A SHOPFLOOROPS FIELD BOOK

One New Part. The Launch Trail.

A field book for following a new part from the day the program lands to a PPAP the customer approves.

8 STEPS · 12 TOOLS



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FIELD BOOK 04

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The part, the tool, the program and every number in this book are a made-up example. The tool sidebars show ShopFloorOps tools, which I make and sell. Every chapter teaches the step itself, so you can use your own forms. New to a term? See the quality glossary.

CHAPTER 1

Set Up the Launch

STEP 1 OF 8 | REQUIREMENTS AND PPAP PLAN

It's Monday of week 1. A purchase order and a drawing arrive for a new part: latch cover LC-5927, a molded plastic cover with a snap hook that latches it to a housing. The customer's PPAP is due at the end of week 12. Twelve weeks sounds like plenty. It is not.

One thing first. PPAP is an automotive process, and your customer's requirements come first. Where they say something different from this book, they win. The steps themselves hold for any new part launch, PPAP or not.

Day one is for reading

Most launch trouble starts with something nobody read. Before any form is opened:

1. **Read the drawing and the customer requirements, end to end.** This drawing has 14 characteristics.
2. **Find the special characteristics.** The customer marks one: snap hook height, 1.20 plus or minus 0.10 mm. It gets the most scrutiny at every step that follows.
3. **Confirm the PPAP submission level.** There are five levels, and the customer's requirements say which one applies. Here they ask for all 18 elements. Do not assume. Read it, and ask if it is unclear.
4. **Draw the process flow.** Five steps: receive resin, dry resin, mold, trim and inspect, pack.
5. **Write the PPAP plan.** Eighteen rows, one per element, each with an owner and a week.

Plan backward from the due date

The plan works backward from week 12: PFMEA in weeks 2 and 3, the control plan in week 4, work instruction and training in weeks 5 and 6, gage studies in week 7, first article in week 8, the run at rate in weeks 9 and 10, the package in week 11, and submission in week 12. Aim to send it two days early. A day of slack costs nothing. A day of surprise costs a week.

Read more: the PPAP 18 elements and IATF 16949 vs ISO 9001. For any term you do not know, see the quality glossary.

The mistake to avoid

Starting with the forms. Teams open the checklist and begin filling boxes. The checklist tracks the work. It does not decide the work. The customer's requirements decide.

TOOL SIDEBAR

The tool: PPAP Submission Checklist (QA-F-225)

Use it as the plan: one row per element, with an owner and a week, set on day one. Step 8 comes back to it as the package tracker. If your customer gives you their own checklist, track against theirs.

ON THE FLOOR MONDAY

- Pull the customer requirements for your next new part.
- Write the submission level and the due date at the top of the plan.
- Give every element an owner and a week this week.

All 12 tools in this book: Launch Trail Bundle

CHAPTER 2

Write the PFMEA

STEP 2 OF 8 | PROCESS FMEA AND ACTION PRIORITY

Week 2. The team stands at the process flow with a pen. The job is to walk it one step at a time and ask four things: how can this step fail, what is the effect, what causes it, and what stops it today.

The PFMEA comes before the control plan, not after. The plan's rows come from the PFMEA's risks. Write the plan first and the PFMEA turns into paperwork that copies it, and the risks the plan missed stay missed.

Rate with Action Priority

Each failure gets three ratings: severity of the effect, occurrence of the cause, and detection by the current controls. You do not multiply them. You look the three up together in an Action Priority table, and it returns High, Medium or Low. High means act, or write down why the current controls are enough. Medium means act or justify. Low means you may.

Here are the five rows for LC-5927, with severity (S), occurrence (O) and detection (D):

1. **Dry resin: resin loaded wet.** Effect: a brittle snap hook that can break at the customer's assembly. Cause: dryer time not tracked. S6, O8, D7. Occurrence is high because dryer time is not tracked. Detection is poor because only a visual check after molding would catch it. Lookup: **High**.
2. **Mold: short shot at the snap hook.** Effect: the cover will not latch. Cause: process window not proven on a new tool. S6, O6, D5. A visual check once an hour. Lookup: **Medium**.

