




(Splash)

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# DESIGN IN DETAIL

## How to Subtitle Your Talk with an Entire Paragraph and Make Sure You Don't Forget to Mention Halo 3

By Jaime Griesemer

BUNGIE

We are in room 130, it is Thursday at 1:30, and I have about 130 slides  
So I am going to talk very fast and cover a lot of ground!


Welcome to **Design in Detail: How to Subtitle Your Talk with an Entire Paragraph and Make Sure You Don't Forget to Mention Halo 3**

Before we start, is anyone thirsty?

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## Who Am I?

- Gameplay Design Lead
- 11 Years at Bungie
- Weapon Balance for All 3 Halos
  - (Except the Halo 1 Pistol)
- When you curse someone for the Battle Rifle Spread™, that's me



BUNGIE

First, let me tell you a bit about myself

--

**Gameplay Design Lead**

--

**11 Years at Bungie**

--

**Weapon Balance for All 3 Halos**

--

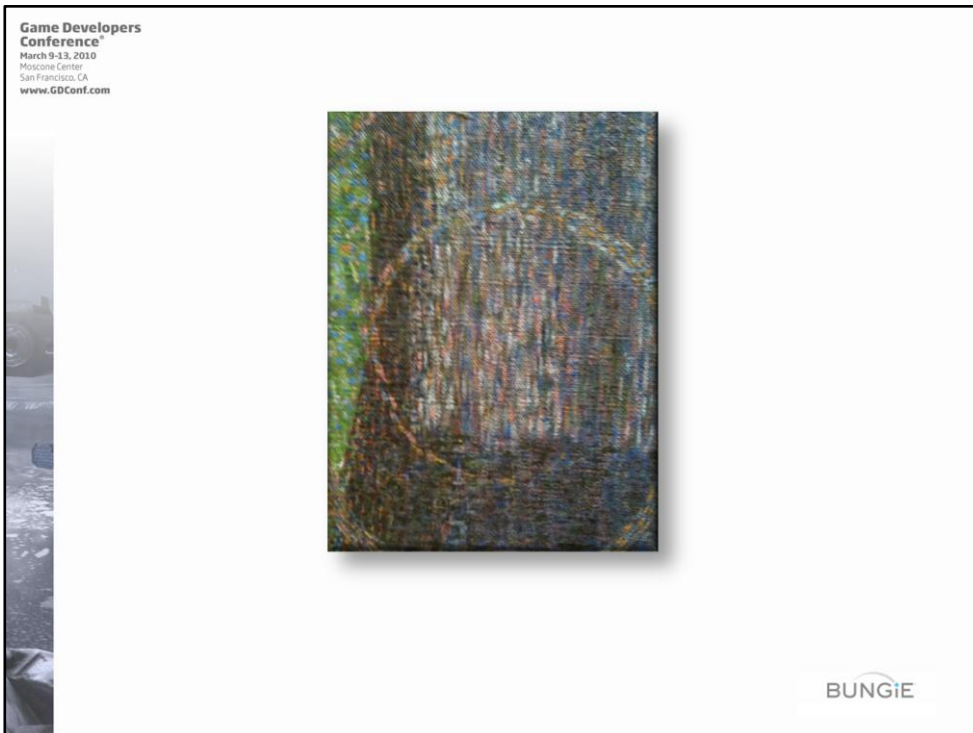
**(Except the Halo 1 Pistol)**

I didn't make that call, I didn't even know about that call... but I'm not bitter about it

--

**When you curse someone for the Battle Rifle Spread™, that's me**

Do you think it will help to put a face on it?



Last year I was at the Art Institute of Chicago  
I saw one of the most famous paintings of all time  
I took a picture of it with my phone  
Any guesses?

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*A Sunday Afternoon on the Island of La Grande Jatte*

By George Seurat

BUNGIE

It's "A Sunday Afternoon on the Island of La Grhand Zhot"  
By Zhorzh Soo-rah  
This painting inspired my talk  
And its very long title  
Still don't recognize it?  
Here it is from a little farther back

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A Sunday Afternoon on the Island of La Grande Jatte


By George Seurat

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(I showed you the part in the lower right by the monkey)

This painting isn't famous for how it looks, or what it shows, but how it was made

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George Seurat

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Seurat lived in the 1800's

He was very interested in how we perceive color

Scientists were just discovering that what we see as one color is actually a mixture of different colored light

To demonstrate this fact, he invented Pointillism

Using tiny dots of basic colors to produce an image

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BUNGE

So I started thinking...  
What happens if we take Halo 3  
Break it into it's tiny details





And analyze just one of them

Take one tiny Decision, and explore it exhaustively

Specifically, the time between shots for the sniper rifle

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## DESIGN IN DETAIL

Changing the Time Between Shots  
for the Sniper Rifle from 0.5 to 0.7  
Seconds for Halo 3

By Jaime Griesemer


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So here is the actual title of my talk

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## Caveats

- My opinions may not represent Bungie management
- My opinions may not represent reality
- All examples, even negative ones, are from good games
- This talk was really hard to write!
- I'm presenting the full version at *SniperRifleCon 2011*



BUNGIE

-

### **My opinions may not represent Bungie management**

In fact, I know they don't!

-

### **My opinions may not represent reality**

This is the past as I remember it, but as we will find out, brains are not reliable

-

### **All examples, even negative ones, are from good games**

I tried to pick on games that everyone knows are great, to avoid controversy

-

### **This talk was really hard to write!**

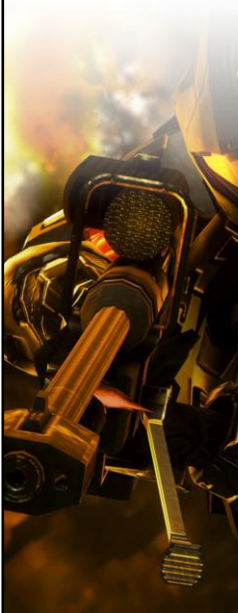
Really hard. The more specific the topic, the more there is to say  
It ballooned to almost 300 slides, editing took forever (and it turns out I *still* didn't edit it down enough!)

--

### **I'm presenting the full version at *SniperRifleCon 2011***

I will be presenting the full version at Halo Sniper Rifle Con 2011

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# DETAIL IN CONTEXT

## Learning from Halo 2

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First, some context from Halo 2

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## Halo 2 was Popular

- Shipped in 2005
- Top Live Game of 2006
- 2007, 2008, 2009
- Will shut down in April
- The Sniper Rifle remained balanced the whole time
- ***Balance is Longevity***



BUNGIE

-

### **Shipped in 2005**

According to Major Nelson

--

### **Top Live Game of 2006**

--

### **2007, 2008, 2009**

--

### **Will shut down in April**

Halo 2 wasn't just popular, it was popular for years

--

### **The Sniper Rifle remained balanced the whole time**

The SR never needed to be changed, limited, banned, it was still fun

This can give us a practical definition of Balance:

--

### ***Balance is Longevity***

## Balance is a State not a Process



- Balance this equation:

$$x^2 - 2x + 4 = 7$$

- Balance this stack of blocks:



BUNGIE

**Balance this equation:**

$$x^2 - 2x + 4 = 7$$

-

Any guesses?

X= 3, I told them my talk would appeal to Engineers!

Great! Now...

--

**Balance this stack of blocks:**

-

(pause)

Balancing an equation is a process

But game balance is a state that either exists or it doesn't

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## Balance is Longevity



*4. Your turn ends 10 seconds after you  
stack your block*

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Let's talk about those blocks for a second  
The 4<sup>th</sup> rule of Jenga makes it clear (say it with me)

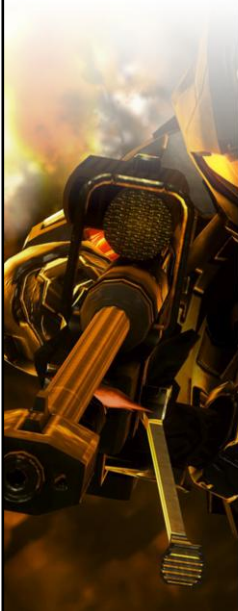
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**4. Your turn ends 10 seconds after you stack your block**

---

It isn't balanced unless it lasts  
*I bet you didn't expect to see a Jenga reference!*

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## Halo 2 Crunch

- Less-than-ideal circumstances
- Production is always worried about a repeat
- Balancer's Paradox
  - Balance can't happen until the end
  - Balance can't wait until the end
- ***Balance in passes***

BUNGIE

There have been other talks about Halo 2's crunch  
I'm not going to re-hash them

-

### **Less-than-ideal circumstances**

My really quick post-mortem, don't set yourself up to try and fix bugs in the Tutorial and balance the Weapons at the same time  
It's not going to work

-

### **Production is always worried about a repeat**

Production and I have a love-hate thing going  
Always asking me when I am going to be done  
So I invented the Balancer's Paradox

-

### **Balancer's Paradox**

I can't balance the Sniper Rifle damage until we set the Player's health  
I can't balance the player's health until we know the engagement distance  
I can't balance the engagement distance until we set the Sniper Rifle damage  
But after using this for awhile, I actually had to invent a solution...

-

### **Balance in passes**

The Sniper Rifle always has to be balanced! You could ship at any time!  
*But there's balanced, and then there's balanced...*

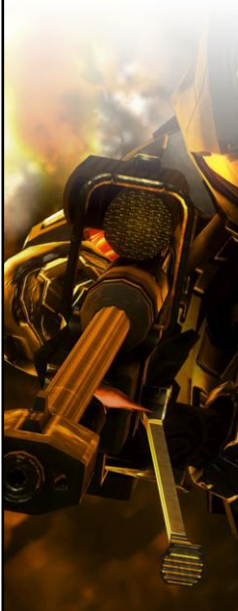


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## Balance in Passes

- At the end of each pass, the game is balanced to a certain level
- Do not backtrack
- Halo 3's Balance Passes
  - Role
  - Flow
  - Strength
  - Limitations
  - Exceptions
  - Perceptions

BUNGIE



--

**At the end of each pass, the game is balanced to a certain level**

--

**Do not backtrack**

Unless you have to, of course

And then it impacts the schedule

--

**Halo 3's Balance Passes**

I'm going to suggest the following passes

They match with stages of game development

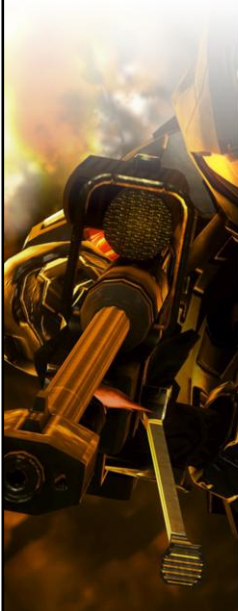
I'll go over them in more detail later

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## Halo 2 was NOT Balanced

- Halo 2 shipped
- Designers played it on Live
- It felt wrong, different, broken
- Somehow we knew it wasn't going to have legs
- *Develop a sense of balance*

BUNGIE



Remember: Balance is Longevity

--

**Halo 2 shipped**

--

**Designers played it on Live**

--

**It felt wrong, different, broken**

--

**Somehow we knew it wasn't going to have legs**

How did we know?

