

Advanced Flight Forms Book

Instruction Packet

AIRCRAFT SYSTEM

MAKE: _____
MODEL: _____
CONFIG: _____

REMOTE PILOT

CODE: _____
NAME: _____
ATTEST: _____

PROCTOR

NAME: _____
ATTEST: _____
DATE: _____
FACILITY: _____

ADV FLIGHT SCORES

SCORE:

1) DISTANCE: _____
2) ALTITUDE: _____
3) FLIGHT NAV: _____
4) EM. RESPONSE: _____

CIRCLE:

FAIL

PASS

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EXERCISE 1 – LONG RANGE OPERATIONS (ZONE 1)

DESCRIPTION:

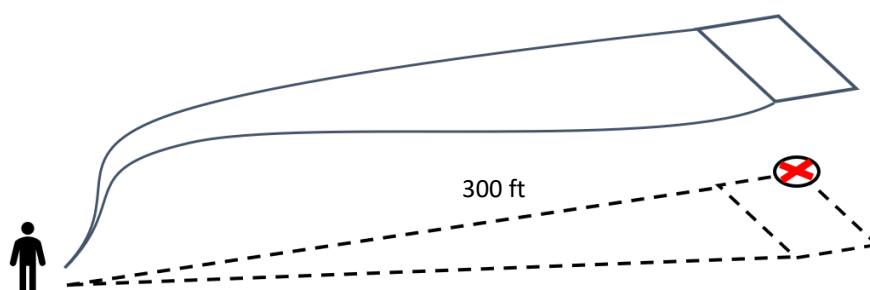
In this exercise, the student will fly to a distance of approximately 300 ft, complete a simple box pattern by utilizing supplementary information from the telemetry (altitude and heading readouts, map-view if available), orient to an unknown direction, re-establish aircraft orientation using push-pull technique and fly home manually.

LEARNING OBJECTIVES

- The student will demonstrate the ability to utilize flight telemetry for positive control.
- The student will demonstrate the ability to maintain positive control at significant distance and altitude.

SITE LAYOUT

Exact distance to target and size of square pattern immaterial. Exercise assessment is based on pilot's spatial awareness, recognition of difficulties and limitations, and following instructions.



| PROCEDURES – LONG RANGE | | |
|--|------------------------|--------------------------|
| CAPTURE IMAGE OF CLOCK – LAUNCH FROM PLATFORM | ASSESSMENT | POINT |
| 1 HOVER AT ALTITUDE OVER PAD | IMAGE – L/L PAD | <input type="checkbox"/> |
| 2 ASSESS FLIGHT PATH AND DOWN RANGE TARGET | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 3 CLIMB TO AN ALTITUDE OF 100 FT AGL | IMAGE – L/L PAD | <input type="checkbox"/> |
| 4 FLY DOWN RANGE STRAIGHT & LEVEL, ALIGN OVER DOWN RANGE TARGET | IMAGE – TARGET | <input type="checkbox"/> |
| 5 USING THE TELEMETRY, FLY THE AIRCRAFT IN A SQUARE PATTERN | SQUARE ON MAP | <input type="checkbox"/> |
| 6 RETURN TO ABOVE TARGET, ALIGN OVER TARGET | IMAGE - TARGET | <input type="checkbox"/> |
| 7 DESCEND TO 75 FT, YAW TO ORIENT HOME, ALIGN HOME | IMAGE – HOME | <input type="checkbox"/> |
| 8 YAW TO ANY DIRECTION | ORIENTATION SET | <input type="checkbox"/> |
| 9 WITHOUT USING TELEMETRY, ESTABLISH AIRCRAFT ORIENTATION | ORIENTATION IDENTIFIED | <input type="checkbox"/> |
| 10 MANUALLY RECALL THE AIRCRAFT TO THE LANDING PAD, ALIGN PAD | IMAGE – L/L PAD | <input type="checkbox"/> |
| LAND CENTERED FACING DOWN RANGE – CAPTURE IMAGE OF CLOCK – END OF TRIAL | | |
| IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY | | |

| |
|-----------------|
| SCORE |
| |
| RELIABILITY (%) |
| |

FAIL __ PASS

EXERCISE 2 – HIGH ALTITUDE OPERATIONS (ZONE 2)

