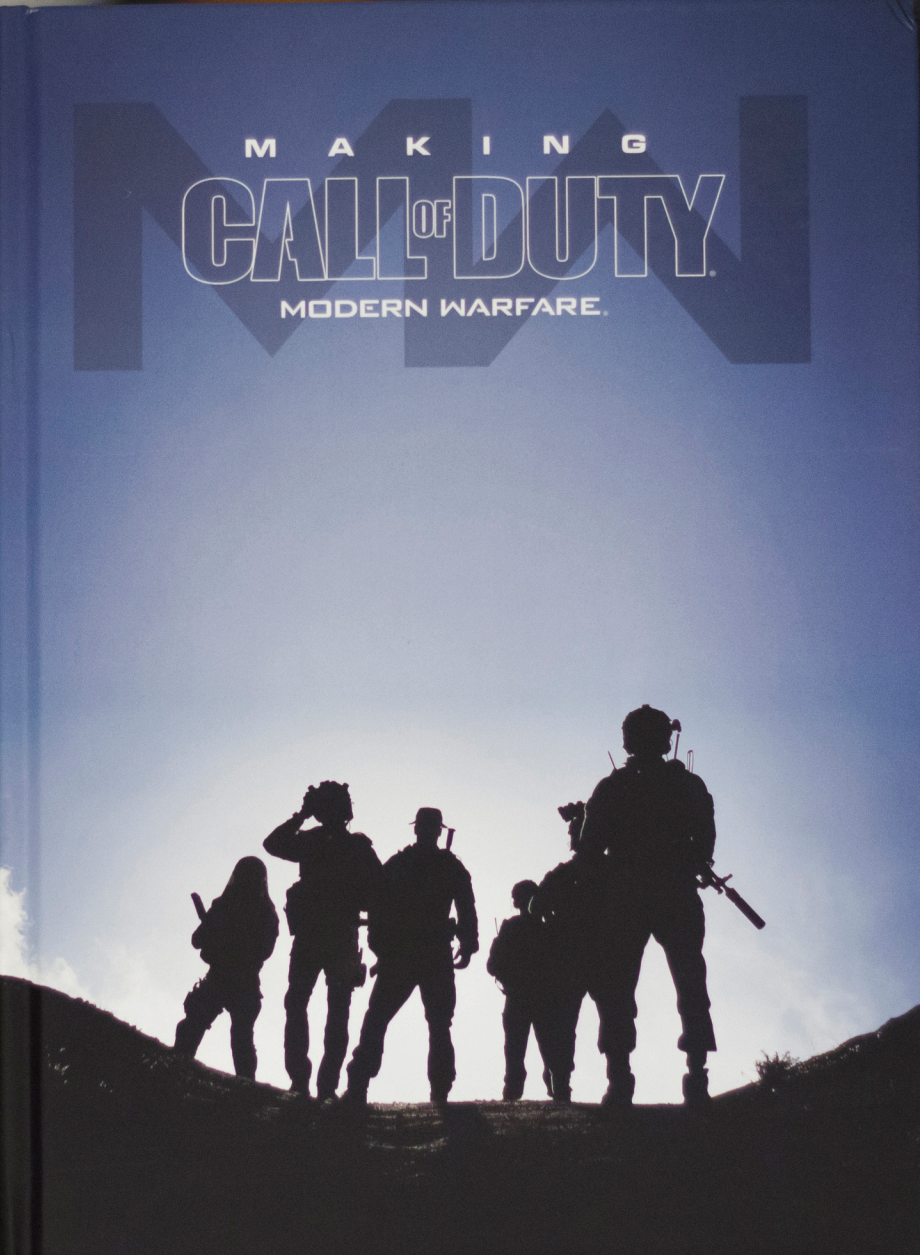
MAKING
CALL OF DUTY
MODERN WARFARE



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MODERN WARFARE

The global balance of power is teetering on the brink of collapse. A diverse cast of international special forces and freedom fighters work within the gray area of their rules of engagement. The battle lines in this modern-day conflict are blurred. The stage is set in multiple theaters of conflict, from iconic European cities to the volatile expanses of the Middle East. Welcome to *Call of Duty®: Modern Warfare®*.

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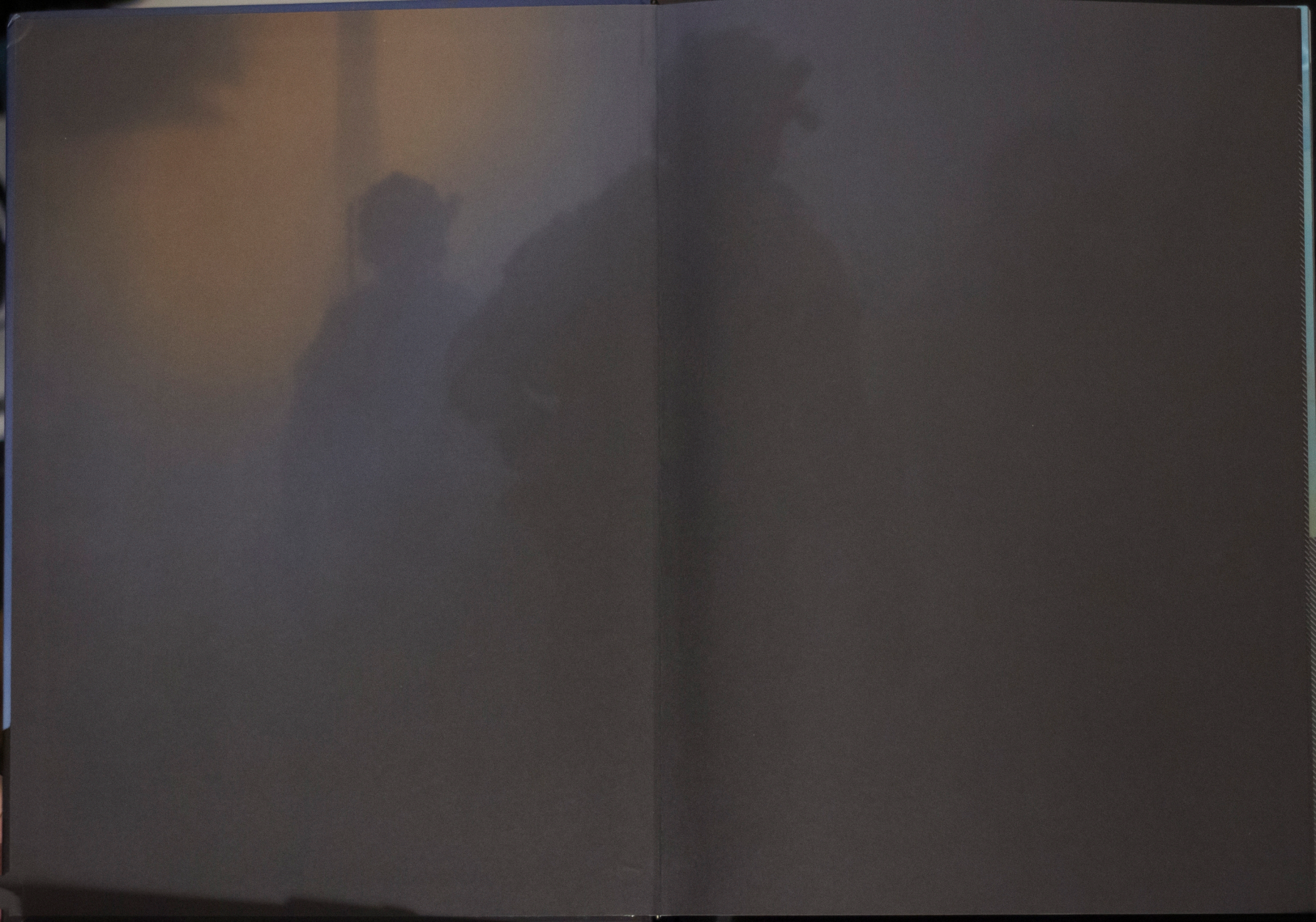



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MAKING

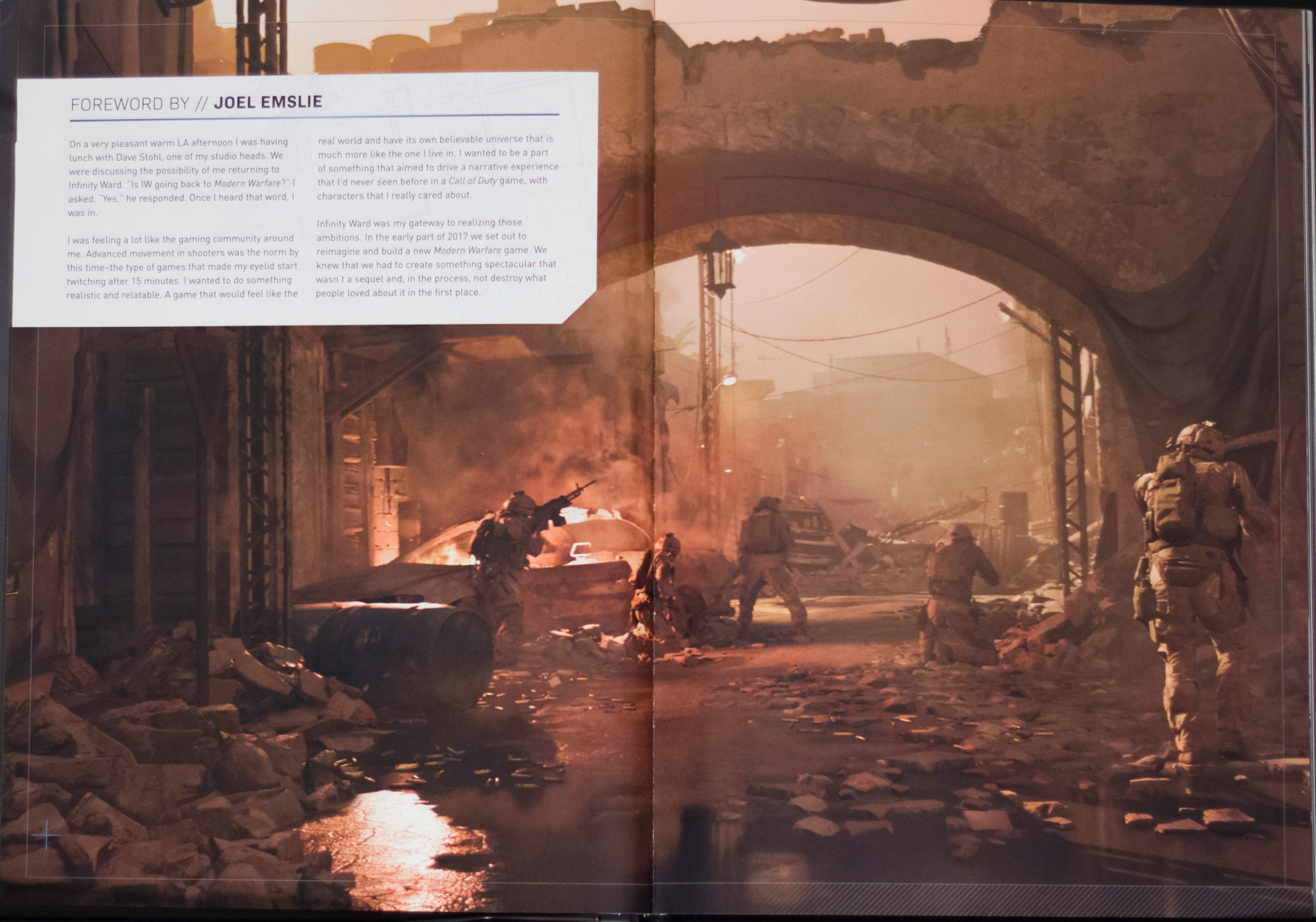
CALL OF DUTY® MODERN WARFARE®

ANDY McVITTIE
FOREWORD // **JOEL EMSLIE**



CONTENTS

FOREWORD BY JOEL EMSLIE 6
INTRODUCTION BY JOEL EMSLIE 9
CHARACTERS 10
WEAPONS 50
LOCATIONS 106
GRAPHICS 178
ACKNOWLEDGEMENTS 192

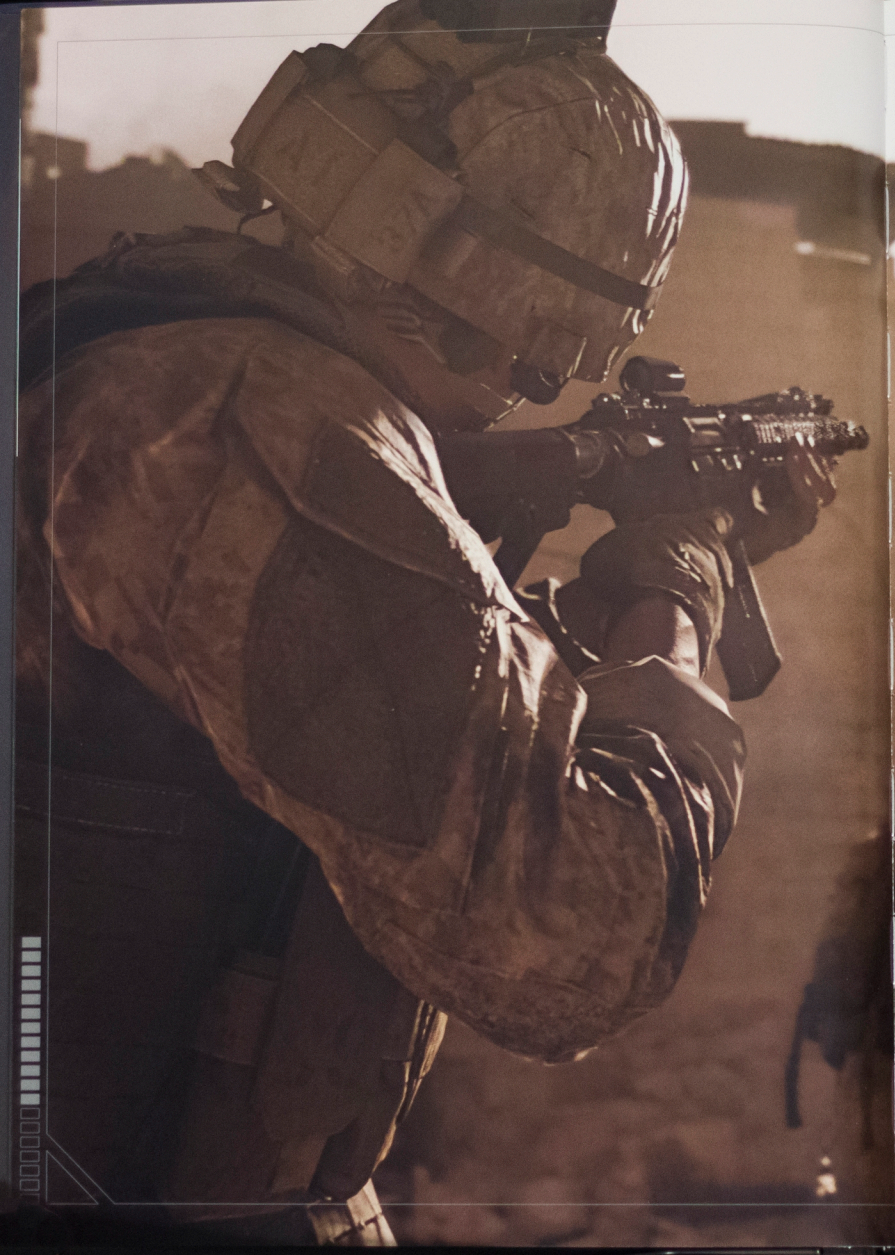


FOREWORD BY // **JOEL EMSLIE**

On a very pleasant warm LA afternoon I was having lunch with Dave Stohl, one of my studio heads. We were discussing the possibility of me returning to Infinity Ward. "Is IW going back to *Modern Warfare*?" I asked. "Yes," he responded. Once I heard that word, I was in.

I was feeling a lot like the gaming community around me. Advanced movement in shooters was the norm by this time–the type of games that made my eyelid start twitching after 15 minutes. I wanted to do something realistic and relatable. A game that would feel like the real world and have its own believable universe that is much more like the one I live in. I wanted to be a part of something that aimed to drive a narrative experience that I'd never seen before in a *Call of Duty* game, with characters that I really cared about.

Infinity Ward was my gateway to realizing those ambitions. In the early part of 2017 we set out to reimagine and build a new *Modern Warfare* game. We knew that we had to create something spectacular that wasn't a sequel and, in the process, not destroy what people loved about it in the first place.



INTRODUCTION

It's hard to believe, but in all the years that various *Call of Duty* games have been in development there was never a 'making-of' or 'art book' published. Not like the one you are holding in your hands, at least. I think there have been a few CD case-sized booklets before, but nothing like this.

I worked at Infinity Ward for nearly six years, and was a part of *Call of Duty 2*, *Call of Duty 4: Modern Warfare*, and *Call of Duty: Modern Warfare 2*, before leaving for seven years to work on other projects. When I returned to IW to start working on a new *Modern Warfare*, I made a deal with myself: Do as much as I can in different ways and with new techniques, and take on challenges that seem impossible. Make this game a tour de force on every level.

This book represents something that has never been done with a *Call of Duty* game at this scope and scale. The game itself is without doubt the largest and most ambitious that Infinity Ward has ever created, and the same goes for me too. It absolutely deserved a making-of book!

I've experienced countless moments during our development where I found myself completely blown away by the raw talent surrounding me. What you are about to read is a collection of various parts that make *Modern Warfare* what it is. We did our absolute best to include as much as we could so that you could get a better idea of what goes into developing a game like this. From the entire studio at Infinity Ward and our partners, we truly hope you enjoy this book and also the game.



CHARACTERS

WE BEGIN WITH THE dramatis personae of *Modern Warfare*; fair, foul and those whose motivations remain uncertain. To tell the story we wanted to tell we set out to create the most realistic and interesting characters *Call of Duty* has ever seen.

CHARACTERS // **PRICE**

A familiar face, if not always a friendly one, Captain John Price–call sign 'Bravo Six'–has survived with tales to tell of previous skirmishes and a sardonic wit that is borne of the battlefield.

Ever the man to have at your side in a firefight, *Modern Warfare* finds Price embroiled in a wholly new campaign that will span the world, multiple storylines and vividly contemporary scenarios. *Modern Warfare* is not a sequel, as such. It's a brand new game with a new story, and it's set in a *Modern Warfare* universe that is relevant to today.

Bringing this increasingly grizzled commander up to date posed a key challenge during development of the game. We wanted to create a new Captain Price but didn't want to destroy the things that everyone loved about the original character, which is not an easy thing to do.

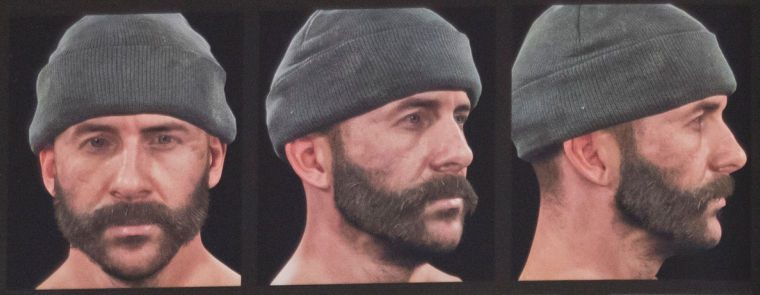
Below: We explored different types of looks for Captain Price knowing that we were eventually going to cast a flesh and blood actor to play him, although the work on his costumes began almost immediately. The game's narrative underwent many revisions during development, but this urban tactical outfit was one that survived the revision process.





Below: During preproduction we had an opportunity to photograph actor Barry Sloane as Price. We've been working with the character for nearly a decade, but this was the first time we would be able to walk up to him and shake his hand in person. As geeky game developers we were star-struck!





"We get dirty and the world stays clean... That's the mission. You got second thoughts, I'll do this alone."

Captain John Price

Thanks to the possibilities afforded by advanced technology and, for the first time, a real actor both voicing and portraying Captain John Price, *Modern Warfare* promises not only a thrillingly realistic campaign, but a remarkable depiction of the many players within. As one of the key non-playable characters, Price is seen in many guises within the game–some suited to the trials of combat, others designed to survive specific conditions or for him to blend in with the general population.

With his trademark facial hair–*above*–Price is beginning to look like the character as we have come to know him. Seen *below*, a selection of more recognizable military fatigues. His presentation has to be authentic at all times. However, it was important to us that our characters have different costumes throughout the game–as they travel to different regions their clothing fits the environment.



Right: Seen here in civilian garb, Price intends to pass unnoticed. Part of the story has Price undercover in St. Petersburg. We needed to design a costume that would look rugged but not look too militaristic. These clothing assets are often completed earlier than the in-game assets, so they are a great way to develop looks early on for the game.



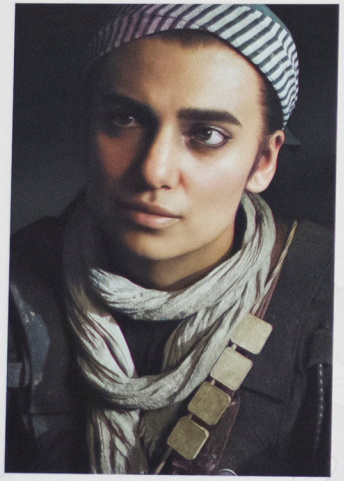
CHARACTERS // **FARAH**

Rebel fighter Farah is new to the *Modern Warfare* universe. She is nevertheless afforded the same attention to detail required not only to illustrate her within the game, but also to make her move and behave convincingly. As with Captain Price, Farah is modeled on a real person–the actress Claudia Doumit. With her performance and the development of her personality, clothing and backstory, Farah became a worthy protagonist in the game.

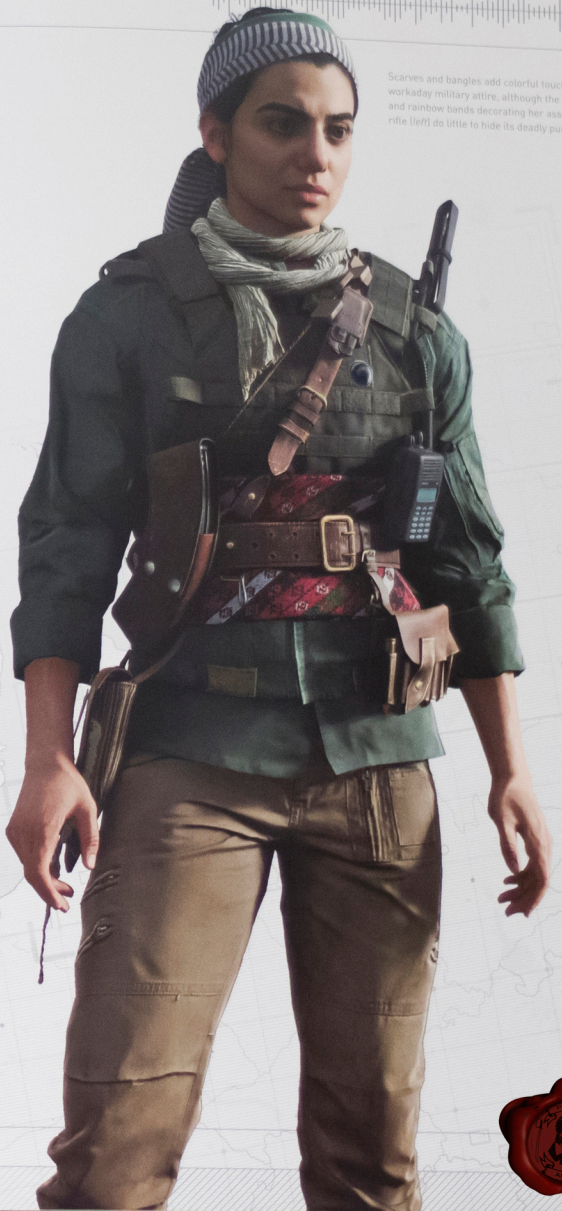
Seen directly *below*, Farah with a choice headwraps and hairstyles befitting of her personality. *Further down*, these annotated artworks reveal something of the lengths that designers went to in bringing Farah to life. Her clothes, posture and even her skeletal structure are taken into consideration and then refined as necessary. None of which is quick or especially easy to do. The process of developing a character like Farah takes a lot of time. We will often design, model and texture the art to see how it looks in the game and then go back afterwards and make a redesign pass like this one. This is an example of the types of shorthand notes we use to communicate visual ideas to each other in the art department.