3. **Mold: snap hook height out of tolerance.** Effect: the cover is loose or hard to latch. Cause: tool wear and press drift. S6, O4, D8. The dimension is checked once a shift. Lookup: **Medium**.
4. **Pack: parts scuffed in the tote.** Effect: an appearance complaint. Cause: parts rub in an open tote. S4, O6, D8. Lookup: **Medium**.
5. **Trim: gate cut too deep.** Effect: a weakened hook near the gate. Cause: the trim fixture wears and the cut gets deeper. S6, O3, D5. Lookup: **Low**.

One High, three Medium and one Low. The team acts on the High and the Mediums. For the Low it writes one line saying why no action is needed and moves on.

Plan the fix, then re-rate

The planned controls change the ratings. A dryer log and a moisture check at the start of each lot take row 1 to O3, D4, which looks up Low. A proven process window with a boundary sample and a check every 30 minutes takes row 2 to O3, D3, Low. Checking the hook on a fixture every 30 minutes takes row 3 to O3, D3, Low. Divider totes take row 4 to O3, D4, Low.

Those new ratings count only once the controls are in place and working. Until then, the original ratings stand. Some customers still ask for RPN. Use whatever your customer requires.

Read more: how to write a PFMEA and a PFMEA example.

The mistake to avoid

Rating detection by hope. If the only control is "the operator will see it," that is a detection rating of 7 or worse, however good the operator is. Rate what the control can actually catch.

> **TOOL SIDEBAR**
>
> **The tools: Process FMEA Template (QA-F-340) and Reverse PFMEA Audit Checklist (QA-F-345)**
>
> The PFMEA turns the process flow into ranked risks. The reverse audit goes the other way: start on the floor and check that each control the PFMEA promises is really there. Use the rating method your customer expects.

ON THE FLOOR MONDAY

- Open one PFMEA and check it was written before its control plan.
- Pick its highest rated row and find the control on the floor.
- Look for any Low row with no written reason.

All 12 tools in this book: Launch Trail Bundle

CHAPTER 3

Build the Control Plan

STEP 3 OF 8 | CONTROL PLAN AND REACTION PLAN

Week 4. The PFMEA is finished, and now each risk that needs action lands on a control plan row: what is checked, how, how often, by whom, and what happens when the check fails. Four of the five PFMEA rows need one. The Low row does not.

The rows

- **Row 1, from PFMEA row 1 (wet resin).** Check the resin moisture at the start of each lot, and log dryer time and temperature against the resin data sheet. Reaction: do not load the resin. Return it to the dryer, retest it, and tag it until it passes.
- **Row 2, from PFMEA row 2 (short shot).** The operator compares the snap hook to the boundary sample on the first five shots after any restart and every 30 minutes. Reaction: stop the press, tag everything since the last good check, call the process technician, and restart only after five good shots.
- **Row 3, from PFMEA row 3 (hook height).** Measure five consecutive pieces on the fixture every 30 minutes, and chart them. Reaction: the same stop, tag, call and restart steps as row 2. The control limits are set after the run at rate in step 7.
- **Row 4, from PFMEA row 4 (scuffing).** One piece per pocket in a divider tote, and one tote checked every hour. Reaction: stop packing, re-sort that tote and the one before it, and fix the pocket that failed.

A reaction plan says what to do

"Notify supervisor" is not a reaction plan. It is a phone call. A real one says what the operator does in the first minute, who they call, what happens to the parts, and who can restart the machine. Every row above says it. Write the stop authority into the plan: the operator stops the press without asking.

Each plan row carries the number of the PFMEA row it came from. A plan row with no PFMEA row behind it is a guess, and a PFMEA row rated High or Medium with no plan row is a hole.

Read more: how to write a control plan, a control plan example and control plan vs PFMEA.

The mistake to avoid

Writing the plan to match what the floor does today instead of what the PFMEA says the floor needs. The plan is where you decide what to do. It is not where you record what you already do.

TOOL SIDEBAR

The tool: Control Plan Template (QA-F-350)

A control plan row ties a characteristic to its check, its frequency, its limits and its reaction plan. Put the PFMEA row number on each row, and write the reaction in full. If the reaction lives in a separate procedure, the operator will not find it in time.

