256	22:37	1357
212	NOP	20:30	1230	20.5	5	82	6.1	20:56	1256	22:37	1357
213	NOP	21:00	1260	21	47	82	57.3	20:56	1256	22:37	1357
214	NOP	21:30	1290	21.5	13	82	15.9	20:56	1256	22:37	1357
215	NOP	22:30	1350	22.5	1	82	1.2	20:56	1256	22:37	1357
216	NYK	14:00	840	14	2	82	2.4	21:00	1260	22:48	1368
217	NYK	15:00	900	15	2	82	2.4	21:00	1260	22:48	1368
218	NYK	17:00	1020	17	4	82	4.9	21:00	1260	22:48	1368
219	NYK	19:00	1140	19	1	82	1.2	21:00	1260	22:48	1368
220	NYK	19:30	1170	19.5	1	82	1.2	21:00	1260	22:48	1368
221	NYK	20:00	1200	20	3	82	3.7	21:00	1260	22:48	1368
222	NYK	20:30	1230	20.5	3	82	3.7	21:00	1260	22:48	1368
223	NYK	21:00	1260	21	17	82	20.7	21:00	1260	22:48	1368
224	NYK	21:30	1290	21.5	41	82	50	21:00	1260	22:48	1368
225	NYK	22:00	1320	22	5	82	6.1	21:00	1260	22:48	1368
226	NYK	22:30	1350	22.5	3	82	3.7	21:00	1260	22:48	1368
227	OKC	14:00	840	14	1	82	1.2	21:02	1262	22:56	1376
228	OKC	16:30	990	16.5	3	82	3.7	21:02	1262	22:56	1376
229	OKC	17:00	1020	17	1	82	1.2	21:02	1262	22:56	1376
230	OKC	19:30	1170	19.5	1	82	1.2	21:02	1262	22:56	1376

231	OKC	20:00	1200	20	9	82	11	21:02	1262	22:56	1376
232	OKC	20:30	1230	20.5	4	82	4.9	21:02	1262	22:56	1376
233	OKC	21:00	1260	21	39	82	47.6	21:02	1262	22:56	1376
234	OKC	21:30	1290	21.5	11	82	13.4	21:02	1262	22:56	1376
235	OKC	22:00	1320	22	4	82	4.9	21:02	1262	22:56	1376
236	OKC	22:30	1350	22.5	9	82	11	21:02	1262	22:56	1376
237	ORL	14:30	870	14.5	1	82	1.2	21:00	1260	22:30	1350
238	ORL	15:00	900	15	1	82	1.2	21:00	1260	22:30	1350
239	ORL	17:00	1020	17	1	82	1.2	21:00	1260	22:30	1350
240	ORL	17:30	1050	17.5	1	82	1.2	21:00	1260	22:30	1350
241	ORL	18:00	1080	18	1	82	1.2	21:00	1260	22:30	1350
242	ORL	19:00	1140	19	1	82	1.2	21:00	1260	22:30	1350
243	ORL	20:00	1200	20	4	82	4.9	21:00	1260	22:30	1350
244	ORL	20:30	1230	20.5	7	82	8.5	21:00	1260	22:30	1350
245	ORL	21:00	1260	21	46	82	56.1	21:00	1260	22:30	1350
246	ORL	21:30	1290	21.5	16	82	19.5	21:00	1260	22:30	1350
247	ORL	22:00	1320	22	2	82	2.4	21:00	1260	22:30	1350
248	ORL	22:30	1350	22.5	1	82	1.2	21:00	1260	22:30	1350
249	PHI	14:00	840	14	2	82	2.4	21:01	1261	23:00	1380
250	PHI	15:00	900	15	2	82	2.4	21:01	1261	23:00	1380
251	PHI	18:00	1080	18	1	82	1.2	21:01	1261	23:00	1380
252	PHI	19:00	1140	19	1	82	1.2	21:01	1261	23:00	1380
253	PHI	20:00	1200	20	5	82	6.1	21:01	1261	23:00	1380
254	PHI	20:30	1230	20.5	1	82	1.2	21:01	1261	23:00	1380
255	PHI	21:00	1260	21	41	82	50	21:01	1261	23:00	1380
256	PHI	21:30	1290	21.5	24	82	29.3	21:01	1261	23:00	1380
257	PHI	22:00	1320	22	3	82	3.7	21:01	1261	23:00	1380
258	PHI	22:30	1350	22.5	1	82	1.2	21:01	1261	23:00	1380
259	PHI	23:00	1380	23	1	82	1.2	21:01	1261	23:00	1380
260	PHX	14:00	840	14	1	82	1.2	20:57	1257	22:55	1375
261	PHX	14:30	870	14.5	1	82	1.2	20:57	1257	22:55	1375
262	PHX	16:30	990	16.5	2	82	2.4	20:57	1257	22:55	1375
263	PHX	17:00	1020	17	1	82	1.2	20:57	1257	22:55	1375
264	PHX	17:30	1050	17.5	1	82	1.2	20:57	1257	22:55	1375

