

KYMENLAAKSON AMMATTIKORKEAKOULU

University of Applied Sciences

Degree Programme in Design

Krisztián Griz

HISTORICALLY THEMED CHESS GAME

Bachelor's Thesis 2013

## ABSTRACT

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GRIZ, KRISZTIÁN

Historically Themed Chess Game

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The Cold War was a defining period of 20<sup>th</sup> century history for Europe and the world. From 1945 until 1991 Europe was divided as a result of the aftermath of the Second World War, leaving two superpowers opposing each other's philosophy about human rights, freedoms, way of life. The cold war's significance cannot be overstated, as it left a permanent mark on the lives of millions of people, and still echoes in today's diplomatic and political events.

The aim of this project was to create a symbolic board game that reminds people of the hopes and struggles of the time. The project hopes to present a neutral stance on the period that captures the essences of the two superpowers authentically.

Research was conducted using many means and media, among which were various documentary films and series, a number of fictional and non-fictional novels and books, articles and essays, open university courses, and countless personal accounts from people growing up and living during the events.

As a result of the research the project achieved in creating the feeling and atmosphere of the time, which results from the correct implementation of various aspects of the historic background, politics and diplomacy, propaganda, lifestyle, culture, architecture, art and design.

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## LIST OF TERMS

*Character*    See Piece

*Checkmate*    a position in which a player's king is directly attacked by an opponent's piece or pawn and has no possible move to escape the check.

*Cold War*    a state of political hostility between countries characterized by threats, propaganda, and other measures short of open warfare, in particular.  
(the Cold War) the state of hostility that existed between the Soviet bloc countries and the Western powers from 1945 to 1990.

*Iron Curtain*    a notional barrier separating the former Soviet bloc and the West prior to the decline of communism that followed the political events in Eastern Europe in 1989.

*Piece*    a figure or token used to make moves in a board game: a chess piece

*USA*    The United States of America

*USSR*    Union of Soviet Socialist Republics

(Oxford Dictionaries 2013)

## 1 INTRODUCTION

The 20<sup>th</sup> century was the most eventful period in all history, which had profound effect on the way people lived their lives, treated one another, saw the world and their place in it. This period hosted major historic events, two terrible world wars, the bringing about of the international community, putting a man in space and on the moon, unprecedented advancements in technology, science, medicine, astronomy, mathematics and physics. It was a defining period for humanity.

The world became smaller. In the second half of the century, the world was recovering from two world wars, but hoped for a brighter future. Overshadowing that hope were two superpowers, now in diplomatic deadlock, with different views on almost every aspect of life. The United States of America and the Union of Soviet Socialist Republics had major influence on the world we live today. Their rivalry was merciless, that affected people profoundly. Focusing on Europe, the main stage of their controversies was Germany, now split and occupied by the allies, who won the Second World War. Dividing Germany, and Europe, had long-lasting consequences that are obvious even today.

This project aims to make a metaphoric monument for this period, capturing the essences of the time in terms of ideology, politics, diplomacy, culture, media, technology and science, lifestyle, and everyday life. The goal is to represent both parties involved authentically, accurately, and unbiased. The metaphor used will be a board game, based on characteristics of the period, mainly strategy and tactics, which will reflect the rivalry authentically. This board game is the chess.

The project will focus on adopting the cultural, economical, design and architectural elements of the United States of America and the Union of Soviet Socialist Republics, to create a clear distinction. The challenges of this project will be to authentically represent both sides, to create clearly distinguishable designs, and to make sure that all the design elements work in harmony to achieve their desired effect and emotional response.

## 2 HISTORIC CONTEXT

### 2.1 1945 – 1953 Beginnings of the Cold War

Even before the end of the Second World War, the allies have seen tension regarding the maintenance of peace in Europe. The western powers sought to have democratically elected governments in Europe that could resolve disputes peacefully through international organizations. Russia, however, opted for increasing security by dominating the internal affairs of European countries. This resulted in an acute tension between the allies. (Cold War 1998, Episode 1)

Following the series of allied conferences, Germany was divided into four occupation zones, supervised by the four main allied powers, the United States of America, France, the United Kingdom, and the Union of Soviet Socialist Republics. Berlin, Germany's capital also was divided the same way. As for the rest of Europe, countries west of Germany had strong support from the United States of America and the United Kingdom, while countries east of Germany were occupied by the Soviet Union. Many international organizations were established after World War 2, to secure peace, human rights, etc., most notable of which was the United Nations. During the years after World War 2 mutual distrust grew between the western powers and the Soviet Union, due to the different interpretations of "democracy", power of law and policies. Wartime allies demobilise, while the US enjoy economic prosperity, Britain and the rest of Europe are exhausted of war. German territories are annexed and given to Poland by the Soviet Union, which causes differences in post-war German rehabilitation. Meanwhile Stalin strengthens his role in Eastern Europe. British Prime minister, Winston Churchill was concerned with the Soviet troops stationed in Eastern Europe and saw it as a threat to peace. In Fulton, Missouri Churchill openly called for an Anglo-American alliance against the Soviet Union, maintaining that Joseph Stalin was establishing an Iron Curtain between the East and West. This causes the US to adopt a more assertive foreign policy. (Cold War 1998, Episodes 1-3)

The Americans, to counter the growing Soviet influence in Europe, enacted the Marshall Plan which pledged economic help to European countries that were willing to participate, including those under Soviet influence. The plan was to rebuild the economic and democratic systems and winning over popular opinion. The Soviets saw this as a threat, and enacted their Council for Mutual Economic Assistance plan, to far

lesser success. Stalin wanted a weak Germany, which would pose no threat to the Soviet Union, whereas the western powers wanted a strong, democratic Germany that would hold off the Soviet influence. To aid their aims, the American, British and French sectors of Germany were merged to facilitate a faster industrial and economic stabilization. Stalin in response enacted the Berlin blockade, which forbade the western powers to transport goods to West Berlin, which was in the Soviet occupation zone. Countering the blockade the United States and other countries began a massive airlift program to supply food and other goods to West Berlin. After tense months, public outcry and political turmoil in Germany, Stalin lifted the blockade in May 1949. Just one month earlier, in April 1949, NATO (North Atlantic Treaty Organization) was established, an intergovernmental military alliance, that was signed by the United States, Britain, France, Canada, and 8 other western European countries. By 1955 West Germany was also a full member of NATO. In the same year, the USSR and the Eastern European Countries signed the Warsaw Pact, a mutual defence agreement. (Cold War 1998, Episodes 3-4)

## 2.2 1953 – 1962 Crises and escalations

Fears in both superpowers' leadership were projected inwardly on the population. The United States investigated communist sympathisers in the State Department and Hollywood. Stalin meanwhile emerged as a personality cult in the Soviet Union, and repressive police and surveillance agents kept their countries population in fear. In 1953, both the United States and the Soviet Union saw changes in their political leadership. In the US Dwight D. Eisenhower was elected president, a previous general in the US army. Eisenhower moved to cut military spending, but to keep the fighting the Cold War effectively. Meanwhile, in the USSR Nikita Khrushchev became the leader, following Stalin's death. Khrushchev, in February 1956, denounced Stalin's crimes at the 20<sup>th</sup> congress of the Soviet Communist Party, and stated that reform was needed. This gave hope to many Eastern European countries to move to a democratic system. In October 1956, the Hungarian revolution took place, briefly overthrowing the Socialist government, only to have the Soviet forces deployed and reinstate it after a few days. This left the Hungarians and many other Eastern European countries disillusioned by the promise of reform. The Soviet Union developed their nuclear weapons, and launched Sputnik into space, this resulted in an unsecure US. Kennedy replaced Eisenhower, to try and close the missile gap. Meanwhile the Soviet Union managed to

take a solid lead in the space race with the first man orbit around the Earth, and successful landing of Yuri Gagarin. From 1957 through 1961, Khrushchev openly threatened the West with nuclear attack, but he declared his goals to be peaceful coexistence. (Cold War 1998, Episodes 6-9)

In 1961, the Berlin crisis brought turmoil to the relation between the US and the USSR. After several attempts by the USSR to keep its citizens from fleeing into the more prosperous west failed, a wall was erected that split the city, famously known as the Berlin wall. This sealed off East Berlin from West Berlin, and passing was only possible with permission at only a couple of border control stations. In October, a dispute occurred over East German border guard's authorization over checking the travel documents of a US diplomat. This act led to a tank stand-off between the US and the USSR. This was one of the closest moments to starting a war. Meanwhile, in the western hemisphere Cuba government was overthrown by communists, and Fidel Castro came to power who received aid and supplies from Moscow. Additionally Cuba received missiles that could strike the USA. The US reacted to this by imposing a blockade on Cuba, while the USSR fearing war was imminent mobilised their forces. Eventually, through secret negotiations, the crisis was resolved, with the US and the USSR agreed to withdraw missiles from Turkey and Cuba, respectively. (Cold War 1998, Episodes 9-10)

### 2.3 1962 – 1979 Period of relaxation

After solving the Cuban missile crisis, the US changed their nuclear security policy. Until then, they targeted Soviet military facilities, essential for warfare. However, because the USSR easily sent missiles capable of attacking US cities to Cuba, the US adopted a policy called Mutually Assured Destruction (MAD). This meant that if attacked by the USSR, the US would counterattack immediately. The thinking behind the Mutually Assured Destruction policy was that it would keep both sides away from starting a nuclear war. Meanwhile both countries continued nuclear development, especially methods of delivering these missiles to the other side, mainly with the use of submarines. The USSR set up an anti-ballistic missile defence to counter the MAD policy. Due to the mutual distrust of the period, both sides heavily prepared for a nuclear war that neither side was willing to start. In November 1969, the USA and the USSR agreed to start talks on limiting arms production. This was known as Strategic

Arms Limitation Treaty (SALT), which was signed in 1971. (Cold War 1998, Episodes 12)

The 1960s saw growing optimism in both countries. In the USA, the economy was booming, stimulated by the space race. The population's expectations of the US rose with growing civil rights movements, mainly against the Korean and Vietnam wars. However, social tensions grew out of control, with race riots, and assassination of Martin Luther King, John F. Kennedy and Robert Kennedy. With the political left divided, Richard Nixon was voted into power in 1969. (Cold War 1998, Episodes 13-14)

Meanwhile in the USSR a new wave of optimism and openness also was forming. As the first youth generation grew up without memory of previous privations and purges. In the USSR the media was controlled by the government, thus it was not independent and was unable to hold the government accountable. In Eastern Europe western influence leaked in, with fashion and music gaining the youth's interest. Khrushchev tried to make the Soviet consumers more affluent, and initiated housing constructions. However, his erratic leadership style, poor handling of the Cuban missile crisis and dismal 1963 harvest led to his removal and replacement by Brezhnev. (Cold War 1998, Episodes 13-14)

Nixon built a better relationship with the USSR and China, and while the USSR was fearful of a US – China alliance, summits between Nixon and Brezhnev led to concrete arms control agreements, and the relaxation of tensions. In Europe, West Germany normalized their relationship with East Germany, the USSR and Poland. A milestone was reached in 1975, when the US – USSR joined in a symbolic spaceflight that celebrated the peaceful arms limitation and relaxation of the political situation. At the time, it looked like the threat of nuclear war was over, and the USA and the USSR managed to strike a deal on how to live together peacefully. (Cold War 1998, Episodes 15-16)

In the late 1970s, the relationship between the USA and the USSR deteriorated, with indirect conflicts in the Middle East, Far East and South America. In 1974, due to a domestic scandal Watergate, Richard Nixon resigned the presidency, which was taken over by Gerald Ford, and followed by Jimmy Carter. During Carter's presidency the US and the USSR agreed to SALT 2, but Carter was perceived as a weak president

who couldn't stand up to the Soviets. The situation was becoming tenser again, with the Iranian revolution, the Soviet-backed Nicaragua revolution both of which overturned the pro-US regimes. (Cold War 1998, Episodes 17-18)

#### 2.4 1979 – 1985 Re-emergence of crises

During the period between 1979 and 1985 relationship between the USA and the USSR saw a dip, while they weren't in direct conflict with one another their spheres of influences overlapped which caused notable tensions in both governments and the world. Carter's ambitions full nuclear disarmament was ill-received in the USSR, and his stance on human rights issues was also not welcome by Brezhnev. The Soviet Union continues the arms race, draining the economy.

