

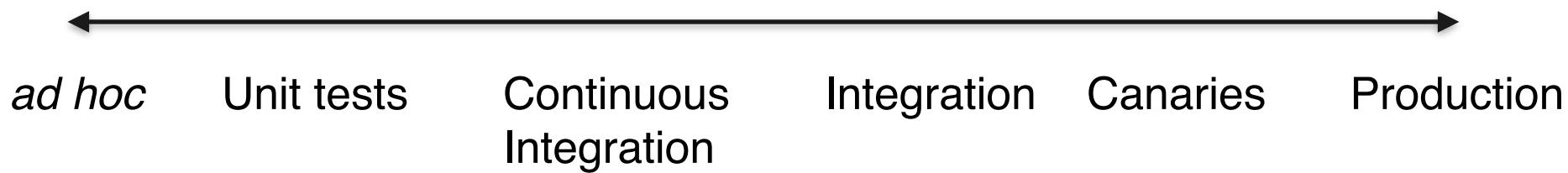
# Code Review

# Ways to Validate

# Ways to Validate

- Static Validation
  - Stare at the Code
- Dynamic Validation
  - Running the source code

# Dynamic Validation



# Static Validation

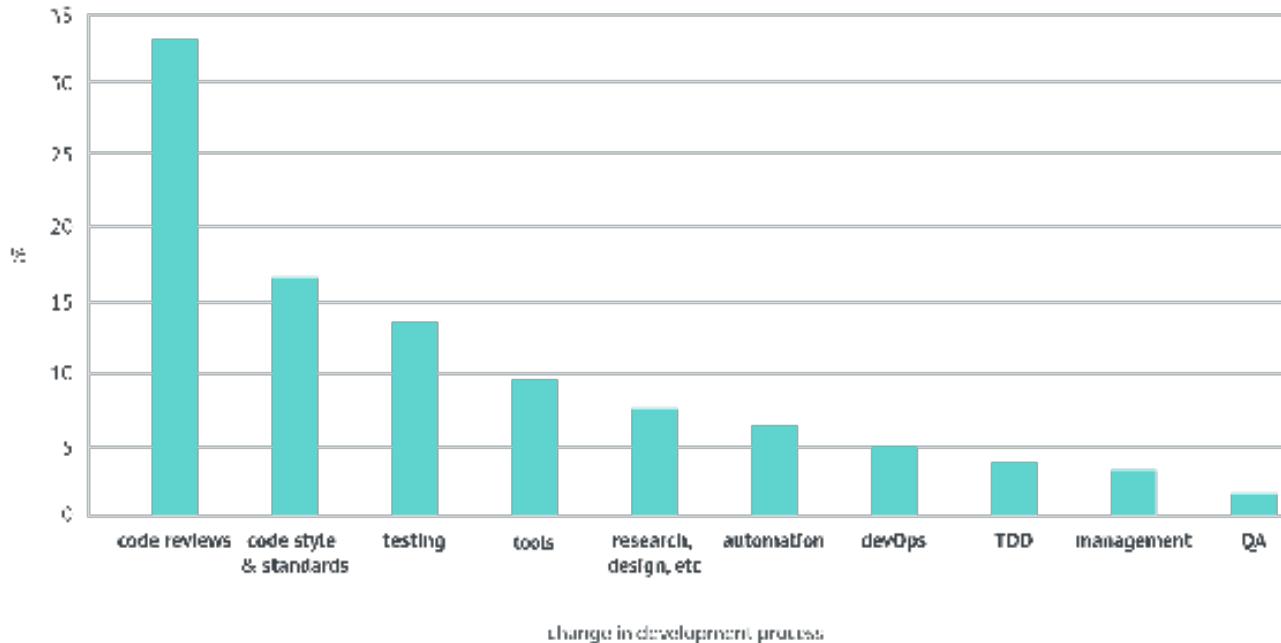
# Static Validation

- Style Guides
- Compiler
- Static analysis
  - [FindBugs](#)
  - [clang-tidy](#)
  - [Pylons Webtest](#)
- Code Review

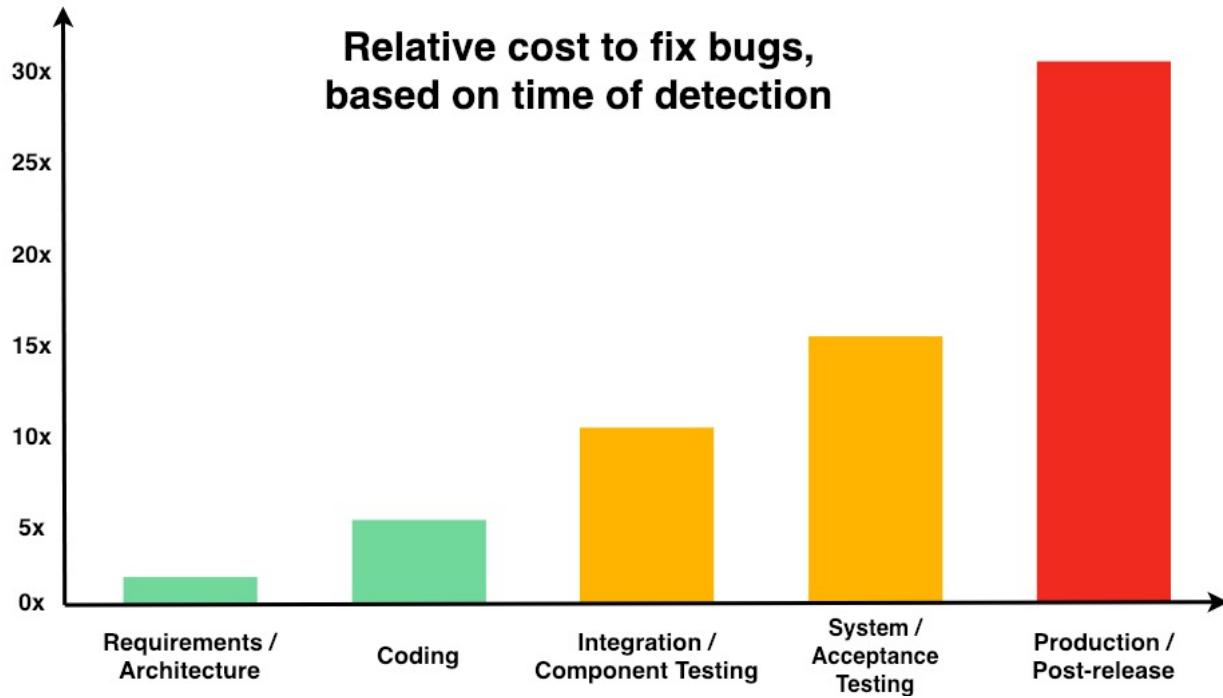
# Code Review

- Does this code do *what* it claims?
  - Are there any programming bugs?
- *Why* are we making this change?
  - Are there any design bugs?