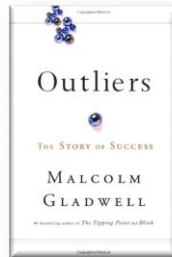
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***Develop a sense of balance***

We had developed our sense of balance

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## Develop a Sense of Balance



*“Ten thousand hours of practice is required to achieve the level of mastery associated with being a world-class expert – on anything”*

*-Malcolm Gladwell*

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In Outliers, Malcolm Gladwell lays out his 10,000 hour rule

--

This makes me the world's only expert in trying to balance the Halo Sniper Rifle  
Sort of a narrow expertise

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## Develop a Sense of Balance



*"An expert is a person who has made all  
the mistakes that can be made in a very  
narrow field."*

*-Niels Bohr*

BUNGIE

Niels Bohr offers this definition

--

This also makes me the world's foremost expert in trying to balance the Halo Sniper Rifle

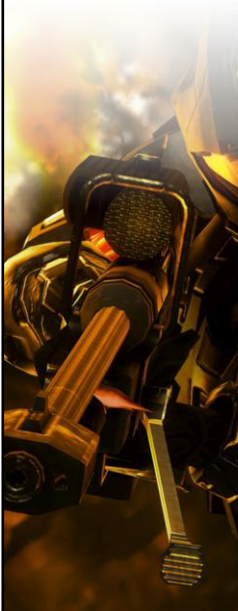
*and* in Driving too Fast for Conditions  
(Don't ask)

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## Develop a Sense of Balance

- The Neuroscience of Intuition
  - Orbito-Frontal Cortex
  - aka “Your Gut”
- Learning process
  - Builds models of the world
  - Makes predictions
  - Releases Dopamine if correct
  - Repeat
- *Get the game inside your head*

BUNGIE



In order to develop a sense of balance, you need to understand how your brain works

-

### **The Neuroscience of Intuition**

You have an Orbito-Frontal Cortex

It's called that because it is located behind your eyes

But it's really your Gut

-

### **Learning process**

It goes through a process when you learn

It builds a model of the world

Makes predictions about that model

If it is right, it releases Dopamine, which cements the model a little bit

If you are a designer, you need to familiarize yourself with how this process feels

--

The ultimate goal is to

***Get the game inside your head***

You want the model in your gut and the game in the world to be the same

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## Halo 2 Patch

- Choosing to patch was hard
- Choosing what to patch was harder
  - Melee did more damage
  - Grenades had a smaller radius
- Choosing what NOT to patch was hardest
  - We didn't change the Sniper Rifle
- ***Make the hard choices***

BUNGIE



Ok, back to Halo 2

--

### **Choosing to patch was hard**

Nobody wants a patch, it is expensive

Luckily we had network bugs, so we were going to have to patch anyway

--

### **Choosing what to patch was harder**

You want to tweak everything, but you can't because then testing gets out of hand

--

### **Choosing what NOT to patch was hardest**

We didn't change the Sniper Rifle

It was right below the line of what we could safely re-balance

Which brings me to my final theme:

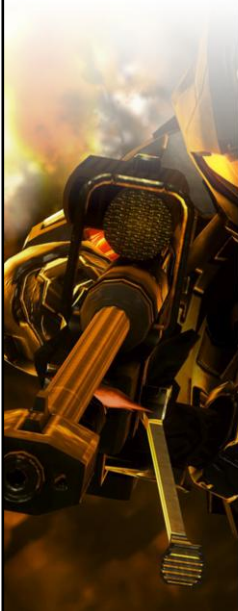
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### ***Make the hard choices***

Balancing is hard because it requires you to do things you don't want to

And it is tricky because there are so many ways to confuse or talk yourself out doing it properly

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## Make the Hard Choices

- The Neuroscience of Reason
  - Pre-Frontal Cortex
  - aka “Your Brain”
- Your brain is a poor tool
  - Very small number of factors
  - Easily confused
  - Subject to constant error
- ***Reason on the detail scale***

BUNGIE

Why are these choices hard?  
Again, the answer is your brain

-

### **The Neuroscience of Reason**

You also have a Pre-Frontal Cortex

It's called that because... Who knows?

We call it your brain

--

### **Your brain is a poor tool**

But it's what we have

You can't reason out everything

You can't reason out very much at all

There are so many ways that your logical mind has to trick you

--

You must confine yourself to

***Reason on the detail scale***

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# Apple or Cake?



*What is your brain's capacity for reasoning?*

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Radiolab is a great show on New York Public Radio  
They have a podcast, you should subscribe!  
In an episode called "Choice" they describe this experiment

Give people a number to memorize, 2 digits to 10 digits  
Send them to another room to repeat their number  
On the way, interrupt them  
(All good psychological tests are about fooling the subjects)

They ask them if they want an Apple or some Cake  
The people with short numbers pick Apples at a high rate  
Apples are better for you, fewer calories, watch your waistline

Longer numbers more often choose Cake  
They are so busy with numbers, they make the decision emotionally  
7-10 numbers are enough to completely fill your rational brain!  
My high school calculator had more horsepower than that!

So when you have to think rationally, think about details or you will get hopelessly lost



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## Four Themes

- Balance is longevity
- Balance in passes
- Develop your sense of balance
- Make the hard choices

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Ok, here are the four themes of my talk

**Balance is longevity**

**Balance in passes**

**Develop your sense of balance**

**Make the hard choices**

I am going to use these themes to explore the Detail

Now let's get to the Sniper Rifle!

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# PAPER DESIGN

## What is the Sniper Rifle for?

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The first step in Halo 3 was the paper design

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## Paper Design Process

- Happens in Pre-production
  - Start before “The Burn”
  - Don’t leave it too early
- Every gameplay object gets a Paper Design
  - Maintain discipline
  - You will save time in the long run

BUNGIE



Are there any producers in the audience?

I have like 4 slides for you, here's the first one

-

### **Happens in Pre-production**

You need to do paper designs *first*

You don't want 40 artists sitting around while you do it

On the other hand, if you leave it too early, you are going to waste lots of time later

So as producers, you need to find creative ways to give us room in this stage

--

### **Every gameplay object gets a Paper Design**

Don't let Designers hand wave

We are great at it!

If we can't write it down it means we haven't figured it out

Lack of design discipline is a huge threat to your project

But if you have a designer that has proven his discipline, then trust his paper design

Take off your design hat

# Halo 1 Paper Design



## Sniper Rifle / Digital Scope

- Long range, high penetration, high rate of fire with 5 round clip (but clip reloads slowly).
- Small contrail, very loud bang with huge flash and slowly dissipating smoke.
- Second trigger adjusts zoom level (exactly how TBD).
- Head shots kill anything man-sized except flood (these high-velocity bullets pass right through flood).

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Nobody has ever seen this outside of Bungie  
Most people at Bungie have never seen this  
I didn't ask if I could show it... oh well  
It's the original paper design for the Halo 1 Sniper Rifle

-

Embarrassingly simple... right?  
(wait)

## Halo 1 Paper Design



- Some specifics are wrong
  - 5 Shots
  - Small contrail
- Some mechanics are unclear
  - Zoom is TBD
  - Headshots are vague
- Many details are missing
  - Maximum ammo count
  - Body shot damage
- ***The Role is an abstract concept***

BUNGE

(Sorry I can't leave it up)

Here's the important things to note:

--

**Some specifics are wrong**

--

**Some mechanics are unclear**

--

**Many details are missing**

--

It's very flawed as a spec, but one thing comes through, the Role of the weapon

**The Role is an abstract concept**

## Halo 3 Paper Design



### Sniper Rifle

*Role: Long-range instant-kill sniper rifle, but reloading makes it hard to use*

- Two zoom levels (2x - 7x)
  - Reloading unzooms
- Magazine of four quick shots, with slow reload
- Does headshots, even through shields
  - kills any biped in one shot (even Players)
  - [anim] special death animation for headshots
  - kill shot accelerates units
- Does massive damage
  - kills a Player in two body shots
  - kills small bipeds in one shot
- Over-penetrates flesh, glass and soft materials
- ~0.5s delay before un-zooming to reload after the last shot of a magazine, so you can see the result of your shot

BUNGE

So now let's look at Halo 3's paper design

--

It's a lot more detailed

It ought to be, it was the third iteration!

--

Still pretty abstract

The role is even more clear

(wait)



## Halo 3 Paper Design

- “Role: Long-range instant-kill sniper rifle, but reloading makes it difficult to use”
- Range
- Damage
- Limitations
- *Clearly specify the role*

BUNGIE

--

**“Role: Long-range instant-kill sniper rifle, but reloading makes it difficult to use”**

The Role is even more clearly called out

(The part about reloading is in there to make it different than the Covenant Sniper Rifle)



## Halo 3 Paper Design

- Important mechanics
  - Two zoom levels (2x - 7x)
  - Magazine of four quick shots, with slow reload
- Desired feelings
  - Does massive damage
- Critical assets
  - [anim] special death animation for headshots
- Special details
  - ~0.5s delay before un-zooming to reload
- ***Include whatever is necessary, nothing more***

BUNGE

Let's look even closer

**Important mechanics**

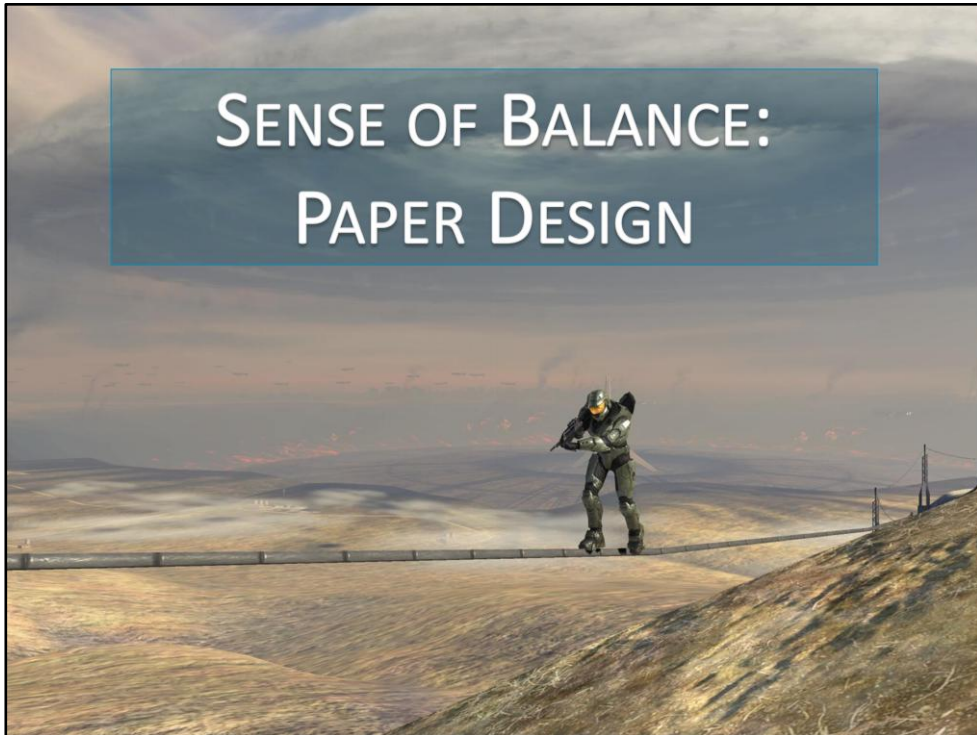
**Desired feelings**

**Critical assets**

**Special details**

***Include whatever is necessary, nothing more***





# SENSE OF BALANCE: PAPER DESIGN

How do you develop your sense of balance for paper designs?