In Europe, the SALT 2 agreement seemed unobservable as more missiles were deployed on both sides. Carter's failure to stand up to the Soviets, to exercise American influence and resolve the Middle East conflicts ultimately lost him the elections. He was replaced by Ronald Reagan. Meanwhile in Poland, a solidarity movement emerged which sought a socialist government independent of Moscow. This was successfully disbanded by Brezhnev. Reagan viewed the USSR as an evil empire, and took an aggressive tone against the Soviets. He envisioned a space based Strategic Defence Initiative that would render the nuclear arms obsolete. The USSR was concerned with this as it would give the USA the upper hand. (Cold War 1998, Episodes 19-22)

#### 2.5 1985 – 1991 Final years of the Cold War

In 1985 Gorbachev assumes power in the USSR, setting forward a new open and reformist agenda. Reagan and Gorbachev got along reasonable well, but little was done to stop the arms race. In the eastern bloc, Soviet leadership weaknesses are exposed with the Chernobyl accident, and Mathias Rust's Red Square landing of a small airplane, which he flew from East Germany undiscovered by the Soviet officials. Gorbachev knew the Soviet Union could not compete with the American Strategic Defence Initiative without severely restricting people's welfare. This however was no longer an option, as the people's expectations of living rose due to exposure to foreign media and popular culture. This forces Gorbachev to agree to a landmark nuclear disarmament, known as the Intermediate-Range Nuclear Forces Treaty.

Following this Gorbachev surprised the Eastern Europeans when he states that satellite countries were free to determine their own destiny, and that there would be no military intervention enforcing Soviet rule. This single statement changed the course of history for many; in Poland the solidarity movement won the Polish free elections, in Hungary the government agreed to give up their monopoly on power and free elections were held. Also in Hungary, the symbolic opening of the iron curtain, this allowed East Germans to flee to West Germany. Seeing that there was no intervention from Soviet forces, as promised by Gorbachev, the Berlin wall was opened. The Soviet Union was on the brink of collapse.

In December 1989, Gorbachev meets US president Bush in Malta, to consider recent events in Europe. Meanwhile in Czechoslovakia the communist government resigned, the Romanian leader was deposed and executed. Gorbachev allowed German reunification, and withdrew Soviet troops from Europe, but failed to secure financial aid from the West. The Soviet economy collapsed, and Gorbachev faced domestic opposition. Gorbachev is sidelined by Boris Yeltsin, who set course for Russia leaving the Soviet Union, and establishing the Commonwealth of Independent States. The Soviet Union officially collapsed on the 25<sup>th</sup> of December 1991. The next day Bush announced to the world the Cold War was over. (Cold War 1998, Episodes 21-24)

## 2.6 Style choice

Following the Second World War, Europe was left devastated. In the 1940s and 1950s the recovering and rebuilding process started. For the Soviet occupied eastern bloc this meant completely rebuilding in a style imposed by Moscow. The plan was to build cities that are modern, efficient and promote equality, in accord to the communist socialist ideology. This meant applying visions from the 1930s modernism style to the 1950s rebuilding process.

In the USA, a country that didn't see war on its territory, the destruction of war seemed distant. However following the 1930s great depression, a new sensitivity for design and style emerged that dealt away with ornamentation, and emphasized quality and a better life for all. In the western part of Europe, ruled mainly by the US free market capitalism allowed the nations to rebuild freely. (The Genius of Design 2010, Episode 1-2)



### 2.6.1 American streamline

The streamline movement appeared after the 1930s, when the US was emerging from the great depression. Art Deco, the mainstream art style at the time, was seen as too decorative and extravagant when compared to the realities of the time. Because of these aspects, Art Deco was replaced with the streamline movement, which essentially stripped away the ornaments and favoured pure aerodynamic shapes. The style was both a reaction to Art Deco and the economic realities. Surprisingly, streamline may have been influenced by constructivism, due to the use of cylindrical forms. The style quickly caught on, due to the fact that the US had an array of designers who really liked the simplicity and purity. Streamline saw the introduction of materials such as cement, metals, and glass. (Appendix 1.)

The style is characterized by a generally horizontal orientation, rounded and curved edges, heavy use of glass and shiny metals, and subdued colours. Notable representatives were Raymond Loewy, Walter Dorwin Teague, Gilbert Rohde, Norman Bel Geddes.

Streamline was used in almost all design fields, ranging from graphic, media, consumer and industrial goods. In the US the design was an important factor to drive consumer sales, and the style was perceived with the hope of prosperity and an exciting future, which was well received by the American middle class. (Reed 1975)

### 2.6.2 Soviet constructivism

The Soviet constructivism dates back to the 1920s. It originated from the avant-garde movement in Russia, and quickly spread around the continent. Constructivism aimed at complete abstraction while being true to the modernity of the times. It featured heavy use of geometric shapes, where minimalism prevailed and the art was broken down to its elements. Themes commonly used were based around geometry, experimental art and conveying little emotion. It functioned as an orderly art style, with a message of unity, understanding, and peace. The painters, sculptors and other artists were often referred to as artist-engineers, because of their usual involvement with industrial materials, machines, functionalism and modern mediums. (Appendix 2.)

Famous representatives were Alexander Rodchenko, Liubov Popova, Vladimir Tatlin, Olga Rozanova, Alexandra Exter, Naum Gabo, El Lissitzky, Antoine Pevsner, Kasimir Malevich and Alexander Vesnin. (Art History Archive 2013)

Construction was regarded as a midway point for technology and engineering, and is characterized by the materials used, precision, clarity of organization, and the absence of decorative elements. To be perceived as constructivist, more and more artists resisted the idea of abstraction, focusing instead on working with industrial materials. The artistic attitude was the result of the utopian feeling after the revolution, which resulted in an industrial revolution in Russia, where civilians could now pursue industrial goods, and industrial machines became essential characteristics of the working class. The government also regarded industrial development a key to social and economic progress thus used the movement for propaganda purposes. The result of this was the style developed heavily in the media and graphic design, whereas it tailed behind in other areas. During Stalin's rule, the art suffered from increased centralized control, which led to the further development of the style into social realism. Constructivism while being inspired by the early idealism of the revolution, ultimately fallen victim to the actual political system that emerged. (Museum of Modern Art 2009)

### 3 BOARD GAME

#### 3.1 Choice

Chess is the ideal choice for the historic context associated to the cold war. The game is a two player strategy and tactical game, played on a board arranged as 8x8 square grid. Each side has the same figures and ranging from pawns, knights, bishops to rooks, the king and the queen. The game's aim is to "Checkmate", to put the opponent's king in an inevitable capture position. Chess has no luck factor, thus the game is highly dependent on the player's knowledge of strategy, forward thinking, anticipation of the opponents moves and tactical foresight to be able to win.

The setup of the classical game is that each player has to arrange their figures the same way, in two rows starting from their respective sides. The front row is made up of pawns, the weakest character, able to move 1-2 steps, provided it is not taken, and capture diagonally one step. The back row is made of symmetrically from the outside

towards the inside as follows: rook, knight, bishop, with the king and the queen in the middle. These figures have more power; they can move more than one step. The rook moves and captures in straight lines, the bishop only in diagonal lines. The horse can only move and capture in an “L” shape step. The king and queen can move in either straight or diagonal, however while the queen has unlimited steps in any given move, the king can only move one step. The game is thus an appropriate metaphor for the cold war, the two sides are equally strong and the outcome is purely at the control of the players. (World Chess Federation 2013)

### 3.2 History

The game dates back to the 6<sup>th</sup> century AD, believed to come from India. As it spread to Persia (nowadays Iran) and then to southern Europe the game evolved, and reached its current configuration and setup in Europe around the 16<sup>th</sup> century. In the later part of the 19<sup>th</sup> century the current modern chess tournaments were organized, and the first world chess championship was held in 1886. In the 20<sup>th</sup> century the game fans and players established the World Chess Federation (FIDE). (Bird 2004)

The predecessor of chess originated in India, known as Chaturanga, with 4 characters, the infantry, cavalry, elephantry and chariotry, which evolved into modern day pawn, knight, bishop and rook respectively. The name of the game in many languages derived from the Persian word “Shah” which means “king”, where as the expression “shah mat”, used when one player’s king cannot escape capture, means “the king is helpless”. (Murray 1913)

As the game spread around the world many different cultures adopted and altered the original game, thus chess has countless variants and other characteristics introduced to make the game easier, harder, faster or slower, more tactical, and more challenging.

In the 16<sup>th</sup> century the modern chess game started to take shape, with the introduction of the bishop’s and queen’s current moves, with these changes the game spread rapidly in Southern Europe, mainly in Italy, France, Spain and Portugal. After this happened the game became shorter, as less moves were required to win, thus making the whole game more accessible. As the game became increasingly popular, books were written about the game theory of chess, as early as 1497. From then on the game gradually became a sport, with more and more chess clubs, coffee houses having

chess games open to the public. In the 19<sup>th</sup> century game tournaments were hosted, and chess problems were regularly featured in newspapers. The most influential writers of these problems were: Bernhard Horwitz, Josef Kling and Samuel Loyd. (Encyclopaedia Britannica 2002)

The modern competitive style chess were hosted in the mid-19<sup>th</sup> century. However, the game 1851 London Chess tournament raised the problem of players taking too long to make moves. To solve the problem the various game variants were developed including speed chess, five minute chess and the previously agreed time and move limit. Eventually timers were introduced, to keep the games to a reasonable span, and to enforce the time limits the player had to forfeit after their time is up. (Encyclopaedia Britannica 2002)

The first Chess tournament was won by a relatively unknown German, Adolf Anderssen. Anderssen played his chess very offensively, which was considered brilliant and energetic at the time. This style became a norm for a time following his success, but was later criticized as being strategically simple and shallow. A better understanding of chess strategy and tactics came afterwards, with American chess prodigy Paul Morphy, Austrian Wilhelm Steinitz. Morphy won most of the tournaments he entered during his brief career spanning from 1857 to 1863. His style consisted of carefully planned attacks in combination with a sound strategy. Morphy also won against Anderssen during this period. Steinitz wrote extensively about how to avoid attacks and weaknesses in one's position, and how to exploit these weaknesses when the opponent opens them. In 1886 Steinitz was the first official World Chess Champion after defeating Polish-German master Johannes Zukertort. Steinitz held this title for another 8 years, when in 1894 he lost it to a German mathematician Emanuel Lasker. Lasker went on to be the World Chess Champion for the next 27 years, the longest tenure.

Jose Raul Capablanca took the title from Lasker, by simple positions and endgame tactics. Capablanca was undefeated for 8 years, until 1924. Russian-French Alexander Alekhine followed Capablanca as champion, playing a strong attacking style. In 1946 he died as World Chess Champion, only losing the title for two years to Dutch Max Euwe. After the First World War new theories revolutionized by the hypermodernist movement, headed by Aron Nimzowitsch and Richard Reti. In their theories they advocated controlling the game by distant more powerful characters, like the bishop,

knight and rook, as opposed to pawns, which were then left to occupy the centre of the board and were objects of attack. Following the end of the 19<sup>th</sup> century, chess became very popular, with master tournaments being hosted yearly. (Hartston 1985)

After the Second World War, and the death of Alekhine, a new world chess champion was sought, and since then FIDE hosts and organizes elite player tournaments. The first winner was Russian Mikhail Botvinnik, who started a Soviet dominance of the game, up until the collapse of the Soviet Union. During this time there was only one non-Soviet champion American Bobby Fischer, between 1972 and 1975. FIDE set up the tournament so that the world strongest players seeded into “interzonal tournaments”, where they were joined by other players from the “zonal tournaments”. The winners of these interzonal tournaments would qualify for the “candidates” stage, which was initially a tournament, later knock-out matches. The winner of the candidates’ stage would finally play the reigning champion. The champion, upon losing, had the right for a rematch one year later. The system worked on three year cycles. Botvinnik partook in championship matches for 15 years. He won in 1948, and retained the title for a number of years, having tied matches in 1951 and 1954, but maintaining the title. In 1957 he finally lost the title to Vasily Smyslov, but regained it only a year later. In 1960 he again lost the title, this time to Latvian Mikhail Tal, but regained it again in 1961.

