

Capt. Mc Rainey (IP)

Pilot Information Bulletin

FLYING DIVISION

15 June 1971

TO : Udorn F/W Pilots

DATE: 13 June 1969

FROM : MFD/FW UDN

REF. NO. MF/FW-69-023

SUBJECT: Standard Drop Procedures

In order to gain greater accuracy in air dropping the following procedures are to be followed:

A. Ground reception parties will:

1. Report wind direction and velocity to the approaching drop aircraft.
2. Smoke or white phosphorous will be displayed for each drop.

B. Air crews will:

1. Request a wind briefing from parties known to have a radio.
2. Check with other aircraft in the vicinity for wind information.
3. Overhead DZ's without radio and wait for smoke or WP.
4. Drop one pallet on the first drop pass to observe wind affects.

The customer demands accurate delivery with the least possible damage to cargo. He has instructed his people to provide the assistance mentioned in Part A.

Air crews must report lax reception via "Trip Reports" so that the desired procedures can be established and maintained.

s/s James H. Rhyne

JHR/cs

cc: MFD/VTE
AB-1 AIR

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TO : All Pilots - SEA

Date

FROM : MFD-SEA

REF. NO. RCP-64-026P(R1)

SUBJECT: Air-dropping - Tips On
Technique

For the information and guidance of all concerned, attached is a short treatise on air-dropping as practiced by our company.

Various personnel have put quite a bit of thought into this memorandum and it is recommended that it be carefully read.

F. F. Walker

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ISSUED BY OPERATIONS TRAINING - BKK

AIR-DROPPING - TIPS ON TECHNIQUE

Below are suggested indicated airspeeds for air-drop operations. These speeds, of necessity, may be adjusted to meet local conditions such as turbulence, tight DZ, etc.

<u>Aircraft Type</u>	<u>Without Flaps Speed</u>	<u>With Flaps</u>	
		<u>Flap Setting</u>	<u>Speed</u>
C-46	105 knots	1/4	100 knots
C-47	95 knots	1/4	90 knots
C-123K	120 knots	70% jets	115 knots
DHC-4A	100 knots	15 degrees	85 knots
Ten-Two	105 knots	11 degrees	100 knots
DO-28	75 knots	Unable to open door and lower flaps simultaneously.	
Helio	70 knots	28 degrees	65 knots

Preliminary

The following is a guide for air-drop procedures in company aircraft. Due to variable meteorological conditions, area political situation, unusual operating conditions and individual pilot techniques it is realized that deviations from those procedures will often occur. These procedures are primarily intended as a guide for pilots initially assigned to the various aircraft programs, but should also be used as a guide by all pilots.

Prior to Takeoff

Obtain briefing from the Operations Specialist. Check the local situation map and plan your anticipated route not only from a navigation standpoint but also keeping in mind the presence of unfriendly areas. Just because you were familiar with the over-all situation previously doesn't mean that the situation hasn't changed during the interim. In case of a doubtful or suspicious DZ don't hesitate to have it checked out by the Operations Specialist. Incorrect coordinates have been given out in the past and this can occur again in the future. Consult with the AFS and other pilots (particularly Helio pilots) whenever there is any doubt.

Go over the inflight emergency signals and any special instructions with the AFS prior to departure, including his signals to denote where the cargo is hitting while dropping.

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In the event that the DZ is new to you, plan your route to the nearest known DZ or prominent landmark and then, using DR navigation, proceed from your known point to the DZ. If this final leg is a short distance of say 10-20 miles and precise navigation is used, it is impossible to fail to overhead your DZ.

While at the briefing map make up your mind where you will head in the event that you are hit while in the air-drop. Tell your crew so that everyone will have at least a rough idea where they are in the event it should become necessary to bail out.

Enroute

After take-off, make a wide circle of the airport and do not depart on course until reaching 3,500 feet over the airport. Plan to use a flight level of at least 9,000 feet for your MEA and don't forget your quadrantal rules.