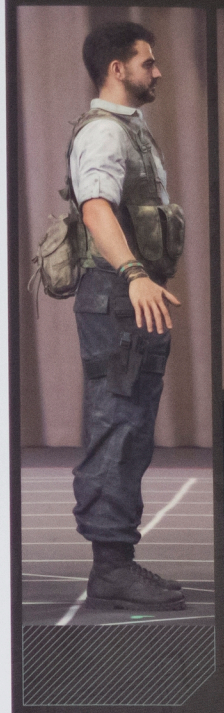


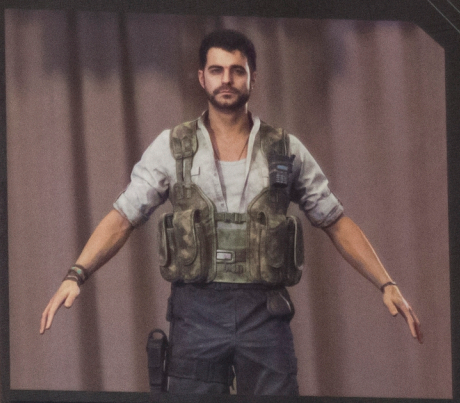
Scarves and bangles add colorful touches to workaday military attire, although the beads and rainbow bands decorating her assault rifle (*left*) do little to hide its deadly purpose.

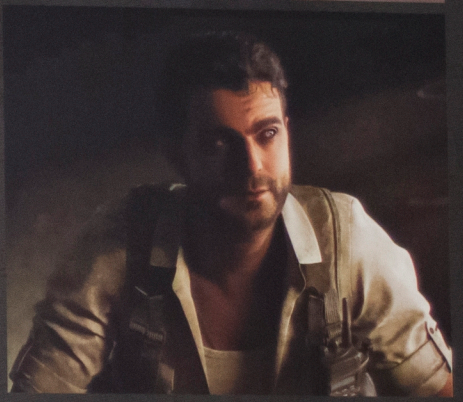


"You think we do this shit with sticks and stones? The enemy only understands violence... So I show them violence..."

Hadir Karim







Above: As one of the major players in *Modern Warfare*, Hadir Karim is also modeled on the performance of an actor. Aidan Bristow brings much character to the role.

CHARACTERS // **HADIR**

Many characters have vital roles to play in the *Modern Warfare* narrative. Farah Karim is significant among them, but her brother Hadir is equally motivated to fight for the freedom of his country.

Born into a middle-class family, he and his sister were able to mount a spirited defense when the Russian Army stormed their country. Neither was able to prevent the loss of their father, though; a matter which haunts Hadir to the present day.

Hadir was forced to grow up quickly, becoming a determined and fearless commander in the guerrilla rebels led by his sister, where he also flourishes as a cunning and uncompromising combatant. Both he and his sister share the same goal–nothing less than liberty and the complete expulsion of the occupying Russian forces–although the two differ in terms of their preferred tactics. Hadir favors direct action, with the invaders expelled by any means necessary. He is thus a danger to the plans of the rogue Russian commander, General Roman Barkov.

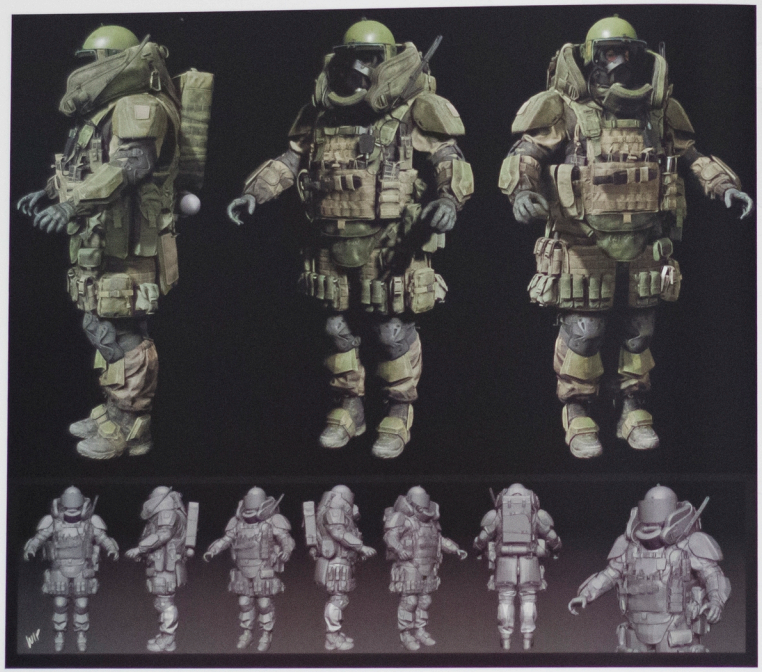
CHARACTERS // **JUGGERNAUT**

Opposite: It's always interesting to see how ideas develop over the lifetime of a videogame series. This early concept for the new Juggernaut was deemed to look too sophisticated and futuristic, so was not used in the final cut.

Not so much fully-fledged characters as inscrutable and worryingly unstoppable *entities*. The Juggernauts didn't make an appearance until *Modern Warfare 2*, but are set to make lives difficult all over again for players this outing.

Heavily armed and substantially armoured, these behemoths are not concerned with taking cover during a firefight. Close quarter assaults are their *modus operandi* and, if anything, they're even deadlier this time around.

We designed the original character 10 years ago and it was time for a refresh. The original suit was just supposed to be a big bullet sponge. This time we wanted to give the character the ability to be more flexible from the waist up, so it could make more agile movements with its upper body and weapon. The goal was to make it hard for it to travel, but not to aim and shoot things.









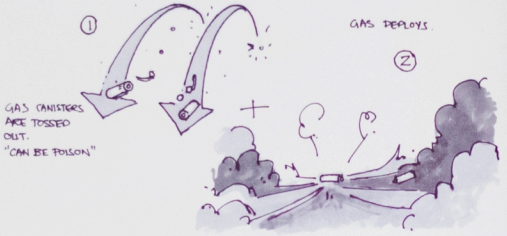


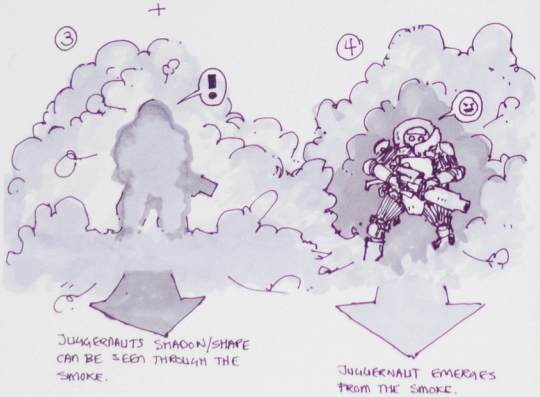
More depictions of the fearsome Juggernaut, this time kit-bashed and realistically painted. Creating a physical model for a digital videogame might seem like a quirky and wantonly laborious solution, although it's quite easy to imagine its use as a tool to instigate conversation and visualization during development. It looks fantastic too, of course.

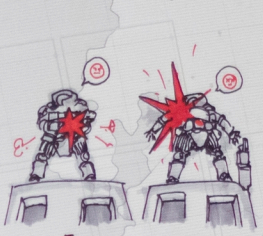
This is a 1:6 scale maquette created for the final look of the Juggernaut. It is influenced by the concepts we created for the character initially. We used various parts of gear to achieve a new look but also made the design relatable and contemporary. Many discussions took place with the animation department about how the Juggernaut should move. This resulted in visual design changes.

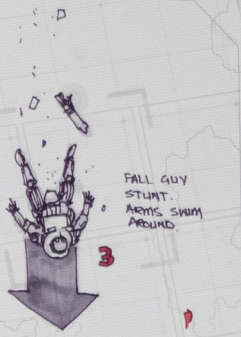


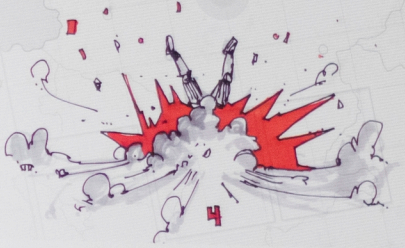
These sketches describe how Juggernauts could be introduced into the game. They are supposed to be wearing biosuits–poison gas is deployed and the Juggernaut enters the arena, guns blazing. What a way to make an entrance!







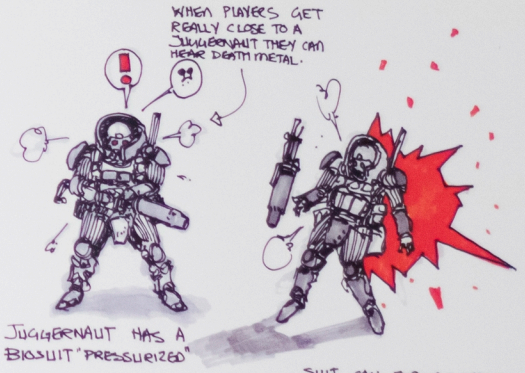


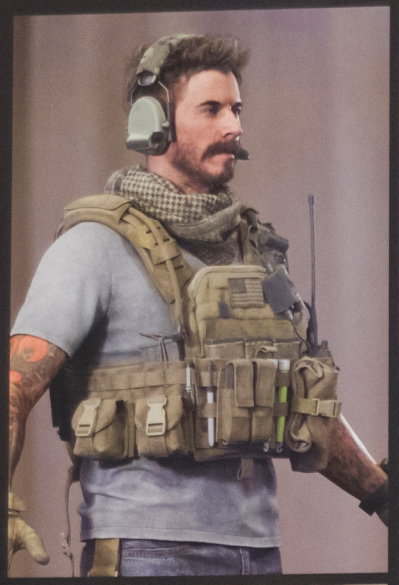


"We have to reach Echo fast. They've got a lot of hell headed their way."

Captain John Price

These speedy renderings illustrate Juggernaut behaviors when the player shoots them. Since the suit is supposed to be pressurized we thought it would be fun to have them explode or expel gas when they are shot.



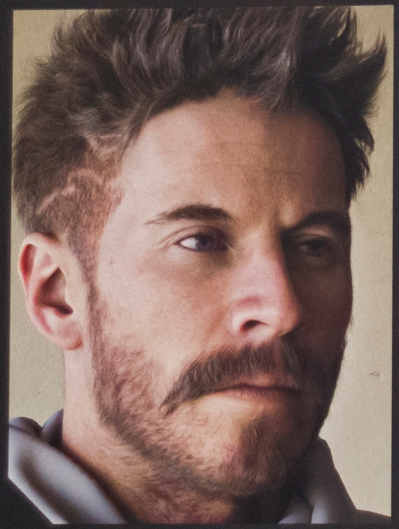


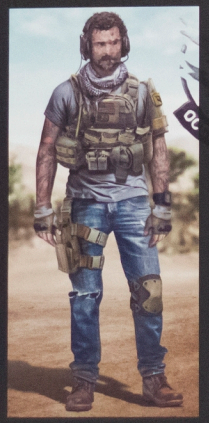


CHARACTERS // **ALEX**

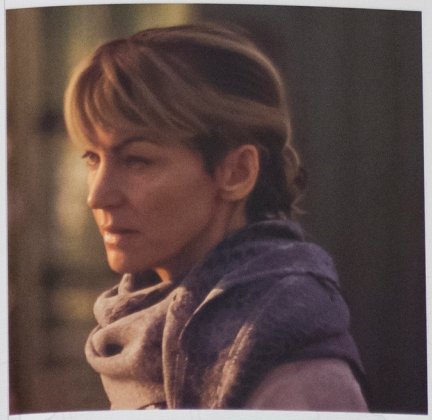
Covert ops specialist, Alex, prefers technology, human intel and remote surveillance to the traditional tools of the battlefield. An officer of the Special Activities Division (SAD) of the CIA, Alex goes where other forces are officially barred from participation.

The character of Alex was designed to fit into Farah's squad from the very beginning. He needed to look a bit sun-bleached, rugged, and still have the look of a Tier One operator. One of the challenges we faced was his facial hair. We had to be careful to not make him look too similar to Captain Price, so the two wouldn't get confused.





Casually attired and coolly postured, Alex is not a conventional operative but do not take his easy-going demeanor for a lack of combat ability. Alex is played by the actor Chad Michael Collins.



CHARACTERS // **LASWELL**

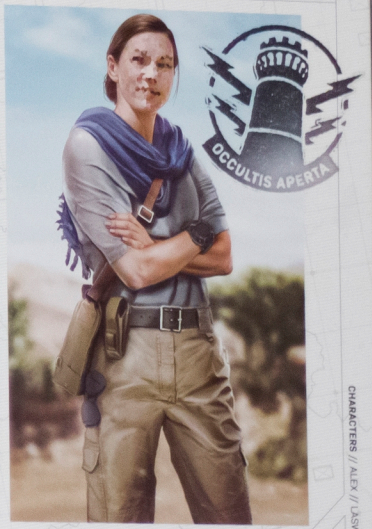
Kate Laswell has played a key role in the ongoing war on terror, her expertise being communications and strategic intelligence. Ambitious, assiduous and often divisive in her strident opinions, her actions have nevertheless helped to subvert enemy activities and save thousands of lives.

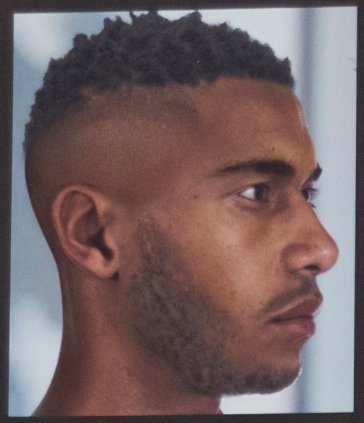
Laswell was a very different character for us to design. She needed to be tough, but not come off like a soldier–and definitely not look like someone who has a desk job. We kicked around a few ideas and went with a mix between archaeologist and adventurer. The actress Rya Kihlstedt brings a lot to the role too.



"Tracking multiple Russian forces headed your way. Sit tight–We're pushing to you for fast exfil–Watcher out."

Kate Laswell





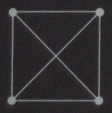
CHARACTERS // **KYLE**

Kyle Garrick, a veteran of multiple campaigns in the British Army, is currently a sergeant in Counter Terrorism Command (CTC), a Specialist Operations branch within London's Metropolitan Police Service. Operations at home and abroad have brought him distinctions, although he is known to value mental fortitude over physical prowess and he takes pride in his ability to withstand many hours of rigorous interrogation.

A skilled and adaptable soldier, Kyle possesses weapons expertise, surveillance skills and a tactical nous. He understands the collateral costs of fulfilling mission objectives, and he is propelled into the narrative after witnessing the horrific events of the Piccadilly mission.

"They sent us in half-arsed, so everyone can keep pretending we're not at war."

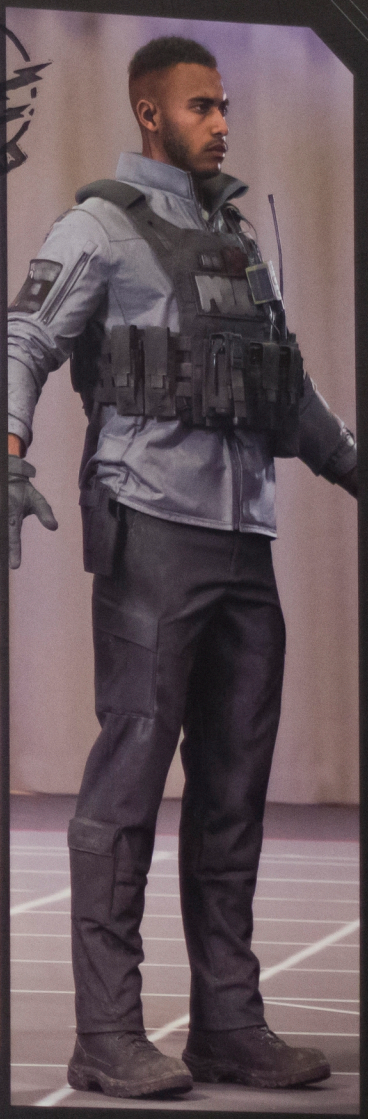
Kyle Garrick

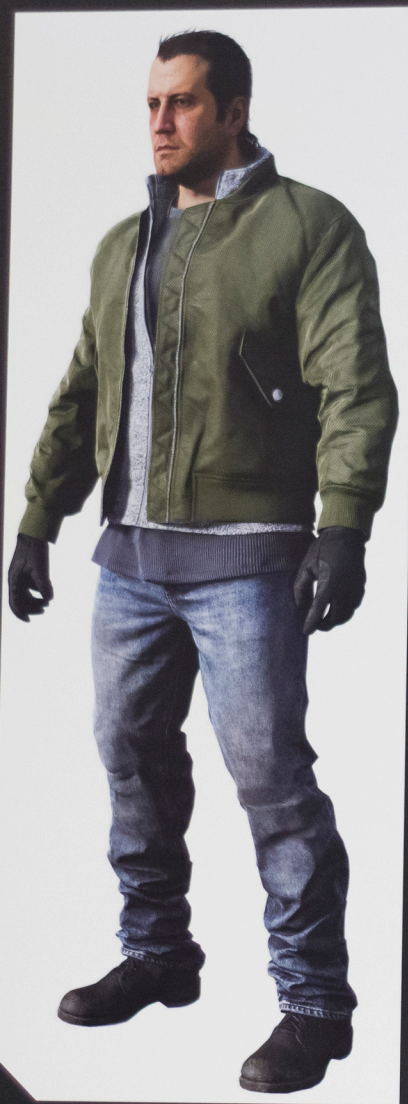


Kyle Garrick is a professional soldier, having been awarded for his service in both the UK and abroad. Seen here in a selection of apparel, his stern expression attests to the sights witnessed on the streets and battlefields. He is played by actor Elliot Knight.









CHARACTERS // **NIKOLAI**

Veterans of the *Modern Warfare* series might recognize Nikolai from the very first iteration of the game. Now more fully realized as a character, his confident swagger and streetwise apparel hint at his function as the 'fixer' in the St. Petersburg mission.

What he's able to fix within this iteration of the *Modern Warfare* series remains for players to discover. His wares, however, are crucial to the events that unfold in Russia's second-largest city. He is played by the actor Stefan Kapičić.

This is the logo of a fictional football team that we created for Nikolai's costume. It's a great way to make the character stand out.



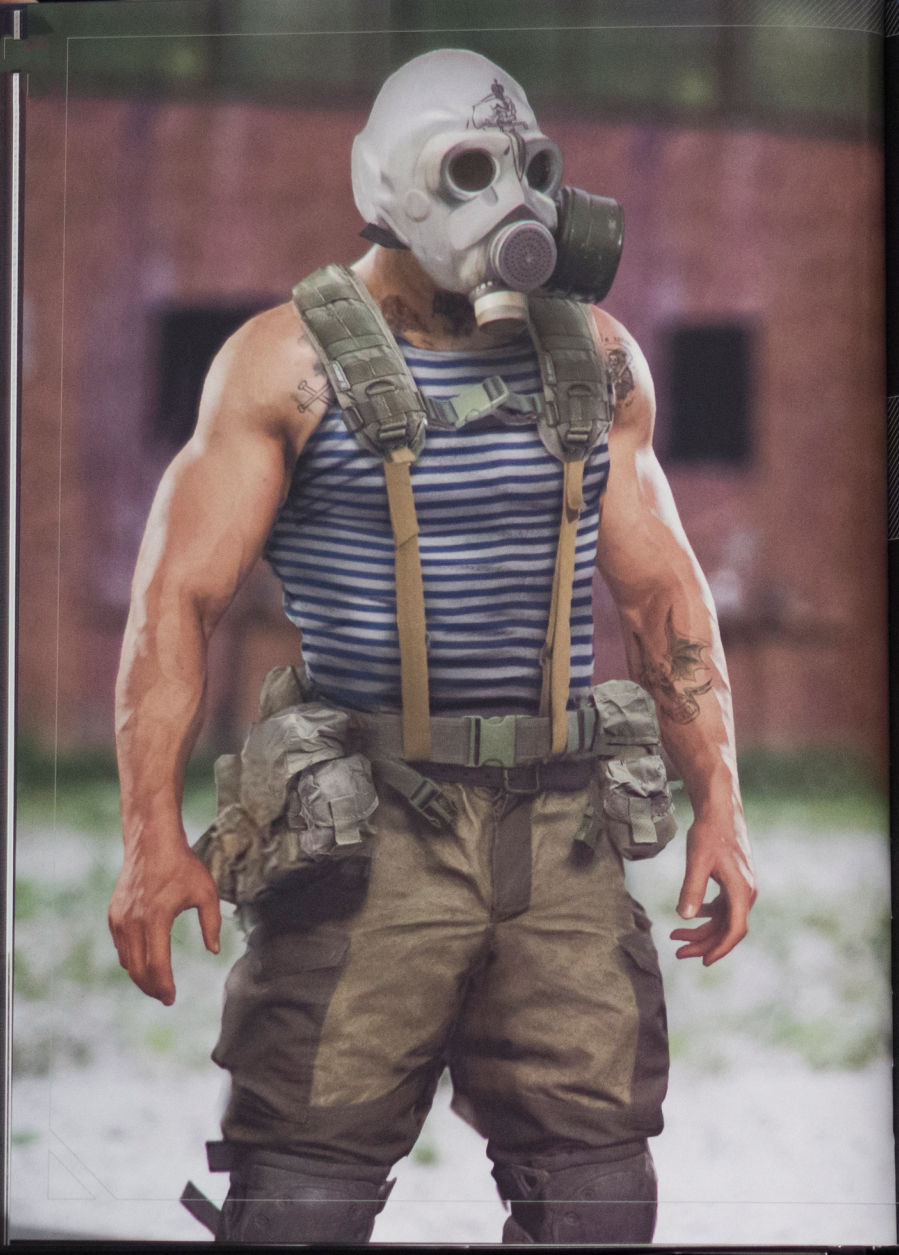


CHARACTERS // **BUTCHER**

A brutal enforcer and second in command to Al-Qatala's leader, the Wolf, the Butcher has a manner befitting his title and the physical stature to back it up–a pistol and knife to hand when all else fails. The use of the actor Nick Tarabay to help visualize the Butcher character led to a minor change in his appearance. Once this character was cast we tried to think of ways to make him stand out in a crowd of his cronies. The glasses were an attempt to give him a visual tell, but ended up not being needed in the final game.







CHARACTERS // **RUSSIAN BEAST**

Lightly armored, but dreadful in every other respect, the Beast is truly the stuff of nightmares. His eyeless, unblinking gaze only adds to his ominous presence. However, this character was actually modeled on a real actor.

When we first planned the moment in the 'Hometown' level, where the story puts two children in a fight for their lives against a soldier invading their home, we wanted to make the soldier as memorable as possible. The concept of the fight was almost like fighting the Minotaur in the Labyrinth from the Greek myth. It seemed wild at the time, but we went with a huge character and dubbed him the Beast. The artist who created the model, Donovan Keele, also happens to be a competitive bodybuilder. So we scanned him and he became the Beast.

"I will never allow crooks and thieves to terrorize my homeland... There can be no peace without law and order."
General Roman Barkov



Below: A fearful symmetry from every angle, these images depict the Beast's modest loadout. The gasmask might impede his vision, but this combatant is sure to prove a substantial challenge.

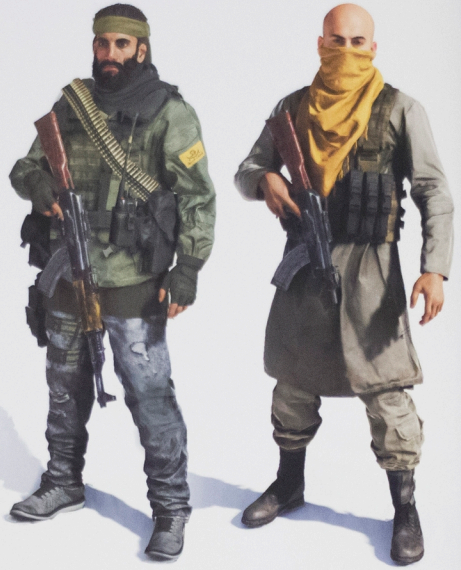


CHARACTERS // **AL QATALA**

The soldiers of Al Qatala fight for the freedom of their homeland, and think nothing of employing the most savage tactics against those who would seek to oppress them.

As the chief bogeymen in the game, these guys proliferate in all manner of guises. Flashes of color help to identify them on arid desert battlefields, but they are harder to spot on the streets when they are wearing civilian clothing.