Following this, FIDE decided to abolish the champion’s right to a rematch, thus upon losing the match the title would go to the winner. The next champion, with this new system, was Armenian Tigran Petrosian, a defensive and strong positional player, went on to be undefeated until 1969. His successor was Russian Boris Spassky, until 1972. In 1972, American Bobby Fischer won the so-called Match of the Century, who defeated his rival by great margins, and clearly won the title match. He was also the first non-Soviet challenger, since the Second World War, for the title. In 1975 however, Bobby Fischer, following a dispute with FIDE, withdrew from the title match, thus handing the title over to Soviet Anatoly Karpov. Karpov went on to defend the title for a number of years, dominating the rest of the 1970s and early 1980s. Karpov’s reign ended in 1985, losing the fellow Russian Garry Kasparov. Karpov and Kasparov contested world title matches between 1984 and 1990, but Karpov never won the title back from Kasparov. In 1993 Garry Kasparov and Nigel Short broke with FIDE to host their own match for the title and founded FIDE competitor Professional

Chess Association (PCA). From 1993 until 2006 there were two parallel, competing titles, World Champions and World Championships, the PCA and the FIDE organized events. In 1999, Kasparov played online against a world team, composed of more than 50000 people from 75 countries. The world team's moves were decided by popular vote, and after 4 months and 62 moves Kasparov won. It is considered the most important game ever played in regard to chess theory, because of the number of ideas and complexity created by the participants. (Bird 2004)

From 2006 on, FIDA and PCA reunified the title when Vladimir Karmnik won against Veselin Topalov and became the undisputed World Chess Champion. In September 2007, Indian Viswanathan Anand became world champion, after winning the match against Karmnik. In October 2008, Anand retained the title, winning a decisive rematch against Karmnik and currently holds it. (as of May 2012). (The Times of India 2012)

### 3.3 Description

The game of chess is played by two people on a chessboard, with sixteen pieces each. Each figure moves in a distinct way, and the aim of the game is to checkmate, by threatening the opponent's king with inevitable capture. The game does not always end in checkmate; player's can resign if they believe they are losing. There are also a number of ways to end the game in a draw. Alongside the basic moves, rules also govern the equipment used, time control, conduct and ethics of players, record of moves, etc.

The chessboard is square board with 8x8 squares of alternating colour. Indifferent of the actual colour of the board, the lighter colour is referred to as white, and the darker colour as black. Each player has 16 figures, one in white, and the other in black colours. These are to be placed on the board according to the rules. The board is placed that the corner white square is on the right side of each player. The board's squares are identified by alphabetic order and number. Thus the first row, counting from the white player, is *1*, the second *2*, and so on until the 8<sup>th</sup> row. The first vertical column, counting from the white player's left side is *a*, the second *b*, and so on until *h*. (World Chess Federation 2013)

Each player gets 16 pieces, of 6 types of figures: the King, the Queen, two rooks, two bishops, two knights, and eight pawns. (figure 1.) These are to be placed on the board as follows:

The rooks are located on the outside left and right corners.

The knights are to be placed immediately inside the rooks, going towards the centre of the board.

The bishops follow the knights, immediately inside of them.

The queen is placed on the vacant square that is the same colour as the player's pieces. For example if the player plays with the black pieces the queen will be placed on the black square between the bishops.

The king takes the last vacant spot in row.

The pawns line up on the second row from the player.



*Figure 1. Diagram of proper chess setup. (World Chess Federation 2013)*

There are popular phrases to remember the proper setup of the game, such as “queen on her own colour” and “white on right” (for the correct board placement).

The game starts with the white making the first move, after which the turns alternate. Making a move is compulsory, even if it puts the player at a disadvantage. The play continues until one player's king is checkmated, or a player resigns. A draw can also be declared in certain situations. Additionally, if the game is played under time control, running out of time means losing the game. Official chess rules don't have a procedure to assign which player plays which colour. There are tournament specific rules

that assign these roles. In non-professional games, usually the colours are assigned by mutual agreement. (World Chess Federation 2013)

Each figure has a specific movement; these movements are made onto vacant squares, unless the player is capturing the opponent's piece. When a capture is done, the player making the capture replaces the opponent's piece with his own. Once a piece is captured, it is removed from the game, and cannot return. The king can be into check but cannot be captured.

The king can move one square horizontally, vertically or diagonally. (figure 2.) The king can attack in these directions, if there is no threat of checking. Only one move is allowed per round. Under certain rules, each player has a one time opportunity to make a special move such as *castling*. The king has no value associated.

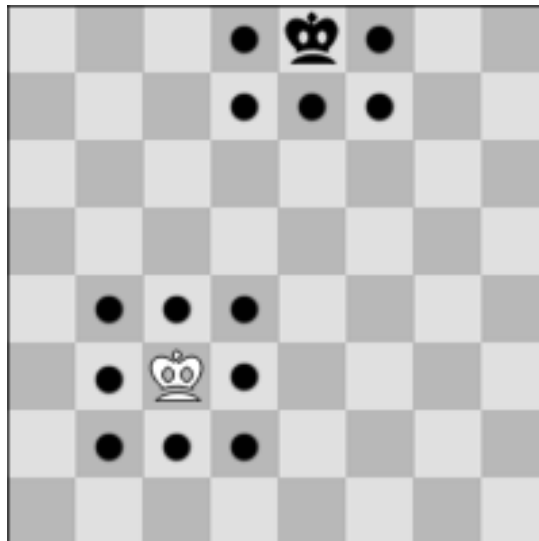
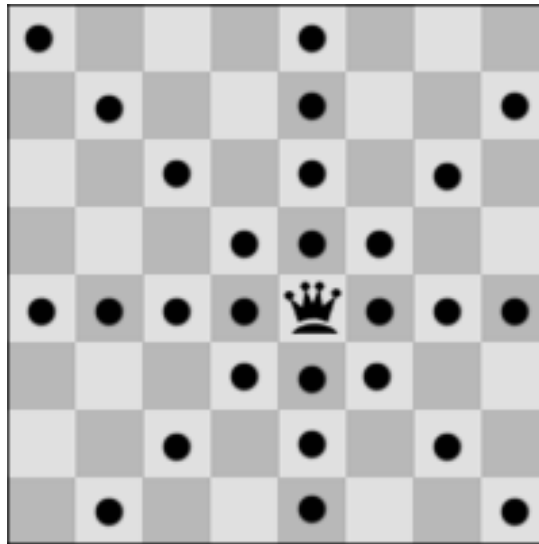


Figure 2. Diagram of the king's move options. (World Chess Federation 2013)

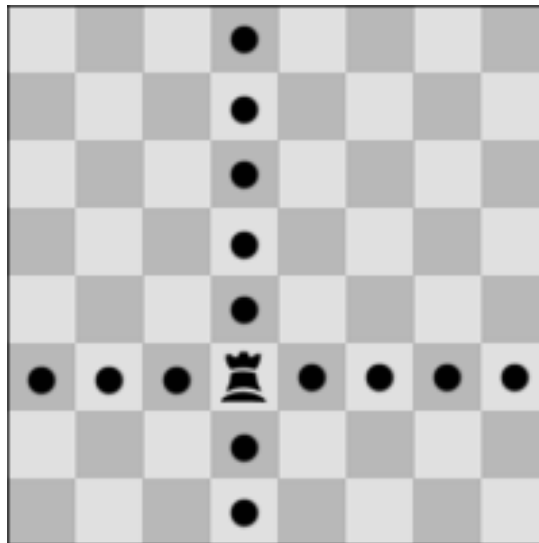
The queen moves in identical pattern as the king, horizontally, vertically, and diagonally, any number of squares. (figure 3.) Thus she is the most mobile and powerful figure, having a relative value of 9 given by Capablanca & de Firmian (2006).





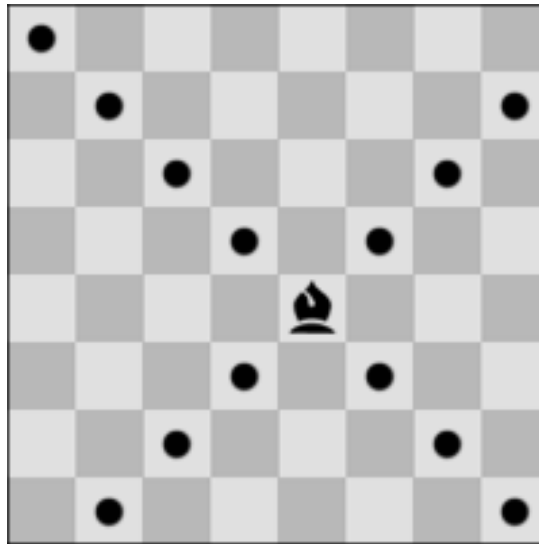
*Figure 3. Diagram of the queen's move options. (World Chess Federation 2013)*

The rook moves horizontally or vertically, either or, not both at the same time, any amount of squares. (figure 4.) The rook attacks in this direction. It is also moved while *castling*. The rooks' relative value is 5 supported by Capablanca & de Firmian (2006).



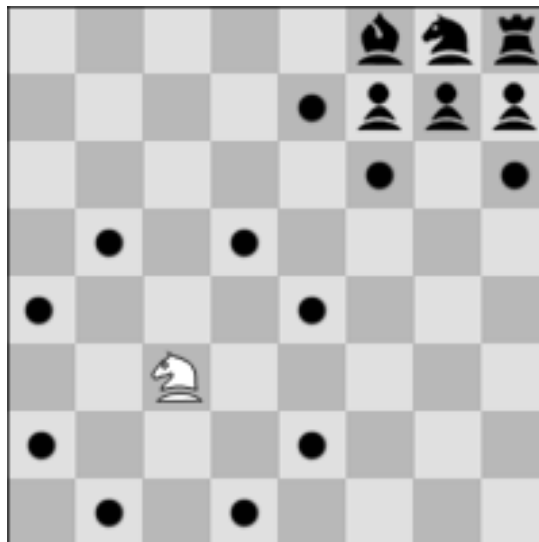
*Figure 4. Diagram of the rook's move options. (World Chess Federation 2013)*

The bishop moves and attacks diagonally. Any number of squares can be travelled during movement and attack. (figure 5.) Capablanca & de Firmian (2006) states, that the bishop's relative value is 3.



*Figure 5. Diagram of the bishop's move options. (World Chess Federation 2013)*

The knight moves in an “L” shape, thus for example jumping two squares horizontally and one square vertically, or any combination of this. (figure 6.) The knight does not need a clear path to the desired square; if it is free it can “jump” there. The knight attacks in the same manner. Capablanca & de Firmian (2006) give the relative value of 3 to the knight.



*Figure 6. Diagram of the knight's move options. (World Chess Federation 2013)*

Finally, the pawn has more complex moves. The pawn moves one square forward, unless that square is occupied. If the pawn has not yet moved in the game the player can choose to move two squares. The pawn is the only figure that cannot move backwards. Pawns are the only pieces that attack in a different way, than moving. While the pawn can only move vertically on the board, it can only attack diagonally forward. (figure

7.) Pawn has also two special moves available under certain circumstances, the *en passant* and the *promotion*. According to Capablanca & de Firmian (2006) the relative value of the pawn is 1. (World Chess Federation 2013)

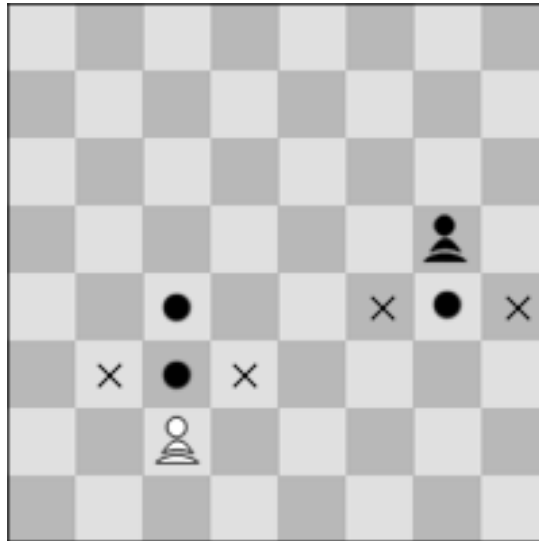


Figure 7. Diagram of the bishop's move options. (World Chess Federation 2013)

*Castling* is move when the king is moved two squares towards a rook, and the rook is then placed on the other side of the king (from the direction it came from). There are rules guiding this move. The rook and the king must not have previously been moved during the game. There cannot be any other figures between the king and the rook. The king may not be checked, and is not allowed to castling move if the resulting position would threaten the king. Both king and rook have to be on the same row on the board.

*En passant* is a special attacking move of the pawn. If the pawn can intercept a two square moving of the opponent's pawn by diagonally attacking, it can do so. The move is only valid if it is done right after the opponent's move.

*Promotion* is a special move of the pawn. If the pawn reaches the 8<sup>th</sup> row, it can be converted into a queen or a rook or a bishop or a knight, at the choices of the player. This choice is not limited to previously captured figures. Thus, in theory it is possible for a player to have 9 queens; or up to 10 rooks, bishops or knights on the board at the same time. If the desired piece is unavailable, the player should call the arbiter to provide the additional piece.

*Check* is the situation where the king is in direct threat by one or more of the opponent's pieces. The player whose king is in check has to make a move to free its king from the attack. There are three ways to get out of the check:

1. Move the king into a square that is not under threat.
2. Capture the opponent's piece that is checking the player's king.
3. Blocking the check, by placing a piece between the attacking opponent's piece and the player's king.