DESCRIPTION:

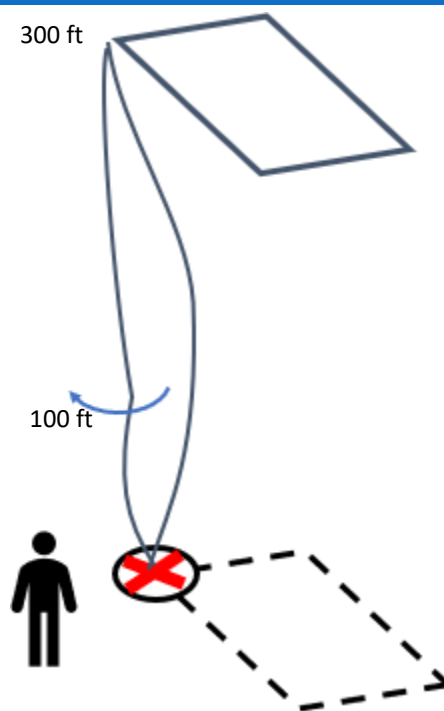
In this exercise, the student will fly to an altitude of 100 ft, rotate 180 degrees, continue to climb to 300 ft, complete a simple box pattern by utilizing supplementary information from the telemetry (altitude and heading readouts, map-view if available), orient to an unknown direction, re-establish aircraft orientation using push-pull technique and land manually. To aid in orientation, the pilot may reposition themselves to a further distance from the launch/landing pad.

LEARNING OBJECTIVES

- The student will demonstrate the ability to utilize flight telemetry for positive control.
- The student will demonstrate the ability to maintain positive control at significant distance and altitude.

SITE LAYOUT

Flight operations will be largely straight up and down above the launch/landing pad. Altitude set by telemetry – square pattern direction and size at the determination of the instructor.



PROCEDURES – HIGH ALTITUDE

| CAPTURE IMAGE OF CLOCK – LAUNCH FROM PLATFORM | | | ASSESSMENT | POINT |
|--|---|------------------------|------------|--------------------------|
| 1 | HOVER AT ALTITUDE OVER PAD | IMAGE – L/L PAD | | <input type="checkbox"/> |
| 2 | PILOT REPOSITION TO SIDELINE | VERBAL CONFIRMATION | | <input type="checkbox"/> |
| 3 | CLIMB TO AN ALTITUDE OF 100 FT AGL | IMAGE – L/L PAD | | <input type="checkbox"/> |
| 4 | YAW 180°, ALIGN PAD (UPSIDE DOWN) | IMAGE – L/L PAD (UD) | | <input type="checkbox"/> |
| 5 | CLIMB TO AN ALTITUDE OF 300 FT AGL | IMAGE – L/L PAD (UD) | | <input type="checkbox"/> |
| 6 | USING THE TELEMETRY, FLY THE AIRCRAFT IN A SQUARE PATTERN | SQUARE ON MAP | | <input type="checkbox"/> |
| 7 | PILOT REPOSITION TO PAD | VERBAL CONFIRMATION | | <input type="checkbox"/> |
| 8 | YAW TO ANY DIRECTION | ORIENTATION SET | | <input type="checkbox"/> |
| 9 | WITHOUT USING TELEMETRY, ESTABLISH AIRCRAFT ORIENTATION | ORIENTATION IDENTIFIED | | <input type="checkbox"/> |
| 10 | MANUALLY RECALL THE AIRCRAFT TO THE LANDING PAD | IMAGE – L/L PAD | | <input type="checkbox"/> |
| LAND CENTERED FACING DOWN RANGE – CAPTURE IMAGE OF CLOCK – END OF TRIAL | | | | |
| IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY | | | | |

SCORE

RELIABILITY (%)

FAIL __ PASS

EXERCISE 3 – FLIGHT NAVIGATION WITH FLIGHT CREW (ZONE 3)

DESCRIPTION:

In this exercise, the student will work with a Visual Observer to navigate to each of the targets in different orientations:

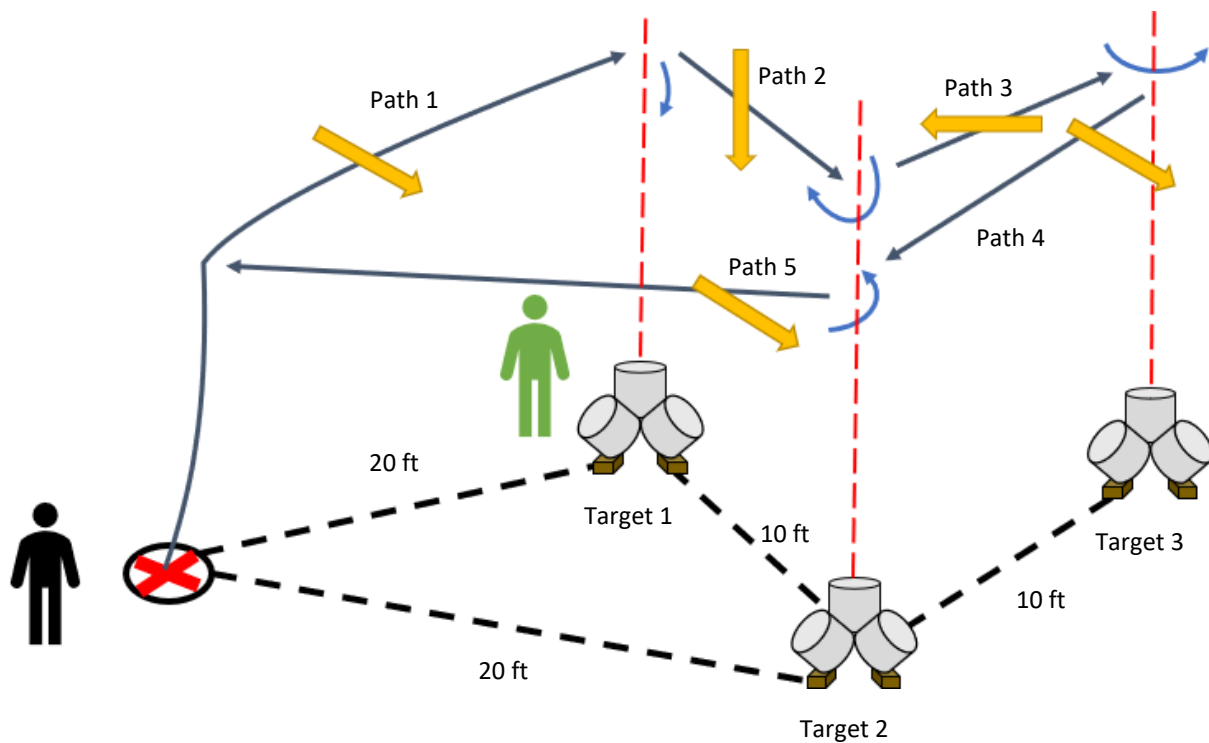
1. Move forward looking towards target.
2. Move laterally to the right looking at ground.
3. Move diagonally forward-right while looking at previous target.
4. Move diagonally backward-right after rotation 180 degrees from previous orientation.
5. Move backwards back to land.

LEARNING OBJECTIVES

- The student will demonstrate the ability to navigate around obstacles as the RPIC and as a member of a flight crew.
- The student will demonstrate effective radio communication and phraseology.

SITE LAYOUT

Lay out three targets in a triangle pattern – approximately 10 ft apart and 20 ft from the launch pad. Exact distance not required. NIST Omni Bucket Stand is utilized in the diagram and procedures but is not required for orientation or scoring. Both the pilot and the visual observer are to be graded.