## What change in your development process had the biggest impact on code quality?



# Motivation



# Motivation

Linus's Law: "Given enough eyeballs, all bugs are shallow."

- *The Cathedral and the Bazaar*, Eric Raymond

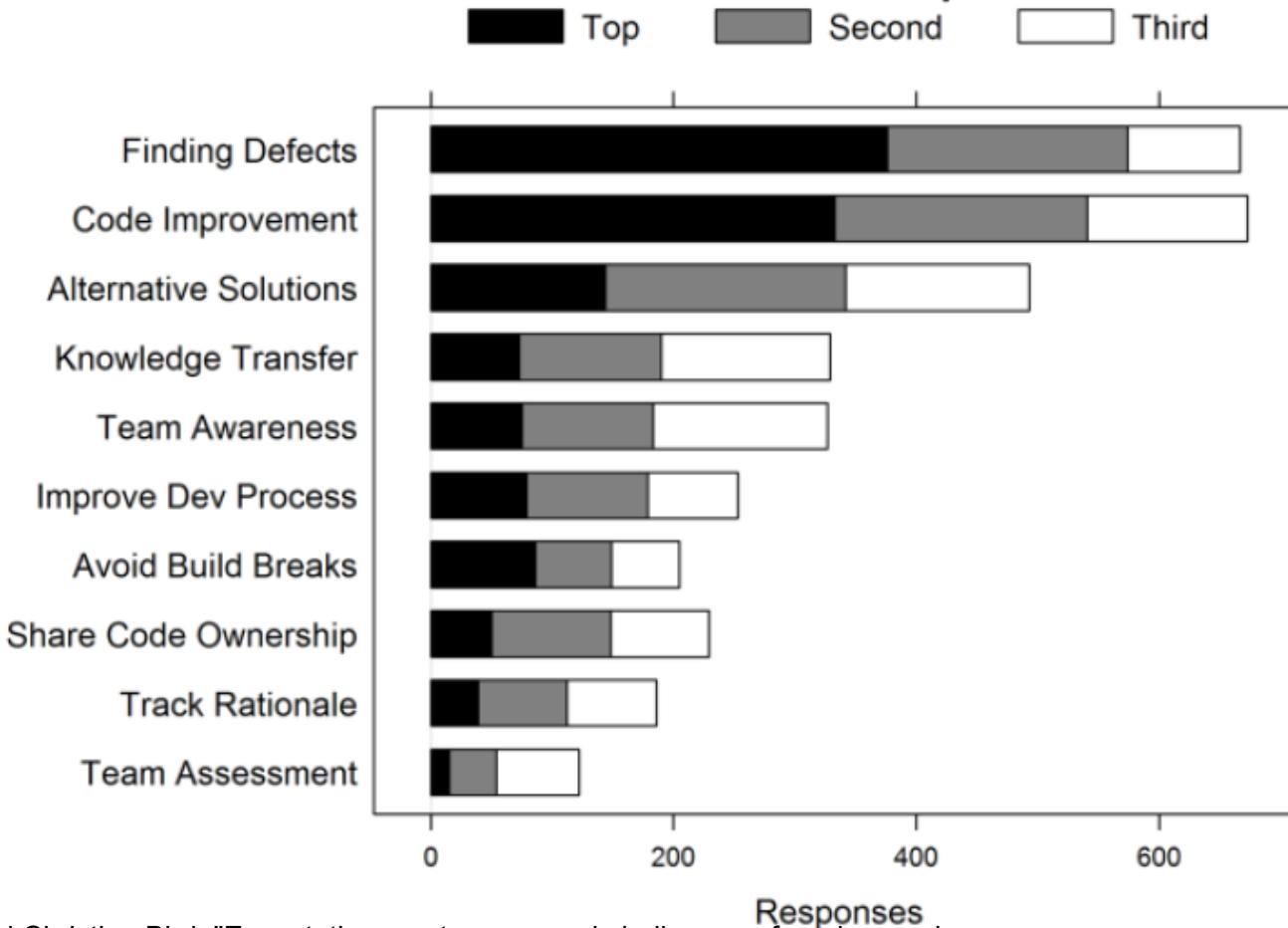
"Have peers, rather than customers, find defects"