(World Chess Federation 2013)

If it is impossible to get out of check, via these above-mentioned moves, the king is checkmated, and the game is over. During non-competitive games, it is customary to announce “check” when making the move, however, in formal competitions it is rarely announced. Unlike other pieces, the king is never actually captured or removed from the board.

The diagram below (figure 8.) shows a typical checkmate situation. The white king is checked by the black queen, and if it tries to capture the queen it would be checked by the black rook. Thus the player cannot escape capture.

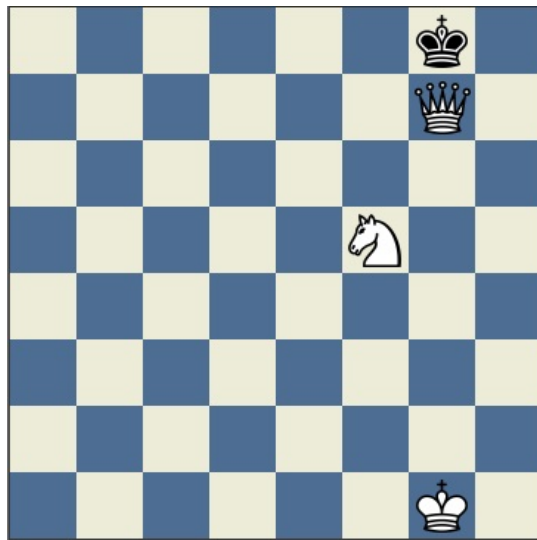


Figure 8. Diagram of checkmate. (Chess.com 2011)

*Resigning* can be announced by either player anytime. The resigning player loses the game. This occurs when one player thinks it is very likely to lose the match. Players can resign either verbally or indicating on the score sheet. In non-competitive games, the gesture of tipping over the king is indicative of resignation, however it is rarely

used. Stopping the time, when played with time control, is not considered resignation as it usually is stopped to call the arbiter. Additionally, a handshake is not necessarily a sign of resignation, as it can be interpreted by one player as agreeing to a draw.

A *draw* can occur in a number of scenarios. The game is called a draw when a player is not checked but has no legal moves. (figure 9.) This is called stalemate. (World Chess Federation 2013)

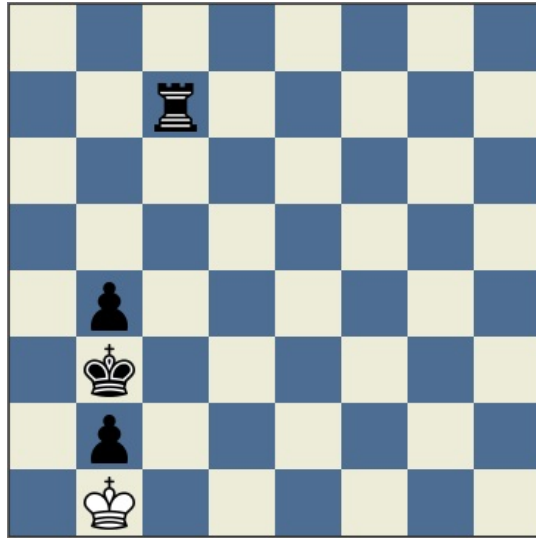


Figure 9. Diagram of a stalemate. (Chess.com 2011)

The game is immediately called a draw when there is no way to checkmate either side with any legal moves. This happens primarily due to lack of pieces. Scenarios that can occur is when only the two kings are left, or king against king and bishop, or king against king and knight, etc. A draw can be agreed on, if both players agree to the offer. Under two circumstances a player can claim a draw; under the fifty-move rule and under the threefold repetition rule. If proven the arbiter announces the draw. The fifty-move rule applies when there have been no capture or pawn movement in the last 50 moves by each player. Threefold repetition is when the same board position appears three times, with the same player to move, and all figures having the same rights of movement, including the right of *castling* or capture of *en passant*. (World Chess Federation 2013)

*Time control* was introduced to prevent player's from taking excessive amount of time to make a move. The time control works in two ways. Either there is an allocated time for the whole game, or a certain amount of time to make a move. In some circum-

stances a small amount of time can be added once a move is complete. (World Chess Federation 2013)

In professional tournaments the players follow strict protocol and code of conduct. For example the pieces are moved with one hand, the move is complete once the player lets go of the piece, and the move cannot be undone, unless the move is illegal. In case of pawn promotion, once the pawn is set on the 8<sup>th</sup> row the player is obliged to promote the pawn. When castling the king is moved first. The touch-move rule states that if the player touches a figure with the intention of moving it, the player has to move that piece. If the player wants to adjust a piece's position on the square, it has to be announced to the opponent by saying "J'adoube" or "I adjust". Players may not use any outside help, notes, computers or advices. Players may not leave the competition area without prior permission from the arbiter. Players are expected to shake hands before and after the game. They are also expected to have high standard of etiquette and ethics. Players should not speak during the game, except when announcing a resignation, offering a draw or pointing out an irregularity. Players cannot distract or annoy the opponent by any means, including repeated offering a draw. (World Chess Federation 2013)

Recording moves is obligatory in formal tournaments. This is compulsory in order to settle disputes of illegal moves, overstepping time control or making claims of a draw, by the fifty-move rule or threefold repetition. On a chessboard, each square is identified by a letter and a number. Horizontal rows are identified by letters from *I* to *8*, from the white player's side. The vertical columns are identified with numbers from *a* to *h*, starting from the white player's left side to right. The current rule is that the move has to be made on the board before recording it. The score sheet has to be available to the arbiter at any time. A player may respond to a move before recording. (World Chess Federation 2013)

The equipment used varies substantially, and there is no FIDE standard for chess games, figures and boards. The size of the squares of the chessboard should be about 1.25 – 1.3 times the diameter of the king's base, usually in the range of 50 – 65 mm. Traditionally the dark squares are brown or dark green, while the light squares are off-white or buff. The chess pieces are usually made of wood or plastic, either painted black and white or made from different wood. The pieces themselves also vary

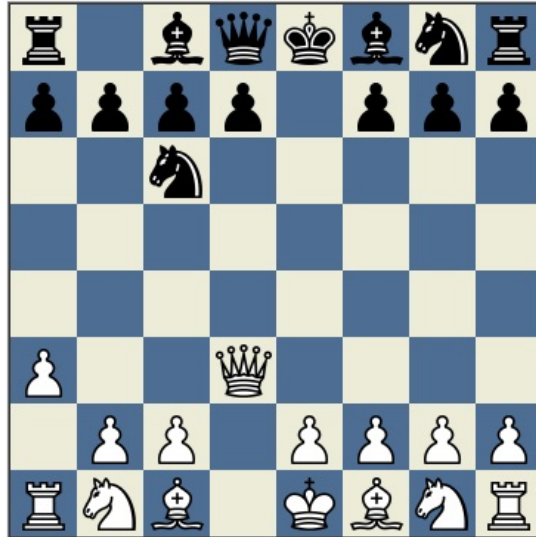
greatly, for example the king can be anywhere between 85 mm to 105 mm in height in professional matches. It is also appreciated if the pieces are well balanced and the diameter of the king's base is about half of its height. The size of the other figures should be in proportion to the king. Regarding time control, the instruments can be analogue or digital, with two clock-faces, and a button each, for stopping and starting the timer, so that the two clocks never run simultaneously. (World Chess Federation 2013)

### 3.4 Game play

To be successful at chess, the player has to have a high understanding of strategy and tactics. Strategy refers to a broad long term goals a player wants to achieve during the game. Tactics refer to immediate moves, manoeuvres to achieve the strategy's goals. Strategy and tactics cannot be completely separated, because strategic goals can be achieved with tactics, and tactical opportunities are based on previous strategic decisions.

As a result of these strategies and tactics the game play can be divided into three phases: opening, middle game, and end game. (Silman 1993)

The opening phase usually consists of the first 10 – 25 moves, when each player develops their armies, and moves their figures into position to help achieve the goals of the strategy. (figure 10.) There are recognizable openings that have been given names such as Ruy Lopez or Sicilian Defence. These are catalogued in many references books, most notably in the Encyclopaedia of Chess Openings. A good general practice is to follow the standard opening sequence as opposed to inventing new variants. However chess masters often chose to ignore this. There are many different openings to choose from varying from silent positional (example: Reti opening) to aggressive offensive (example: Latvian Gambit). Professional players spend years, and most of their careers studying openings. (Encyclopaedia of Chess Openings 2008)



*Figure 10. Diagram of opening. (Chess.com 2011)*

The fundamental strategic goals for openings are generally the same:

**Development** – To place the figures, mostly the knights, bishops and less so the rooks, into useful squares that have an effect on the game play.

**Control of the centre of the board** – To place figures in such a manner that it is easy to move to any part of the board. This can have a limiting effect on the opponent's strategy and tactics.

**King safety** – To keep the king safe, and have opportunity to escape when under threat.

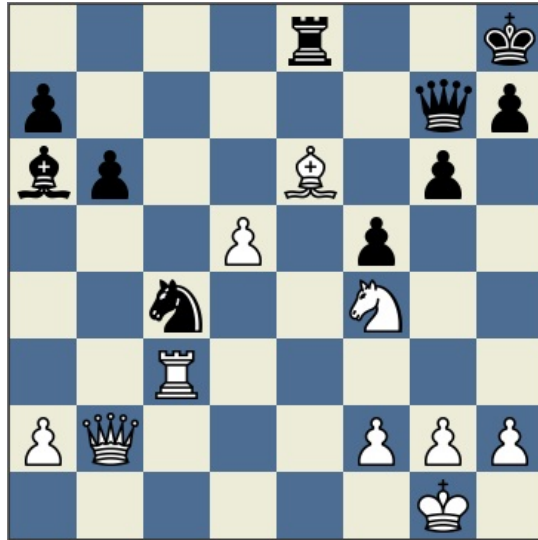
**Pawn structure** – Players position pawns to avoid weakness such as isolation, doubled or backward pawns and pawn islands.

Most theoreticians consider that, because of moving first, the white is at a minor advantage; while the black tries to equalize this advantage. (Fine 1990)

The middle game phase follows the opening, when the pieces are mostly set up. This is the time to assess the situation, the positions and create a plan for further development of the game. (figure 11.) Sometimes this means altering the strategy as it can be unachievable due to the features of the positions. A good opening leaves the player open for tactical manoeuvring during middle game, without losing sight of strategic



goals. This is phase of the game when most combinations occur, often connected to eventual attack of the opponent's king. Another important aspect of the middle game is to prepare for the end game. This is done by reducing the pieces and setting up the plan of attack. (Heisman 2001)



*Figure 11. Diagram of middle game. (Chess.com 2011)*

The end game is the phase when there are only a few pieces left on the board, and the ultimate aim is to checkmate the opponent. There are differences in strategy and tactics in the end game compared to previous phases. (figure 12.) Most important of which is that the pawn's importance increases, because it has the possibility to be promoted. The king is often moved to the centre of the board as the likelihood of being checked decreases, and the opportunity to escape increases. The situation known as Zugzwang is a disadvantage of the player that has to move, and is an important factor of the end game. (Seirawan 2003)

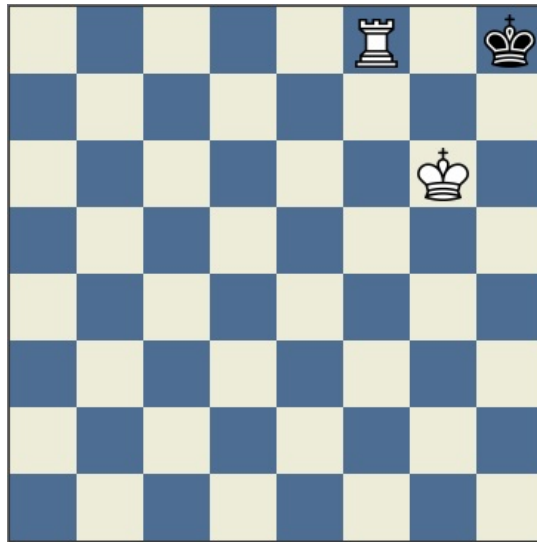


Figure 12. Diagram of end game zugzwang. (Chess.com 2011)

End games are classified by the remaining pieces on the board. Basic checkmate occurs when one side has only the king, while the opponent has the king and one or two other pieces, greatly increasing the possibility of winning. (Soltis 2003)

Tactics are a series of moves that limits the opponent's moves and have a tangible gain. The fundamental elements of the tactics is to create a situation where the opponent cannot respond to all the threats his pieces face, thus giving the advantage to the attacking player. There are a number of tactical moves to create this situation, including *forks, pins, batteries, discovered attacks, undermining, overloading, deflection and interference*. Often these are combined to help the strategy along. (Brace 1978)

For any of these manoeuvres to work it is vital to understand two concepts, attacking (threatening) and defending (protecting). A piece is attacking when it has the possibility to capture the opponent's piece in the next move. A piece is defending when the player's piece is under threat of capture by the opponent, the player can counterattack following the capture (if it happens).