EXERCISE 3 – FLIGHT NAVIGATION WITH FLIGHT CREW (ZONE 3) CONT.

| PROCEDURES – VISUAL OBSERVER | | |
|--|------------------------|--------------------------|
| AT PILOTS INSTRUCTION – REPOSITION NEXT TO BUCKET 1 | ASSESSMENT | POINT |
| 1 GUIDE PILOT TO BUCKET 2 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 2 GUIDE PILOT TO BUCKET 3 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 3 GUIDE PILOT TO BUCKET 1 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 4 GUIDE PILOT TO BUCKET 2 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 5 GUIDE PILOT TO PAD | VERBAL CONFIRMATION | <input type="checkbox"/> |
| RETURN TO PAD | | |
| IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY | | |
| | | |
| PROCEDURES – FLIGHT NAVIGATION | | |
| CAPTURE IMAGE OF CLOCK – LAUNCH FROM PLATFORM | ASSESSMENT | POINT |
| 1 HOVER AT ALTITUDE OVER PAD, ALIGN BUCKET 1 | IMAGE – 1A | <input type="checkbox"/> |
| 2 PATH 1 - FORWARD TO BUCKET 1, INSTRUCT VO TO BUCKET 1 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 3 ALIGN BUCKET 1, MAINTAIN ORIENTATION | IMAGE – 1 | <input type="checkbox"/> |
| 4 PATH 2 - FOLLOW VO INSTRUCTIONS TO BUCKET 2 | IMAGE – 2 | <input type="checkbox"/> |
| 5 ALIGN BUCKET 1, MAINTAIN ORIENTATION | IMAGE – 1B | <input type="checkbox"/> |
| 6 PATH 3 - FOLLOW VO INSTRUCTIONS TO BUCKET 3 | SQUARE ON MAP | <input type="checkbox"/> |
| 7 YAW 180°, MAINTAIN ORIENTATION | IMAGE – 1 | <input type="checkbox"/> |
| 8 PATH 4 - FOLLOW VO INSTRUCTIONS TO BUCKET 2 | IMAGE – 2 | <input type="checkbox"/> |
| 9 ALIGN BUCKET 3, MAINTAIN ORIENTATION | ORIENTATION IDENTIFIED | <input type="checkbox"/> |
| 10 PATH 5 - FOLLOW VO INSTRUCTIONS TO PAD | IMAGE – L/L PAD | <input type="checkbox"/> |
| LAND CENTERED FACING DOWN BUCKET 3 – CAPTURE IMAGE OF CLOCK – END OF TRIAL | | |
| IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY | | |

| |
|-------|
| SCORE |
| |

FAIL __ **PASS**

| |
|-----------------|
| SCORE |
| |
| RELIABILITY (%) |
| |

FAIL __ **PASS**

EXERCISE 4 – EMERGENCY RESPONSE (ZONE 4)

DESCRIPTION:

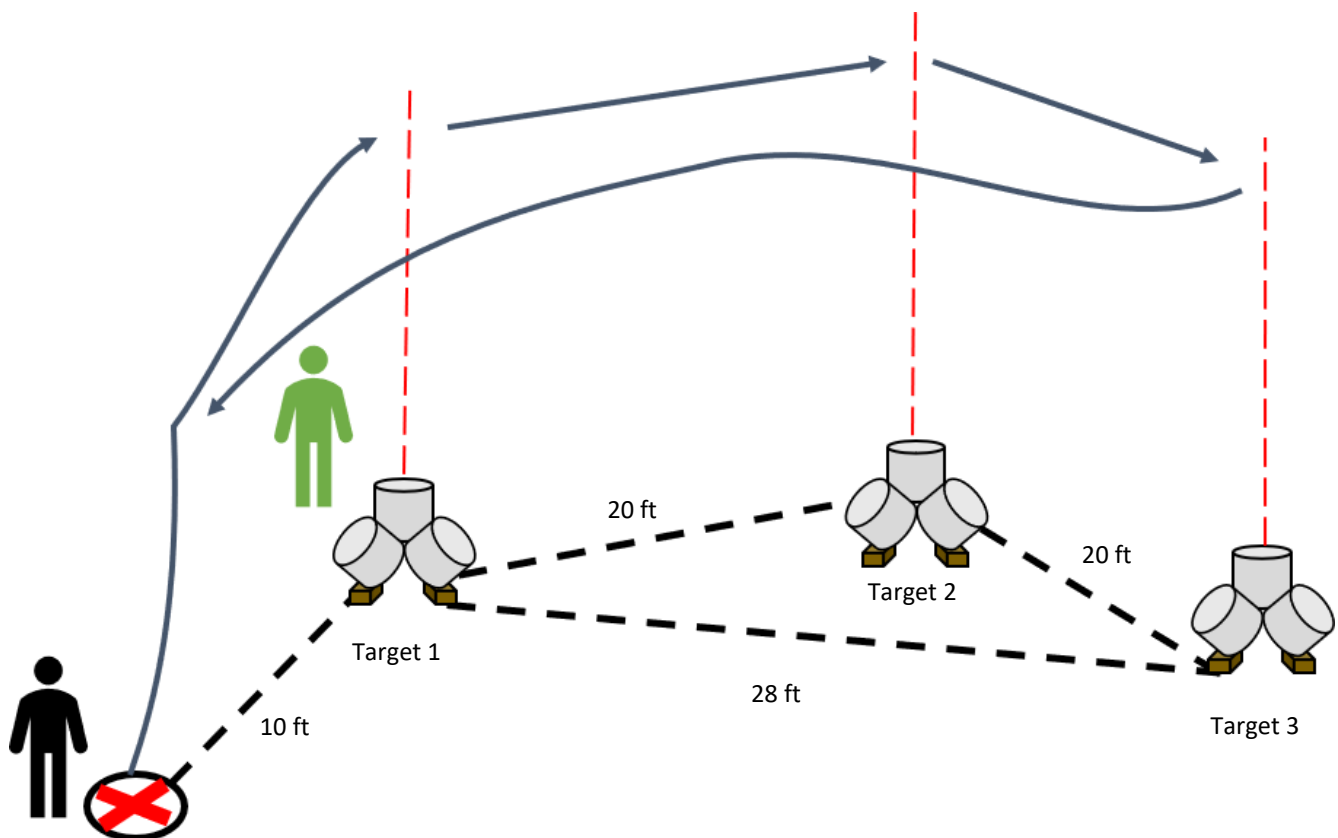
In this exercise, the student will work with a Visual Observer to resolve two emergency scenarios. The course proctor will select an emergency scenario each from Table 1: Scenarios A-C and Table 2: Scenarios D-F. The course proctor may improvise to

LEARNING OBJECTIVES

- The student will demonstrate the ability to analyze and respond to off-nominal situations.
- The student will demonstrate effective radio communication and phraseology.

SITE LAYOUT

Lay out three targets in a triangle pattern – approximately 20 ft apart and 10 ft from the launch pad. Exact distance not required. NIST Omni Bucket Stand is utilized in the diagram and procedures but is not required for orientation or scoring. Both the pilot and the visual observer are to be graded.



EXERCISE 4 – EMERGENCY RESPONSE (ZONE 4) CONT.