265	PHX	18:00	1080	18	2	82	2.4	20:57	1257	22:55	1375
266	PHX	19:30	1170	19.5	1	82	1.2	20:57	1257	22:55	1375
267	PHX	20:00	1200	20	3	82	3.7	20:57	1257	22:55	1375
268	PHX	20:30	1230	20.5	7	82	8.5	20:57	1257	22:55	1375
269	PHX	21:00	1260	21	38	82	46.3	20:57	1257	22:55	1375
270	PHX	21:30	1290	21.5	13	82	15.9	20:57	1257	22:55	1375
271	PHX	22:00	1320	22	6	82	7.3	20:57	1257	22:55	1375
272	PHX	22:30	1350	22.5	6	82	7.3	20:57	1257	22:55	1375
273	POR	14:30	870	14.5	1	82	1.2	20:49	1249	22:37	1357
274	POR	16:30	990	16.5	1	82	1.2	20:49	1249	22:37	1357
275	POR	17:00	1020	17	5	82	6.1	20:49	1249	22:37	1357
276	POR	18:00	1080	18	1	82	1.2	20:49	1249	22:37	1357
277	POR	20:00	1200	20	6	82	7.3	20:49	1249	22:37	1357
278	POR	20:30	1230	20.5	3	82	3.7	20:49	1249	22:37	1357
279	POR	21:00	1260	21	52	82	63.4	20:49	1249	22:37	1357
280	POR	21:30	1290	21.5	11	82	13.4	20:49	1249	22:37	1357
281	POR	22:00	1320	22	1	82	1.2	20:49	1249	22:37	1357
282	POR	22:30	1350	22.5	1	82	1.2	20:49	1249	22:37	1357
283	SAC	14:00	840	14	1	82	1.2	21:00	1260	22:35	1355
284	SAC	16:30	990	16.5	1	82	1.2	21:00	1260	22:35	1355
285	SAC	17:00	1020	17	2	82	2.4	21:00	1260	22:35	1355
286	SAC	19:00	1140	19	1	82	1.2	21:00	1260	22:35	1355
287	SAC	19:30	1170	19.5	1	82	1.2	21:00	1260	22:35	1355
288	SAC	20:00	1200	20	5	82	6.1	21:00	1260	22:35	1355
289	SAC	20:30	1230	20.5	2	82	2.4	21:00	1260	22:35	1355
290	SAC	21:00	1260	21	53	82	64.6	21:00	1260	22:35	1355
291	SAC	21:30	1290	21.5	12	82	14.6	21:00	1260	22:35	1355
292	SAC	22:00	1320	22	3	82	3.7	21:00	1260	22:35	1355
293	SAC	22:30	1350	22.5	1	82	1.2	21:00	1260	22:35	1355
294	SAS	13:00	780	13	1	82	1.2	20:54	1254	22:55	1375
295	SAS	14:00	840	14	1	82	1.2	20:54	1254	22:55	1375
296	SAS	16:00	960	16	1	82	1.2	20:54	1254	22:55	1375
297	SAS	16:30	990	16.5	1	82	1.2	20:54	1254	22:55	1375
298	SAS	17:00	1020	17	2	82	2.4	20:54	1254	22:55	1375