A *fork* is a move when the player uses one piece to attack in two opponents at the same time. This leaves the opponent at a disadvantage, because it is only possible to defend one piece. Bishops, knights and the queen are preferred for the fork move.

A *pin* is a move when a player moves and forces the opponent's piece to stay put, because if moved it would leave a more valuable piece under threat. The logic behind

the pin move is that player's tend to defend their higher value pieces as opposed to lower value pieces.

A *battery* is the positioning of two or more pieces in a horizontal, vertical or diagonal line, and it is used to plan a series of attacks.

A *discovered attack* is an attack that is revealed when a player moves a piece out of the path of another.

*Undermining* is an attack on a defensive piece which leaves the opponent's pieces less defended or undefended. This leaves the opponent with the choice of either recapturing or saving the undefended piece.

*Overloading* is manoeuvre when a player put the opponent's defending piece into a situation of defending two pieces, thus having to choose.

*Deflection* is a manoeuvre where one player forces the opponent into giving up a square, resulting in the exposure of its king. This is usually used in a combination of moves, where the exposed king can be threatened after deflection.

*Interference* occurs when the line between an attacking piece and its defender is interrupted, by a sacrifice piece. This seldom occurs as the defended piece has to be more valuable than the sacrificed piece. (Chess.com 2011)

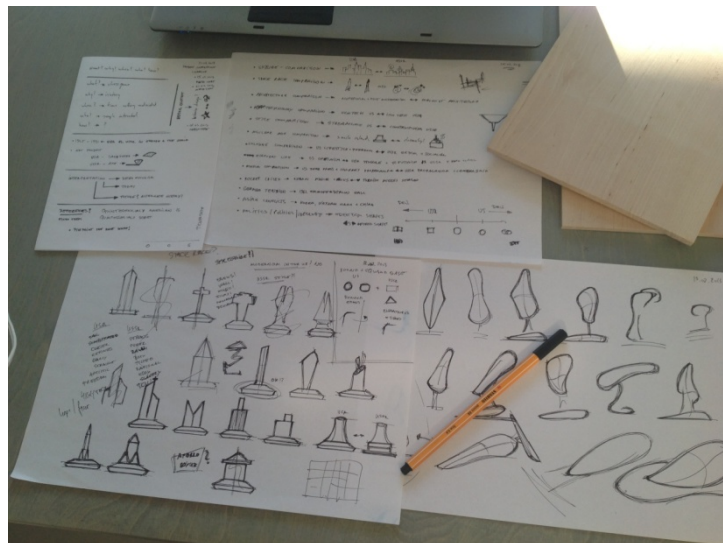
Strategy and tactics are essential to a successful chess campaign and careful study of these moves and manoeuvres are often irreplaceable for better understanding the game dynamic.

## 4 CONCEPT DEVELOPMENT

### 4.1 Initial development

Every design concept development starts with summarizing the findings in the research phase. Certain principles were already established, on symbolic and metaphoric grounds. For example, the relative height of each piece is only minutely different, making the figures look more united, for both sides. This was a direct result of both superpowers' philosophy, and strong tendency to stay and appear strong. Class differences and hierarchy, clearly emphasized in traditional chess figures, were downplayed and made less obvious. The board itself, traditionally a simple square grid wooden board, was also heavily influenced and altered to represent the period more accurately.

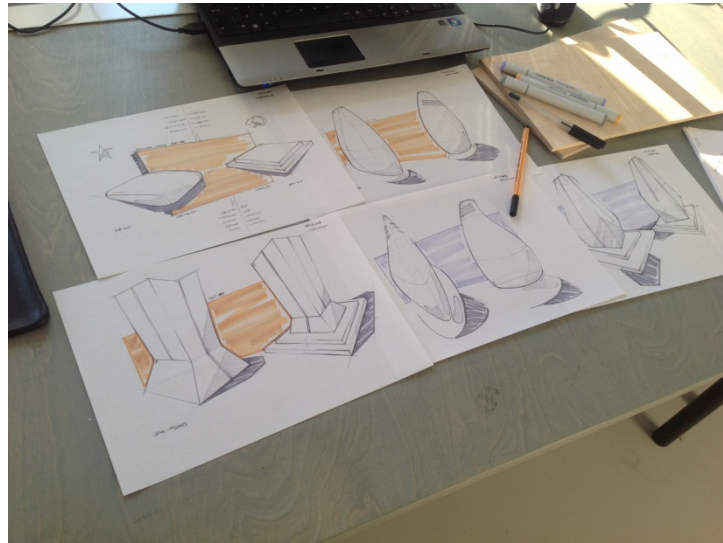
Following these principles, the start of the concept development itself could begin, usually by quick sketches, called doodles, which has to sole purpose of idea generation. (figure 13.) This does not have any artistic value, nor is it intended to be shown widely, it is only a tool for the designers to self-stimulate.



*Figure 13. A selection of doodles.*

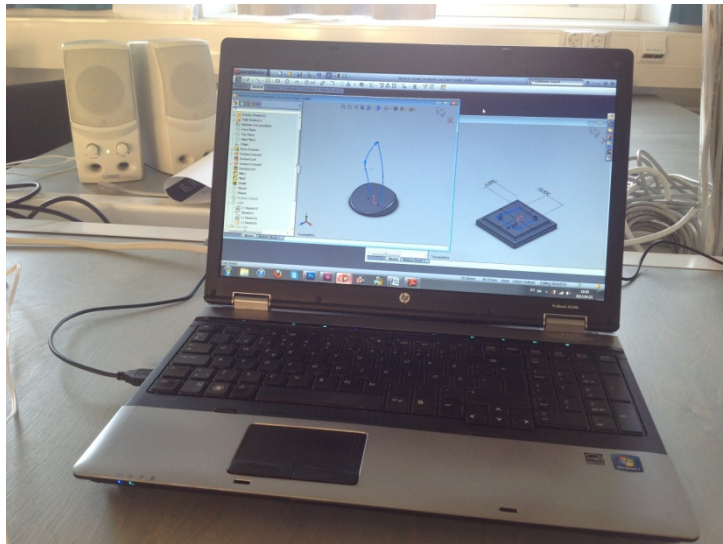
However insignificant doodles may seem they are a key part of the process, as it is the foundation of the design development direction. Once there is a coherent development path in mind, sketching takes over from doodling. Sketching is a more focused drawing that shows off the idea, general shape, proportions, functions, materials, colours, etc. The sketches are presentable widely, and are often done so to communicate and get feedback about the concept proposal. (figure 14.) A well drawn sketch is the basis

for computer aided design (CAD) modelling. Throughout these phases the design constantly evolves, and often designers jump from one stage to the next and back again to check and examine design changes and tweaks.



*Figure 14. A selection of sketches.*

A designer can choose from a wide range of CAD modelling software. Most commonly used introductory software packages are Autodesk AutoCAD, and Rhinoceros. Students start learning CAD using these, 2D modelling with Autodesk AutoCAD, and 3D modelling with Rhinoceros. More advanced CAD software are Solidworks and ProEngineer, which is more popular in industry, but designers prefer using these software because it allows them to better understand and develop their ideas. Solidworks was used to create this project. (figure 15.) CAD software allow near perfect visualization of design concepts, including shape, form, parts, wall thicknesses, draft angles, etc, which are indispensable for product manufacturing.



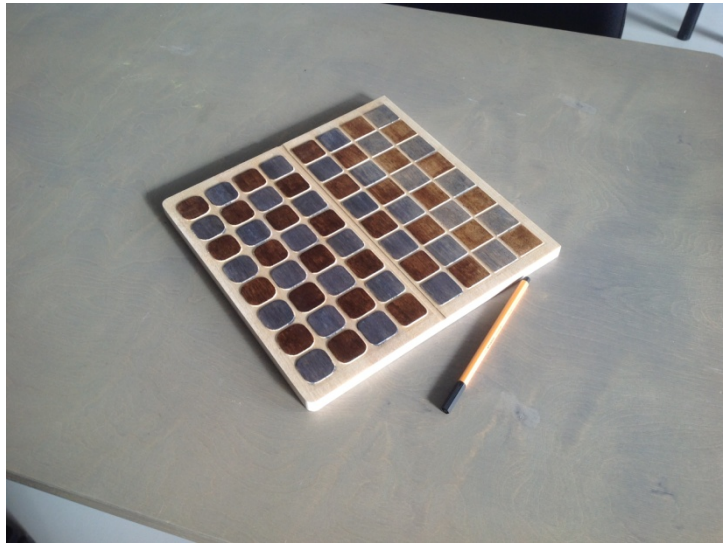
*Figure 15. Picture of CAD modelling.*

## 4.2 Stage

The stage for the game is the chessboard itself. It was designed with the clear principle in mind of combining the USA and USSR features, without overpowering either side. During the design process authenticity was one of the key focus points; this influenced the choice for materials and shapes that were developed. The main material of the board is wood, a natural material, found and extensively used in both cultures. The spheres of influences are clearly marked by the shapes of the “squares”, which is a progressive blend from a rounded square towards a perfect square. This transition goes both ways, signifying the American and Soviet dominated zones. The American side has a rounder end, and the board itself also has rounded edges on their side. The Soviet side has a straighter line, and the board itself has a clear cut angle. (figure 16.)

There is wider gap between in the centre of the board, which both are a symbolic feature and a tension builder. The gap represents the Berlin Wall, which was built 1961 and lasted until the end of the Cold War. Beside this metaphor, the gap functions are a tension builder, which makes the game more intense. There are guides engraved in this gap, for correct positioning, as well as the dates of the Cold War period. This engraving is an element from a compass, directing the board northward. If correctly used and the board arrow is point to the North, the Americans will set up base on the west side (left side) while the Soviets on the east side (right side). This gives the board a symbolic earth like appearance, which is true to real life. Staying true to the classic board game set up, the right corner is lighter colour, when the board is set up cor-

rectly. The university's computer numeric control (CNC) machine was used to create the board, while the finishing was done by hand. The differences in tone and colour were achieved by using paints and varnish.

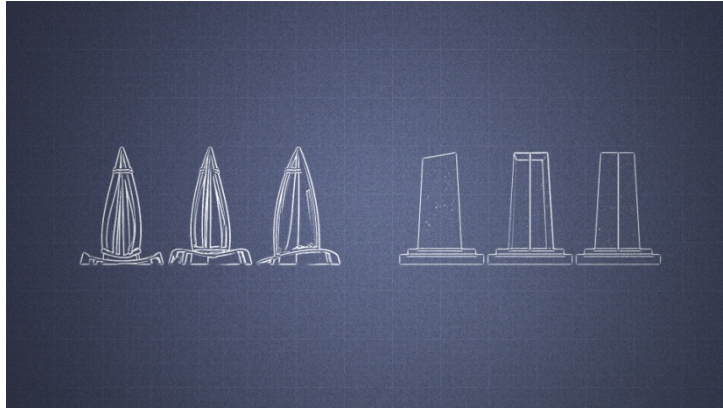


*Figure 16. Picture of chess board.*

#### 4.3 Pawns

Each figure, on both sides, has been carefully designed to have a specific look and touch experience, while maintaining their stylistic authenticities. The pawns are the weakest and thus the shortest pieces on both sides. Relative to one another, the US piece is 2 mm taller than the USSR piece to counterbalance the volume of the later. (figure 17.) The pieces carry very little features, and are very basic expressions of the styles. Each side has a distinguishing element that enforces the relative strength of their character. Thus the US pawn has two strips on the top, while the USSR pawn has one cut through the middle. The base for all the US characters are the same, so too for the USSR, to create a uniform look. Due to the fact that both superpowers prided themselves in unity and equality this feature can be found in all the pieces. (Appendix 4/1.)