Al Qatala is the primary enemy force. The design challenge was to make them feel believable and be recognizable to players in the middle of a firefight. Important details had to be considered in their design. We wanted them to be culturally diverse but still fit their regions. We had to get them to fit into many different environments and countries in the game's story.



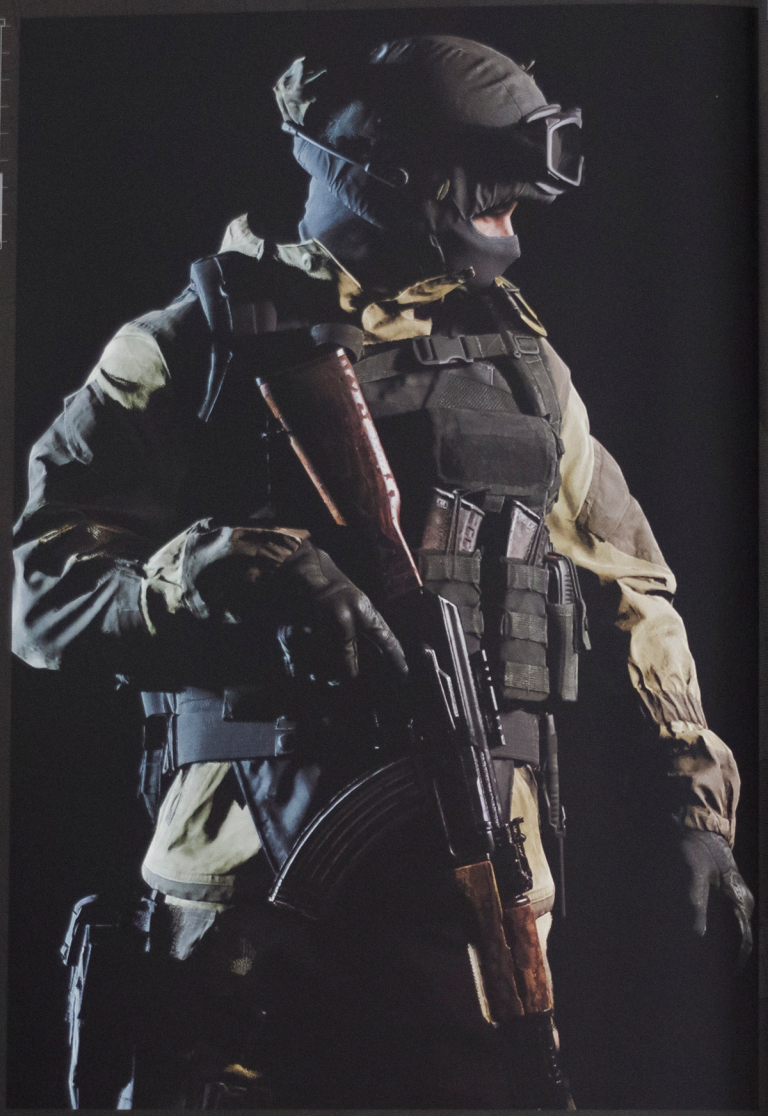
"Our war is not for faith. We fight to remove all foreign power from our soil. We fight without sorrow, we wage war without sympathy. This is the only way to die a true soldier."

Wolf, leader of Al Qatala





Dressed for covert assaults or cooler mountain environments, their armor might be non-existent but their lighter clothing probably helps them move faster on the battlefield and they are plainly equipped for the conflict in store.





CHARACTERS // **SPETSNAZ**

Under the command of rogue Russian general, Roman Barkov, these soldiers of the 'Spetsnaz' Special Forces unit are not only well equipped and appropriately dressed for battle, they're highly trained as well. All of which is going to make the task of putting them down much harder.

Once again, an impressive amount of detail has been lavished on these non-playable characters– all in the name of creating a credible gameplay experience. The character department's top priority was to create the most realistic characters possible. The design of the Spetsnaz wasn't as much of a challenge as it was to gather and build their costumes. A lot of time and effort went into collecting the right references and building practical assets that the artists would then distress, paint, and scan. The result is as photo-realistic as we could make it.

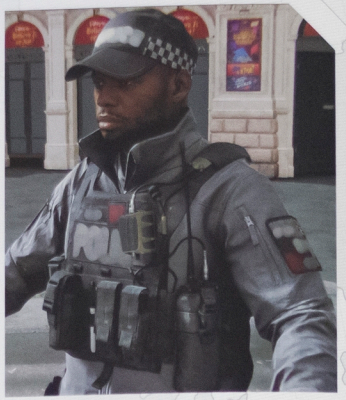




CHARACTERS // **FRIENDLIES**

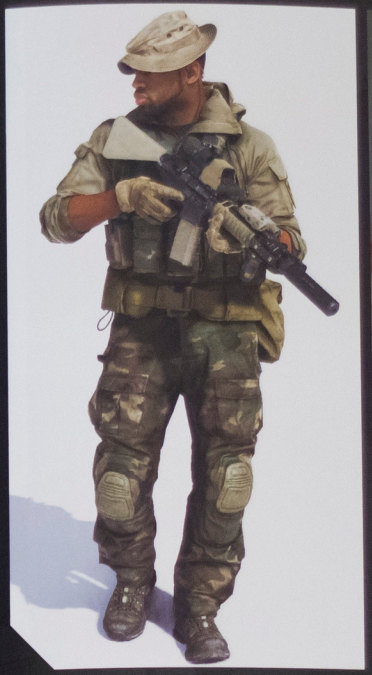
With many aggressive adversaries in the game, it's perhaps comforting to find a few characters who are not bent on your immediate demise. British police and assorted military personnel are just some of the non-playable characters encountered, all of whom are as fully realized and realistically rendered as possible.

When you raise the bar high in certain aspects of the game it requires you to meet that bar everywhere else. We had to put as much time and effort into side characters as we did our heroes in order to maintain visual continuity throughout the entire experience.



Not the everyday attire of the typical British bobby. The officers *below* and the one on the *right* look like they are dressed for trouble. And you can be sure there will be plenty of that.

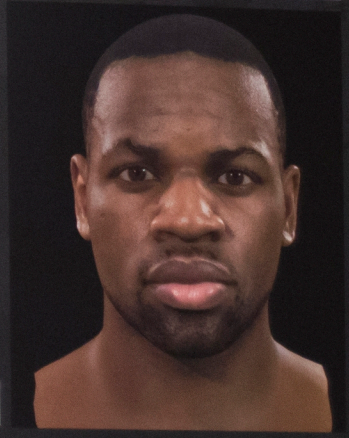






CHARACTERS // **THORNE**

Where every single non-playable character is rendered in incredible detail, it's great to learn that those you can choose in the multiplayer game–such as Thorne here–are just as photo-realistic too. *Modern Warfare*'s multiplayer experience required the creation of memorable high quality characters that players could choose to represent themselves as avatars. These are called Combat operators. These characters have to be distinctive and have different costumes and profiles for players to choose from.



With multiplayer characters having such lifelike features, combat is sure to be a vividly realistic experience.









CHARACTERS // **BALE**

The multiplayer components of *Modern Warfare* are not straightforward matches of good versus evil. Rather, opposing forces are arranged along broad geographical lines. Combat Operators exist within two primary factions in the game's universe–West and East. This is Bale, who is a Tier One Spetsnaz character that embodies a true-to-military visual quality.

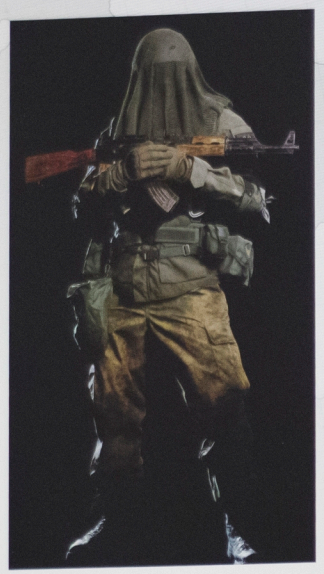
His face, hidden in a balaclava, reveals little of Bale's personality. Then again, his lethal armaments and substantial armor tell you everything you need to know.



CHARACTERS // **SYD**

Multiplayer character choices are not only limited to burly male combatants. Everything about Syd–her agile posture, loadout and focused expression–is a warning to treat her with extreme caution.

Player choice in our Combat Operators lineup is important. A design goal was to make certain that when we introduced a female CO that they look combat effective. We did a lot of homework looking for female operatives from around the world and what they look like when they are deployed into combat zones.

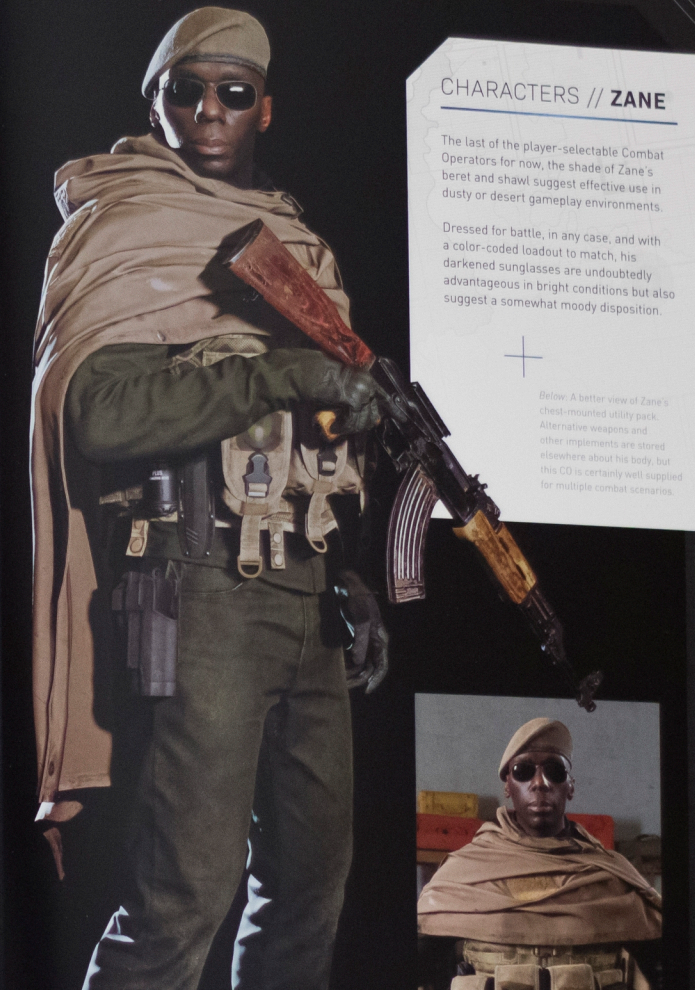


CHARACTERS // **KRUEGAR**

Camouflage is an important consideration in the field of battle. Kruegar's woven scrim headgear not only makes him harder to pinpoint in certain environments, but it also looks completely awesome. Its protective usefulness is otherwise minimal, but if you're heading into a fierce multiplayer firefight you might as well do so in style. Years ago we came across an image of a Special Forces soldier with a netted veil over his head. It was a really cool look, but at the time it wasn't possible to create the net mesh covering the head convincingly. It's amazing to see this character fully realized as the Combat Operator Kruegar.



In spite of his casual posture, it's fairly safe to assume that Kruegar is no slouch on the battlefield.



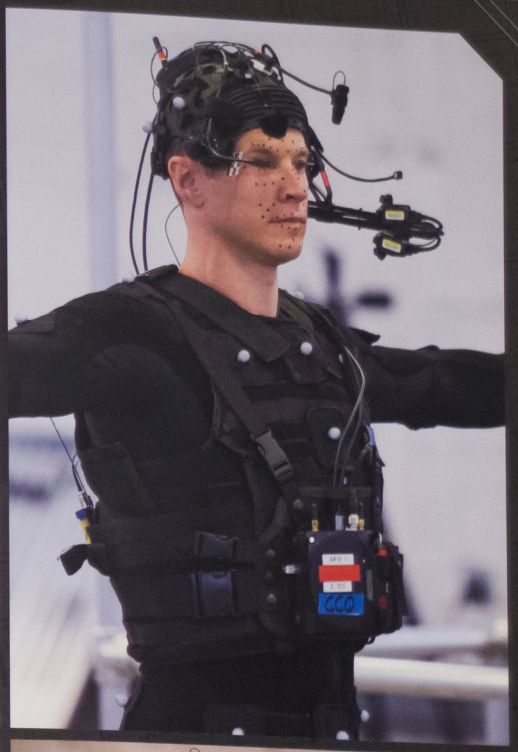
CHARACTERS // **ZANE**

The last of the player-selectable Combat Operators for now, the shade of Zane's beret and shawl suggest effective use in dusty or desert gameplay environments.

Dressed for battle, in any case, and with a color-coded loadout to match, his darkened sunglasses are undoubtedly advantageous in bright conditions but also suggest a somewhat moody disposition.

Below: A better view of Zane's chest-mounted utility pack. Alternative weapons and other implements are stored elsewhere about his body, but this CO is certainly well supplied for multiple combat scenarios.







CHARACTERS // **PERFORMANCE CAPTURE**

Real actors have been used to portray many of the characters in *Modern Warfare*, their performances recorded and brought into the game using a process called 'performance capture'– or 'p-cap' for short. This complex procedure has been in development for many years. In summary, reference markers are placed about an actor's body and/or face–the dots and balls in these pictures. The scene is then filmed digitally, as directed, with smaller cameras and microphones worn about the head to monitor facial and character movements, and vocal performances at the same time. The position and motion of the markers are tracked as the actor moves, and this data is later matched to the digital model of the character. That's a dramatically short and basic overview, but fluid and unerringly natural animation is produced as a result. Combined with photorealistic visuals, the characters in the game are brought to life like never before.

The following pages show various scenes from the performance capture studio, but we begin with a group shot to get the ball rolling. Left to right we have Chad Michael Collins (Alex), Claudia Doumit (Farah Karim), Barry Sloane (Captain John Price) and Elliot Knight (Kyle Garrick)–the main players in the game. While shooting performance capture scenes on stage, body motion, facial movements, and audio is simultaneously recorded. This helps create authentic performances with nuanced emotions, allowing the actors to be inspired by, and play off of each others' performances.

Top: Chad Michael Collins 'T-poses' to initialize the skeleton on his model before capturing a sequence. *Above:* Elliot Knight rehearses his blocking for a scene. When shooting scenes on the p-cap stage, rudimentary sets are built for actors to have 'touch points'. This creates a grounded performance with characters that organically interact with the CG environment.





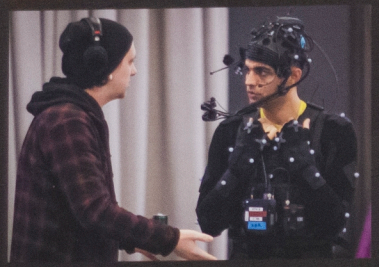




The process of performance capture begins in earnest, and we get a closer look at the markers that track an actor's movements. It is also interesting to note the amount of equipment that they need to wield–not least the ersatz rifle, but also the power packs and technical gadgetry that is worn about the body and head. All of which makes it even more impressive that the actors were able to turn in a performance at the same time. Clockwise from the left: The tiny dots track the actor's facial expressions and help the animation team to accurately capture his performance. This data is then applied to the CG character model, which is created from a 1:1 scan of the actor. This renders a naturalistic execution of the scene.

Top of the page: Reference cameras provide the narrative editorial department the raw performances from a scene. These reference angles are cut together to form a road map of the scene before it goes to animation. Middle: Shoulder-mounted cameras capture the cast performance in order to ground the scene and respond to the actors' movements in real-time. Right: Claudia Doumit stares intently as she performs a scene.





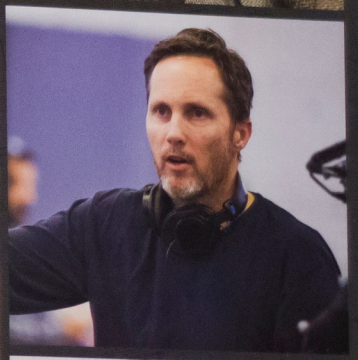


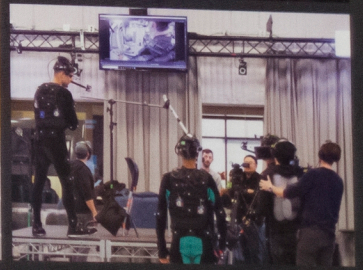
Finally, we have a selection of scenes from both sides of the cameras and we get a greater sense of the complexity involved in putting a performance capture scene together–also some of the unlikely shortcuts entailed.

Clockwise from top left: The p-cap crew at their stations, as the rest of the team prepares the shoot. It takes a group of 25 people to capture a scene. p-cap and facial technicians, sound engineers, camera operators, and makeup artists work together seamlessly to bring performances to life. *Above right:* A little down time in the Green Room. *Left to right*–Producer Graham Hagmaier and Studio Narrative Director Taylor Kurosaki prepare scripts, as several cast members wait for the next shot. *Middle left:* Taylor Kurosaki gives the cast a little script insight before shooting commences. *Lower right:* The cast rehearses a scene while the crew watches through the virtual camera. This enables them to view the character models in real-time, and in turn allows them to react to discoveries the actors make as they rehearse. *Right:* A little of the magic is revealed, as Barry Sloane and Elliot Knight perform a scene in a haphazard vehicle assembled from speedrail and apple boxes. It will not appear in the game like that, of course!



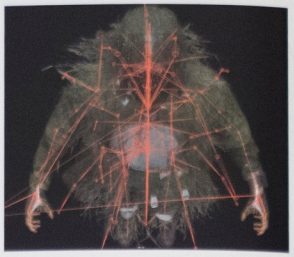






Above right: Animator Zach Volker gets into the game as he helps Claudia to prepare for her sequence. *Above Left:* Cinematographer Jeff Negus and Aidan Bristow (Hadir Karim) discuss the main elements of a scene.





CHARACTERS // **TECHNICAL RIGGING**

Rigging is the placing of a digital skeleton within our character meshes. These skeletons have a built-in logic, along with nodes that are placed on the joints of the skeleton. Using these digital handles and points, the animators can drive and pose the character like a puppet. These skeleton 'rigs' require a tremendous amount of skill and patience to build.

Modern Warfare characters are very diverse, not only in the personalities but their gear and body types as well. The rigging team was challenged early on in the project to tackle some really difficult features. The first was to allow the character department to have characters with various long coats, ponchos, and hoods. This all required finding technical solutions that simulate dynamic cloth. The characters also wear a considerable amount of gear. 'Jiggle joints' were added so that the gear flops and bounces around when the characters are in motion. Another big improvement was to get the Juggernauts to move more believably. The Juggernaut not only needed extra rigging work, but also a specific type of motion capture that could only be done with a special padded suit that simulates the character's proportions.





The skeletal 'rig' within each character allows for realistic postures and movements. The rig itself can be seen *upper left*, and the other images demonstrate the incredible potential of using this system.





WEAPONS AND TECH

THE RIGHT TOOLS TO do the job are always required, whatever the circumstances. From simple handguns to inter-continental missiles, and the myriad vehicles and equipment needed for each mission scenario, the *Modern Warfare* team set out to create the most realistic-looking weaponry and mil-spec tech possible.







WEAPONS // **SNIPER RIFLES**

Accurate and devastating in the right hands, these long-range weapons are a sharpshooter's best friend. *Modern Warfare* players will find lots of occasions to make good use of them too. Marksmanship is more important than ever in the game. For rifles such as this, wind direction, physical bullet drop, and even the caliber of bullets was considered when designing the weapon.

These rifles are fired at long-range, so the scopes on them needed to look high-powered too. An important addition that isn't noticeable here is how realistic our magnified scopes are in the game. When a player aims through our scopes the scope actually magnifies what the player is aiming at–just like a real optic.

A weapon of many parts, effective use requires a steady hand and a sturdy and preferably covert platform. A realistic scope facilitates accuracy over long distances, although environmental factors must also be taken into consideration.



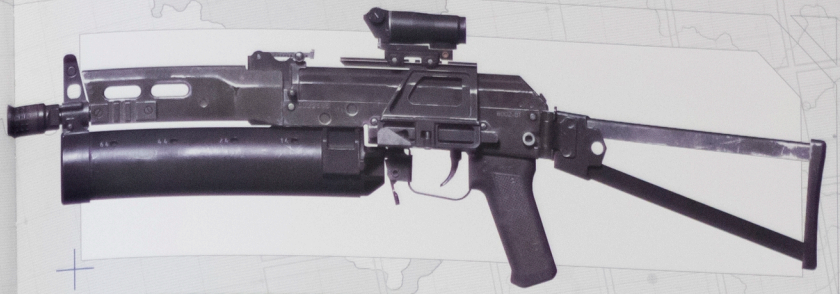




WEAPONS // **HANDGUNS**

In tight spots on the field of battle, when backed into a corner or when all other options are exhausted, a simple handgun is a very capable weapon to have at your disposal. Small and eminently portable, it copes best in close-quarters combat scenarios. For our handguns we explored different finishes, plastics and stippling to give them character. Every model we created was detailed down to the interior parts and components.

Among the many other benefits of these firearms, they also come in green or black colorways. The very thing for style-conscious combatants.





WEAPONS // **SUBMACHINE GUNS**

Realism and credibility are key components of the entire *Modern Warfare* experience, and this holds true for the weapons used in the game as much as the characters and locations visited. Seen here are concepts for variations of some submachine guns. It's always tricky to create weapons that look like custom designs, but without looking like they belong in a science fiction movie. We followed a very basic design rule–they need to look logically functional with realistic materials. A good example is that you would never make the barrel out of a plastic material.

A lightweight plastic body enhances portability, although the important parts of this SMG are made out of metal.



WEAPONS // **MODELS**

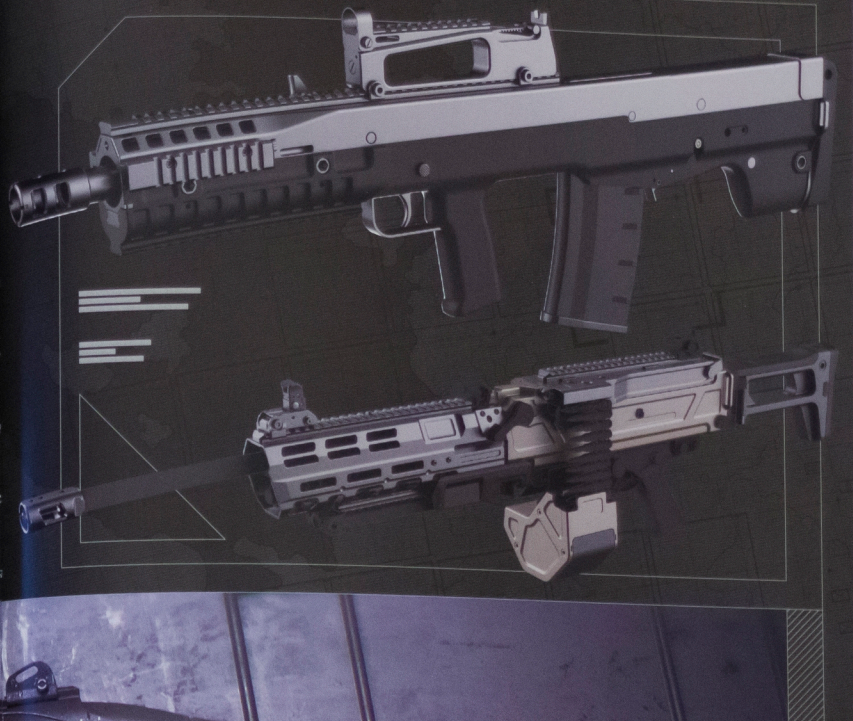
Certain combat scenarios are best suited to specific load-outs and gameplay strategies. In spite of that, and with specific reference to *Modern Warfare*'s multiplayer gameplay options, players can not only choose from a generous array of stock weaponry, but they are also able to select from a menu of components in order to build and craft their own.