299	SAS	18:00	1080	18	1	82	1.2	20:54	1254	22:55	1375
300	SAS	20:00	1200	20	8	82	9.8	20:54	1254	22:55	1375
301	SAS	20:30	1230	20.5	4	82	4.9	20:54	1254	22:55	1375
302	SAS	21:00	1260	21	38	82	46.3	20:54	1254	22:55	1375
303	SAS	21:30	1290	21.5	18	82	22	20:54	1254	22:55	1375
304	SAS	22:00	1320	22	1	82	1.2	20:54	1254	22:55	1375
305	SAS	22:30	1350	22.5	6	82	7.3	20:54	1254	22:55	1375
306	TOR	15:00	900	15	1	82	1.2	21:10	1270	22:28	1348
307	TOR	16:30	990	16.5	2	82	2.4	21:10	1270	22:28	1348
308	TOR	17:00	1020	17	1	82	1.2	21:10	1270	22:28	1348
309	TOR	17:30	1050	17.5	2	82	2.4	21:10	1270	22:28	1348
310	TOR	20:00	1200	20	5	82	6.1	21:10	1270	22:28	1348
311	TOR	20:30	1230	20.5	2	82	2.4	21:10	1270	22:28	1348
312	TOR	21:00	1260	21	22	82	26.8	21:10	1270	22:28	1348
313	TOR	21:30	1290	21.5	42	82	51.2	21:10	1270	22:28	1348
314	TOR	22:00	1320	22	5	82	6.1	21:10	1270	22:28	1348
315	UTA	15:30	930	15.5	1	82	1.2	21:00	1260	22:28	1348
316	UTA	16:30	990	16.5	1	82	1.2	21:00	1260	22:28	1348
317	UTA	17:00	1020	17	3	82	3.7	21:00	1260	22:28	1348
318	UTA	18:00	1080	18	1	82	1.2	21:00	1260	22:28	1348
319	UTA	20:00	1200	20	6	82	7.3	21:00	1260	22:28	1348
320	UTA	20:30	1230	20.5	3	82	3.7	21:00	1260	22:28	1348
321	UTA	21:00	1260	21	39	82	47.6	21:00	1260	22:28	1348
322	UTA	21:30	1290	21.5	24	82	29.3	21:00	1260	22:28	1348
323	UTA	22:00	1320	22	4	82	4.9	21:00	1260	22:28	1348
324	WAS	14:30	870	14.5	1	82	1.2	21:07	1267	23:46	1426
325	WAS	19:00	1140	19	1	82	1.2	21:07	1267	23:46	1426
326	WAS	19:30	1170	19.5	3	82	3.7	21:07	1267	23:46	1426
327	WAS	20:00	1200	20	7	82	8.5	21:07	1267	23:46	1426
328	WAS	20:30	1230	20.5	1	82	1.2	21:07	1267	23:46	1426
329	WAS	21:00	1260	21	54	82	65.9	21:07	1267	23:46	1426
330	WAS	21:30	1290	21.5	13	82	15.9	21:07	1267	23:46	1426
331	WAS	22:00	1320	22	1	82	1.2	21:07	1267	23:46	1426
332	WAS	23:30	1410	23.5	1	82	1.2	21:07	1267	23:46	1426

Table A6. Repeated late GDP finish per team. (2026). Source: Own elaboration.

9.2.2.6. Maximum consecutive days with ADP

	team	start_date	end_date	consecutive_days
0	MIA	2025-02-21	2025-04-13	52
1	SAS	2025-03-07	2025-04-13	38
2	MIL	2025-03-08	2025-04-13	37
3	CHA	2025-02-19	2025-03-26	36
4	NOP	2025-02-21	2025-03-25	33
5	IND	2025-03-14	2025-04-13	31
6	UTA	2025-02-21	2025-03-23	31
7	BOS	2025-01-15	2025-02-13	30
8	CLE	2024-10-23	2024-11-21	30
9	BKN	2025-03-04	2025-04-01	29
10	HOU	2025-03-01	2025-03-28	28
11	SAC	2025-03-17	2025-04-13	28
12	WAS	2025-03-08	2025-04-04	28
13	MIN	2024-12-27	2025-01-20	25
14	ORL	2024-10-23	2024-11-16	25
15	ATL	2025-01-22	2025-02-13	23
17	MEM	2025-02-28	2025-03-22	23
18	NYK	2024-12-27	2025-01-18	23
19	OKC	2024-10-30	2024-11-21	23