All crewmembers will don parachutes or harnesses not later than shortly after reaching cruising altitude.

Normally, do not begin your let-down prior to reaching the DZ. Hold your altitude and overhead the DZ maintaining a safe altitude. (When in known friendly territory, however, it is permissible to let down on course enroute.)

If unable to locate a DZ from a safe altitude due to low clouds or poor visibility, proceed to an alternate. Do not descend to a low altitude to search for a DZ. Wandering around at a low altitude searching for a DZ is dangerous in more ways than one.

Over the DZ

Even if the DZ is well known, and you think the area is known to be friendly, do not descend until the proper signal is identified. If, upon overheading the DZ no signal is evident, it may be necessary to circle the DZ for a few minutes to enable the DZ personnel to move out and place the signal. Some camps lie at a considerable distance from the camp DZ.

If there is an apparent lack of human activity and no animals (in remote areas) are to be seen in the DZ area or around dwellings, exercise extreme caution. This generally indicates either a deserted DZ or, more importantly, the immediate presence of unfriendly forces.

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Here a set of cheap Japanese binoculars is very useful. A glass of six or seven power is recommended. More than seven power transmits too much of the aircraft's vibration. The 7 x 25 wide angle with 10° field is probably optimum. These glasses retail in Hong Kong for less than \$20.00 U. S. and can prove a lifesaver.

Circling to identify a signal affords the pilot an opportunity to evaluate the DZ, the surrounding terrain and the cloud cover, if any. At this time the pilot should mentally select his drop pattern and target area. Direction of the pattern should be based on combination of DZ direction (lengthwise), terrain features, cloud cover and any known unfriendly forces in the immediate area.

Whenever parachutes are to be dropped, wind direction and velocity must also be considered. Whenever practical, drops should be made on a heading which will give the pilot the most DZ to aim for, i. e., drop on a heading running through the length of the DZ as opposed to across the DZ.

In the event dwellings are near or on the DZ, select a heading which will preclude, in the event of an undershoot or overshoot, dropping into the dwellings. On some DZs it may be desirable to drop on an area other than that where the signal is located. This is a matter of pilot technique and judgment.

Prime consideration should always be given to the possible loss of an engine. Establish the drop pattern with this possibility in mind.

**ALWAYS LEAVE YOURSELF A WAY OUT IN THE EVENT OF ENGINE FAILURE.
PARACHUTES WILL BE WORN AT ALL TIMES BY ALL CREW MEMBERS WHILE
DROPPING IS IN PROGRESS.**

Descent to the DZ

Once the DZ has been visually identified, the proper signal recognized and it is ascertained that the drop can be safely completed, the PIC will inform the AFS to prepare the cargo for airdrop, advise the AFS of the target area and execute the A/D check list. It is important to execute the check list and particularly the magneto check (to check for a partial or complete magneto failure) prior to leaving a safe cruising altitude.

AIRDROP CHECK LIST

See the various aircraft check lists and CP memoranda.

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Spiral down over the DZ in a steep turn of 30-45 degrees of bank, as necessary, being careful to remain directly over the DZ which is presumably a friendly area. The terrain nearby may not be friendly. Wandering away from the immediate DZ area at a low altitude is not a safe practice.

Never descend at high speeds if any turbulence is expected. Always keep in mind that in mountainous terrain on a windy day moderate to even heavy turbulence can be expected at the lower altitudes.

Drop altitudes normally will be 800-1000 feet above the DZ for freefall drops and approximately 300 feet above the DZ for parachute drops. These altitudes will necessarily vary at times due to existing conditions. It is possible to drop parachutes from as low as approximately 200 feet. On the well-known sites the altitude is published, otherwise the altitude can be "eye-balled" with a little practice, or a low pass can be made over the DZ to determine its altitude.