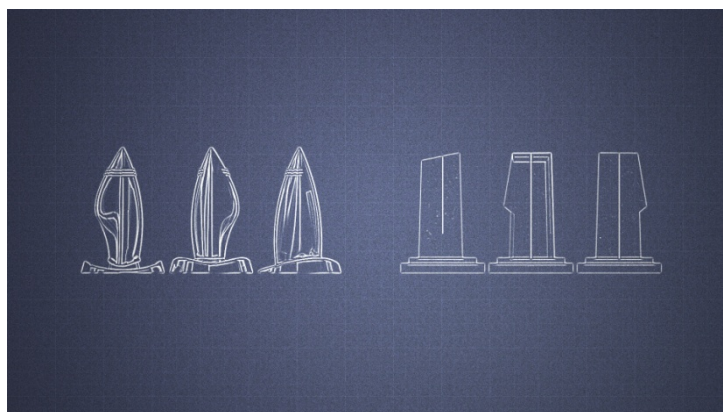




*Figure 17. Blueprint of pawns, USA and USSR.*

#### 4.4 Knights

The knights were developed unconventionally, but using the same principle for both sides. In traditional chess the knight is the only piece that is not a rotated form; this however results in a clearly different look and feel for the character. Since having a non-uniform look would have greatly undermined the unity of the sides, the knights were developed using a different approach. After simplifying the profile the knights are top heavy, but not disproportioned. This means that they are easily identifiable yet maintain their inherent characteristic. (figure 18.) The US knight is 2 mm taller than the USSR knight. Following the same principle of hierarchy, the US knight has 3 strips on top, one more than the pawn, while the USSR knight has two cuts, again one more than the pawn. (Appendix 4/1.)

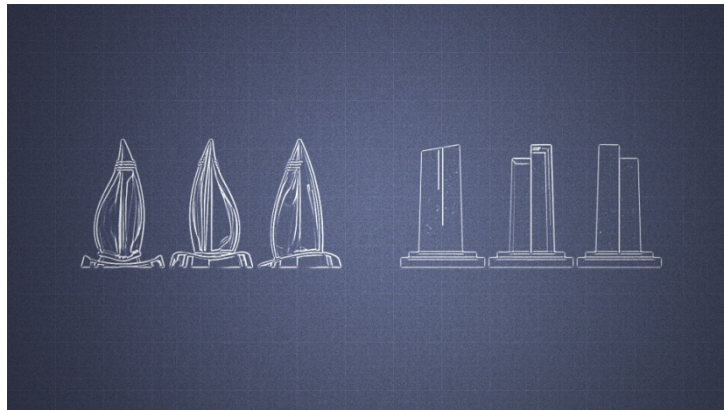


*Figure 18. Blueprint of knights, USA and USSR.*



#### 4.5 Bishops

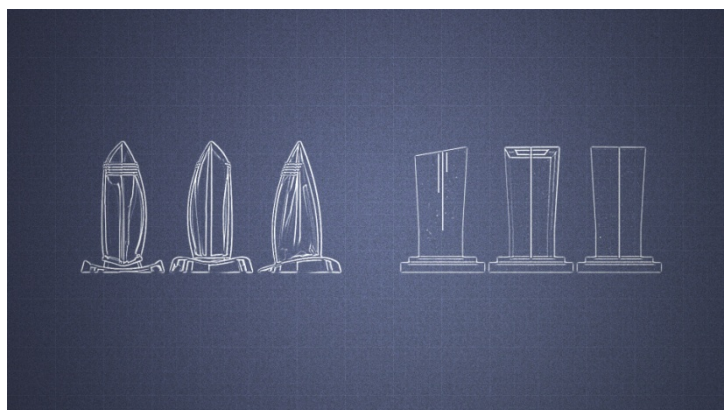
The bishops were developed by exaggerating the shape of the classic chess piece. This means that the cut in the piece's top is overdone, and leaves half of the top empty. (figure 19.) The US bishop is 2 mm taller than the USSR bishop. Additionally, the US bishop has 4 stripes, while the USSR bishop has 2 cuts and a profile engraving on the side. These pieces are more expressive stylistically, and follow their respective styles faithfully. (Appendix 4/2.)



*Figure 19. Blueprint of bishops, USA and USSR.*

#### 4.6 Rooks

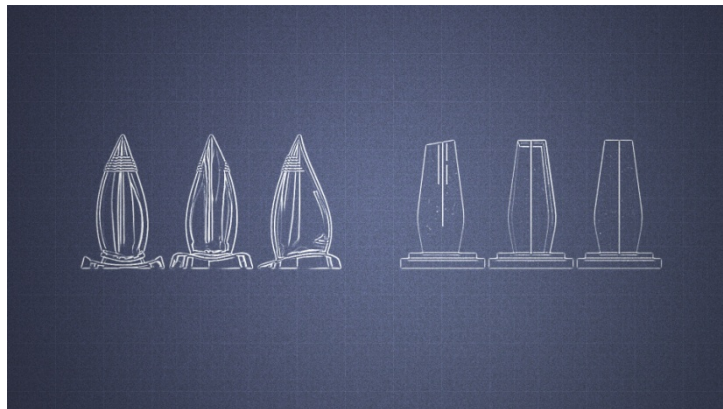
The rooks are generally seen as strong pieces, and thus their development was focused on expressing this. The US rook mimics a shield, which is an ideal interpretation. The USSR rook has very strong and sharp lines, making it look more powerful than it really is. (figure 20.) The US rook is 2 mm taller than the USSR rook. The US rook has 5 strips, the USSR rook has 2 cuts and 2 profile engravings. (Appendix 4/2.)



*Figure 20. Blueprint of bishops, USA and USSR.*

#### 4.7 Queens

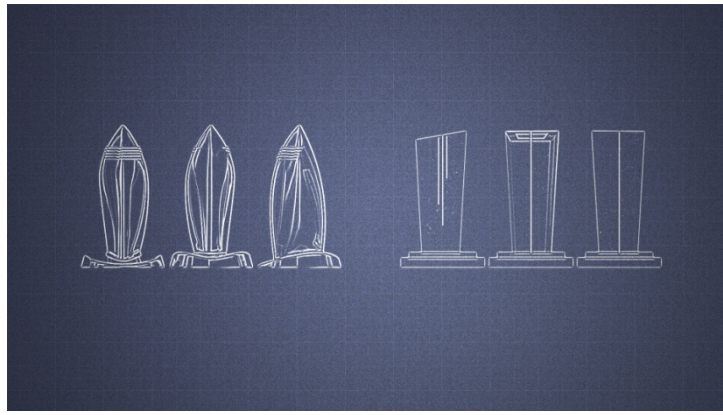
The queen is the most valued and powerful character, it has the most mobility and possibility to capture. This is the only character that is clearly feminine. The US queen has exaggerated curves, making the piece look strong yet gently at the same time. The USSR queen is the only Soviet piece that has curved lines, allowing it to be more feminine, while to breaking the constructivist style. (figure 21.) The US queen is 2 mm taller than the USSR queen. The US queen has 6 strips, and the USSR queen has 2 cuts and 3 engravings. (Appendix 4/3.)



*Figure 21. Blueprint of queens, USA and USSR.*

#### 4.8 Kings

The king is the most precious character, as the aim of the game is to capture it. Both kings are designed to appear masculine and strong. They are also top heavy, extending in a V shape profile. (Figure 22.) The US king is 2 mm taller than the USSR king. Since the king is not as mobile as the queen, it has one less feature than the queen. This means the US king has 5 strips, and the USSR king has 2 cuts and 2 engravings. (Appendix 4/3.)



*Figure 22. Blueprint of kings, USA and USSR.*

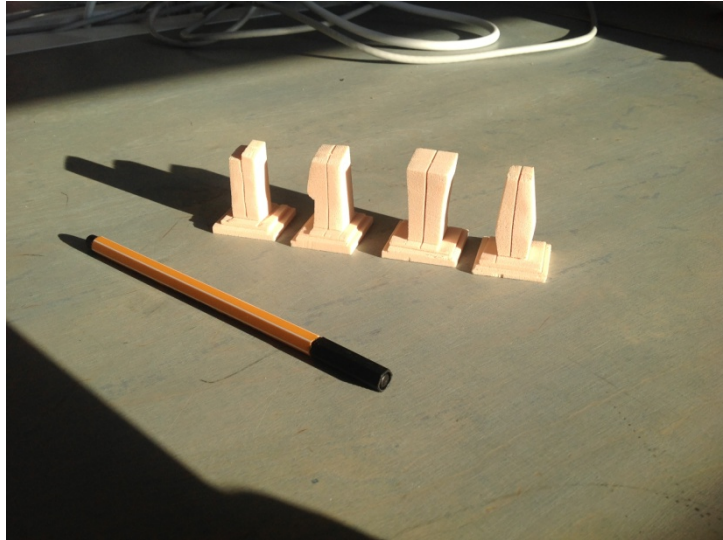
#### 4.9 Mock ups

During the development process quick handmade prototypes were used, to check the proportions, size, and relative aspect comparison. These were made in the university's plastic workshop and art house. For the American side the prototypes posed a complex model building challenge. Due to the fact that the American figures are freeform shapes, it was impossible to accurately model them using sipa. The material characteristics are rigid for these sorts of shapes. Instead, a simple plastic sheet was used to create the 2D cross-section of the form, and clay was used to fill in the gaps to create a smooth surface. (figure 23.) This technique resulted in a sufficiently accurate model which could be used for review and design changes. Following these mock ups, the designs for both sides were slightly altered, to create a more matching and equal setup.



*Figure 23. Picture of mock-ups for the American side.*

The Soviet side, due to their cubic nature was quickly done in the workshop using sipa, a polyethylene terephthalate plastic material. It is a relatively strong and rigid, wood like material. The models were crafted using saws, handsaw and sand paper. (figure 24.)



*Figure 24. Picture of mock-ups for the Soviet side.*

These mock-ups were a vital part for proper development. The use of them resulted in a fine tuned design that better represents both sides.

#### 4.10 3d prints

Following the fine tuning made possible by the previous steps, the final details were added to the 3D models, and it was prepared for 3D printing. Final touches included a discreet hierarchy for the pieces on both sides, suggesting each pieces' strength relative to others. In the case of the Americans this was done using small stripes, which were already a stylistic element. The simple logic behind it was that the more stripes the pieces have the stronger it is. On the Soviet side, cuts were the distinguishing element, following the same logic as the Americans.

Preparing the 3D models for print meant, adjusting minor details, scaling the pieces, and most importantly hollowing out the interiors for the pieces. The hollowing was important as it would increase the speed of production, while saving material thus costs. The university's newer 3D printer was used to create the models, which prints from two materials, one build material and one support material. After the prints are



done, it is necessary to clean away the support material to get the final pieces. Following this the pieces are ready. (figure 25.)



*Figure 25. Picture of 3D prints.*

#### 4.11 Cast models

Using the 3D prints the process continued with creating one piece from each side from the actual material envisioned during the modelling and rendering phases. This meant moulding and casting pieces from concrete and aluminium. The pawns were chosen as the pieces to be moulded and casted because they are the simplest and most common piece on the board.

The American pawn was done in the jewellery workshop. The process itself is simple, but requires great attention when dealing with molten metal, in this case aluminium. First, the 3D printed American pawn was prepared for moulding, which meant creating a support structure. After this was done, the investment could be done, using gypsum, which creates the mould around the piece. Since the 3D printed plastic has a low melting point temperature, the casting could be done directly over the mould while the piece was still inside. This technique saves a lot of casting time, but leaves the piece in a rough finish, which has to be polished after the cast cools. After the cast is cooled, the mould can be broken and the piece is ready for finishing. (figure 26.)



*Figure 26. Picture of mould and casted piece*

The final piece has a shiny finish, which was the intended purpose for the cast. (figure 27.)



*Figure 27. Picture of casted piece next to 3D prints*

The Soviet pawn was moulded and casted in the art house. The process requires careful mould making. Due to the shape and angles of the Soviet pawn the mould making created a problem, which had to be addressed before continuing. This meant parting the mould at an angle which was no ideal. To be able to make a perfect parting line and to ease the mould making, clay was used to split the piece by creating wall. The next step was to create the first half of the mould. Plaster is used to create moulds for concrete moulding. The plaster is mixed with water, and applied to the piece. After an hour the plaster hardens, and it can be removed from the piece. Moulding the second

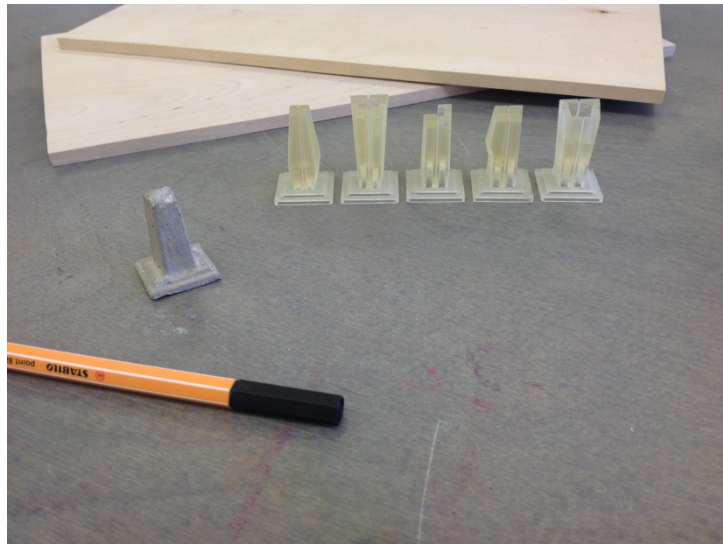
part is done in the same way; however the dividing wall is replaced with first part of the mould. This makes the second part of the mould align up correctly with the first part to create seamless mould. Once the two parts of the mould are set and hardened, the mould is taken apart, the 3D printed piece to create the mould is removed, and the mould is put back together.