20	POR	2025-03-16	2025-04-07	23
21	DEN	2025-03-08	2025-03-29	22
22	CHI	2024-11-04	2024-11-24	21
23	DAL	2025-02-25	2025-03-16	20
24	LAL	2025-03-13	2025-04-01	20
25	PHI	2024-12-28	2025-01-16	20
26	DET	2024-10-23	2024-11-10	19
27	TOR	2025-03-20	2025-04-06	18
28	GSW	2025-03-28	2025-04-13	17
29	LAC	2025-03-21	2025-04-06	17
30	PHX	2025-01-04	2025-01-20	17

Table A7. Maximum consecutive days with Athletic Duty Period (ADP). (2026). Source: Own elaboration.

9.2.2.7. Maximum consecutive free days per team

	team	free_start_date	free_end_date	consecutive_free_days	free_day_count	season_days
0	TOR	2025-02-13	2025-02-20	8	45	173
1	WAS	2025-02-13	2025-02-20	8	43	172
2	BKN	2025-02-13	2025-02-19	7	48	174
3	DAL	2025-02-14	2025-02-20	7	41	172
4	DEN	2025-02-13	2025-02-19	7	44	172
5	DET	2025-02-13	2025-02-19	7	45	173
6	HOU	2025-02-14	2025-02-20	7	50	173
7	NYK	2025-02-13	2025-02-19	7	47	175
8	UTA	2025-02-14	2025-02-20	7	49	173
9	ATL	2025-02-13	2025-02-18	6	41	173

10	BOS	2025-02-13	2025-02-18	6	42	174
11	CHI	2025-02-13	2025-02-18	6	38	174
12	CLE	2025-02-13	2025-02-18	6	41	174
13	GSW	2025-02-14	2025-02-19	6	45	174
14	IND	2025-02-13	2025-02-18	6	42	174
15	MEM	2025-02-13	2025-02-18	6	43	174
16	MIA	2025-02-14	2025-02-19	6	47	173
17	MIL	2025-02-13	2025-02-18	6	39	174
18	MIN	2025-02-14	2025-02-19	6	41	175
19	NOP	2025-02-14	2025-02-19	6	44	173
20	OKC	2025-02-14	2025-02-19	6	44	173
21	ORL	2025-02-13	2025-02-18	6	47	174
22	PHI	2025-02-13	2025-02-18	6	42	173
23	PHX	2025-02-13	2025-02-18	6	49	174
24	POR	2025-02-13	2025-02-18	6	46	173
25	SAC	2025-02-14	2025-02-19	6	44	172
26	SAS	2025-02-13	2025-02-18	6	46	173
27	CHA	2025-02-13	2025-02-17	5	45	174
28	LAC	2025-02-14	2025-02-18	5	51	173
29	LAL	2025-02-13	2025-02-17	5	49	174

Table A8. Maximum consecutive free days per team. (2026). Source: Own elaboration.

9.2.2.8. Season mileage by team

team	total_miles	avg_miles	route_count
POR	50575.1	1744	29
GSW	49116.7	1693.7	29
SAC	47747.8	1646.5	29
LAC	45474.1	1568.1	29
LAL	45314.6	1562.6	29
MIA	39596.8	1365.4	29
PHX	39062.1	1347	29

BOS	38368.2	1323	29
UTA	37272.2	1285.2	29
ORL	34922	1204.2	29
BKN	34077.7	1175.1	29
NYK	34067.8	1174.8	29
PHI	32686.4	1127.1	29
SAS	31946.3	1101.6	29
DEN	31410.7	1083.1	29
WAS	30895.5	1065.4	29
TOR	30586.9	1054.7	29
HOU	30366.8	1047.1	29
NOP	29728.5	1025.1	29
CHA	29013.6	1000.5	29
MIN	28757.5	991.6	29
DAL	28088.3	968.6	29
ATL	27777.3	957.8	29
CLE	27640.7	953.1	29
DET	27365.8	943.6	29
OKC	27088.5	934.1	29
MIL	26541.3	915.2	29
CHI	25773.4	888.7	29
MEM	25574.6	881.9	29
IND	25310	872.8	29

Table A9. Season mileage per team. (2026). Source: Own elaboration.