| PROCEDURES – VISUAL OBSERVER | | |
|---|---------------------|--------------------------|
| POSITION NEXT TO PILOT | ASSESSMENT | POINT |
| 1 DESCRIBE RESPONSIBILITY TO SCENARIO 1 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 2 RESPOND TO SCENARIO 1 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 3 DESCRIBE RESPONSIBILITY TO SCENARIO 2 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 4 RESPOND TO SCENARIO 2 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 5 GUIDE PILOT TO PAD | VERBAL CONFIRMATION | <input type="checkbox"/> |
| RETURN TO PAD | | |
| IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY | | |
| | | |
| PROCEDURES – FLIGHT NAVIGATION | | |
| CAPTURE IMAGE OF CLOCK – LAUNCH FROM PLATFORM | ASSESSMENT | POINT |
| 1 HOVER AT ALTITUDE OVER PAD, ALIGN BUCKET 1 | IMAGE – 1A | <input type="checkbox"/> |
| 2 FORWARD TO BUCKET 1, ALIGN BUCKET 1 | IMAGE – 1 | <input type="checkbox"/> |
| 3 FORWARD TO BUCKET 2 | IMAGE – 2 | <input type="checkbox"/> |
| 4 SCENARIO 1 – CIRCLE: A B C | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 5 DESCRIBE RESPONSE TO SCENARIO 1 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 6 RESPOND TO SCENARIO 1 | IMAGE – 3 | <input type="checkbox"/> |
| 7 SCENARIO 2 – CIRCLE : D E F | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 8 DESCRIBE RESPONSE TO SCENARIO 2 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 9 RESPOND TO SCENARIO 2 | VERBAL CONFIRMATION | <input type="checkbox"/> |
| 10 FOLLOW VO INSTRUCTIONS TO PAD | IMAGE – L/L PAD | <input type="checkbox"/> |
| LAND CENTERED FACING DOWN BUCKET 1 – CAPTURE IMAGE OF CLOCK – END OF TRIAL | | |
| IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY | | |

| |
|--------------|
| SCORE |
| |

FAIL __ **PASS**

| |
|------------------------|
| SCORE |
| |
| RELIABILITY (%) |
| |

FAIL __ **PASS**

SCENARIOS A – C: EMERGENCY WITH FLIGHT CREW

Table 1: Scenarios A-C

| | Scenario | Start Instructions | Resolution | Scenario End |
|---|-----------------------------------|--|---|----------------------|
| A | Flight Interruption by Pedestrian | Inform VO of pedestrians about to enter the flight area. | VO should guide pilot to stop or restart as appropriate. | UAS reaches Bucket 3 |
| B | Tablet Failure | Inform pilot of tablet failure and that Bucket 3 is the designated safe landing point. | VO should guide pilot to bucket 3 with verbal commands. | UAS reaches Bucket 3 |
| C | Intrusion by Helicopter | Inform VO of helicopter about to enter the flight area. | VO should guide pilot to stop, descent, or pause flight as appropriate. | UAS reaches Bucket 3 |

SCENARIOS D – F: PILOT EMERGENCY

Table 2: Scenarios D-F

| | Scenario | Start Instructions | Resolution | Scenario End |
|---|---------------------------------------|---|--|------------------|
| D | In-Flight Fire | Inform pilot of in-flight fire and that the Landing Pad is the designated safe landing point. | Pilot should give instructions to VO to get fire equipment ready, and to clear the flight area. Pilot should land immediately and recover the UAS when safe. | UAS lands at Pad |
| E | Bird Risk | Inform pilot that a hawk or other raptor bird is following the drone | Pilot should increase altitude, travel slowly before return home. Pilot should communicate to VO during resolution. | UAS lands at Pad |
| F | Interruption during Autonomous Flight | Inform the pilot to perform an automated return-to-home flight. Short after beginning the return to home, inform the pilot to interrupt the return to home to maneuver around an imaginary obstacle between Bucket 3 and home | Pilot should ask VO to guide around imaginary obstacle (towards Buckets 1 and 2) and return to home manually. | UAS lands at Pad |

EQUIPMENT

Omni Bucket Stands may be used but are not mandated. Any object or cone of sufficient size (2ft diameter minimum) may be used. Unlike the NIST Standard Test Methods, camera alignment accuracy is not used for score purposes. A large sized digital clock is recommend - time keeping is additionally not utilized in scoring, but is used for trial documentation.

EXAMPLE FIELD SETUP

The below diagram may be used as a guide for setting a field into four zones.