- Karl Wiegers

# **Expectations and Outcomes**

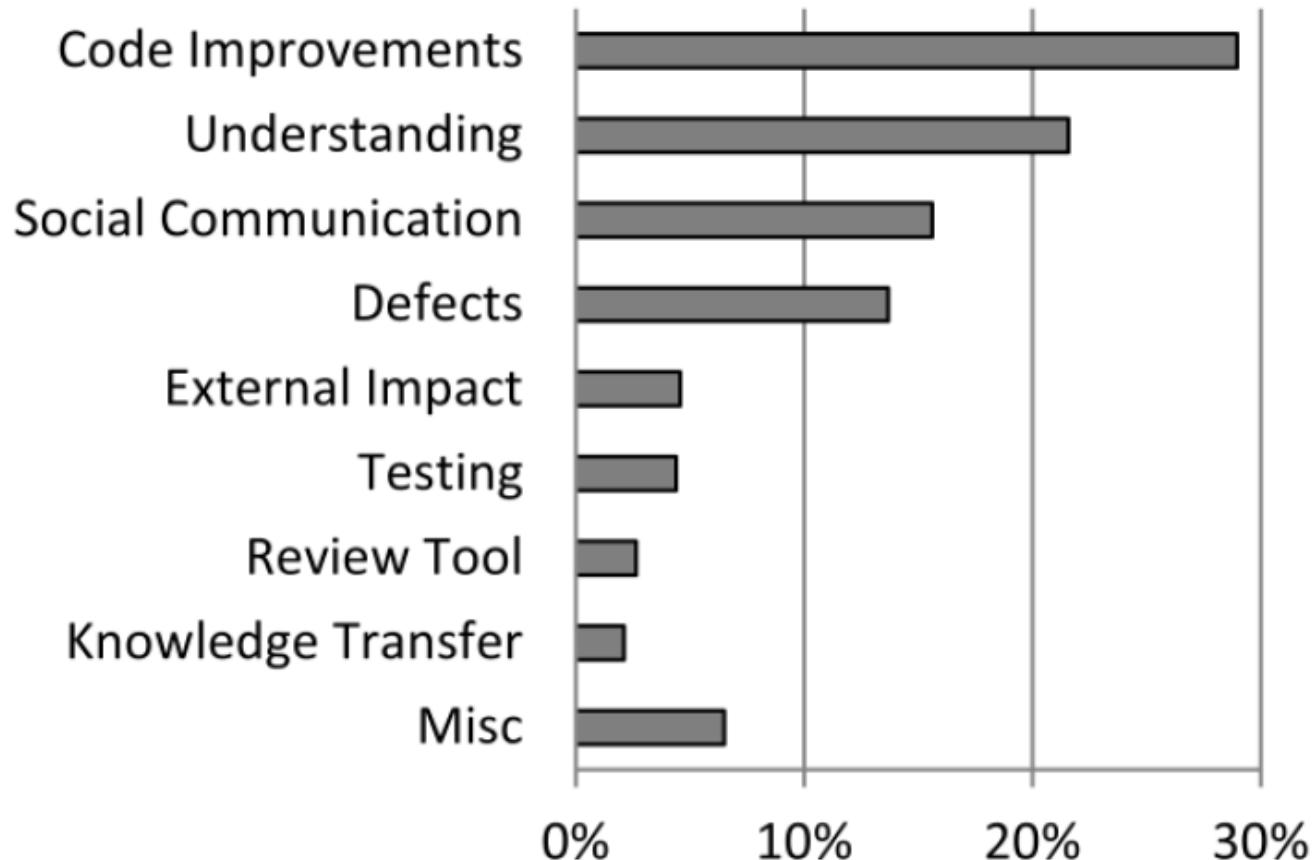
# Code Review at Microsoft

Ranked Motivations From Developers



Bacchelli, Alberto, and Christian Bird. "Expectations, outcomes, and challenges of modern code review." Proceedings of the 2013 International Conference on Software Engineering. IEEE Press, 2013.

# Outcomes (Analyzing Reviews)



# Mismatch of Expectations and Outcomes

- Low quality of code reviews
  - Reviewers look for easy errors, as formatting issues
  - Miss serious errors
- Understanding is the main challenge
  - Understanding the reason for a change
  - Understanding the code and its context
  - Feedback channels to ask questions often needed
- No quality assurance on the outcome

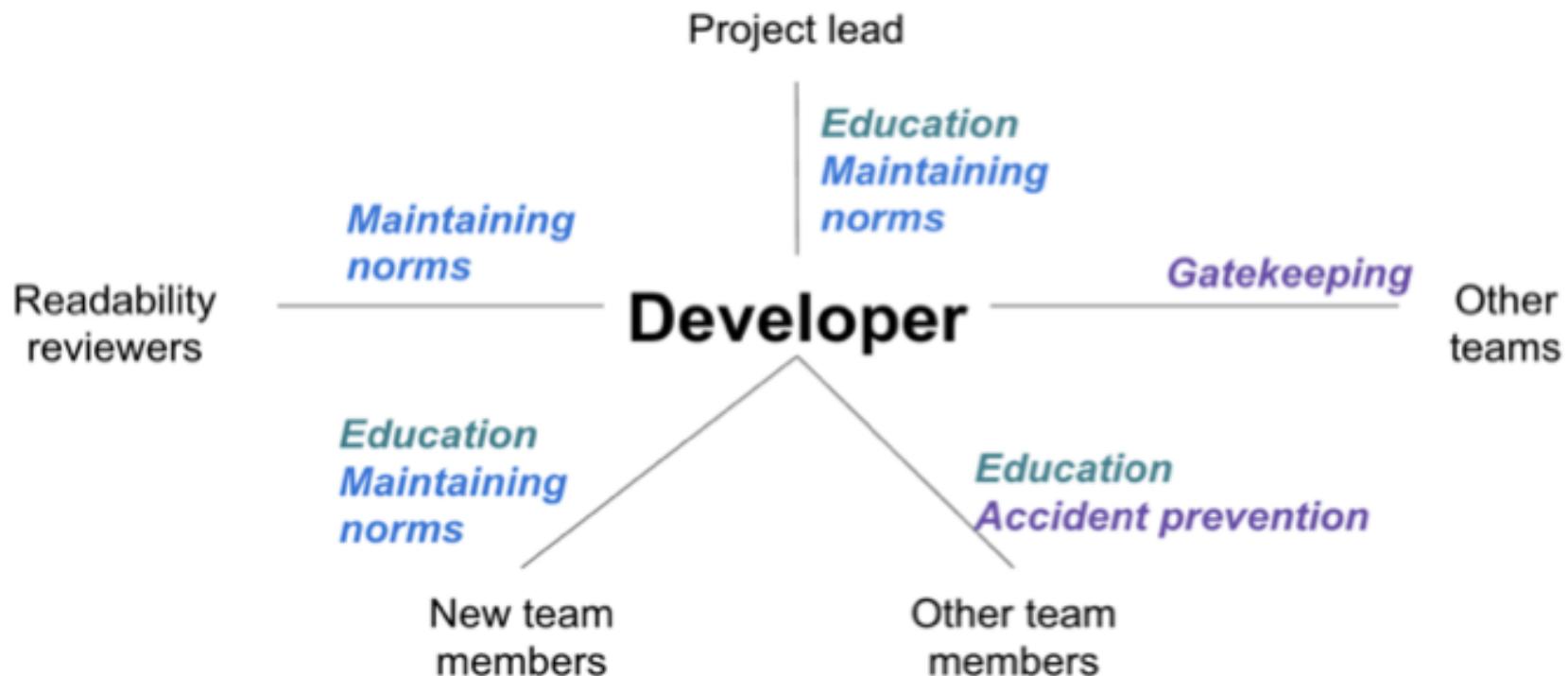
# Code Review at Google

Introduced to “force developers to write code that other developers could understand”