If terrain clearance is a problem, avoid dropping towards high terrain. It is safer to drop either away from the high terrain or parallel thereto. If the DZ has considerable slope, it is best to drop rice into the slope rather than down the slope. Dropping down-slope tends to rip open the rice sacks as they tumble along downhill. Dropping into the slope, the rice bags will not move after hitting the ground.

If an emergency arises necessitating bailing out, the C-46 and C-47 autopilots can be engaged and the pilot can proceed to the rear of the aircraft and jump with minimum risk to himself. With the autopilot gyros caged and the indices lined up, the autopilot may be engaged in any flight attitude and it will hold this altitude long enough for the pilot to effect a safe exit. Time permitting it is preferable to level the aircraft. The autopilot may also be engaged at speeds as low as 100 knots in the C-46 and 90 knots in the C-47 when operating on one engine. This is an emergency measure and not a normal operating procedure.

Note that, even though caged, the directional gyro and autopilot indices require frequent minor adjustments in the course of an air-drop.

In the C-123K and DHC-4A aircraft the cockpit operated control surface locks may be used as are the C-46 and C-47 autopilots for this same purpose.

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In the Drop Pattern

The drop pattern normally consists of a race track pattern with a downwind leg, base leg and final. Upon entering the downwind leg the pilot will turn on the red light and ascertain visually that the AFS and AFD are ready to drop. On turning into final the pilot will turn on the green light to notify the cabin crew that the drop is imminent.

Unless the DZ is a large one, it is normally a good idea to drop only one pallet, initially, to serve as an aiming drop. Corrections can then be made for an aiming point for the balance of the load.

Each pilot seems to have his own method of aiming for free fall drops. Each method has some merit, but for a starting point in the case of C-46, if the pilot's head is held approximately over the alarm bell control and a sight is taken from that position to the corner of the side windshield where it joins the upright, at 105 knots and approximately 800' over the DZ, the dropping point is when the target comes into the corner of the "V". After the first pass, minor corrections can be made as required.

In the case of C-47, some pilots prefer to open the side window and drop with their heads out in the slip-stream. This is an accurate method, however, many other pilots do equally well by looking out of the corner of their eye and dropping when some landmark abeam the target comes into the "V" of the corner of the left rear portion of the forward sliding window.

It is imperative to remember that for consistent accuracy the same altitude and airspeed must be maintained on each pass.

If there is any appreciable wind drift it is best to pick up a heading on final that will give the desired track over the DZ and, when this heading is determined, the pilot can then switch to the directional gyro and hold the heading up to the drop point.

As soon as the bell is rung and the load is dropped (and not before), start your turn as there is no point in continuing any further beyond the DZ than is necessary. Always remember to stay as close aboard the DZ as practicable.

It is not a good practice to make extreme turns (over 45 degrees) in an effort to see where the load falls. Rely on the AFS for this information and, when on the downwind leg again, check with him to determine where the load hit in order to correct as necessary on the next pass. Normally, the base leg may be started when the target area passes the left wing tip.

A list of power-off stall speeds and turning radius for the various company operated aircraft are included on the next two pages.

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ANGLE OF BANK VERSUS STALL SPEED MAXIMUM GROSS WEIGHTS IAS KNOTS

C-46 - 48,000 lbs.

ANGLE OF BANK	0°	30°	45°	60°
STALL SPEED CLEAN	79	85	94	112
LDG. CONFIGURATION	66	71	79	94

C-47 - 28,000 lbs.

STALL SPEED CLEAN	69	75	83	98
LDG. CONFIGURATION	60	65	72	85

C-123K - 60,000 lbs.

STALL SPEED CLEAN	93	100	111	133
LDG. CONFIGURATION	79	85	94	113

BEECH TEN TWO - 10,200 lbs.

STALL SPEED CLEAN	79	85	94	112
LDG. CONFIGURATION	68	74	81	97

CARIBOU - 28,500 lbs.