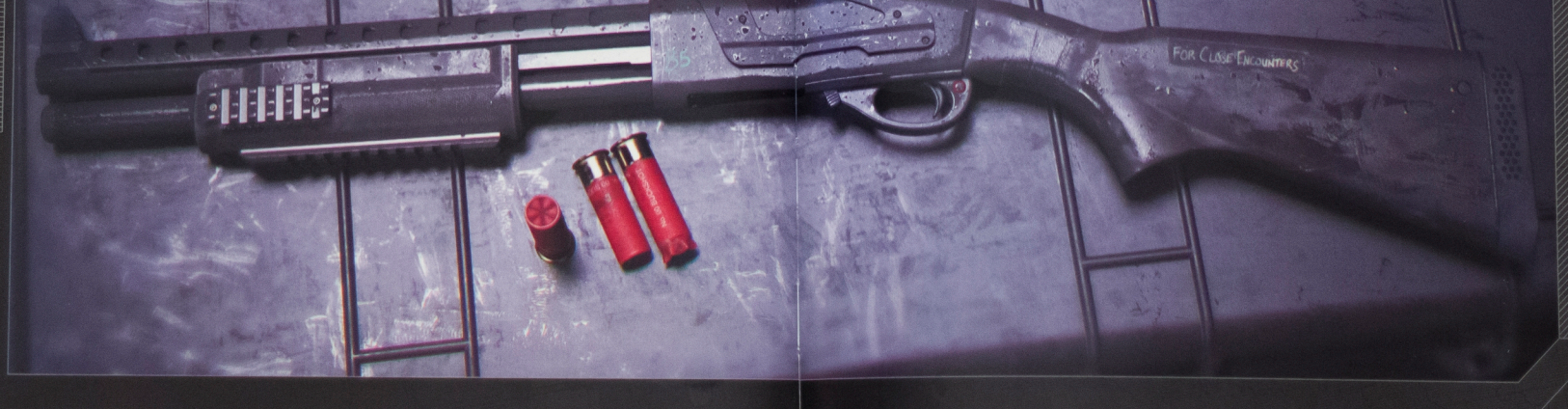
The weapons shown here are modest examples of what can be achieved with this system, and they are quite credible at the same time. More outlandish creations are also possible, as we'll soon see, but it is a luxury to have such a wealth of options. *Modern Warfare* has a vast library of firearms. The game even supports a system which allows players to customize and smith their own weapons in game. With all these possibilities comes a great deal of personality.

From bespoke shotguns to powerful personalized assault rifles. None has a specific advantage over stock weaponry, but smithing a firearm ensures a unique load-out on the battlefield.



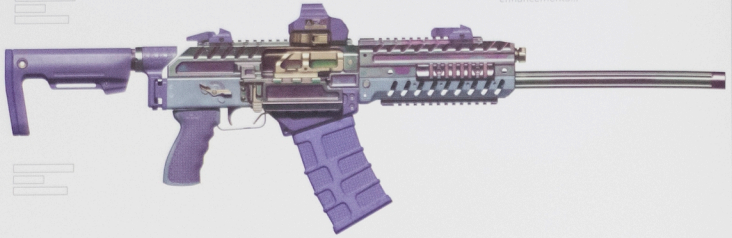
Some narrative scenarios require weapons to reflect a Special Forces unit, a faction or a particular country. Subtle details like rubber bands and gaffer tape are a great way to add a human touch to the hardware.







There is nothing wrong with any of the standard issue firearms, in that they will all perform their intended functions. If players are seeking to personalize their load-out, however, they can certainly withstand a few enhancements...









WEAPONS // **CUSTOMIZED DESIGN**

Modern Warfare boasts an entire arsenal of weapons, some better suited to particular conditions or combat situations than others– all of which is up to players to explore.

In the meantime, a range of customization options can make weapon selection a game in itself, and also allows players to tailor their experience to their own tastes. One of the first big tackles early in the project was Weapon Customization. In advance of the Weapons Department's involvement, the Concept Department experimented with hundreds of designs by assembling components together in Photoshop. Grips, rails, magazines, muzzles, scopes, skins– just about anything we could think of were available as separate pieces and assembled like building blocks. It was fast and produced a lot of interesting results.

Above: The customization options allow for some lively liveries. However, more modest designs are less likely to attract the wrong sort of attention on the battlefield.

WEAPONS // **HERITAGE**

Over the course of three previous *Modern Warfare* games, and now with a fourth, the series has established a vibrant, compelling and credible mythology. Prior knowledge is not a barrier to enjoyment, of course, but long-time fans will find nods to earlier outings peppered throughout this latest one. *Modern Warfare* has a history and, even though this game is a reimagined story and universe, we still inserted references to the previous games. This handgun has the words 'War Pig' scratched into its slide. This is referencing a mission from the original mission with a tank named 'War Pig'.

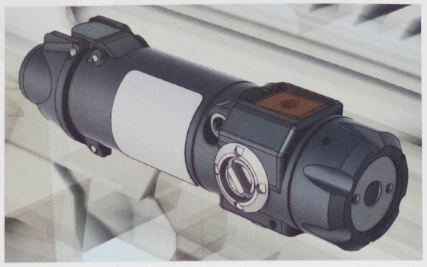




WEAPONS // **OPTIC SIGHTS**

Gaining a better view of the battlefield is not only crucial from a tactical perspective, but using the correct gun sight can make the difference between accurately targeting an adversary or missing a shot entirely.

Optics play a huge role in the game–they aren't just about looks. Different optics can have various reticles for aiming and different magnifications for better sight pictures. Every player has different likes and dislikes about optics depending on the weapon or the mission.

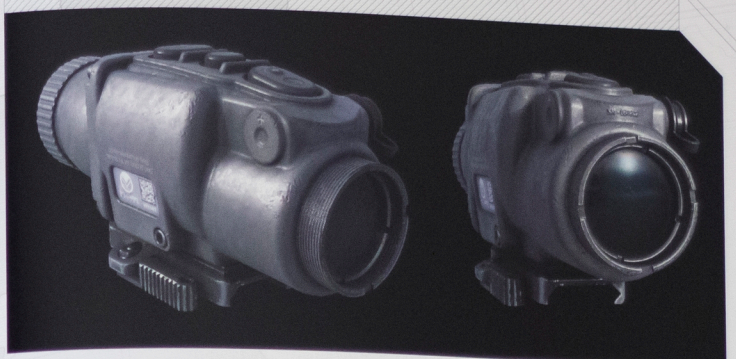




WEAPONS // **LASER SIGHTS**

Modern Warfare employs a system called 'spectral rendering', which uses real wavelengths in order to display light beyond the visible spectrum–infrared, for instance. Using this technology is complicated, although the results are certainly more realistic to the eye–as seen throughout this book.

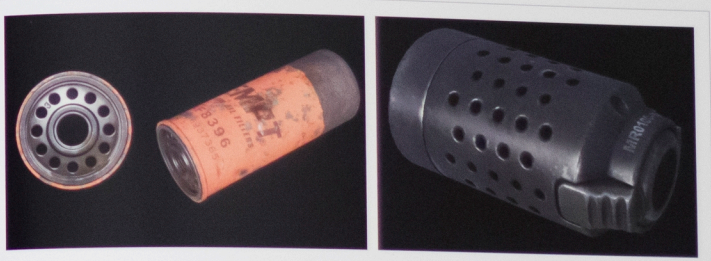
The laser sight *on the right* operates outside the range of normal eyesight, although an opponent wearing night vision goggles will immediately spot its beam. Careful use is certainly advised. Seen *below* is a tactical light that can be attached to a weapon and used to illuminated paths or targets.



WEAPONS // **THERMAL SIGHTS**

Certain objects emit heat signatures, and thus reveal themselves to this useful thermal sight. Other game developers might seek to mimic this effect, although that wouldn't quite suffice for the *Modern Warfare* team.

Our graphics engineers developed realistically accurate rendering techniques. All of the thermal scopes in the game work realistically. All the surface materials in the game allow for temperature settings. Running car engines can be set to hot to show an active vehicle, while inanimate objects can be set to cold.



WEAPONS // **MUZZLE ATTACHMENTS**

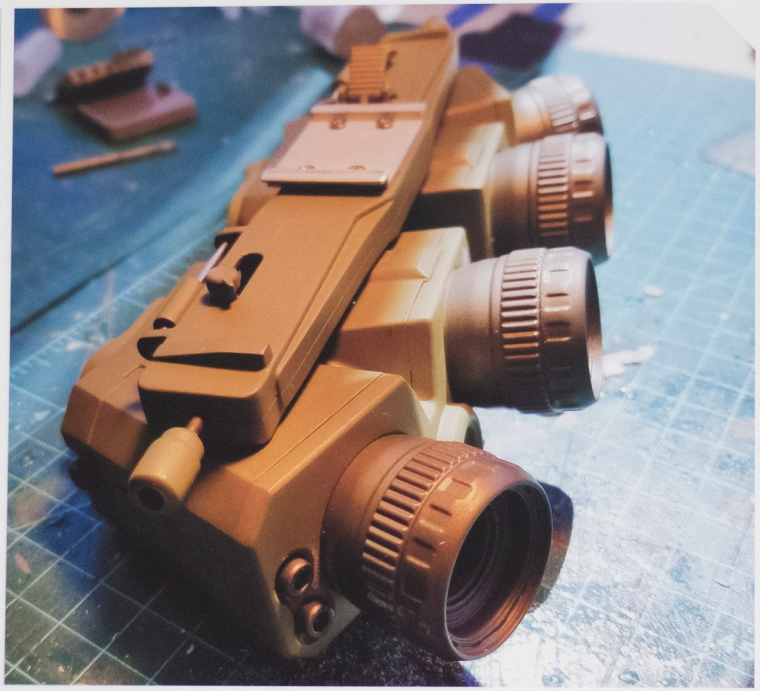
An impressive attention to even the smallest details has resulted in an unprecedented level of authenticity in the game. This extends even to the choice of gun barrel, although careful selection can enhance functionality in certain instances.

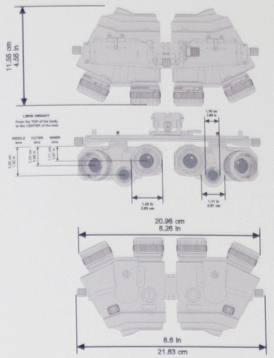
Seen on the *left*, this orange cylinder is a makeshift suppressor made from an oil filter. We did some research on this, and it actually works if done properly. On the *right*, this muzzle brake is used to expel the gas from the weapon barrel as it fires. The gun is more stable and provides less recoil as a result.

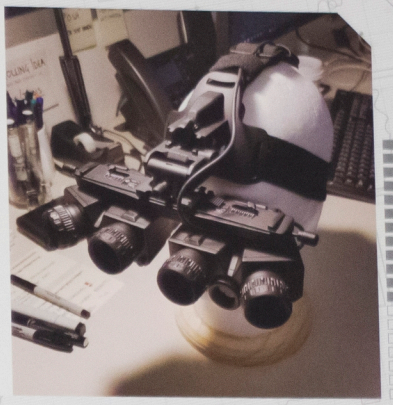


WEAPONS // **GREEN BEAM**

The Green Beam is a take on an infra-red targeting system that is commonly used by military and law-enforcement personnel. The in-game version required a few tweaks before it made the cut. Real military hardware is often designed merely to be functional, although the hardware in shooter games often has a tendency to be over-designed to point of being tacky. The trick is to aim for a design that balances *grounded* and *entertaining*. Real-world imagery was used to help sell this concept to the *Modern Warfare* team–in this case, a photo-realistic render composited in a real photo. The original photo was actually of a hand holding a flashlight.









WEAPONS // **NIGHT VISION**

Night vision goggles are a vital tool in dark or stealth missions–and they are back with spectacular enhancements in *Modern Warfare*.

The goggles come into play in a number of challenging scenarios, but those used in previous games are much different in comparison to this magnificent multi-lens system. As with much of the game, no detail has been overlooked in the design–the precise dimensions for which are provided *above*. The collector's edition of *Modern Warfare 2* was famous for its night vision goggles. They were pretty impressive for their time, but for this new collector's edition we were given the opportunity to design our NVGs from scratch. Once we were happy with the design, we not only sent them off to be built from the ground up, but also integrated them into the game to match.

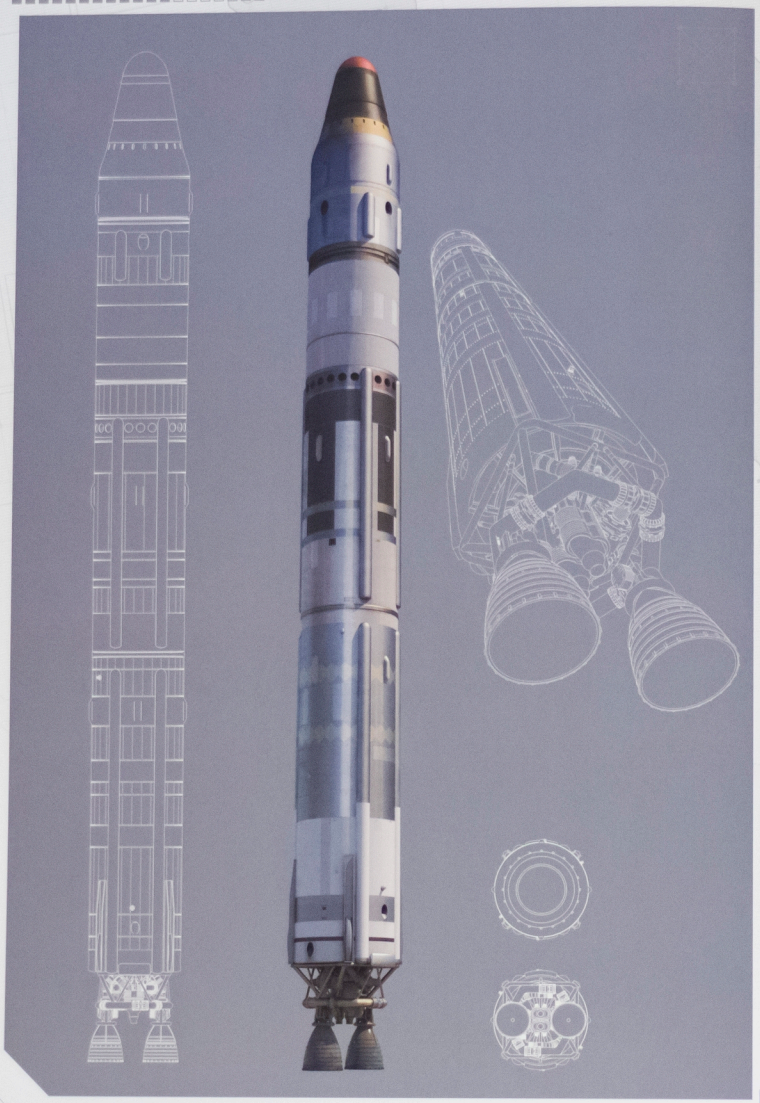
The new night vision goggles have enhanced capabilities in-game, but look absolutely incredible in reality too.



WEAPONS // **MOBILE TURRET**

Portable, stable and armored, the mobile turret is an accurate and effective addition to any arsenal. As with other weapons available in *Modern Warfare*, its design is based on a real-world item. Form follows function, as the saying goes, but in this case form follows design too. Our team requested a mobile turret that looked like it could be carried and deployed by a single soldier. The design called for a lightweight ballistic shield and a retractable tripod base. Whenever building something like this we take inspiration from military hardware to ensure that the design is believably authentic.















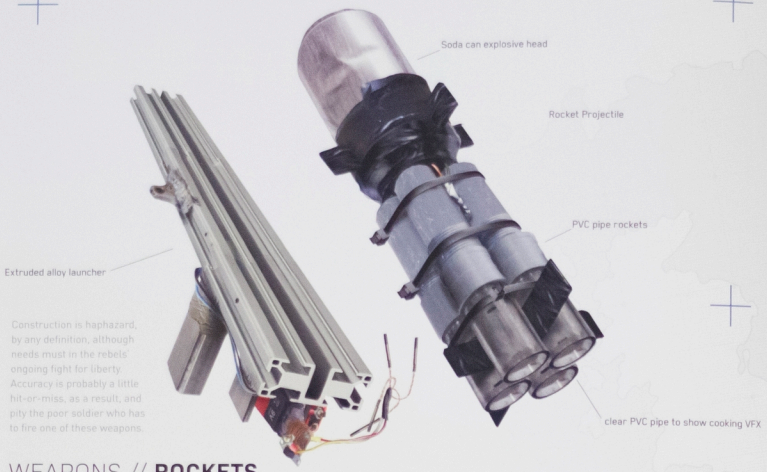


WEAPONS // **ICBM**

ICBMs are designed to reach long-distance targets, so in-game combatants are unlikely to see the source of their firing. It hardly matters, though, as the first thing to do at the sight of an incoming ICBM is to run and hide with extreme urgency!

Back in the realm of game development, the in-game ICBM is based on an actual missile. The model and a few rendered concepts were produced starting with a basic cylinder, then we built out some surface add-ons to complete its look.

Above: The nuke killstreak is a fan favorite from past *Modern Warfare* games and we knew we had to bring it back. These are designs and storyboards that the VFX team used to build the final effects passes for the moment the nuke detonates and obliterates the environment.

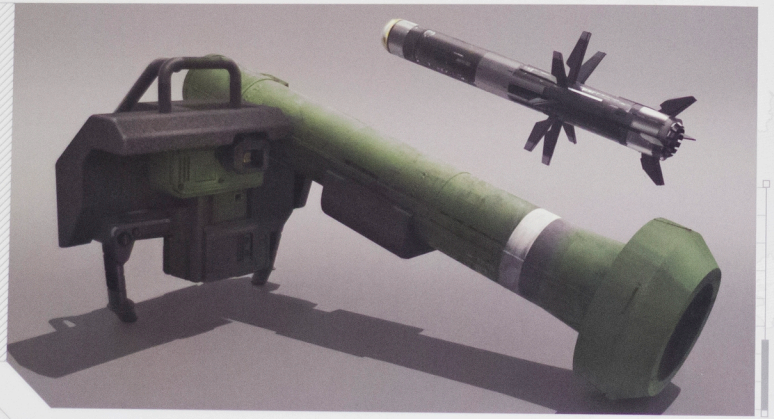


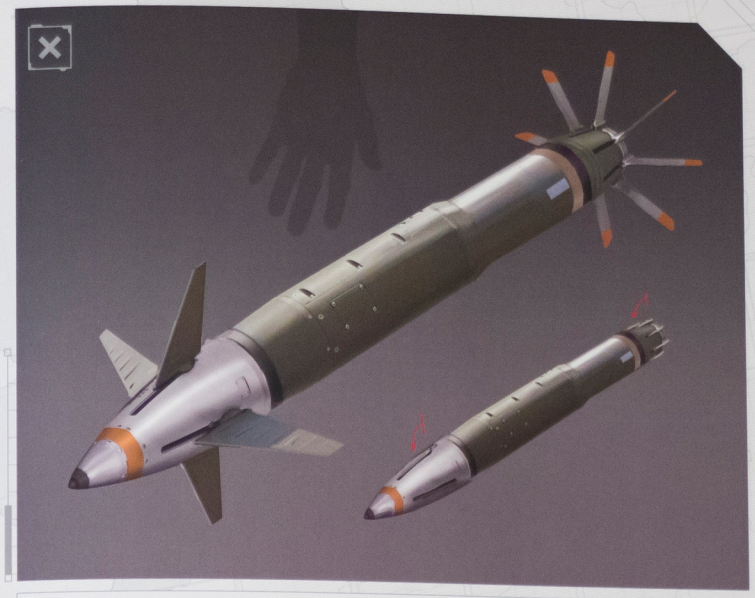
Construction is haphazard, by any definition, although needs must in the rebels' ongoing fight for liberty. Accuracy is probably a little hit-or-miss, as a result, and pity the poor soldier who has to fire one of these weapons.

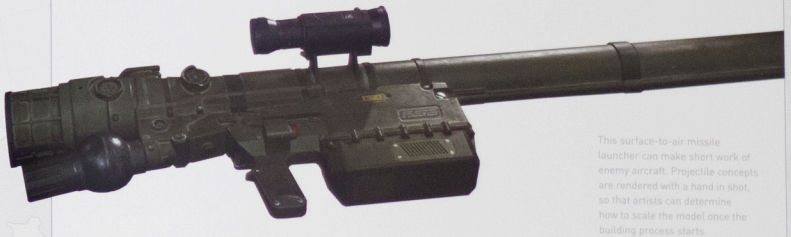
WEAPONS // **ROCKETS**

Handguns and automatic weapons are useful in a great many circumstances, but sometimes more powerful munitions are required to get the job done–particularly for distant or more heavily armored targets. This is where rockets and rocket-propelled ordnance come into their own.

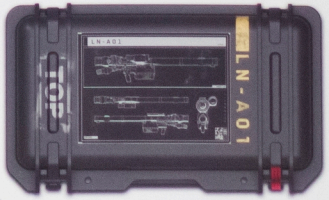
All sides make use of such weapons, although their construction can sometimes leave a little to be desired. Seen above, makeshift options employed by rebel forces, and a strip of extruded alloy stands in for a handheld rocket launcher. A rather more substantial offering below. With all the weapon choices in the multiplayer game and with mobile armor rolling around, players will need some heavy anti-armor support like this Anti-Tank platform.

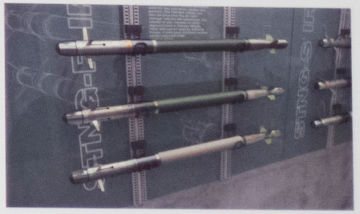






This surface-to-air missile launcher can make short work of enemy aircraft. Projectile concepts are rendered with a hand in shot, so that artists can determine how to scale the model once the building process starts.







Mortars play an important role in *Modern Warfare*. They are used by enemy forces and by the player as illumination rounds in the 'Embassy' mission.







WEAPONS // **ZULU 23**

Necessity is the mother of invention, and Urzikistani freedom fighters create weapons with what they're able to scavenge or assemble from random parts. This begins with the re-purposed anti-aircraft gun *above*, which was left behind by retreating adversaries–it is now used in a defensive capacity.

The DIY Hell Cannon launcher on the *left* is another example of rebel ingenuity. We were surprised to find that launchers like this one exist in some parts of the world.



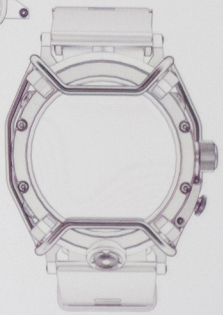
WEAPONS // **KNIVES**

As dependable as they are lethal, knives and bladed implements never run out of ammunition and they are silent in use–the perfect weapon in close-quarters encounters, then. As expected, many of the knives found in the game are based on or inspired by real-world and military-grade equipment.

Edge weapons can range from high-end tactical weapons to a simple kitchen knife–such as the one *below*, which appears in Farah's house in the 'Hometown' level. In that instance it's used by the player and the combat is viewed at close range. As such, *Modern Warfare* designers had to render the asset in two ways to support the storyline–tellingly, one view of the knife is much bloodier than the other.



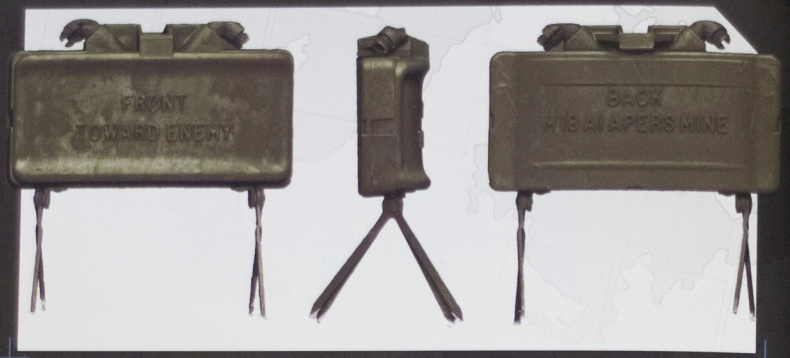




DEVICES // **WATCHES**

Military operations often require precise timing. *Modern Warfare* features a range of functional wrist-wear that the player can choose, and these rugged watches can offer a little more than their apparent functionality–which is up the player to discover.

We started with standard time pieces but things started getting imaginative and we began creating watches that did an array of cool things you can see in the final version of the game.



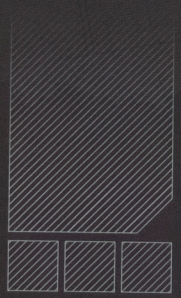




EQUIPMENT // **EXPLOSIVES**

A mine has the potential to incapacitate an adversary long after the combatant deploying it has departed the scene. Properly placed they are a threat in waiting; ripe for the moment that an unsuspecting foe walks by or steps on it. Mines come in a variety of shapes, sizes and explosive capacities, although more recent iterations also offer radio controls, anti-detection composite constructions and tripwire triggers that are barely visible to the naked eye. They offer a clear advantage if used correctly.

When it comes to equipment and devices such as these, there is always a gameplay purpose that drives them. What's important about assets like these is getting their visual language to look right. Visually these things need to tell the player how they can be used or how they are a threat.