- Three Found benefits:
  - checking the consistency of style and design
  - ensuring adequate tests
  - improving security by making sure no single developer can commit arbitrary code without oversight

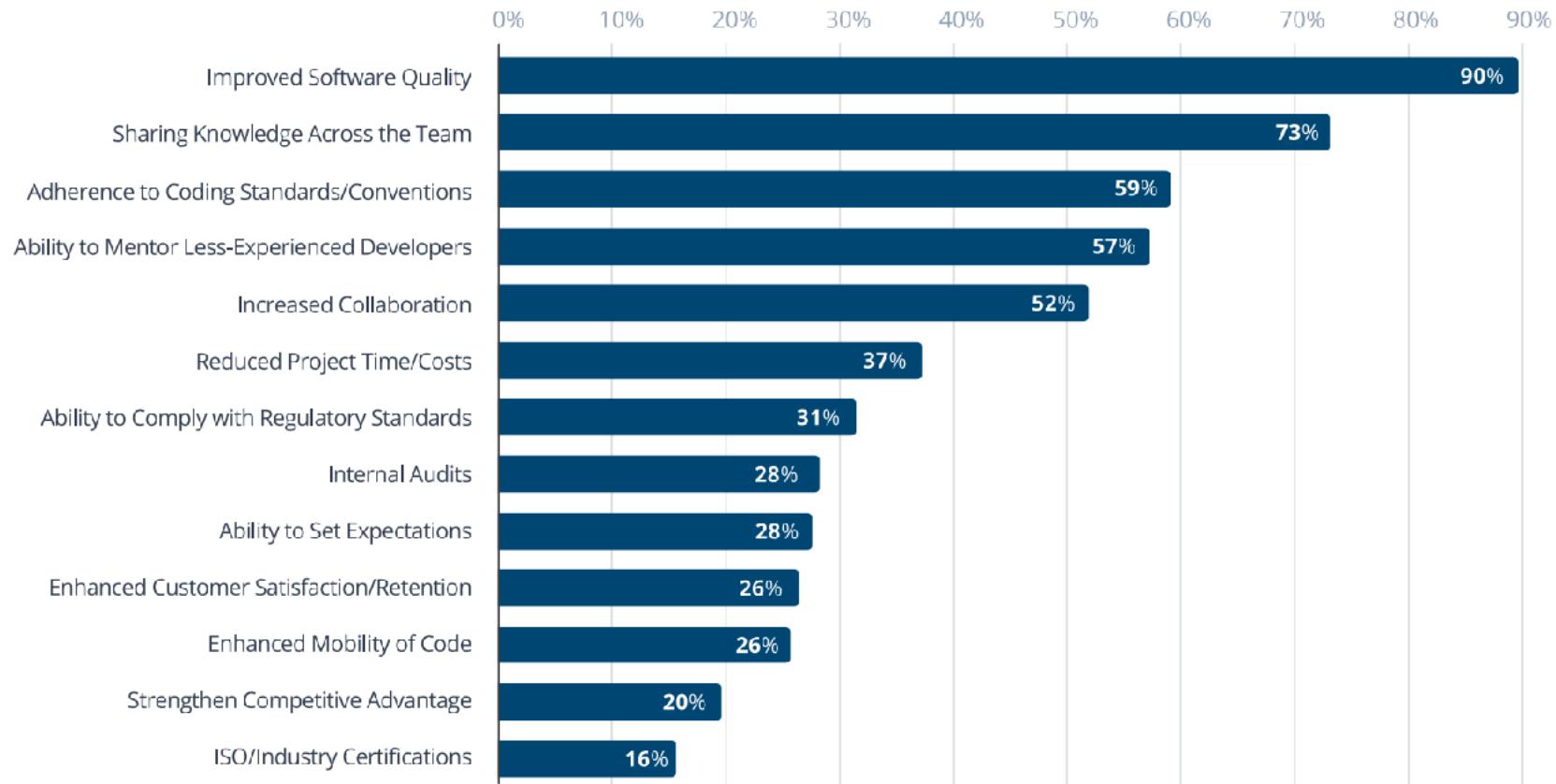
Caitlin Sadowski, Emma Söderberg, Luke Church, Michal Sipko and Alberto Bacchelli. 2018. Modern Code Review: A Case Study at Google. International Conference on Software Engineering

# Reviewing Relationships



# The State of Code Review survey

What do you believe are the most important benefits of code review?



n = 1129

# Code Review

- Start with the “big ideas”
- Automate the little things
- Focus on understanding
- Remember a person wrote the code
- Don’t overwhelm the person with feedback

# Code Review - Real Life Examples

- <https://github.com/discourse/discourse/pull/8726>
- <https://github.com/discourse/discourse/pull/8706>