STALL SPEED CLEAN	75	80	89	106
LDG. CONFIGURATION	56	60	66	79

HELIO - 3,000 lbs.

STALL SPEED CLEAN	50	54	60	71
LDG. CONFIGURATION	44	48	53	63

DORNIER - 5,400 lbs.

STALL SPEED CLEAN	30*	32*	36*	43*
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* The DO-28 cannot be stalled, power-off. The above stall speeds are based on using rated power in the stall.

NOTE: Speeds are power-off stall speeds except the DO-28.

Helio speeds are minimum flight speeds and are MPH, not knots. The aircraft does not stall. No speeds shown for the Helio Courier above 3000 lbs. gross weight.

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RADIUS OF TURN CHART ANGLE OF BANK VS RADIUS OF TURN IN FEET

	10°	15°	20°	30°	40°	50°	60°
90	4000	2800	1800	1200	700	600	500
100	5000	3300	2400	1600	900	700	600
110	6000	3900	3000	1900	1000	900	700
120	7000	4800	3500	2300	1300	1000	800
130	8200	5800	4200	2600	1600	1200	900
140	9500	6500	4800	3000	2000	1400	1000
150	11000	7600	5500	3500	2400	1700	1200

Airspeed
in
knots

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After Completion of the Drop

Don't fly around admiring your handiwork. Go to climb power and spiral up over the DZ area until reaching a safe altitude before proceeding on course. Make your radio report.

Be just as careful of your navigation on the way home as on the way out. Check rides have shown that more pilots carelessly fly over known unfriendly areas on the way home than on the way out.

GENERAL

Always use common sense and a safe technique when dropping. Remember, the loss of a crew and aircraft will harm any effort much more than returning a load. Do not fly into clouds when you are below surrounding terrain even though the clouds are broken or scattered. Do not let down until you are certain of your position and, once underneath the clouds, leave yourself room to maneuver clear of clouds. When flying at low altitudes in mountainous area and in bad weather conditions, leave yourself room to turn and reverse course if necessary. Stay to the right so the turn can be made to the left. Do not fly into the next valley until you can see enough of it to be certain that it is large enough to reverse course in if necessary. Use caution in flying up a ridge line at a low altitude on a windy day. Keep the direction of the wind in mind at all times. Remember, the leeward side of a ridge in addition to being turbulent will give you downdrafts whereas the windward side will give updrafts. Under high wind conditions, a lee wave will often be present well to the leeward and above the altitude of the ridge line. These leewaves can produce severe to catastrophic turbulence under some conditions. Also remember that, due to the increase in "G" loads, turbulence substantially increases stall speeds. In turbulence maintain the proper rough air speeds C-47, 120 knots; C-46, 140 knots (or 55 knots above stalling speed for your configuration in the C-47 and 60 knots for the C-46 and the C-123K); 133 knots (max.) for the Ten-Two, 102 knots for the DO-28, 119 knots for the Caribou and 98 mph (flaps up) or 65 mph (flaps down) for the Helio Courier.

The following table is for general information purpose. Observing the table we can see that a gust load of 2 "Gs" would increase the stall speed of an aircraft 41.4%. A 45 degree bank increases the drag on the aircraft 100%, and also increases the stall speed of the aircraft 18.9%.

While not exact, a commonly used conservative rule of thumb is that the stall speed increases with angle of bank as follows:

30 degrees - 10%

45 degrees - 20%

60 degrees - 40%

75 degrees - 100%

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Increase in Stall Speed Vs "G" Load

Angle of Bank	"G" Factor	% Drag Increase	% Stall Speed Increase
0	1.0000	0	0
5	1.0038	0.8	0.2
10	1.0154	3.1	0.7
15	1.0353	7.2	1.7
20	1.0642	13.3	3.2
25	1.1034	21.7	5.0
30	1.1547	33.3	7.5
35	1.2208	49.0	10.5
40	1.3054	70.4	14.3
45	1.4142	100.0	18.9
60	2.0000	300.0	41.4