Right: Tripwire devices are tricky to circumvent. Move slowly and cautiously to avoid triggering them–or perhaps there's a more creative solution to be found.



It pays to tread carefully at all times, although the prominent antennae on these landmines might give their positions away.









WEAPONS // **GRENADES**

Fraught combat scenarios can be brought to a swifter conclusion with a few well-aimed grenades. They are effective over close to medium ranges–as near or far as the player can throw them–and they offer a variety of useful and often quite devastating effects.

They have never been so diverse or looked so realistic either. Offhand devices like these play an important role in the game's tactical gameplay. *Modern Warfare* has several new elements in its environments that let players choose how they want to breach through doors. Different types of grenades like these give players tactical choice in *Modern Warfare's* new door-driven gameplay.

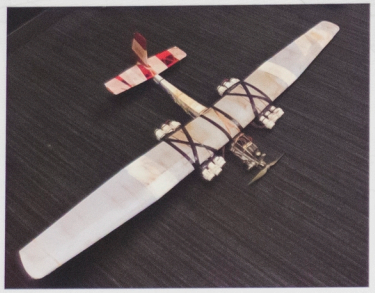
Above: A selection of thrown devices, but the flashbang grenade in the middle can temporarily stun several opponents at once. *Above right:* Frag grenades have never looked this good before. *Below right:* This 'snap shot' grenade produces a strobe effect to help detect hidden enemies. Admittedly it's a bit gamey, but sometimes you need to embrace the fun and not rationalize things too much.

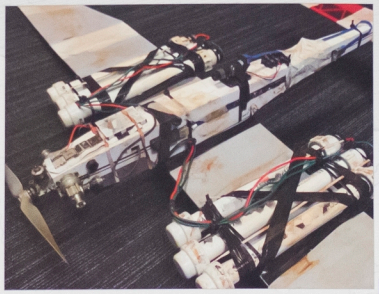












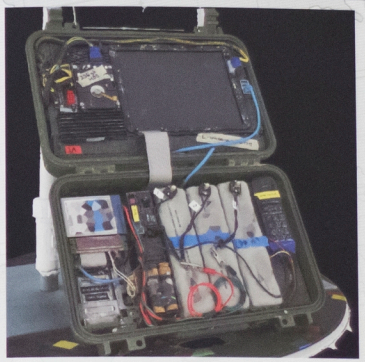
WEAPONS // **BOMBS**

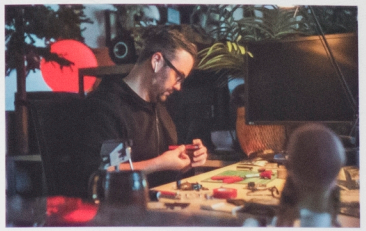
Bombs have an important role to play in *Modern Warfare*, although it must be remembered that all sides have the capability to use them. More worrying, the volatile materials that cause explosions can be secreted into packages of all shapes and sizes, triggered remotely and even worn about the body.

An example of the latter can be seen at the *top* of the page. Artists also had a concept in mind for the detonator. We let the physical materials determine the look of how it all fit together.

Immediately *above* is an improvised drone bomb. In one of the later levels we see Farah's squad using remote-controlled drones to launch a guerrilla attack on advanced enemy hardware. We were having so much success with creating physical props that we built the drones for real and scanned them.

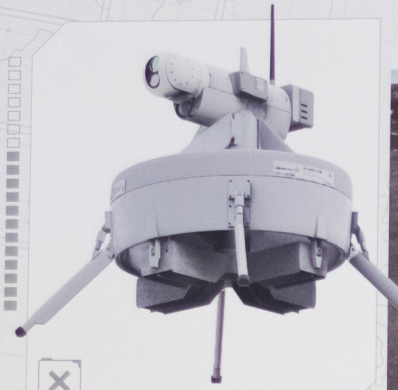


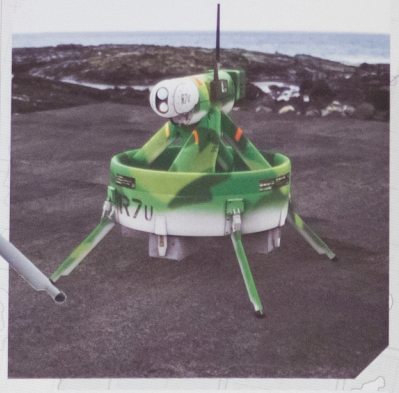






The images above illustrate an explosive device hidden inside a suitcase–a complicated project for somebody to defuse.







WEAPONS // **DRONES**

Controversial in their deployment in contemporary theaters of conflict, drones enable forces to reconnoiter or strike opponent targets remotely–and crucially without risking any of their own personnel during an operation.

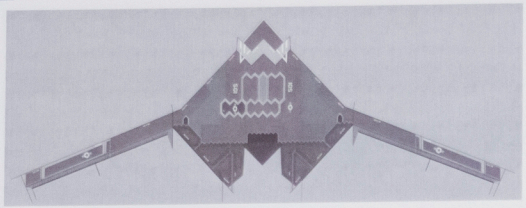
They are the scourge of the battlefield in *Modern Warfare* too, with uses in many scenarios, and they are thus many and varied in their design and construction. As such, it is vital that their functions are clearly understood from the outset.

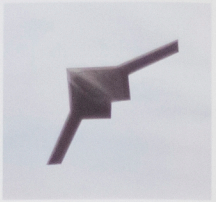
Drones in the game have different uses and capabilities. Like much of our equipment and tech it's important that these things visually tell the player what they are and what they do.

This larger drone is closer to a light aircraft in terms of size and speed. It is used to carry missiles and can be called in as a killstreak.





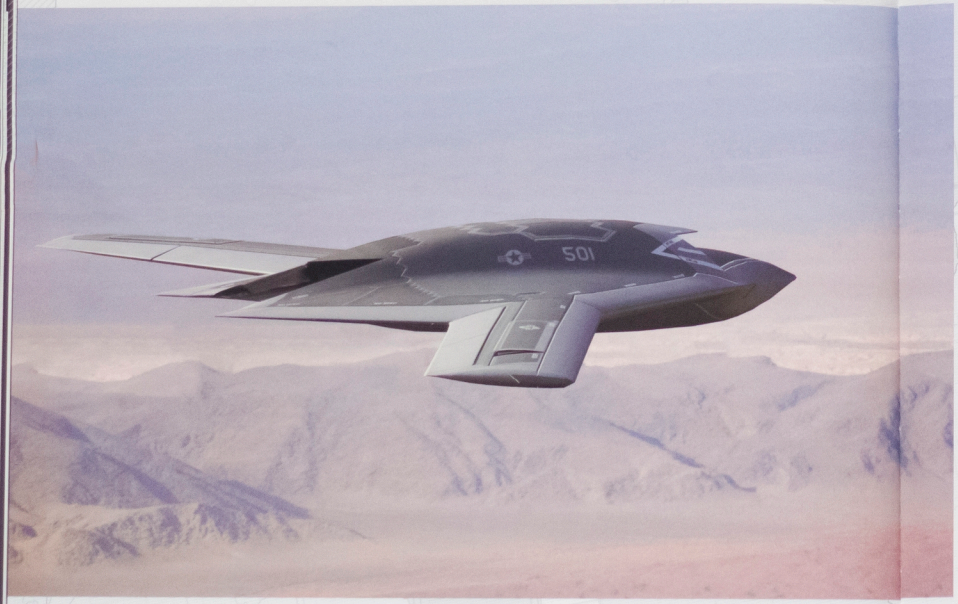




WEAPONS // **OVERSEER**

With a 'flying wing' morphology designed to defy detection, opposing factions are unlikely to spot the Overseer on radar before it arrives to deliver its devastating payload. its ominous profile makes it somewhat easier to spot by eye, however, so careful deployment is advised.

A larger and heavier drone like this one can be used for various mission profiles. One of its main uses is as an unmanned aerial vehicle (UAV) radar drone. Its silhouette is important because opposing players need to be able to see it and shoot it down if they are trying to knock out the enemy's radar.





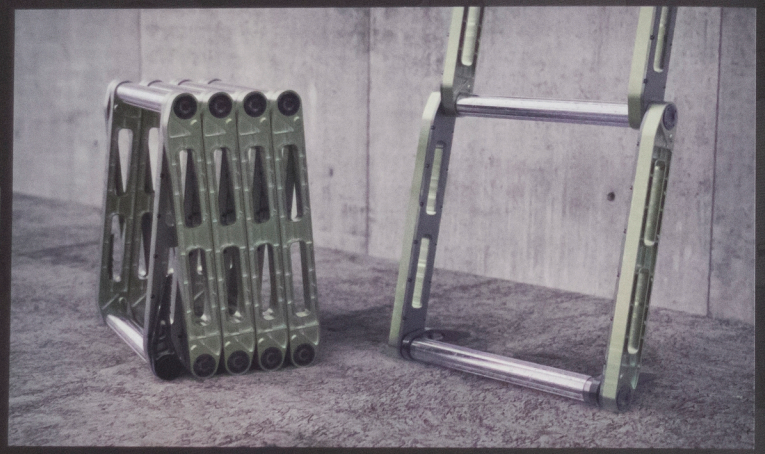


WEAPONS // **NUCLEAR WARHEAD**

Compact enough to be stored in sturdy carry-cases, the very portability of these nuclear devices poses the unappetizing prospect of them easily falling into the wrong hands. This was requested for a specific moment in the game where the player has to open the warhead and defuse the bomb. It was suggested that the player takes the plutonium cores out and carries them around for a mission goal.

These armaments are otherwise chillingly credible. The nuclear warhead concept is the result of a full collaboration between the concept artist and the team that requested this design. We started with a clear brief and clear goals as to what the design needed to accomplish. Once those guidelines were defined, the rest was simply execution. The design was the result of good team collaboration.



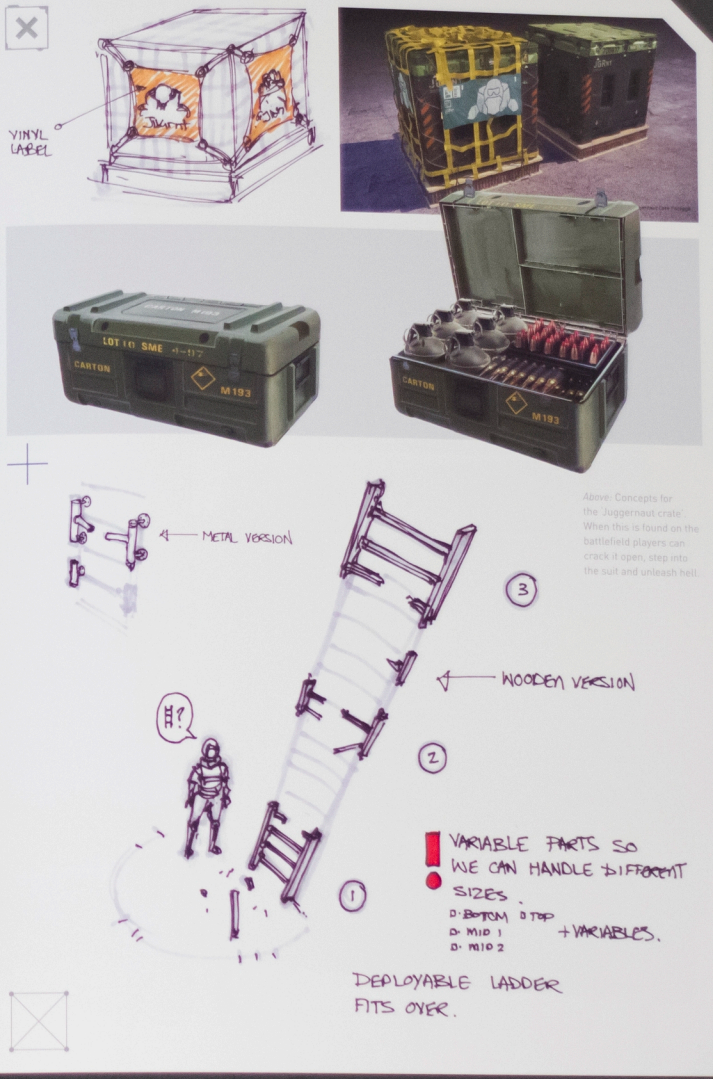


WEAPONS // **PORTABLES**

Combatants need to move across the battlefield with speed and efficiency. Simple barriers such as walls and fences should not be an impediment to progress, although a standard ladder would be an entirely impractical solution. In such instances, something smaller and more portable is required.

Our military consultants told us about scenarios where deployable ladders like this were used. The 'Townhouse' mission makes use of one and they are also available in other modes. We had to come up with a design that looked functional but could also be carried on a squad mate's back without looking ridiculous.

With a lightweight and foldable construction, the portable ladder easily surmounts obstacles of modest height.



Above: Concepts for the 'Juggernaut crate'. When this is found on the battlefield players can crack it open, step into the suit and unleash hell.

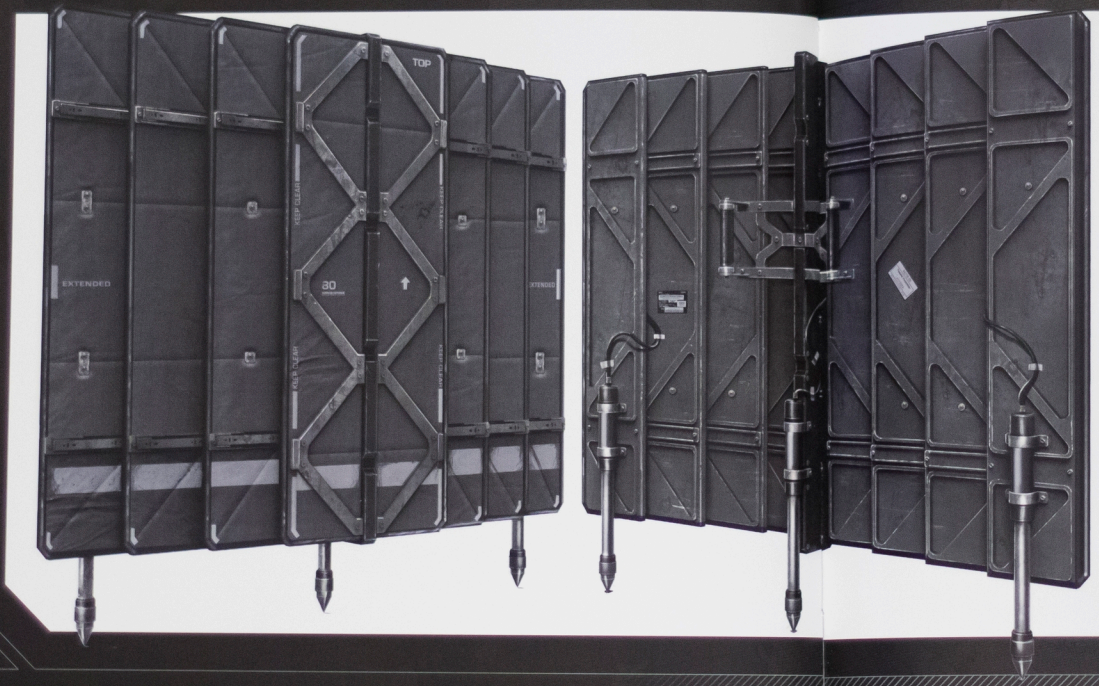
WEAPONS // **SHIELDING**

Finding cover during a firefight is a highly recommended survival tactic, although safe havens are not always easy to locate. In such instances the solution is a portable barrier. In practical terms, such devices are no more advanced in nature than a medieval shield–the concept works, so why fix it! The modern day versions are obviously more advanced in their construction, though, and offer more protection from the bullets of high powered contemporary weapons.

Once again, *Modern Warfare* designers found inspiration the world of military hardware. Deployable cover is actually a real device that is used by tactical teams. In order to make this portable enough to carry around and deploy much of the device is made up of lightweight bullet-resistant material.









Personal shielding is also available in certain gameplay scenarios, and players of previous games might recognize the concept. The Riot Shield is back but we gave it a serious update to look more like some of today's models. *Above left and right:* A gas mask is no defense against bullets, but will provide protection during a poison gas attack.



TECH // **TACTICAL DEVICES**

We live in an age of digital communications and devices, and the players on *Modern Warfare* battlefields make good use of such technology. Sleek and lightweight they are not, in most instances, as these implements are required to survive the rigors of combat. In all other regards, the computer servers, laptops, touchpads, routers and mobile phones used in *Modern Warfare* are every bit as sophisticated as those in the real world. Perhaps more so, since this equipment also needs to operate beyond the reach of the communication networks of civilian society.

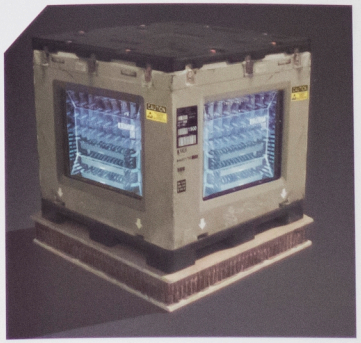
Above: This touchpad is used for calling in killstreaks, and its display shows some of the details. Some pads are interactive and the player can pinpoint where strikes need to be deployed. A mil-spec laptop can be seen *below*.







The wifi units *above* are robust enough for operation on the battlefield. The mainframe *below left* is used as an objective for various game modes. The mobile phone *below right* has certainly seen better days, but it too is built to withstand rough handling.

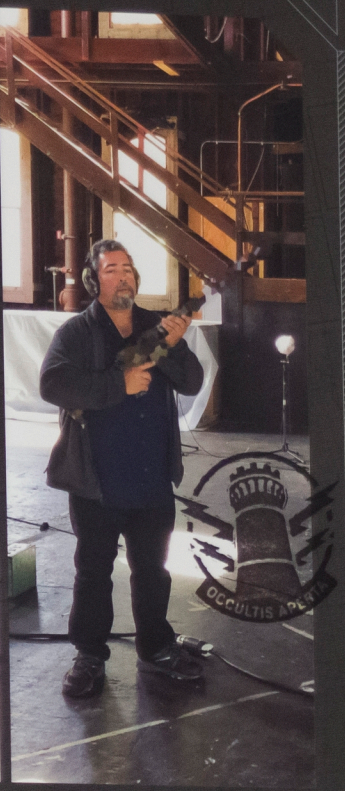












WEAPONS // **AUDIO**

The pursuit of a photo-realistic gaming experience has encouraged the *Modern Warfare* team to stretch the limits of gaming technology. Their monumental efforts have already yielded some stunning and utterly credible results–as seen throughout this book. The game not only establishes a new benchmark in terms of authenticity, but this same fastidious attention to detail also informs the sound design.

The audio soundscape is not always appreciated in the heat of a battle, yet it encompasses the entire game. From the unique atmospheres of locations flung far and wide, to the distinct sounds that different weapons and explosive devices make, right down to the noise of impact on various materials. In many instances, the only way to replicate a sound was to record its real-world equivalent.

In capturing the sound of weapons, there was no alternative but to actually fire them–the pictures on these pages demonstrate a few examples of the team doing just that. As with the rest of *Modern Warfare*, the entire audio system has been overhauled and improved. The process of capturing a sound accurately and with utmost fidelity is difficult and time-consuming, but it enabled some surprisingly sophisticated results.

To capture these components of the weapons several microphones were used. The upgraded audio system is so detailed that the player's spent brass that flies out of the ejection port on the side of the weapon can be heard hitting a wall if the player is firing next to one. Among the many other things the system drives is the sound of gunfire reflecting off of nearby buildings, if the player happens to be shooting in that type of an environment. This is all physically-based and working at that actual speed of sound.

Sound design is a complicated procedure requiring expensive equipment, multiple microphones and real weapons. In spite of that, it appears that these gents are enjoying their work.











VEHICLES // **AIRCRAFT**

A selection of military and civilian aircraft, all brought convincingly to life through the process of photogrammetry. The two fighter jets are based on real-world aircraft, each poised for imminent action. The jet liner to the left resembles mighty contemporary aircraft. The drone helicopter above can be called in as another of the in-game killstreaks.

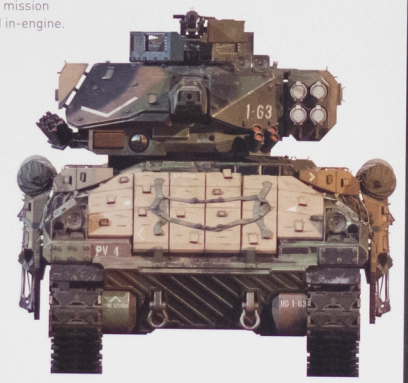


VEHICLES // **HEAVY ARTILLERY**

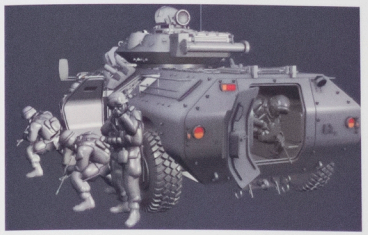


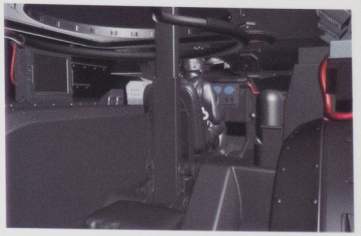
A new feature in the *Modern Warfare* multiplayer game allows players to radio in for a tank. The unit *on the left* is delivered by aircraft and parachuted down. Then players can jump aboard and create carnage in the battlefield. *On the right* is an original design for a Russian Armored Personnel Carrier. It has the name 'VIKTOR' and it can be fitted out for an assortment of mission profiles. All the assets on these pages were captured in-engine.

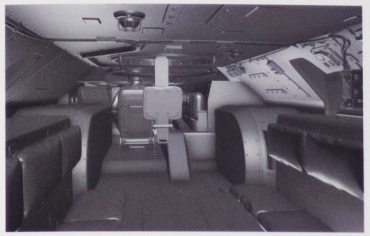


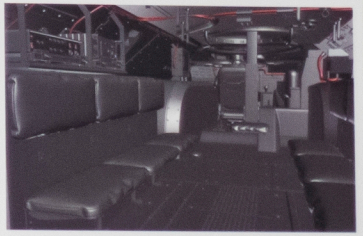








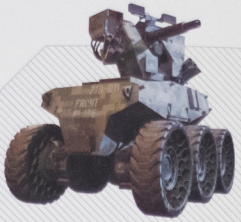




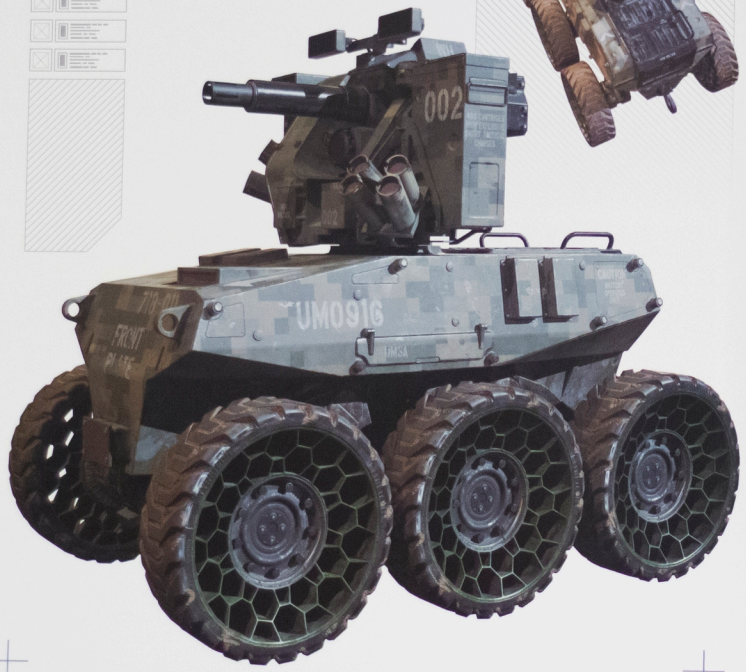
VEHICLES // **WHEELED GUN DRONES**

Remotely-piloted drones negate the requirement to meet an opponent face-to-face, the general idea being to strike further into enemy-held territories and reduce loss of troops in doing so. They have become an effective facet of contemporary conflicts, and now they play an increasingly prominent role in *Modern Warfare* too.