# Checklists



## CESSNA 172 Extended Quick Reference Checklist- Normal Procedures

CABIN

EMERGENCY

NOSE

RIGHT WING &amp; TRAILING EDGE

BEFORE START UP

Hobbs and Tach Time	RECORD ON SHEET
Documents AROW	Airworthiness - Registration - Operating Manual (POH), Weight & Balance
Pilot Tube Cover	REMOVE
Control Wheel Lock	REMOVE
Ignition Switch	key on glare shield
Avionics Master Switch	OFF
Master Switch	make sure no one within the arc of propeller
Fuel Quantity Indicators	gas gauges left and right
Avionics Master Switch	ON
Avionics Cooling Fan	CHECK AUDIBLY
Avionics Master Switch	OFF
Static Pressure Alternate Source Valve	OFF
Fuel Selector Valve	BOTH
Fuel Shutoff Valve	Push full in
Flaps	EXTEND → Interior and Exterior Lights.
Pilot Heat/Tube	warm to touch within 30 Sec.
Master Switch	OFF
Baggage Door	Lock with the key
Fire Extinguisher	Verify pointer in green arc.
Rudder Gusset Lock	if installed
Tail Tie Down	REMOVE
Control Surfaces	freedom of movement, security of hinges
Trim Tab	CHECK
Antennas	security of attachment and general condition
Flap	security and condition
Aileron	freedom of movement, security
Wing Tie Down	REMOVE
Main Tire	inflation, wear, cracks
Fuel Sump	contaminants, sediment, color, water bubbles
Fuel Filler Cap	aligned with longitudinal axis
Fuel Strainer	Check visually for desired level of fuel
Engine Oil Level	8 max, 5 min. If less than 5, Don't fly
Engine Cooling Air Inlets	No obstruction
Propeller and Spinner	nicks, cracks
Alternator Belt	present, looseness
Carburetor Air Filter	Clean, no restrictions
Exhaust Pipe	SECURE
Nose Wheel Strut and Tire	inflation, wear, cracks
Static Source Opening	CHECK
Main Wheel Tire	CHECK, REMOVE CHOCK
Fuel Sump	contaminants, sediment, color, water bubbles
Fuel Quantity, Quality and Filler Cap	MEASURE, CHECK
PITOT Tube Cover	Check opening for stoppage
Fuel Quantity and Vent	CHECK
Stall Warning Opening	apply light suction for sound
Landing/Taxi Light	filaments
Wing Tie Down	REMOVE
Aileron	CHECK
Flap	SECURE
Preflight inspection	COMPLETE
Passenger Briefing	CRM for S-A-F-E-T-Y
Seat Belts fastened for taxi, takeoff, landing. Shoulder Harnesses fastened for takeoff, landing. Seating Position adjusted & locked.	
Air Vents, All Environmental Factors (discussed), Action (In the event of passenger discomfort/sickness, Feeling ill TELL ME)	
Fire Extinguisher (Location and Operation)	
Exit doors, Emergency Evacuation Plan and Kit (discussed)	
Traffic Scanning, spotting & notifying pilot (Point out) and Sterile Cockpit (TAXI, TAKEOFF, LANDING) Your Questions (Any Q?)	
Seat, belts, shoulder harnesses	ADJUST & LOCK
Doors ... Closed & Locked ↔ Seat Track and Back	LOCKED
Brakes	TEST & SET

RECORD ON SHEET	
Fuel Selector Valve	BOTH
Fuel Shutoff Valve	Push full in
Alternate Static (IFR)	slight dip in altimeter, then rise
Avionics/Radios	OFF
Electrical Equipment (switches)	OFF
Circuit Breakers	CHECK IN
Parking Brake	SET
Throttle (Power-black)	1/4 inch finger method
Mixture (red)	... IDLE CUT-OFF
Prop	SHOUT CLEAR PROP, WAIT, LOOK
Carburetor Heat	Push In
Mixture → RED	FULL RICH
Prime	2-3X Summer, 3-5X Winter If engine is warm, limit priming
Throttle →	AS REQUIRED OPEN 1/8"
Master Switch	ON → Beacon
Ignition Switch	MAGS → BOTH and START → START & RELEASE Release when engine starts
Master Switch	ON → Beacon → Fuel Pump → ON
Mixture	until stable fuel flow (3-5 seconds)
Mixture	FULL RICH
Auxiliary Fuel Pump	OFF
Brakes	HOLD
Right Hand	ON MIXTURE
Ignition	Release when engine starts → START then BOTH
Mixture	ADVANCE to RICH
Oil Pressure	If no pressure in 30 seconds, shut down
Throttle	1000 RPM
Adjust	
Alternator Switch	ON → Mixture → LEAN → 1" Inch
Lights at night (navigation, taxiway)	ON
Transponder	STANDBY
Seat Belts and Harness	I'm in, safe and adjusted
Flaps	RAISE
Avionics/Radios	CTAF/AWOS
ATIS/AWOS/CLEARANCE	ON and SET
Transponder	VFR 1200
Altimeter	Set the elevation of departure airport (within 75 feet)
Radio	twist vol knob to check volume
Taxi Light	AS REQUIRED
Parking Brake	RELEASE
Brakes	pilot & co-pilot
Attitude Indicator	During straight taxi no tips
Turn Coordinator	Indicates turns, bank moves, opposite of turns
Heading Indicator	Indicates turns, BUG the RWY, Tax to the tail
Magnetic Compass	Indicates correct headings (should move freely)
Crosswind Aileron/Elevator Deflection	APPLY
Brakes	Nose pointed in to the wind, no any blast hazard
Fuel Selector Valve	SET & HOLD
Elevator Trim	SET FOR TAKEOFF
Flight Controls	Visually check, functioning properly
Flight Instruments	FREE & CORRECT
Fuel Quantity	6-Pack
Mixture	CHECK & SET
Oil Pressure	CHECK
Throttle	Full Rich
Magno	For Injected Engines (1800 RPM)
Vacuum Gauge	Max. 150 drop each, 50 difference
Ammeter	Turn on the lights, alt heat, See positive rate of charge
Carb. Heat	'0' / Pull the Carb Heat ON (HOT). Note the drop
Oil Pressure ↔ Oil Temperature	GREEN ARC
Mixture	Slowly pull the mix. back till the engine begins to cough
Annunciator Panel	NONE ILLUMINATED
Idle	Engine is not going to stop, steady RPM
Throttle	Slightly Increase
Throttle Friction	1000 RPM
	if too loose or tight

## Normal Procedures

Flaps	0° (Normal), 10° (Soft and Short)
Mixture	... BEST POWER
Heading Indicator	ALIGN TO COMPASS
Landing & Strobe Lights	ON
Radios and Navigation Equipment	SET
Transmitter Selector	COMM 1
Intercom Receiver Selector	COMM 1
GPS Flight Plan	ENTER
Comm 1 Volume	CHECK
Autopilot	If installed OFF
Autopilot Alert Altitude	SET to CRUISING ALTITUDE
Manual Electric Trim	CHECK OPERATION
Elevator Trim	SET FOR TAKEOFF
Passenger Seat Backs	MOST UPRIGHT POSITION
Seat and Seat Belts	CHECK SECURE
Doors and Windows	CLOSED & LOCKED
Clearance Received	Tookoff, Hold, Line up CONFIRM RWY