ON THE FLOOR MONDAY

- Pick one control plan row and trace it back to a PFMEA row.
- Read its reaction plan. Does it say what to do, who to call and who can restart?
- Find any High or Medium PFMEA row with no plan row.

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CHAPTER 4

Train the Station

STEP 4 OF 8 | WORK INSTRUCTION AND SIGN OFF

Weeks 5 and 6. The control plan only works if the operator at the station can follow it. Station 30 is trim and inspect, run on three shifts by six operators. The plan's checks all land on that station, so the work instruction is written for it first.

Write it for the person doing the job

One page, steps in order, one key point each, a picture of the boundary sample, and the reaction written where the operator needs it. The station's six steps:

1. Load the part in the trim fixture.
2. Trim the gate in one cut.
3. Compare the snap hook to the boundary sample.
4. Every 30 minutes, measure five consecutive pieces for hook height on the fixture and record them.
5. Place good parts in the divider tote, one per pocket.
6. If any check fails, stop and follow the reaction on the sheet.

Release it at a revision letter, here Rev A. Every training record names the revision it was trained to. A record that does not name one proves nothing when the instruction changes.

Train, then prove they can do it

A signature on a sheet shows someone sat through a briefing. It does not show they can do the job. Each of the six operators ran the station on five pieces, and one of the five was a planted short shot.

Five of the six operators found the planted piece and recorded it correctly. One passed it. That operator was retrained on the

boundary sample and tested again, and found it. Six of six were then signed off on the skills matrix, with the date and Rev A.

Read more: how to write a work instruction.

The mistake to avoid

Training by handing out the instruction and collecting signatures. If nobody watched the operator find a bad part, nobody knows the control plan works.

TOOL SIDEBAR

The tools: Work Instruction & Change Release (QA-F-390) and Skills Matrix (QA-F-320)

The work instruction says how. Its change release record keeps the revision under control so the floor never runs an old copy, and its training sign-off ties each person to a revision. The skills matrix shows who is signed off on which station, and when.

ON THE FLOOR MONDAY

- Pick one station and read its work instruction at the station.
- Ask an operator to do the steps. Does the sheet match what they do?
- Check every operator's training record names the current revision.

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CHAPTER 5

Prove the Gage

STEP 5 OF 8 | GAGE R&R AND CALIBRATION

Week 7. Every number from here on comes from a gage. Before anyone measures a first article, each gage on a key characteristic has to prove it can tell good parts from bad ones.

Two gages matter here. Snap hook height, the special characteristic, is measured on a fixture with a dial indicator that reads to 0.001 mm. Width across the lugs, 42.00 plus or minus 0.30, is measured with digital calipers. Each study uses 10 parts, 3 appraisers and 3 trials.

The hook fixture fails first

The hook height tolerance is 0.200 mm wide. The first study gave repeatability 0.0066 mm and reproducibility 0.0088 mm, both as standard deviations. Combined, that is the square root of 0.0066 squared plus 0.0088 squared, or 0.0110 mm. Six times that is 0.066 mm, which is 33.0 percent of the tolerance.

A common rule of thumb says under 10 percent is good, 10 to 30 percent is a judgment call, and over 30 percent needs work. Ask your customer what they require. At 33.0 percent this gage fails. Measuring first articles on it would leave a third of the tolerance as measurement noise.

The cause was physical: the part rocked in the nest, and each appraiser seated it a little differently. The team added a locating pin and ran the study again. Repeatability 0.0018, reproducibility 0.0024, combined 0.0030 mm. Six times that is 0.018 mm, or 9.0 percent of the tolerance. The fixture passes.

The calipers and the calibration log

The width tolerance is 0.600 mm wide. The calipers gave repeatability 0.0036 and reproducibility 0.0048, combined 0.0060 mm. Six times that is 0.036 mm, or 6.0 percent of the tolerance.

The calibration log shows both gages in date: the calipers were calibrated three months ago and are due in nine, and the indicator two months ago and due in four.

Read more: Gage R&R explained.

The mistake to avoid

Studying the easy gage and skipping the hard one. The calipers pass without effort. The fixture on the special characteristic is the one that needed proving, and it failed on the first try.