9.2.2.9. Team Risk

	team	total_risk	metric	count
0	HOU	13	under_12h	5
1	CLE	13	under_12h	3
2	OKC	12	under_12h	5
3	ATL	12	under_12h	4
4	MIA	11	under_12h	6

5	PHX	11	under_12h	5
6	NYK	11	under_12h	3
7	SAS	11	under_12h	3
8	BKN	11	under_12h	2
9	TOR	10	under_12h	6
10	CHA	10	under_12h	5
11	PHI	10	under_12h	5
12	DAL	10	under_12h	4
13	DET	10	under_12h	4
14	LAC	10	under_12h	4
15	CHI	10	under_12h	3
16	IND	10	under_12h	3
17	MIL	10	under_12h	3
18	SAC	10	under_12h	3
19	DEN	10	under_12h	2
20	WAS	9	under_12h	6
21	ORL	9	under_12h	2
22	UTA	9	under_12h	2
23	GSW	9	under_12h	1
24	MEM	9	under_12h	1
25	MIN	9	under_12h	1
26	LAL	8	under_12h	2
27	NOP	8	under_12h	2
28	POR	8	under_12h	2
29	BOS	7	under_12h	4
30	HOU	13	overlaps	8
31	CLE	13	overlaps	10
32	OKC	12	overlaps	7
33	ATL	12	overlaps	8
34	MIA	11	overlaps	5
35	PHX	11	overlaps	6
36	NYK	11	overlaps	8
37	SAS	11	overlaps	8
38	BKN	11	overlaps	9

39	TOR	10	overlaps	4
40	CHA	10	overlaps	5
41	PHI	10	overlaps	5
42	DAL	10	overlaps	6
43	DET	10	overlaps	6
44	LAC	10	overlaps	6
45	CHI	10	overlaps	7
46	IND	10	overlaps	7
47	MIL	10	overlaps	7
48	SAC	10	overlaps	7
49	DEN	10	overlaps	8
50	WAS	9	overlaps	3
51	ORL	9	overlaps	7
52	UTA	9	overlaps	7
53	GSW	9	overlaps	8
54	MEM	9	overlaps	8
55	MIN	9	overlaps	8
56	LAL	8	overlaps	6
57	NOP	8	overlaps	6
58	POR	8	overlaps	6
59	BOS	7	overlaps	3

Table A10. Team risk. (2026). Source: Own elaboration.

9.2.2.10. Monthly rest per team

	team	current_month	median_rest_hours	under_12h	overlaps
0	ATL	2024-10	17.925	0	1
1	ATL	2024-11	14	3	1
2	ATL	2024-12	22.2	1	0
3	ATL	2025-01	14	0	2
4	ATL	2025-02	16.5	0	1
5	ATL	2025-03	21.63	0	1
6	ATL	2025-04	14	0	2

7	BKN	2024-10	14	0	1
8	BKN	2024-11	14	1	1
9	BKN	2024-12	14	1	1
10	BKN	2025-01	18.045	0	2
11	BKN	2025-02	24.015	0	1
12	BKN	2025-03	14	0	2
13	BKN	2025-04	14.23	0	1
14	BOS	2024-10	21.98	0	0
15	BOS	2024-11	17.485	1	0
16	BOS	2024-12	20.615000000000002	1	0
17	BOS	2025-01	16.655	0	1
18	BOS	2025-02	14	1	0
19	BOS	2025-03	19.020000000000003	1	1
20	BOS	2025-04	21.93	0	1
21	CHA	2024-10	14	0	1
22	CHA	2024-11	21	1	0
23	CHA	2024-12	14	2	0
24	CHA	2025-01	21.435000000000002	0	0
25	CHA	2025-02	14	2	1
26	CHA	2025-03	15.215	0	2
27	CHA	2025-04	23.45	0	1
28	CHI	2024-10	14	1	0
29	CHI	2024-11	14	1	2
30	CHI	2024-12	23.1	0	1
31	CHI	2025-01	18.6	0	1
32	CHI	2025-02	17.98	0	1
33	CHI	2025-03	14	0	2
34	CHI	2025-04	14	1	0
35	CLE	2024-10	14	0	1
36	CLE	2024-11	18.15	1	1
37	CLE	2024-12	14	1	1
38	CLE	2025-01	15.685	0	2
39	CLE	2025-02	14	0	2
40	CLE	2025-03	14	1	2