It can be done, you can look at a paper design and have an intuition about how it will work

You are looking for role

And you are looking for a couple key factors that are the results of the role



## Sense of Depth

- Balance between Simple and Complex
  - Too Simple => Bored
  - Too Complex => Boggled
- ***Balance is a barely manageable number of choices***

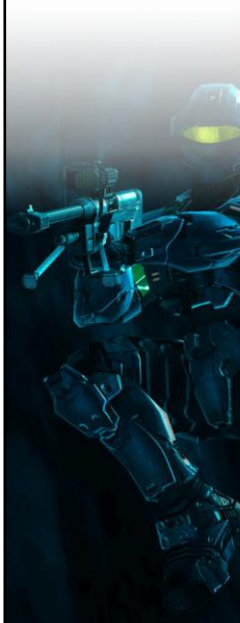
BUNGIE

### **Balance between Simple and Complex**

If your paper design is one sentence long, it is probably too simple  
People are going to reach the limitations and stop playing  
(Remember, balance is longevity)

If it is a page long, it is too complex  
People will never reach their comfort level, they will stop playing

***Balance is a barely manageable number of choices***



## Roles Provide Depth

- The Sniper Rifle is the best weapon in some situations
- Equal payoffs lead to randomized strategies
- Asymmetry demands movement
- *Roles require real differences*

BUNGIE

This is where roles come in

--

### **The Sniper Rifle is the best weapon in some situations**

The Sniper Rifle has a clear role

Times and situations where it is the best

--

### **Equal payoffs lead to randomized strategies**

Game theory tells us that if all the possible strategies have the same payoff, players will pick randomly

You want to avoid choices that don't ultimately matter

--

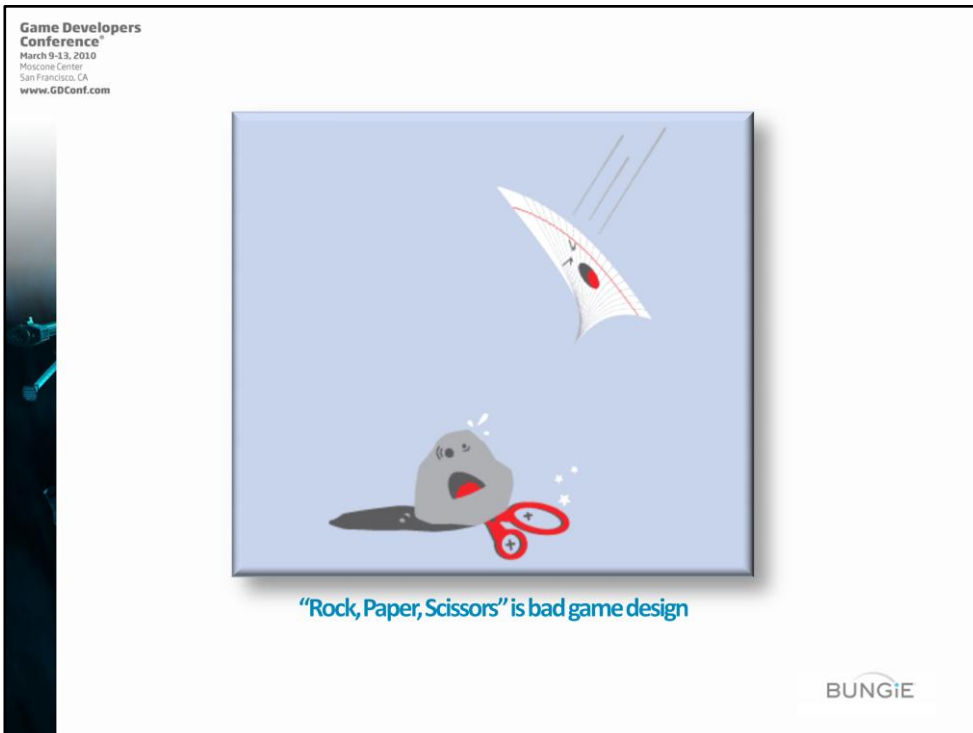
### **Asymmetry demands movement**

But roles provide asymmetry

Incentives to move from one strategy to another depending on the situation

--

### ***Roles require real differences***



One of the tropes of the design community... Rock, Paper, Scissors  
 But it's a terrible game!!!  
 Every choice has the same payoffs, so you pick randomly  
 A cool shirt, though ([www.noisebot.com](http://www.noisebot.com))

EDIT:

After my talk, several people took issue with the fact that RPS is a bad game  
 "It is the foundation of all good RTS games!"

But imagine a RTS game where you could only pick one unit, you had to pick it before the game started, and if you picked wrong you couldn't possibly win, It'd be a bad game!

The reason a RTS game works is because it isn't RPS:

- You can play mixed strategies (choose more than one kind of unit)
- Strategies have different costs to play (tanks cost more than barbarians)
- You can change strategies mid-game
- Strategies rarely have an all-or-nothing payoff (10 Air units can usually kill 1 Anti-air unit)

So I am not using RPS in the casual sense of "a game with counter-strategies" but as defined in game theory  
 Hopefully that clears things up a bit

EDIT 2:

I also got a lot of people saying, "It is the foundation of Street Fighter!"

This is true, somewhat, more than the RTS case, anyway

But imagine a turn-based game of SF where the first hit wins the match, again, a bad game

The reason SF works is that it is also not really RPS:

- SF is a *series* of RPS interactions, so things like reputation and anticipation come in
- It is played *very* quickly, so low level decision making and muscle memory determine your strategy more than choices
- And even with that, most non-expert players tend to "button-mash" which is a great example of "random strategy"

Believe me, I am not trying to insult RTS games or SF (or even Ro Sham Bo Tournament Champions) but to encourage designers to see how roles lead to non-equal payoffs, and therefore avoid random strategies



## Roles Provide Depth

- The Sniper Rifle is the *only* very long-range weapon
- (Okay, technically there is a Beam Rifle, but not on the same mission!)
- Role:Weapon is 1:1
- Weapons without unique Roles add complexity, not depth
- It is hard to add weapons to Halo, all the roles are filled
- *Roles must be unique*

BUNGE

--

**The Sniper Rifle is the *only* very long-range weapon**

--

**(Okay, technically there is a Beam Rifle, but not on the same mission!)**

--

**Role:Weapon is 1:1**

---

**Weapons without unique Roles add complexity, not depth**

--

**It is hard to add weapons to Halo, all the roles are filled**

--

***Roles must be unique***



“Rock, Paper, Scissors, Lizard, Spock” is worse game design

BUNGE

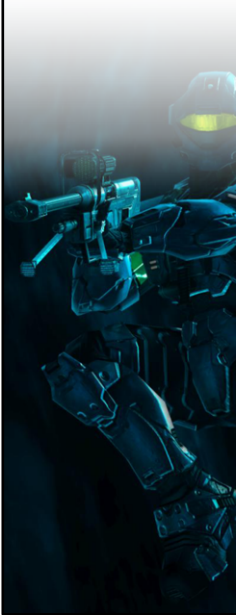
### “Rock, Paper, Scissors, Lizard, Spock” is worse game design

This game is from the show “Big-Bang Theory”

It looks more interesting, but it isn't

It is just more complicated

It will still reduce to equal payoffs and random play



## Roles Provide Depth

- The Sniper Rifle is necessary
- Weapons:Roles is 1:1
- Roles without Weapons make the game incomplete
- This is why every game has the same set of weapons
- *Roles must be filled*

BUNGE

The converse is also true!

--

**The Sniper Rifle is necessary**

--

**Weapons:Roles is 1:1**

--

**Roles without Weapons make the game incomplete**

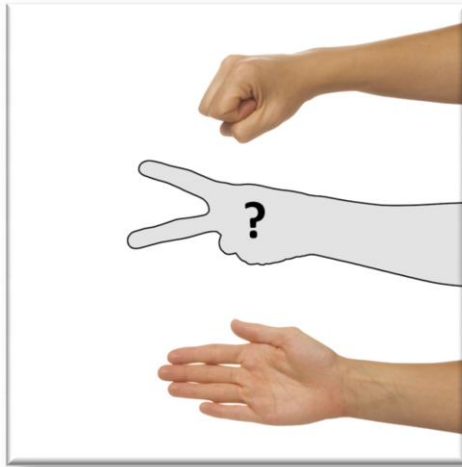
--

**This is why every game has the same set of weapons**

--

***Roles must be filled***

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"Rock, Paper" isn't even game design... is it?

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This doesn't even make sense!

(Interesting note: Halo 1 was this close to shipping without a Shotgun, can you imagine?)



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## Roles Provide Depth

- No “Crappy Sniper Rifle”
- Avoid strict dominance

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--

**No “Crappy Sniper Rifle”**

--

**Avoid strict dominance**

Wait, what is strict dominance?



Example of Strict Dominance

--

Who picked the Health Potion? The single-use health replenisher you can buy for 30 rupees?

Who picked the Piece of Heart? The totally unique health-extender you can never buy?

-

Right, everyone picks the Piece of Heart  
(If you didn't, it's ok, you were probably eight.)



## Roles Provide Depth

- No Crappy Sniper Rifle
- Avoid strict dominance
  - Cut the Short Range Sniper Rifle
- Practice “iterative deletion”
  - If you cut the Tank, cut the Anti-Tank Mine

BUNGIE

--  
--

### Practice “iterative deletion”

Iterative deletion means you remove all the dominated strategies  
Then you remove all the strategies that were only good against those strategies

If you cut the Tank, cut the Anti-Tank Mine



## Sense of Anticipation

- Between Chaos and Certainty
  - Too Chaotic => Guesses
  - Too Certain => Fatalism
- ***Balance means probable, but not inevitable, future events***

BUNGIE

The second way to develop a sense of balance about paper designs is to look for anticipation

(Anticipation really isn't the right word for it, maybe "Imperfect Predictability"?)

--

Between Chaos and Certainty

Too Chaotic => Guesses

Too Certain => Fatalism

If you make players guess, they won't see the point and will quit

If you don't give them a chance, they will feel controlled and quit

--

***Balance means probable, but not inevitable, future events***

## Bad Anticipation



*"I'm not a great fool, so I can clearly not choose the wine in front of you. But you must have known I was not a great fool; you would have counted on it, so I can clearly not choose the wine in front of me."*


*-Vizzini*

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So what is Vizzini doing in this scene?  
Other than drinking the poison? (Spoilers!)

EDIT:  
He is engaged in a never-ending series of second-guesses

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## Roles Enable Anticipation

- Yomi
  - David Sirlin ([www.sirlin.net](http://www.sirlin.net))
  - Japanese for “Reading the mind of your opponent”
- Yomi Layers
  - Layer 1: I know what **I** will do
  - Layer 2: I know what **he** will do
  - Layer 3: He knows what **I** will do in reaction to what I know **he** will do
  - **STOP!!!**
- The Sniper Rifle has one purpose
- ***Limit the amount of second-guessing***

BUNGE

David Sirlin ([sirlin.net](http://sirlin.net)) is a SF Champion and a game designer  
 (Wave to David in the audience!)