TOOL SIDEBAR

The tools: Gage R&R (QA-F-295) and Calibration Log (QA-F-230)

The calibration log shows each gage is in date and what it was checked against. The Gage R&R shows whether your appraisers get the same answer from it on your parts. Run both before the first article, and again if the fixture, the part or the people change.

ON THE FLOOR MONDAY

- List the gages on your special and key characteristics.
- Find the Gage R&R for each one. Missing or old means schedule it.
- Check the calibration log for any of them past due.

All 12 tools in this book: Launch Trail Bundle

CHAPTER 6

Make the First Article

STEP 6 OF 8 | FIRST ARTICLE INSPECTION

Week 8. The tool is in the press, the gages are proven and the operators are trained. Now the team makes the first article: parts from the production process, measured against every characteristic on the drawing.

"From the production process" is the point. The production tool, the production material, the normal setup and the normal people. Parts hand-picked or hand-finished prove nothing about production.

Every characteristic, every reading

The drawing has 14 characteristics. Five parts were measured on all of them, which is 70 readings. All 70 are in tolerance. Record each reading, not just pass or fail, so anyone can see how close to a limit it ran.

Three of the 14, to show what the record looks like:

- **Snap hook height, 1.10 to 1.30.** Readings 1.19, 1.21, 1.20, 1.22 and 1.18. Average 1.200.
- **Width across the lugs, 41.70 to 42.30.** Readings 42.06, 41.94, 42.11, 42.02 and 41.98. Average 42.022.
- **Wall thickness at the hook root, 1.45 to 1.75.** Readings 1.57, 1.62, 1.60, 1.64 and 1.59. Average 1.604.

The setup report records the press settings and the resin lot used, so the first article can be tied to how the part was made. If a setting changes later, you know which results it affects.

Read more: what is a first article inspection.

The mistake to avoid

Measuring the characteristics you expect to pass and marking the rest "not applicable." The ones you skip are the ones the customer will check.

TOOL SIDEBAR

The tools: First Article Inspection (QA-F-240) and Setup & First-Off Inspection Report (QA-F-280)

The first article report records every characteristic, every reading and the gage used. The setup and first-off report records the settings and the approval to run, so the results can be tied to how the parts were made.

ON THE FLOOR MONDAY

- Pull your last first article and count the characteristics on the drawing.
- Check every one has a reading, not just a tick.
- Check the report names the gage used for each.

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CHAPTER 7

Run at Rate

STEP 7 OF 8 | INITIAL PROCESS STUDY

Weeks 9 and 10. A first article shows the tool can make good parts. It does not show the process can keep making them. For that, make a significant production run: production speed, production tooling, production people and production gages.

A common run size is 300 pieces. The customer sets the real number, and in this case it is 300.

The rate

The planned cycle is 36 seconds, which is 100 pieces an hour. The run took 188 minutes from first piece to last, including one 8 minute stop at piece 150 to refill the dryer hopper with a new resin load. That is 95.7 pieces an hour over the elapsed time, and 100.0 while the press was running.

The capability

All 300 pieces were measured for snap hook height, in production order, in 60 subgroups of five. The tolerance is 1.10 to 1.30. Sigma within subgroups is the average range divided by 2.326. Overall sigma is the standard deviation of all 300 readings.

The full run. Average 1.2106, average range 0.03085, sigma within 0.01326, overall sigma 0.01529. Cp is 2.51 and Cpk is 2.25. Pp is 2.18 and Ppk is 1.95. This customer's requirement is a Ppk of at least 1.67, so it passes.

Stopped at piece 150. Average 1.2018, average range 0.02967, sigma within 0.01276, overall sigma 0.01235. Cp is 2.61 and Cpk is 2.57. Pp is 2.70 and Ppk is 2.65. It looks better, and it hides something.

What the second half shows

Control limits from the first 30 subgroups: average 1.2018, average range 0.02967. Upper limit 1.2018 plus 0.577 times 0.02967, which is 1.2189. Lower limit 1.1847. Range limit 2.114 times 0.02967, which is 0.0627.