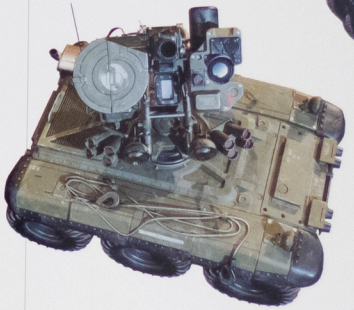
A dreaded sight on any battlefield, it is already bad enough that they can take the form of winged aircraft and helicopters. However, these images show that they can also trundle into battle like heavily-weaponised buggies. Not only that, these wheeled vehicles also come in two distinct varieties. This is one of our new killstreaks. For the Western version *on the left* we built the design around an electric engine powered by a battery pack.













The Eastern version of the wheeled drone is not built to the same standard as its rival, with a slightly different design aesthetic and a more traditional means of propulsion. We decided to make it sound more industrial. It's powered by a combustion engine and has a different geometric language, being more rounded off than the Western model.











VEHICLES // **CUSTOM**

Fighting forces without the financial wherewithal to purchase heavyweight tanks and other military equipment are forced to rely on their ingenuity; employing civilian vehicles in the making of mobile battering rams, ad-hoc machine gun trucks and the like. The results are certainly eye-catching, in a post-apocalyptic manner, and yet they are entirely within the bounds of possibility.

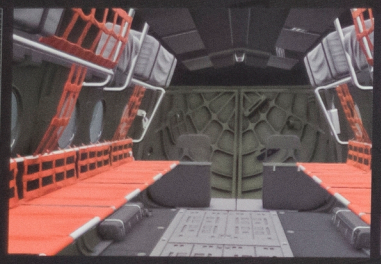
Indeed, the *Modern Warfare* team didn't need to look much further than contemporary real world conflicts for inspiration.

It's very challenging to come up with designs for vehicles that have been slapped together in a junkyard and make them look cool. We worked hard to find a balance in our DIY armored vehicles.

The military might of organized forces may be overwhelming in many instances, although history repeatedly shows that guerilla wars are notoriously difficult to win. Otherwise, these impromptu assault vehicles are surely able to run rings around lumbering enemy tanks on the battlefield.







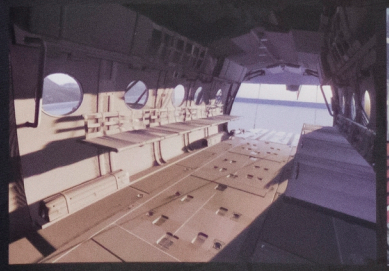


VEHICLES // **INTERIORS**

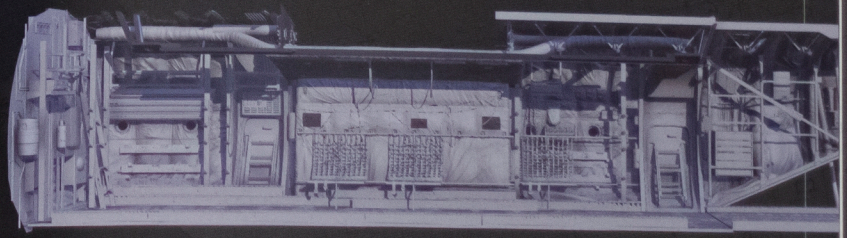
It is difficult not to over-emphasize the extent to which the *Modern Warfare* team has gone to in the quest for an authentic gameplay experience. Characters move and speak like never before, cities and towns both real and fictional are depicted in astounding detail, military equipment merges with the real-world via the process of photogrammetry and no detail was too small for due consideration.

As the ongoing conflict escalates worldwide, a variety of vehicles and aircraft is required to move troops from one battlefield to another. It might have been easier to bypass such scenes entirely, although that is not the way of *Modern Warfare* artists and designers. Put simply, if a helicopter looks photo-realistically accurate on the exterior, the interior should be constructed to the same standards.

Troop carrying aircraft play a big role in *Modern Warfare*. The interiors need to be highly detailed to support players riding in them from a first person view. Building assets this large is always a challenge because of memory. They are often the size of a building. Our artists used various tricks to get the visual fidelity to where it needed to be while keeping the memory budget on track.





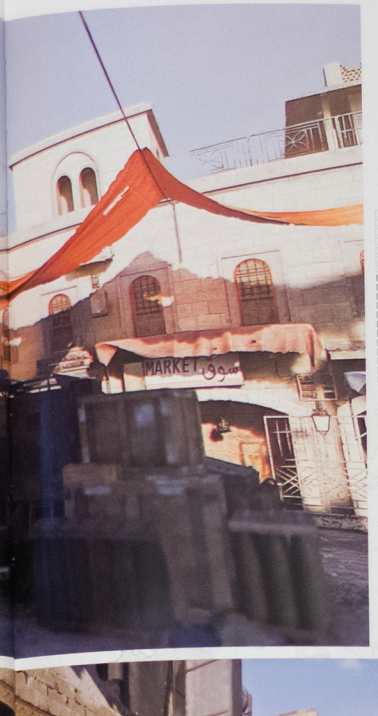




LOCATIONS

FROM THE BACKSTREETS OF London to the mountain caves of Urzikistan... as known enemies, freedom fighters and power-crazed generals push their inflammatory agendas and conflict circles the globe, it seems that peace will be hard-won indeed. Here we examine some of the locations visited en route.





Left: Wooden market stalls are a common feature dating back to the Ottoman era. These detailed natural wooden materials provided a nice contrast to all the stone and plasterwork seen throughout the levels.

Below: Spear functions as both a multiplayer battleground and as part of the main singleplayer campaign.

LOCATIONS // **SPEAR**

This fictional Northern Urzikistan city is the site of an Al Qatala base and a thriving arms trade. Russian intelligence, in tracking stolen weapons, has launched a devastating strike. Allied forces now find themselves in a firefight that threatens to engulf the entire region.

Stucco walls bear the marks of the ensuing conflict; buildings crumble, debris spills into the city streets and few of its frightened residents dare to shop in the once thriving marketplaces. This is a palette of shattered concrete, exposed cinderblock, twisted metal and the dusty tones of the arid desert environment, although humanity still prevails among the rubble.









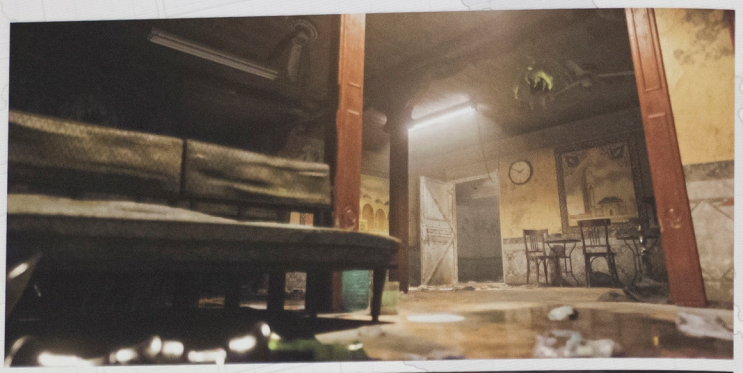




Scenes from a city under siege. Sandbags on a roof terrace can offer some protection in a gunfight, while other images depict the blasted detritus of the ongoing battle. Street signs, intact for now, point to other locations in the city and offer additional routing and orientation benefits.

As with other elements of the gameplay, much effort was employed in Spear's layout and design. It follows a three-lane construction, but incorporates verticality, route exploration and power positions for players to discover. In a standard team deathmatch this twist on the basic design gives players something to fight over.

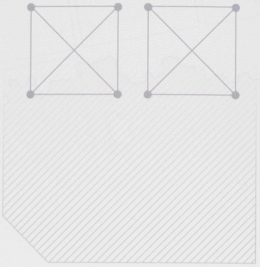
Above: The rising dust of a late, lightly overcast afternoon gives a golden glow to this broken down backyard. A triumph of lighting design.





Although Spear is situated in the Urzikistani desert, some of the action sequences take place indoors, in artificially lit spaces, dim evening and dark nighttime environments. This posed several challenges for the *Modern Warfare* team, particularly in terms of the lighting design, but these were soon turned to gameplay advantages.

We wanted to make night time versions of some of our maps, but we wanted them to push gameplay in new ways. *Modern Warfare* has a robust night vision mechanic that we thought we should use for these maps. The design challenge was to make sure the maps had the right amount of pitch-black areas and lit sections as well. We didn't want players to be able to shoot out all the lights, so we needed to create a design language which tells players that specific lights are bulletproof. This is all part of balancing the quality of light and dark gameplay in the map.



Volumetric lighting does much to convey the dank atmosphere in these enclosed spaces. The two lit fires above barely illuminate the scene, so night-vision goggles may be required.











The first two years of *Modern Warfare* development required the art and engineering departments to integrate reality capture into these fraught environments. Highway was one of the first builds that integrated this technology successfully.

LOCATIONS // **HIGHWAY**

Farah fights for the freedom of her country, although her cause is not to be confused with the lethal ideology of Al Qatala. She is a key player in the Urzikistan missions, and the action takes a dramatic turn when players join her rebel force as they lie in wait for an Al Qatala convoy moving down the local highway.

Chaos follows as Russian forces give chase, their fighter jets strafing the road from above. Their attentions soon turn to the village, which is practically razed to the ground in the conflict. However, a plan is soon hatched to bring the fighting to an explosive conclusion.





These scenes of carnage and devastation are so convincing that they could be taken from a real-world battlefield. The Highway sequence changes from one moment to the next, both in terms of gameplay, pace and the campaign narrative. A clear visual guide needed to be created to support these transitions. Color images, such as these, were an effective way to guide lighting and color that bests fit the action and tone of the level.

















Designers studied how buildings explode and crumble, and the contents of a dwelling are exposed to the elements. *Left:* The rising heat haze gives a sense of true scale to targets and mountains in the far distance.

Farah's village, which borders the highway, does not survive the rogue Russian-led assault intact–if anything, it suffers an even worse fate than the nearby city. Tanks take up positions within the bounds of the desert settlement, and the resulting firefight decimates the homes of local residents.

Atmospheric conditions play an important role in bringing this level to life. Plants and grasses sway in the direction of the prevailing wind and remote targets shimmer in the haze generated by the burning desert sun–both of which convey the visual language of the level and, of course, have a tangible impact on the accuracy of shots fired.

This is principally a defensive mission. The battle commences at a distance, but the pace changes considerably when the enemy forces break through the perimeter and the combat changes to close quarters.

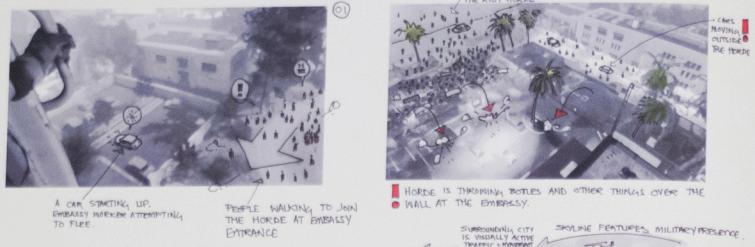


LOCATIONS // **EMBASSY**

Chaos reigns, as soldiers loyal to Al Qatala stage an attack on the US Embassy in Urzikistan.

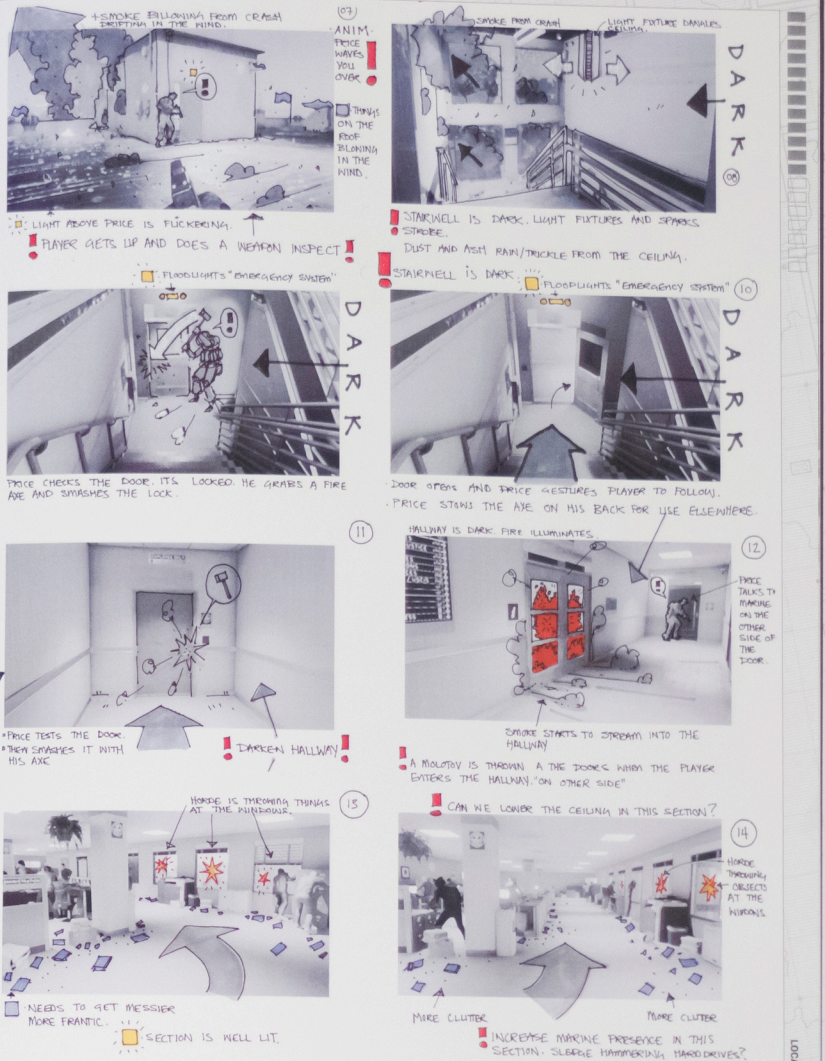
Concrete and barbed wire are ineffective in preventing the mob from breaking through the Embassy barriers. Improvised missiles are lobbed over the compound walls, vehicles are set alight, and smoke fills the air.

Against this calamitous backdrop, the player takes part in the extraction of a prisoner. Farah and Price bring their expertise to bear, although it is perhaps wise to allow the attackers to enter the Embassy and engage them at close range rather than confronting them en masse.



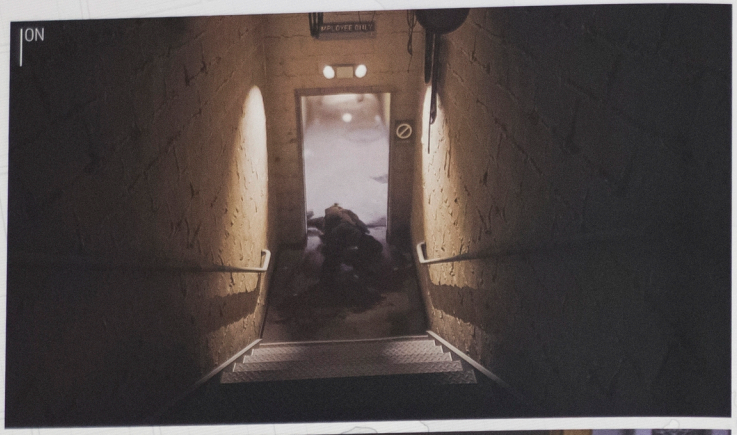
Storyboards are a useful way to work out storylines and specific narrative events. Techniques vary, but they are often a little rough and ready to enable the speedy communication of ideas.

This infiltration sequence from the Embassy mission involved multiple departments. It's interesting to note the combination of screen-captured images with illustrated elements and handwritten stage directions. The gameplay is clearly and excitingly described, however.

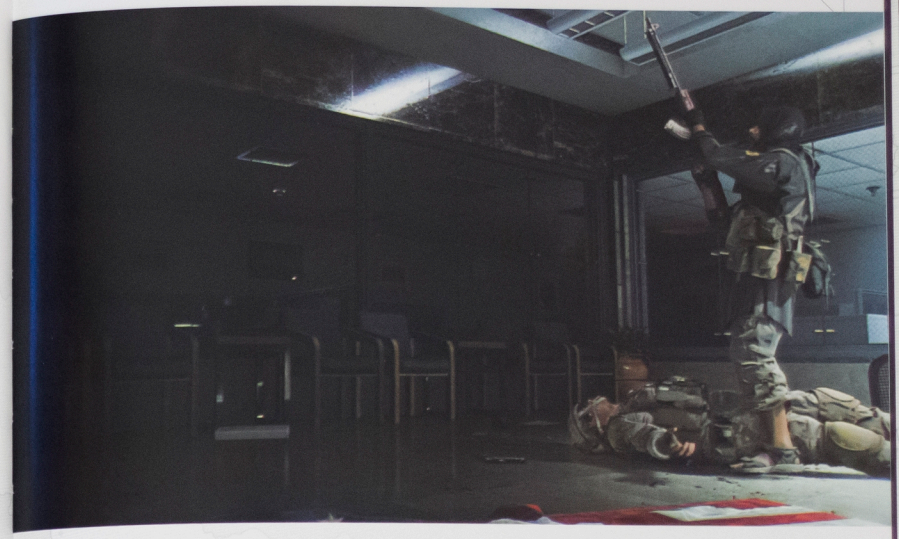


Lighting design directions are provided as Captain Price prepares to enter the Embassy building and descend the stairwell. It is already dark when this event takes place, but players are able to increase their advantage by shooting out certain lights.

Such stage directions also explain how specific visual effects are integrated into the sequence. They are also helpful in detailing animated moments that give the scenes personality and context.





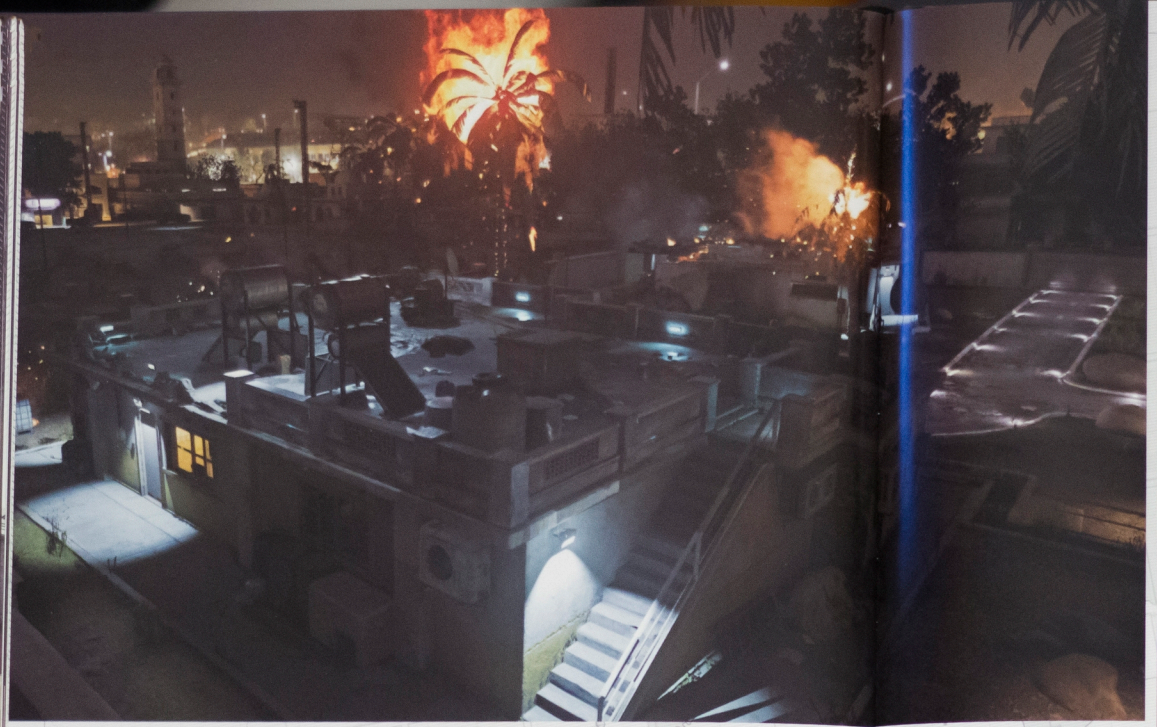


Above: The level begins in a violent assault, but the action soon moves into the confines of the Embassy buildings. This required careful staging by the design team, as the scale and severity of the attack is seen before the actual confrontation takes place. The answer was to fill some of the windows with military-grade bullet-proof glass. *Left:* Farah and Price escort the prisoner, and the firefight moves into the stairwell and basement of the Embassy.



The custom-designed seal seen directly *above* brings an additional sense of authenticity inside the US Embassy building, although the unfolding action is already strikingly realistic.

Exit signs are much easier to spot when illuminated, and this is just one element of the visual language in the Embassy level. Players are able to shoot some of the lights within the compound, which has obvious gameplay advantages when the attack takes place at night. Those that can't be shot have a protective metal grille.







The Embassy compound comprises sizeable grounds and a number of smaller out-buildings. This is the final stand against the Al Qatala incursion and the firefight intensifies as the action moves from one location to another, and into smaller, tighter spaces. We had to map out the level from a drone view in order to stage the assault, and give the player the feeling of the world closing in on them.











LOCATIONS // **SAFEHOUSE**

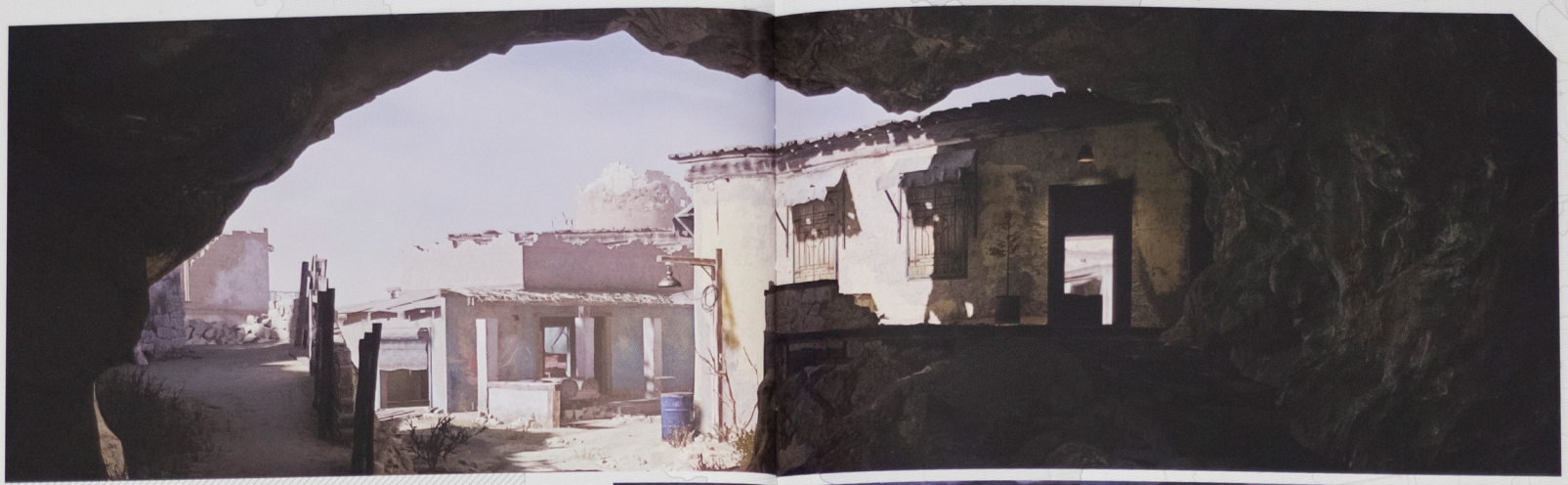
Differing views of the Safehouse level demonstrate the colors of this arid desert setting, the dust easily rising in the slightest breeze. The wrecks of military and civilian vehicles are a reminder that the streets are no longer safe for cars or drivers, and the skeleton of a local town hall has been laid bare in the fighting.

Signs of life remain in the chaos, as planks make an unsteady causeway above street level. It was decided that Safehouse would be a cat and mouse sabotage mission, with multiple sight lines, nooks and crannies to hide in and avenues to support the freedom of movement.





Top: Combat is tricky enough in the heat and dust of the desert, but a sandstorm increases the intensity and can conceal players and enemies alike. *Above:* Dimly lit interiors enable players to hide and perhaps use silenced weapons to ambush enemies.



LOCATIONS // **CAVES**

Deep in the mountains of Urzikistan, and beneath the gaze of occupying Russian forces, Al Qatala is using an extensive series of underground caves to manufacture weapons and store the materials needed to make other ordnance. Airless and uncomfortable at any time of day, power and facilities are fed in from outside and basic quarters are constructed wherever possible. The caves level was inspired by a real location in Afghanistan, where local craftsmen had been creating and copying weapons of all varieties.