41	CLE	2025-04	15.385	0	1
42	DAL	2024-10	14	0	1
43	DAL	2024-11	14	1	2
44	DAL	2024-12	18.93	0	1
45	DAL	2025-01	14	1	2
46	DAL	2025-02	16.61	0	0
47	DAL	2025-03	15.64	2	0
48	DAL	2025-04	18.57	0	0
49	DEN	2024-10	14	0	1
50	DEN	2024-11	21.365	0	2
51	DEN	2024-12	14	1	1
52	DEN	2025-01	14	0	3
53	DEN	2025-02	19.21	0	1
54	DEN	2025-03	17.064999999999998	1	0
55	DEN	2025-04	16.41	0	0
56	DET	2024-10	14	1	0
57	DET	2024-11	14	3	1
58	DET	2024-12	21.27	0	1
59	DET	2025-01	18.689999999999998	0	1
60	DET	2025-02	26.375	0	1
61	DET	2025-03	17.77	0	1
62	DET	2025-04	17.5	0	1
63	GSW	2024-10	17.67	0	0
64	GSW	2024-11	16	0	1
65	GSW	2024-12	19.88	0	1
66	GSW	2025-01	17.7	1	1
67	GSW	2025-02	14	0	2
68	GSW	2025-03	18.689999999999998	0	1
69	GSW	2025-04	14	0	2
70	HOU	2024-10	27.535	1	0
71	HOU	2024-11	17.35	2	1
72	HOU	2024-12	14	0	2
73	HOU	2025-01	14	0	2
74	HOU	2025-02	14	1	2

75	HOU	2025-03	21	1	1
76	HOU	2025-04	16.975	0	0
77	IND	2024-10	14	1	0
78	IND	2024-11	19.37	1	0
79	IND	2024-12	14	1	2
80	IND	2025-01	21.08	0	0
81	IND	2025-02	19.68	0	2
82	IND	2025-03	15.75	0	3
83	IND	2025-04	19.4	0	0
84	LAC	2024-10	14	1	0
85	LAC	2024-11	19.325	1	1
86	LAC	2024-12	17.9	0	1
87	LAC	2025-01	18.87	0	1
88	LAC	2025-02	14	1	1
89	LAC	2025-03	16.5	1	2
90	LAC	2025-04	17.91	0	0
91	LAL	2024-10	17.95	0	0
92	LAL	2024-11	19	0	2
93	LAL	2024-12	14	0	1
94	LAL	2025-01	18.15	0	1
95	LAL	2025-02	20.6	0	1
96	LAL	2025-03	16.43	2	0
97	LAL	2025-04	14.85	0	1
98	MEM	2024-10	15.785	0	1
99	MEM	2024-11	21.4	0	0
100	MEM	2024-12	14	0	2
101	MEM	2025-01	20.07	0	1
102	MEM	2025-02	14	0	3
103	MEM	2025-03	21.1	1	0
104	MEM	2025-04	14	0	1
105	MIA	2024-10	23.2	0	0
106	MIA	2024-11	16.875	1	1
107	MIA	2024-12	14	2	1
108	MIA	2025-01	18.99	1	0