CRUISE

Power	Pick RPM setting from POH
Mixture	using EGT, tachometer, engine roughness
Heading Indicator	LEAN
Engine Instruments	CHECK
Heading Indicator (HI)	ALIGN TO COMPASS
Mixture	Slowly
Power	2200
ATIS/AWOS	Set the altimeter
Heading Indicator	OBTAIN
APPROACH Set Frequencies, Descent Checklist & 10-15 Miles Away	Check the Sectional Chart for Visual Reference Points
Note: For Non-powered Airports, Determine the Active Runway (ATIS), Descent To The Traffic Pattern Altitude (TPA) from 3-Mile Away.	
APPROACH BRIEFING (Visual, Instrument, Short, Soft)	
IFR MAP Review, Determine FAF Alt, ATIS - Alt. Setting Prior to IAF Radios (NAV-COM-GPS), HI-Sel, MDA (30 Sec), DH (50')	
IFR STA ↔ TURN, TIME, TWIST, THROTTLE and TALK → AT FAF	
Autopilot	If installed OFF
Landing Light	ON
Seat belts & harness	ON
Fuel Selector Valve	BOTH
Mixture	Full Rich
Carburetor Heat	If available Best Power
Airspeed	80-85 KIAS

TAKEOFF BRIEFING

I will be performing this normal (rolling, soft field, short field) takeoff. We will depart on runway ..., which is .... ft long, our ground roll will be .... ft long. I will abort if not airborn by the point (Establish the point where you will abort if not airborn) if not going planned. A windsock, fence post, etc.). The wind is from .... at .... knots, which is a .... knots crosswind component; I'll hold full right aileron at the start of the roll. Flaps will be at 0, mixture leaned for density altitude, full power, rotate at 55 knots and climb out at Vy 74 knots. If we have any problems (such as slow acceleration, loud noise, excess vibration) before rotation or with adequate runway remaining after liftoff, we will abort. Standard emergency procedure will be used in the event of engine failure without adequate runway remaining. If we lose engine before 1000 feet, turn 20-30 degrees right or left, and land straight ahead. Best glide is 68 KIAS. We won't even think about returning to this airport unless we are at 1,000 AGL. Any questions or comments?

TAKING RWY &amp; LINE UP

Note: Use shortest line up. Apply a ninety degree turn in order to maximize take off distance. Smart Pilots use their eyes, ears effectively.

Heading BUG	On Course
Altitude	Recall & SET
Transponder	CRUISING ALTITUDE
Time Off	ALT
Brakes	On NAV LOG

CLEAR FOR TAKEOFF: S.T.A.R.T (Strobes, Time, Airspeed, Runway Heading, TRANSPONDER.)

Aircraft ALIGNED WITH CENTERLINE

Timer START

Heading Indicator (HI) CHECK ALIGNMENT TO RUNWAY

Throttle FULL

RPM 2300 4 Seconds

Oil Pressure/Temperature GREEN ARC

Elevator Call Out: Speed 40, 50, 55 Rotate LIFT AT 55 KIAS

Climb Call out: Positive Rate of Climb, Speed 70-80 Kt. Vy 74 KIAS

Flaps \*Raising flap will cause certain amount of sink.

Heading ON COURSE

Enroute Climb 70-90 KIAS

Power SET

Mixture SET

Engine Instruments CHECK

Landing Light OFF

Flight Plan OPEN

Flight Following (Radar Control) OBTAIN

Note: You may request Flight Following (Radar Control) either from the local ground control at the first contact (for controlled airports) or from departure control following the takeoff.

Note: A good pilot is scanning outside the aircraft 85-90 of the time during the VFR flight. (Collision Avoidance)

DESCENT

Power	Pick RPM setting from POH
Mixture	using EGT, tachometer, engine roughness
Heading Indicator	LEAN
Engine Instruments	CHECK
Heading Indicator (HI)	ALIGN TO COMPASS
Mixture	Slowly
Power	2200
ATIS/AWOS	Set the altimeter
Heading Indicator	OBTAIN
APPROACH Set Frequencies, Descent Checklist & 10-15 Miles Away	Check the Sectional Chart for Visual Reference Points
Note: For Non-powered Airports, Determine the Active Runway (ATIS), Descent To The Traffic Pattern Altitude (TPA) from 3-Mile Away.	
APPROACH BRIEFING (Visual, Instrument, Short, Soft)	
IFR MAP Review, Determine FAF Alt, ATIS - Alt. Setting Prior to IAF Radios (NAV-COM-GPS), HI-Sel, MDA (30 Sec), DH (50')	
IFR STA ↔ TURN, TIME, TWIST, THROTTLE and TALK → AT FAF	
Autopilot	If installed OFF
Landing Light	ON
Seat belts & harness	ON
Fuel Selector Valve	BOTH
Mixture	Full Rich
Airspeed	80-85 KIAS

TAKEOFF

Power	Monitor white arch
Mixture	EXTEND 10°
Pitch	Power-Pitch-Trimm, look for the traffic
Flaps	Monitor increasing speed
Airspeed	60 KIAS

DOWNWIND - ABEAM TOUCHDOWN POINT

Power	1500 RPM
Mixture	Monitor white arch
Pitch	Power-Pitch-Trimm, look for the traffic
Flaps	Monitor increasing speed
Airspeed	75 KIAS

BEFORE LANDING

BASE - Establish Stabilized Descent	
Flaps	Power-Pitch-Trimm PPT, Look for TRAFFIC
Airspeed	EXTEND 20°
Positive Rate Climb	Stabilize the A/C, Climb at Vy
Flaps	ESTABLISH

GO AROUND

Power	Ensure Carb. Heat OFF, elevator pressure apply
Flaps	Don't raise the flaps until safely away the ground
Airspeed	RETRACT 20°
Positive Rate Climb	Monitor Increasing speed
Flaps	60 KIAS

AFTER LANDING

Power	Stabilize the A/C, Climb at Vy
Flaps	Clear of Runway
Trim	RETRACT
Strobes	OFF
Landing Light	ON

GO AROUND

Time Off	AS REQUIRED
Brakes	ON COURSE
Throttle	70-90 KIAS
Power	SET
Mixture	RELEASE

AFTER LANDING

Throttle	1000 RPM
Electrical Equipment	OFF
Interior and Exterior Lights	OFF
Avionics Master Switch	OFF
Magnetics for broken P-Lead	CHECK LEFT and RIGHT

SECURING AIRPLANE (SHUTDOWN)

Ignition	key on glare shield
Master Switch	OFF
Flap Selector Valve	to prevent crossfeed
Hobbs and Tach Time	RECORD
Control Wheel Lock	INSTALL

TIE DOWNS

Chocks	INSTALL
Tie Downs	HOOK UP
Pilot Cover	INSTALL
Doors	CLOSED and LOCKED
Flight Plan	CLOSE

\* The Pilot In Command (PIC) Must Ensure The Aircraft Is Operated In Accordance With The Approved Aircraft Flight Manual (AFM) At All Times.