He calls this concept Yomi

--  
 --

### **STOP!**

In an action game like Halo you don't want players to engage in this kind of second-guessing  
 It will paralyze them from acting and end up in random guessing

--

### **The Sniper Rifle has one purpose**

You *know* what someone with a sniper rifle is going to do  
 The role prevents you from guessing

--

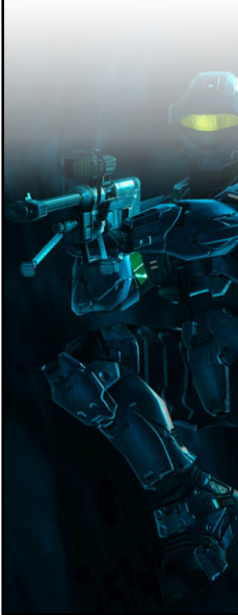
### ***Limit the amount of second-guessing***

Because you want people to be able to anticipate what is going to happen  
 If they are expecting an event, they can process it more quickly and follow the action better

EDIT:

I should have made the point that this *doesn't* apply to all games  
 RTS, Street Fighter, a lot of other games *are* about reading your opponent  
 And those games are *extremely* hard to make  
 You need to give players clues to what their opponent is thinking, like what buildings they have, or what the first frame of the next animation looks like

So this point is probably only true for action games like Halo



## Roles Enable Anticipation

- Successfully sniping confers no benefits
- Success Feedback => I know I will win!
  - Kill streaks
  - Experience points
- Failure Feedback => I know I will lose!
  - Out of Ammo
  - Very long reloads
- ***Feedback loops push away from balance***

BUNGE

### **Successfully sniping confers no benefits**

As designers, we throw around the term “Feedback Loop” a lot  
But they are not always good  
They lead to a game being overly predictable

--

### **Success Feedback => I win!**

I can predict with certainty that I will win, so I stop needing to anticipate

--

### **Failure Feedback => I lose!**

The same is true from the opposite perspective

--

Anticipation requires uncertainty, and feedback loops work against that

### ***Feedback loops push away from balance***

EDIT:

Chris Hecker (and others) pointed out that I had misused the term “Negative Feedback” to describe positive feedback that made me feel bad  
This was the result of me hastily combining two slides at the last minute (which was the result of me being a procrastinator)  
Sorry for the sloppiness!



## MORE THAN YOU CAN CHEW

The best thing about roles is that they help you keep things manageable  
They break the design into workable parts





## Roles are Manageable

- The Sniper Rifle is never your only option
  - Melee Attacks, Grenades
  - Vehicles, Turrets
- The entire balance never rests on one weapon
- *Use multiple Gameplay Channels*

BUNGIE

If you are using roles, make sure players always have other options

**The Sniper Rifle is never your only option**

--

**The entire balance never rests on one weapon**


--

***Use multiple Gameplay Channels***

EDIT:

I could write a whole talk on this topic (maybe next year) but it doesn't fit on a slide very well.

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## Roles are Manageable

- The Sniper Rifle takes up a specific inventory slot
- Monolithic is hard
  - Strict Classes
  - Cars in a racing game
- Slots are easier
  - Sniper vs Warthog
  - Grenade vs Equipment
- ***Use balance groups***

BUNGIE

### **The Sniper Rifle takes up a specific inventory slot**

--

### **Monolithic is hard**

--

### **Slots are easier**

I won't say that monolithic is always bad, just harder

--

### ***Use balance groups***

Balance groups are collections of objects that only have to be balanced against each other

EDIT:

Somebody mentioned that this sounded like a swipe at Monolith Productions Inc...  
That's a stretch

Somebody else said this sounded like a swipe at action games with classes...  
Maybe? 8)

No, not really. There are plenty of cases where classes make sense, just as long as you understand you are making your job harder when it comes to balancing

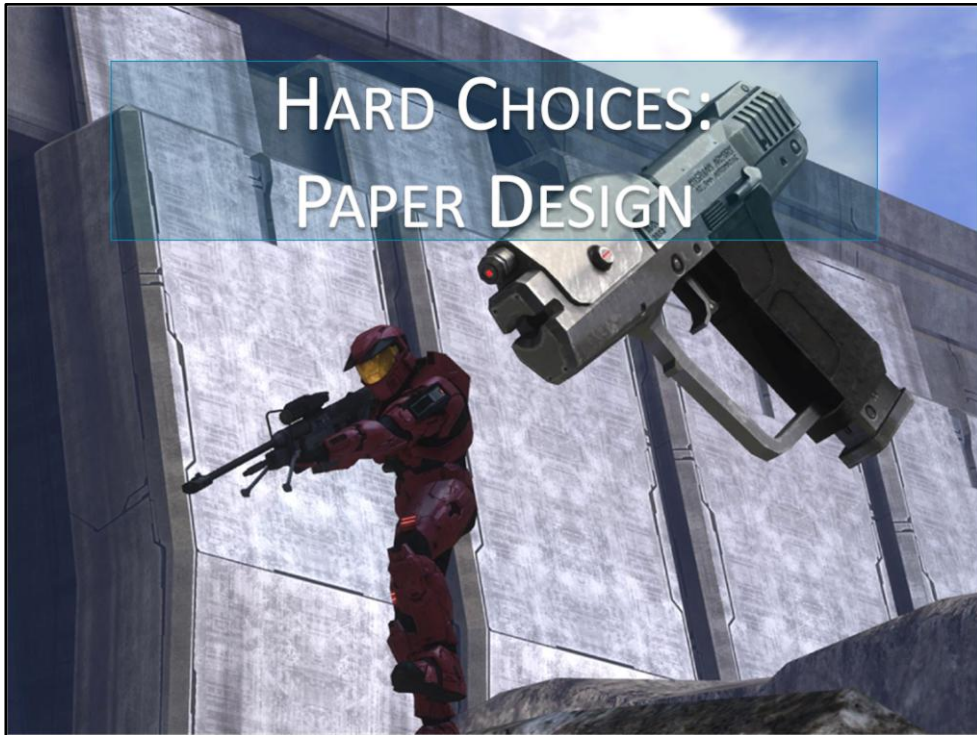


## Roles are Manageable

- The Sniper Rifle is not on every map
  - 75% of MP Maps
  - 50% of SP Maps
- Limited interactions
- Removal based on Role
- *Use subsets of your arsenal*

BUNGIE

**The Sniper Rifle is not on every map**  
**Limited interactions**  
**Removal based on Role**  
*Use subsets of your arsenal*



Imagine somebody is holding a gun to your head... There is too much to do, what are you going to cut!

What are you going to do? How can you get control of your scope?

By making the hard choices



## Hard Choices

- Picking the mechanics
  - Sniper Rifle night vision scope
  - Avoid unimportant details
  - Prioritize early by editing
- Capturing the mood
  - Don't be sterile
  - Engage the imagination

BUNGIE

What are the Hard Choices in this pass?

--

**Picking the mechanics**

--

**Capturing the mood**



## Hard Choices

- Core before Spice
  - The Sniper Rifle was done before the Overshield
  - Focus on the core objects
- “Once you are done, cut half”
  - If you can’t describe the role, cut it
  - If it is too similar to something else, cut it
  - If you can’t sell it to the team, cut it

BUNGIE

--

### **Core before Spice**

Producers, please insert your fingers in your ears at this time

--

### **“Once you are done, cut half”**

Some of the best advice I ever got  
I have never regretted doing this

I’m not going to say “Kill your babies”


Now that I am going to be a dad, the term doesn’t seem appropriate anymore

How about “Put your babies up for adoption”?

There’s always the sequel!

There’s ALWAYS the sequel...

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## INITIAL SETTINGS

### What makes the Sniper Rifle flow?

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After paper design, we move to initial settings  
(Sometimes you would have a long wait while the Engineers prepare the weapon system)

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## Initial Setting Process

- Early in Production
  - As objects come online
  - Set the tone up front
  - Stay ahead of everyone else
- Get plenty of space
  - Feedback is not important
  - Best done in private

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Wake up Producers!

-

**Early in Production**

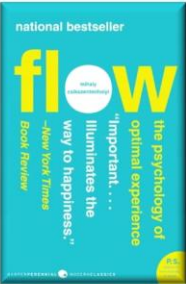
-

**Get Plenty of Space**

Some of the best producers I have worked with really understood the fact that this stage needs some breathing room!



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*“If one takes control of what the body can do, and learns to impose order on physical sensations, entropy yields to a sense of enjoyable harmony in consciousness.”*

*-Mihaly Csikszentmihalyi*

BUNGIE

How many of you are familiar with the concept of Flow?

Lots of talks have been done on this, I'm going to assume you know what I am talking about in general

**“If one takes control of what the body can do, and learns to impose order on physical sensations, entropy yields to a sense of enjoyable harmony in consciousness.”**


Mee-high-ee Cheek-sent-me-high-ee  
(I swear you can get into a flow state just by repeating his name over and over)

The problem is, he wrote in the '70s, he doesn't address video games  
So what does flow look like in a video game?

EDIT:


If you are an aspiring game designer, read this book!  
Heck, if you work on an assembly line or as a tennis pro you should read this book, too!

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## Cadence

- The Sniper Rifle fires with a very specific timing
- Too slow isn't flow
  - Fingers get bored
- Too fast isn't flow
  - Shots blur together
  - A single shot doesn't matter
- ***Cadence leads to flow***



Smiling makes you happy  
 Laughing makes you healthy  
 Certain finger movements make you have flow  
 We call that Cadence

-

**The Sniper Rifle fires with a very specific timing**

--

**Too slow isn't flow**

--

**Too fast isn't flow**

This timing is different for different weapons or different parts of the game  
 But Cadence is important in all kinds of flow

--

***Cadence leads to flow***

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## Verisimilitude

- The Sniper Rifle is on a trigger
- Finger movements match the action
  - Shooting is a trigger
  - Punching is a button
- No verisimilitude, no comfort
  - Punching on a stick
  - Inventory on a D-Pad
  - *Anything* on a Stick-Click
- ***Verisimilitude is required for flow***

BUNGIE



Verisimilitude: the quality of seeming to be true

--

**The Sniper Rifle is on a trigger**

Ok, that's obvious, but it isn't always the case for all game mechanics

--

**Finger movements match the action**

--


**No verisimilitude, no comfort**

The only thing that I have seen work on a stick-click was the Dead Space breadcrumb trail

--

Remember the Paper Design for Halo 1? It speculated that zoom was on a trigger  
If I could go back in time, it probably would be

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## Spectacle

- The Sniper Rifle has a carefully planned effect on the world
  - Sound delay
  - Hanging contrail
  - Headshot animations and physics
  - Unzoom late
- ***Plan the Spectacle***

BUNGIE

-

### **The Sniper Rifle has a carefully planned effect on the world**

The sniper rifle doesn't unzoom as soon as you fire your last shot (even though that would be more efficient)

It unzooms with a slight delay so you can see the results of your last shot

Why is this important?