109	MIA	2025-02	14	2	1
110	MIA	2025-03	21.935000000000002	0	1
111	MIA	2025-04	15.015	0	1
112	MIL	2024-10	14	1	0
113	MIL	2024-11	17.77	0	1
114	MIL	2024-12	14	2	0
115	MIL	2025-01	18.13	0	1
116	MIL	2025-02	14	0	2
117	MIL	2025-03	17.615000000000002	0	1
118	MIL	2025-04	14	0	2
119	MIN	2024-10	16.535	0	0
120	MIN	2024-11	14.52	1	1
121	MIN	2024-12	21.07	0	0
122	MIN	2025-01	14	0	3
123	MIN	2025-02	15.86	0	2
124	MIN	2025-03	20.08	0	1
125	MIN	2025-04	14	0	1
126	NOP	2024-10	18.32	0	0
127	NOP	2024-11	19.155	0	1
128	NOP	2024-12	16.88	1	1
129	NOP	2025-01	14	0	2
130	NOP	2025-02	18.69	0	0
131	NOP	2025-03	18.15	1	1
132	NOP	2025-04	16.45	0	1
133	NYK	2024-10	21.45	0	0
134	NYK	2024-11	14.77	1	0
135	NYK	2024-12	21.035	0	1
136	NYK	2025-01	22.18	1	1
137	NYK	2025-02	14	0	3
138	NYK	2025-03	17.63	0	1
139	NYK	2025-04	14	1	2
140	OKC	2024-10	14	0	1
141	OKC	2024-11	18.43	0	2
142	OKC	2024-12	14	1	1

143	OKC	2025-01	20.115000000000002	1	0
144	OKC	2025-02	14	0	3
145	OKC	2025-03	19.48	2	0
146	OKC	2025-04	14.815000000000001	1	0
147	ORL	2024-10	14	0	1
148	ORL	2024-11	16.990000000000002	1	0
149	ORL	2024-12	28.9	1	0
150	ORL	2025-01	17.73	0	1
151	ORL	2025-02	16.6	0	2
152	ORL	2025-03	14.89	0	3
153	ORL	2025-04	15.6	0	0
154	PHI	2024-10	16.61	0	0
155	PHI	2024-11	21.765	0	0
156	PHI	2024-12	14	1	1
157	PHI	2025-01	14	1	2
158	PHI	2025-02	18.22	1	0
159	PHI	2025-03	14	2	2
160	PHI	2025-04	22.240000000000002	0	0
161	PHX	2024-10	14	0	1
162	PHX	2024-11	17.46	2	0
163	PHX	2024-12	17.285	0	2
164	PHX	2025-01	19.52	0	2
165	PHX	2025-02	14	1	1
166	PHX	2025-03	16.95	2	0
167	PHX	2025-04	16.65	0	0
168	POR	2024-10	22.07	1	0
169	POR	2024-11	14	0	2
170	POR	2024-12	20.13	0	0
171	POR	2025-01	17.12	0	2
172	POR	2025-02	20.759999999999998	0	0
173	POR	2025-03	21.37	1	1
174	POR	2025-04	14	0	1
175	SAC	2024-10	14	0	1
176	SAC	2024-11	17.58	0	2

177	SAC	2024-12	18.200000000000003	0	1
178	SAC	2025-01	18.7	1	1
179	SAC	2025-02	15.885	0	1
180	SAC	2025-03	14.55	1	1
181	SAC	2025-04	18.165	1	0
182	SAS	2024-10	14	0	1
183	SAS	2024-11	19.12	2	1
184	SAS	2024-12	17.63	0	0
185	SAS	2025-01	15.32	0	1
186	SAS	2025-02	15.29	1	1
187	SAS	2025-03	16.85	0	2
188	SAS	2025-04	14	0	2
189	TOR	2024-10	18.064999999999998	0	1
190	TOR	2024-11	14	1	1
191	TOR	2024-12	30.97	2	0
192	TOR	2025-01	22.58	0	1
193	TOR	2025-02	17.5	1	1
194	TOR	2025-03	17.68	2	0
195	TOR	2025-04	15.985	0	0
196	UTA	2024-10	27.975	0	1
197	UTA	2024-11	18.87	0	1
198	UTA	2024-12	18.95	0	0
199	UTA	2025-01	14	1	2
200	UTA	2025-02	30.86	0	1
201	UTA	2025-03	18.47	1	2
202	UTA	2025-04	16.5	0	0
203	WAS	2024-10	22.37	0	0
204	WAS	2024-11	14	2	0
205	WAS	2024-12	23.03	0	0
206	WAS	2025-01	18.7	2	0
207	WAS	2025-02	21.27	0	1
208	WAS	2025-03	14	2	1
209	WAS	2025-04	14.475	0	1

Table A11. Monthly rest per team. (2026). Source: Own elaboration.