**S3D** Software and Societal Systems Department

# Code Review

# Checklists

Cessna 172 Quick Reference Checklist (Continue)			
<b>Abnormal Procedures</b>			
<b>ENGINE FAILURE DURING TAKEOFF ROLL</b>			
Throttle ..... IDLE			
Brakes ..... APPLY			
Wing Flaps ..... RETRACT			
Mixture ..... IDLE CUT-OFF			
Ignition Switch ..... OFF			
Master Switch ..... OFF			
<b>ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF</b>			
Airspeed ... Flaps Up ..... 70 IAS Flaps Down ..... 65 KIAS			
Mixture ..... IDLE CUT-OFF			
Fuel Shutoff ..... FULL FULL OFF			
Ignition Switch ..... OFF			
Wing Flaps ..... AS REQUIRED			
Master Switch ..... OFF			
Cabin Door ..... UNLATCH PRIOR TO TOUCHDOWN			
Land ..... STRAIGHT AHEAD			
<b>ENGINE FAILURE IN FLIGHT - Restart Sequence</b>			
Airspeed ..... 68 KIAS			
Fuel Shutoff Valve ..... Push Full In			
Fuel Selector Valve ..... BOTH			
Auxiliary Fuel Pump ..... RICH			
Mixture ..... If prop stopped..... LEFT, RIGHT, BOTH, START			
Auxiliary Fuel Pump ..... OFF			
<b>EMERGENCY LANDING WITHOUT ENGINE POWER</b>			
Airspeed ..... Vg best gliding speed ..... 68 KIAS			
Mixture ..... IDLE CUT-OFF			
Fuel Shutoff Valve ..... FULL FULL OFF			
Ignition Switch ..... OFF			
Flaps ..... 3D recommended..... AS REQUIRED			
Master Switch ..... OFF			
Doors ..... UNLATCH PRIOR TO TOUCHDOWN			
Touchdown ..... SLIGHTLY TAIL LOW			
Cabin Heat and Air ..... APPLY HEAVILY			
<b>ENGINE FIRE DURING START ON GROUND</b>			
Crank ..... CONTINUE			
If engine starts, Throttle ..... CONTINUE			
Engine SHUTDOWN and Inspect for damage.			
If engine fails to start, Throttle ..... FULL OPEN			
Mixture ..... IDLE CUT-OFF			
Cranking ..... CONTINUE			
Fuel Shutoff Valve ..... FULL FULL OFF			
Fire Extinguisher ..... OBTAIN			
Master Switch ..... OFF			
Ignition Switch ..... OFF			
Aircraft ..... EVACUATE			
Fire ..... EXTINGUISH			
Fire Damage ..... INSPECT			
<b>ENGINE FIRE IN FLIGHT - Emergency Descent</b>			
Mixture ..... IDLE CUT-OFF			
Fuel Shutoff Valve ..... PULL OUT OFF			
Auxiliary Fuel Pump ..... OFF			
Master Switch ..... OFF			
Ignition Switch ..... OFF			
Aircraft ..... PULL OUT			
Fuel Shutoff Valve ..... EXECUTE			
<b>FORCED LANDING TO THE BEST SPOT (A-B-C Procedures)</b>			
Seats and Seat Belts ..... SECURE			
Airspeed ..... Vg best gliding speed ..... 68 KIAS			
Best spot ..... Turn into the wind ..... DECIDE			
Checklist Procedures: Apply the POH/AFM			
Mixture ..... IDLE CUT OFF			
Fuel Shutoff Valve ..... FULL OUT			
Ignition Switch ..... OFF			
Flaps ..... 3D recommended for final..... AS REQUIRED			
Master Switch ..... OFF			
Doors ..... when landing is assured..... UNLATCH			
Touchdown ..... Prior to touchdown Slightly Tall Low			
Brakes ..... APPLY Heavily			
<b>ELECTRICAL FIRE IN FLIGHT</b>			
Master Switch ..... Magnets BOTH ..... OFF			
Vents/Cabin Air/Heat ..... CLOSED			
Fire Extinguisher ..... ACTIVATE			
Avionics Master Switch ..... OFF			
All other switches ..... except Ignition (magnets) ..... OFF			
Vents/Cabin Air/Heat ..... OPEN			
If fire is out, and electrical power is necessary for flight			
Master Switch ..... ON			
Circuit Breakers ..... do not reset			
Radio/Electrical Equipment ..... one at a time			
<b>SIMULATED ENGINE FAILURE IN FLIGHT (Call Out ABC)</b>			
* A - Airspeed establish Vg 65-70 K. (loss of altitude)			
* B - Best place to land (Select a spot fly into the wind, clear of obstacle, MAYDAY 3X, Squawk 7700.)			
* C - Checklists (reset all systems mentioned above, Refer POH) if engine does not start, MAYDAY 3X, N172SP, 10 Miles West of Airport, 10,000 feet, Cessna 172, Engine Failure, 2 people on board, forced landing imminent."			
Apply the checklist items aforementioned "FORCED LANDING TO THE BEST SPOT"			
<b>POWER-ON STALL (Takeoff Stall)</b>			
HASL ..... PERFORM			
Throttle ..... 1500 RPM			
Altitude ..... MAINTAIN			
Flaps ..... INCREMENTALLY TO FULL			
Airspeed ..... 65 KIAS			
Throttle ..... descend 65 KIAS (trimmed) ..... SLOWLY TO IDLE			
Pitch ..... SLOWLY TO LANDING ATTITUDE			
Note: Back Pressure/HOLD to maintain landing attitude.			
At Stall Recognition ..... REDUCE AOA, FULL THROTTLE			
Wings ..... rudder trim, aileron if a tendency to turn..... LEVEL			
Flaps ..... RAISE to 20°			
Airspeed ..... Vx 62 KIAS			
Flaps ..... RAISE INCREMENTALLY			
Altitude ..... last altitude ..... RECOVER			
<b>AT LIGHT GUN SIGNALS</b>			
If radio fails, the transponder should be set to 7600 and light signals should be received from the tower.			
<b>COLOR &amp; TYPE</b>			
<b>STEADY GREEN</b>			
ON THE GROUND			
Cleared for takeoff			
IN FLIGHT			
Cleared to land			
<b>FLASHING GREEN</b>			
ON THE GROUND			
Cleared for taxi			
IN FLIGHT			
Return for landing			
<b>STEADY RED</b>			
STOP!			
<b>FLASHING RED</b>			
ON THE GROUND			
Taxi clear of the runway			
IN FLIGHT			
Airport unsafe, Do not land			
<b>FLASHING WHITE</b>			
ON THE GROUND			
Return to starting point			
IN FLIGHT			
Not Applicable (N/A)			
<b>ALTERNATING RED/GREEN</b>			
Exercise extreme caution			