The combat takes place in both day and night settings, which offers two quite different gameplay experiences. Lighting conditions can vary dependant on time and location, although players will need to use night vision goggles to spot enemies after darkness falls or in pitch-black corners of the cave system.





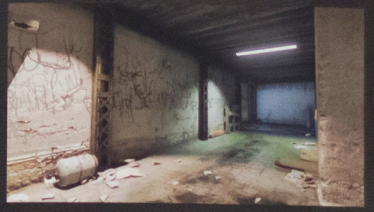


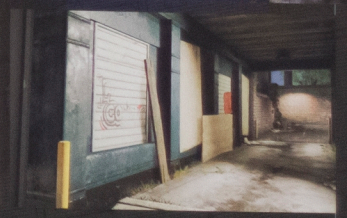












LOCATIONS // **HACKNEY**

British Intelligence has acquired information suggesting that Al Qatala's next attack is being planned from a derelict warehouse in this neglected corner of London. AQ operatives aim to bring the capital to its knees with a series of terrorist incidents, and have been using shipping containers to stockpile the materials needed to manufacture suicide vests and ad-hoc bomb devices. The final phase of its assault will employ an explosives-laden van in a highly populated area. The mission is thus set to thwart this lethal objective.

The East London borough of Hackney backdrops this urgent assignment, and this is another mission that offers day or night gameplay. Cleverly, light switches have been placed in some of the buildings so that players can blind unsuspecting enemies who enter while wearing their night vision goggles.

LOCATIONS // **PICCADILLY CIRCUS**

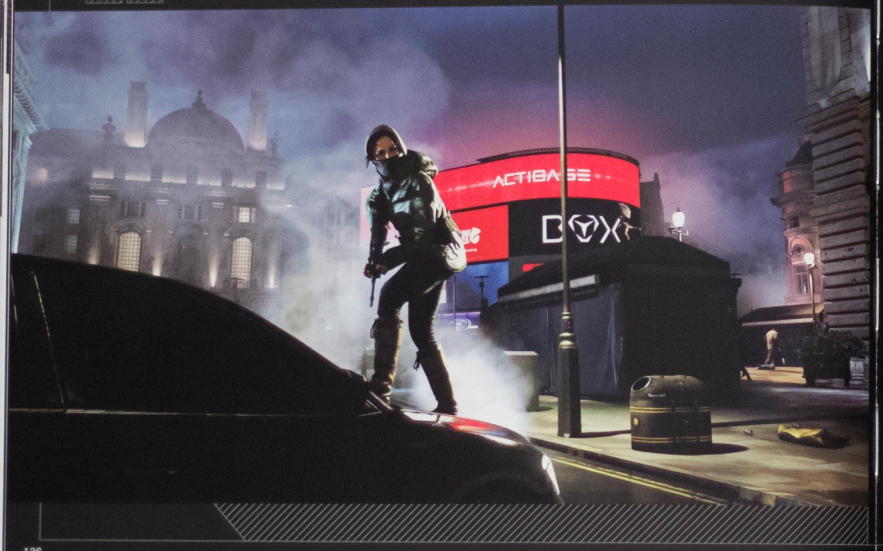
Few London landmarks are better known than the statue of Eros in the center of Piccadilly Circus, which is both a famous meeting point and the setting for a spectacular mission to foil a lethal Al Qatala plot.

Busy day and night, it is a prime target. Lighting and atmospheric effects bring much drama to the scene, with rain-soaked streets shining in the light of the famous advertising billboards.

This London location was selected early in the development process and represents a high point for *Modern Warfare* series. It takes advantage of every graphical advancement made to the game engine, and the entire environment is a visual ecosystem of city hustle and bustle. Also, the impact of the events that unfold at Piccadilly also sets Kyle Garrick's storyline in motion.







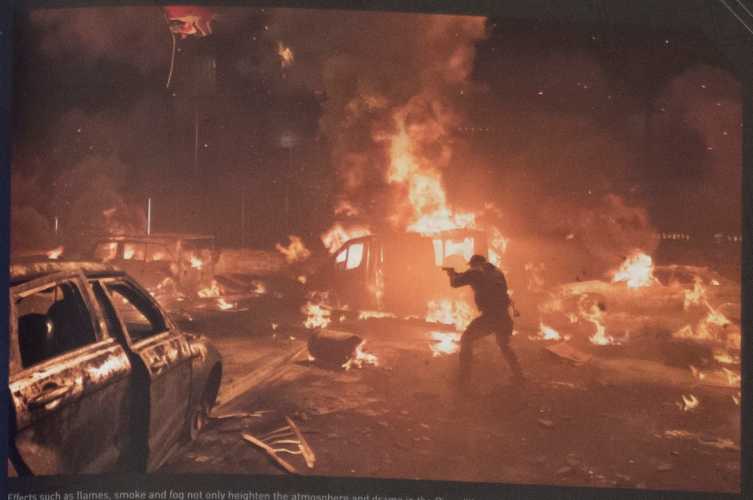


Various options were explored for the Piccadilly Circus sequence, including color schemes and hours of the day. We went through different lighting conditions for this level–day time, golden hour etc. Then we realized that night was the right time to bring this space to life.





Citizens of London will recognize scenes in and around Piccadilly Circus too, all faithfully rendered. In our work towards getting environments like Piccadilly to look as photo-realistic as possible, we quickly realized that layers of atmosphere are crucial to getting the look right.



Effects such as flames, smoke and fog not only heighten the atmosphere and drama in the Piccadilly sequence, but sometimes have gameplay benefits too. Silhouetted against the raging fire of burning vehicles, it is easy to spot this enemy in an otherwise visually noisy and chaotic environment.











Piccadilly Circus looks quite different in the daylight hours, as it is seen in *Modern Warfare*'s multiplayer gameplay modes.

The sun is shining, strong shadows are cast over building facades and several other modifications were made to enhance the whole experience. Union Jack flags flutter and London buses enter the scene to support better gameplay geometry and give players sections to use for traversing the lengths of the large open streets.







LOCATIONS // **SAINT PETERSBURG**

The Russian city of St. Petersburg is also a unique level in *Modern Warfare*. Captain Price and his crew go into the city undercover to follow an important lead–a dangerous endeavour, considering this is in the homeland of General Roman Barkov and his highly trained Spetsnaz fighters. Its location, in a corner of the Baltic, results in an often damp climate, and the Soviet architecture in its backstreets and alleyways looks especially austere after recent rainfall.

There's much grandeur elsewhere, although the entire location has been rendered in an astounding level of detail. While the same is true for every mission in the game, capturing St. Petersburg entailed sending team of artists and designers on an extended field trip to study and scan the city. Their efforts made it possible to create a highly convincing environment.







LOCATIONS // **ESTATE**

There is much variety in the Estate mission. Gameplay objectives can be approached in any order of the player's choice, there are light and dark action sequences to complete and enemies can be manipulated by shooting out certain lights within the compound.

The main image to the *left* demonstrates the size and variation of the Estate environment. The conflict unfolds throughout a number of buildings, both large and small, there are multiple floodlit pathways to negotiate, remote outposts to locate and the whole area is surrounded by deep woodland. This presented unique challenges in terms of the lighting models. Also, the night-vision goggles were modified to automatically detect when the player is indoors or outdoors; switching to a long range torch outside, so that the player can engage enemy soldiers over greater distances.



Night-vision goggles have become a staple of the *Modern Warfare* series, rendering scenes in an uncanny green light. The woodland scene *below* looks serene in the moonlight. It is likely to be anything but peaceful, of course...

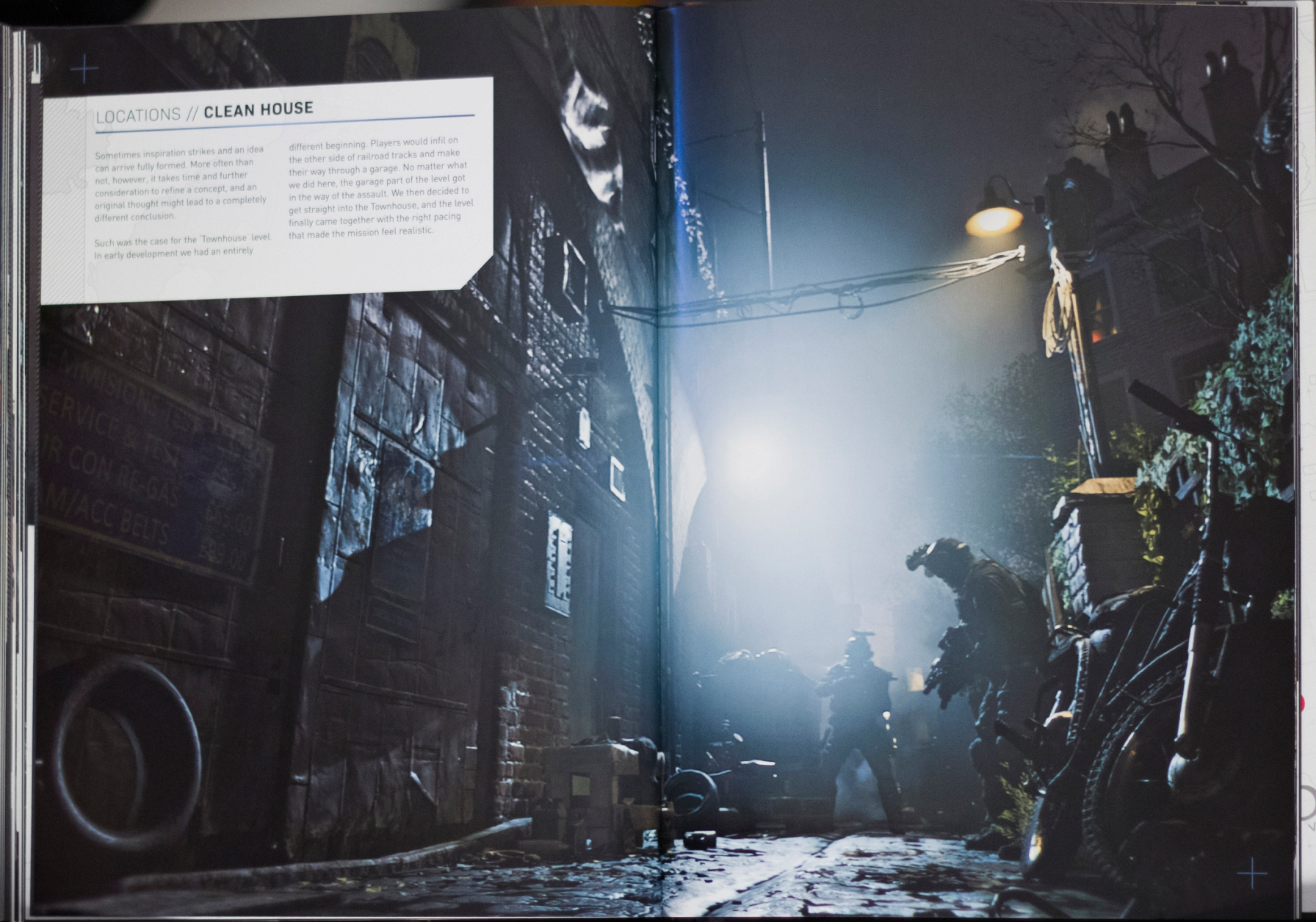






A rogues gallery by any definition, these are just a few of the paintings adorning the walls of the stately home and surrounding buildings of the 'Estate' mission.

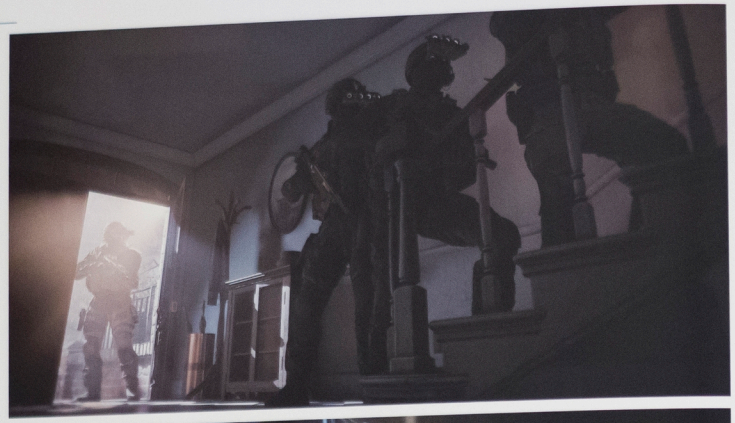
The faces in these lavishly painted portraits will be unfamiliar to the majority of *Modern Warfare* players. However, they're actually members of the Infinity Ward team. It's always nice to add personal touches like this to the game that end up becoming cool Easter Eggs.

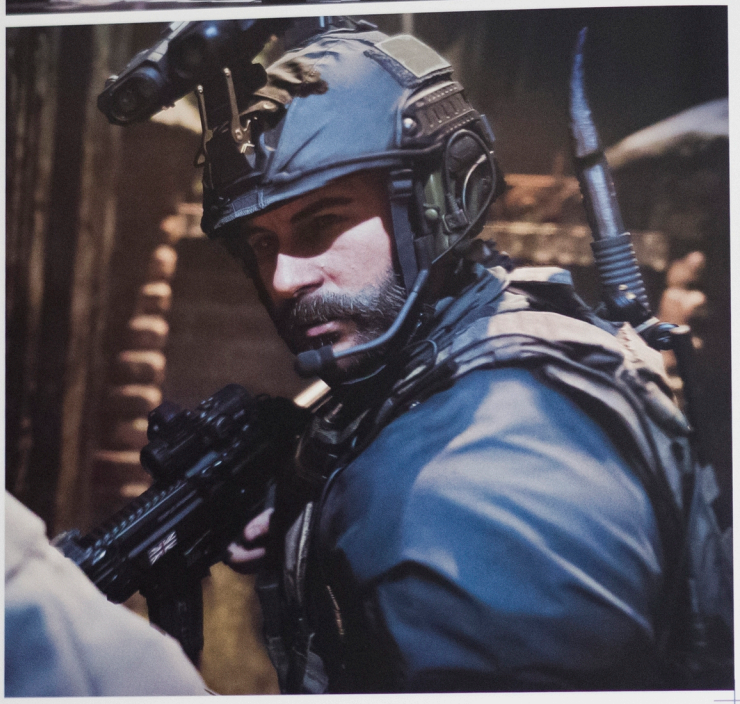


LOCATIONS // **CLEAN HOUSE**

Sometimes inspiration strikes and an idea can arrive fully formed. More often than not, however, it takes time and further consideration to refine a concept, and an original thought might lead to a completely different conclusion.

Such was the case for the 'Townhouse' level. In early development we had an entirely different beginning. Players would infil on the other side of railroad tracks and make their way through a garage. No matter what we did here, the garage part of the level got in the way of the assault. We then decided to get straight into the Townhouse, and the level finally came together with the right pacing that made the mission feel realistic.





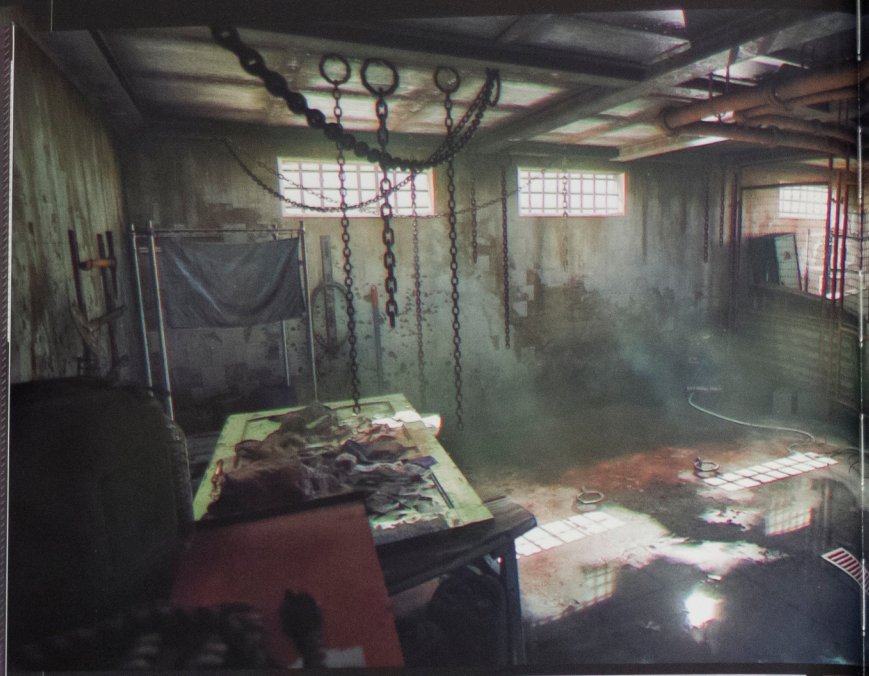


Townhouse encapsulates the accurate sense of scale felt throughout *Modern Warfare*– the building proportions in other games are sometimes exaggerated to aid player and AI character movements, and to avoid the potential for bugs to occur, but this environment is largely constructed at a ratio of 1:1. Highly immersive gameplay follows as a result.

Images to the *left*, *middle-left* and *below* illustrate the infiltration component of the mission. Dramatic backlighting heightens the tension as SAS operatives prepare to breach the Townhouse courtyard. All three of these pictures have been captured within the game engine.

Above: Night vision goggles will come in handy during certain sections. *Below:* Volumetric lighting adds much atmosphere to this tense sequence.





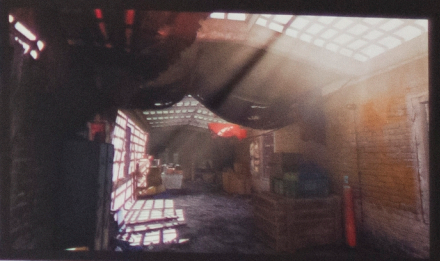


LOCATIONS // **CAPTIVE**

Some *Modern Warfare* locations are grim by nature, although these images might have come straight from a horror movie.

Chains hang from the ceiling; their purpose unknown but unlikely to be anything pleasant. Meanwhile, an old door makes for an ad-hoc bed or some kind of interrogation table, there are metal hoops in the concrete floor, there's a palpably dank atmosphere and the less said about the reason for the electrical wires strewn about the better.

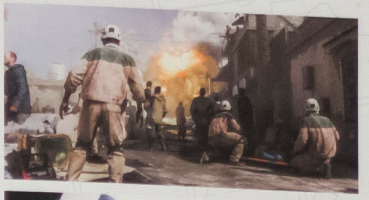
It's no wonder that gasmasks are required in this nightmarishly dilapidated environment. This mission is crucial, however, as SAS operatives attempt to break in and free a prisoner. As elsewhere, all the images here are captured in-engine.

















LOCATIONS // **HOMETOWN**

Among the chaos and raging firefights of other *Modern Warfare* missions, Hometown is unique in the emotional punch that it delivers.

Hometown is quite unlike other levels created for the *Call of Duty* series, in being viewed as a flashback to childhood. As youngsters, Farah and her brother Hadir are witnesses to harrowing events when their homeland is attacked and occupied by invading foreign forces. The rural image *above* is part of their story, although those on the *right* illustrate scenes of the violent incursion itself.

No child should ever have to suffer such actions, of course, but what Farah and Hadir see as children informs their later development as ardent freedom fighters.

Above: An apparently tranquil scene in a rural poppy field hides the truth of a poison gas attack. Reactive foliage sways in the wind, indicating that the poison will soon blow away and the air will be safe to breathe again. This ingenious feature took several months to get right.







LOCATIONS // **DEADZONE**

Whether their cause is justified or not, the means employed by Al Qatala are certainly harsh and the organization is spreading across the globe.

An AQ cell has established a base in a Ukrainian village, from where they plan to store weapons and launch attacks in the region. Russian intel reports that the insurgents have taken prisoners and hijacked missile launchers. A mission is deployed to rescue the captives, destroy the cache and recover the missing equipment. One of the interesting aspects of this map is the idea of putting modern elements into an older looking environment. The contrast adds an element of personality.







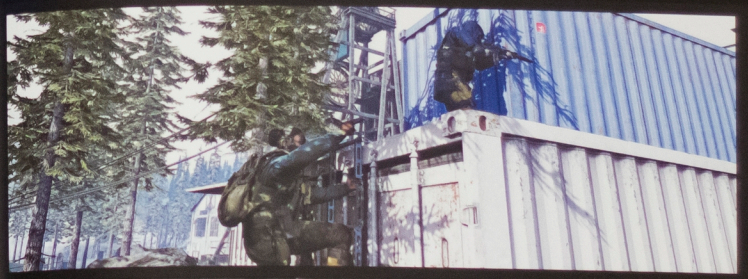
LOCATIONS // **RUNNER**

Trouble stirs among the pitheads and chimney stacks of this rural Russian coalmine. Rising smoke indicates that it is still semi-operational, although it also serves as a novel arena for raging multiplayer firefights.

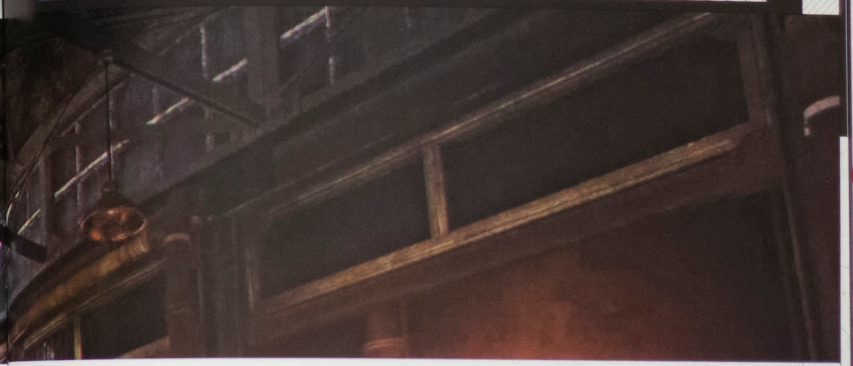
Runner is surely ripe with gameplay potential, with stacked shipping containers, wooded areas and railway infrastructure. Also, with its lofty towers and building rooftops, there are lots of opportunities to gain a height advantage over an opponent–or to become an easier target, of course. One can only hope that the mine cart comes into play at some point.

These images demonstrate scenes from Runner in an earlier iteration, major sections having been expanded as the game developed. The images *above* and *right* provide a taste of what players can look forward to.









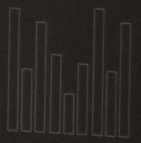




LOCATIONS // **EUPHRATES**

Like many places visited in the game, this fictional Urzikistani town is inspired by real world locations. It is otherwise a scene of great turmoil, as Allied and Al Qatala forces clash. A single bridge provides the sole access, but a stranded bus is rigged with explosives that could detonate at a moment's notice.

Euphrates is one of our favorite levels. The high ground of the bridge and the surrounding structures offer great vantage points that overlook the play space.



An overhead view of the girder bridge offers a preview of the dangers ahead. The abandoned bus is a potential hazard that's best avoided, although the image below suggests that the entire bridge is booby-trapped.



LOCATIONS // **BUILDING KIT**

Game development is a complicated and lengthy process, and certainly more so when the goal is photo-realistic perfection. However, with all the research and prototyping in the bank, *Modern Warfare* designers were able to develop 'Build Kits to help streamline production. These are basically collections of assets that fit together, both technically and thematically. Building vast environments is difficult and time consuming if you are to start from scratch each time you build a new area. Build kits make building environments, easier with creative freedom that doesn't slow the game down.

















LOCATIONS // **RAID**

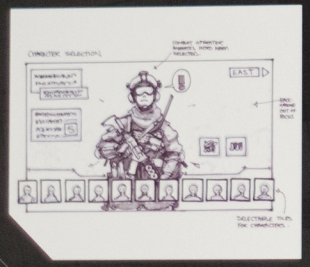
The blasted town of 'Raid' is set in an undisclosed Eastern European location. It is the present day, although the destroyed buildings, wrecked vehicles and empty streets make some sections look more like scenes from World War 2. In this respect, the Raid map could be seen as a return to the roots of the *Call of Duty* series.

Raid has plainly suffered as the result of a recent conflict. Happily, the vacant shells of its bombed-out buildings make perfect hiding places, or covert vantage points to give players the upper hand in multiplayer firefights. The possibilities are tantalizing, indeed. The buildings themselves are incredibly realistic, thanks to use of 'photogrammetry' – a technique that seamlessly blends real-world and digital images.