Studies have shown that *blue* sleeping pills work better

They are chemically identical, but the placebo effect is enormous

Slow-mo explosions look more "real"

Ask any action director, authentic explosions look fake because we have been looking at slow ones for so long

Your brain has expectations

When those expectations are met, the effect is amplified

-

### ***Plan the Spectacle***

Spectacle is part of the flow state

It encourages your brain to maintain flow



Let me tell you a story

Once upon a time:  
This red guy shot at this blue guy  
But the blue guy ducked, so he missed  
Then there was this CRAZY RICOCHET INSANITY!!!  
And the red guy got a Betrayal

How can I tell this story?  
I wasn't that red guy  
(I was the blue guy that ducked!)

--


The answer is: Causality

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# Causality

- The Sniper Rifle looks great on YouTube
  - Giant contrail to the head of an enemy
  - Special headshot animation
- Exaggerated Causality
  - The sequence of events should be artificially stretched out
  - The important reactions are amplified
- *Causality preserves flow*

BUNGIE



### **The Sniper Rifle looks great on YouTube**

You can really follow the action

Even someone that has never played Halo can figure out what happened

--

### **Exaggerated Causality**

The key is to stretch out the time

So cause and effect are very clear

--

### ***Causality preserves flow***


Your brain can connect the events unto a continuous stream of events



But how do I know which initial settings will lead to flow?

How do I train myself to set things up the right way?

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## Lower Your Flow Barrier

- Sniping flow is very fragile
- Make yourself easy to entertain
  - Ignore Framerate problems
  - Ignore bugs and glitches
- Practice filling in details
  - Use your imagination
  - Play the final game in your head
  - Make mouth noises
- Play B-Games with an open mind

BUNGIE

--

### **Sniping flow is very fragile**

It is so easy to break out of  
 Distractions, misses, frustration  
 Especially when you are first setting it up

--

### **Make yourself easy to entertain**

So you while you are setting it up  
 You need to put yourself in a mindset that allows you to maintain flow

--

### **Practice filling in details**

I'm not kidding, get your mouth engaged!  
 Kids are easy to entertain because they make up the fun as they go along


--

### **Play B-Games with an open mind**

The last game I played... Avatar!  
 I had enormous fun!  
 If you can't have fun with an imperfect game, you won't be able to find the flow in  
*your* imperfect game



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## Raise Your Flow Barrier

- Sniping flow has a high ceiling
- Never be satisfied
  - Be irritated by every bump
  - Unleash your inner critic
- Play good games harshly
  - Make lists of what is wrong
  - Point out every flaw

BUNGIE

On the other hand, don't be satisfied with "sorta fun"

--

### **Sniping flow has a high ceiling**

By this I mean that when you get into a flow state, it can be incredibly deep  
So don't sell it short by being easy to entertain

--

### **Never be satisfied**

--

### **Play good games harshly**

Play Halo and then rip the hell out of it!

I can barely stand to play our old games, because I see *every* flaw

Warning: This is going to wreck your ability to *play* games

That's ok because you get to *make* games, which is a lot more fun

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## This is Why You Are a Designer



- Control over Flow is *the* essential design skill
- Don't expect others to have it
  - Most Programmers see bugs
  - Most Artists see in still frames
  - Most Producers see inexplicable delays
- Apply conscious control
  - Know when to have fun
  - Know when you are fooling yourself
  - Half our designers were Philosophy Majors



### **Control over Flow is *the* essential design skill**

In my opinion, control over flow is what makes someone a good designer

This is the *BIG* skill

--

### **Don't expect other disciplines to have it**

Most Programmers see bugs

Most Artists see in still frames

Most Producers see inexplicable delays

--

### **Apply conscious control**

But you need to practice conscious control

I imagine a fun thermostat inside my head that I can set at will

It's impossible to interview for

But philosophy helps you do this

I think it is because philosophy forces to view yourself from the outside

To examine why you think what you think

A crucial part of controlling flow

EDIT:


This slide could be another talk. I flew through it at GDC because I'm not sure it can be explained. Either you understand it instinctively, or you don't.

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## Find the Flow Knobs

- Most Sniper Rifles aren't fun
  - They never find their flow
  - They had some other goal
- Not Doing Science
  - You don't need a control group
  - You don't need to have a theory
  - *Change drastically*

BUNGIE



### **Most Sniper Rifles aren't fun**

And sniper rifles are easy compared to some things  
So find the fun at all costs!

--

### **Not Doing Science**

This is why you do this step in private

You don't need everyone to know all the dead ends you ran down

I would never tell the Engineers half the crazy stuff I have tried

EDIT:

This is not strictly true, I have a reputation for being crazy, so I can get away with more experimentation

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## Find the Flow Knobs

- Learning to Drive
  - The accelerator doesn't do anything until you find the ignition
  - Blinkers are pointless unless there is traffic
  - Sometimes you will release the emergency brake and roll down the hill into a tree
- *Change in groups*

BUNGIE

--

### Learning to Drive

Imagine you were learning to drive, but nobody was able to teach you  
You might never figure it out

--

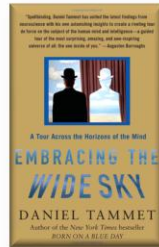
### Change in groups

Again, this is not science  
You are training your powerful emotional brain  
You are making modes and releasing dopamine

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## Find the Flow Knobs



*“Unlike the ‘jaggedness’ of composite numbers, I visualize primes as smooth and round ‘pebbles’... I am able to generate larger primes... by drawing on my intuition of how prime numbers ‘look’”*

BUNGIE

Daniel Tammet has Asperger’s disease  
He has amazing skill with numbers  
He can just *intuitively* spot prime numbers  
(Read Quote)

-

For me, there is an audible click when something hits the sweet spot  
Like a record player falling into the groove

So, go with your gut!  
Trust your heart.  
Reach out with your feelings?



(wait)

This picture has nothing to do with the topic, I just loved it



## Remember the Flow Knobs

- Certain things about the Sniper Rifle lead to flow!
  - 4 Shots per clip
  - Max zoom distance
  - Zoom time
  - Overpenetration
  - Zero error
  - No permanent kick
  - Total Ammo
  - Headshots always kill
- Once you find them, make note
- ***Know what cannot change, and then don't change it!***

BUNGIE

--

**Certain things about the Sniper Rifle lead to flow!**

--

**Once you find them, make note**


--

***Know what cannot change, and then don't change it!***

--

Remember, no backtracking! Don't wreck the flow balance during future passes

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## Crank the Flow Knobs

- The Sniper Rifle:
  - Is *perfectly* accurate
  - Travels *instantly*
  - Zooms *instantly*
  - *Always* kills with a headshot
- Too strict => Fewer reach flow state
- Too loose => Heightened sensitivity to distractions

BUNGIE

Once you have the knobs, crank them to 11!  
Don't be shy!

--

### **The Sniper Rifle:**

All of them are set to the max, no hedging for fear of balancing them later

--

### **Too strict => Fewer reach flow state**

If you don't, people won't have room to reach the flow state.

--

### **Too loose => Heightened sensitivity to distractions**

Ironically, the more you loosen up these knobs, the more obvious other distractions get

Do it anyway!



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## ROUGH BALANCE


How does the Sniper  
Rifle relate to other  
weapons?

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Ok, now you have a flowing Sniper Rifle  
And all the other weapons are fun by themselves

How do you put them together?

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## Rough Balance Process

- Mid-to-Late production
  - Don't start until the game works!
  - Balancing too early is worse than balancing too late
- Solid build
  - Write bug-free code
  - Fix gameplay bugs immediately
- Optimized build
  - 30 FPS (under real conditions)
  - Good Lighting, Sounds, Effects, Animations

BUNGIE

This slide is for the Engineers

---

### **Mid-to-Late production**

Design needs to start doing rough balancing in the middle of production  
 Probably before you hit any kind of Code Complete milestones

--

### **Solid build**

Write bug free code, easy for me to say, right?

But stability is important, if the build is broken it interrupts the process and I have to start over

And if you don't maintain the gameplay systems the whole time, the game will never get fun

--

### **Optimized build**

And I know coding practice is to "optimize at the end"

But you are killing us!

True fact: If you do not have good lighting in a playtest build, your AI will score lower  
 I don't know why, but it is an example of how performance problems make it hard to balance the game

So once you have a solid build, what exactly are you balancing?



During this pass, you are balancing strength

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## Strength

*“The taste of Heinz’s ketchup began at the tip of the tongue, where receptors for sweet and salty first appear, moved along the sides, where sour notes seem the strongest, then hit the back of the tongue, for umami and bitter, in one long crescendo. How many things in the supermarket run the sensory spectrum like this?”*

- Malcolm Gladwell

BUNGIE

In What the Dog Saw, Gladwell tries to figure out why there are 50 kinds of mustard, but just one kind of Ketchup

-

(Read Quote)

Gladwell goes on to say that Heinz is the best because it has all of them in balanced proportions.

EDIT:

I couldn't find a way to fit this into my talk, but I found it interesting

Well after publication of this book, some research came out that we can also taste fat, which is probably why we put ketchup on french fries.

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## Heinz Ketchup

- Heinz Ketchup
  - Salty, Sweet, Sour, Bitter, Umami
  - All really strong flavors
  - All perfectly balanced
- Professional Tasters call that “Amplitude”

BUNGIE

Heinz Ketchup  
Tasters call that Amplitude

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## Halo is Ketchup

- Lots of flavors
  - Close range, long range
  - Aiming, running
  - Vehicles, grenades, melees
- All of them strong, working together
- ***Balance requires strengths***

BUNGE

Halo is like ketchup

--

Lots of flavors

--

All of them strong, working together


--

***Balance requires strengths***

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## Affordance

- A visual clue to the function of an object
  - Heidegger called this “Ready-to-hand”
  - This is where Sci-Fi games have trouble
- *If you have to explain it, it’s not a strength*



BUNGIE

A big part of knowing if something is strong or not is Affordance

--

**A visual clue to the function of an object.**

We have trouble with this in sci-fi

What is a Proton Phase Amplifier good for?

--

***If you have to explain it, it’s not a strength***

If it isn’t affordant, it probably doesn’t have a strength

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## Competence Motivation



*“Competence’ may be defined as a condition or quality of effectiveness, ability, sufficiency or success.”*

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This book is a hardcore textbook and it rocks  
And by that I mean it is dense and hurts your head

--

The authors define competence this way


The desire to show competence is a major human motivator



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## Competence

- Sniping starts off hard
- The more you learn, the more competent you get
- Strengths are things you can get good at



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**Sniping starts off hard**

--

**The more you learn, the more competent you get**

--

**Strengths are things you can get good at**

But why is competence so important?

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# Competence Motivation



*“Implicit motives [like Competence] are the primary source of motivational energy.”*

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Because they are implicit motivators

-

External motivators evaporate fast

When you reach the level cap, you stop playing

When you finish the story mode, you stop playing

Internal motivators last and last

When you get good at sniping, you want to play MORE!!!

And remember, balance is longevity, so you need long-term motivators



So how do you recognize strength when you see it?


How can you train yourself to appreciate strength?

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## Change Constantly

- People hate it when the Sniper Rifle changes
  - “Just when I was getting good!”
  - It resets their competence
- Prevent optimization
  - Brains are lazy, don’t let your playtesters optimize
  - Beginner’s Luck
- Prevent Inertia Bias
  - “But that’s the way it has always been”
  - “It’s perfect now”
  - “Why is that Designer still making changes?!”
- ***Every playtest, something different***

BUNGIE



--

### **People hate it when the Sniper Rifle changes**

Why do they hate it?