Concrete mixing can now begin, after the mould is securely fastened together. When the concrete is mixed, it is poured into the mould, and left for 3 days to set. Opening the mould has to be done carefully, to not damage the concrete cast. Following this final sanding and finishing is done to the piece. (figure 28.)



*Figure 28. Picture of mould and cast piece.*

The final piece has the desired effect thanks to the concrete material. (figure 29.)



*Figure 29. Picture of cast piece next to 3D prints.*

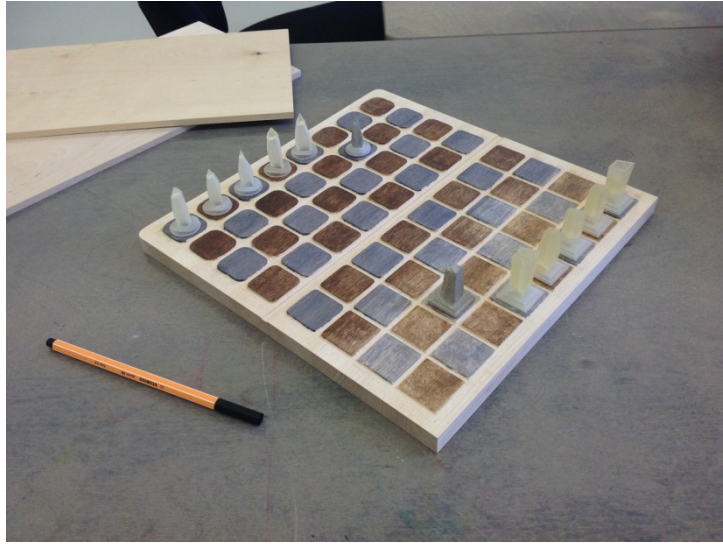
#### 4.12 Overview

The nature of this project is artistic, conceptual design, due to the fact that it would be very difficult to manufacture on large scale. Also, because of the fact that there are so many different manufacturing techniques involved, the costs would not be able to be kept at a reasonable level. Additionally, certain aspects and details of the designs are troublesome to replicate, without specialized equipment.

The game chess captures the diplomatic turmoil of the time, with strategic, tactical elements that were faced during the 46 years of the Cold War. Additionally, chess has a characteristic of being deceiving, much like the Cold War was.

The chessboard and the figures are essentially capturing the mood, atmosphere and feeling they were intended. The board sets up stage for the events, with clearly distinguishable zones of influence for both parties, and the centre “Berlin Wall” add just the right amount of tension to the game. (figure 30.)





*Figure 30. Picture of final board with cast and 3D printed pieces*

Both sides' figures are designed to relative same height, as both sides prided themselves in unity, both metaphorically and literally. Neither side was explicit about class hierarchy, which is reflected in the pieces as well. Each figure class is distinguishable, and ranking properly when compared to other figures. Both styles, the American streamline and the Soviet constructivism, are captured authentically in the pieces without over exaggerating their characteristics. In summary the concept in large delivers its intended purpose of capturing this delicate period of the 20<sup>th</sup> century.

## 5 CONCLUSION

This project is a good example of one designer's process, even if the final design is not mass producible in the current state. The process starts from a clearly defined setting, the Cold War era, which is the backbone for the design development. It is an abstract term, regarding the development, leaving many opportunities for a designer to explore. Translating this theme authentically to a board game is the challenge of this thesis. The development of the project is a textbook case of design development, going through extensive direct and indirect research, ideation, mind-mapping, visualization with doodles and sketches, CAD modelling using Solidworks, renderings, mock-ups, design revisions, 3d printing, CNC milling and finally moulding and casting pieces. Additionally, the designer's role was extended to photography, presenting and storytelling.

The ideal follow up for this project would be the completion of casting all the pieces. As a result of not being mass producible, this project could be an artistic expression for the Cold War. It could be presented in a museum that pays homage to the time. Alternatively, it could be scaled up to have to about 500 mm for each piece, to have a public exhibition of the project, presented somewhere in Berlin.

The main aim of the project is to educate and remind people of the hopes and fears, the opportunities and challenges of the era, to pay respect to all the people involved, and to better understand the world we inherited.

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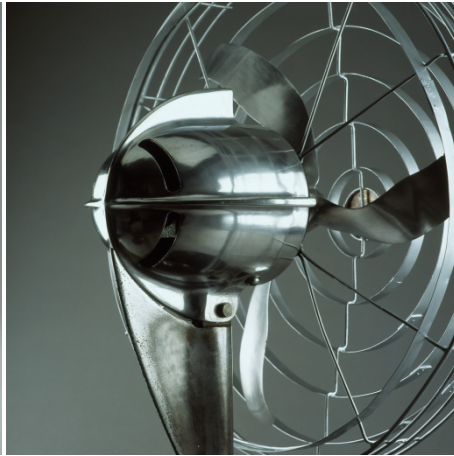
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## AMERICAN STREAMLINE STYLE BOARD

Appendix 1.



Toaster



Fan



Lamp



Hair dryer



Car



## SOVIET CONSTRUCTIVISM STYLE BOARD

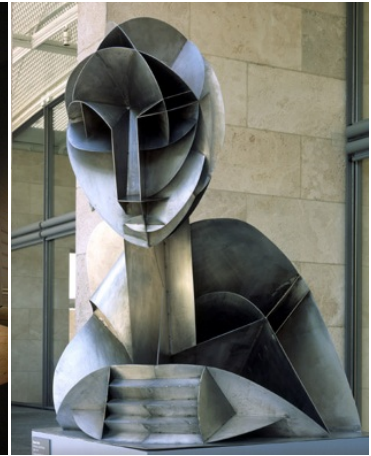
Appendix 2.



Soviet monument



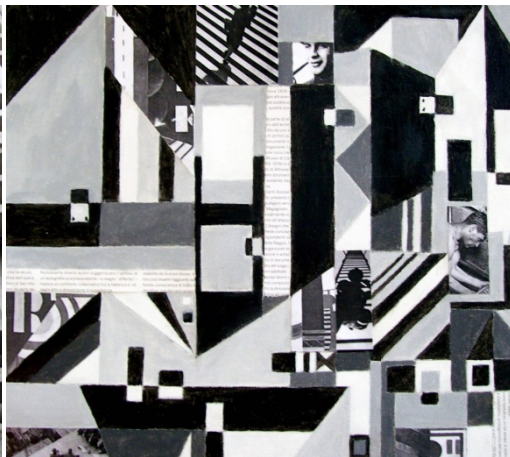
Tatlin's tower



Sculpture



Concrete structure



Painting

[*Car*] n.d. [image online]

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[*Hair dryer*] n.d. [image online]

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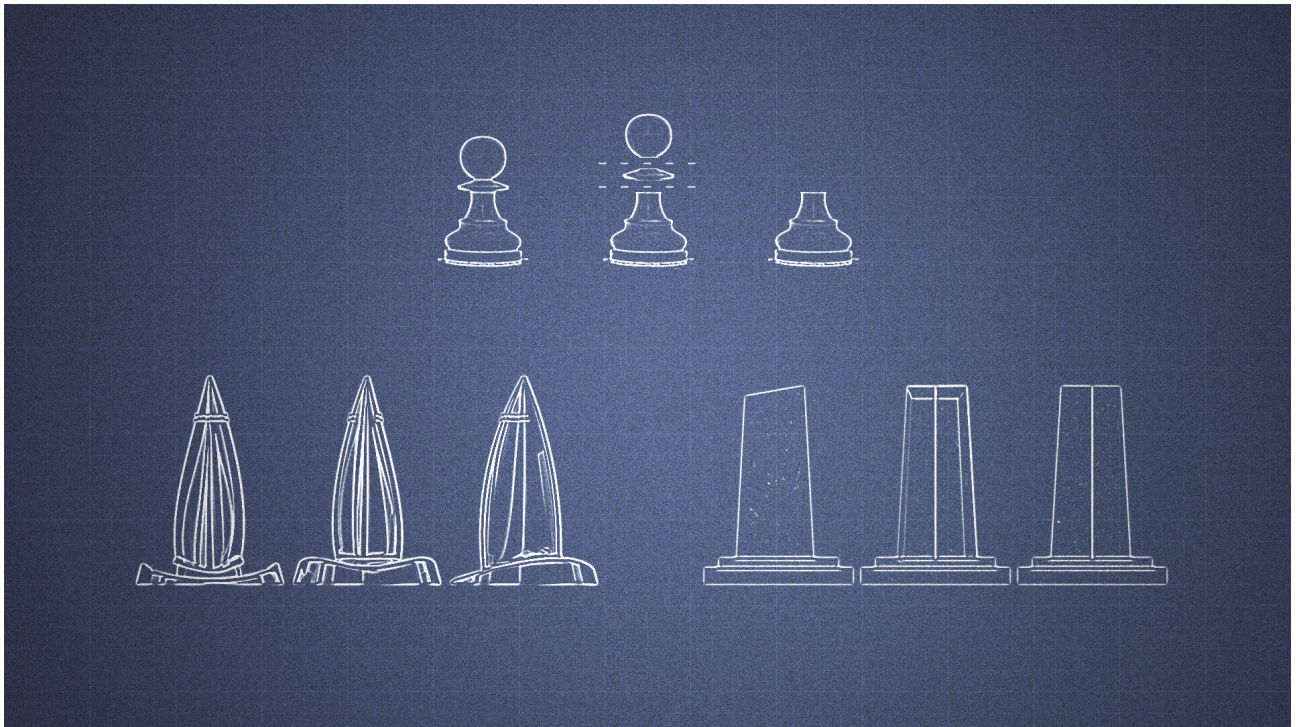
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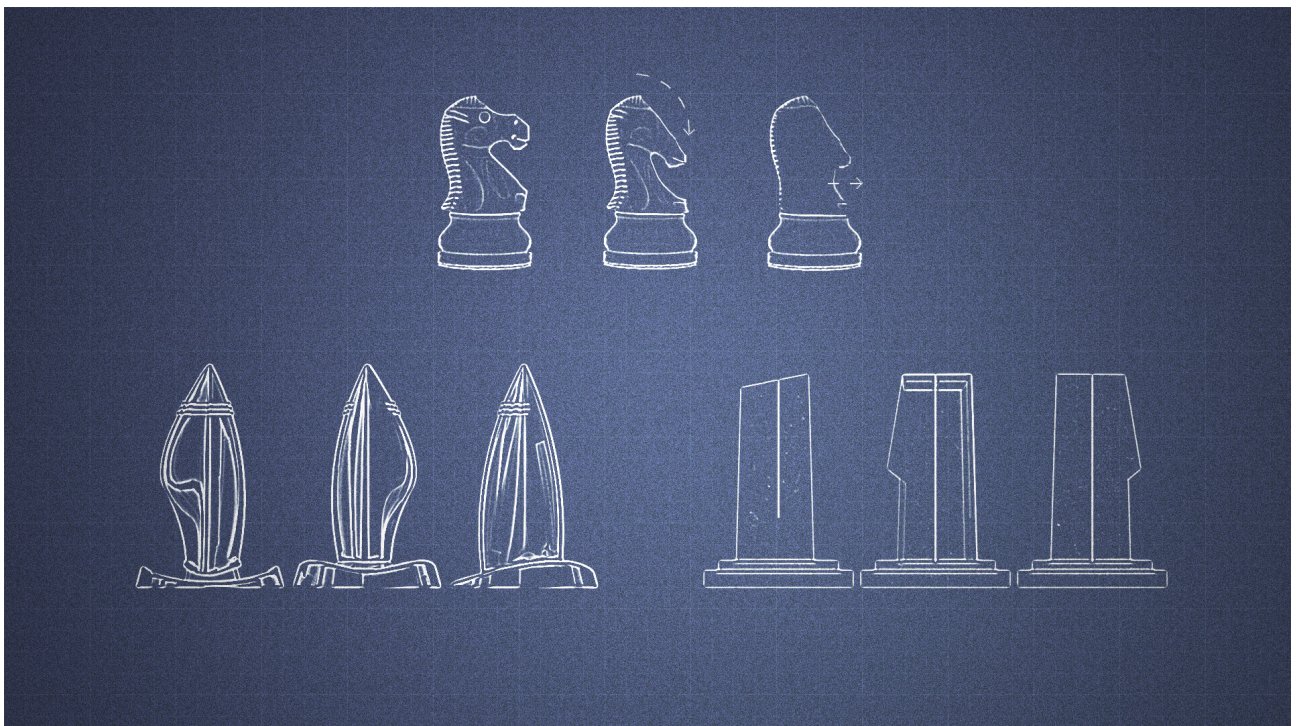
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<http://designapplause.com/wp-content/xG58hlz9/2011/02/toaster1.png> [Accessed 16 April 2013]