In the unfortunate event that the aircraft does receive gunfire, don't be optimistic. It is almost impossible to evaluate the extent of the damage while in the aircraft. Break off the drop and send all crew members (including the co-pilot, if possible) to the rear of the aircraft adjacent to the main cabin door and tell them to be ready to jump upon signal. Head for friendly areas enroute home, send your drop-kick messages and try to keep everyone informed of your position and intent. If fire does break out in the engine, nacelle or wing, use the appropriate emergency procedures but unless the fire is extinguished at once, don't hesitate, leave her!

Caution: While our SEA based aircraft are, in the main quite stable when operated within defined limits, never forget that in a drop pattern. You don't make steep turns in a thunderstorm in like turbulence, so don't do it here. Clear air turbulence can be just as fatal as IMC turbulence.

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DOs and DON'Ts.

DO go over the inflight emergency signals and any special instructions with the AFS prior to departure.

DO plan your route to the nearest known DZ or prominent land mark in such a manner as to leave a final short leg to the DZ if the drop is not a familiar DZ.

DO make maximum use of the facilities of the Operations Specialists; it could save your life.

DO ask questions of other pilots, AFS, etc., if the drop is not completely familiar.

DO request a "checkout" on any doubtful coordinates.

DO remember that the situation is rarely static and that areas can change hands in literally a matter of minutes.

DO make up your mind prior to departure the safety route out that you intend to use in the event that you are hit, and inform the rest of the crew as to your proposed route.

DO circle the airport to at least 3500' before starting on course.

DO use an altitude of at least 9000' enroute, and remember your quadrantal rules.

DO checkout your survival kit; it could provide the only means of locating you if downed.

DO insist that the entire crew wear parachutes whenever in suspicious areas.

DO maintain a safe altitude until the DZ is positively identified except in well known cool areas.

DO proceed to an alternate if unable to locate your DZ from a safe altitude; there is always another day.

DO use extreme caution if the DZ area appears deserted - it could be under attack or hostile.

DO use your head in selecting the drop pattern - people have been killed by rice bags.

DO keep in mind the possibility of engine failure.

DO use your air drop check list before you descend.

DO spiral down over your DZ in a tight pattern; DON'T wander.

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- DO observe rough air speeds in turbulence or possible turbulence.
- DO keep your airspeed and altitude constant at release point - it is the only way maximum accuracy can be obtained.
- DO try to drop away from high terrain into low terrain if possible.
- DO remember to use your autopilot in case you have to leave her.
- DO keep as tight a pattern as practical - get the job over with.
- DO rely on the AFS to advise you of the drop pattern. DON'T use unnecessarily steep turns to watch the load fall.
- DO remember your stall speeds in various altitudes and configurations.
- DO keep in mind constantly the turning radius of the airplane.
- DO spiral up over the DZ to a safe altitude before proceeding on course.
- DO use precise navigation at all times.
- DO know your MEAs and use them in IMC flight.
- DO use common sense and observe good, sound, mature, professional judgment at all times.
- DO break off your mission immediately if aircraft is hit by ground fire, head for home and safety - it is impossible to accurately evaluate the damage while in the air.
- DON'T wander around at low altitudes searching for a DZ - it could kill you.
- DON'T drop on an incorrect signal even if you are positive it is the correct DZ without checking with Operations first.
- DON'T use unnecessarily steep turns to watch the load fall.
- DON'T fly around admiring your handiwork when the drop is completed - get out of there fast.
- DON'T rely solely on radio navigation aids.
- DON'T hesitate to dump your load in the event of engine failure.

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DON'T get caught by weather in valleys, canyons, etc. - always leave yourself a safe way out.

IF THE WORST COMES TO PASS AND YOU HAVE AN UNCONTROLLABLE FIRE, DON'T HESITATE - LEAVE HER!

30 April 1964