It resets their competence

Why should you do it anyway?

--

### **Prevent optimization**

Beginner’s Luck is what happens when your brain is sub-optimal

You think it through, you are very careful

--

### **Prevent Inertia Bias**


You could also call it “We have a Deadline Bias”

--

### ***Every playtest, something different***

Keep the changes coming!

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## Change in Passes

- Strength is relative
  - Strong things get weaker
  - Many Halo weapons kill in one shot
- Make passes
  - Increasing the strength
  - Weed out the weaknesses
  - Compare to the last pass
- ***Bring everything to the same level of strength***

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During this stage, you should be continuously making passes because

--

### **Strength is relative**

By the time you get through all the weapons, the ones you started with will be weak again

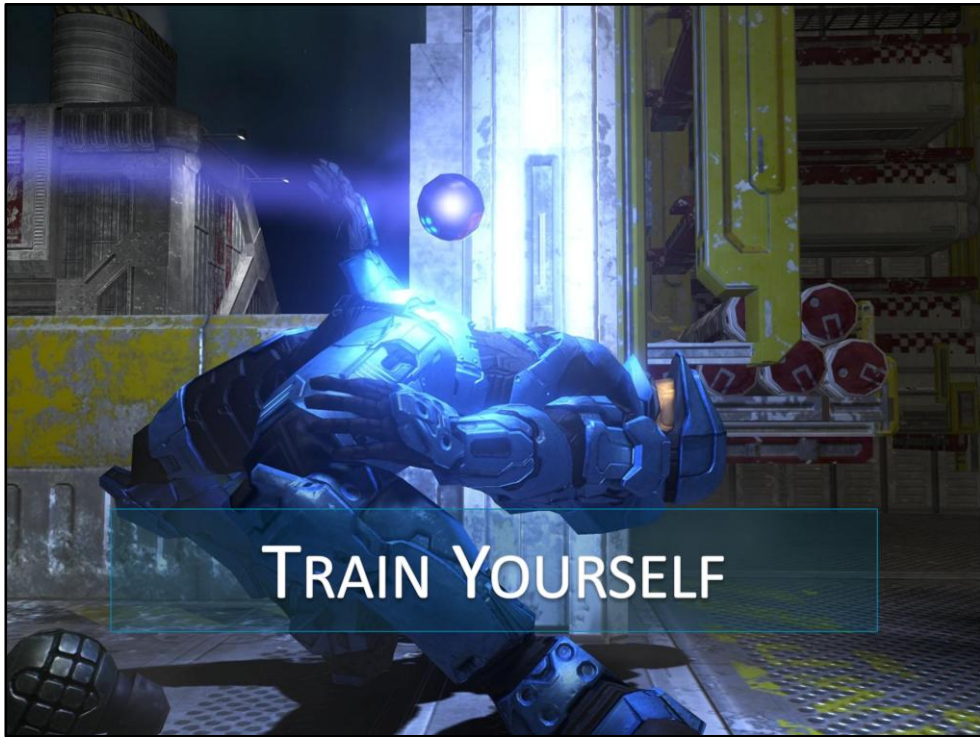
That's how you get to the point where lots of weapons kill in one shot

--

### **Make passes**


--

***Bring everything to the same level of strength***



This guy is really good at Halo

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## Train Yourself

- I am NOT really good
  - I am not a good *Sniper*
  - I am not good at any weapon!
  - I am not good at Halo *on purpose!*
- Dopamine is not specific
  - Success feels good
  - You will mistake it for good balance
- ***Keep your neurons plastic***

BUNGIE

Pro-players often complain that “The guys making decisions suck at their own game”

-

That’s true

**I am not really good**

-

The problem is

**Dopamine is not specific**

--

***Keep your neurons plastic***

You should always feel like you are learning about your game

If you start to feel like you have mastered it

Change something so you aren’t good again

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## Train Yourself



- Don't play too much
  - Don't get invested in your competence
  - Don't forget your paper designs
- Don't specialize
  - Don't pick favorites
  - Don't neglect things
- ***Spread yourself out***

BUNGIE

It isn't just about getting good

--

### **Don't play too much**

Even if you aren't getting good

Your lazy brain will like what is more familiar

--

### **Don't specialize**

I must admit, I love the Warthog

It got a lot more time than anything else, and it shows

But be responsible, at least make sure your favorite things are the most important things

--


### ***Spread yourself out***

Jump from thing to thing

If it starts to feel comfortable, move on to something else



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## Train yourself

- On the other hand... sometimes you *do* want to play a lot
- Spend more time with what works than what doesn't
  - Just driving the Warthog around
  - Playing a Sniping encounter over and over
- ***Once it works, get it stuck in your head***

BUNGIE

BUT sometimes this is not true!

**On the other hand... sometimes you *do* want to play a lot**

--

**Spend more time with what works than what doesn't**

I have spent hours and hours just driving around a working warthog

--

***Once it works, get it stuck in your head***


This is going to help you notice problems later

Some bug will make the Warthog drive funny and you will notice immediately



Notice that these guys are getting stronger and stronger as we go?

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## Hard Choices

- Bug#12: The Sniper Rifle reload is too long
- Don't let people file bugs against balance during rough stage
- Don't let people file bugs against balance period
- Don't even listen to complaints yet, they have no foundation
- ***Don't be reactive***

BUNGIE

Hey Producers, this is the most important slide!

--

**Bug#12: The Sniper Rifle reload is too long**

I actually got this bug once

Note that it is only the 12<sup>th</sup> BUG!

--

**Don't let people file bugs against balance during rough stage**

--

**Don't let people file bugs against balance period**

**--'t even listen to complaints yet, they have no foundation**

"This gun has no sounds. Is it going to ship like that?"

Sometimes the Hard Choice is to follow through on your paper design

Be faithful to your plan, get it up before you tear it down

--

***Don't be reactive***

You are getting paid to do this, it is your duty to use your best judgment

And enjoy it, because after this stage you don't get to ignore feedback!

NOTE:

Early in my career, I was often accused of ignoring feedback

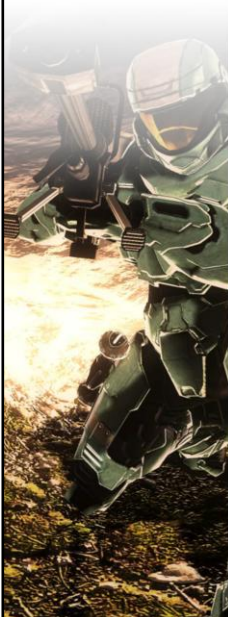
Mostly because we spent a lot of time in the rough balancing stage

When really I was just unable to do anything with the feedback until it was working

Now I try to make it clear to people that "This thing is not working yet, please hold your feedback until it is ready"



If you design by committee, you end up like these guys



## Hard Choices

- Certain things about the Sniper Rifle make it strong
  - Damage
  - Accuracy
  - Distance
  - Headshots
- Write them down for later
- Remember, no backtracking
- ***Know what cannot change, and then don't change it!***

BUNGE

### **Certain things about the Sniper Rifle make it strong**

--

Here are a few of them

--

### **Write them down for later**

Just like with the Fun Knobs, you want to know what makes something strong

--

### **Remember, no backtracking**

Or at least, if you do have to backtrack, admit that you are doing it

And let it get reflected in the schedule

--

***Know what cannot change, and then don't change it!***



## Hard Choices

- Crank them to 11
- Make everything overpowered
- *If everything is overpowered, nothing is*

BUNGIE

If you get one thing from me, it's this:

--

### **Crank them to 11**

Don't do half measures, if you find something that works, CRANK IT!

This is especially true of strength

--

### **Make everything overpowered**

If you do this to every part of the game, balance will still be attainable

--

To paraphrase The Incredibles...

*If everything is overpowered, nothing is*



## Hard Choices

- Flow Knobs are set
- Strength Knobs are set
- Flatten the Rest
  - Remove complexity
  - Simplify functionality
  - Don't obscure the Role

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--

So at this point

**Flow Knobs are set**

--

**Strength Knobs are set**

And here comes the hard choice

--

**Flatten the Rest**

There are going to be a lot of little subtle things that get lost

But those things are just noise, confusion

Maybe find a way to make them strengths

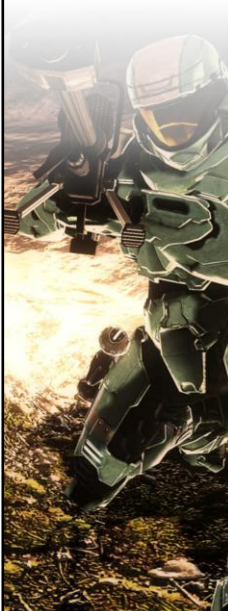
Maybe add them in as polish details

But for now they just get in the way!

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## Hard Choices

- The Sniper Rifle was balanced for Multiplayer
- Once you have Multiplayer, Single-player is simple
- Make the AI accommodate
  - Halo AI knows when they are in your sights
  - Sniper Ammo is doled out sparingly
  - Some encounters are intended to be easy
- ***Focus on the multiplayer***



BUNGIE

--

**The Sniper Rifle was balanced for Multiplayer**

--

**Once you have Multiplayer, Single-player is simple**

--

**Make the AI accommodate**

--

***Focus on the multiplayer***

EDIT:

I think I went through this slide in about 3 seconds because we (Bungie) have talked about this before

But it *is* important, multiplayer is much harder to get working than single-player

And you don't want to have difference between the two if you can help it

So a lot of times single-player balance needs to wait

(Which makes the mission designers nervous, of course, so get it done before the missions are being tuned for difficulty)





Again, you can't make things too powerful!

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## POLISH PASS

How do you fine tune a  
Sniper Rifle?


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How do you fine tune a sniper rifle?