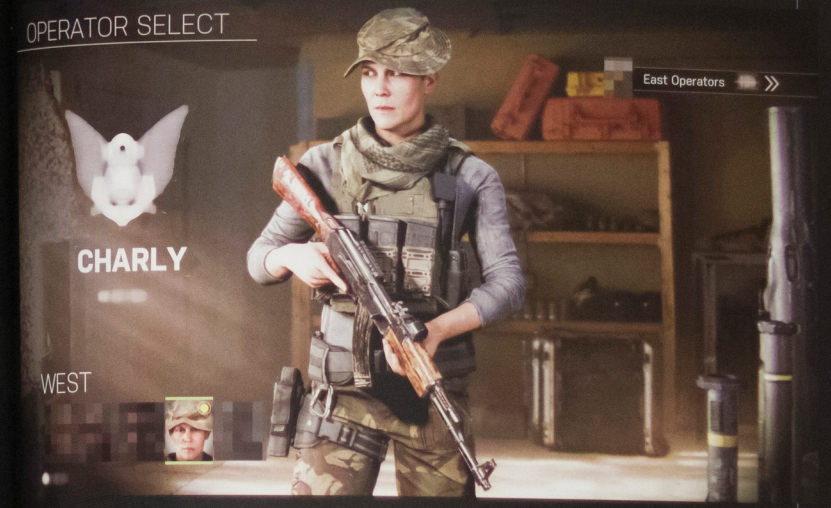


LOCATIONS // **CAPTURING REALITY**

Character selection is an enjoyable part of the *Modern Warfare* multiplayer experience, although the process is considerably enhanced in this game. Once again, real and digital images were combined to incredible effect. We needed a photorealistic set to place these characters in, but these sets had to be created quickly and be low on memory so that we could fit them into our menu systems. We started with concepts and decided to use a photo projection technique to create the sets in-game. The challenge was that we needed to go to real locations, and create and dress physical sets. Once we had our shot we captured the scene with our cameras and took precise measurements and readings.



Superimposing a digital character over an image of a real background might have been easier, but the *Modern Warfare* team took up the challenge of making the character appear to *inhabit* the environment. Integrating our real-world captures was tricky at first, but we soon discovered techniques to get our characters to seamlessly stand in our photo-projected sets. The final result is the character standing in a three- dimensional space that has depth and is photo-realistic.



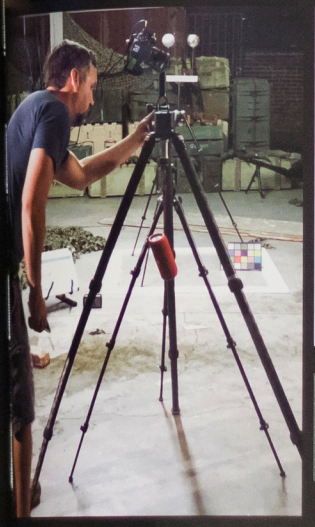


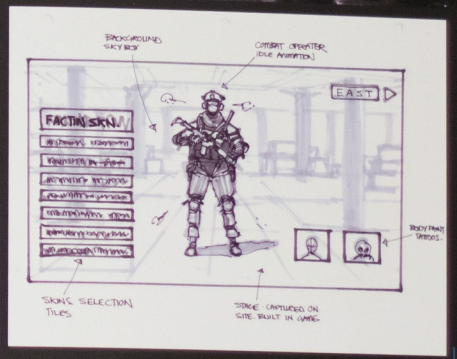




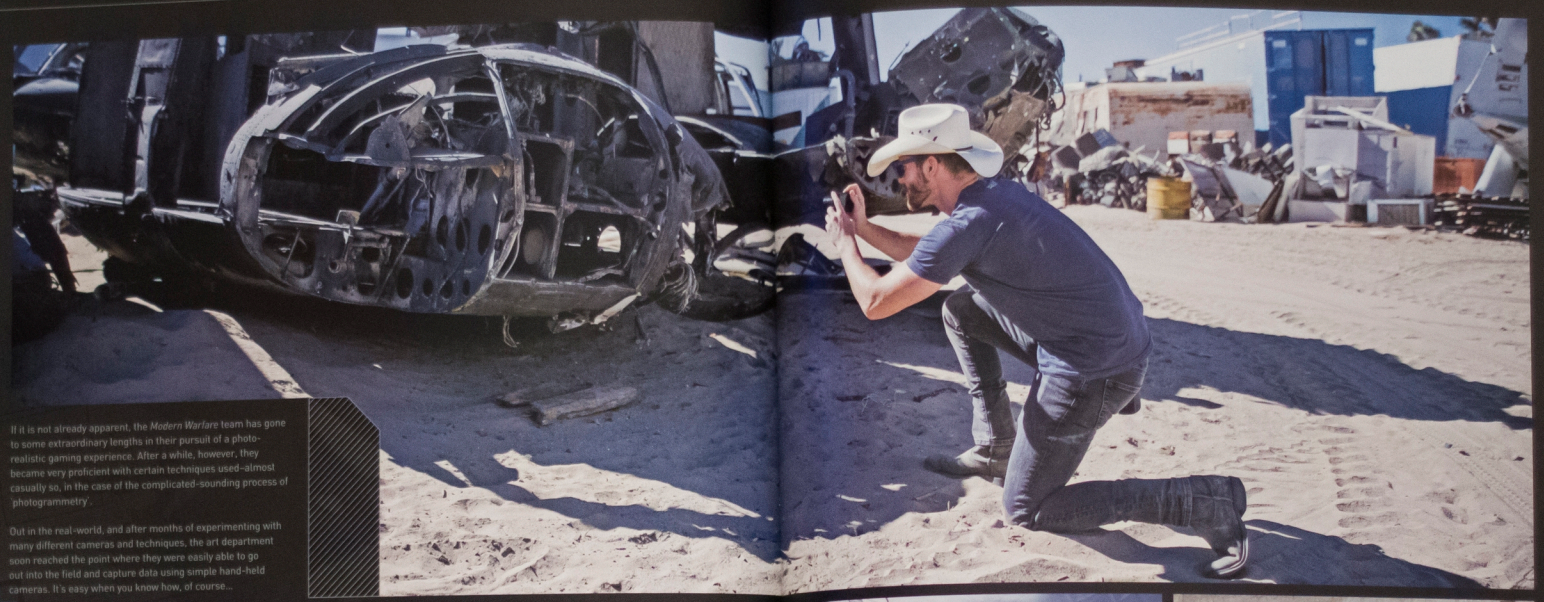


When a physical set is created, the *Modern Warfare* team captures an image called an 'IBL'– an 'Image Base Light'. These are generally used as sky boxes for an environment, although this was slightly different. Firstly, the team needed to become proficient at capturing rooms and small spaces, but also in a way that supported High Dynamic Range. This entailed several different exposure layers for each of the photographs taken. These enhanced IBL images allow characters and objects to look like they were in the scene when it was photographed. If a character is wearing sunglasses the entire room is reflected in its lenses.



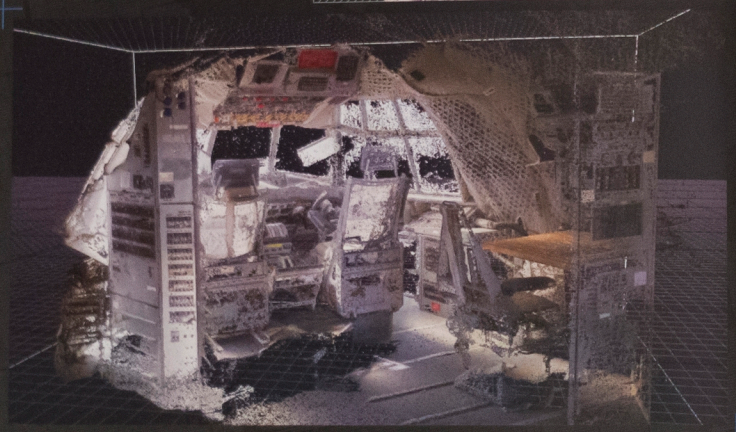


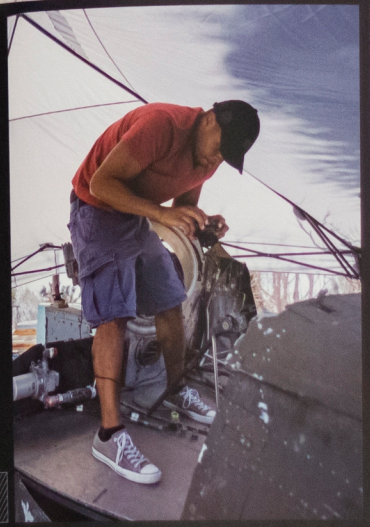
Perfect preparation prevents poor performance, as the saying goes. For the *Modern Warfare* team, this not only entailed the effective management of multiple resources and several departments, but also the storyboarding of each image or sequence captured. These setups required a tremendous amount of coordination. Everyone pitched in to get the job done. It is very helpful to go into these types of setups with a proper plan in mind. Storyboards go a long way, and are useful tools for communicating the idea of what we are trying to achieve.



If it is not already apparent, the *Modern Warfare* team has gone to some extraordinary lengths in their pursuit of a photo-realistic gaming experience. After a while, however, they became very proficient with certain techniques used–almost casually so, in the case of the complicated-sounding process of 'photogrammetry'.

Out in the real-world, and after months of experimenting with many different cameras and techniques, the art department soon reached the point where they were easily able to go out into the field and capture data using simple hand-held cameras. It's easy when you know how, of course...



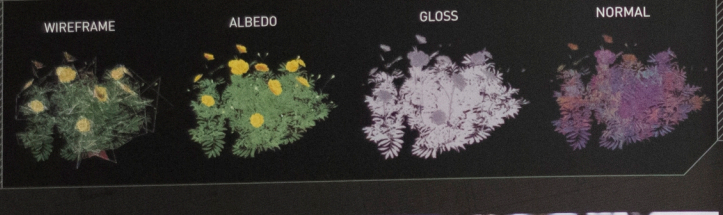




The process of photogrammetry is beginning to look like fun, although it is undoubtedly more complicated than it might appear. In the hands of skilled professionals, however, the photographs taken with relatively simple cameras can later be used to bring unprecedentedly photo-realistic images and environments into the game. Using these hand-held cameras also facilitates the capture of images and data that would otherwise be nearly impossible to get. The data can then be integrated on a one-to-one level or used by artists as handy three-dimensional guides for building convincingly lifelike models.









Adding flora to a level is no simple task of picking something green and vaguely plant-like, and then placing it wherever it might look convincing–not in the *Modern Warfare* universe, at least. Creating a new environment also entails researching and capturing even the smallest details. When we start the build process of a new environment style or a location, we research the types of biomes that would exist in that region. We use reality capture to collect the data and then integrate it into our libraries. All of this involves a tremendous amount of very specialized work.



Flora and foliage are notoriously difficult to get right, and then environmental factors might also have an effect–a field of poppies bending convincingly in the wind, for instance, or the way that light makes leaves and grasses seem to glow when they are back-lit. Deep foliage provides excellent cover, though, as we can see above.

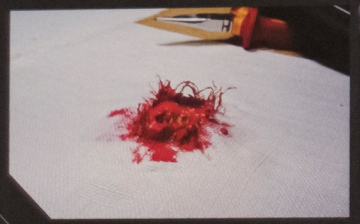


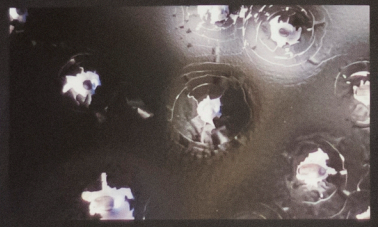


Even the smallest details are considered in the pursuit of photorealistic perfection. The *Call of Duty* series has always involved a range of destructive gameplay, but how often do players really think about the way that bullets leave holes in certain materials, how wood splinters when it is hit and how rock and concrete shatters?

It might be easy to overlook such minor details while playing, but when the rest of the game looks so utterly convincing the *Modern Warfare* team just had to get them right. What's more, in building rigs, using all manner of tools and generally smashing things to pieces, it looks like they might have had fun at the same time!

To achieve realistic looking impacts for our weapons our VFX artists created a library of practical impacts that they could use for reality capture. Various materials are brought into the lab and pulverized using different techniques to achieve the desired effects. The VFX team even constructed their own custom scanners to capture the data.

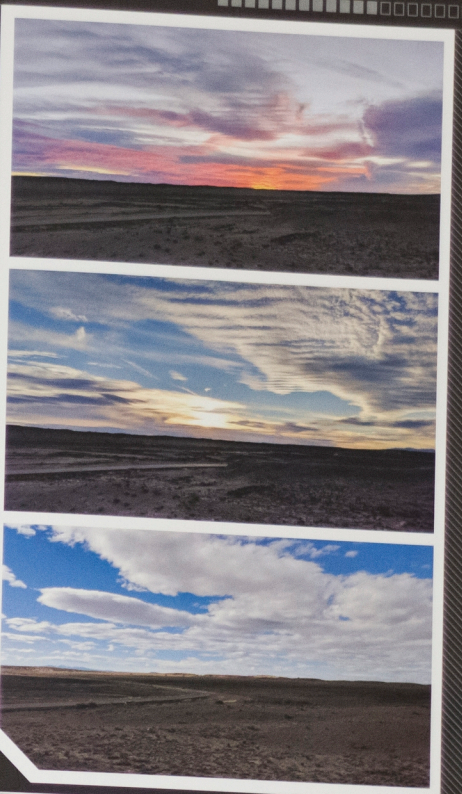












It seems somehow fitting to conclude this chapter with a collection of cloudscapes and sunsets. These might be painted by a skilled digital artist, although that would not suffice since the *Modern Warfare* team is trying to make every element of the game look as convincingly lifelike as possible.

Intensive field study was once again the solution, although it does not appear to have been much of a chore for anyone involved. Even so, copious photographs of skies and sunsets were taken in many locations, and factors such as time and prevailing weather conditions were measured.

Put simply, if the skies in *Modern Warfare* look realistic, that's because they probably are.

The skies you see when you play the game are captured by our lighting team. Several trips were made to remote locations to photograph unique skies. It was crucial that the team not only photograph the skies overhead but also take precise measurements where the photos were taken. This requires a good deal of patience and even greater technical knowhow. The data they captured helps give the game its photographic look.









GRAPHICS

THE PURSUIT OF A credible experience has led the *Modern Warfare* team to consider even the smallest details–from product branding and the posters seen on walls, to faction insignia and body art. You might overlook the minutiae in the heat of battle, but the game would feel flat and lifeless without them. Here's a selection of the background visual items found throughout.



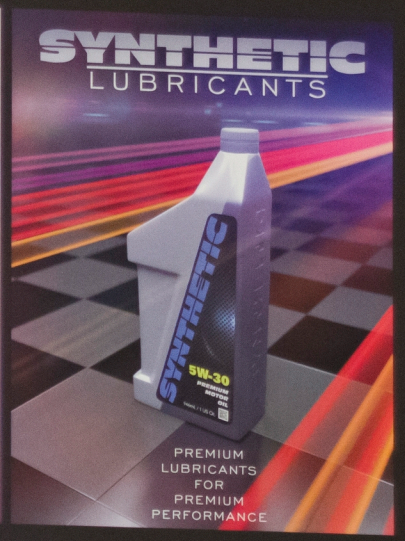
GRAPHICS // **BRANDING**

Modern Warfare combatants will come across many products and faux advertisements spread throughout the gameplay environments– all fictional, but each appropriate to the location and presented in an entirely authentic manner.

There is a sense here that the design team had fun in creating this selection of logos. If not for the fact that they're imaginary, it would be easy to believe they are the logos for real-world automotive items and suppliers.







GRAPHICS // **AUTOMOTIVE POSTERS**

As with the branding seen previously, this selection of automotive posters has been given the same amount of consideration and is equally convincing. Given the use of the Union Jack flag in the background of the posters *left* and *above left*, it's a safe bet at least two of these images hail from the UK-based missions. The attention to detail is laudable regardless of their location, however.

Likewise the design and branding of the motor oil products *above* and *below*–none of which are available in stores right now, or at any time in the future. The game takes place all over the world, so we had to create ads and other branding that fit the local cultures for which they were supposedly created.









GRAPHICS // **DRINKS LABELS**

Counteracting the worst excesses of zealous terrorist factions and power-crazed Russian generals is thirsty work. Sadly, *Modern Warfare* players will not be able to avail themselves of the delicious looking sodas *below*, although they look so plausible they might easily exist in the real world.

Luna beer, *above*, might well be magic in a bottle–even though such a brew never existed. However, this scuffed bottle is performing an entirely new trick as an impromptu incendiary device. Useful in a tight spot, no doubt, but the characters in the game would probably have preferred the original contents after a hard day on the battlefield. Even the finest details had to be considered. Beverage companies and even the Molotov Cocktail had to be an original creation.



CORVUS DEFENSE

GRAPHICS // **LONDON**

Below: This poster from Piccadilly Circus might be fake, but it still seems utterly plausible. The logo *above*, meanwhile, is suitably serious for the in-game arms manufacturer.

Players might not appreciate such symbols, as they engage in a fraught mission to prevent Al Qatala operatives from detonating an explosive-laden van at this iconic location. However, minor details like this, in combination with other signifiers–such as red London buses–makes for a more cohesive and believable depiction of the city.

The city is filled with ads for products, shows, events and such. This poster imagines a corny medieval-themed musical, but it might be fun to spot similar advertising in the London missions.















GRAPHICS // **INSIGNIAS**

The symbols indicating the allegiance of factions fighting in the game are yet more examples of the extraordinary lengths the *Modern Warfare* team has gone to in their pursuit of a credible game experience. Such details have no bearing on the action, of course, although they can bring a sense of authenticity to any environment, and their absence would have led to an ineffably lesser experience on the whole. A layer of detail that makes a world of difference in character and vehicle design is the markings passes. Having these details included in the artwork really makes them take on a level of realism. It is often the most fun part of building videogame models.







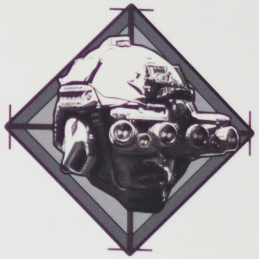














GRAPHICS // **GAME MODE ICONS**

Modern Warfare comprises a thrilling campaign for single players and a number of exciting modes designed to suit multiplayer gameplay. It remains for combatants to discover what each of these ominous looking icons represents, and the mission requirements within. The creation of these symbols was slightly problematic, however, and we had to go through hundreds of designs to get versions that we can use. The most challenging part is creating icons that can be seen at very small sizes.



These icons don't only represent a gameplay mode, but also the players and teams engaged in them. As such, each icon is designed so that it works in a variety of colorways.



GRAPHICS // **FACTION ICONS**

Things are starting to get personal, with this selection of player-selectable icons to use as faction insignias in the multiplayer battlegrounds. This is just a sample, although the preponderance of aggressive and dark imagery seems somehow relevant to the ferocious action in store. Less overtly hostile icons are also available–the Special Forces badge is positively sober in comparison to the others on this page–but the remaining choices at least bespeak intention on the part of the player.

Modern Warfare's multiplayer gameplay has gone back to its roots in factions. We had to find designs for both Western and Eastern sides and the sub-factions that fall under those two. Each sub-faction icon is meant to embody the personality origin of the squad it represents.

Faction icon design is a tricky business, with designs intended to represent aggression, a death-or-glory *esprit de corps* or to strike fear in the hearts of opponents.

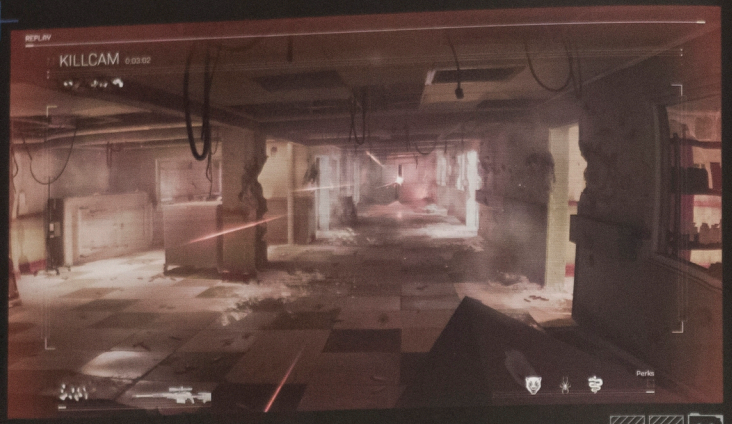


GRAPHICS // **BODY ART**

Customization options are a crucial component of the multiplayer experience. Players may of course enter any combat arena kitted out with the default selections, although that is to miss out on some of the fun available beforehand. Seen here is just a small selection of tattoo concepts designed by the *Modern Warfare* team. Fierce imagery prevails, naturally, and it presumably falls to the player to make good on the promise of their ink choices thereafter.

Our Combat Operators have a considerable amount of variations and incarnations. For many of the alternates we like to include tattoos and other forms of body art. It's amazing to think that we went to this level of detail to render onto the characters' skin.

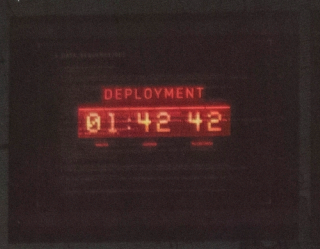
There is no requirement to get ink. In any case, once battle commences, opponents are probably more likely to get a better view of a player's choice. However, flourishes such as this add a layer of choice and ensure a distinctive appearance.

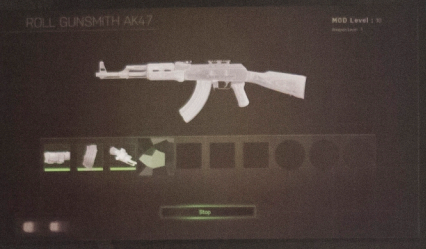


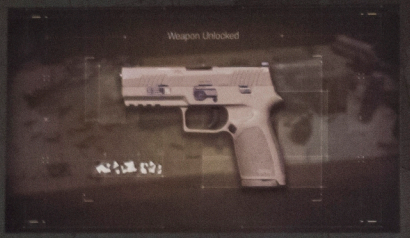
GRAPHICS // **USER INTERFACE**

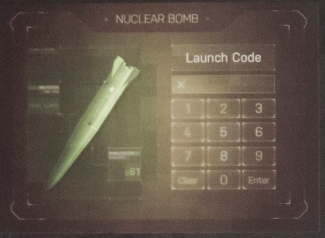
Our attention finally alights on a few of the ways in which the game presents itself–how it is viewed in certain gameplay scenarios and in some of the menu options.

Seen *above*, this 'killcam' view reduces the scene to near monochrome, presumably as a function of the lower-specification of the camera aboard the device–or perhaps for clarity. A variety of weapon selection screens and interfaces *below*, all suitably military and utilitarian in their appearance. The User Interface has been in development since day one. These are just a few, but if we were to properly cover the work that goes into this part of the game we would probably need two books!





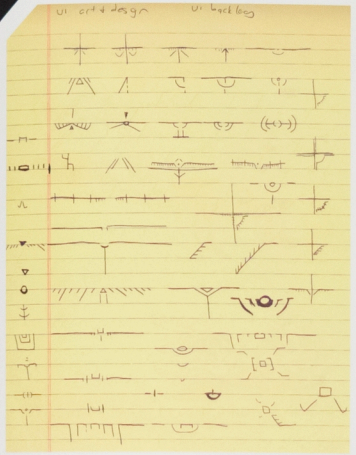


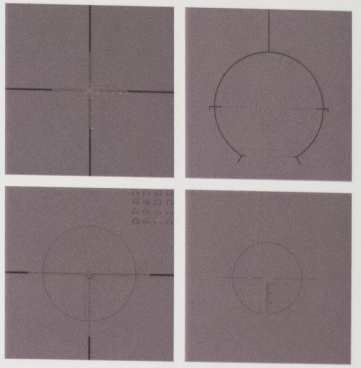




A similarly colorless view is adopted in this overhead perspective of the battlefield. Players of previous outings will recall many occasions when similar aspects were required for the sake of gameplay.

An authentic presentation was once again part of the experience, although the design of these interfaces entailed a standard approach. The targeting systems in the game have many layers to them to make them seem realistic. Aside from all the graphical features used to make it seem as though you are looking through a drone camera or an optic on a weapon, often times we will just simply sketch these elements.





The reticle seen in many gun sights depends on the weapon chosen. Simple crosshairs are generally useful for targeting distant enemies, although do not allow for finer adjustments. It is interesting to see these sketched concepts on the *left*–like scribblings in a school exercise book, but a delightfully analogue solution for what would eventually be a digital interface.

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