Subgroup 31, the first after the refill, has a mean of 1.2200, above the upper limit of 1.2189. Every subgroup after it sits above the center line. The new resin load moved the average up by about 0.02 mm. The spread did not change. Cpk dropped from 2.57 to 2.25 and Ppk from 2.65 to 1.95. Still above 1.67. But a run stopped at 150 would never have shown it.

The fix goes into the control plan: any new resin load triggers a five piece hook height check before production resumes. Update the PFMEA row for it too, so the two still agree.

Read more: Cpk vs Ppk and SPC control charts for beginners.

The mistake to avoid

Stopping the run when the numbers look good. The first half of a run is the easy half. Resin changes, shift changes and tool warm-up show up late.

TOOL SIDEBAR

The tools: Process Capability Study (QA-F-250) and Production Run Rate & Capacity Calculator (QA-F-245)

Use the capability study to work out Cp, Cpk, Pp and Ppk from the run, and keep the inputs with the result. Use the run rate calculator to compare the planned rate with the rate you actually held. The customer sets the number of pieces and the minimum index.

ON THE FLOOR MONDAY

- Find your customer's required run size and minimum capability index.
- Check your last run was not stopped early.
- Compare Cpk with Ppk on it. A big gap means something moved during the run.

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CHAPTER 8

Submit the PPAP

STEP 8 OF 8 | PACKAGE, WARRANT AND APPROVAL

Week 11. Everything the team built in steps 1 to 7 now goes into the package, along with the rest of the 18 elements the customer's requirements ask for. The checklist from day one is now the tracker: 18 rows, each with an owner, a week and a status.

Assemble it at the level the customer requires

Do not build what you think the customer wants. Build what the requirements say, at the submission level they name. Then go through it as a reviewer would.

1. Every record agrees with every other. The part number and revision match everywhere.
2. Every number matches its source. The 300 piece run, the capability figures and the gage results are the ones in the records.
3. The control plan, the PFMEA and the work instruction all describe the same process, including the resin load check added in step 7.
4. Nothing is blank. Every element is either complete or marked as not required by the customer, with a reason.

Sign the warrant and submit

The Part Submission Warrant is signed by someone with the authority to say the parts and records meet the customer's requirements. Check every entry on it against the records before it is signed. Here it went out on Wednesday of week 12, two days before the due date. The customer's approval came back the following Wednesday.

That is the end of this case: an approval. Production release follows.

If it comes back rejected

A rejection is a message, not a verdict on the team. It arrives with reasons. Handle it calmly and in order:

1. Read every reason. If one is unclear, ask the customer what they need. Do not guess.
2. Turn each reason into one action with an owner and a date.
3. Fix the cause, not just the paper. If a number was wrong, find out why it was wrong.
4. Update every record the fix touches, so they still agree with each other.
5. Resubmit the way the customer requires.

Read more: the PPAP 18 elements.

The mistake to avoid

Submitting records that disagree with each other. A part revision that differs between the warrant and the control plan, or a capability figure that does not match the study, invites questions you could have answered in week 11.

TOOL SIDEBAR

The tool: PPAP Submission Checklist (QA-F-225)

Back to the checklist from step 1, now as the package tracker. Each of the 18 rows shows its owner, status and where the evidence lives. Do a last pass against the customer's requirements, not just against the checklist.

ON THE FLOOR MONDAY

- Take your next PPAP and compare the plan to the requirements, line by line.
- Check the part number and revision match in every record.
- Write down who signs the warrant and what they check first.

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Monday Board

One action per step. Pick one and do it this week.

1. Pull the customer requirements for your next new part and give every PPAP element an owner and a week. ☐
2. Check one PFMEA was written before its control plan, and find its highest rated risk on the floor. ☐
3. Trace one control plan row back to a PFMEA row and read its reaction plan. ☐
4. Ask one operator to do the steps on their work instruction and check it matches what they do. ☐
5. List the gages on your special characteristics and find the Gage R&R for each. ☐
6. Pull your last first article and check every drawing characteristic has a reading. ☐
7. Check your customer's run size and whether your last run was stopped early. ☐
8. Compare your next PPAP plan to the customer requirements and check the part revision matches everywhere. ☐