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## Process

- Late Production
  - Start before things settle
- Playtest Lab
  - Regularly scheduled
  - Quick build process
  - Don't tell them what changed
- Focus Groups
  - Get the feedback immediately
  - Let people argue with each other
  - Don't let them talk about solutions



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### **Late Production**

You need to start before things start to settle  
You don't want game balance to happen randomly  
It needs to be an intentional process

--

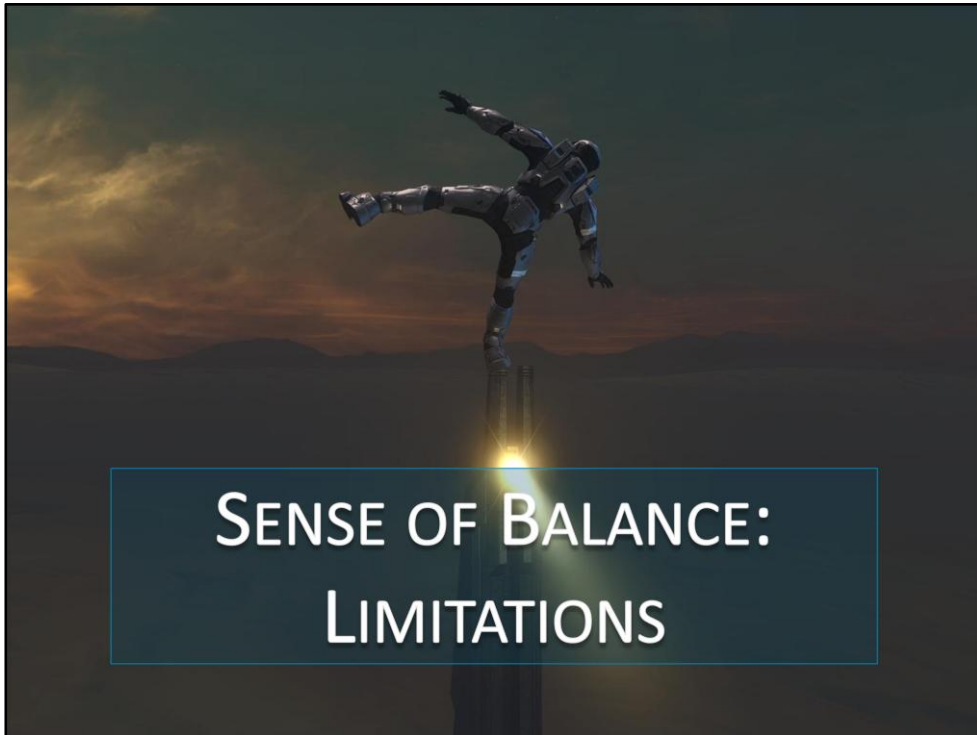
### **Playtest Lab**

There have been other of talks on our playtest process  
John Hopson gave a good one last year  
Here's a quick summary

--

### **Focus Groups**

At this stage, most of your feedback is going to come from focus groups  
Probably with members of the dev team




So how do you tune a sniper rifle?

The answer is NOT by adding weaknesses!

It's by limiting the strengths

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## Balance is Choices

- Balance between Predictability and Random
  - Too Predictable => Only One Choice
  - Too Random => No Basis for Choices
- *Watch for Mixed Strategies*

BUNGE

### **Balance between Predictability and Random**

If your game becomes predictable, you probably need to limit strengths

--

### ***Watch for Mixed Strategies***

Game theory tells us that the ratio of people playing strategies is roughly the same as their effectiveness.


Ok, here comes the hard part...



Taking Team Feedback


Without anyone getting kicked in the face

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## Types of Feedback

- Desirable Feedback
  - “I don't like this”
- Thoughtful Feedback
  - “I don't like this because...”
- Undesirable Feedback
  - “You should change this to this”
- People can tell you what they don't like, but not how to fix it
- ***Trust their guts, not their brains***



There are three kinds of feedback

--

**Desirable Feedback**

--

**Thoughtful Feedback**

--

**Undesirable Feedback**

--

**People can tell you what they don't like, but not how to fix it**

--

You always need to listen when people don't like something

You are too close to it

And you probably already fixed all the things *you* didn't like

--

***Trust their guts, not their brains***


Trust people's emotional reactions, don't just blindly take their advice

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## Types of Feedback

- Feedback means "the game in my head is different"
  - What is the game in their head?
  - Is it the game we are making?
  - Even people with the wrong game have useful feedback
- Watch out for Development Bias
  - Less likely to overcome barriers to entry
  - More likely to complain
  - People accept things once they are set

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Before you can interpret someone's feedback, you need to know the source

--

### **Feedback means "the game in my head is different"**

Always preface any feedback with this phrase

Often times your response to feedback should be to probe about what kind of game they are imagining

You don't necessarily need to agree on the game you are making

--

### **Watch out for Development Bias**


You see this a lot with the public when the development process is very open, as well



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## Types of Feedback

- Look for Types of Players
- The Optimizer
  - *If Luke uses the Sniper Rifle, it is probably overpowered*
  - Find the optimal solution quickly
  - Great at breaking balance
- The Rager
  - *If Chad is angry, something is disturbing the flow*
  - Low tolerance for imbalance
  - Point out rough spots



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You also need to understand the source of feedback

--

### **Look for Types of Players**

If you can categorize someone's play style, it will help you understand how to react to their feedback

Here are some examples:

The names have been changed to protect the guilty

--

### **The Optimizer**

--

### **The Rager**



## Types of Feedback

- The Role Player
  - *Joseph always snipes, how successful is he?*
  - Always play the same way
  - Test ineffective strategies
- “Your Mom”
  - *Look, Steve can’t figure out how to zoom*
  - Naïve or poor players
  - Show you where newbies will falter

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--

### The Role Player

--

### “Your Mom”

As in, this is so obvious, even your Mom could do it

I used to balance “Easy” by playing with my nose

Steve still couldn’t beat it

I miss that guy, he was incredibly useful for balancing



## Types of Feedback

- The Griefer
  - *If Nathan is having fun sniping, someone else is hurting*
  - Looking for different kinds of strength
  - Represents most players on Live
- The Pro
  - *If Charlie wants to cut the Sniper Rifle, it is probably too random*
  - Pro-style players hate random outcomes
  - Want to simplify the game to just skill
- ***Watch people that play differently than you***

BUNGE

--

### The Griefer

--

### The Pros

Most importantly, figure out what kind of player *you* are!  
(I'm a role-player)

And then

--

***Watch people that play differently than you***



Sometimes, you need to let your head drive

EDIT:

I removed the next three slides about how a million monkeys will not make Hamlet in a million years

I SHOULD have removed them BEFORE my talk

They were tangential, complicated, too long, full of math, distracting, boring, lame  
And I didn't even do the math correctly

A disaster that I could have avoided by following my on advice

"If it doesn't support the role, cut it"

Sorry for the revisionist history...

Take it as a concrete example of what happens when you think something is just too clever to get rid of, even if it doesn't work

## Hard Choices



- Physics Over Math
  - Players don't perceive math directly
  - Fix rate-of-fire, not the damage-per-shot
  - Fix base damage, don't add random variance
- Instant over Average
  - Players don't perceive averages over time
  - Don't use total ammo to balance lethality
  - Don't use playtest data to avoid fixing a bad event
- ***Balance what the players can see***

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### **Physics Over Math**

Players can't see math, they can't develop a feel for it

--

### **Instant over Average**

Players don't care about the average

They care about individual events

--

As a Designer you *can* see the math

As a Designer you *do* care about the average

Resist the urge to use those to balance

### ***Balance what the players can see***



Hey look, a totally fair game

A totally boring, pointless, frustrating, *fair* game

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## Hard Choices

- Temptation to Symmetry
  - Every fight in Halo is unfair
  - Especially with the Sniper Rifle
  - On the small scale, that is fine
- Tic-Tac-Tie is a bad game
- ***Don't polish off your edges***

BUNGIE



“Fairness” isn’t the goal

It is part of the goal, but balance is longevity

Making a game fair by making it homogenous will wreck longevity

--

**Temptation to Symmetry**

--

**Tic-Tac-Tie is a bad game**

--

***Don't polish off your edges***

If there is nothing to complain about, there probably isn’t anything worth talking about at all

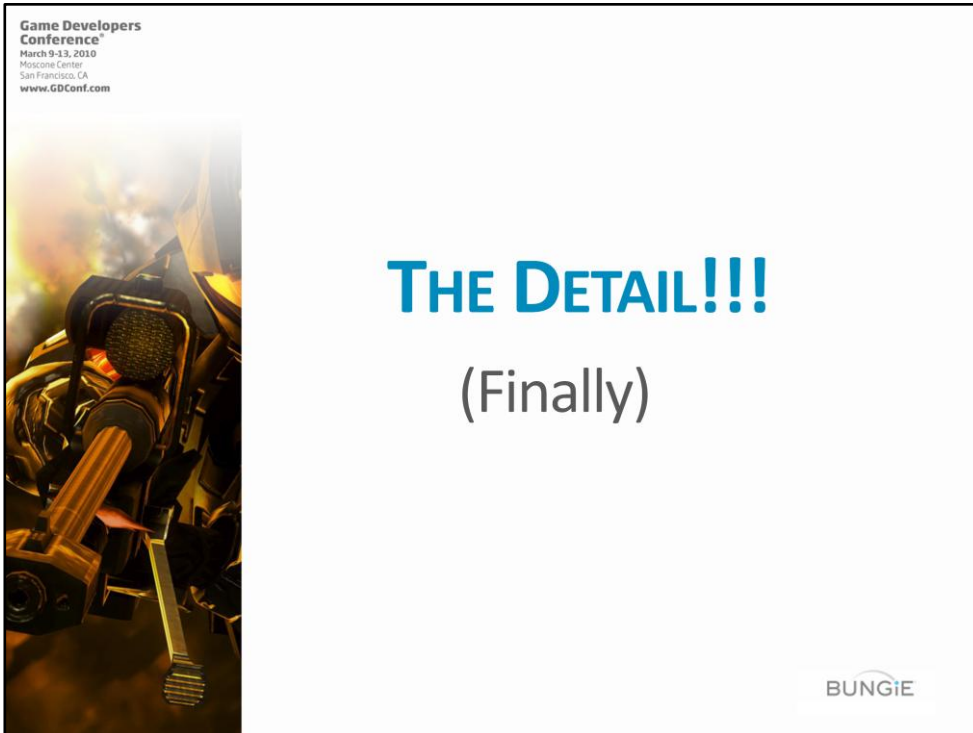
--

Ok, now we are ready

We have done our passes

We have trained our sense of balance

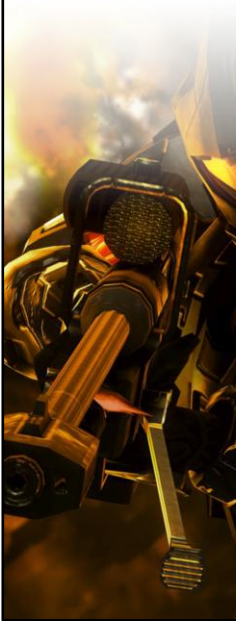
We have made the hard decisions



This is the point in development where we finally changed the Sniper Rifle

Now I will try to describe how all the work from previous passes informed this decision





## Finding the Problem

- The Sniper Rifle was overpowered
  - Remember, we made it that way!
  - But now the other weapons felt weaker
- Optimizers were using it exclusively
  - Depth was gone, game was too simple
  - Role Players were getting creamed

BUNGIE

--

### **The Sniper Rifle was overpowered**

But it made the other aspects of the game feel weaker

--

### **Optimizers were using it exclusively**

Note that not *everyone* was using it

But certain people I knew were optimizers were



## Finding the Problem

- It was being used at close quarters
  - Outside its role, dominating other weapons
  - Contrary to all the effects and expectations
- No counter-strategies
  - Sniper could acquire, zoom and fire too quickly
  - Even after a body shot, couldn't make it to cover

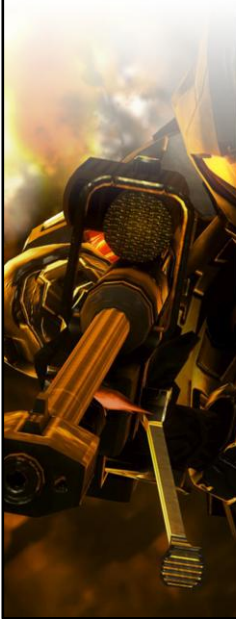
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--

**It was being used at close quarters**

--

**No counter-strategies**



## Finding the Problem

- Most importantly, every time I saw someone use it, I got nervous
  - My internal model was wrong
  - Dopamine was down
  - Emotional self was tingling
- *Use your Sense of Balance to feel when something is wrong*

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**Most importantly, every time I saw someone use it, I got nervous**

When something impacts you emotionally we say we were “moved”

Emotions are what compel you to act, not data, not graphs

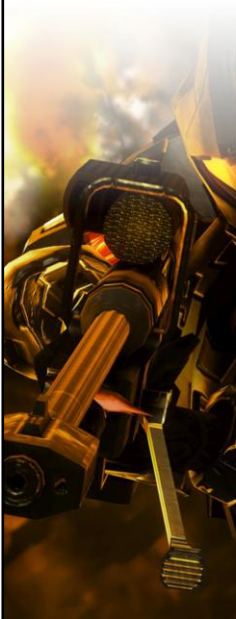
--

***Use your Sense of Balance to feel when something is wrong***

## THE SNIPER RIFLE IS BROKEN



After we came to the conclusion that the sniper rifle was broken, how did we fix it?