# Activity: Create your own checklist

- In pairs, think about dumb mistakes your “friend” made the last time they were coding.
  - Write your names on a piece of paper.
  - Write down two checklist items that would have caught those errors.
- Divide into teams: left and right sides of the classroom.
- Shout your ideas to Profs Brown and Wright, who will write them on the chalkboard.
  - Which team had the most unique/good entries in their list?
- As you leave, turn in your paper at the front of the class.

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- Arguments
  - Are the correct arguments used in all method calls?
- Variables
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  - Are all declared variables being used?
- If-Then Statements
  - Do the if-else statements fit the intended purpose?
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- Loops
  - Do the loops end under all possible conditions?
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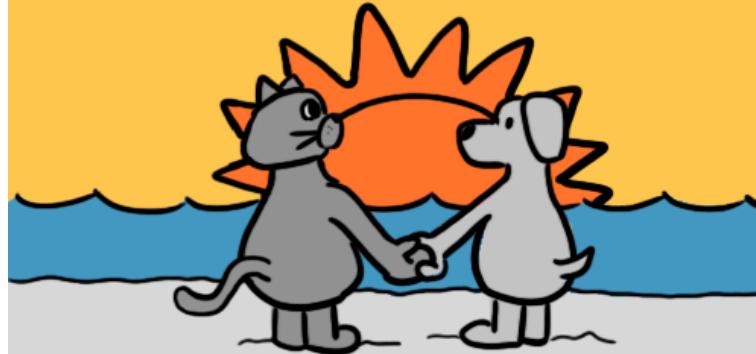
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- Final Check
  - Are all changes consistent with one another?

# Checklist Suggestions

- Review the unit tests
- Consider readability
- Best practices
- Quality Attributes
- Design Principles
- Communication around code (names, comments, etc)
- Maintain the Checklist

# A DEVELOPER'S GUIDE TO HAPPY ROMANCE

BY MICHAEL LYNCH



FIND ALL YOUR PARTNER'S FLAWS, GUARANTEED!

HARNESS THE LATEST SOFTWARE TOOLS TO  
TRACK THEIR SHORTCOMINGS OVER TIME

"Now I finally  
understand everything  
that's wrong with  
[my boyfriend]."  
- Kayla  
SEATTLE, WA



**S3D**

Software and Societal  
Systems Department

**Code Review is a  
Human Activity**

# 3 Pillars of Social Interaction

- Humility
  - You are not the center of the universe (nor is your code!). You're neither omniscient, nor infallible. You are open to self-improvement.
- Respect
  - You genuinely care about the others you work with. You treat them kindly and appreciate their abilities and accomplishments.
- Trust
  - You believe others are competent and will do the right thing, and when appropriate, you are OK with letting them drive.

# Static Analysis

- Automated code review!
- Code formatting
- Examples:
  - <https://clang.llvm.org/extra/clang-tidy/checks/bugprone-too-small-loop-variable.html>
  - <https://errorprone.info/bugpattern/ConstantOverflow>

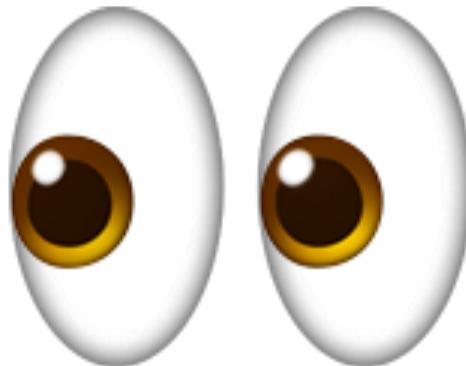
# Style Guide

- List of environment-specific preferred practices
- Could include:
  - Libraries / idioms to use
  - Formatting

# Style Guide Examples

- <https://www.python.org/dev/peps/pep-0008/>
- <https://github.com/airbnb/javascript>
- <https://subversion.apache.org/docs/community-guide/conventions.html>
- <https://google.github.io/styleguide/cppguide.html>
- <https://google.github.io/styleguide/pyguide.html>

# Who writes the Style Guide?



# Who writes the Style Guide?

- (ad hoc) Self-proclaimed code protectors
- (wisdom) Team veteran developers
- (copy-paste) Blog posts by experts
- (empirical study) Evidence-based analysis of code styles that correlate with bugs.

# Use Examples!

```
if (vector.empty()) {  
    return true;  
} else {  
    return false;  
}
```

Bad:

“What about directly returning from the function?”

Good:

“What about using `return vector.empty()` instead?”

# Other Thoughts

- Start high level and work your way down
- Never say “you”
- Frame feedback as requests, not commands
- Tie notes to principles, not opinions

[<https://mtlynch.io/human-code-reviews-1/>]

# Code Review

In general, reviewers should favor approving a change once it is in a state where it **definitely improves** the overall code health of the system being worked on, even if the **change isn't perfect**.