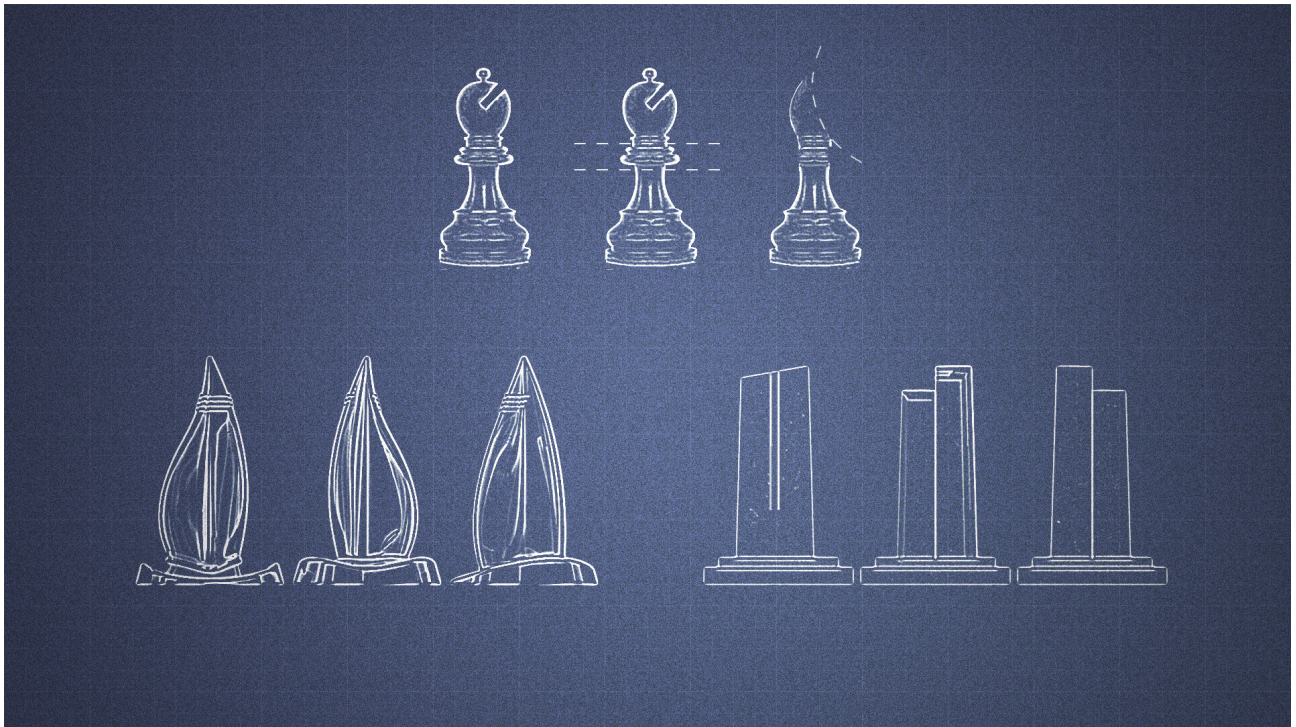


*Pawns*

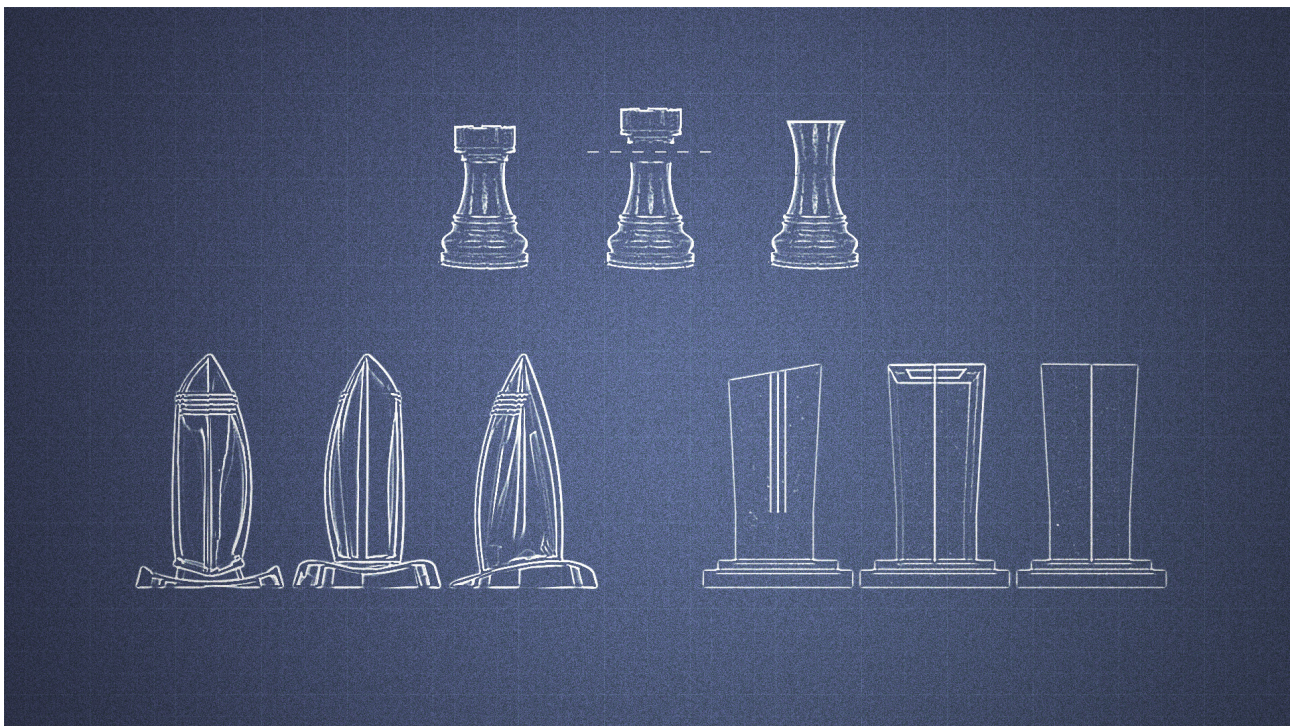


*Knights*



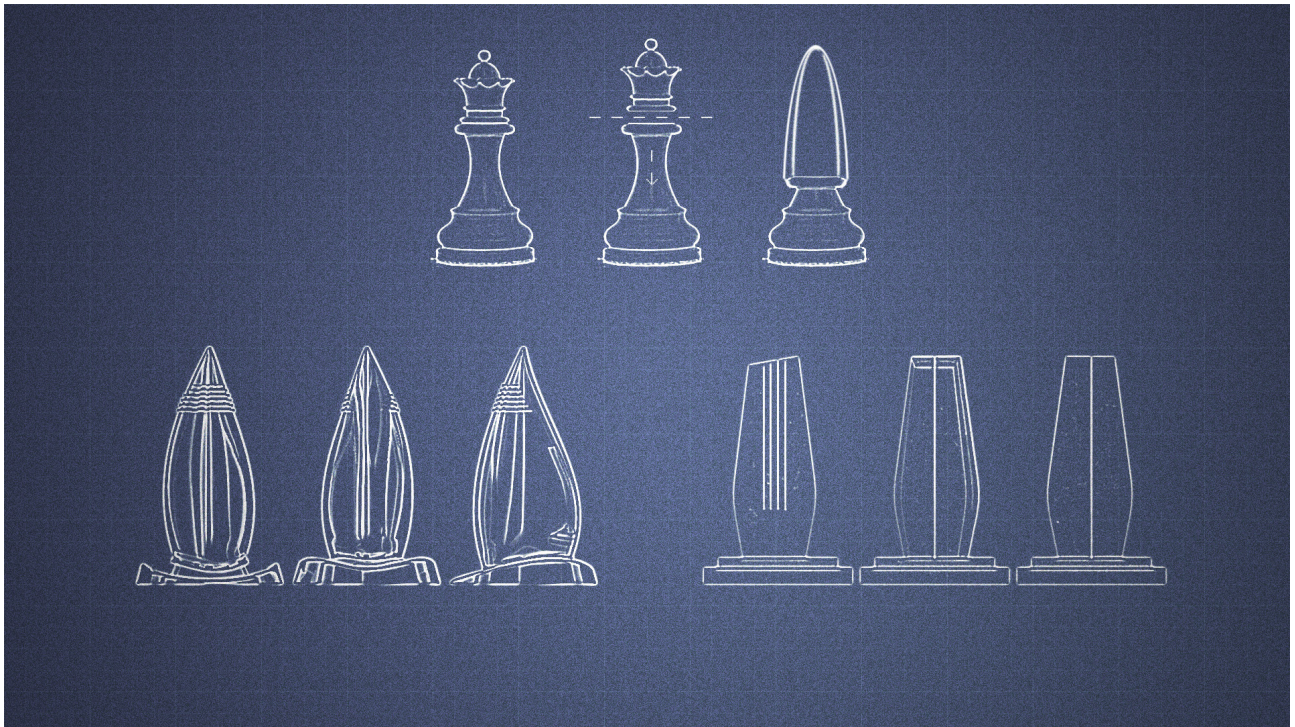


*Bishops*

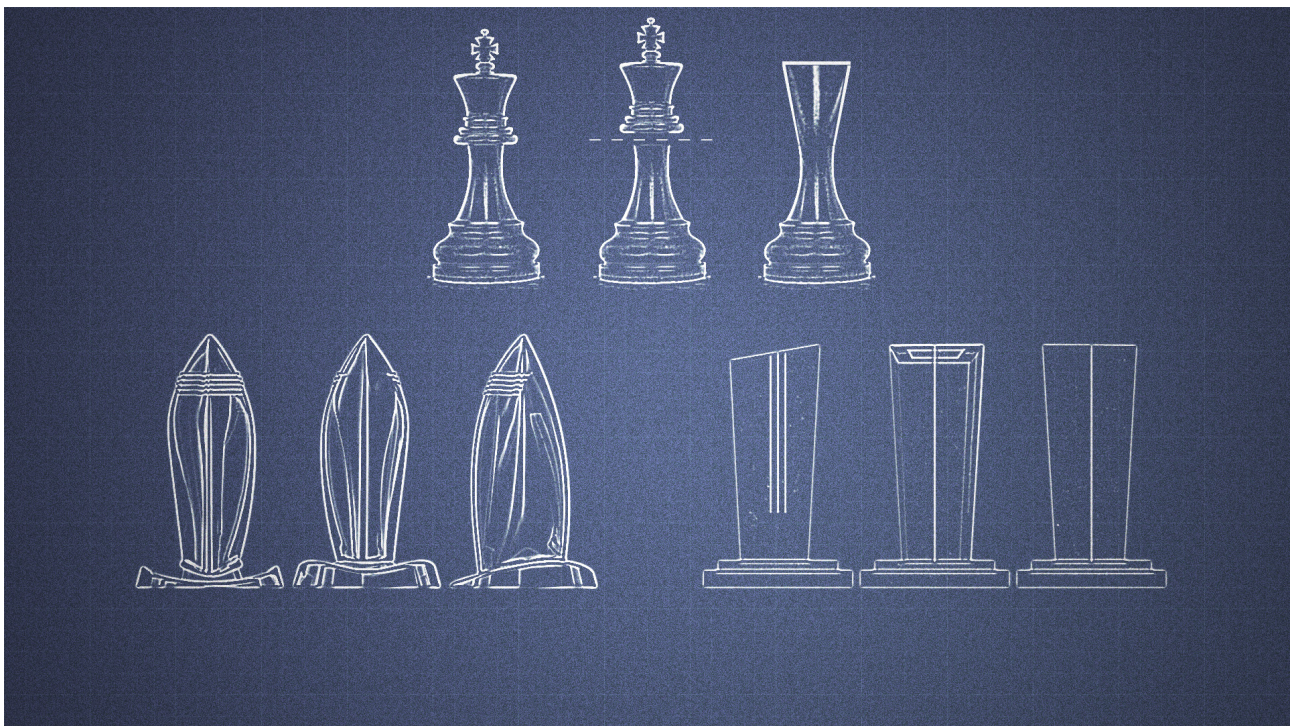


*Rooks*





*Queens*



*Kings*