## Making the Change

- Don't touch the Strength Knobs
  - Can't reduce the damage
  - Can't shorten the range
- Don't try to add weaknesses
  - It's seductive, it's easy, it's what everyone else does
  - It will ruin your game
  - Can't add any error
  - Can't remove the melee attack
  - Can't give it a constant warning sound

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Here's what we didn't do

--

### **Don't touch the Strength Knobs**

In most cases, they aren't the problem anyway

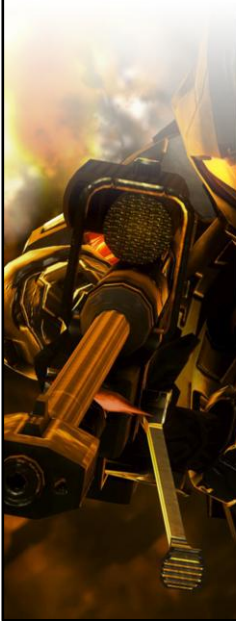
When a weapon is being used as intended, it *should* feel overpowered

So most imbalances come from using it outside its role

--

### **Don't try to add weaknesses**

It often feels like the only option, but find something else!



## Making the Change

- Have to touch the Flow Knobs
  - Remember, we removed all the other knobs
  - What happened to “Don’t backtrack”?
- Fine tune without losing flow state
- Cadence is the most flexible
  - Most prominent part of the Sniper Rifle’s flow
  - Has a large impact on strength
- *Use your Rational Brain to decide how to change*

BUNGIE

--

### **Have to touch the Flow Knobs**

There isn’t anything else, because we removed it  
But wait, I said don’t backtrack!

--

### **Fine tune without losing flow state**

Revisit in light of what you now know about the game  
Don’t change them so far that you lose flow

--

### **Cadence is the most flexible**

So many problems can be fixed by adjusting cadence  
Because so many cadences work for flow

--

### ***Use your Rational Brain to decide how to change***

Don’t rely on your gut, you need to make this change very intentionally



## Making the Change

- Balance by limiting strengths
  - Which change fixes the problems?
  - Which change has the least impact?
- Shots in the clip
  - 3 shots isn't enough to kill two people
  - Pressure to reload after every kill
- Length of the reload
  - Would have to be increased a lot
  - Felt like adding a weakness

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--

### **Balance by limiting strengths**

Where is strength happening outside of the role?

--

### **Shots in the clip**

So we couldn't change the shots in a clip

--

### **Length of the reload**

This is also a cadence knob

But we would have had to increase it so much

It would have felt like a weakness



## Making the Change

- Time to full zoom
  - Fixes the problem with acquisition speed
  - Doesn't fix the problem of close range use
  - Encourages people to fire without zooming, breaks the role
- Unzoomed Headshots
  - Fixes the problem of close range use
  - Doesn't fix the problem with acquisition speed
  - Severely limits strength

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--

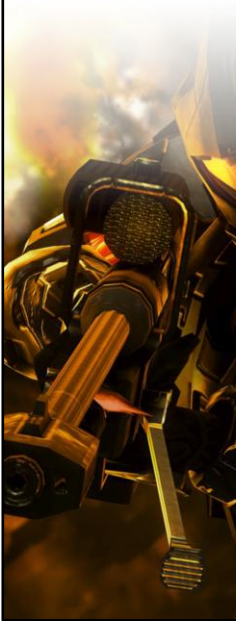
### **Time to full zoom**

We actually tried this  
But it broke the role

--

### **Unzoomed Headshots**





## Making the Change

- Maximum total ammo
  - Strictly limits kills
  - Fixes the average, but not the instant
- Time between shots
  - Fixes acquisition speed and close range use
  - A small change goes a long way
  - Isn't a negative feedback loop (prolongs the fight)
  - This is the one
- ***Make the hard choices carefully***

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--

### Maximum total ammo

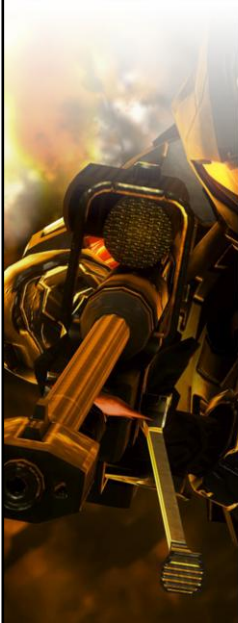
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### Time between shots

There were actually a number of other options we considered  
Many of them we made, tested, and then reverted

--

### ***Make the hard choices carefully***



## Making the Change

- 0.5 -> 0.7
- Don't make changes less than 10%
  - Has no noticeable effect
  - You can twiddle numbers forever
- Overshoot and come back
  - Insure the change actually has the desired outcome
  - Compensate with another knob
- Don't break the flow
  - Anything higher than 0.7 was a drag
  - Unfair is better than unfun

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### 0.5 -> 0.7

And there is the change

0.2 seconds

--

My rough policy is

**Don't make changes less than 10%**

It's very easy to convince yourself you *can* feel tiny changes

But even if *you* can, nobody else will be able to

Balance never hinges on a 5% difference in a single number

--

**Overshoot and come back**

I think I initially tried 0.9 seconds

Which totally wrecked the flow

But *did* fix the problem, so we knew we were on the right track

--

**Don't break the flow**

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## Verify the Change

- Verifying the Change
- The Sniper Rifle is still overpowered
  - Remember, we want it that way!
  - But other weapons don't feel weak
- Optimizers started to diversify
  - And complain, of course
  - Jason the Shotgun Ninja is happy again

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--

### **Verifying the Change**

Go back to what told you that a change was required  
And verify they have been addressed

--

### **The Sniper Rifle is still overpowered**

Only overpowered in its role  
When you are using it right, we want to reward you

--

### **Optimizers started to diversify**



## Verify the Change

- Much less effective at close quarters
  - Can't get the second shot off fast enough
  - Requires a no scope, which is an event
- No longer predictable outcome at range
  - Maybe you get a second body shot
  - Maybe they get back to cover
- I was no longer nervous
- ***Use both your brain and your gut to verify a change***

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**Much less effective at close quarters**

--

**No longer predictable outcome at range**

--

**I was no longer nervous**

--

***Use both your brain and your gut to verify a change***



THE SNIPER RIFLE IS BALANCED!

--

EDIT:

At this point, the audience at the GDC talk started clapping, cluing me into the fact that I was out of time

So I just went with the flow and ended it there, which was fine

I had walked people through the balancing process, brought up the important principles, and applied them to the sniper rifle change

But I had also intended to mention a couple things about the last stages of balancing, so here they are!

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# BETA BALANCE

Fix the exceptions,  
meet expectations

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I'm talking about a public beta, like we had for Halo 3

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## Process

- Wait until you have *finished* the polish balance
  - In this stage you shouldn't have to make balance changes
  - You will be dealing with exceptions and perceptions
- Do it early enough to react
- Treat it like a release cycle
- Don't include everything

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--

### **Wait until you have *finished* the polish balance**

You need to be confident in your balance before you start setting expectations

--

### **Do it early enough to react**

It doesn't have to be that long, I think we had 2 weeks for Halo 3

--

### **Treat it like a release cycle**

Because your customers will treat it like a demo

It better be solid

--

### **Don't include everything**

Because you don't include everything in a demo

And some pieces may not be through the polish pass when you need to be ready for the beta

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## Exceptions

- Unexpected uses
- Glitches and Bugs
- Untested combinations
- Map or Mission imbalances
- *Trust your balance, but look for where it breaks*

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What are you looking for in a beta, if it isn't balance?

--

### **Unexpected uses**

Remember, most balance problems come from using a weapon outside its role  
And beta testers are great for finding ways people will abuse the roles

--

### **Glitches and Bugs**

Especially bugs that break the balance  
No test team could catch them all

--

### **Untested combinations**

Tests everything vs everything

--

### **Map or Mission imbalances**

Tests everything everywhere

--

### ***Trust your balance, but look for where it breaks***

It's not a good idea to overreact to feedback and do last minute re-balances  
(Halo 1 Pistol again)

Betatesters definitely suffer from Development Bias, if it doesn't change the forum  
posters will still accept it




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## Perceptions

- New players have no expectations
  - They believe what the effects and sounds tell them
  - They won't take the time to look for hidden strengths
- ***Make sure perceptions match reality***

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The other thing you are looking for is perceptions that don't match the balance

--

### **New players have no expectations**

They find mis-matches between what the game is telling them and the actual balance  
Beta players thought the Spartan Laser should be a super weapon like the rocket launcher

We intended it to be an anti-vehicle weapon

We had to change a lot of the effects, especially the targeting laser

--

### ***Make sure perceptions match reality***

But we change the effects, not the role

Don't change reality to match perceptions (if you can get away with it)

RECAP!





## Conclusions

- Balance is Longevity
  - It's a state, not a process
  - Balance strengths, not weaknesses
  - Doesn't need to be perfect, just lost in the noise
- Balance in Passes
  - Role, Flow, Strength
  - Limitations, Exceptions, Perceptions
- Develop a Sense of Balance
  - Use Emotions to know when something needs to change
  - Use early stages to train your mental model
- Make the Hard Choices
  - Use Reason to determine what specific change to make
  - Evaluate changes rigorously
  - Don't take the easy way out
- *Make the time between shots for Sniper Rifle 0.7 seconds!*

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--

**Balance is Longevity**

--

**Balance in Passes**

--

**Develop a Sense of Balance**

--

**Make the Hard Choices**

--

***Make the time between shots for Sniper Rifle 0.7 seconds!***

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## Screenshots



Barack Obama X  
Hawty McBloggy  
HxC R 2The aven  
KNIGHT179  
Masterofdeath07  
MiniPotnoodle  
Morio\_kun  
oOJAKEOo

Robofighter4  
Static Jack  
TheLightShow  
tOm saville  
VoLcOm ArMy  
XxHeLLsSnipErX  
YourUncleBob  
[www.halo3screenshots.org](http://www.halo3screenshots.org)  
[www.noisebot.com](http://www.noisebot.com)

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Special Thanks to all the Halo fans out there making great screenshots!

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Probably the most useful slide in the whole talk



Bye!